



# HOW CHANGES OF GLOBAL FRESH WATER DISTRIBUTION AFFECT ITS AVAILABILITY

# INTRODUCTION

This indicator book was created as part of the Teaching Green project and should support teachers of students aged 10 – 16 years who are implementing education about climate change.

The educational process is divided into 4 steps. The first step is the creation of a group of students who will implement the project activities. In the introductory part, students fill out also an questionnaire about their attitudes link to the indicator mentioned below. The second step is theoretical preparation. You can use online learning models or your own resources. The third step consists of practical monitoring of the indicator (at least twice). The result of the monitoring is a presentation prepared by the students containing findings from the practical part. In the final fourth part, students fill out the attitudes questionnaire again and the changes in their character qualities are evaluated.

## CLIMATE CHANGE IMPACT

Water covers 70% of our planet. However, freshwater – the water we drink, bathe in, cook with, use in farms – is incredibly rare. Only 3% of the world's water is freshwater, and two-thirds of that amount is stored in frozen glaciers or otherwise unavailable for our use. Climate change is altering patterns of weather and water distribution around the world, causing water scarcity and droughts in some areas and floods in others. As a result, ecosystems become stressed and rivers, lakes, and other water sources are drying up or becoming too polluted to use.

**INDICATOR:** Availability of freshwater through the year.

**Project activities support development of 6 essential character qualities:**

 **mindfulness**

 **curiosity**

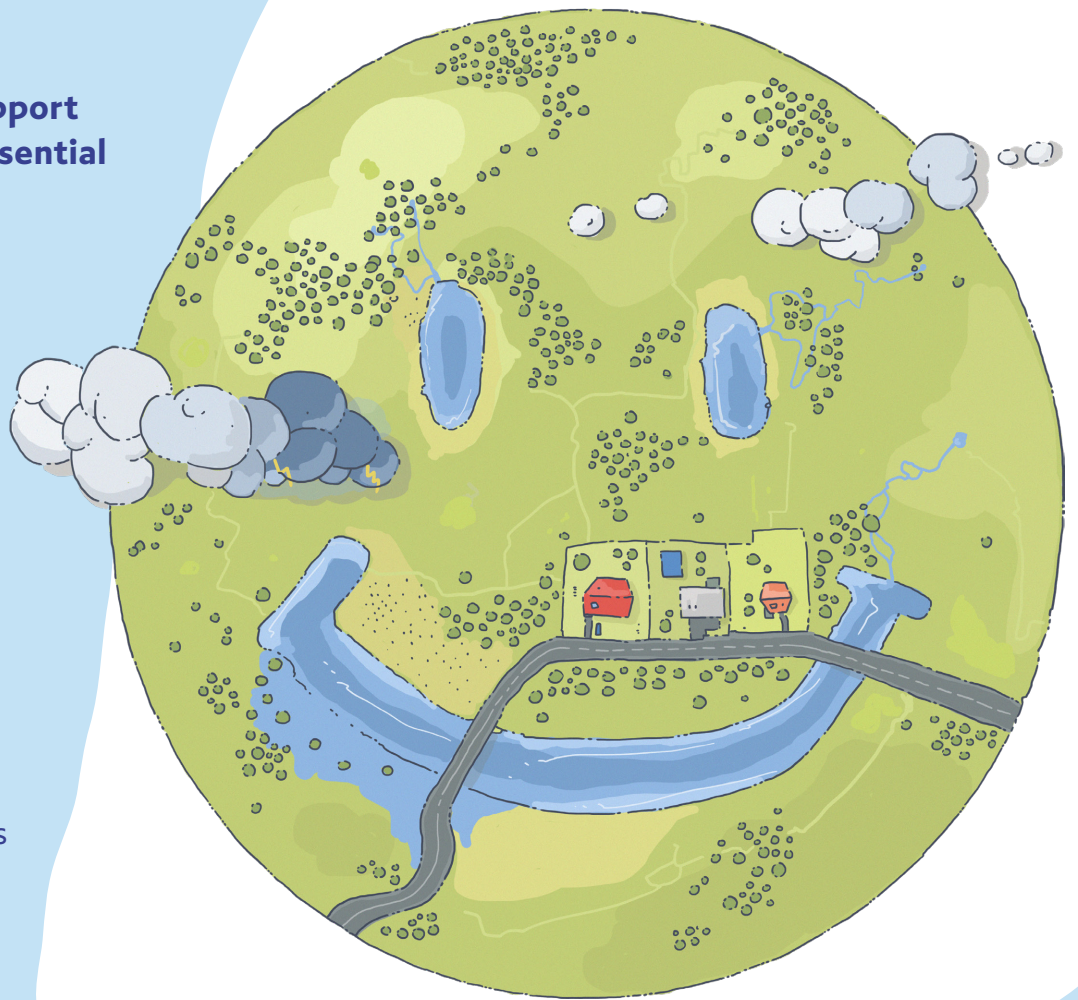
 **courage**

 **leadership**

 **resilience**

 **ethics**

You can find these icons next to the exercises.



