



urban science



# GOOD PRACTICE PORTFOLIO



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**We would like to give thanks to all the teachers and students  
who tested Urban Science educational modules,  
and specially to those who contributed to the publication.  
On the basis of their comments and remarks, we improved and adjusted  
our materials so they can help make a real change in classroom practice.**

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The Case Studies booklet was prepared as a practical guidebook for science teachers and educators. It summarises the results of the piloting phase of the Urban Science project that took place from September 2017 until October 2020 in six European countries (UK, Poland, Latvia, Bulgaria, Italy and Hungary).

This booklet includes examples of how Urban Science learning materials were used in the classroom to educate young people about the major challenges in making our cities more sustainable.

All Case Studies are based on personal experience of the teachers who piloted our Learning Modules. So, in case you get interested in any specific Case Study or have further questions about tools or methods used during science classes, feel free to contact the relevant project partner directly.

We believe this booklet will bring a change at the classroom level by getting more teachers confident in using Urban Science approaches in their everyday work. We also hope that this publication will become an inspiration for many educators to use a wide range of methods effectively and appropriately to the learning needs and preferences of their students.

Urban Science Project Team

**We hope you enjoy this booklet!**

## Introduction to the Urban Science approach

Over two-thirds of the European population live in cities. Enabling those cities to deliver services sustainably while keeping their citizens safe, healthy, prosperous and well-informed is amongst the most important challenges in this century.

The Urban Science European project is an education response to this, to improve the teaching of scientific inquiry and investigation so that students develop the competences to actively contribute to creating healthy cities, gain scientific skills to enter the world of work, and meet the demand for the urban scientists of the future.

Urban Science works through outdoor inquiry-based learning where urban areas become living-laboratories that help students explore how science can create healthier and sustainable places to live. It is solutions based; placing a strong emphasis on creativity and problem solving to ensure scientific understanding can be applied in a meaningful context.

The project draws on several influences in inquiry-based learning and an understanding of how the natural world provides a systems model for sustainability. Critical to the success of the project is weaving together the needs of curriculum in the partner countries, teacher competences and learner profiles.





# Case Studies

## How would Rezekne city look like in a zero-waste future?

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***I chose this topic for my students because we are an Eco-School and “waste” is one of the topics that we have to talk about in our school every year. This time we were keen to discover what the situation is in Rezekne regarding the waste topic. We also wanted to dream a little and imagine how our city would look in a zero-waste future. This module allowed us to look at city topics and waste challenges from a different perspective!***

*Anita Vaivode, Rezekne Polish State Gymnasium, Rezekne (Latvia)*

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### URBAN SCIENCE IN PRACTICE – IMPRESSIONS & REFLECTIONS

The students were involved in choosing a module to work with and they were interested in the “Make Waste Zero”. Activities were tried out in Geography lessons for grades 10 and 11 on a topic about cities. Materials were adapted for each class. The school had little experience working on city topics before, this was a new experience for them.

Some creative activities were added; students had to draw or make a collage about how Rezekne city could look if waste bins are removed but waste remains and how it would look in 2030 when it becomes a zero-waste city.

Students worked in groups at specific places in their city, which made their work more connected to real life, and students were motivated. Urban Science lessons were different because teachers do not usually organize outdoor lessons so often. Using Urban Science materials also allowed the teacher to observe students in a different situation.

Now the teacher feels that they know their city a bit better and she can talk with students about their city challenges more freely. From these learning materials, she has gained new ideas and methods to use and adapt to different lessons. Usually the teacher does not use so many IBSE methods – she would like to use this methodology more often and this project was a good opportunity.

### IMPACT ON STUDENTS

The active involvement and increased activity from students in lessons is a great benefit of using Urban Science materials. Of course, it is not possible to observe significant changes in student motivation in such a short time. Although active and serious involvement in learning activities could indicate an increase in motivation to participate in the assessment and improvement of the urban environment in their hometown. Students enjoyed the activity about visualizing how their city could look in 2030. These materials give an opportunity to study, think and draw conclusions based on the real-life situation which we sometimes miss in everyday lessons.





## TIPS & TRICKS

Plan and work together with more subject teachers if possible. It will help to promote the development and improvement of student competencies.

## GET INSPIRED!

This case study was based on the Learning Module called “Make Waste Zero”.

