

CURRICULUM

# Through Upcycling to the Design of Eco Cities



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TUDEC – Through Upcycling to the Design of Eco Cities

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# Module 4

# TREE FRIENDS

“

The best time to plant a tree is 10 years ago;  
the second-best time is now.

(Chinese proverb)

”

## 4. INTRODUCTION

In recent years, the importance of integrating nature into urban environments has gained significant attention, and trees have gained recognition as vital components of urban landscapes. As the world experiences rapid urbanisation, there is fierce competition for urban space. Still, for environmentalists, urban planners, and policymakers, trees in cities have become a critical consideration, as they provide many benefits that extend beyond their aesthetic appeal, contributing to urban areas' overall health, sustainability, and liveability ([link to Further Exploration #1](#)).

The concept of urban forestry, which involves cultivating and managing trees in urban settings, has evolved as cities strive to strike a balance between concrete jungles and green havens. This module delves into the significance of trees in cities, exploring the various roles they play and the benefits they offer to both the environment and the people who inhabit these urban spaces. From mitigating the effects of climate change to improving air quality and providing recreational spaces, trees have proven to be integral to the well-being of urban communities ([link to Further Exploration #2](#)).

In this module, we will explore the multifaceted aspects of urban trees, including their ecological importance, the challenges they face in urban environments, and innovative approaches to promoting healthy urban tree populations. By conveying the value of trees in cities to young people, educators can empower students to become environmentally conscious individuals who actively contribute to a sustainable future. Together, we can inspire the next generation of tree friends, fostering a love for nature and a commitment to its protection ([link to Further Exploration #3](#)).



Credit: Unsplash

## 4.1 AIR TO BREATHE

In the hustle and bustle of modern urban life, it's easy to overlook the silent heroes that stand tall amidst the concrete jungle - trees. These majestic beings play a pivotal role in maintaining the air quality of our cities, and their significance for clean air cannot be overstated.

Oxygen production is one of the most fundamental roles of trees in urban environments. Through photosynthesis, trees convert carbon dioxide into oxygen, which is essential for all life on earth. A single mature tree can produce enough oxygen to support two human beings for a year. As cities grow and the demand for clean air intensifies, the importance of trees as oxygen generators becomes increasingly apparent.

Furthermore, trees act as natural air filters. Their leaves, bark, and roots trap and absorb various atmospheric pollutants, such as carbon monoxide, sulphur dioxide, and nitrogen dioxide. Additionally, they capture particulate matter like dust and pollen, which can be harmful to respiratory health when inhaled. By doing so, trees contribute significantly to reducing air pollution in urban areas.

Trees are also crucial players in the fight against global climate change. They act as carbon sinks, absorbing carbon dioxide from the atmosphere and storing it as carbon in their trunks, branches, and roots. This process, known as carbon sequestration, helps reduce the overall concentration of greenhouse gases in the air, mitigating the effects of climate change.



## CONNECTED TOPICS IN CURRICULUM



### **SUBJECT: Science lessons / STEM**

- Basic knowledge about trees (characteristics, differentiation, knowledge of regional species, seasonal changes etc.)
- Essential properties of the air and their importance for (human) life
- Measures to protect natural resources
- Phenomena in the environment that are a consequence of the negative influence of man (example: climate change, global warming, greenhouse effect, acid rain, damage to the ozone layer, extinction of endangered species of plants and animals)
- Human activities for the protection of the environment

### **SUBJECT: Arts** - Creative expression and appreciation

- Artistic production of works from recycled material
- contribution of art and other forms of cultural expression to understanding and changing the world by expressing own ideas, experiences and emotions (individual or collective)