**Mindfulness**

*wisdom, self-awareness, observation, insight*

“The awareness that emerges through paying attention on purpose, in the present moment, and non-judgmentally to the unfolding of experiences moment by moment.”

**Curiosity**

*open-mindedness, exploration, passion, initiative, enthusiasm*

“The essential desire for information, the drive to resolve uncertainty.”

**Courage**

*bravery, determination, confidence, risk taking*

“The ability to act despite fear or uncertainty, in risky situations or when we are feeling vulnerable.”

**Leadership**

*responsibility, accountability, dependability, reliability, selflessness*

“The relational and ethical process of people attempting to accomplish positive change.”

**Resilience**

*perseverance, grit, tenacity, resourcefulness, self-discipline*

“The ability or set of qualities that allow one to overcome obstacles.”

**Ethics**

*benevolence, humaneness, integrity, respect, justice, fairness*

“The moral principles that govern a person’s behavior or the conducting of an activity.”



# THEORETICAL PART

## Introduction to students

The water cycle is part of our daily lives, but climate change can have unimaginable consequences on everyday access to water.

It is already affecting people's access to water worldwide, causing more severe droughts and floods.

Climate change affects the water cycle by affecting when, where and how much precipitation falls. Low levels of rainfall and high temperatures lead to water deficits - when rainfall is low, there is less water available; when temperatures are high, water evaporates and so there is less available to use.

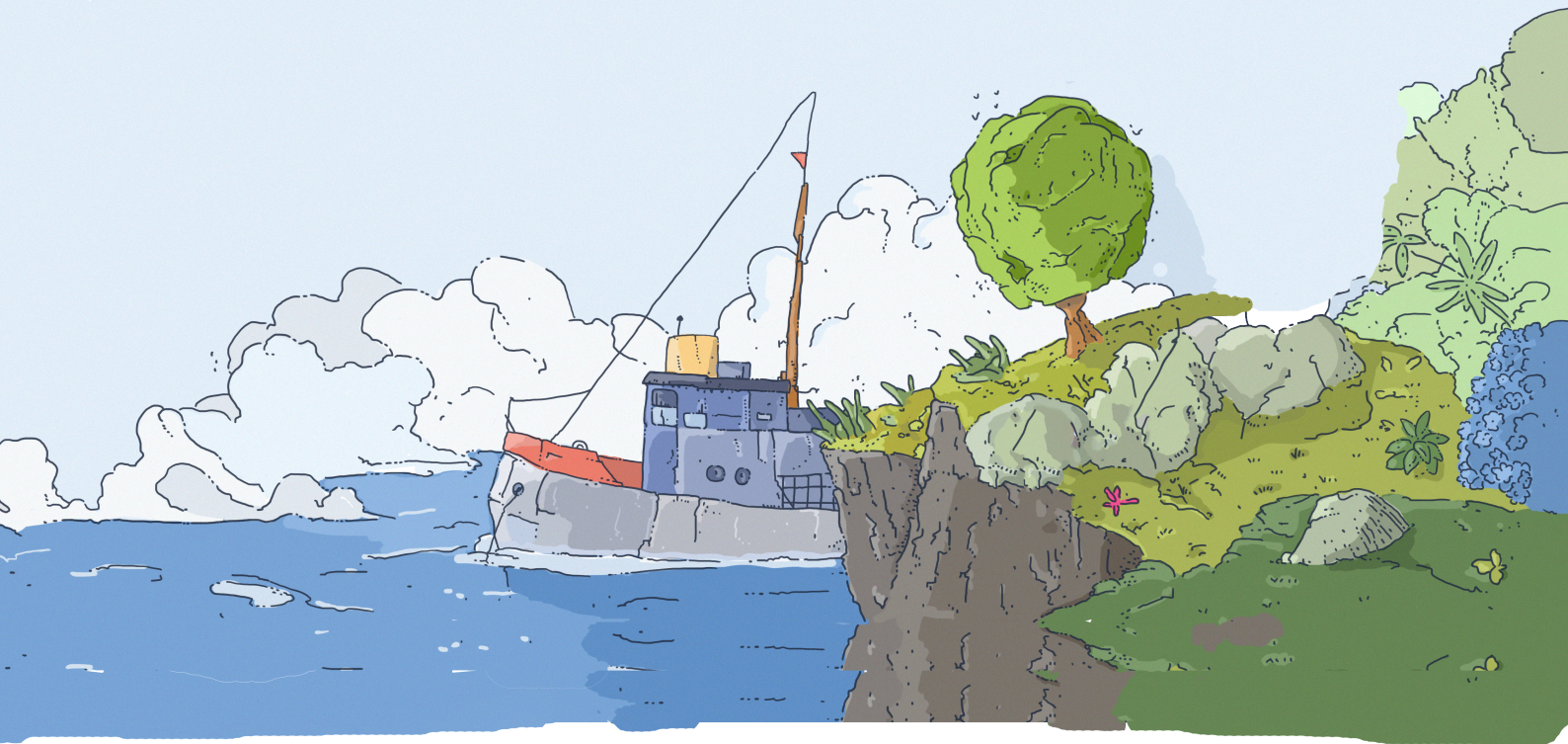
In countries, where snow, a freshwater source, typically accumulates—warmer temperatures mean less snowfall, which leaves less water available in local reservoirs after winter. This negatively impacts ecosystems, left without sufficient water during the growing season. Water has an amazing ability to fight climate

