



Urban permaculture education

in Europe's school education

lesson manual
for teachers



Impresum

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Lesson manual for teachers



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Introduction

Dear professors and educators in secondary schools,

We have prepared a manual to assist you in teaching permaculture and its related topics. The manual comprises sixteen lessons and fourteen digital resources to aid you in preparing and delivering lectures and practical activities.

This manual was created as part of the “Education on Urban Permaculture in European schools” project and is designed for educators working with high school students. The work of the members of the association Permakultura Dalmacija inspired the idea for this manual. Their efforts led to the development of an education program on urban permaculture in the vocational course “Introduction to Urban Permaculture,” which provided comprehensive education on addressing the challenges faced by city dwellers.

Our goal with this project and manual is to make permaculture more accessible to secondary school teachers and students. To achieve this, we have adapted existing lessons, expanded on them, and created entirely new lessons on various topics. The manual will be published in four languages (English, Croatian, Serbian, and Romanian) and will be available on websites dedicated to urban permaculture. It will also include additional educational materials such as quizzes, educational videos, study cards, and interactive materials.

While this manual does not serve as a complete course program, we recommend that students be introduced to permaculture and its ethics and principles before starting any of the proposed topics (lessons). This will help students approach the subject like permaculture designers, focusing on analysis and problem-solving. The introductory lessons will be particularly helpful in this regard.

We also provide detailed analysis and design tools and encourage you to further expand your knowledge by consulting the extensive literature available on permaculture. Our recommendations can be found at the end of each lesson.

As per one of Bill Mollison’s principles, the yield is only limited by the creativity and understanding of the designer. We urge you to embrace this principle and find new ways to impart values, knowledge, and skills to your students, always striving for results that contribute to the well-being of the ecosystem, both locally and globally.

We encourage you to observe, analyze, be creative, and involve everyone who can assist you in this process. Best of luck in your endeavors!

Marin Kanajet, Graduate Permaculture Designer, Permakultura Dalmacija.



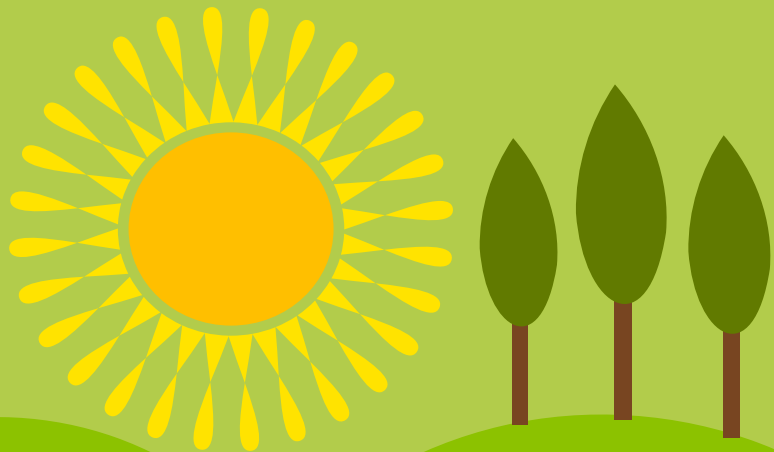
If you are new to the concept of permaculture, don't worry. We believe that you may already be practicing some of its principles. We have created a brief questionnaire for you to assess your lifestyle practices, some of which are covered in this manual.

What is permaculture? Ethics and principles of designing

Duration:

2 sessions of 45 minutes

Introduction to permaculture involves learning about the benefits of using permaculture methods and approaches to analyze and design various physical and social environments. This lesson serves as a foundation for other lessons within this program.



GOAL

Getting to know the term “permaculture” involves understanding the context in which it was created and the approach it takes to address social and environmental challenges.

INTRODUCTION/BACKGROUND

Permaculture emerged as a response to the social and ecological crises brought about by industrial food production and the unsustainable exploitation of limited resources for the global economy. Initially conceived as “permanent agriculture,” it evolved into a holistic approach for analyzing social reality and providing systemic solutions to observed problems. As a result, the name was shortened to “permaculture” to better reflect its universality.

Permaculture, as a design approach, forms the basis for developing more efficient systems that conserve energy, time, money, and resources. It involves creatively utilizing readily available resources to build soil, improve housing solutions, enhance community relations, increase harvests, and enrich the environment. The design integrates both traditional and contemporary knowledge and skills, shaping living spaces to mimic natural processes. Permaculture’s applications are diverse, covering individual and communal spaces, properties, organizations, neighborhoods, and workplaces.

Since its emergence, practitioners have explored new ways and areas of application, developing new techniques and tools. Permaculture can be applied across different climates, social and political contexts, and natural and social conditions. Ethical principles such as “care for the earth, concern for people, and fair

distribution of resources” provide the ethical backdrop for assessing practices and actions, ensuring that design principles and tools are tailored to and respect the diverse contexts in which they are applied.

David Holmgren identified 12 principles of permaculture design. These principles guide the design process to ensure that needs are met while respecting both natural and social circumstances. The goal is to achieve results that meet our needs without disregarding the needs of others within the systems we design.

LEARNING OBJECTIVES

- Understand the concepts of permaculture and permaculture design.
- Get familiar with permaculture ethics and principles.
- Gain insight into various applications of permaculture, with a focus on urban solutions.

PREPARATION/MATERIALS/TOOLS

- Blackboard/magnetic board, chalks/markers
- Projector and projection screen
- Educational cards - Ethics and principles

STEP BY STEP

1. Presentation:

- Discuss the origin and concept of permaculture, permaculture ethics, and principles



- Provide positive examples of permaculture, especially focusing on urban areas and examples in which students can participate

2. Group Work:

- Divide the students into four groups and give each group three cards, each containing one permaculture principle
- Each group should choose one or more examples presented during the presentation, relevant to the group of students, to recognize and explain how each principle was applied to meet a specific need or solve a problem
- Groups will discuss and present their conclusions, along with examples of alternative solutions or applications in different situations, comparing permaculture ethics dichotomies such as personal/social influence, local/global action, and private/public good

REFLECTION QUESTIONS

- How are you personally and society as a whole affected by environmental and social problems?
- What can we do to address these issues, both personally and as a community?
- What does permaculture mean to you? How and why was it created?

- What are the principles of permaculture ethics? Have you already implemented them in your life?
- Where can you apply permaculture in your school and your city?

Literature:

Bill Molison : Permaculture : A Designers Manual

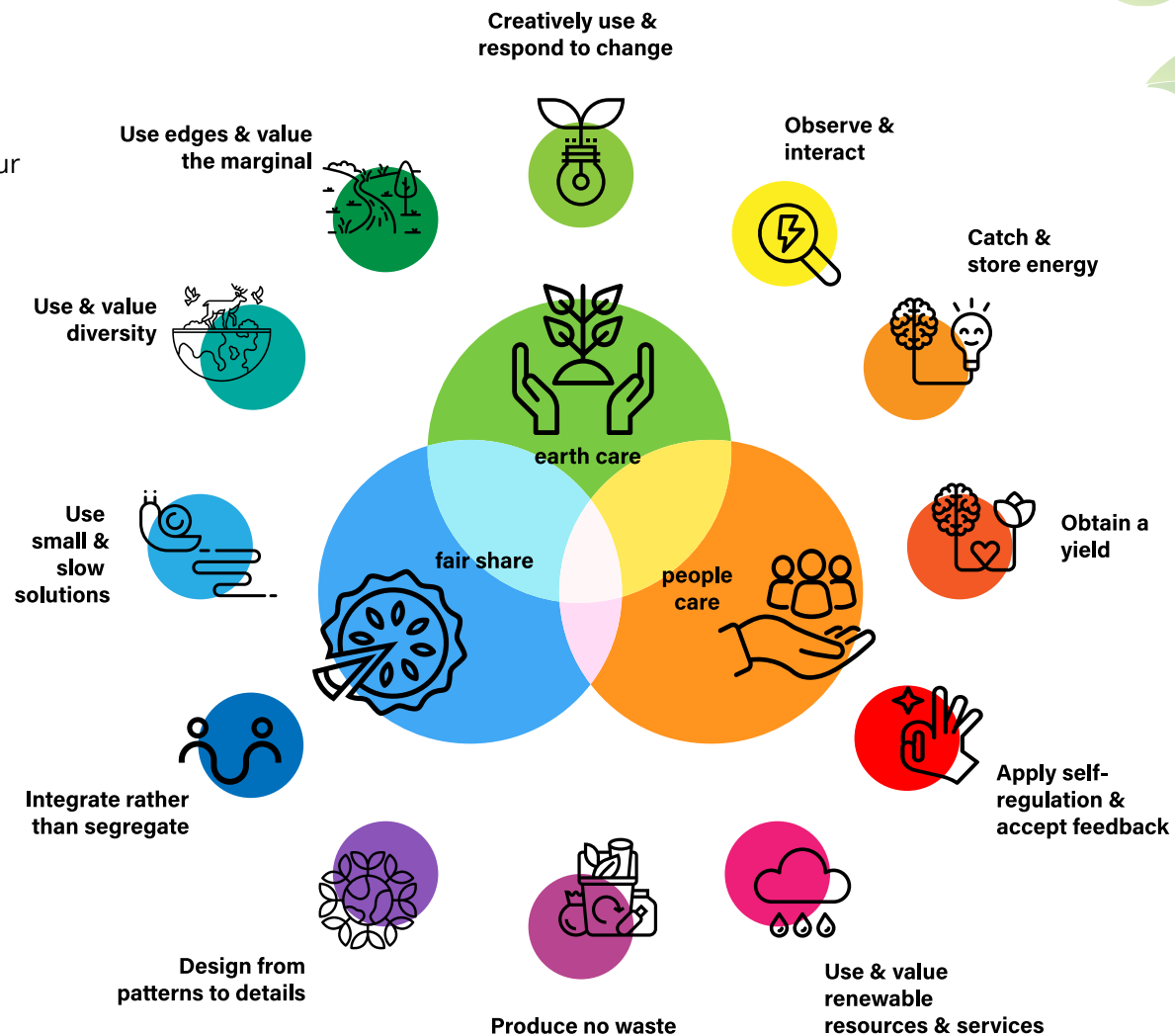
David Holmgren : Permaculture : Principles and Pathways beyond Sustainability

MATERIALS WITH THE LESSON



NOTE WITH THE NUGGET:

You can use cards featuring symbols of permaculture ethics and design principles to assign tasks listed in the lesson to individuals and groups of students. Each card contains an illustrated symbol and the name of the principle, serving as a reminder and incentive for students to recognize the application of a particular principle in their actions or in social



contexts presented in the lesson. Moreover, the cards can be used for recording questions and insights reached during the lesson. They can be distributed in a targeted manner or randomly drawn to achieve the effect of uncertainty. In lower grades, they can be used as a memorization game, including clarifications of discovered principles and connections with examples. You can design your own way of using these cards.

Permaculture analysis – 5 Elements analysis

Duration:

3 sessions of 45 minutes

Understanding the significance of conducting various types of analysis before initiating the design process is crucial. This involves analyzing five elements through environmental observation, as well as utilizing different methods of data collection such as maps, existing physical and online resources, and research techniques.

GOAL

Emphasize the importance of conducting quality analysis before initiating the design and implementing it. Highlight the complexity of the environment and the necessity of utilizing this approach to gather data beneficial for the design process.

INTRODUCTION/BACKGROUND

Permaculture design involves a complex process that includes respect for permaculture ethical principles, design principles, and the application of specific tools in order to create a design that is effective and meets the needs of the user. Various methods help us to understand the complexity of the environment we are designing in order to create a comprehensive design.

The most frequently used tools for permaculture design are: analysis of 5 elements, sector analysis, zoning, functional analysis, and design based on nature's patterns. The analysis of 5 elements represents energy, water, air, soil/food, and society. We not only analyze the existing situation, but also the potential the analysis area offers us, and our own needs to satisfy them with the final design.

Permaculture was created as a response to global crises, illustrated through the analysis of these elements, and our goal is to offer solutions to identified problems at both local and global levels. By conducting this analysis, we aim to connect collected data into systems during the design process.

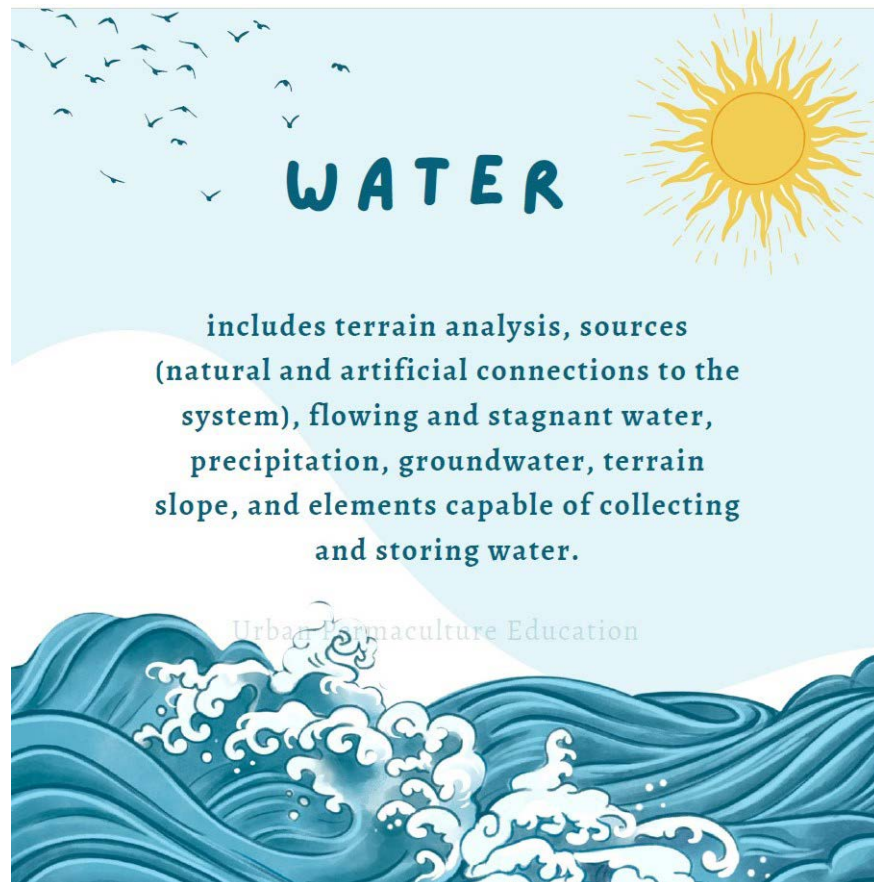
During the analysis, we should take the following into account:

WATER

Analysis of the terrain, sources (natural and artificial connections to the system), liquid and stagnant water, precipitation, underground water and the slope of the terrain and elements that can collect and store water

Need: water for household and irrigation

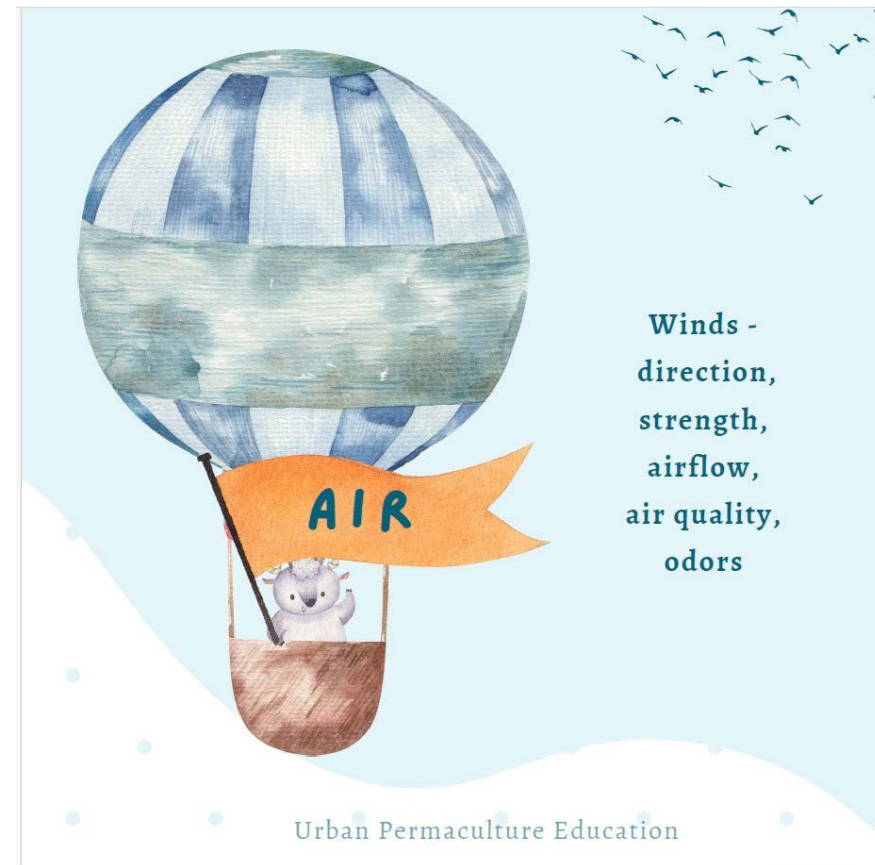
Potential problems: disposal of black and gray water



AIR

Winds (direction, strength), air flow, air quality, smells

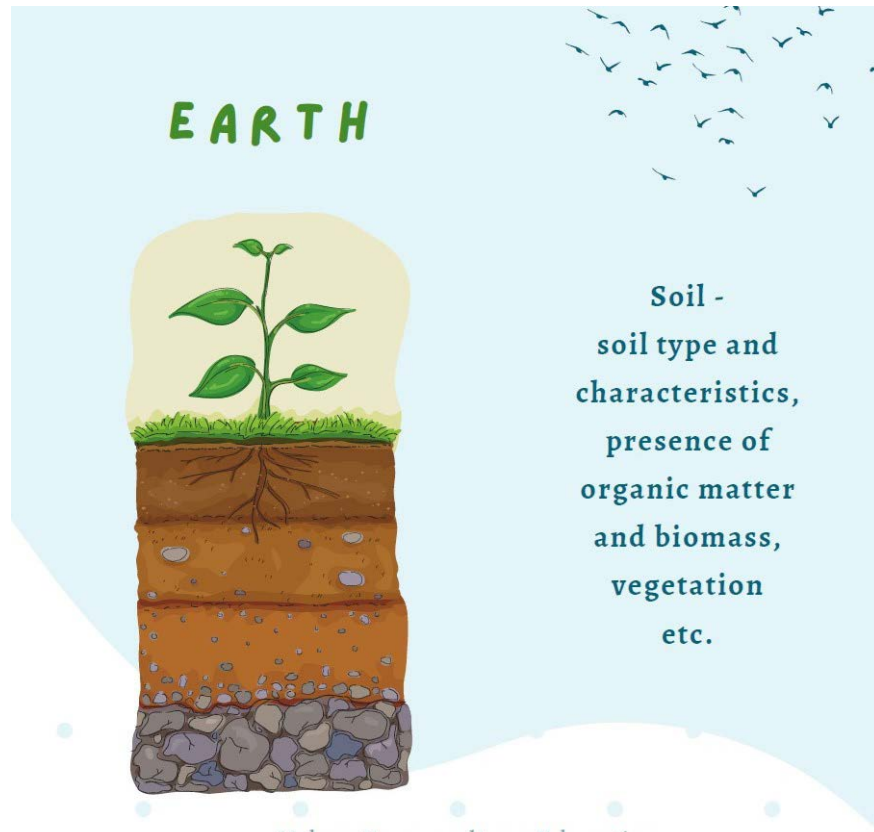
Potential problems: pollution, noise



SOIL

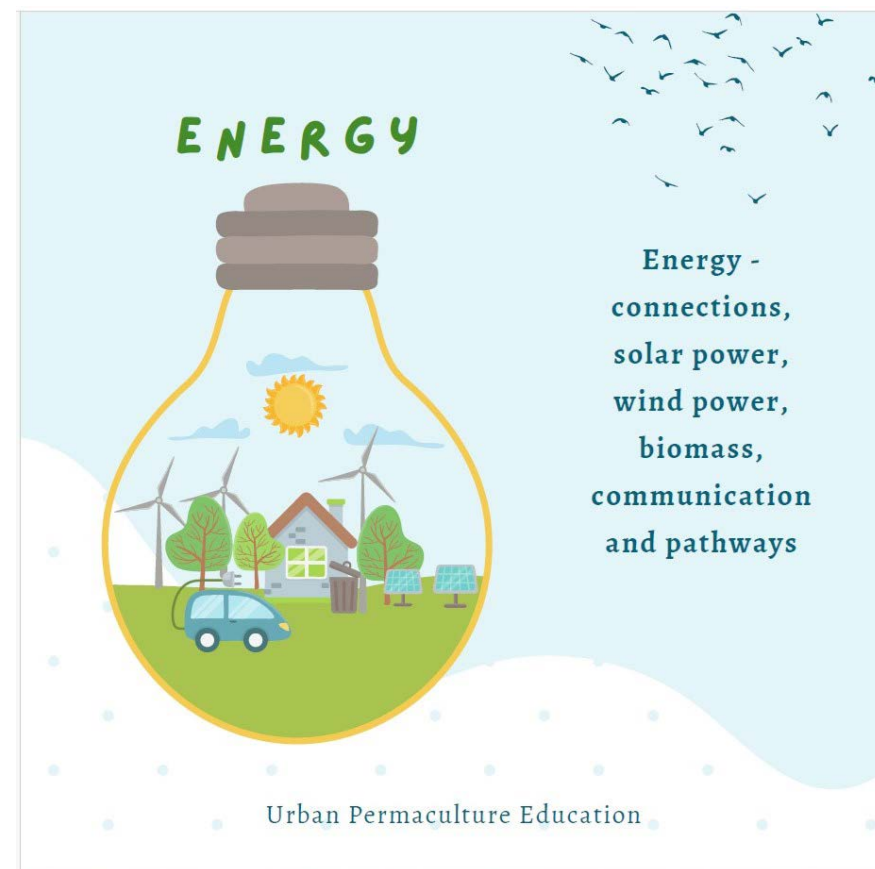
Type and characteristics of soil, existence of organic matter and biomass, plants