Module materials in English are available from: <https://urbanscience.eu/uk/learning-modules/>

Module materials in Latvian are available from: <https://www.videsskola.lv/macibu-materiali/87-dabaszintnes-pilst?start=7>



## Kandava – one step closer to become a zero-waste city!

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***We chose the module “Make Waste Zero” because we saw the opportunity for different subject teachers to work on it together.***

*Elita Lavrinovica, Kandava Regional Secondary School, Kandava (Latvia)*

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### URBAN SCIENCE IN PRACTICE – IMPRESSIONS & REFLECTIONS

At the beginning of a trialling the team was formed including biology, geography, chemistry and physics teachers. Activities were divided so that they would better fit within the subjects. Eighth grade students were involved and a few activities were trialled with students with learning disabilities.

Teachers used the urban environment as part of their learning process and they had some experience in doing research and making ideas for sustainable development in the city in different projects. During Urban Science lessons they went out in the city more often as usual.

The school has previous experience in using IBSE methods in science classes. During Urban Science lessons teachers followed the way they usually organize investigations outdoors – dividing large classes into smaller groups which makes it easier to organize research work outdoors.

Working with Urban Science materials teachers took different roles – they observed students, got involved in the process and also explained things that were not so easy to understand for students, e.g. *to find something that has an educational function in nature* in the activity “Function Hunt”.

During this project, both students and teachers got to know the *zero-waste* concept better. This project helped teachers of different subjects to work together as a team. Teachers mentioned that learning materials are well prepared and consist of step-by-step activities that can be adapted to different science lessons. Also, teachers have an opportunity to choose from several methods.

### IMPACT ON STUDENTS

Teachers noticed that students` motivation varied – some students were happy to be involved and also some who got involved formally and tried to do something else while working in groups. Most of the students were satisfied with working with Urban Science. Students appreciated the knowledge they gained about the experience of different zero-waste cities.



## TIPS & TRICKS

- In one class it was hard for students to form groups and they got quite distracted, so in the next lesson teacher helped to form groups by choosing group leaders.
- Learning materials are very well prepared but time-consuming so teachers need to plan their work well ahead.
- The amount of given information for some activities is too large for students. The recommendation for teachers is to select the most important parts of this information, that way reducing the amount of given information.
- It is important to guide students towards a zero-waste approach rather than thinking that recycling is the solution to all waste problems.
- We would like to encourage students to do research – analyse the amount and composition of waste that is generated by their households.
- Materials are suitable for work in project weeks or different after school clubs.

## GET INSPIRED!

This case study was based on the Learning Module called “Make Waste Zero”.

Module materials in English are available from: <https://urbanscience.eu/uk/learning-modules/>

Module materials in Latvian are available from: <https://www.videsskola.lv/macibu-materiali/87-dabaszintnes-pilst?start=7>

## No more waste!

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***We used the materials in our biology classes where we linked the Urban Science content to the classes for symbiotic relations between different organisms and how it links to the transfer of nutrients in an ecosystem.***

*Vassil Levski School, Karlovo (Bulgaria)*

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### URBAN SCIENCE IN PRACTICE – IMPRESSIONS & REFLECTIONS

The learning materials helped to look at nature in the city in a new way, to learn from the functioning of trees and suggest how an unspoiled forest system in a city could create favourable climate conditions for physical and psychological health. Materials supported students in the planning and organisation of their science project.

Karlovo city is located in the southern foothills of the Balkan Mountains which gives a number of advantages to the inhabitants but, unfortunately, many of them through their actions lead to the destruction of the natural habitats of species valuable for nature. From students' observations it turns out that those actions lead to an ongoing destruction of our environment.

So, students' ideas included the creation of a plastic waste recycling device called ECOBOT. Once every citizen discards their plastic waste in this device, a value amount will be displayed on a small screen. Depending on this, the person will be able to choose how to use these funds. There are three options offered:

- to make a donation to a charitable cause related to the improvement of natural conditions in our city;
- to receive shopping bags made from recycled or environmentally friendly materials, thus the use of plastic bags is reduced;
- to receive a QR-code-voucher, which will be used for discounts when shopping in the local shops.

In this way, every resident would receive satisfaction from the work done and an incentive to continue this activity and to appeal to everyone else to join our initiative.

To implement this project, students will ask for support and cooperation with the hypermarkets in the area which could transport collected plastic to the recycling centres, and would also help to introduce the above QR-code vouchers in their stores.



### IMPACT ON STUDENTS

The participation in the project was an euphoric experience for students with many artistic expressions within the science classes and many debates. There were a lot of individual opinions when developing the idea since the way topics were presented allowed for student's imagination to go beyond the usual straightforward thinking in science.

### GET INSPIRED!

This case study was based on the Learning Modules called "No more waste!".