change. Sustainable water management and its retention in the landscape is fundamental to building the resilience of ecosystems and reducing carbon emissions. **Everyone has a role to play** – actions at the individual and household levels are vital.



*Open discussion about usage of rainwater to find out what they know about the topic already.*





### ? Questions for students



- Have you ever wondered how much water drains in the landscape/country unnecessarily?
- In your opinion, why don't people harvest rainwater on a bigger scale?
- Have you seen usage of rainwater in your surroundings?  
What was it used for?

### ! Activities:

- Find out how much precipitation falls annually in your area from relevant, trusted sources. Compare this data with previous periods and see if the amount of precipitation is increasing or decreasing.
- Talk to your parents/grandparents if they remember if it used to rain more than it does today.
- Try to find out if there were freshwater sources (wells, springs) in your area in the past, which have since disappeared or dried up.  
Do you know of any new freshwater sources in your area?





## RESOURCES FOR FURTHER STUDYING:

- ONLINE MODULE about Climate Change
- Websites informing about the average precipitation totals in the region, in the given country / Europe, e.g. Slovak Hydrometeorological Institute, available at:
- ONLINE MODULE about Water Availability
- Websites informing about the use of freshwater in your country/Europe, e.g.: European Environment Agency, available at:



*Mention only what is necessary to support students efforts to search for data, others will be available in the module for teachers.*

## NECESSARY TOOLS:



- Measuring tool for measuring distances – e.g. tape measure, paper, pen, calculator, internet connection, computer

# PRACTICAL PART



## Aims of the activity

Students become aware that harvesting rainwater is one of the adaptation measures of climate change. They will identify the potential for a more sustainable solution and actively contribute to improve freshwater availability in their area.

## Orientation or Engagement

After finishing the theoretical part, lead a discussion about their experiences with water scarcity. The result of the discussion should be that students are motivated to actively contribute to improve the current situation at school.



Use these questions to guide the discussion towards mindfulness and resilience.

## ? Questions for students



- **Have you ever seen thirsty wild animals or dry plants on the school premises?**
- **How does the lack of water affect their lives?**
- **Do you believe that you can make a difference and help somehow?**
- **Have you ever wondered how much rainwater we could harvest on our school premises?**
- **What other usage could the rainwater have?**