Potential problems: pollution, soil unsuitable for one of the purposes (gardening, building, or making a lake)



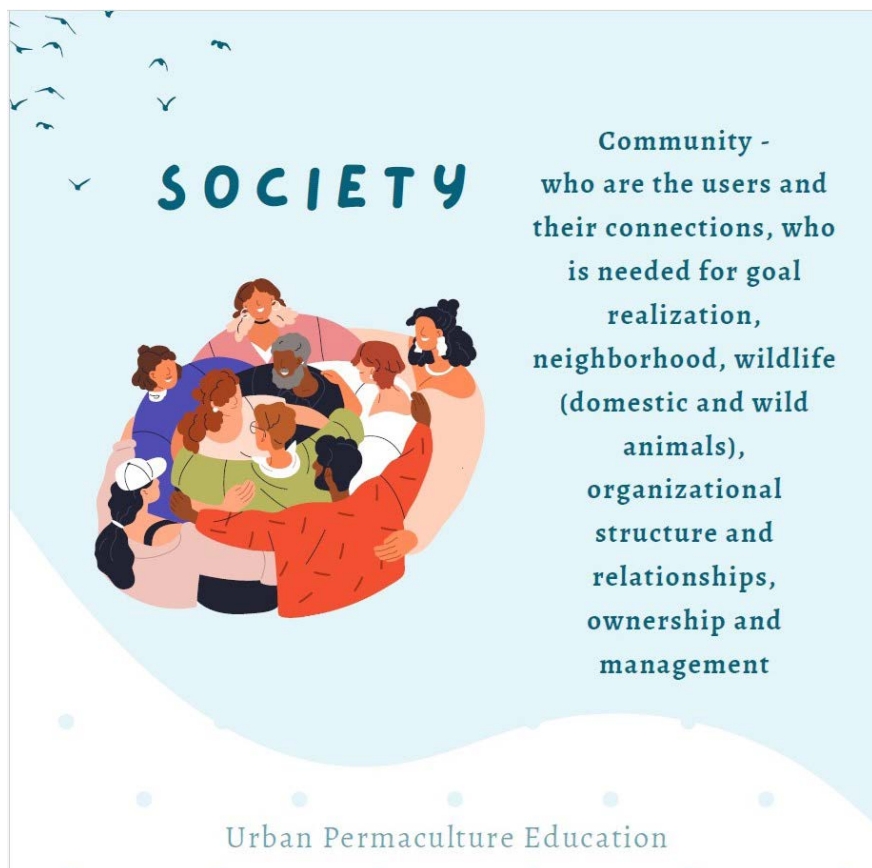
ENERGY

Connections to the energy network, sun, wind, biomass, communications, and roads.



SOCIETY/COMMUNITY

Who are the users and with whom are they connected, who is needed for the realization of the goal, the neighborhood, the animal world (domestic and wild animals), organizational structure and relationships, ownership and management.



LEARNING GOALS

- Understanding the concept and function of analysis.
- Exploring the concept of 5-element analysis.
- Learning how to conduct the analysis.
- Applying the 5-element analysis to a specific example.

PREPARATION/MATERIALS/TOOLS

- Blackboard or magnetic board
- Chalks or markers
- Projector and projection screen
- Table for recording insights

STEP BY STEP

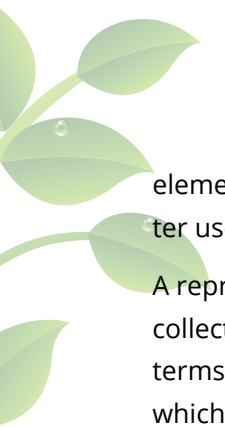
A. NEEDS ANALYSIS (45 MINUTES)

Objective: To determine the necessary requirements for achieving a specific goal, such as establishing a school garden, a vertical garden, or a school cooperative.

Question for students: What do we need to ensure in order to successfully achieve our goal and ensure its functionality?

Participants, divided into groups of 4-6 members, will collectively list essential needs and conditions for realizing the goal and ensuring its successful implementation on a shared sheet of paper.

Briefly introduce the lesson topic, which involves analyzing the 5 elements, and draw a “permaculture flower” on the board. Write the 5



elements in the petals of the flower, leaving the middle empty for later use to review permaculture ethics.

A representative from each group will present the terms they have collectively written, and in discussion with the other students, these terms will be recorded next to the corresponding petal (or more) to which they refer. This way, we will document all concepts and needs presented and collectively consider if anything has been missed. Detailed analysis of the needs is necessary in preparing the lesson to supplement the students' suggestions.

Let's conclude that we have conducted a needs analysis, categorized according to 5 elements, which we will further analyze in the specific field we aim to design.

B. Field analysis (45 minutes))

Objective: Our objective is to familiarize ourselves with the terrain we intend to design and to utilize all our senses to gather information from the space. If possible, we will visit the terrain we plan to design. Before heading out to the field, we will input the grouped needs from the previous exercise into the needs section of a table. This table is organized so that each of the 5 elements has three sections: needs, situation on the ground, and potentials/obstacles.

The students will be divided into groups and in the remaining sections of the table (prepared paper version), they will record the data collected in the field. Despite the fact that the same needs and the element's name will guide the students to search for things and phenomena that address the needs, we will instruct them to record as much information as possible obtained by all senses (sight, hearing, smell, touch) during the analysis. Furthermore, students will create a

map of the terrain and illustrate their observations with a legend and comments.

We will also introduce students to other methods of gathering information, such as reading a map, analyzing data such as sunshine and rainfall, wind patterns, and conducting interviews with individuals who can provide us with valuable information that we cannot obtain on our own.

C. How to meet needs in a real environment? (45 minutes)

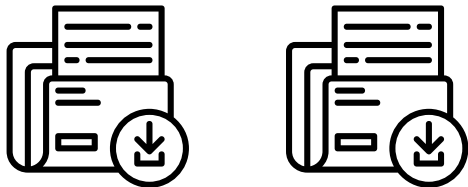
Objective: Compare the needs with the current situation and determine which needs can be met under existing conditions, and which require additional activities and the introduction of new elements. We will analyze the collected data and mark in green the elements that are useful for meeting certain needs, and link them to the needs they fulfill. For needs that cannot be satisfied with existing elements, or for which there are obstacles to satisfaction, we will propose solutions using the current situation or by introducing new elements. In the "potentials/obstacles" column, we will record our observations and indicate how we will utilize a certain potential or find a solution for a specific obstacle.



REFLECTION QUESTIONS

- Why is it important to set clear goals?
- Why is it important to identify needs?
- What did we analyze and what kind of analysis can it be?
- How did the analysis of 5 elements help us collect information?
- In what other cases can we apply the 5 elements analysis?
- What would happen if we started implementing the design without conducting an analysis?

MATERIALS WITH THE LESSON



Permaculture analysis – Sector analysis

Duration:

2 sessions of 45 minutes

It is important to conduct sector analysis before starting the design process. This will help us better understand the space we are designing and provide effective solutions that align with our wishes and needs.

GOAL

Conducting a sector analysis that provides a clear visual presentation of the anticipated impacts on a specific area we are designing, whether they are desirable or undesirable.

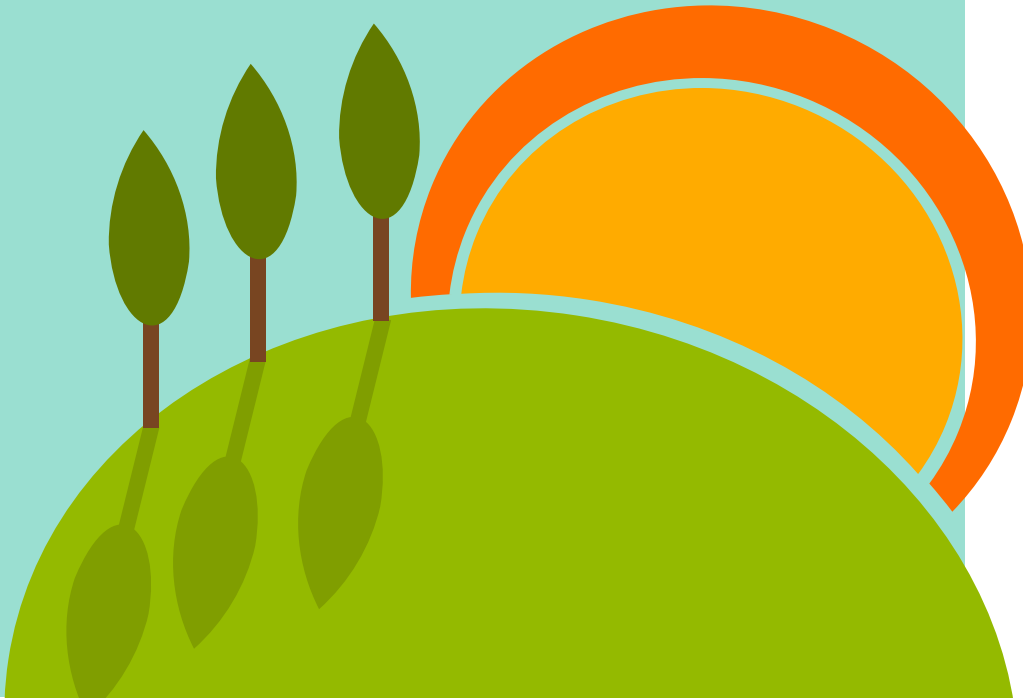
INTRODUCTION/BACKGROUND

Sectoral analysis is a tool used in permaculture to gather information for design. It is complemented by other analytical procedures, such as analyzing the 5 elements mentioned in the previous lesson. These procedures provide additional information about how natural and social phenomena influence the space we want to design.

Before conducting the sector analysis, we need to choose a reference point in space (or a specific, not too large area) for the analysis. If necessary, we can conduct the analysis for multiple points in space for the specific area we are designing.

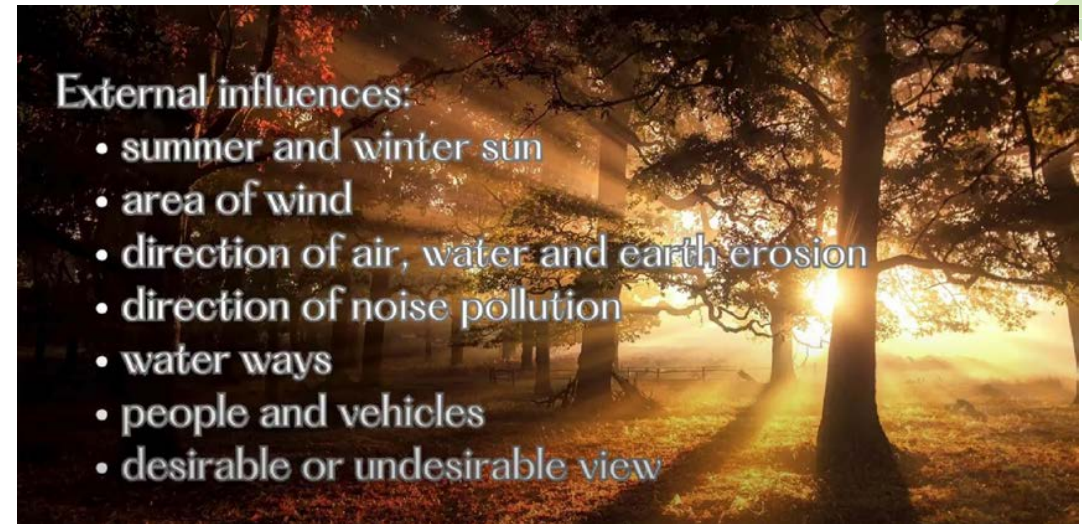
Starting from the chosen point, we observe all external influences acting on it. These influences are crucial because they impact the future use of the area. We consider influences from all directions, covering a full circle of 360 degrees around the reference point. The influences themselves can originate from one or more directions, or from a wider area.

We record these influences and often visually display them as lines or segments of a circle in the part of the circle from which they affect the observed area.



Please take note of the following influences:

- The area influenced by the summer and winter sun.
- The area influenced by each wind direction from the wind rose.
- Direction of air, water, or erosion pollution.
- Direction of noise pollution.
- Direction of water entry.
- Direction of movement (approach) of animals, birds, and insects.
- Direction of the approach of people and vehicles.
- The direction of fire danger.
- Area of desirable or undesirable view...



Keep in mind that sectors of influence encompass all external influences that intersect the observed space, such as a road or a stream.

It's important to understand the desired usage of the space and the necessary conditions in order to effectively utilize the information obtained through sector analysis.

We seek to embrace positive influences and leverage their beneficial traits by removing obstacles that may hinder their impact. Conversely, we aim to diminish or eliminate negative influences by introducing design elements that hinder their effect.

Sector analysis assists us in determining the location and type of design elements needed in the space.



LEARNING OBJECTIVES

- Familiarize yourself with sectoral analysis and its implementation method.
- Recognize the importance of understanding external influences on our design area.
- Learn how our design can influence external factors.

PREPARATION/MATERIALS/TOOLS

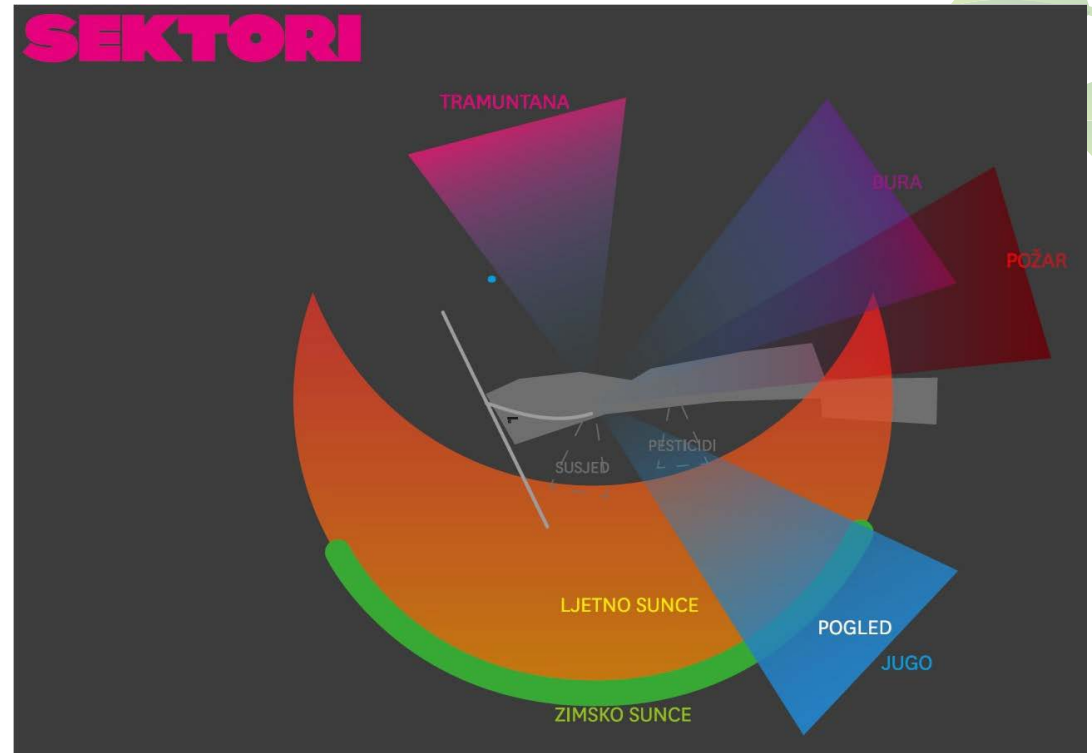
- A4 or A3 paper or terrain map
- List of influences
- Crayons
- Ruler and compass

STEP BY STEP

When conducting a sectoral analysis, we can do it in the classroom or out in the field that we are analyzing.

In the field, we use all our senses—sight, hearing, smell, and touch—as well as information from sources like the Internet, various applications, or literature such as atlases, encyclopedias, and maps. Additionally, people familiar with the terrain can provide valuable information.

To start the exercise, we introduce the concept and purpose of sector analysis to the students and explain the task—identifying and mapping sectors in the chosen terrain.



1. Start by selecting the terrain, preparing or drawing a terrain map, and defining the geographical position.
2. Draw a reference point on the terrain map.
3. Share the list of influences (sectors) and draw them on the prepared map as a task.
4. Draw sectors that can be recognized by the senses on the map.
5. Draw sectors that need to be explored through other sources (such as summer and winter sun, winds) on the map.
6. Define sectors that cannot be recognized or mapped due to lack of information and discuss how to obtain this information.
7. Ask if there are any other important influences that have not been mentioned.

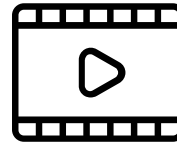
8. Once all impacts have been identified, discuss the desirability of each individual impact on the purpose and use of the terrain.

9. Provide suggestions on how to address the established influences with concrete solutions and elements in the space.

REFLECTION QUESTIONS

- In sectoral analysis, what do we call the external influences on the sector we are analyzing?
- What is the dominant influence in your sector analysis?
- How does it affect the entire system?
- Can we isolate just one influence and gain a true understanding of the situation based on that?
- Is it possible to eliminate sector influences? If so, why and how?
- Why do we perform a sector analysis?
- What are the methods for conducting sector analysis?

MATERIALS WITH THE LESSON



Permaculture analysis – Functional analysis

Duration:

45 minutes

In our design, each element serves a specific function, so we've carefully integrated and positioned them accordingly. In this lesson, we'll learn about functional analysis, understanding the role of each design element, and what is needed for it to function effectively.



GOAL

“The goal is to understand the complexity of the system, including each individual element and its connections with other parts. By analyzing each element’s function, characteristics, and needs for proper functioning, as well as the outcome of its actions, we can obtain valuable information about how to place it optimally in the system we design. This helps us achieve the best results while minimizing the use of resources and energy.”