Module materials in Bulgarian are available from:

<https://ecosystemeurope.org/%d0%b3%d1%80%d0%b0%d0%b4%d1%81%d0%ba%d0%b0-%d0%bd%d0%b0%d1%83%d0%ba%d0%b0-%d0%bf%d1%80%d0%b8%d1%80%d0%be%d0%b4%d0%bd%d0%b8%d1%82%d0%b5-%d0%bd%d0%b0%d1%83%d0%ba%d0%b8-%d0%b2-%d0%bf%d0%be%d0%b4%d0%ba/?slide=1>,

## Looking for the zero carbon future of Kavarna city

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***My students enjoyed acquiring information of the many skills of the living world, which made them think about the majestic forests and how important is to keep them alive. They were fascinated how different species in nature create partnerships, also how soft organisms like the fungi can brake hard ones like the stones, also how the dying tree supplies the living with its resources – something they found superior to human's thinking.***

*Yodran Yovkov School, Kavarna (Bulgaria)*

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### URBAN SCIENCE IN PRACTICE – IMPRESSIONS & REFLECTIONS

In the teachers' opinion, this module offered topics of present-day importance for the students – topics that require much attention. Right now our way of life still depends on mineral fuels, extracted from the bowels of the earth. However, the world has already exhausted half of these fuels, and in a few decades they will disappear forever. It is therefore vital that Europe develops secure energy sources that will not be depleted; energy from the sun, wind, water and plants.

Learning materials were used as a basis for students' project on renewable energy, particularly biomass – energy of biological material. It allowed a class to go deeper in the understanding that plants give simply the oxygen we need to live. Scientists point to algae as the most promising raw material for biofuel production. Thus, students' project focused on using algae from the Black Sea, which are washed ashore.

Young people tried to get zero carbon energy from the mixture of water and algae. Through their experience young people could see how to limit the amount of fossil fuels used. The production of energy from algae also has an economic effect: new jobs are created, which will reduce the unemployment rate, while creating opportunities for engaging people from minorities in the area, developing small and family businesses. The production of energy from algae does not emit carbon dioxide into the atmosphere. This is a production in which CO<sub>2</sub> is absorbed and oxygen is released, which leads to cleaner environment.

Learning materials were directly linked to the local context as the city of Kavarna is located right on the sea coast with about 65,000 sq.m. of available beaches. Students estimated the amount of algae collected through the year can be used to produce biogas, meeting the energy needs of the population of Kavarna.





### IMPACT ON STUDENTS

After finalizing the project, students concluded that there were two kinds of people. One, linked to nature and other – destroying it to build more buildings, for instance. But by doing so we destroy the homes of birds and squirrels to whom our wellbeing also depends should we be able to ‘see it’. We should think more about other living beings and I hope science can help us realize that.

### GET INSPIRED!

This case study was based on the Learning Module called “Let logical energy and climate balance”.

Module materials in Bulgarian are available from:

<https://ecosystemeurope.org/%d0%b3%d1%80%d0%b0%d0%b4%d1%81%d0%ba%d0%b0-%d0%bd%d0%b0%d1%83%d0%ba%d0%b0-%d0%bf%d1%80%d0%b8%d1%80%d0%be%d0%b4%d0%bd%d0%b8%d1%82%d0%b5-%d0%bd%d0%b0%d1%83%d0%ba%d0%b8-%d0%b2-%d0%bf%d0%be%d0%b4%d0%ba/?slide=1>,



## Let's take a deep breath of fresh air!

***Air quality is an important issue in our city. During autumn and winter time we fight with an increasing air pollution. So the Learning Module's topic was fully related to the local context. Unfortunately, it didn't directly link to the curricula of the specific grade I wanted to work with. Thus, I decided to use this material as a basis for a project for the interested students aged 12–13.***

*Jolanta Tworek, Primary School no. 10, Tarnobrzeg (Poland)*

### URBAN SCIENCE IN PRACTICE – IMPRESSIONS & REFLECTIONS

In general, the project was implemented as an activity for a group of students interested in environmental issues and eager not only to read about science but simply do it. Project was implemented both at school – where students worked under teacher's supervision – and in the urban environment – where young people organized their work themselves. Proposed list of the activities was directly followed by the teacher (only one was missed due to lack of time).

Hours spent in the classroom were dedicated for group activities including introductory discussion, planning of the air quality sampling, summary of the field observations, development of the future vision of the city and summary of the project – students prepared a letter to the City Mayor summarizing results of their work and presenting ideas for the activities which can help to create healthier and greener Tarnobrzeg.

Outside the classroom students had some freedom in planning and organising their work. They were aware of the outcomes to be produced and had to make sure that they are going to be delivered. The freedom provided created conditions to develop students' responsibility. During the time of the project national teachers' strike occurred. Schools were closed for the whole month. Yet, students were still engaged in the project and when schools came back to work, they were ready to analyze collected air quality samples and discuss the results.