## Conceptualization

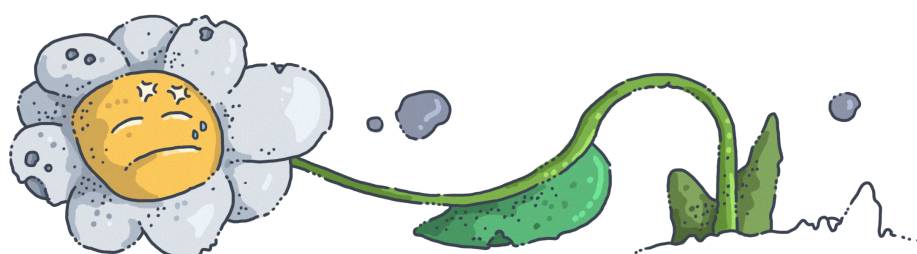
- I. Make a tour around the school premises to assess the current status - if all roofs have a harvesting system, where the rainwater ends up, and if it is currently already used. Let students draw the current situation, or take photos of the places (on mobile phones), for example school grounds, where measures will be solved.
- II. After the tour, let students suggest (in the form of brainstorming, or group work) possible solutions to improve the harvesting and usage of rainwater. Additionally, allow them to use internet resources to find out possible usage of recycled water (irrigation, for flushing at school, direct drainage of water to rain gardens, vertical gardens, ponds, etc). Record individual ideas and at the end choose the solutions they would like to implement.

In the second step, students should identify what information they need for analysis. They will need to determine the average total precipitation in a given area, and calculate the area of roofs with a harvesting system.

## Investigation

After all the preparation you are ready for **real analysis**.

Check that all students have the necessary tools, the tasks are distributed, and everybody knows the agreed methods and procedures.





In the analysis, **focus** in particular on:

- which buildings (with their existing rainwater harvesting systems) are suitable for water collection right now (without further investment),
- how gutters and downspouts are placed and how they are adapted to capture water, not just to drain it into the ground,
- how the system could be changed to better capture rainwater for further use
- measuring the size of buildings/roofs, calculation of the area from which rainwater flows (area of roofs)
- finding out the amount of precipitation that falls during the year in particular region (10 mm = 10 l on a square meter)
- determination of the amount of precipitation that falls during the year on the monitored roof area and could be further use

Enjoy your investigation and during your work try to motivate each other because the analysis may be hard.

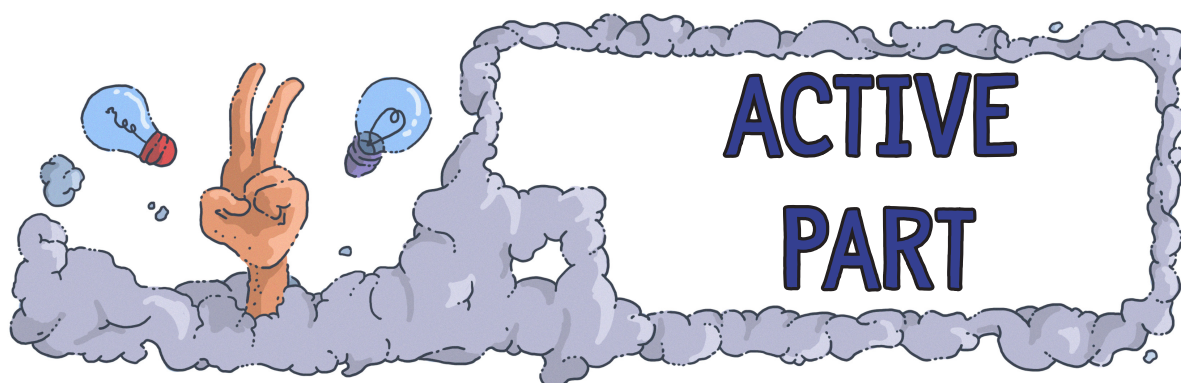
## Conclusion

Create a report (ppt, video, article), in which you will:

- **summarize the results of investigation**
- **present your results**
- **suggest possible solutions for better rainwater harvesting and further use** - e.g. collection tanks (above ground, underground), use of rainwater for irrigation, flushing at school, direct drainage of water to rain gardens, vertical gardens, ponds, etc.
- **present an impact of the solution - how much water can your school save if it retains water**

### Alternatives:

- **estimate the budget for implementing the solution**
- **estimate the amount of saved tap water and saved money (water, sewage)**
- **create a SWOT analysis of the situation**



Your last task will be to inform the public about the need to retain rainwater - your classmates, teachers, school management, parents, representatives of municipalities, residents of your town/village, etc.

### Choose one target group and focus on it.

In the case of informing the public, think about whom you want to present the information to, and how and where you want to inform them. Prepare informational material that will



introduce them to the issue of water scarcity in the landscape and the need to retain rainwater - an information board, a video document, an article on the web, a radio show, etc. As an example, state the conclusions and calculations from your practical monitoring. Present your suggestions for a solution - at a parents' meeting, at the city hall, at a school event, etc.

