ACTIVITY TITLE: Eco-Tech Detectives:

Investigating Urban Heat Islands

Activity code: ncEHU01

DURATION	90 minutes
AGE RANGE	17-18 y/o
TOPICS	DATA ANALYSIS CLIMATE URBAN ENVIRONMEN PROTOTYPING VISUALIZATION

Description of the project

Welcome to *Eco-Tech Detectives*! In this activity, you'll take on the role of climate investigators to explore a real-world problem affecting cities around the globe: the Urban Heat Island (UHI) effect. This happens when buildings, roads, and other human-made structures absorb and retain heat, making urban areas much hotter than surrounding places.

Your mission is to analyze temperatures collected from different parts of your school or neighborhood using digital tools or mobile apps (Weather Underground, MyRadar, NOAA Weather Radar Live). You'll look for patterns and figure out what might be causing some areas to heat up more than others. Along the way, you'll dive into important concepts like environmental data, climate and microclimates, urban sustainability, and how all of this connects to social equity and inclusion.

Innovators who changed the world started just like you: observing, questioning, and proposing. Your solution could be the next big idea for a fairer and cooler planet.

After analyzing your data, your team will design a creative solution, maybe a digital awareness campaign, a shade design for hot spots, or even a prototype for a cooling app. You'll present your ideas through eye-catching visuals like infographics or digital posters and reflect on how your solution helps different members of the community, especially groups that are often left out of urban planning conversations.

By the end of the session, you'll walk away with a deeper understanding of how climate, science, and technology can come together to create more sustainable cities—and how your voice can be part of that change.

Objectives: What will I learn?

- **Learn how to analyze and interpret environmental temperature data** by investigating microclimates around your school or community, in order to identify how human activity contributes to urban heat zones.

- **Understand the causes and effects of the Urban Heat Island effect** by analyzing real-world data and case studies, to explain its environmental, social, and health impacts—especially in vulnerable communities.
- **Develop and design a prototype solution to mitigate UHI impacts** (e.g., shaded spaces, awareness apps, or green installations) through teamwork, creativity, and iterative design processes, to propose meaningful changes in urban environments.
- **Practice visual and artistic communication skills** by translating your findings and solutions into engaging formats like infographics, posters, or digital storyboards, so that you can share your ideas effectively with others.
- **Apply collaborative problem-solving and inclusive design thinking** by working in diverse teams and considering gender, accessibility, and cultural perspectives, to ensure your solution benefits a wide range of users.
- **Enhance critical and systems thinking** by evaluating the effectiveness of your proposed solution and connecting it to broader issues such as climate justice, sustainable urban planning, and innovation.

Materials: What do I need?

1. **Provided by the teacher/institution:**
   - Printed data collection templates
   - Prototype design worksheets
   - Visual communication supplies (poster board, printed icons, markers, etc.)
2. **Provided by students:**
   - Smartphones or tablets with internet access
   - Notebooks and pens for data analysis.
   - Optional: colored markers or pencils for visual design
3. **Downloadable resources:**
   - Prototype planning guide
   - Visual storytelling tipsheet (how to make your project visually engaging)

Previous preparation

- Before beginning the activity, the teacher should:
- Form student teams of 3–4 members ensuring diversity and encouraging collaborative skills. When forming teams, ensure girls and gender-diverse students take on at least one technical or leadership role (e.g., spokesperson, programmer, designer). This guarantees fair participation.
- Print and prepare materials such as data collection templates and prototype planning guides and design worksheets.

- Define the data collection zones around the school or nearby public spaces, ensuring there's a range of shaded, built, and natural areas to compare.
- Show a short introductory video (3–5 minutes) explaining the Urban Heat Island effect with real-world footage (e.g., from ESA, NASA, or local case studies).
- Prepare a resource board (physical or digital) with examples of artistic infographics, sustainable urban designs, and inspiring women in environmental science.
- Discuss safety guidelines for students working outdoors and handling devices.

RESEARCH

Have a look at these resources

Cities are growing fast, but with more buildings, cars, and pavement comes an unexpected challenge: they trap and hold heat. This is called the Urban Heat Island (UHI) effect, and it means that cities can be several degrees hotter than nearby rural areas. Why does this happen? What does it mean for people's lives, especially for those who live in areas with less greenery, poorer housing, or limited access to cooling spaces?