INTRODUCTION/BACKGROUND

The principles that guide us when designing are:

“Let one element perform several functions,” which achieves efficiency and practicality, and “Let several elements perform same essential function”, which is important for system stability.

In order to accomplish that, we need to analyze the individual elements.

Every element serves a specific function, which is why we incorporate it into the system. For example, a garden bed is where we plant vegetables, a fruit tree provides us with fruits, and a faucet gives us access to water. Our goal is to fulfill users’ needs by strategically planning elements that cater to those needs. However, during planning, we often focus solely on one basic need that an element fulfills, without considering other needs that it could also partially or fully meet, as well as its interactions with other elements.

Functional element analysis

-Chicken-

Inputs &
Needs

- FOOD**
- WATER**
- SHELTER**
- OTHER CHICKENS**
- DUST**
- CARE**



Outputs &
Behaviours

- EGGS**
- MEAT**
- FEATHER**
- MANURE**
- SCRATCHING**



For the element to perform its function successfully, it is necessary to ensure certain conditions. To ensure that the garden bed can successfully fulfill its purpose of growing vegetables, it needs to meet certain conditions. It should be positioned to receive ample sunlight and be shielded from strong winds. The soil must be high quality with sufficient organic matter to provide the plants with the necessary water and nutrients for healthy growth. When planting a fruit tree or installing a faucet, similar considerations should be considered. The faucet should be easily accessible and connected to a water source to ensure practicality.

When we consider all the conditions and inputs a certain element needs, we reduce the chance of not providing everything necessary

for its optimal functioning and intended purpose.

Each element has its unique characteristics that affect its needs and the outcomes of its actions. These characteristics should be considered when choosing an element. Whether it's the type of animal, variety of vegetables, or a machine with different technical specifications, the specific characteristics of each element should be taken into account.

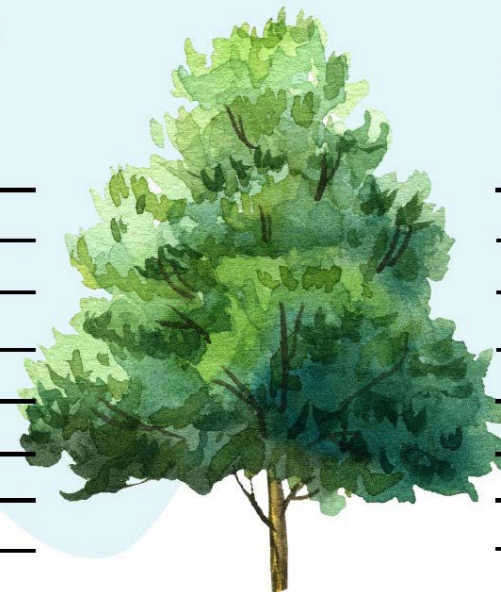
The presence of one element can be a requirement for the functioning of another. For example, for a composter to work effectively, we need kitchen and garden biowaste as well as paper waste from

Functional element analysis

-Tree-

Inputs &
Needs

WATER



Outputs &
Behaviours

OXIGEN



packaging. Therefore, it's practical to place the composter close to a source that provides the necessary raw materials for its operation. Additionally, the composter should be located near the garden bed where the produced compost will be used.

Let's apply this logic of thinking when designing, and the information gathered through functional analysis helps us to establish the most efficient network of relationships and connect elements in space by connecting processes into logical chains.

LEARNING OBJECTIVES

- Recognizing the needs, characteristics, and function of an individual design element.
- Gaining insight into the complexity of the system.
- Recognizing connections between different elements of the system.
- Connecting elements for system optimization.

PREPARATION/MATERIALS/TOOLS

- Blackboard and writing utensils
- Cards for analyzing and recording insights

STEP BY STEP

1. Select the element that will be the subject of functional analysis.
2. Invite the students to tell what we can get from the specified element (its function).

The diagram is titled "Functional element analysis" and is set against a light blue background. It features two columns of horizontal lines. The left column is labeled "Inputs & Needs" and the right column is labeled "Outputs & Behaviours". In the center, between the two columns, is a white, cloud-like shape with the text "Draw element" written inside it. At the bottom left of the diagram is a circular logo for "Urban Permaculture Education" featuring a stylized house and plant. At the bottom right is the Erasmus+ logo, which includes the European Union flag and the text "Erasmus+".

3. Ask them to tell what is necessary for its functioning.
4. And what are the characteristics/specificities of that element.
5. We write down all the information on the board according to the example of the "permaculture chicken" illustration.
6. Select one element in the chain before and after the analyzed element and repeat the analysis on them.
7. After you have three connected elements, indicate other connections and the possibility of branching in different directions and further in the chain.
8. At this point, let's present this method as a functional analysis tool and explain why functional analysis is important to us and

what the obtained results are for.

9. Let's relate the system we are designing to the individual element and element assemblies, as well as their position in space and the system.
10. Using an example, let's explain how permaculture design is a systemic design.

REFLECTION QUESTIONS

- What is an element in a system?
- What is a function of element?
- Why do we want one element to have multiple functions in the system?
- Why do we want more elements to perform important functions?
- How do we connect elements in the system?

MATERIALS WITH THE LESSON



My school garden as a community garden

Duration:

4 sessions of 45 minutes

It is getting to know the concept of urban community gardens and how they function in urban environments. How an urban garden is established and the possible forms of an urban garden concerning its purpose and management method. The social aspects and function of urban gardening and its role in community building will be specifically addressed. School open green spaces will be considered sites for school/community urban gardens. The urban garden as an element of urban green areas will be analyzed through the prism of permaculture design, both in the analysis segment and in the elements it consists of and their arrangement in space.



GOAL

In this lesson we will discuss the concept of urban community gardens and how such gardens function in urban environments. They will be encouraged to join existing gardens or establish new ones and connect with fellow students from their own and other schools, as well as with the community (teachers, professors, parents, and neighbours) that is part of or connected to their school. Throughout, they will be encouraged to approach the problem from the perspective of a permaculture designer.

INTRODUCTION/BACKGROUND

In modern urban environments, people often lack access to green areas for relaxation and leisure. The impact of climate change is particularly noticeable in cities with unique microclimatic conditions. Establishing urban gardens can help address these issues by utilizing existing spaces or creating new ones. This not only improves the aesthetic and functional aspects of the city, but also enhances soil quality through biogardening practices, improves air quality and microclimate through diverse planting, and encourages the reuse of resources such as rainwater and waste through composting and upcycling. Furthermore, urban gardens promote social interaction by involving the school community in their management and maintenance while working towards reducing the ecological footprint.

The benefits mentioned above can be realized and further promoted through urban school gardens, which are a type of space that resembles polygons.

Successful urban gardening practices can be found in many Eu-



ropean and world cities today. There are examples of models that should be analyzed and applied in the local context.

LEARNING OBJECTIVES

- Understanding the concept and function of an urban garden.
- Identifying the problems that can be solved through the various functions of an urban garden.
- Recognizing different models of use and management of an urban garden.
- Being aware of the social component of self-organization and participatory decision-making.
- Exploring alternative uses of school spaces, particularly green areas.
- Learning how to apply a permaculture approach to analyze, design, and work in urban gardening and urban gardens.

PREPARATION/MATERIALS/TOOLS

- Blackboard or magnetic board with chalks or markers.
- Projector and projection screen.
- Map of the school or location where education takes place.
- Photos of potential garden locations.
- Literature on urban gardens - qualitative research on user experiences.
- Poster with a list of five elements analysis (available throughout the course).
- Papers, pencils, and crayons.
- Links to literature on gardening, urban gardening, and the organization of urban gardens.



FIELD WORK (2-3 HOURS)

A trip to the school's urban garden - if it exists and is available to visit.



STEP BY STEP

A. PRESENTATION: GOOD PRACTICES OF URBAN GARDENING (45 MINUTES)

Objective: The presentation aims to showcase the various contexts in which urban gardens are established and to demonstrate the appearance and functionality of urban gardens in different cities. It will cover different definitions of urban gardens, their varied uses, and the different groups of users.

Before commencing the presentation, we will pose a question about the benefits of community gardens. The replies will be noted on the board. Throughout the presentation, these benefits will be elaborated with examples and supplemented with additional benefits:

- contribution to local self-sustainability
- preservation of biodiversity
- promotion of ecological food cultivation
- contribution to the preservation of local varieties and food sovereignty
- reduction of ecological footprint (personal and collective)
- mitigating the effect of heat islands
- contribution to the renewal of the hydrological cycle
- availability of healthy food
- promotion of healthy eating and healthy eating
- education
- development of ecological awareness and worldview
- personal development
- contribution to a healthier environment
- contribution to a more beautiful and rich image of the city
- a place of rest and recreation
- encouraging physical activity
- improvement of psychophysical condition
- connecting with nature
- development and strengthening of community and civil solidarity

- therapeutic and rehabilitative dimension
- inclusion of marginalized and vulnerable groups
- inclusion of individuals with special needs
- identification with space
- development of a culture of cooperation and participatory decision-making.

B. VISIT TO A SCHOOL URBAN GARDEN OR A SCHOOL LOCATION SUITABLE FOR AN URBAN GARDEN (90 MINUTES)

Objective: To see how an urban garden works in practice and the potential of space for the establishment of an urban garden.

B.1. A visit to the urban garden that includes communication with the manager of the urban garden and a presentation of the management and work organization model applied in the garden. A tour of the garden with a presentation of the elements that make up the garden and the activities/programs that take place in the garden. The visit also includes a conversation with some of the users of the garden (students and school staff), through which participants will be introduced to the experiences of participating in and working in a community garden.

Optionally, participants can take part in some of the work activities that take place in the garden or participate in the preparation and consumption of meals if such an opportunity exists.

B.2. A location in one's own school that has the potential to become a school urban garden is chosen and the location is visited to analyze the possibilities for the establishment of a school urban garden. (It is necessary to have several locations in preparation, from which one is

chosen for this activity). The location is analyzed with the tools offered by permaculture (see the lessons Analysis of 5 elements, sector and function analysis).

C. REFLECTION ON THE STUDY/ FIELD VISIT (45 MINUTES)

Based on experiences and recorded data (notes from visits to the garden/location and pre-recorded list of useful functions of the urban garden), and analysis of 5 elements, participants will conclude which benefits the example meets and to what extent. Also, based on the location plan/draft, the participants will list the elements they would include and argue for the locations of the elements and the connections between them. In particular, the relationships between garden users and ways of involving the wider community will be analyzed.

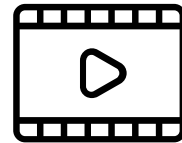


REFLECTION QUESTIONS

- Why are community gardens important in urban areas?
- Why is the social component of urban gardens important?
- What is the current use of areas that could be a school urban garden?
- Do I want and do I have the possibility to participate in the work of the existing urban garden?
- Do I have the possibility to participate in the establishment of an urban garden?
- What would happen if an urban garden were established in my school? What benefits would I get from it?



MATERIALS WITH THE LESSON

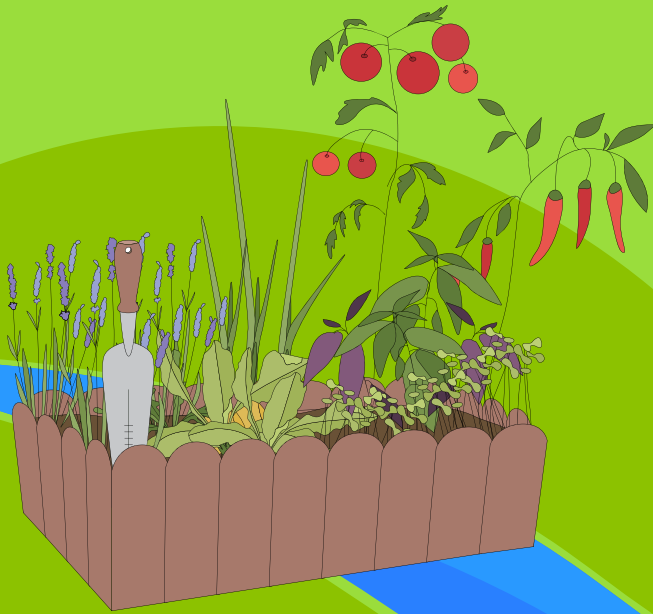


Literature : Gardeniser - <https://gardeniser.eu/en>

Small green spaces (courtyards, balconies...)

Duration:
2 hours

What are the methods for implementing permaculture practices to design and develop small green spaces in urban environments? Even the tiniest urban areas can be utilized to cultivate food.



GOAL

The goal of this lesson is to teach students how to use permaculture analysis and tools to develop productive green spaces in small areas like yards and balconies. They will also explore various solutions for growing food in small urban areas.

INTRODUCTION/BACKGROUND

It's possible to grow food successfully without needing a large yard or a huge greenhouse. Some of the most productive gardens can grow delicious fruits and vegetables in a small space, even in an urban environment.

All you need are design skills, materials, tools, and imagination. Techniques like vertical gardening and intercropping can help maximize your growing space. Even a small, sunny area on a balcony or terrace can be a great space for growing plants.

However, there are a few important points to keep in mind when growing food in a small space. It's crucial to start with analysis and design.

GROUND COVER

If you have a small yard in an urban area, it's important to check the depth of the soil. Sometimes, green areas are just a thin layer of soil over gravel or concrete. You can easily find out the soil depth by observing the plants in the area. Deep-rooted plants indicate enough soil for growing food directly, while shallow-rooted plants suggest the need for raised beds or pots without a bottom.

In most cases, yards are covered with concrete or tiles, so containers are the only option for growing food.



WATER

Small urban spaces can be vulnerable to excess water due to limited drainage. It is important to ensure that containers have proper drainage to prevent water damage. Be mindful of the water needs of each plant to avoid overwatering and provide good drainage for plants that prefer drier soil. Additionally, consider conserving water by utilizing local resources and recycling water from sinks or air conditioners.

SUN AND DAYLIGHT

Plants require sunlight and water, in addition to soil, to grow. In urban environments with limited space, a lack of sunlight can be a common issue. It is important to carefully assess the amount of sunlight and the level of lighting in the area where you plan to add greenery. The design of the space should take these factors into account, and plants that require a lot of light (heliophytes) should be

distinguished from those that can thrive in shade or partial shade (sciophytes).

AIR POLLUTION

When planning to grow food in an urban environment, it's important to consider the air quality in the area. Ideally, the location should be at least 100 meters away from any major road or highway, or it should be higher than the 3rd floor. Additionally, some plants can act as barriers and help mitigate pollution.

USE EVERY SQUARE METER IN THE BEST WAY

The incorporation of vertical gardens in this concept is highly beneficial for maximizing and utilizing available space. In this scenario, it may be necessary to plant vegetation in close proximity, so careful consideration of companion planting is important when growing food in small spaces. It's also wise to select fast-growing vegetables that can be harvested as they grow, such as watercress, chives, nasturtium, etc.

MAXIMIZING SPACE: TIPS FOR GETTING THE MOST OUT OF YOUR SPACE

COMPANION PLANTING

Companion planting involves planting two or more crops together in order to create a diverse and mutually beneficial environment. By combining plants that complement each other, we can increase the



amount of food grown per unit area. This method provides mutual physical support and protection among plants, positively impacts soil health, aids in pest control, enhances pollination, and provides habitat for beneficial insects.

CHOOSE COMPACT VARIETIES AND AVOID CROPS THAT TAKE UP A LOT OF SPACE

Carrots, broccoli, cabbage, and other crops come in different sizes. Look for small varieties labeled as “miniature,” “baby,” or “compact.” Select varieties that don’t require a lot of space and don’t have an aggressive growth habit.

APPLY SUCCESSION PLANTING

Implement succession planting, which involves growing different varieties of the same crop that mature at different times. Rather than planting just one crop of carrots, consider planting spring, sum-

mer, and fall carrots. Successful succession planting requires careful planning.

DON'T FORGET TO TRIM

Pruning is a great way to increase your harvest in a limited space. Unpruned crops like tomatoes, strawberries, and cucumbers can occupy more space than needed. Pruning helps the plant produce more fruit instead of directing its energy towards leaf growth.

DON'T FORGET THE MARGINAL AREAS

Remember to utilize the edges and margins of your garden, a key principle in permaculture design. Whether it’s a fence, a wall, or narrow beds, maximize the potential of these areas. For instance, you can plant perennial beds along the garden’s edge for companion planting. Lavender, rosemary, and other perennials can assist with pollination and pest control for your crops.

TYPES OF GARDENS IN SMALL SPACES

RAISED BEDS



VERTICAL GARDENS



GARDEN ON THE BALCONY OR WINDOWSILL



LEARNING OBJECTIVES

- Understand the prerequisites and possibilities of growing food in small urban areas.
- Learn to identify and analyze the existing conditions of a small space that will be transformed into a green area.
- Acquire knowledge on how to design a small green area.


PREPARATION/MATERIALS/TOOLS

- Meter
- Paper
- Ruler
- Pencils, pens, crayons
- Square meter garden planner
- List of companion plants


STEP BY STEP

Plan a garden on your balcony/terrace/yard

1. Create at least one-floor plan and section of the balcony/terrace/courtyard, and make sure to include the windows, fence, walls, and all existing elements on the balcony.
2. Take a photo of the selected space.
3. Analyze the selected space with the students using the 5-element analysis and sector analysis.

- 
4. Divide the students into groups.
 5. Distribute a blank floor plan to each group.
 6. Students have 30 minutes to create a basic design of the space with sketches showing plant pots. They should also research and think about different plants to include in their small gardens. Additionally, they should consider what tanks they will use and whether they'll collect and recycle water.

or

7. Start with a piece of paper to outline the space.
 8. Measure the entire area and visualize different layouts.
 9. Divide your garden into 3-4 different zones, such as annual vegetables, perennials, and decorative flowers.
 10. Decide on the shape of your beds, whether you want them to be rectangular, square, or another shape.
 11. For a small yard, elongated rectangular beds can work well.
 12. Determine the width of your paths based on the access you'll need near your flower beds.
 13. Look for opportunities to incorporate vertical or container gardening techniques.
 14. Study different layouts and choose the one that provides the most usable square footage.
- 

REFLECTION QUESTIONS

- Why is it important to have green spaces in small cities?
- What are the benefits of small urban green spaces for people and the planet?
- Can you create a small green space in your school or home?
- How might it affect your colleagues or family?
- What can you grow in a small green area?
- What is important to consider when designing a small green space?

Link:

<https://www.thespruce.com/companion-planting-with-chart-5025124>

Native and introduced species – Choosing the right plant for the right location

Duration:

3 hours of theory + 1 hour of practical part

The right plant, the right place!

The “right plant in the right place” principle can prevent many common ecosystem problems and potentially reduce green space maintenance requirements. Different plants have different growth requirements and not every plant is suitable for every place, especially in an urban environment where various elements of urbanization and nature interact. Not all plants are ideal for planting in your area, so research what plants are native to your area or what the growing conditions are like in your region.

Analyze with the students the environment and the environment of the area where you live. Familiarize them with native plants and the possible negative consequences of choosing a non-native, invasive plant.



GOAL

In this lesson, our aim is to enhance students’ skills in selecting the appropriate plant and planting location based on the plant’s requirements and its interaction with the surrounding environment. Additionally, participants will gain an understanding of the significance and outcomes of planting both native and non-native plant species.

INTRODUCTION/BACKGROUND

When planning new green areas, it’s important to consider the specific requirements of each location. Not every plant is suitable for every area, so it’s crucial to analyze the environment and its needs before choosing the right plant. It’s helpful to create a design on paper, including a floor plan and section, to understand the potential plant positions and their relationships with each other and the environment. The ultimate goal is to create a self-sustaining landscape that is in harmony with its natural surroundings and minimizes the need for excessive maintenance and resources. This type of landscape facilitates the work of those who manage it and promotes harmony between plants, microbes, soil, and air.

ENVIRONMENT

When designing a green area, the first and most crucial choice is whether it will be in harmony with the environment or have a negative effect on it. We can attempt to grow whatever we want, without considering the natural and domestic conditions of the



garden, or we can select plants and cultivation methods that align with the environmental conditions, both below and above ground.