In the case of a school, focus on practically changing something on the school ground. First of all, think about whether your proposals are feasible for the school management (with a minimal budget, or you can provide everything yourself), or whether you are beyond your capabilities, or require larger investments.

You can prepare **two proposals** for the implementation of water retention measures, which you will present to the school management:

- **one with a minimal budget that will be able to be implemented immediately/in the near future and which will contain everything you can get for minimal costs, how you can use rainwater better, or how much the school will save watering the garden if it uses captured rainwater.**
- **the next proposal may contain higher costs, but it will significantly save water costs in the coming years, with an estimate of the saved funds that can be used for other purposes.**

**In this case, you also need presentational material about the created solution that would be able to address the target group – an information board, ppt presentation, video document, etc.**

**Present your proposals for a solution.**

## ? Questions for students in your evaluation session

- **How many litres of drinking water were you able to save with your proposed rainwater capture and use?**
- **What can saved water be used for?**
- **How did your neighbourhoods react to the effort to change the collection and use of rainwater?**
- **Did you encounter understanding from the school management, city, parents, and classmates?**
- **What would you like to remember from the project in the future?**
- **Are you proud that you took part in this project?**



*Let the students prepare a presentation about their journey within the project.*

## THEY MAY FOCUS ON:

- **How will your use of rainwater contribute to saving freshwater resources?**
- **How others can use rainwater instead of freshwater, e.g. in the households?**
- **What is your personal story?**
- **How to motivate others to try to capture and make better use of rainwater, which we irretrievably (and especially quickly) lose without use during the rainy days?**

## SLOGAN (MAIN MESSAGE)

**EVERY DROP COUNTS!**



## RESOURCES

Factors affecting water availability. In: BBC Bitesize [Online]. [Accessed: 2022-08-30]. Available at: <<https://www.bbc.co.uk/bitesize/guides/zybtjty/revision/2>>

How Climate Change Impacts Water. In: National Geographic [Online]. [Accessed: 2022-08-30]. Available at: <<https://education.nationalgeographic.org/resource/how-climate-change-impacts-water-access>>

Water and Climate Change. In: United Nations WATER [Online]. [Accessed: 2022-08-30]. Available at: <<https://www.unwater.org/water-facts/water-and-climate-change>>