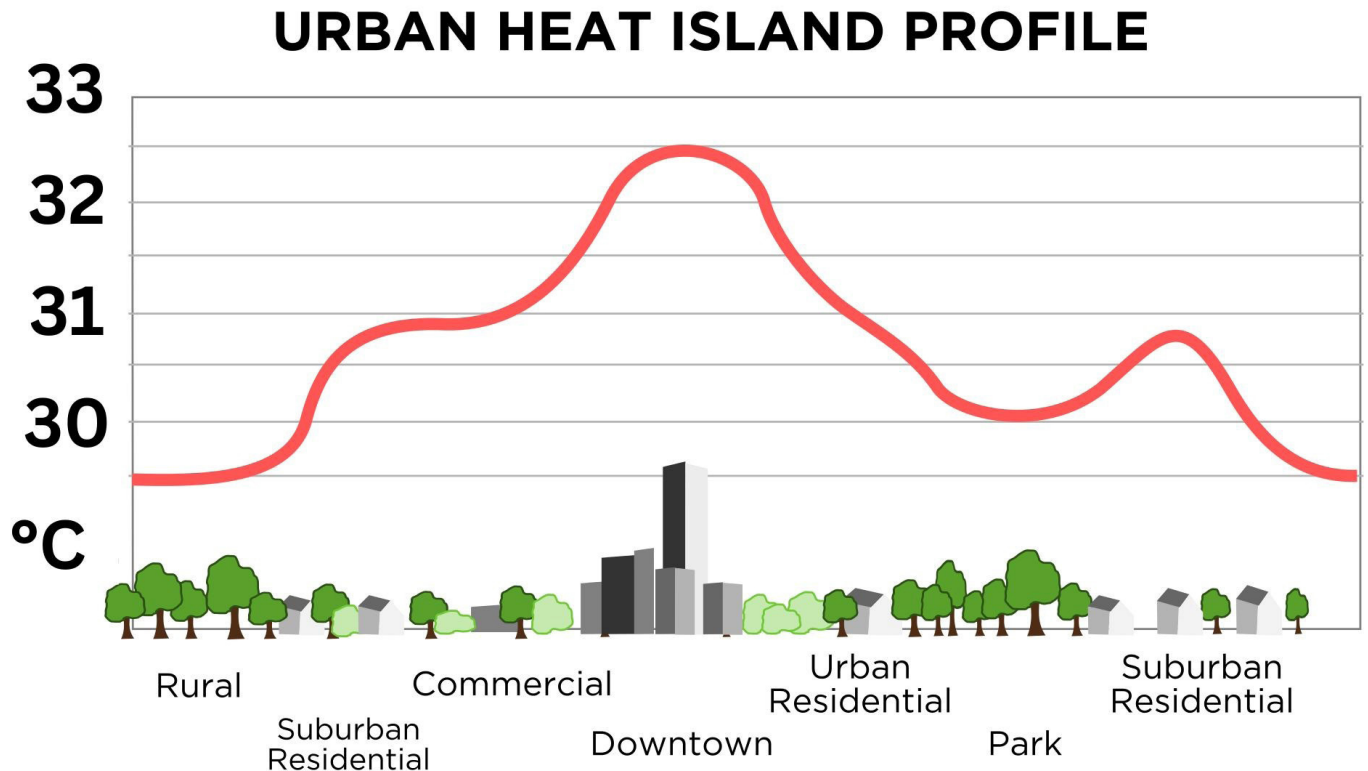
## 4.2 GIMME SHADE!

Shade is vital in mitigating the effects of excessive heat and sun exposure. It provides relief from the sun's rays, reducing the risk of heat-related illnesses and creating more comfortable outdoor spaces. Shade also helps to cool buildings, reducing the need for air conditioning and energy consumption.

Trees provide this kind of natural cooling by shading streets, sidewalks, and buildings. This helps lower temperatures in urban areas, combating the Urban Heat Island effect.

Urban heat islands, characterised by higher temperatures in cities compared to their surrounding rural areas, are a growing concern due to climate change and extensive urbanisation. It occurs as metropolitan areas and towns replace natural vegetation and green spaces with concrete structures, pavements, and buildings. Trees provide shade and help cool down the surroundings through a process called transpiration. Their leaves release water vapour into the air, which cools the immediate environment, making cities more habitable and reducing the energy required for air conditioning.

Mechanism of the urban heat island effect: the densely-built downtown areas tend to be warmer than suburban residential areas or rural areas.



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## CONNECTED TOPICS IN CURRICULUM



### **SUBJECT: Science lessons / STEM**

- Effects of sunlight
- Weather phenomena, temperature, climate
- Measures to protect natural resources
- Phenomena in the environment that are a consequence of the negative influence of man (example: climate change, global warming, greenhouse effect, acid rain, damage to the ozone layer, extinction of endangered species of plants and animals)
- Human activities for the protection of the environment

### **SUBJECT: Arts** - Creative expression and appreciation

- Artistic production of works from recycled material
- contribution of art and other forms of cultural expression to understanding and changing the world by expressing own ideas, experiences and emotions (individual or collective)

### **SUBJECT: Languages**

- Narrating and describing (using appropriate vocabulary and using present and past tense verbs, describing people, characters, plants, animals, natural phenomena and landscapes, expressing thoughts and feelings)
-



## 4.3 RAIN ON ME!

As climate change has a significant impact on weather patterns, the intensity and frequency of storms and heavy rain may increase in the future. For cities, this already entails several challenges today, from overflowing of drainage systems to damage to infrastructure and properties to the disruption of services.