Remember to consider the environment where the plants will be placed. Think about its proximity to roads, sidewalks, and the size of the area. The type of plant you choose will depend on the space available and its surroundings, so it's important to have valid reasons for your plant choices.

Connect your garden with the natural surroundings by selecting plants that attract local insects and animals, provide shelter, and serve as a food source. Aim to create plantings with multiple purposes and functions.

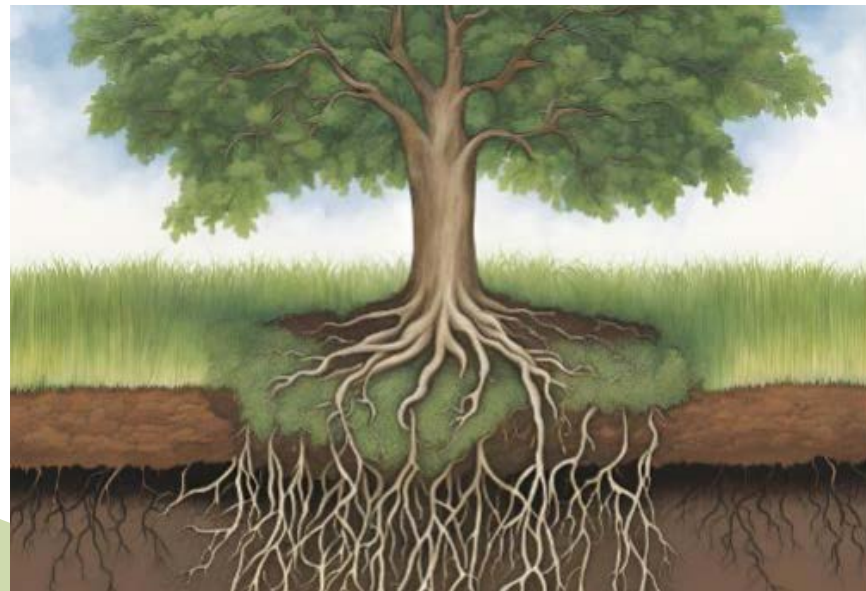
PERENNIAL / SEASONAL

The decision to plant perennial or seasonal plants depends on the purpose of the green space, available resources, existing needs, and preferences to be met. It can be a combination of both, depending on the maintenance and long-term plan for the location.

Annual plants complete their life cycle in one growing season. To grow the same plants again next year, you should collect their seeds. Many edible plants, such as vegetables and herbs, are annuals, making them an essential part of your vegetable garden or herb garden. Annuals are perfect for containers and smaller enclosed areas. With only a short growing season, they are unlikely to outgrow the container and require repotting.

On the other hand, perennials are plants that grow and produce fruit over several growing seasons. Once planted, depending on the crop, they can live anywhere from two years to a decade.

Perennials play a vital role in maintaining soil health. As they do not require replanting each year, they minimize soil disturbance and contribute to the thriving of soil organisms. Perennials have extensive root systems and store carbon deeper in the soil, where it remains more stable. In addition to sequestering carbon, perennial plants can enhance water holding capacity and reduce soil erosion.



EVERGREEN / DECIDUOUS

“When deciding whether to plant evergreen or deciduous trees, a combination of both can be a good choice. It’s important to consider the specific needs of the green areas. Evergreen plants, which grow tall, provide shade year-round. On the other hand, deciduous plants can allow more sunlight during the colder months in some cases. In smart passive design, evergreens are typically planted in the north to act as windbreaks, while deciduous plants are planted to the south or west of buildings, gardens, and parks.

It’s best to have a healthy mix of deciduous and evergreen trees in your yard. Deciduous plants offer beautiful fall foliage and good shade when fully grown, while evergreen plants provide privacy and act as wind protection for years.”



SIZE AND SHAPE

When considering plant size, it’s important to plan for the future. We need to consider both above and below ground development and growth of the plants. If we densely plant species with large roots or crowns in a small area, the plants won’t have enough space to grow properly and will overcrowd other nearby plants. When planting young trees, it’s crucial to anticipate their future growth in both height and width. Larger trees should be spaced apart to allow room for their growth, and they shouldn’t be planted too close to buildings or roads.

Similarly, smaller trees and fruit trees require space for their crown development, which can obstruct pathways and other features.



INDIGENOUS / NON-INDIGENOUS

Observing the environment, we can easily recognize the plants that have always existed there - they are called autochthonous plants. These plants adapt easily once planted, as they are accustomed to environmental conditions and are able to withstand local weather conditions, including winter cold and summer heat. They may not need as much care as other plants once they are well established and growing, and they are resistant to most pests and diseases. All these features mean that native plants meet the sustainable needs of today’s urban gardener.

On the other hand, we can notice non-native plants everywhere. So-

ometimes they become invasive species that are difficult to get rid of once they start spreading. This is an important reason to think carefully before planting a non-native plant. However, sometimes it can even be beneficial to introduce new plant species into the environment because they can have beneficial effects. In this case, we must be sure that they are not invasive and that they will not aggressively interfere with the existing environment, creating an imbalance.

Consider integrating “volunteer” seedlings of native plants (plants that have grown wild in the area and are often considered weeds), rather than indiscriminately weeding them. Conversely, avoid planting non-native plant species that could invade and disrupt nearby natural areas.

CHOOSE VARIETY

Use a wide variety of plants that complement and balance each ot-



her horticulturally and decoratively. Include a variety of trees, shrubs, and perennials to provide structure. Plant them with a number of edible and ornamental annuals to increase variety and yield. Combine nutrient-demanding plants, such as tomatoes, with nitrogen-accumulating plants, such as legumes, to balance and restore soil fertility.

MANAGE NATURAL PROCESSES

Create a compost pile for spent vegetation and uneaten produce to return their nutrients and organic matter to the soil. Use mulch with beneficial additives and fertilize with organic materials that support beneficial soil microbes and increase organic matter. Disturb the soil as little as possible to maintain its structure and to avoid bringing buried weed seeds to the surface to germinate.

Keep the “good” insects at bay by using plants that attract them. Cut back native perennials in early spring, not fall, to provide food for birds, protection from erosion, and shelter for beneficial insects.

LEARNING OBJECTIVES

- Acquiring knowledge about the local flora.
- Acquiring knowledge about the specific characteristics of different plants.
- Developing the ability to analyze a location to determine if it can be enhanced by introducing new plants.
- Learning to design urban green areas based on a careful selection of plants.

PREPARATION/MATERIALS/TOOLS

- Paper bags
- Paper, newspaper
- Herbarium folder
- Scotch tape
- Pencils
- Literature on the topic of plant species

STEP BY STEP

CREATE A HERBARIUM

1. Take the students for a walk in your immediate surroundings and take photos of the plants you find.
2. Collect as many plants as possible in paper bags (leaves and stems, for trees only leaves).
3. Identify plants using books, apps, or others. Determine whether they are indigenous or non-indigenous.
4. Find out as much as you can about the plants and write them down.
5. Place them between sheets of newspaper.
6. Print them in the book together with the paper with the name of the plant and the description.
7. Leave the plants to flatten and dry in the books for a week.
8. Put them in the herbarium.
9. Share your new knowledge with the rest of the school (exhibition, wall newspaper...).

or

10. Take the students for a walk in their immediate surroundings.
11. Sketch the surface, including all the elements.
12. Identify any plants that are already there.
13. Use books, apps, or other resources to identify the plants. Determine whether they are indigenous or non-indigenous.
14. After the analysis, write down which plants to plant, where, and why, to improve and enrich the existing conditions.
15. Share your new knowledge with the rest of the school through an exhibition, wall newspaper, or other means.

REFLECTION QUESTIONS

- Why is it important to analyze the location and its characteristics before planting?
- What native and non-native plants grow in your area?
- What important plant characteristics should we consider before planting?
- What effects can plants have on existing or planned urban green areas?
- How do non-native plants affect the environment?

Soil, construction and regeneration

Duration:

2 hours

In this lesson, the instructor discusses the significance of soil for micro- and macro-ecosystems, as well as the tools for constructing and regenerating soil.



GOAL

The aim of this lesson is to emphasize the significance of maintaining healthy soil, practicing soil conservation, and understanding soil formation. It will also highlight different methods of creating and maintaining healthy soil, both in urban environments and in gardens or larger areas.

INTRODUCTION/BACKGROUND

Healthy soil is the foundation of all terrestrial life on Earth. Its health is crucial not only in agricultural areas, but also in forests, uncultivated areas, and urban settings.

Healthy soil is essential for the growth of plant cover, which directly and indirectly supports life by:

- Filtering and purifying water
- Supporting vegetation growth and enabling nutrient circulation
- Regulating the atmosphere and playing a key role in climate regulation through gas storage (e.g. CO₂)
- Providing resilience against extreme events such as drought or flooding (soil hosts 1/4 of the planet's biodiversity and is one of the most complex ecosystems)
- Housing a multitude of macro- and micro-organisms that contribute to global nutrient cycles and enable life on Earth (according to the FAO, over 95% of food comes directly from the soil)
- Serving as a source of calories, carbohydrates, proteins, fibers, minerals, oils, and medicines





SOIL TYPES

Considering the size of mineral particles, soils can be classified as:

- Clay < 0.002 mm
- Clay (powder) from 0.002 to 0.05 mm
- Sand > 0.05 mm

The composition of a soil sample, including its mineral particle sizes, indicates the type of soil, usually a mixture of clay, silt, and sand in varying proportions.

CHEMICAL PROPERTIES OF SOIL

The acidity or alkalinity of the soil depends on its chemical reaction and affects which plants can grow best. Most soils have a neutral pH, or close to it, being slightly acidic or slightly alkaline. Soils with extreme acidity or alkalinity are very rare.

SOIL ORGANIC COMPONENT AND SOIL FERTILITY

LIFE IN THE SOIL

The entire soil food web relies on plants. Through photosynthesis, plants take carbon from the air, use some for themselves, and release the rest into the soil as simple sugars.

The soil is home to many types of microorganisms, ranging from simple bacteria to complex fungi, amoebas, flagellates, and nematodes. Just like the visible world, there is a bustling microscopic life.

Some microorganisms work together with plants, forming symbiotic relationships by living on the sugars that plants release through their roots. In exchange, they protect the plants from harmful organisms and provide them with essential nutrients. Others are parasites or act as hunters, while some help decompose dead organic matter.

Living organisms capture carbon and nitrogen from the atmosphere, gradually increasing the amount of biomass in the soil. Microbiological processes transform dead organic matter into humus over time.



HUMUS

Humus is formed when dead organic matter is converted into complex compounds through a process called humification, which is driven by microbiological activity in the soil.

- Humus gradually releases important nutrients for plants such as nitrogen, phosphorus, and potassium.
- It is composed of 75% water and 25% dry matter, including humic acid, humin, and fulvic acid.
- Humus contains up to 60% carbon and up to 6% nitrogen.
- Fertile soils typically contain between 3% and more than 10% humus.

SOIL FERTILITY

Soil fertility is the soil's ability to support plant growth, and it depends directly on the amount of humus in the soil.

Regardless of the soil type, the increase in organic matter, and the gradual increase in the proportion of humus in the soil, improves the soil's structure and texture, enhances water absorption and retention, and improves soil permeability. All of these factors directly contribute to improved soil fertility.

CONVENTIONAL TILLAGE AND NEGATIVE CONSEQUENCES

FROM THE BEGINNINGS OF TILLAGE TO THE PRESENT DAY

Since the early days of agriculture, humans have used a variety of to-

ols to cultivate the land. They started with wooden sticks and ploughs, and later transitioned to using domesticated working animals with ploughs. Over time, wooden tools were gradually replaced by metal ones. As farming areas expanded, the need for stronger work animals grew, leading to selective breeding for larger and stronger animals. This allowed for the cultivation of larger areas and deeper ploughing of the soil. Additionally, simple ploughs that only furrowed the surface were replaced by more advanced ploughs that turned over the earth. As agriculture expanded, forests were cleared for grazing, resulting in the decline of wilderness areas and a decrease in the number of large carnivores in Europe, with some species disappearing completely.

Since the introduction of internal combustion engines and the availability of cheap oil, the frequency and depth of mechanical tillage have significantly increased. Agricultural machinery has become bigger and stronger, leading to more frequent crossings over arable land.

In the 1950s, the use of mineral fertilizers and pesticides increased. Plots have grown larger, and monoculture cultivation of several species has become the basis of food cultivation. Hybrid wheat, corn, and rice have become the primary crops. Yields per hectare have more than tripled since the 1950s. The way we raise animals has also changed, with cattle and sheep moving from pastures to large industrial farms, relying on food grown on arable land.

However, this success in breeding comes at a cost. The reduced variety of cultivated crops has led to an overall reduction in biodiversity, with natural habitats shrinking and disappearing.

Plowing and turning over the land degrades and destroys microbiological soil ecosystems. Increased oxidation returns to the atmosphere a greater amount of carbon than the land is able to absorb. The amount of humus in the soil decreases and disappears. The soil loses its ability

to absorb and retain water. Bare plowed land is vulnerable to erosion caused by wind and rain.

Spraying monoculture fields with pesticides indiscriminately poisons all organisms, both those we are trying to suppress and those that are collateral victims. All living things are suffering, both above ground and soil microbiology.

Excessive use of mineral fertilizers does not contribute to soil health either. Plants absorb and use only a small part; the rest seeps into the deeper layers of the soil and pollutes underground and above-ground water.

STRATEGIES FOR MAINTAINING FERTILE SOIL AND RESTORING DEPLETED SOIL

STRUCTURAL CHANGES OF LAND

In order to minimize and prevent soil erosion caused by water movement, we implement various structures. Depending on the climate, soil type, terrain slope, and precipitation frequency and amount, we select the most suitable solutions for our specific conditions. The objective is to decelerate water movement across the terrain and evenly distribute it. Slower-moving water has more time to seep into the soil, making it more beneficial for plants, especially agricultural crops. Drywalls, terrain terracing, swales, accumulation channels based on contour lines, dams, and similar structures are tools that enhance rainwater absorption into the soil. Additionally, ponds, puddles, reservoirs, and other water storage methods can be used to store excess water for use during dry periods.

Excess water on the ground can be drained using drainage channels, absorption wells, and ditches. It is important to carefully plan any stru-

ctural changes to the land before starting any work. A well-designed and implemented water management system is a long-term investment in soil health.

REDUCED TILLAGE

The use of heavy machinery on the cultivated plot directly impacts soil compaction. The tractor, which is the towing vehicle, pulls the necessary attachment for the work. By following the sequence of plowing, disking, harrowing, sowing, and top-up with liquid fertilizer, the tractor can be connected to perform multiple operations in one pass, reducing soil compaction and saving time and money on fuel.

Plowing overturns the soil layers, burying the upper humus layer and plant cover while bringing the lower soil layer to the surface. This process increases the soil's exposure to air (oxygen) and causes the oxidation of accumulated carbon, releasing it into the atmosphere. However, frequent plowing can lead to the formation of a compacted layer



of soil, known as a plow sole, which restricts the growth of plant roots. Alternatives to plowing, such as subsoilers, penetrate and aerate the soil without overturning its layers. This helps preserve the soil's structure, texture, and microorganism habitat, allowing aerobic organisms to thrive in deeper layers.

A subsoiler also breaks up the resulting plow sole. The immediate benefits include improved water infiltration and the development of deeper and stronger plant roots. To make better use of rainfall and reduce erosion, the subsoiler should be used along the contours of the terrain, creating furrows that also function as swales..

MULCHING

Mulching involves covering the cultivated soil with organic materials such as straw, hay, compost, and wood chips. This practice helps to suppress the growth of unwanted weeds, protect the soil and its microorganisms from UV rays and overheating, and prevent rainwater from collecting on the surface. As a result, water infiltrates into the soil more slowly, reducing evaporation and maintaining a consistent temperature and moisture level. The presence of mulch also fosters a more active microorganism community, as it serves as a source of food and eventually decomposes to enrich the soil. While mulching is practical for small cultivation areas, gardens, and flower beds, it is not cost-effective for large-scale applications.

LIVE MULCH, PRE-SOWING, GREEN MANURE

Mulch doesn't have to be dead organic matter, nor does it need to be brought from another location. When working with larger areas, it's more practical to grow mulch in the same area where the main crop is

grown. The key is to prevent bare land without vegetation. By planting ground cover when the plot is not used for the main crop, we protect



the soil and the microorganisms in it. This enables additional photosynthesis and carbon accumulation in the soil through the interaction of plants and microorganisms. Any plant cover, even wild "weeds," is better for the soil than bare soil.

The newly grown biomass will become food for microorganisms after we destroy it before sowing the main crop. Different plant species have different needs for nutrients, root depth, and structure, and each achieves symbiosis with a different set of microorganisms in the root area (rhizosphere). By encouraging plant species diversity, we also encourage biodiversity in the soil. We shallowly plow the green cover into the soil before sowing the main crop, which is known as green fertilization or sideration.

We can also destroy the cover crop by laying it down or mowing it. This way, the aerial part of the plant does not dig into the soil; it remains on the surface and continues to protect the soil and the new crop.

It's possible to sow directly into the mulch without previous plowing, by hand or machine. The pioneer of this method of sowing was Masanobu Fukuoka (author of the book "One Straw Revolution"). Before sowing, the seeds can be "packaged" in clay balls (seed balls) or sown directly without prior preparation.

In urban conditions, large soil areas are generally not used for growing food. Most often, they are parks with grassy areas for all residents. Public areas, including green areas, are mostly under the administration of the city or utility companies. However, plants in parks also require healthy soil and are subject to the same natural laws as everyone else. They need sufficient sun and water, deep enough soil for root development, enough nutrients, and diverse and numerous soil microbiology to help them grow.

The principles of building healthy soil in parks are the same as in other planting areas. We must regulate water movement through the terrain, prevent erosion caused by water and wind, and strive for maximum biodiversity on the planned planting area. A great biodiversity of plant cover also ensures a diverse microorganism population in the soil. We should choose native and non-native plant species adapted to local conditions when selecting plants, without losing sight of the basic function of green areas in the city.

SOIL CONSTRUCTION METHODS THAT WE CAN USE IN CITY PARKS ARE

1. Mulching: We do not remove fallen tree leaves from the park area. They should be left where they are to naturally decompose and enrich the soil.
2. Composting: We have set up composters in collaboration with the utility company for the disposal of bio waste generated by park visi-

tors. This includes fruit remains, used paper packaging, and similar items. The compost produced can be utilized in areas of the park where it is needed.

3. Spraying with compost tea or extract: If we have a small amount of good compost and a large area of land to introduce beneficial microorganisms, we can prepare a solution and apply it with a watering can or sprinkler. It is advisable to do this just before rainfall to ensure the microorganisms reach the soil promptly.

4. Chop and drop: Trimmed branches of bushes and trees should not be removed from the park. Instead, they should be left in areas where they do not disrupt visitors. Over time, they will decompose and provide a habitat for small animals and insects in the park.

5. Chipping: Pruned branches can be chopped using a machine and spread on the soil surface or used for composting.

6. Reduce mowing: Limit mowing on grassy areas to allow the development, flowering, and pollination of native grasses, thereby increasing biodiversity.



7. Soil construction on private plots: The methods mentioned can be applied at the discretion of the owner without the need for coordination with local authorities or neighbors. The owner is free to choose the appropriate method based on their needs and the purpose of the area.

LEARNING OBJECTIVES

- Getting to know the basic tools that we can use when building a humus layer of soil, regardless of the purpose and surface area of the plot.
- Learn to analyze the existing soil condition and identify problems, and choose some of the tools that are useful in a specific case.
- Acquiring knowledge of how nature builds soil and applying it in the best possible way in given circumstances.

PREPARATION/MATERIALS/TOOLS

- projector and screen
- jars of 1 liter of water for conducting the soil analysis test.

STEP BY STEP

1. Presentation (30 minutes) focusing on the importance of soil quality for the production of healthy food. We will explain the elements and characteristics of soil, as well as techniques for soil regeneration and improving its quality.