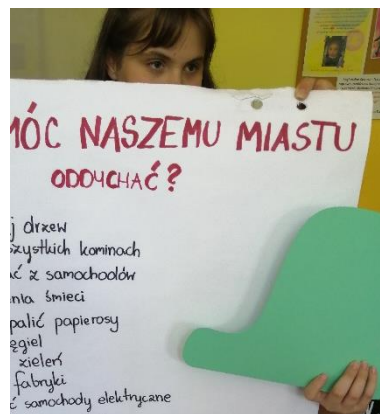
Mrs. Tworek is an experienced teacher who uses IBSE methods in her everyday work. Yet, she still found some new inspirations in the teaching materials including Six Thinking Hat method. Both, she and her students really enjoyed this activity. It helped to foster young people's creativity in developing future scenarios for their city development.

#### STUDENTS' PERSPECTIVE

- *"This project was important because I know that the air quality in our city is not very good."*
- *"Issues discussed are crucial for the healthy future of our city. People need to change their daily habits – maybe they can use some suggestions we prepared during one of the activities?"*
- *"We all want to live in a healthy city. Everyone should be aware of the fact that environmental pollution harms our health."*



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3	115	
4	171	
5	193	



## IMPACT ON STUDENTS

In teacher's opinion, such amazing students' engagement was caused by the local context of a topic – young people often recalled their own experience. They all agreed that air quality is one of the biggest concerns their city needs to face.

Organization of the project enabled young participants to use and improve skills which are usually missed in everyday school work. Students liked the activities involving discussion and group work (i.e. Six Thinking Hats or looking into the future and discussion on how to help people change bad life style). It seems that there is not enough time for a discussion during typical lesson and they missed that. Students also loved to work independently in the field, i.e. when taking photos of the 'healthy' and 'unhealthy' city or collecting air samples.

## TIPS & TRICKS

- Module can be implemented throughout the year – during autumn or wintertime if teacher wants to focus on pollution created by households and during spring/summertime when natural air pollution can be observed (i.e. pollen from plants).
- Students should locate lots of samples for the air quality measurements across the city – some may be destroyed by weather conditions (wind, rain etc.), birds or people.
- Youth can successfully make measurements and observations as part of their extra work.
- Teacher can select specific activities and include them in a plan of a "normal" lesson – sometimes as a great introduction (i.e. the activity "Atmosphere in our city") or summary (i.e. the activity "The healthiest city in the world").

## GET INSPIRED!

This case study was based on the Learning Module called "Let's take a deep breath of fresh air in our city".

Module materials in English are available from: <https://urbanscience.eu/uk/learning-modules/breathless/>

Module materials in Polish are available from: <http://urbanscience.gridw.pl/dla-nauczycieli/scenariusze>

## What does Lielvarde city sound like?

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***I chose this material to use in distant learning period for 6th grade in physics. I feel that in this process not only students learned new things but also their parents and me as well.***

*Inita Semjonova, Edgars Kaulins, Lielvarde Secondary School, Lielvarde*

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### URBAN SCIENCE IN PRACTICE – IMPRESSIONS & REFLECTIONS

The trialling of the Urban Science activities happened right in a time of emergency of COVID-19 in Latvia when schools had to use distant learning instead of face-to-face lessons. This was a challenge and also the opportunity to use materials in an unusual situation. The topic of sounds fits very well with the curriculum of physics. The module “Sounds in My City” was tried with 6<sup>th</sup>-grade students during the distant physics classes.

The city topic is not new in the teacher’s experience, she often goes outdoors with students to explore and do observations. The use of IBSE methods is not as often as it takes more time. Usually, they use this method mostly during the project weeks when the schedule is more flexible.

It took more time to prepare this lesson for distant learning because the teacher had to select activities which students could do independently and adapt materials for 6<sup>th</sup> grade. The teacher also added more information so students can do their project easier – e.g. noise map of Riga and Lielvarde town map so they could prepare their own noise map.

Using Urban Science Materials helped to connect theory and practice. Lessons became more active and more connected to the urban environment. Students were more interested in working outside the classroom. Sometimes working outside brings more behavioural issues to occur and students might have problems with discipline and self-control.

The main benefit of using Urban Science materials were practical activities and the possibility to better explore the city. Students learned about noises in Lielvarde and also found out that there are a lot of pleasant sounds in the city as well. Teacher feels more confident to speak about city challenges.

### IMPACT ON STUDENTS

As the teacher used learning materials in distance learning, she was not able to see how students worked. But students could work together with their parents and explore the local neighbourhood together. I could see that parents got involved – some parents shared photos of different birds from their cameras that take photos remotely so birds don’t get scared. Also, some kids reported that they made bird feeders to observe birds.