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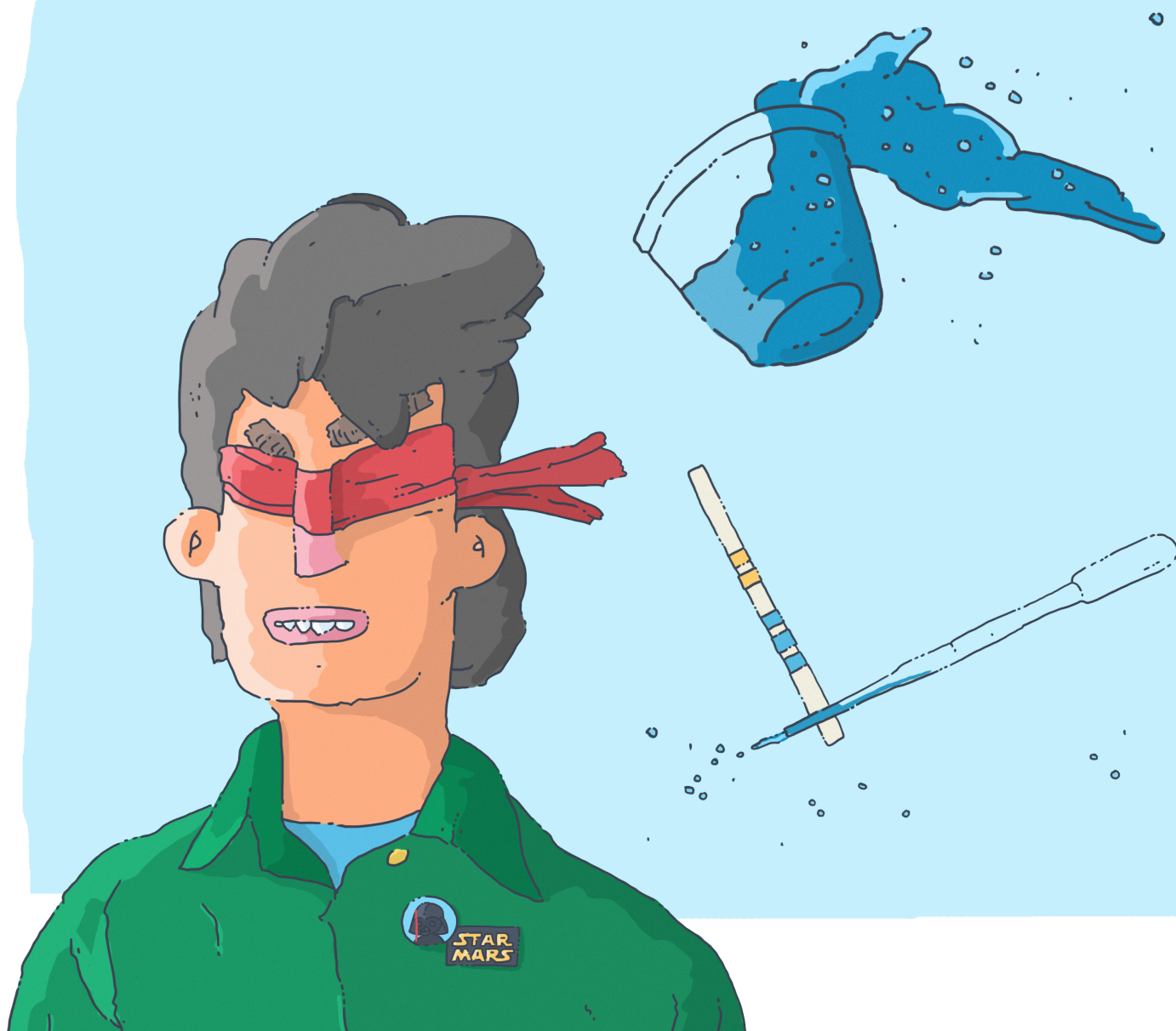
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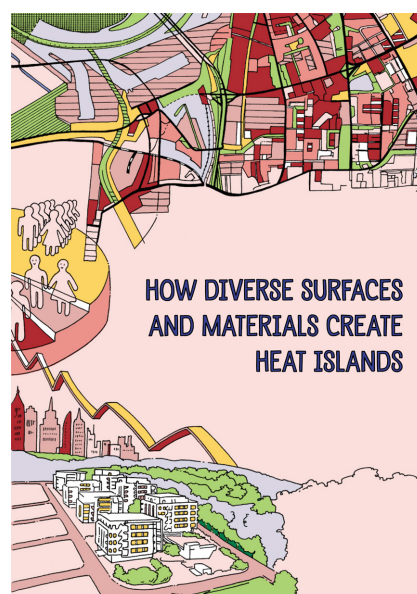
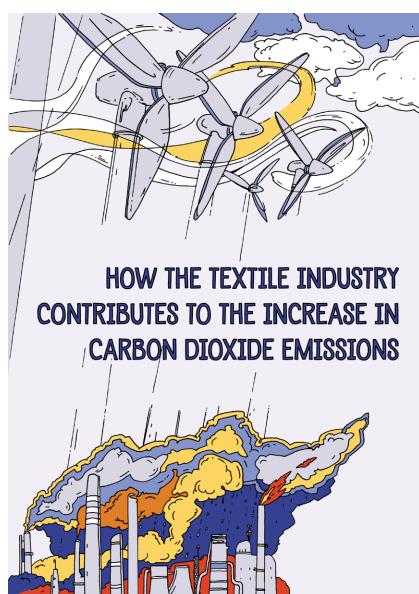
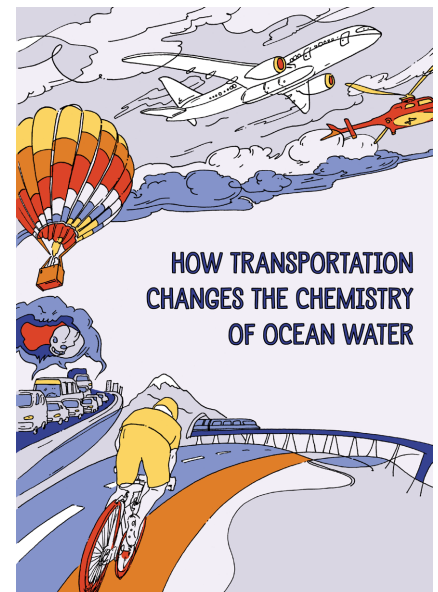