2. Soil analysis test: Sampling can be conducted prior to the presentation, with the sample analysis taking place afterward. We will instruct the students on how to collect samples from different locations. The collected sam-

ples will be placed in designated jars, water will be added, and the contents will be mixed and left to settle.

Once the contents of the jar have settled, we will interpret the individual layers, their characteristics, and assess the suitability of the soil from which the sample was taken for the intended purpose. If a deficiency is identified (e.g., lack of humus), we will discuss solutions to address the observed problem, such as adding humus or mulching.

REFLECTION QUESTIONS

- What types of soil exist?
- Is there life in the soil, and if so, which organisms are present?
- Can we impact soil quality?
- Why is healthy, high-quality soil important to you?

MATERIALS WITH THE LESSON

Seeding calculator



Instructions:



Literature:

State of knowledge of soil biodiversity – Status, challenges and potentialities, Summary for policy makers. Rome, FAO, ITPS, GSBI, SCBD and EC. 2020.

Composting

Duration:

2 hours

This lesson will cover the topic of composting, which involves processing organic waste with the help of aerobic organisms. Composting helps us convert biowaste created in households, agriculture, or industrial production into a valuable and inexpensive resource that can be used to grow plants on balconies, in gardens, and on larger areas.



GOAL

The aim of this lesson is for students to understand the value of biowaste, identify potential resources in their environment (school, household, property, village, or city), and discover how to solve a problem by using the provided tools.

INTRODUCTION/BACKGROUND

COMPOST AND COMPOSTING

INTRODUCTION

In nature, all dead organisms are decomposed by various natural processes, and their bodies become part of a new cycle of life. Nature is thrifty and reasonable. It does not throw anything away or build huge landfills of dead plants or animals. Instead, it recycles. Complex buildings of dead organisms are broken down into basic building blocks, and new ones are built according to complex plans. An atom of carbon or phosphorus that is embedded in the stem of a dried sunflower may, in two years, be part of the fruit of a cucumber, a tree, a cat, or even you.

WHAT IS COMPOSTING?

Imagine a compost pile as a fast-forward button for the natural decomposition processes that happen on the ground. When leaves, fruits, grass, and branches fall to the ground, various organisms like bacteria, fungi, insects, earthworms, snails, and centipedes kickstart the decomposition process, turning the dead material into humus which enriches the soil and makes it easier for new plants to grow.



The compost pile acts as a catalyst for these natural processes and cultivates beneficial microorganisms that we want to increase and introduce into the soil. Composting is essentially the controlled breakdown of organic material with the help of aerobic organisms.

WHY COMPOST

Composting is a simple and effective way to transform our biodegradable waste from a problem into a solution, creating a useful product - compost.

Every household produces a certain amount of biodegradable waste daily. Kitchen waste and other biodegradable household waste make up more than half of the total waste generated by the average household. When we consider the “waste” from our yards or gardens (like garden plant remains, stems, leaves, inedible fruits, tree pruning residues, weeds, and ornamental plants), the proportion of biodegradable waste in the total waste mass increases even further. This waste needs proper disposal, whether we manage it ourselves or through the utility company.

In places where the separation of bio-degradable waste (and other types of waste) is not organized, all waste is mixed together, covered with new waste and soil. The biodegradable part of mixed municipal waste decomposes without oxygen, with the help of anaerobic microorganisms. This process generates methane, a potent greenhouse gas. Additionally, unsorted waste landfills pose a significant threat to groundwater, and the leakage of harmful substances from such landfills can lead to potential environmental disasters.



THE DIRECT BENEFITS WE ACHIEVE FROM COMPOSTING ARE:

- Proper disposal of bio-waste
- Significant reduction in the burden on local landfills
- Lower waste disposal costs
- Decreased emission of greenhouse gases
- Protection of underground and surface water
- Contribution to the preservation of nature
- Destruction of the agents causing plant diseases
- Elimination of agents causing human diseases (E. Coli bacteria, parasites)
- Facilitation of nutrient circulation (N, C, P, K, Ca, and other ele-

ments)

- Increase in the presence of beneficial microorganisms in the soil, including helpful bacteria, fungi, and nematodes through compost
- Promotion of healthy soil for the growth of healthy plants
- Improvement of the soil's water absorption and retention capabilities

WHAT CAN WE COMPOST?

Material suitable for composting is categorized as follows::

- Material rich in carbon (carbon material C)
- Material rich in nitrogen (nitrogen material N)
- The rest

Material rich in carbon (carbon material C)

- Paper packaging, cardboard, paper (if there is no way to send the paper for recycling)
- Used paper goods (handkerchiefs, napkins, paper towels)
- Textiles of natural origin (linen, cotton, wool...)
- Remains of indoor plants and potted plants
- Remains of branches from pruning fruit trees and ornamental plants
- Garden residues, stems and leaves of vegetables and fruits
- Sawdust and shavings from carpentry workshops (natural, che-

mically untreated wood)

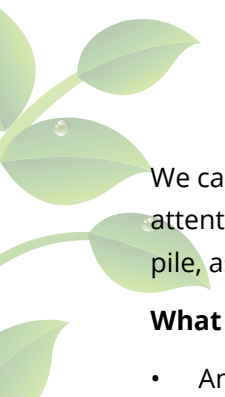
- Sawdust and bark residues from firewood (if possible, use biodegradable oil to lubricate the saw chain)
- Wood chips
- Harvest residues (straw, corn husks, grapes...)

Material rich in nitrogen (nitrogen material N)

- Raw remains of fruits and vegetables
- Food that is no longer usable (wormy meal, moldy bread, etc.)
- Coffee grounds
- Used tea bags (if they are in paper bags, avoid buying tea in non-degradable bags)
- Dry and fresh grass
- Food for herbivores that can no longer be used (soggy hay, silage, etc.)
- Manure with litter (sheep, horse, chicken, pig...)
- Feces and litter of herbivorous pets and birds (hamsters, mice, parrots, pigeons)
- Feathers, wool, pet hair
- Cut hair, nails

The rest

- Eggshells



We can compost all of this without any problems. It's essential to pay attention to the correct proportions of carbon and nitrogen in the pile, as well as moisture and air circulation.

What we don't compost?

- Animal remains, remains of meat, bones, fish, dead pets.
- Cooked food
- Waste fats from the kitchen (fat, cooking oil)
- Paper towels soaked in cooking oil
- Ash
- Human excrement
- Dairy products

We don't put certain ingredients in the compost for various reasons. Some attract mice or rats (cooked food and meat), some require specific microorganisms to break down (fats), some pose a risk of infection (human waste, potential bacterial infections, and parasites), and ash can alter the pH of the compost pile. While there are methods to compost these ingredients, we avoid doing so in a home or garden composter.

What items are not suitable for composting?

- Glass
- Metal
- Plastic
- Glossy or plasticized paper

- Meds
- Paints, chemicals
- Sawdust from glued boards (chipboard, plywood, MDF and the like, due to chemical glues and resins)
- Synthetic fabrics

These ingredients are unsuitable for composting as they are either inorganic or contain chemicals that could degrade the compost and contaminate the soil.

HOW TO COMPOST?

We can start composting already in the apartment, where most of our bio waste is generated.

COMPOSTING IN A BUCKET

One bucket with a volume of 40 to 60 liters is sufficient. The procedure is simple. We drill a hole around the rim of the bin so that the compost has enough air, cover the bottom with broken or cut twigs, so that air can reach the bottom of the container. Some cardboard or dry leaves, and some soil, or ready-made compost go on them. Soil or compost serve as an inoculator, they contain microorganisms that will inhabit our kitchen and other waste and turn it into compost over time. Kitchen waste is rich in nitrogen, so it should be mixed with some carbon-rich material. Cardboard, sawdust, wood chips or dry leaves will serve the purpose. When we put our waste in this small home composter, we simply cover it with sawdust and moisten it as needed. The ratio should be about three parts brown,





carbon-rich material for every part green, carbon-rich material. So, for every handful of leftovers from the kitchen, three to four handfuls of sawdust (or whatever you already have). The contents of the bucket should be stirred every couple of days, so that air reaches all parts of the container. You can keep the container in the apartment or on the balcony, it is important that it is not in direct sunlight and that it is not exposed to freezing in winter. In addition to the correct ratio of nitrogen, carbon and air access to the container, adequate humidity is also very important. If the compost is too dry, it needs to be moistened, if it is too wet, add a little more sawdust and mix everything. We can do the composting process from start to finish in a home composter like this and use the finished compost in the garden, flower pots, or give it as a gift to someone who has a garden.

If you have your own garden and garden composter, you can use a

home composter as a convenient storage for kitchen waste mixed with an appropriate amount of carbon-rich material. Fill the container with this mixture until it is full. When the container is full or when convenient, empty the contents into the garden composter.

If you only intend to use the home composter as temporary storage for biowaste generated in the household, and you plan to compost the contents in the garden composter instead, simply stack the brown and green materials in layers without adding water. Sawdust or another dry carbon-rich material can be used to absorb water from kitchen scraps and prevent the formation of harmful gases and unpleasant odors.

ROTO (ROTATING) COMPOSTER

Composting in urban areas poses unique challenges. The limited space and many residents living in apartments without private yards make it difficult to compost. If your building has a common area, garden, or yard, you can place a garden composter there with the agree-



Foto: Mladen Mladenović <https://www.perforum.info/izrada-rotacionog-protocnog-kompostera/>

ment of all tenants. However, a classic garden composter may not be the best solution for several users. It's hard to ensure everyone adds enough carbon material and maintains the right moisture level. Composting still requires supervision and occasional intervention to control temperature, humidity, and turning over the pile. Not everyone may be willing to take on this additional responsibility, and a neglected compost pile can lead to unpleasant odors.

An elegant solution for communal composting is a rotating composter variant.

Using this composter is easy. You just need to add your biowaste and the required amount of brown, carbonaceous material, then spin the composter. Rotating the composter helps mix and aerate the compost, and the composting process happens pretty quickly. Depending on the design, these composters can either be emptied manually or be flow-through, allowing the finished compost to fall out on its own through the provided openings.

COMPOSTING WITH THE HELP OF EARTHWORMS

Composting with earthworms is easy. These earthworms don't require much care. They can be kept in a bucket under the sink or in an area of several hundred square meters. Compost worms, most often *Eisenia fetida* but sometimes other species, require minimal resources. They need a place to live (a bucket, plastic or wooden container with a lid), food, moisture, and air. They efficiently turn biowaste into vermicompost. If their living conditions are good, they will not leave their habitat. They self-regulate their population. When they feel they have multiplied enough and filled their habitat, they stop reproducing. The main product of compost earthworms is their excrement,

vermicompost (worm castings). Earthworms' excrement is rich in nutrients that plants can readily absorb.

COMPOSTING IN A GARDEN COMPOSTER

Composting in the garden is a common method of composting. We can compost in composters or in a pile without them. It's beneficial for the garden compost pile to have a volume of one cubic meter, whether in a composter or not. This volume ensures that the compost pile has enough air, even in the middle, and that the composting conditions are aerobic throughout all stages.



We can create a garden composter from materials like old boards, pallets, panels, brick, stone, or wire mesh. The shape of the composter is usually a cube or a roller (if using wire mesh).

The mature, finished compost from our composter can be used in the garden to enhance soil quality. To maximize the benefits for our garden and crops grown from the compost, we must pay attention

to the following:

- Contents of the compost pile
- The volume of the compost pile
- Correct ratio of brown (carbon) and green (nitrogen) material
- Optimum humidity and breathability of the compost pile material
- Compost pile temperature

CONTENTS OF THE COMPOST PILE

The main sources of material for our compost are biowaste generated in our household or farm. If our compost needs exceed what we produce, we can collect or purchase biowaste from others to meet our requirements. Whether the material is acquired for free or bought, it's important to avoid introducing unwanted materials into the compost. Agricultural crops are often treated with pesticides, and these chemicals can be present in the crop residues. While a thermal compost pile can break down most pesticide residues, not all will decompose. If these residues make their way into our garden, they can harm the soil's micro- and macrobiology. Additionally, consuming vegetables and fruits grown in such soil may result in us ingesting these harmful chemicals or their residues.

THE VOLUME OF THE COMPOST HEAP

Regardless of the type of composter, we always aim for our compost piles to have a volume of one cubic meter. This volume ensures there is enough oxygen and compost in the center of the compost heap.

Oxygen is necessary for aerobic microorganisms to thrive and facilitate proper composting.

CORRECT RATIO OF BROWN (CARBON) AND GREEN (NITROGEN) MATERIAL

All organic matter is composed of carbon (C) combined with smaller amounts of nitrogen (N). The balance of these two elements is referred to as the C:N ratio. Materials with a high nitrogen content are called nitrogenous or green materials such as animal excrement, urine, grass clippings, vegetable and fruit residues, and coffee grounds. Materials with a high carbon content are called brown materials such as sawdust, wood chips, straw, and cardboard. Aerobic microorganisms in the compost pile are most active at a ratio of 1N:3C. This means that for every unit of green, nitrogenous material, it is necessary to add three units of brown, carbonaceous material.

We layer the materials as shown in the diagram below until the composter is full or reaches the desired volume. It's recommended to pour water on the material between each layer, making sure not to overdo it. The material should be moist but not soaked.

OPTIMUM HUMIDITY AND BREATHABILITY OF THE COMPOST PILE MATERIAL

With adequate moisture (approx. 60%) and enough air (oxygen), our compost pile will quickly start to heat up.

How to determine if the compost is moist enough?

Take some compost in your hand and squeeze it in your fist.

Result number 1:

The compost is moist and cold to the touch, and has an unpleasant smell. When we squeeze it in our fist, liquid drips from it. Compost that is too wet allows anaerobic bacteria, which are undesirable for compost, to dominate.

How to “repair” compost that is too wet:

Shake and aerate the compost pile by adding more carbon material. Dry carbon material will absorb excess moisture. A pile that is dried and ventilated like this will quickly start working. Aerobic microorganisms will once again get ideal conditions for living and will eliminate undesirable microorganisms.

Result number 2:

The compost is dry to the touch or just slightly moist. When we squeeze it in our fist, the material dissipates. The material that we put in the compost pile decomposes slowly or not at all. The compost pile is not heated. The compost is too dry, the ingredients of the compost heap are not decomposed, and the microbiological activity is minimal.

How to “repair” too dry compost:

Shake or rearrange the compost heap evenly moistening the material.”

Result number 3:

Compost should feel moist to the touch. If you squeeze it in your fist and it forms into a lump from which it is not possible to squeeze out water, that’s a good sign. The formed lump of compost should be easily dispersed with little pressure. The material in the compost heap should show clear signs of decomposition, without any unpleasant

smells.

The ideal moisture level for compost is neither too dry nor too wet, so no intervention is required.

COMPOST PILE TEMPERATURE

Microorganisms that break down the compost material under favorable conditions reproduce rapidly, consuming the compost material and each other. The increased temperature of the compost pile is a result of these active microscopic processes. The rising temperature of the compost heap indicates that we have determined the correct C:N ratio and ensured sufficient water and air.

Thermal composting is good for several reasons. Temperature destroys

- weed seeds
- causative agents of plant diseases
- causative agents of human diseases
- eggs and larvae

Monitor the temperature of the compost pile using a thermometer. The temperature should not go above 65 degrees Celsius. When it reaches this temperature, the compost should be turned over, aerated, and possibly dampened. Temperatures exceeding 65 degrees can also kill off beneficial microorganisms that we want to thrive and add to the soil in large numbers.

COMPOST RIPENING

After two or more rearrangements of the compost pile (depending

on the material and the pulverization of the starting material), it is observed that the compost pile no longer reaches such high temperatures. The starting material has decomposed and is no longer recognizable. Microbiological activity is still present in the compost, but it is no longer as active. The resulting material is dark brown in color and has a pleasant, earthy smell. This compost can be used in the garden, in compost preparations, as mulch, and so on.

If intending to use the compost for seedlings or as an addition to potted plant substrate, the compost should undergo a ripening or aging phase to reduce the microbiological activity to a level where it will no longer harm your plants. This involves further rearranging the compost, moistening if necessary, and leaving it in a suitable place for three to six months.

HOW DO WE KNOW IF OUR COMPOST IS MATURE ENOUGH?

To determine if the compost is ready, we can perform a simple “salad test.” Plant a few lettuce seeds in the compost container. In well-matured compost, the lettuce seeds will germinate within two to five days. The resulting plants should be dark green and healthy. If the lettuce does not sprout within this timeframe, or if the sprouted plants appear stressed, irregular, stunted, or light green, it’s best to let the compost continue to mature for a bit longer.

LEARNING OBJECTIVES

- To understand the potential of biowaste and how to convert it into a valuable resource for the garden with minimal effort.
- Learn to identify compostable materials, how to compost them

correctly, and how to recognize and correct potential issues in the compost pile.

- Learn how to effectively layer a thermal compost pile.

PREPARATION/MATERIALS/TOOLS

- Four wooden pallets
- Hammer
- Meter
- Wood screws
- Cordless drill
- Bits for cordless drill
- Drill bits for cordless drill
- Rope/wire

STEP BY STEP

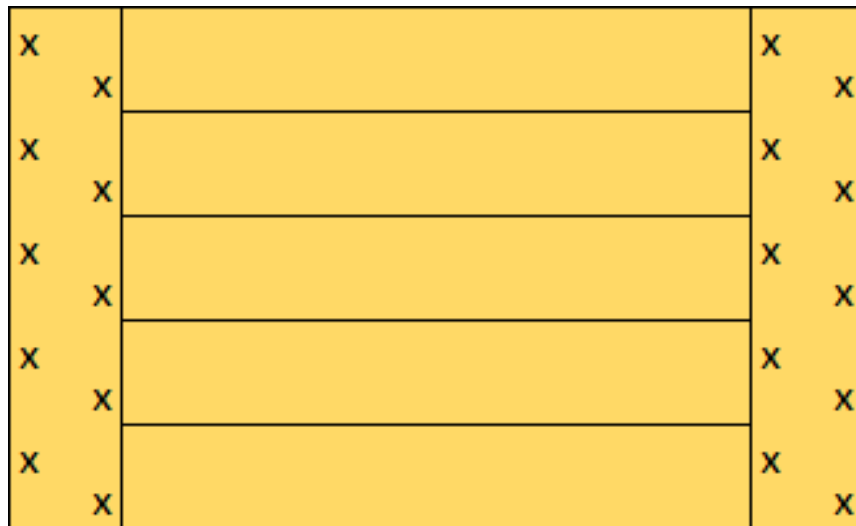
Create a composter with a volume of 1 cubic meter using the available materials. The composter should be sturdy enough to maintain its shape during composting and should be designed for easy disassembly, access to the compost, and handling (such as overturning and emptying the composter).

A BOARD COMPOSTER

Composters made from pallets or recycled boards are very popular among gardeners and other composting practitioners. The material is easy to obtain, and you don’t need to be particularly skilled to

make it. You can assemble an efficient composter from pallets without any intervention with tools. Simply arrange the pallets on their sides to form a cube in the ground plan, connect them with twine, wire, nails or screws, and the composter is ready for filling. The most commonly used pallet dimensions are 120cm x 80cm. The composter assembled in this way has dimensions of 120cm x 120cm and is 80cm high. Its volume is slightly larger than 1m³ (more precisely 1.152m³ or 1152L), but still, the middle of the compost pile can be sufficiently aerated.

Making a composter out of a pallet or some other board requires a little skill with tools. Even if we are not very skilled carpenters, making a composter is a great beginner's project. If the pallets are the



source of the board for the future composter, we must first disassemble them. The tools we will need to disassemble the pallets are a hammer, crowbar, pliers, etc. Try to work on a clean and flat surface

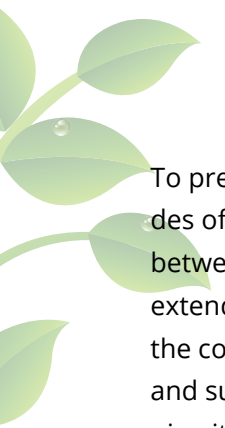
and be extremely careful. A rusty nail sticking out of the board can cause injury.