In the case of extreme weather events, trees play a crucial role in managing stormwater in urban and natural environments. They help mitigate the negative impacts of storms and heavy rain by providing several key benefits:

The canopy of trees intercepts rainwater, reducing the direct impact of rainfall on the ground. This helps prevent soil erosion and minimises soil compaction that can occur when raindrops hit bare ground. Furthermore tree roots absorb water from the soil, reducing surface runoff. This process helps recharge groundwater aquifers and decreases the amount of water flowing directly into storm drains and water bodies.

Generally trees store a significant amount of water in their tissues, including leaves, stems, and roots. This stored water is gradually released after the storm, helping to regulate the flow of water into nearby streams and rivers. This can reduce the risk of flash floods.

By binding soil particles together, trees prevent erosion and soil loss during heavy rainfall. This helps maintain the integrity of the soil, which in turn aids in stormwater management.

In addition, as stormwater percolates through the soil around tree roots, it is filtered and purified. This way, trees can remove pollutants and excess nutrients from the water, improving water quality before it reaches natural water bodies.

Street trees offer a wide range of benefits that directly impact the quality of life in urban areas, and educating young people about these benefits can help them appreciate their significance.

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## CONNECTED TOPICS IN CURRICULUM



### **SUBJECT: Science lessons / STEM**

- Essential properties of water, cycle of water in nature
- Weather phenomena, temperature, climate
- Measures to protect natural resources
- Phenomena in the environment that are a consequence of the negative influence of man (example: climate change, global warming, greenhouse effect, acid rain, damage to the ozone layer, extinction of endangered species of plants and animals)
- Human activities for the protection of the environment

### **SUBJECT: Arts** - Creative expression and appreciation

- Artistic production of works from recycled material
- contribution of art and other forms of cultural expression to understanding and changing the world by expressing own ideas, experiences and emotions (individual or collective)

### **SUBJECT: Languages**

- Narrating and describing (using appropriate vocabulary and using present and past tense verbs, describing people, characters, plants, animals, natural phenomena and landscapes, expressing thoughts and feelings)
- Working with written texts: comprehension and reproduction of meaning (use of texts about these topics)

### **SUBJECT: Music**

- Songs about rain
  - Creating noises and sounds, making themes sonorous
- 



Credit: Freepik.com

## 4.4 HOME FOR BIRDS AND BUGS

Urban trees serve as habitats for various birds, insects, and small animals, contributing to urban biodiversity. A rich urban ecosystem with diverse plant and animal life is essential for maintaining the environment's overall health.

How does a tree contribute to that?

First of all, a tree is habitat for various species. They provide homes, shelter, and nesting sites for a wide range of organisms, including birds, insects, mammals, and fungi. The complex structure of a tree, with its leaves, branches, and cavities, offers niches and microhabitats for different species.

Furthermore, trees produce fruits, nuts, seeds, and nectar that serve as essential food sources for many wildlife species, such as birds, mammals, insects, and even other plants. Some trees are particularly important in this regard, like oak trees that support numerous wildlife species.

Reciprocally, many tree species rely on pollinators such as bees and butterflies for reproduction. By attracting these pollinators, trees indirectly support the biodiversity of other plant species that also depend on these pollinators.

In addition, trees improve soil fertility by dropping leaves and needles that decompose and enrich the soil with organic matter. Healthy soils support a diverse range of organisms, including earthworms, microbes, and fungi.

By caring for our trees, we provide our animal neighbours with a suitable habitat and help maintain the delicate balance of nature and contribute to a thriving ecosystem ([link to Further Explorations #4](#)).