### TIPS & TRICKS

- Activities in Urban Science materials will help to know your city better.
- Students plan to make suggestions for the City Council on how to make the city better regarding noise issues.

### GET INSPIRED!

This case study was based on the Learning Module called “Sounds in My City”.

Module materials in English are available under the link:

<https://urbanscience.eu/uk/learning-modules/>

Module materials in Latvian are available from: <https://www.videsskola.lv/macibu-materiali/87-dabaszintnes-pilst?start=7>

Module materials on the same topic in Italian are available from: [www.creda.it/wp-content/uploads/2020/07/8\\_UrbanScience\\_moduloCittaSonora.pdf](http://www.creda.it/wp-content/uploads/2020/07/8_UrbanScience_moduloCittaSonora.pdf)

Module materials on the same topic in Latvia are available from:

<https://www.videsskola.lv/component/attachments/download/211>

## Living in the shade

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***Discussing impact of UV light on our health is a great topic for pre-summer school activities. It engages students into scientific discussion when everyone already thinks about holiday. In our case it also helped to run skin cancer awareness school campaign.***

*Jolanta Tworek, Primary School no. 10, Tarnobrzeg (Poland)*

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### URBAN SCIENCE IN PRACTICE – IMPRESSIONS & REFLECTIONS

Materials from the Learning Module were used to support teacher's work during skin cancer awareness campaign run at school by 7<sup>th</sup> graders (aged 12–13). During typical lessons young people got to know more about UV light as well as its impact on our health. Afterwards, they shared their knowledge and experience with other students during open presentation at school gathering.

The lead teacher decided not to carry out all the activities. She selected those which helped her to introduce a topic (what is UV light?), encourage students to participate in the experiment and prepare presentation of the results. Therefore, time needed to implement the module was shorter in comparison to the planned one.

### IMPACT ON STUDENTS

Students really engaged in the activities because of an interested topic – directly related to their everyday life (and upcoming summer holiday). Moreover, they were motivated by the final task – presentation of the results derived from the experiment, including photos, to their younger and older colleagues, explaining influence of environmental conditions on our health.

### TIPS & TRICKS

- Module is a great example of the materials linking science with our everyday life, no matter if implemented before summer holiday or wintertime when we also need to protect our skin against UV light.
- Location of a new cafeteria (example mentioned in the Module) can be easily modified to adjust situation to specific conditions of a school and help students better understand a challenge. Teacher can use an example of school canteen or any other place well known to students.





### GET INSPIRED!

This case study was based on the Learning Module called “In the Shade”.

Module materials in English are available from: <https://urbanscience.eu/uk/learning-modules/>

Module materials translated into Polish and adjusted are available from: <http://urbanscience.gridw.pl/dla-nauczycieli/scenariusze>

Module materials on the same topic in Italian are available from: [www.creda.it/wp-content/uploads/2020/07/7\\_UrbanScience\\_moduloOmbra.pdf](http://www.creda.it/wp-content/uploads/2020/07/7_UrbanScience_moduloOmbra.pdf)



## Can Nature help us to create more sustainable cities?

*Topics raised by Urban Science are important because they provide a realistic opportunity to understand where and how we humans intervene with natural processes, where we make mistakes and how we can reverse this wrong interaction, while minimizing our impact on nature. While some topics are not new the way they are presented allowed a different perspective.*

164 School “Miguel de Cervantes”, Sofia (Bulgaria)

### URBAN SCIENCE IN PRACTICE – IMPRESSIONS & REFLECTIONS

In teachers’ opinion, the topics raised by Urban Science are important to implement in curriculum since they reflect on elements of our everyday life that we sometimes ignore. Thus, when there is content that remind us of their importance and omnipresence, the education benefits. The challenge is that scientific content has been imposed in us, content that is not always precise and lots of thinking is required to realize that some of it might be speculation. Urban Science is delivering an approach to science that is asking students to find deeper questions on the functioning of the living world around us.

The benefits of Urban Science include: easy implementation with little preparation time and links to the curriculum subjects; and, an innovative approach to otherwise familiar topics (i.e. waste and air pollution).

This different point of view is supplemented by the opportunity to work with the whole class and outside in the urban environment, not far from school, which saves time and limits the administrative burden to organize outings.