Define the dimensions of the future composter, measure and saw the boards to the desired length, and assemble the four same sides as in the sketch below.

Make sure to use two screws to fasten each board in order to create strong and stable sides. You can stack the horizontal boards on the sides of the composter, leaving a small space between them. This allows for better aeration and ensures smooth composting processes. If you stack the boards densely and find that the compost lacks oxygen after the first composting cycle, you can use a drill to create additional air holes. Ideally, the composter should have a volume of 1m³, but feel free to adjust its dimensions to suit your available space and materials. Lastly, you can connect the pages using twine, wire, or simple clips.

Characteristics of a wooden composter

- The construction material is easy to obtain, as there are discarded boards (pallets) everywhere.
- The production process is simple, and the method can be easily adapted to our capabilities and needs.
- The finished composter is easy to disassemble and reassemble if necessary.
- A wooden composter retains moisture better than a wire one, but not as well as a brick one.
- The durability of the composter is relatively short compared to the previous two. Wood is an organic material, and microorganisms, sun, and moisture gradually break it down and degrade it.



To prevent the compost from drying out, consider lining the inner sides of the composter with cardboard. This will also serve as a barrier between the composting microorganisms and the wooden sides, extending the composter's lifespan by several years. Avoid painting the composter as the colors may wash or peel off into the compost and surrounding soil. Instead, consider protecting the wood by burning it, which can significantly increase the composter's durability.

A wooden composter can be an attractive addition to your garden. If you're skilled and have time, you can create a unique composter with a pentagon or another polygonal base. Decorate the sides with woodcuts, combine woodcuts with burning the surface, or add ventilation holes according to a particular pattern or design. Your imagination, determination, and effort are the only limits, and you'll gain experience and skill through the process.

REFLECTION QUESTIONS

- Why is it important to compost ?
- How much biowaste does your family produce?
- How much unused (thrown away) biowaste does your town/village produce (factories, family businesses, catering and commercial facilities)?
- Can we use at least some of the unused bio-waste of community waste as raw material for compost for our own garden or field?



Waste management

Duration:

3 hours

The issue of waste is a significant problem in modern society and is an inevitable consequence of our way of life. As our standard of living changes, so does the quantity and harmfulness of waste. Waste directly threatens people's health and pollutes the soil, water, and air because most waste ends up in landfills and becomes garbage that cannot be recycled.

Discuss with students the problem of waste and ways to reduce it through actions and habits that we can personally adopt and apply.



GOAL

The aim is to introduce students to the issue of waste, raise awareness about the increasing volume of waste produced daily, and highlight the adverse effects of the waste problem on both individuals and the environment. The intention is to educate them on how they can contribute to solving the waste issue by modifying their own habits.

INTRODUCTION/BACKGROUND

It's crucial to recognize that everything we buy and use has an impact on the environment. The production and transportation of goods require energy and resources, such as water and materials, which can contribute to pollution and depletion of natural resources. Furthermore, land use for production and infrastructure can disrupt ecosystems and reduce natural habitats. It's important to consider the environmental impact of our consumer choices and strive for sustainable practices to minimize these effects.

Municipal waste generated by households, private entities, and industries is a growing problem. On average, 2.01 billion tons of waste are produced annually worldwide. Rapid population growth and urbanization





have exacerbated the issue of waste management, especially in cities, due to increased consumption. Every individual needs to understand waste management as a responsibility.

The objective of waste management is to prolong the lifespan of products and promote the reuse and recovery of materials when possible. This helps reduce the total amount of waste sent

to landfills and lessens the impact on the environment. Responsible waste management is crucial for supporting sustainable development and transitioning to a circular economy, ultimately creating a valuable resource. Individuals can help reduce waste through actions like practicing the 3Rs (Reduce, Reuse, Recycle), which involves cutting down on disposable items and opting for reusable alternatives to significantly decrease waste production.

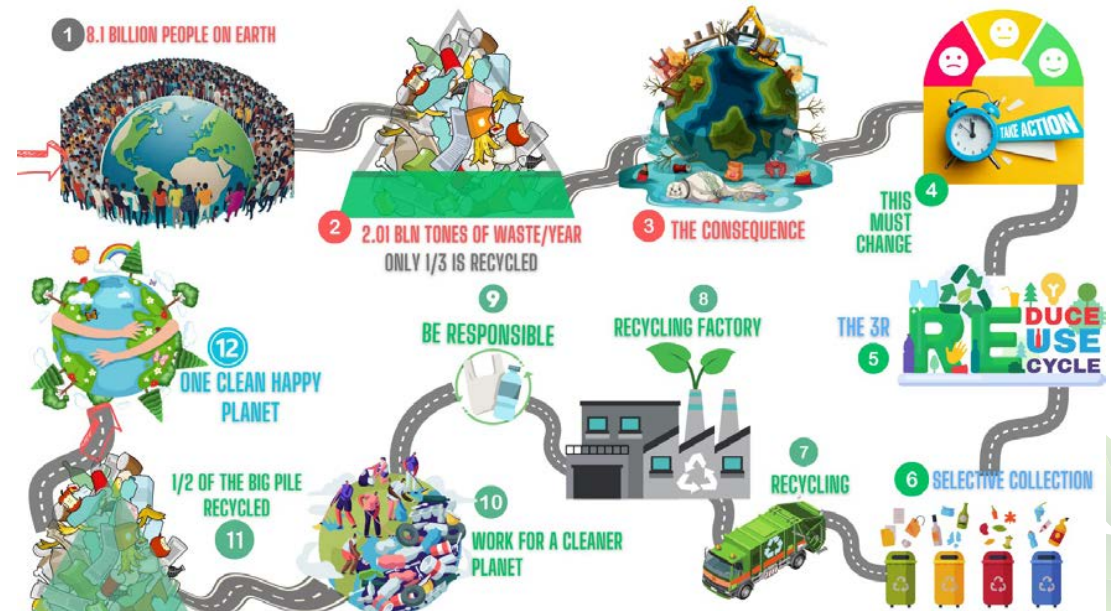
Additionally, reusing items whenever possible can help extend their life and reduce the need for new products. This can be achieved through activities such as repairing damaged items, donating unwanted but usable items, or creatively repurposing materials.

Furthermore, recycling plays a key role in waste management. Separating recyclable materials from general waste and ensuring they are properly recycled can help conserve resources and reduce the amount of waste that ends up in landfills.

Another effective way to reduce waste is to practice responsible consumption. This includes making informed choices about the products we buy, choosing products with minimal packaging or packaging that is recyclable or biodegradable.

Finally, raising awareness of the importance of waste reduction and recycling within our communities can have a positive effect. Encouraging others to adopt sustainable habits and participate in local initiatives or clean-up actions can contribute to a cleaner environment.

Biowaste accounts for one third of municipal waste, making it the largest component of such waste. It consists of kitchen waste, residues from food preparation, and garden or green waste. This type



of waste is a valuable raw material used in producing high-quality compost. Composting is the process of aerobic decomposition of

biowaste, resulting in the production of carbon dioxide, water, heat, and compost within a few months. Compost nourishes plants, improves soil aeration, retains water, and promotes the growth of root plants. Composting offers a simple and effective way to transform biodegradable waste into a useful product - compost.

LEARNING OBJECTIVES

- Learn about waste management and why it is important.
- Understand how the waste management hierarchy works.
- Explore ways to apply the waste hierarchy principles in daily life.
- Develop the knowledge and skills for proper waste separation.
- Acquire the skill of home, office, or garden composting.

STEP BY STEP

Make your own home compost

1. Get a compost bin or make one yourself from plastic containers, wooden pallets...
2. Choose a location for your compost bin
3. Research what you can compost and in what proportion (carbon vs. nitrogen, compostable and non-compostable organic materials)
4. Get compost pile ingredients - green (nitrogen) and brown (carbon)
5. Determine the right balance of brown and green material

6. Aerate it well by turning it regularly.
7. Monitor your compost (is it too dry or wet, unpleasant smell...).
8. Use the produced compost for indoor plants, garden, public park...

EXCHANGE FAIR

Organize a fair with your students where you can exchange items you don't need and don't use.



REPAIR CAFÉ

Repair Cafés are workshops where participants, along with volunteers, have the opportunity to repair defective items instead of disposing of them in a landfill.

Organize an event where you invite volunteers who have the knowledge and skills to repair various items (electronic/mechanical devices, clothing, etc.). Encourage students to bring non-functioning or damaged items and work together with volunteers to repair them.



REFLECTION QUESTIONS

- Why has waste become a big problem in urban areas?
- Why is it important to reduce waste production?
- What will happen to us and our environment if we continue to produce large amounts of waste?
- How can I contribute to solving this problem?
- What can I do to encourage the people closest to me to change their habits and produce less waste?

MATERIALS WITH THE LESSON



Construction with natural and recycled materials:



INSTRUCTIONS WITH NUGGET:

Depending on the class they are teaching, teachers can use the cards one at a time or cut out each icon (each step), using them separately. Teachers can encourage students to arrange the icons or steps in the order they appear based on the card that shows the whole picture. This way, each icon will be part of a “puzzle,” and the students will recreate the complete image of the “puzzle.”

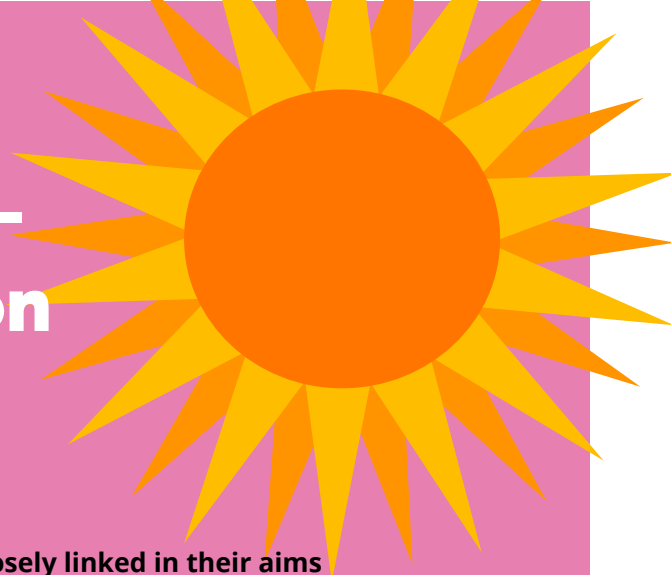
Transition – social action

Duration:
theoretical part 2 x 45 min

Transition and activism are closely linked in their aims to create positive changes in society. Transition focuses on community-led efforts to develop resilient and sustainable communities. It emphasizes the importance of local action, participatory decision-making, and fostering cultural and mental changes.

Activism encompasses a wider range of actions aimed at addressing social, political, or environmental issues. Activists often work for systemic change by raising awareness, mobilizing communities, and advocating for policy reform.

In this lesson, students will learn about the concepts of transition and activism, which are important parts of the movement. They will also learn about the essential steps involved in starting a transition initiative in communities.



GOAL

To familiarize students with the significance of the transition movement and the process of establishing a transition initiative in the community.

INTRODUCTION/BACKGROUND

The Transition movement has been growing since 2005. Transition groups and communities follow transitional principles and use participatory methods to imagine the necessary changes. They focus on initiatives such as renewable energy projects, localizing food systems, and creating resilient communities and green spaces. They promote entrepreneurship, collaborate with municipalities, and emphasize the importance of repair and retraining. Recognizing the potential of community-level action, there is a growing understanding that top-down approaches alone are not enough to drive meaningful change.



The Transition Movement was prompted by a combination of concerns for the environment, recognition of resource limitations, and a desire for community empowerment and resilience to global challenges.

Activism within the Transition Movement involves individuals or groups taking action to promote the principles and goals of transition at the local or community level. Transition activists work to create sustainable, resilient, and socially just communities by applying practical solutions and advocating for systemic change. They are involved in activities such as organizing social events, raising awareness of environmental issues, promoting renewable energy projects, supporting local food systems, and cooperating with local authorities and organizations. Transition activism aims to empower communities to take control of their future and actively participate in shaping a more sustainable and just society.

Steps to start a transition initiative in your community:

1. Research and Educate: Gain knowledge about sustainability, local environmental issues, and successful transition initiatives in other communities. This will help you understand the challenges and opportunities involved.
2. Identify like-minded individuals: Reach out to friends, neighbors, local organizations, and community leaders who share your passion for sustainability. Forming a core group of dedicated individuals will make your initiative stronger and more influential.
3. Set goals and create a vision: Define the purpose and goals of your transition initiative. What do you want to achieve? Be clear about your vision and communicate it effectively to attract others who want to join your cause.

4. Get the community involved: Organize community meetings, workshops, or events to raise awareness of the importance of sustainability and gather input from community members. Encourage dialogue, listen to different perspectives, and involve different stakeholders.

5. Collaborate and build partnerships: Reach out to local businesses, schools, government agencies, and nonprofits. Working with these entities can help leverage resources, knowledge, and networks to support your transition initiative.

6. Take action: Begin implementing specific projects and initiatives that are in line with your goals. These could be community gardens, recycling programs, energy efficiency campaigns, or educational workshops. Remember, even small actions can have a big impact!

7. Communicate and celebrate progress: Keep the community informed about your initiatives on a regular basis, share success stories, and encourage active participation. Celebrate milestones and achievements to maintain momentum.



A successful transition means finding a balance between:

Head: we act by the best available information and evidence, and direct our collective intelligence towards discovering better ways of living.

Heart: when we work we empathize because we value and pay attention to the emotional, psychological, interpersonal and social aspects of our work.

Hands: we turn our visions and ideas into concrete reality by initiating practical projects, because that's how we create a new, healthier economy where we live. (Transition Network, 2016)

Transitioning to a more sustainable community takes time and commitment. It is important to stay positive, be open to learning, and adjust your approach as needed.

* <https://transitionnetwork.org/> - how to start transition activities and methods of inclusion and work of transition groups

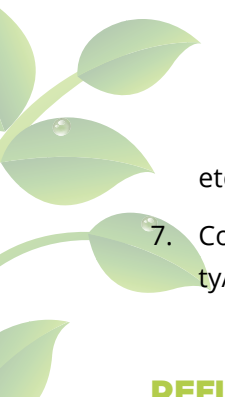


LEARNING OBJECTIVES

- Understand the importance of the transition movement and the reasons why it is crucial to initiate transition activities in our community. Learn the steps to start transition initiatives in the local community.
- Recognize how to involve the local community in changes and activities aimed at preserving the environment, caring for people, and achieving sustainable and fair use of local resources.
- Application of participatory methods in involving community members in transition activities.

STEP BY STEP

1. Plan and organize a transition activity in your school/local community
2. Familiarize students with examples of transition activities/events that you can find on <https://transitionnetwork.org/> and the ways of their organization.
3. Discuss with your students what are the main problems that they recognize in their environment and that need to be addressed. Analyze the needs of your community.
4. Based on your capabilities and resources, decide how you can contribute.
5. Decide together how your activity/event will be organized and how responsibilities will be distributed.
6. Analyze what additional resources, members/schools/institutions



etc. you need and make connections.

7. Connect with the local community and invite them to your activity/event.

REFLECTION QUESTIONS

- What are the negative effects of the way we produce, consume and communicate with the environment and the people in it?
- Is it sustainable and how will it affect our future?
- Is there a way local community members can come together to make positive changes and build resilient communities and a sustainable future?
- What activities could be organized in my community? What are the possible obstacles to this and what are the prerequisites for the organization?
- How can we contribute to the transition movement?

Making decisions in groups – Decision making by consent

Duration:

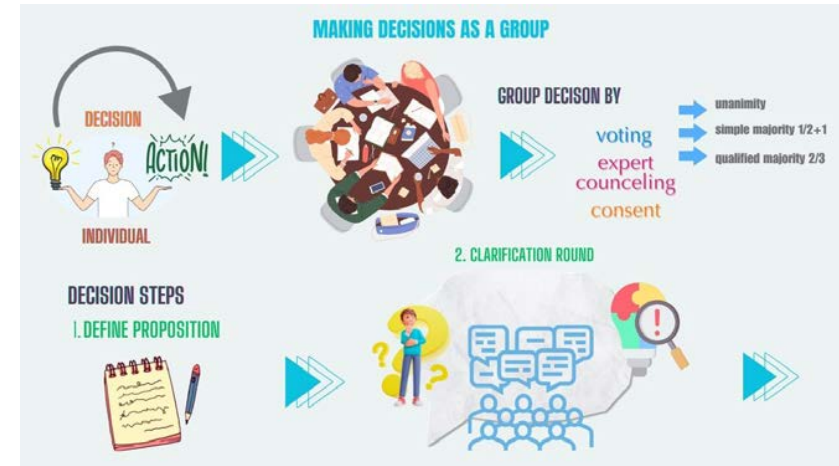
2 sessions of 45 minutes each.

Effective group communication and decision-making are crucial for reaching objectives. In this lesson, students will explore various decision-making techniques and will have the opportunity to practice the consent decision-making method. This particular approach allows everyone involved to participate in the decision-making process and addresses certain challenges associated with other methods.



GOAL

The goal of this lesson is to train students and teachers to adopt and simply apply the consensus decision-making method.



INTRODUCTION/BACKGROUND

The decision-making method known as “Decision-making by consent” was developed as part of the sociocracy movement.

Sociocracy is a management method that focuses on equality, the involvement of all members, and making decisions through consensus. It was created in the mid-20th century in the Netherlands by Gerard Endenburg, a Dutch engineer and entrepreneur. The key features of sociocracy include:

1. Circles: The organization is structured into interconnected circles (or teams), with each circle having specific tasks and responsibilities. These circles independently make decisions within their area of responsibilities.

2. Dual connectivity: Circles are linked via dual connectivity, meaning that each circle has a representative participating in higher-level decision-making. This ensures that information flows in both directions and that decisions at higher levels reflect the needs and attitudes of lower levels.

3. Decision-making by consent: Decisions are made through consensus, seeking the consent of all circle members. The goal is to achieve “no objections,” meaning that all circle members must be satisfied with the decision or at least have no serious objections that would prevent the decision’s implementation.

4. Elections and evaluation: Members are elected to positions through decision-making by consent, and their performance is regularly evaluated. This practice ensures that all members feel accountable and that roles are clearly defined.

Sociocracy is utilized in various kinds of organizations, such as businesses, non-governmental organizations, schools, and communities. The objective is to establish a more efficient, transparent, and equi-

table method of management, enabling all members to participate in decision-making and ensuring that their voices are both acknowledged and respected.

LEARNING OBJECTIVES

- Understanding the importance of communicating in groups.
- Familiarity with various decision-making methods and their pros and cons.
- Learning about non-verbal communication cues.
- Understanding the consent decision-making method.
- Applying the consent decision-making method through a guided exercise.

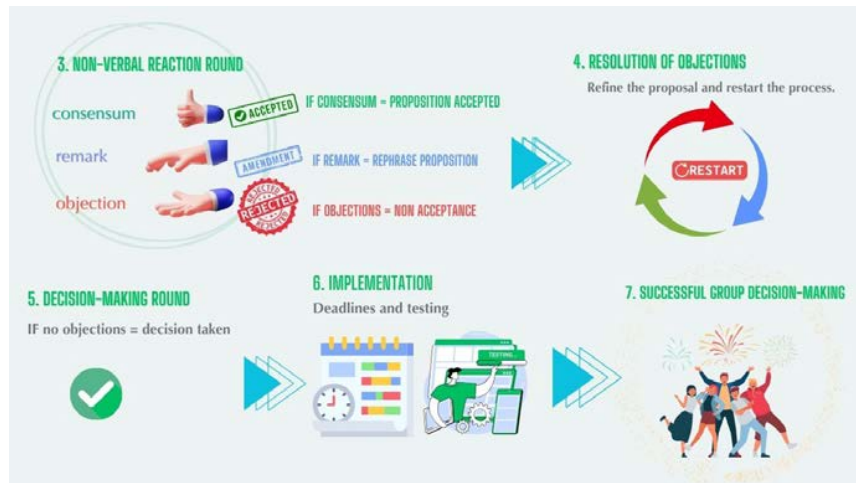
PREPARATION/MATERIALS/TOOLS

- Blackboard/magnetic board, chalks/markers
- Written materials containing descriptions of non-verbal communication signs.
- Written materials outlining the steps of the consent decision-making process.