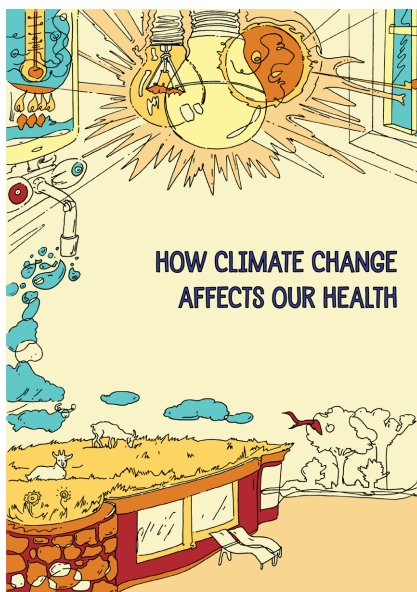
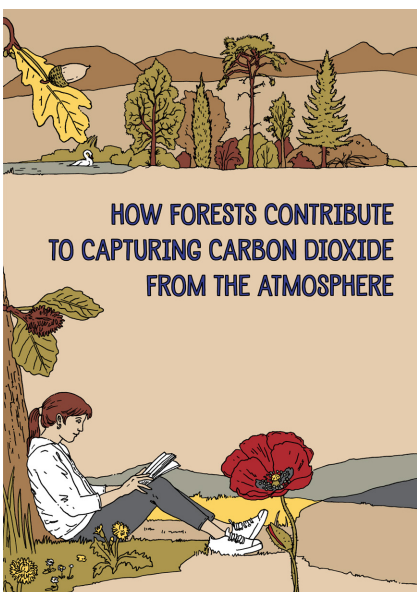
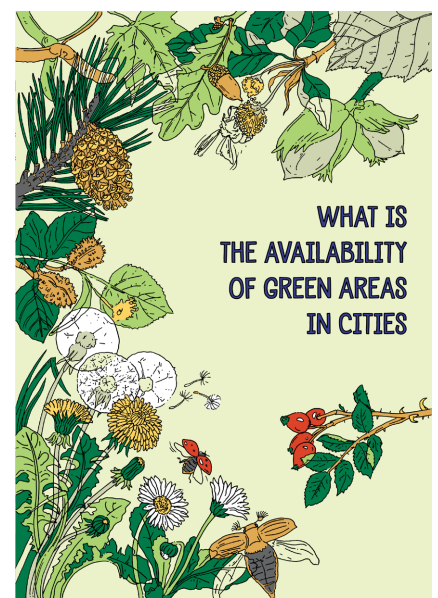
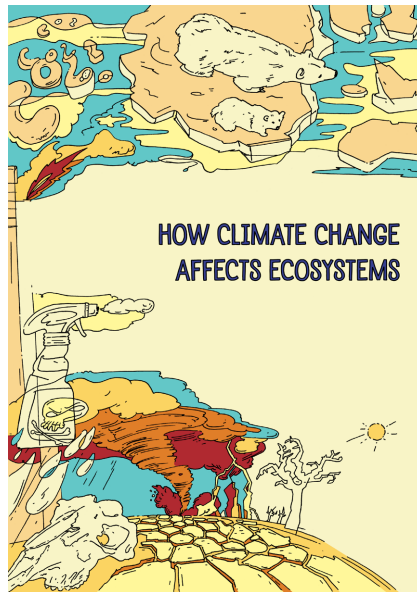
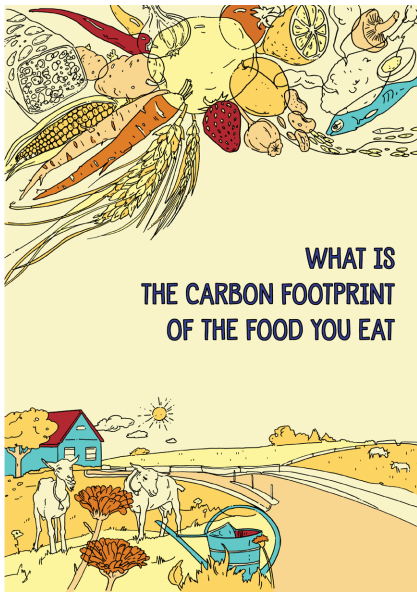
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