### IMPACT ON STUDENTS

Thanks to the implementation of the Urban Science materials,

#### STUDENTS’ PERSPECTIVE

- “I was really surprised that the energy flow is creating the shapes we see around; the physical world. The whole world is just an energy flow of interconnectedness.”
- “I never knew trees are communicating to one another. And that even different species are helping each other by sharing resources.”
- “I realized how different event in an ecosystem are actually connected.”
- “It was really intriguing to see how energy ‘travels’ from the biochemical processes in our bodies all the way to the thermo power plants and the impacts of its use on the balance in the biosphere.”
- “I got a new look into things and an opportunity to work with information with practical implications.”
- “I started wondering how the energy in my body is unbalanced by the energy drinks, alcohol, drugs and all unnatural additives in food, thus leading to illnesses. Is it the same when we send greenhouse gases in the biosphere and making it sick?”



students realized the complexity of the links between all living organisms on the planet. This connection is optimizing the functioning of different organisms so they can survive as one whole. It taught them of the mutually beneficial links between different organisms in nature. For example, most of the students have never suspected that fungi break down rocks to supply trees with food. Some of the stories were so amazing and difficult to believe, yet they helped young people to realize how complex interactions in nature are on a system level.

Students could also see that thanks to science they are able to understand the living world – science is studying the interconnectedness in the world and it means understanding the world. Because the scientific information was presented in a different way, it was more accessible to the students. It provoked the students to think in a different way and in their everyday science experiences in school. They enjoyed how science was presented in a fictional way and they were provoked to look for additional scientific information after my classes – a rare thing.

As students claimed, they never thought science can be so beautiful! It was really big for them how the classes linked physics, biology and chemistry through the same activity.

### GET INSPIRED!

This case study was based on the Learning Modules called Plant up the City!; Eating not killing!; Logical energy and climate balance.

Module materials in Bulgarian are available from:

<https://ecosystemeurope.org/%d0%b3%d1%80%d0%b0%d0%b4%d1%81%d0%ba%d0%b0-%d0%bd%d0%b0%d1%83%d0%ba%d0%b0-%d0%bf%d1%80%d0%b8%d1%80%d0%be%d0%b4%d0%bd%d0%b8%d1%82%d0%b5-%d0%bd%d0%b0%d1%83%d0%ba%d0%b8-%d0%b2-%d0%bf%d0%be%d0%b4%d0%ba/?slide=1>,

## Can we save the planet from plastic litter?

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***I decided to work on this challenge because my students were already interested on the waste management produced in our school. They also showed curiosity to understand why there is so much plastic waste in seas and oceans if in our cities we collect and divide all plastic materials. I had already the chance to work with the IBSE approach and I wanted to try it with this topic to work both on scientific and citizenship skills.***

*Francesca Salogni, Secondary School of Vedano al Lambro*

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### URBAN SCIENCE IN PRACTICE – IMPRESSIONS & REFLECTIONS

The teacher started working on this topic with students right in the beginning of the school year. Students had some practical summer homework such as taking pictures of plastic litter in different places, finding evidences and making hypothesis on the reasons because litter was there and making controlled degradation experiments on plastic and others type of waste. This homework turned out to be an extraordinary way to commit students: they were ready to know more on this topic when school opened.

Students were used to working with the IBSE method. The teacher had an idea of the module structure to be followed and of the activities to propose to students, but she had in mind also to be open to students results and to re-think the timing and the activities along the way.

What has been different from their previous experience with IBSE was the topic (sustainability goals) and the teaching setting (urban environment). Sustainability goals often are topics just to refer to when dealing with subject such as ecosystems, biodiversity, energy and so on and outdoor learning in the urban environment is not usual.

After this experience, teacher is more confident with the possibility to use IBSE outside of the classroom and to link to a sustainability challenge to teach science.

### IMPACT ON STUDENTS

Teacher reflected that, while students were working with plastic materials to understand their properties and limits in phase 3, some science and math topics which were not directly related such as solutions, concentrations, density, elasticity, the use of microscope and scales and proportions have been revised and students understood their importance in relation to this real activity.

This experience is, if possible, never-ending. How many students' questions came out from this first experience? So many that there was not the time to delve into all of them. The impact on students of this experience is related to this: they realized that real life problems, such as the plastic issue, is complex and it has links to so many other issues. They learnt that answers

to the plastic challenge for the planet can't be easy and straight forward, so many impacts, effects and reasons are behind it, and it is worth to get to understand them to take decisions in a responsible way.

### TIPS & TRICKS

- Plastic (unfortunately) is everywhere: you can look for samples of soil, riverbank sand, class dust, cosmetics, clothes, and river water.
- If you have a stereoscope, it is worth to use it to look for microplastic and to examine them.



### GET INSPIRED!

This case study was based on the Learning Module called Sfida alla Plastica.