STEP BY STEP

Introduction

We start with an initial question: How do we make decisions as a group?



Write down the answers on the board.

Next, give a brief presentation that covers the most commonly used decision-making methods. We will also connect these methods with the answers to the initial question and highlight their respective advantages and disadvantages.

We will then introduce the concept of “consent decision-making” to



the students. Define and explain this term as a decision-making method and compare it with the methods mentioned in the earlier presentation. Discuss the problems that the mentioned methods solve and their respective advantages. Additionally, provide some context regarding the emergence of the consent decision-making method.

EXERCISE: ROUND

Explain to the students that you will be conducting a decision-making exercise with consent. Introduce them to the term “rounds” as a method that will be used during the exercise.

Arrange the group in a circle so that everyone is facing each other. Explain the rationale for using the round method (equal opportunity for communication, enabling everyone to express themselves, allowing everyone to see each other and their reactions). Clarify the speaking order and the option to skip a question, with the possibility of still answering at the end of the round. Also, explain the concept and role of the facilitator in the process.

Test the first round with a simple question, such as “How do I feel when I need to communicate in this way?” or “What do I think about this method?”

When you have completed at least one round and confirmed there are no ambiguities, define the topic for decision using the consent decision method.

EXERCISE: DECISION MAKING BY CONSENT

The leader or facilitator introduces the consent decision-making method and explains the non-verbal communication signals to be used during the exercise:

1. Defining the proposal to be decided on and familiarizing the participants with the context in which the decision is made (the proposal should be a topic close to the students - a proposal for the location of a trip/excursion, use of common resources - the location of the school garden, the name of the school cooperative or some similar topic).

NOTE: In order to be accepted, a proposal does not need to be “perfect” in the sense that it is the ideal proposal for all group members. It should be such that it is acceptable to everyone and good enough

that everyone who decides “can live with it”, that they have no objections to it and that they are willing to try it.

2. A defined proposal is followed by a clarification round in which participants can ask the proponent questions to obtain clarifications and/or additional information about the proposal. It is important that the proposal is clear to everyone who decides, and if necessary, the proposal itself can be reformulated to make it clear to everyone. (No counter-proposals or alternative proposals are given, but rather the removal of ambiguity in relation to the proposed)

3. This is followed by a round in which the participants declare the proposal with a non-verbal reaction (reactions are expressed at the same time with non-verbal hand signs that the facilitator presented earlier).

4. There are three possible reactions: consent, remark and objection. Consent means no objection and acceptance of the proposal. Remark means that there is no objection and does not necessarily indicate agreement with the proposal, but the proposal is accepted with some expressed amendment that does not fundamentally change the proposal itself. A remark does not need to be argued and can mean disagreement but without concrete arguments against the proposal. Remarks are considered as contributions and are recorded. It is expressed with the palm facing down. Objection means that we do not accept the proposal and argue the reasons that we consider not acceptable - the reasons should be such that they endanger or damage one of the members of the group or another individual, as well as that the proposal is not by ethical principles, vision and the goals we represent. The objection is expressed with the palm facing up because it is considered a contribution to making a correct decision acceptable to all group members.

If there are no objections, a decision is made.

5. If there are any objections, they are resolved by making changes and refinements to the proposed decision in order to address the objection. The objection in the new decision proposal can be integrated by the facilitator or it can be a part of the group decision-making process involving all or part of the group participating in the decision.

6. The group will indicate their reaction to the new decision proposal through non-verbal means. If there are no objections to the proposal, the decision will be made. However, if there are objections, a decision cannot be reached.

7. The adoption of the decision is concluded, and remarks are recorded if there were any and if they were not integrated into the proposal. Followed by an agreement on implementation, deadlines, and testing, if necessary.

8. Celebration for successful group decision-making.

REFLECTION QUESTIONS

- Why is effective decision-making important?
- What are the methods of decision-making in groups and what are their advantages/disadvantages?
- What are the advantages of the consent decision-making method?
- Can everyone always be satisfied with the decisions made?
- In what situations can I apply this method?

MATERIALS WITH THE LESSON



Water in urban areas

Duration:

3 sessions of 45 minutes

Managing water in cities is a complex task that requires careful planning, investment in infrastructure and sustainable practices. By adopting effective water management strategies and promoting responsible water use, cities can ensure a reliable water supply for their residents while minimizing their impact on the environment.



GOAL

The aim is to assist students in comprehending the challenges and strategies involved in the management of water resources in urban areas. The objective is to educate them about the significant role of sustainable water management methods and their impacts on urban communities and the environment. By doing so, students will gain a deeper appreciation for the significance of efficient water management in densely populated areas and the vital need for sustainable practices.

INTRODUCTION/BACKGROUND

Water is a precious resource that goes through a continuous cycle of evaporation, precipitation, and return to the oceans. However, this process is not always simple, especially at the local level. Sometimes water falls on an area, accumulates, and causes flooding, or can run off quickly, leading to water shortages. That is why it is crucial to manage water resources efficiently and sustainably. By keeping water in our systems as long as possible, we can use it more than once, reduce water wastage, and even prevent flooding.



In urban areas, water is crucial for drinking, sanitation, and industrial processes. However, managing water in cities can be difficult due to limited water sources and high population density. Important factors related to urban water management include water supply, demand, infrastructure, wastewater and stormwater management, water conservation, and water management. By implementing effective water management strategies and encouraging responsible water usage, cities can guarantee a steady water supply for their residents while minimizing their environmental impact.

Several water conservation methods can be implemented in urban areas to promote sustainable water usage. Some of these methods include:

1. Efficient irrigation systems: Installing drip irrigation or using sprinkler systems with smart controllers can help reduce water wastage by delivering water directly to plant roots and adjusting watering schedules based on weather conditions.



drip irrigation

sprinkler system



2. Rainwater harvesting: Collecting rainwater from roofs and storing it in tanks or underground reservoirs can provide an additional source of water for gardening, washing cars, or flushing toilets.



3. Greywater recycling: Treating and reusing greywater from sources such as sinks, showers and washing machines for purposes such as irrigation or toilet flushing can significantly reduce the demand for

fresh water.

4. Water efficient devices: Installing low-flow faucets, showers and toilets can help reduce water consumption without compromising functionality.

5. Public awareness and education: Promoting water conservation practices through public campaigns and educational programs can raise awareness of the importance of water conservation and encourage responsible water use.

6. Detection and repair of leaks: Regular inspection and repair of leaks in water supply systems, in households and public infrastructure, can prevent unnecessary water loss.

7. Xeriscaping : Landscape design with native plants that require less water can reduce the need for irrigation in urban areas.



Xeriscaping

8. Water metering and pricing: Implementation of water metering systems and various pricing models can promote water conservation

by increasing users' awareness of their water usage and encouraging efficient use.

Water pollution poses a significant problem for urban areas. Phytoremediation, which involves using plants to purify water, is a natural and environmentally friendly solution. Certain plants can absorb, break down, or transform contaminants in water. Here are some commonly used plant-based water purification techniques:

1. Wetlands or Constructed Wetland Systems: Wetlands are natural water filtration systems that use plants, soil, and microorganisms to remove pollutants. Constructed wetlands mimic this process and can be designed to treat specific pollutants. Plants such as rushes, reeds and sedges help filter pollutants as soil microorganisms break them down.

2. Aquatic plants: Some aquatic plants, such as water hyacinths and water lentils, can absorb and accumulate pollutants such as heavy metals and organic compounds. These plants can be grown in bodies of water to help purify the water by absorbing pollutants.

3. Biofilters: Biofilters use plants and their root systems to filter water. The water passes through a container filled with plant roots that trap and break down pollutants. This method is commonly used in aquariums to maintain water quality.

4. Algae-based systems: Algae can remove nutrients such as nitrogen and phosphorus from the water, which can cause water pollution. Algae ponds or bioreactors can be used to grow algae and remove these nutrients from wastewater or polluted water sources.

The use of plants in urban environments can play a significant role in flood prevention by controlling stormwater. Here are some ways plants can be useful:

- 1. Green infrastructure:** Green infrastructure involves using techniques such as green roofs, rain gardens, and bio-lights to absorb and retain rainwater. These features consist of vegetation and permeable surfaces that enable water to soak into the soil, which helps reduce the amount of runoff and slow down its flow.
- 2. Planting trees:** Trees have extensive root systems that can absorb significant amounts of water. Planting trees in urban areas helps increase soil permeability and reduces surface runoff. In addition, trees provide shade, which can lower the ambient temperature and reduce the risk of intense rainfall.
- 3. Riparian Protectors:** Creating a vegetative buffer along rivers, streams, and other water bodies can mitigate flooding by stabilizing banks, absorbing excess water during heavy rainfall, and filtering out pollutants to improve water quality.
- 4. Green spaces and parks:** The creation and preservation of green spaces within cities, such as parks and urban forests, can act as natural rain sponges. They help water to seep into the soil, thereby reducing both runoff and the likelihood of flooding.
- 5. Sustainable Urban Drainage Systems (SUDS):** SUDS are designed to mimic natural drainage processes by incorporating vegetation, permeable surfaces and storage features. They help manage stormwater runoff by slowing its flow, promoting infiltration, and reducing the burden on traditional drainage systems.

When implementing these measures, it is important to take into account the specifics and requirements of each city. Local climate, soil conditions and urban design should be considered to maximize the effectiveness of plant-based treatment and flood prevention strategies.

We can all contribute to conserving and managing water resources. This can be done by adopting simple habits such as reducing water use, promptly fixing leaks, using water-efficient appliances and equipment, employing responsible irrigation techniques, and being mindful of water use in everyday activities like showering and washing dishes. Additionally, supporting initiatives and policies that promote sustainable water management can further enhance our conservation efforts.

In conclusion, it is crucial to preserve and safeguard water as it is a precious resource. Responsible management and understanding of its cycle provide us with sufficient water for our future needs and generations.



LEARNING OBJECTIVES

The objective is to educate students about the challenges and strategies involved in effectively managing water resources in densely populated areas. We aim to raise awareness of the significance of sustainable water management practices and their impact on urban communities, the environment, and future generations. The main objectives are:

- 1. Identifying water-related challenges in urban areas:** This includes discussing specific water-related problems facing cities, such as water scarcity, pollution, aging infrastructure and increased demand due to population growth.
- 2. Research on sustainable water management strategies:** This involves introducing different approaches to solving the problem, including water conservation, rainwater harvesting, wastewater treatment and reuse, green infrastructure and efficient water distribution systems.
- 3. Promoting responsible water usage:** The objective is to encourage students to develop water-saving habits, such as reducing water consumption, fixing malfunctions, and using water-efficient appliances and equipment.
- 4. Consideration of social and environmental impacts:** This involves discussing the impact of water management decisions on public health, ecosystems, and the overall sustainability of urban areas.

PREPARATION/MATERIALS/TOOLS

- Plastic plates.
- Textiles, different items that will imitate the landscape.

STEP BY STEP

Water in the landscape - an experiment

- Prepare two plastic sheets. Leave one panel blank.
- Cover the second panel with several layers of textiles to simulate the layers of the earth.
- Use different objects and materials (textiles, plastic straws, sponges, toothpicks) to create models of drywall, trees, lakes, bushes, etc., and place them on the board.
- After preparing the plates, instruct the students to pour the same amount of water on both plates.
- Observe and note what happens to the water.

Discuss with the students the results of the experiment and the importance of healthy soil and water retention barriers.

REFLECTION QUESTIONS

- How can we contribute to water management in urban areas?
- What specific actions can be taken to promote water conservation in urban areas?
- How can we raise citizens' awareness of the importance of water management and conservation?
- What steps have we taken to reduce water consumption in our own homes or schools?
- Are there innovative technologies or practices that can be applied to optimize water use in urban areas?
- How can we engage with the community to encourage their participation in water conservation practices?

Biodiversity

Duration:

4 sessions of 45 minutes

Use and value variety. Increased biodiversity leads to a more stable provision of ecosystem services and enhances the resilience and self-sufficiency of the system as a whole.

“Diversity reduces vulnerability to a variety of threats and takes advantage of the unique nature of the environment in which it resides.” - David Holmgren



GOAL

The study of biodiversity provides valuable insights into how ecosystems function and the interdependence between species. Understanding how different species interact and contribute to ecosystem processes helps us comprehend the delicate balance and resilience of natural systems. This knowledge is essential for making informed decisions about conserving and sustainably managing ecosystems.

INTRODUCTION/BACKGROUND

Biodiversity refers to the variety of life forms, including plants, animals, and microorganisms that exist in a particular ecosystem or on Earth as a whole. It encompasses the diversity of species, genetic variation within a species, and the diversity of ecosystems and ecological processes. Biodiversity is crucial for ecosystem functioning as it provides essential services such as pollination, nutrient cycling, and climate regulation. Each species has its own unique characteristics and contributes to the overall complexity and resilience of the planet. Nevertheless, biodiversity is currently facing significant threats due to human activities such as habitat destruction, pollution, climate change, and overexploitation of natural resources. Conservation efforts are vital to protect and maintain biodiversity for the benefit of current and future generations.

Biodiversity is crucial for maintaining the balance and stability of ecosystems. Each species within an ecosystem has a specific role or niche, and the interactions between different species contribute to the overall functioning of the ecosystem. These interacti-

ons include processes such as pollination, nutrient cycling, and pest control, which are critical to ecosystem productivity and sustainability..

Biodiversity is crucial for providing a wide range of ecosystem services that are essential for human well-being. These services include food provision, clean water and air, as well as climate regulation, disease control, and natural disaster prevention. Biodiversity also supports cultural and recreational activities, and has aesthetic and spiritual value.

Biodiversity is crucial for scientific and medical advancements. Many of the medications we use today are derived from natural sources. Studying various types of biodiversity helps us comprehend their potential benefits for human health. Additionally, biodiversity adds to our scientific knowledge and understanding of ecological processes, evolution, and adaptation.

Biodiversity holds inherent value. Every species possesses unique characteristics and adds to the overall beauty and complexity of the natural world. Biodiversity conservation is not only practically important, but also an ethical responsibility to safeguard the variety of life on Earth for



future generations.

Biodiversity loss is primarily caused by human activities.

1. Habitat destruction: The conversion of natural habitats into agricultural land, urban areas, or industrial zones leads to the loss of biodiversity. Deforestation, land clearing, and habitat fragmentation are disrupting ecosystems and displacing many species.

2. Pollution: Pollution from various sources, such as industrial activities, agriculture, and improper waste disposal, can have adverse effects on biodiversity. Chemical pollutants can contaminate water bodies, soil, and air, harming both aquatic and terrestrial species.

3. Climate change: Changing human-caused greenhouse gas emissions have a significant impact on biodiversity by altering global climate patterns. This results in rising temperatures, changes in precipitation, and extreme weather events that can disrupt ecosystems, affect species habitats, and lead to changes in species distributions.

4. Overexploitation: Unsustainable exploitation of natural resources, such as overfishing, illegal wildlife trade, and excessive logging, can diminish species populations and disrupt ecosystems, leading to loss of biodiversity and ecosystem collapse.

5. Invasive species: The introduction of non-native species into new environments can have detrimental effects on native species and ecosystems. Invasive species can outcompete native species for resources, disrupt food chains, and alter ecosystem dynamics.

6. Habitat fragmentation and loss: Habitat fragmentation caused by infrastructure development, such as roads and dams, can isolate populations, limiting their ability to migrate or find suitable habitats. This can result in reduced genetic diversity and increased vulnerability to extinction.

Addressing the causes of biodiversity loss requires coordinated efforts, including sustainable land use practices, pollution reduction, climate change mitigation, responsible resource management, and measures to control invasive species. Conservation efforts, protected areas, and international agreements also play a key role in conserving biodiversity.

Biodiversity loss has important impacts on ecosystems and human societies.

1. Disturbance of the Ecosystem: The loss of biodiversity disrupts the delicate balance of the ecosystem. When species disappear, it can lead to imbalances in food chains, reduced resilience to environmental changes, and decreased ecosystem stability. This can result in the loss of essential ecosystem services, such as pollination, nutrient cycling, and natural pest control.

2. Decline in ecosystem productivity: As biodiversity decreases, ecosystem productivity may also decline. This means that processes like photosynthesis and nutrient cycling may become less efficient, which can ultimately affect the availability of resources like food and clean water that are essential for human well-being.

3. Increased vulnerability to climate change: The loss of biodiversity worsens the effects of climate change. Ecosystems with a wide variety of species can adjust more effectively to changing environmental conditions. But when biodiversity decreases, ecosystems become more susceptible to the impacts of climate change, including extreme weather events, habitat loss, and shifts in species distribution.

4. Loss of medicinal resources: Many medicines and drugs are derived from natural sources, including plants, animals, and microorganisms. Loss of biodiversity reduces the availability of these resources, limiting our potential to discover new treatments and cures for disease.

5. Economic effects: The decline in biodiversity can result in substantial economic impacts. Sectors like agriculture, forestry, and fishing depend on diverse species and healthy ecosystems for their productivity and profitability. A decrease in biodiversity can cause lower crop yields, diminished fish stocks, and heightened vulnerability to pests and diseases, which in turn affect people's livelihoods and economic growth.

6. Cultural and social impacts: Biodiversity loss has an impact on the cultural and social aspects of human societies. Many indigenous and local communities have strong cultural and spiritual connections to their natural environments, which are often abundant in biological diversity. The decline of species and ecosystems can interrupt cultural traditions, disrupt customary practices, and harm the well-being and identity of these communities.

It is crucial to address the loss of biodiversity and take proactive measures to conserve and restore it. Biodiversity conservation is essential for the health of ecosystems and human societies and is vital for maintaining a sustainable and resilient planet.



LEARNING OBJECTIVES

- An understanding of how ecosystems function and how species depend on each other.
- Recognizing the significance of conserving and safeguarding species and their habitats.
- Increasing environmental awareness and promoting responsible planet management.
- Comprehending the impact of human activities on the loss of biodiversity.

STEP BY STEP

1. Presentation (45 min): During this presentation, we will illustrate the network of interrelationships and connections within the ecosystem, highlighting the benefits for the various elements, particularly those that impact humans. We will also provide examples of how disrupti-



ons in ecosystem biodiversity can have far-reaching consequences.

2. Making an insect hotel is an example of biodiversity conservation (video link at the end of the lesson). Before construction or during the introductory presentation, the functions and uses of insect hotels are explained.

3. When setting up an insect hotel in the garden or meadow, it's important to consider the lessons we've learned from terrain analysis. We need to choose a suitable location and position the hotel in relation to other elements. It's crucial to analyze what insects need to survive during winter and after leaving the hotel, and to create the necessary conditions, such as seeding a flower meadow).



REFLECTION QUESTIONS

- How does biodiversity contribute to ecosystem stability and resilience?
- What are some of the main threats to biodiversity, and how can they be addressed?

- How does biodiversity support human well-being and provide ecosystem services?
- What are the economic implications of biodiversity loss?
- How can individuals and communities contribute to the preservation of biodiversity?
- What are some successful examples of biodiversity conservation efforts?
- How does climate change affect biodiversity, and what can be done to mitigate its effects?
- How does biodiversity contribute to food security and agricultural productivity?
- What are the ethical considerations surrounding biodiversity conservation?
- How can we raise awareness of the importance of biodiversity and promote sustainable practices in our daily lives?

MATERIALS WITH THE LESSON



BIODIVERSITY QUIZ



1. Assign a quiz to be completed after the lesson as a form of assessment for understanding of the material covered.
2. Provide clear instructions on how to access the quiz.
3. Remind students of the importance of the quiz in assessing their comprehension of the material.
4. Explain the format of the quiz, including the number of questions and type of questions.
5. Encourage students to use their notes or textbooks as resources while completing the quiz, if allowed.
6. After completing the quiz, review the answers with the class to provide immediate feedback and clarify any misunderstandings.
7. Use the results of the quiz to gauge student understanding and tailor future lessons to address any areas of weakness.
8. Encourage students to ask questions or seek clarification on any concepts they may have struggled with during the quiz.
9. Provide positive reinforcement for students who performed well on the quiz and offer additional support or resources for those who may need extra help.