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## CONNECTED TOPICS IN CURRICULUM



### **SUBJECT: Science lessons / STEM**

- Habits of native birds throughout the year
- Way of life of selected native animal species
- Importance of the tree habitat
- Nature observations
- Measures to protect natural resources
- Human activities for the protection of the environment

### **SUBJECT: Arts** - Creative expression and appreciation

- Artistic production of works from recycled material
- contribution of art and other forms of cultural expression to understanding and changing the world by expressing own ideas, experiences and emotions (individual or collective)

### **SUBJECT: Languages**

- Narrating and describing (using appropriate vocabulary and using present and past tense verbs, describing people, characters, plants, animals, natural phenomena and landscapes, expressing thoughts and feelings)

### **SUBJECT: Music**

- Songs about nature, birds and bugs
-

## FURTHER EXPLORATION

Peter Wohlleben is a German bestselling author who brought the secret lives of trees into the book charts worldwide. The young readers edition of his book is a treasure chest for teaching nature's wonders to children:

Wohlleben, P., Tanaka, S., Billingham, J., & Wohlleben, P. (2019). *Can you hear the trees talking?: Discovering the hidden life of the forest ; Young Readers Edition*. Greystone Kids.



Andrea Curtis and Pierre Pratt provide a picture book for children on the benefits of tree-rich parks and streets in the city with great illustrations:

Curtis, A., & Pratt, P. (2020). *A forest in the city*. CNIB.

This elementary school in Berkeley, California is engaging their students in planting micro forests on the school grounds. Meet science teacher Neelam Patil and her students and get inspired to advocate for urban forests:

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Pamela Hickmann and Zafouko Yamamoto (Illustrations) created a children's book on trees being a habitat for so many animal species. It follows life on and in an old oak tree through the seasons: Hickman, P., & Yamamoto, Z. (2021). *A tree is a home*. Kids Can Press.

# CONNECTED ACTIVITIES

4.1 Windsock Crafting

4.2 Windsock crafting for learners with different abilities

4.3 Bird Nest Observation

4.4 Bird Nest Observation for learners with visual impairments

4.5 DIY Air Purifiers Workshop

4.6 Gardening Workshop

4.7 Gardening Workshop for learners with different abilities

4.8 Shade Shelter Design Workshop

4.9 How does it rain?

4.10 Umbrella Decorating

4.11 Raindrop Art

4.12 Raindrop Art for learners with motor skills abilities

4.13 Weather Journal

4.14 DIY Sun Hats

4.15 Bug Anatomy Exploration

4.16 Feather Painting

4.17 Balloon Racers

4.18 Exploring the Air We Breathe

4.19 Bird and Bug Relay Race

4.20 Build a Treehouse or Fort



# VISIONARY BOX

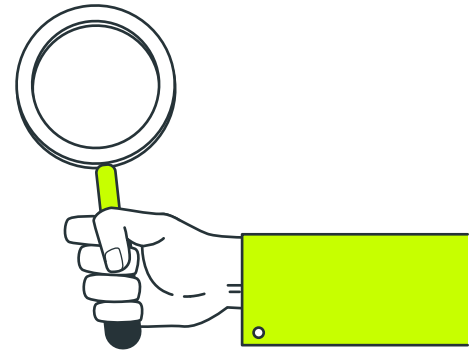
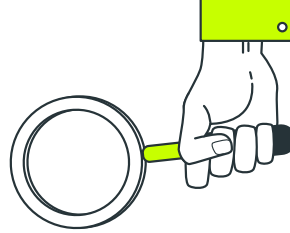


North Macedonia

This activity, planting trees, is made a national holiday, "Day of the tree". Every year every school in North Macedonia has actions for planting trees, every school gets a donation of trees and they plant them in the school yard or some place in the city that needs greenery. The schools organise actions and they go to a place that needs greenery and plant trees.



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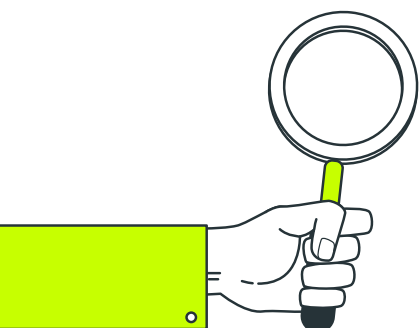
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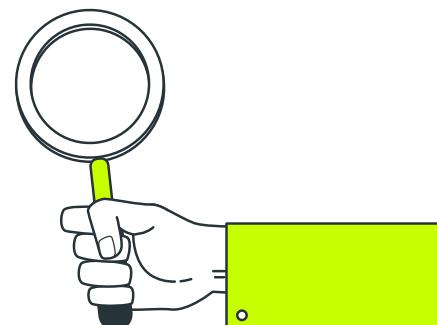
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