Module materials in English are available from: <https://urbanscience.eu/uk/learning-modules/>

Module materials in Italian language are available under the link: [www.creda.it/wp-content/uploads/2020/07/3\\_UrbanScience\\_moduloSfidaallaPlastica.pdf](http://www.creda.it/wp-content/uploads/2020/07/3_UrbanScience_moduloSfidaallaPlastica.pdf)



## Seed bombing

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***We chose biodiversity because it is a topic which is related to our biology curriculum and because it is not easy for students to understand its importance for the planet life. So we thought that this was an opportunity to find new tools and methods to reveal the importance of biodiversity for ecosystems.***

*Elisa Redaelli and Rosangela Bianconi, Secondary School of Monza*

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### URBAN SCIENCE IN PRACTICE – IMPRESSIONS & REFLECTIONS

Teachers decided to use Urban Science resources because they were interested in the topics of sustainability and they did not know about the IBSE method and were curious to experiment with it.

Biodiversity issue fit in their program and gave them the opportunity to take their students outside of the classroom to examine the school yard and to think of a plan for its improvement from the point of view of biodiversity. In the last few years, in fact, school effort has been focused on the agronomic valorization of the school green area, and this education unit has been a way to have student's perspectives and involvement.

Teachers had a precise number of hours to dedicate to this module because it was a specific science project. At the end extra work has been necessary, especially for the last stage of documentation because they decided to present their work to a local science festival. Teachers noted many differences between everyday classes and these lessons. What they evaluated positively was the opportunity to have a common thread that was perceived by the students. Each activity had a reason in relation to the development of the journey on biodiversity discovery. The methodology also gave them the opportunity to give importance to phases of work that often teachers do not have the opportunity to give space to, such as initial involvement and the documentation stage.

### IMPACT ON STUDENTS

Before starting the activities, students' motivation wasn't that high. Some of the students' comments reported that the biodiversity issue wasn't interesting for them because they didn't understand its importance in relation with their life and what they could effectively do for

#### STUDENTS' PERSPECTIVE

- *"I have done some math, without thinking I was doing math!"*
- *„The thing I really loved to do was to present our work to the Science Festival of our city: we did good!"*
- *"I loved to take pictures of the living organisms; I didn't realize how much life is around me."*

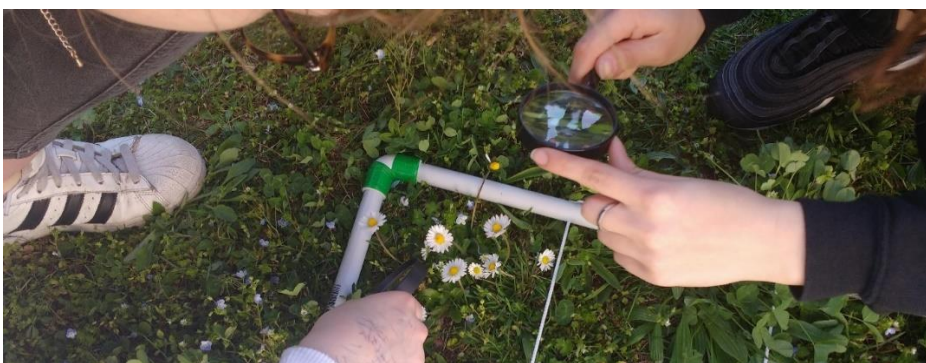


biodiversity. After the lessons, students started to look at their school yard in a different way with a new interest to find and to recognize each kind of living organism they found. Some students looked for an App to recognize flowers and insects and many of them used it. They were also enthusiastic to feel that they could take an action: the example of the guerrilla gardening and of the seeds bombs inspired them and they learned how to make seeds bombs and which seeds are the best to be sprout.



### TIPS & TRICKS

- Don't forget the use of digital technology: personal mobile phones can be a didactic opportunity and a resource especially for mapping, taking pictures, make short research while students are outside.
- With Thinglink App students have georeferenced pictures on biodiversity and the territory where they live.





## GET INSPIRED!

This case study was based on the Learning Module called Welcome Biodiversity (Benvenuta Biodiversità!).

Module materials in English are available from: <https://urbanscience.eu/uk/learning-modules/>

Module materials in Italian language are available from: [www.creda.it/wp-content/uploads/2020/07/1\\_UrbanScience\\_moduloBenvenutaBiodiversita.pdf](http://www.creda.it/wp-content/uploads/2020/07/1_UrbanScience_moduloBenvenutaBiodiversita.pdf)

## An ecosystem in a bottle

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***The IBSE approach is effective and we were happy to experience it to inspire students on this important sustainability issues such as biodiversity.***

*Paola Magnani and Luisa Bonaria, Secondary School of Lissone*

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### URBAN SCIENCE IN PRACTICE – IMPRESSIONS & REFLECTIONS

Biodiversity is one of the topics in the curriculum of the school: teachers decided to plan lessons in class and outdoor, in the school yard and in city parks and gardens. They planned since the beginning to participate with their students to a Science Event with a symposium on biodiversity and some exhibits. The planning phase took them 10 hours all together.