Good economy

The term 'economy' refers to the entire system that includes producing, distributing, and consuming goods and services in a particular region or country. However, current economic models are not sustainable and harm the environment. Students will be introduced to the concept of a 'good economy' and its models, including the three main ethics of permaculture: care for the earth, care for people, and fair distribution.

GOAL

The objective is to introduce models of economic organization that promote the development of sustainable and resilient communities while upholding permaculture principles: caring for people, caring for the planet, and ensuring fair distribution.

INTRODUCTION/BACKGROUND

The economy encompasses the entire system of producing, distributing, and consuming goods and services within a specific region or country. It encompasses various elements such as companies, industries, markets, financial institutions, and individuals. This system plays a vital role in the overall well-being and development of society.

The economy is currently encountering several challenges. These challenges encompass income inequality, environmental sustainability, access to resources, and economic stability. Various initiatives such as the Sustainable Development Goals, Fair Trade Practices, and Responsible Business Practices are being implemented to tackle these issues.

It is impossible to achieve the three ethical principles of permaculture without establishing new, fair, and sustainable economic foundations: caring for people, caring for the planet, and ensuring fair distribution.

In the context of permaculture, economics focuses on designing systems that are economically viable, socially just, and environmentally sustainable. It includes strategies such as localizing production and consumption, supporting regenerative companies, promoting fair trade, and reducing waste.



A good economy is an economy that:

- supports the quality of life in the entire community
- creates many opportunities and possibilities to satisfy our needs without endangering others
- accepts responsibility and fosters solidarity
- fairly uses and shares resources
- respects the sustainability of the ecosystem. (Simleša, 2015)



Activist Association, Split - Buvljak

MODELS OF GOOD ECONOMICS

There are various models and approaches to defining a strong economy, each with its own principles and goals. These models are not mutually exclusive, and elements of each can be combined to create a more comprehensive approach to a strong economy.

FAIR TRADE

Fair trade means ensuring that producers receive fair prices for their products, promoting sustainable production, and supporting social and environmental standards.

Fair trade aims to guarantee that producers receive fair prices for their products, which helps cover the costs of sustainable production. To support primary producers, we agree to pay a slightly higher amount than what is paid for the same product in local supermarkets or shopping centers.

Fair trade aims to empower small producers by providing them with direct access to markets, eliminating middlemen, and enabling them to negotiate better deals.

Fair trade encourages sustainable agriculture and production methods that minimize negative impacts on the environment. This includes the promotion of organic agriculture, conservation of biological diversity, and responsible management of resources.

Fair trade works to ensure safe and fair working conditions for workers, such as banning child labor, guaranteeing reasonable working hours, and promoting gender equality.

Fair trade aims to support community development projects, such as the construction of schools, health facilities and infrastructure, by using a portion of the fair trade premium paid by customers.

ETHICAL BANKS

Ethical banks, also known as sustainable banks or socially responsible banks, are financial institutions that prioritize ethical and sustainable practices in their operations.

Ethical banks typically operate based on a set of values and principles that help them make decisions. They seek to support projects and companies that meet social and environmental criteria, such as promoting renewable energy, fair trade, sustainable agriculture, and affordable housing. They also refrain from financing activities that are harmful to people or the planet, like extracting fossil fuels or manufacturing weapons.

Ethical banks not only focus on their lending practices, but also prioritize transparency and accountability. They strive to openly communicate where customers' money is invested and ensure that it aligns with their values. Some ethical banks also partake in impact investing, directing funds toward initiatives that generate positive social or environmental outcomes.



Feniks Association, Split - Carpentry workshops

COOPERATIVE SOCIETY

Cooperatives are a distinct type of business organization that prioritizes democratic decision-making, joint ownership, and the well-being of its members. They operate on the principle of "one member, one

vote," ensuring that each member has equal influence on the cooperative's affairs, regardless of their level of investment.

Cooperatives can exist in various forms, including consumer cooperatives, worker cooperatives, agricultural cooperatives, or housing cooperatives. They are established based on the needs and interests of their members, who unite to accomplish shared objectives, whether it's obtaining affordable goods and services, ensuring fair employment, or securing safe housing.

Cooperatives have a key strength in their focus on people and their communities. Their goal is to provide benefits to their members rather than to maximize profits for outside shareholders. This focus often results in fair prices, quality products and services, and a commitment to local economic development.

Cooperatives promote solidarity and cooperation among their members. By pooling resources and sharing risks, they allow individuals to work together to achieve goals they couldn't reach alone. This spirit of cooperation can strengthen social bonds and create a stronger sense of community.



Most Association, Split - Making and selling clothes

LOCAL AND REGIONAL CURRENCIES

Local and regional currencies are forms of currency used within specific communities or regions to complement national currencies.

Local and regional currencies are designed to promote support for local businesses and keep money circulating within the community. By using these currencies, people can buy goods and services from local merchants, providers, and manufacturers, which helps to strengthen the local economy. These currencies foster collaboration with local businesses, promote relationship building, and support sustainable local practices. This, in turn, contributes to job creation, enhances local self-sufficiency, and reduces reliance on external sources. Additionally, these currencies can help mitigate the impact of economic fluctuations on the local economy, as they are not influenced by the same global market forces as national currencies.

These currencies often operate alongside national currencies and have their own distinctive features. They can be physical currencies, such as paper notes or coins, or digital currencies managed through online platforms or mobile applications.

SOCIAL AND SOLIDARITY ECONOMY (SSE)

The social and solidarity economy (SSE) includes a wide variety of organizations and initiatives, such as cooperatives, mutual societies, non-profit organizations, social enterprises, and community-based organizations.

SSE aims to tackle social, economic, and environmental challenges by giving priority to the well-being of individuals and communities over profit. It advocates for democratic decision-making, community participation, and the fair distribution of resources and wealth. As a result,

it actively promotes social justice, solidarity, and sustainable development.

SSE places emphasis on the social impact of economic activities. Rather than solely pursuing financial gains, SSE organizations prioritize social goals, which include creating jobs, reducing inequality, promoting gender equality, supporting marginalized groups, and protecting the environment.

Social and Solidarity Economy (SSE) also promotes empowerment and inclusivity. It often involves marginalized or disadvantaged individuals and communities, providing them with opportunities for economic participation, skill development, and social integration. By involving people in the decision-making process and ensuring equal access to resources, SSE promotes a more inclusive and fair society.

Moreover, Social and Solidarity Economy (SSE) promotes collaboration and mutual assistance among its participants. Organizations in the SSE frequently form partnerships, networks, and relationships rooted in solidarity. They share knowledge, resources, and experiences to



Sunce Association, Split - Green student companies

collectively pursue social and economic objectives, enhancing the overall effectiveness and longevity of their endeavors.

“COMMON GOOD”

A common good refers to resources available for use by a group, such as land, water bodies, forests, and cultural heritage.

The concept of commons entails managing resources for the benefit of the entire community, as opposed to private ownership or individual control for personal gain. It highlights the significance of shared responsibility, cooperation, and sustainable resource management.

Historically, commons have played a significant role in supporting local economies, preserving biodiversity, and fostering social cohesion. In recent times, the commons have faced challenges such as over-exploitation, privatization, and environmental degradation.

There are efforts to protect and revitalize common resources through various means, such as community-based management approaches, participatory decision-making processes, and legal frameworks that



Udruga Vestigium

recognize and conserve common resources.

LEARNING OBJECTIVES

- Understand the goals and possibilities of a strong economy. What are the models for a strong economy and how can they be implemented?
- Gain an understanding of how the current economy functions and the limitations of existing models. Learn how implementing a strong economy can contribute to the well-being of people and the planet, as well as to fair distribution.
- Explore the practical application of the strong economy model within the local community.

STEP BY STEP

Plan and organize a cooperative in your school

1. Introduce students to the concept of cooperatives.
2. Assess the needs of your community.
3. Determine how you can contribute based on your capabilities and resources.
4. Decide as a group how to organize your cooperative and distribute responsibilities.
5. Identify any additional resources, members, schools, or producers needed and establish collaboration.
6. Engage with the local community and introduce them to your cooperative activities.

REFLECTION QUESTIONS

- What are the negative impacts of today's economy on people, the planet, and the allocation of resources and profits?
- What are the benefits of following principles and models of good economics?
- How can we implement these models in our community? What obstacles might we face, and what prerequisites are necessary for organizing such models?
- How can we contribute to a fair and sustainable economy by changing our own production and consumption habits?

MATERIALS WITH THE LESSON



QUIZ ON GOOD ECONOMICS



1. Assign a quiz to be completed after the lesson as a form of checking understanding of the material covered .
2. Give clear instructions on how to take the quiz.
3. Remind students of the importance of quizzes to assess understanding of the material.
4. Explain the format of the quiz, including the number and type of questions.
5. Encourage students to use their notes or textbooks as resources while taking the quiz, if allowed.
6. After completing the quiz, review the answers with the class to provide immediate feedback and clear up any misunderstandings.
7. Use the quiz results to assess student understanding and adjust future lessons to address any areas of weakness.
8. Encourage students to ask questions or ask for clarification on any term they may have had difficulty with during the quiz.
9. Provide positive reinforcement for students who do well on the quiz and offer extra support or resources for those who need extra help.

Wellbeing indoors (Indoor air quality, acoustic quality, indoor materials, SBS)

Duration:

2 sessions of 45 minutes

Various factors in the indoor environment impact human well-being and contribute to a safe, comfortable, and healthy habitat. We will examine three important aspects: air quality, acoustic quality (noise), and the various materials we encounter indoors. By analyzing these aspects, we can understand how they influence our well-being and learn how to create an environment that promotes optimal indoor living conditions.

Learners will be introduced to the term “sick building syndrome” (SBS). SBS is a condition in which building occupants experience comfort and health effects that appear to be linked to time spent indoors.

GOAL

The purpose of this lesson is to present a fresh perspective on our daily indoor environments and emphasize how they can affect our quality of life and well-being.

It aims to educate students about the importance of indoor well-being and the different ways to improve it. This includes raising awareness about Sick Building Syndrome (SBS), its symptoms, causes, and methods to reduce risk factors.

In addition, the goal is to illustrate the impact of poor indoor air quality on individuals and underscore the importance of incorporating indoor green spaces to eliminate and prevent SBS.

INTRODUCTION/BACKGROUND

A significant amount of our time is spent indoors, so it's important to understand and improve our indoor well-being. Several factors can influence the well-being of individuals indoors, including the air, acoustic, and material quality of the indoor space.

Air quality: Poor air quality, caused by pollutants such as volatile organic compounds (VOCs like benzene, formaldehyde, toluene, xylene), chemicals, allergens, and mold spores, can lead to respiratory issues, allergies, and other health problems. On the other hand, good air quality promotes better respiratory health and overall well-being.

Acoustic Quality: Excessive noise levels in indoor spaces can lead to stress, sleep disturbances, difficulty concentrating, and decreased productivity. Creating a quiet and peaceful environment can enhance well-being and allow for better focus and relaxation.



Material Quality: The choice of materials in indoor spaces can have an impact on well-being. For example, using materials that emit harmful chemicals or allergens (such as paints, chemical cleaners, glues) can affect indoor air quality. Choosing natural and non-toxic materials can promote a healthier and more comfortable environment.

The surroundings in which we live can also influence indoor air quality. For instance, if an indoor space is located near a busy road or industrial area, it can be more prone to pollution and outdoor sources of contaminants. Proper ventilation systems and air filtration can help mitigate the impact of external air pollution on indoor air quality.

Sick Building Syndrome (SBS) is a condition characterized by unexplained illness or discomfort experienced by individuals in enclosed spaces, often caused by poor indoor air quality. It refers to a range of symptoms such as headaches, dizziness, fatigue, and respiratory issues experienced by individuals who spend time in a particular building. The occurrence of Sick Building Syndrome can be influenced by the environment in which individuals live, study, or work. Factors such as poor ventilation, indoor pollutants, high humidity levels, in-



adequate lighting, and lack of natural elements can contribute to SBS symptoms.

To improve well-being indoors, individuals can take certain measures such as:

- Ensuring good ventilation and air circulation in indoor spaces.
- Regularly cleaning and maintaining indoor spaces to prevent the buildup of dust, mold, and other allergens.
- Selecting non-toxic, low VOC materials and furniture for indoor design.
- Minimizing noise pollution through sound insulation and using acoustic materials.
- Choosing greenery and plants to improve air quality and aesthetics.

Adding indoor plants can help improve indoor air quality and mitigate various concerns related to building pollutants and sick building syndrome. Here are some points to consider:

Air Purification: Certain plants (Snake plant, Peace lily, Dracaena, Aloe vera...) have the ability to absorb harmful pollutants from the air through a process known as phytoremediation. They can remove volatile organic compounds (VOCs) and other toxins, such as formaldehyde and benzene, which are commonly found in indoor environments.

Moisture Regulation: Plants release moisture through a process called transpiration, which helps regulate indoor humidity levels. They can add natural moisture to the air and prevent it from becoming too dry or too damp.



Natural Cleaning Alternatives: It's important to be mindful of the chemicals used for cleaning indoor surfaces and floors, as many commercial cleaning products contain harsh ingredients that can worsen indoor air quality. Switching to natural alternatives, such as vinegar, baking soda, or plant-based cleaners, can provide effective cleaning while minimizing the release of harmful substances into the air.

Noise Reduction and Pollution Prevention: Planting evergreen trees near roads and buildings can act as natural barriers and help reduce noise from outside sources. These trees can also act as a protective barrier against excessive pollution, preventing pollutants from reaching indoor spaces.

Additionally, having greenery around can provide psychological benefits by fostering feelings of relaxation, well-being, and connection to nature.



LEARNING OBJECTIVES

- Learn about common chemical elements found in indoor air, their sources, and potential health effects.
- Understand the influence of nearby busy traffic on air quality and the potential pollutants emitted.
- Gain knowledge about possible causes and effects of SBS and preventive measures that can be taken.
- Acquire skills in selecting natural and safe materials for indoor design, including considerations for low VOC options and sustainable choices.
- Learn skills on using plants as air filters, including plant selection, placement, and care.
- Develop a well-rounded understanding of indoor air quality, sick building syndrome, and the use of plants as a preventive measure.

PREPARATION/MATERIALS/TOOLS

Air quality data in your area.

- List of compounds found in materials used for interior construction (paints, adhesives, etc.)
- Lists of chemical elements that are in a closed space
- Materials on possible causes and preventive measures related to SBS
- Materials and images of plants used indoors and their impact on air quality
- A3 papers, glue, scissors, and markers

STEP BY STEP

Plants for prevention of SBS / Poster making

1. Divide the learners into 3-5 small groups.
2. Introduce the learners to the theory of Sick Building Syndrome (SBS) and provide them with material on this subject.
3. Provide them with or refer them to sources of materials on indoor plants and their characteristics.
4. Analyze the interior building (building materials, paints, adhesives, etc.) and surroundings (roads, external sources of pollution, etc.).
5. Each group has 15-20 minutes to connect possible causes/effects of SBS with plants whose characteristics can help to prevent them.
6. After they have finished, discuss their findings.
7. Create a poster with pictures of plants connected with SBS effects

that can be prevented.

REFLECTION QUESTIONS

- How does the quality of air, acoustics, and materials indoors affect well-being?
- What influence do our surroundings have on indoor air quality?
- How can we improve our well-being indoors?
- Why is it important to acknowledge the impact of the indoor environment on our health?
- In what ways does the space we inhabit or work in contribute to Sick Building Syndrome (SBS)?
- What are the consequences of ignoring this issue?
- How can we prevent or reduce SBS through the use of green indoor spaces?

MATERIALS WITH THE LESSON



LINK:

<https://nurserylive.com/blogs/sustainable-living/28-best-air-purifying-plants-according-to-nasa>

PARTNERS



PERMACULTURE DALMATIA, CROATIA

Association **Permakultura Dalmacija** was founded with the aim of promoting permaculture, sustainable living and regenerative permaculture design in Dalmatia and Croatia. Permaculture is a holistic approach that integrates agriculture, architecture, ecology and social systems to create more sustainable human environments. Through its activities, the association strives to educate the community as a whole, especially the population of young people of preschool and school age, as well as farmers and residents of cities and rural areas, about the importance of preserving natural resources and applying environmentally friendly practices in everyday life.

The mission of the association is to promote the principles of permaculture through education, practical workshops, projects and cooperation with local communities. Objectives include:

Education: Organizing courses, workshops and lectures on permaculture principles, ecological agriculture, sustainable construction and other topics

Practical application: Implementation of permaculture projects in

local communities, such as urban gardens, regenerative agricultural systems...

Collaboration and networking: Bringing together similar organizations, institutions and individuals to share ideas, resources and experiences.

Raising awareness: Informing the general public about the importance of sustainable living and preserving the environment through the media, campaigns and public events.

The association operates primarily in Dalmatia, but its programs and initiatives can be extended to other regions in Croatia. The main activities include:

Educational programs: Development and implementation of educational programs for schools and youth, in order to educate future generations about the importance of sustainable development and permaculture.

Ecological construction and water management: Encouraging the construction of sustainable, energy-efficient and environmentally friendly buildings using local materials and permaculture principles. Collection, storage and optimal use of water resources.

Urban gardens and food production in cities: Creating and maintaining urban gardens in cities, enabling citizens to grow their own food and learn about organic farming.

Community building: Organization and connection of people thro-

ugh activities such as the Time Bank, Repair Shop and Bicycle Repair Shop and workshops for the general population (composting, making irrigation systems, gardening...) in which, in addition to promoting regenerative practices of waste reduction, recycling and reuse, work is being done to establish networks of interpersonal relationships and the creation of active citizenship.

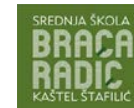
Association Permakultura Dalmacija works to create awareness and change behavior towards the environment, inspiring people to live in harmony with nature and create sustainable communities.



ZELENO DOBA, SERBIA

Zeleno Doba, Center for Sustainable Growth and Development Green Age, Serbia was established in 2018. Based in Serbia, the center is a dedicated community of individuals spanning various fields and ages, united by a shared passion for creating a hub for research, education, empowerment, and community building. Its core mission is to harmonize human life with the laws of nature. Through education, empowerment, and networking, the members of Zeleno Doba actively support and advocate for the development of sustainable communities, initiatives, and individuals. They are deeply passionate about forging connections with like-minded individuals, groups, initiatives, and organizations in Serbia, the Balkan region, and Europe. Members of Zeleno Doba have a history of successful international cooperation with eco-villages and sustainability initiatives across Europe, or with

Erasmus + project in order to implement a training on the topic of creating sustainable initiatives and training young facilitators in rural communities.



BRAĆA RADIĆ HIGH SCHOOL, CROATIA

Braća Radić High School is situated on the edge of Kaštel Štafilić in a more than half-a-century-old building in Croatia.


It is located in an authentic Dalmatian environment of gardens, vineyards, olive groves, Mediterranean plants, and the smell of the sea and tamarisk from the nearby beaches.

In veterinary medicine, agriculture, and nutrition vocational programs, students can be trained in three- and four-year professions. In addition to vocational programs, the school also has a high school department of general and language high school.

The school's basement has a wine cellar where students learn how to make wine and sparkling wine.

Student Cooperative also operates in the school through numerous sections.

The school cooperates with the local community and actively participates in events in the city of Kaštela. It's involved in various humanitarian and environmental activities.



Through various collaborations, the school enriches its program so that students receive the most up-to-date and high-quality transfer of knowledge.



ASOCIATIA FOUR CHANGE, ROMANIA

Established in 2012, the Four Change Association emerged from the collective efforts of civil society experts driven by a shared vision for positive transformations in Romanian society. Since the beginning, we've stood as pioneers at the forefront of reshaping the NGO sector, infusing passion and expertise into every project we had. Though small in size, our team is unwaveringly determined to shatter conventional molds, leaving a lasting impact and empowering local communities.





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