Students began to think about the concept of biodiversity through their realization of photos representing footprints, remains, traces, shells, animals and plants in urban sites. Students had experiences of the meaning of biodiversity in their territory through individual or group research and readings of articles on the subject. Then students produced a preliminary definition of biodiversity to be analysed in 2 different way: some students experimented the conditions needed to make an ecosystem in a closed bottle and others explored a park nearby and observed flora and fauna of different type of ecosystems such as of fresh water canals, river and a green area.

In total they dedicated 8 hours outside of the classroom and 20 hours in class. Teachers evaluated the learning focusing on the following aspects: participation in the working groups, fulfilment of assignments, spirit of initiative, respect for others, material management. They used the following assessment tools: cognitive autobiography, systematic observations, assessment during the learning process and at the conclusion.

## TIPS & TRICKS

- Remember to collect as many questions of students as possible and then to ask to student to classified them to find the ones that refer to sustainability and that are investigable with a scientific approach.
- Even though is much more straightforward to follow an IBSE approach on a “mono” conceptual content (for example: density), even a complex topic such as biodiversity, can be experienced with the same approach. In some cases, the tip is to narrow the investigation to a couple of questions and, if there is the possibility, to start new IBSE cycles at the end.







## GET INSPIRED!

This case study was based on the Learning Module called Welcome Biodiversity (Benvenuta Biodiversità!).

Module materials in English are available from: <https://urbanscience.eu/uk/learning-modules/>

Module materials in Italian language are available from: [www.creda.it/wp-content/uploads/2020/07/1\\_UrbanScience\\_moduloBenvenutaBiodiversita.pdf](http://www.creda.it/wp-content/uploads/2020/07/1_UrbanScience_moduloBenvenutaBiodiversita.pdf)

## How do we get to school? Let's change it!

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***We decided to work together on Urban Science in an interdisciplinary way with a topic that could easily link to science, math, technology and Italian language.***

*Francesca Bellia, Secondary School of Monza*

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### URBAN SCIENCE IN PRACTICE – IMPRESSIONS & REFLECTIONS

Teachers decided to work on air quality combined to mobility topic because Air Quality Index of the area of the school exceeded standard values and because they realized that there were many students that arrived to school by car instead of by bikes or foot.

This topic was also seen ideal to be addressed with a multidisciplinary mode, involving different expertise of the teachers involved. Teachers worked in team and met together to evaluate intermediate results and to decide next steps.

They reported that the link to a real problem of the community where students live has been crucial for students' engagement: students wanted to know more about what are air pollutants and how to measure them and to understand why the territory where they live had such a bad quality air. The IBSE approach incited to find ways to actively research to understand causes and effects of air pollution in their territory: students designed and proposed a survey to all the population of the school on the habits to reach the school and then they chose the type of actions that are necessary to mitigate the problem both locally and regionally.

### IMPACT ON STUDENTS

Students were already interested to the topic. But during the implementation this first interest grew, because each student had an active role especially in stages 3 and 4. Students decided to make an Instagram page of the project autonomously and, when invited to prepare materials to for the presentation of their work in a voluntary base, surprisingly, all of them decided to participate. Teachers reported that the type of learning during the lessons was different, not just only because students could dive deep into the topics they studied in their text books, but even because students could relate bad air quality to causes, to impact and to possible actions to take.

All students, if guided, were able to research and elaborate scientific information for debating on air pollution issue. Moreover, they were also able to relate findings to their everyday life habits and to propose actions to contribute to the air quality issue thinking to themselves, schoolmates and families. From assessment, it was found that the inquiring on questions that students want to explore, and on their misunderstandings and misconceptions, on air quality,



air pollution and climate change was the most important keys for turning on curiosity and will to know more.

### TIPS & TRICKS

- The approach used and the complexity of the topic have unfolded many possible directions that students would have liked to deepen but some had to be dropped for problem of time. Next time teachers would work with less questions in the beginning.





### GET INSPIRED!

This case study was based on the Learning Module called Air clean Operation (Operazione aria pulita).

Module materials in English are available from: <https://urbanscience.eu/uk/learning-modules/>

Module materials in Italian language are available from: [https://www.creda.it/wp-content/uploads/2020/07/2\\_UrbanScience\\_moduloAriaPulita.pdf](https://www.creda.it/wp-content/uploads/2020/07/2_UrbanScience_moduloAriaPulita.pdf)



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