In this activity, you'll take on the role of climate detectives. You'll collect real temperature data from different areas around your school or neighborhood and look for patterns. You'll combine science, technology, and mathematics to understand what's happening—and then use design and creativity to propose smart, sustainable solutions.

But this is more than a science experiment. The UHI effect impacts people in different ways. For example:

- In low-income neighborhoods, residents may not have access to green spaces or air conditioning.
- Older adults and children are more vulnerable to heat-related health problems.
- In many cities, areas historically underserved, often where minority or marginalized communities live, are also the hottest.
- Female scientists and urban designers, though historically underrepresented, have led innovations like cool roofing materials and community gardens that reduce heat and improve wellbeing.

You'll explore all this through data, visual storytelling, and collaborative design.

Real-World Examples

- Los Angeles, USA has mapped temperature disparities using satellite data and found that poorer areas can be 10°C hotter than wealthy ones. The city is testing white paint on streets to reflect sunlight.
- Ahmedabad, India launched a Heat Action Plan after a deadly heat wave in 2010, combining early warning systems and community outreach—led in part by women health workers.
- Barcelona, Spain created "climate shelters" in schools and libraries to offer cool spaces to everyone, including children and the elderly.
- Greta Thunberg may be a well-known activist, but did you know about Maria Neira, the Spanish doctor who links urban design with public health? Or Abeer Seikaly, the Jordanian-Palestinian architect designing self-cooling refugee shelters?

Key Questions to Research and Discuss

- Why do cities heat up more than rural areas? What materials and activities cause this?
- Who is most affected by extreme heat in cities? Why do some neighborhoods feel hotter than others?
- How can data and technology help us measure and solve climate challenges?
- What roles have women played in responding to urban climate issues?
- How can you use design and visual storytelling to create solutions that are not only functional but also inclusive and inspiring?
- If you could redesign one area of your school or city to make it cooler, what would it look like, and who would benefit most?

CREATE

Some things you need before beginning

Now that you've explored how cities heat up and who's affected most, it's time to turn your insights into action. You'll design a solution that helps cool down your environment, whether it's physical, digital, or awareness-based. This is your chance to combine data, creativity, and empathy to build a better city.

Interesting Concepts to Consider:

- Adding green spaces can lower local temperatures by up to 5°C.
- Light-colored roofs and pavements reflect sunlight and reduce heat.
- Smart tech (like apps, sensors, or AI) can alert people to unsafe heat conditions.

- Visual storytelling and infographics are powerful tools for raising awareness.

Why It Matters:

Your prototype isn't just a classroom project, it's a model for how youth-led innovation can improve public spaces, support vulnerable communities, and inspire civic change. Urban sustainability is a global issue, and you have the chance to address it locally, starting right outside your school doors.

Now, follow these steps

Step 1: Review your data and context

- In teams, look closely at the temperature data collected/provided.
- Which spots were the hottest? Why do you think that is?
- What did you observe—lack of shade, heat-absorbing surfaces, little vegetation?
- Compare data from different sources (e.g., ESA vs. NASA) and discuss any differences or potential biases in how urban heat is represented.
- Evaluate where your data comes from: Is it from public, academic, or private institutions? What level of reliability does each offer?
- How does this relate to what you learned about health, equity, or sustainability? Use your data sheets and highlight patterns.

Step 2: Define your problem clearly

- Choose one specific challenge based on your findings. Examples:
  - "There's no shade in the lunch area."
  - "Students don't know the risks of heat exposure."
  - "Our school's entrance reflects too much sunlight."
- Consider who is most affected—children, older people, people with disabilities, etc.

Ask yourself: Who is left out in our current urban design? How can we help them?

Step 3: Brainstorm creative solutions

- Sketch ideas on a whiteboard or paper. Think freely—no idea is too wild!
- Combine tech, art, and science. Can you:
  - Add a cool mural made with heat-reflective paint?
  - Create an app to alert when temperatures spike?
  - Design a green roof model with self-watering plants?
  - Find how other cultures cool their homes without air conditioning? Try to use one of their ideas in your solution.

- Visually represent a traditional cooling technique using a mural or artistic model that combines science and local culture?
- Explore how indigenous cultures cool their spaces and translate that knowledge into an infographic or storyboard that bridges tradition and technology?

Think inclusive: How can your solution work for everyone, regardless of age, ability, or gender?

Step 4: Choose your prototype format

Select how you'll express your solution. Pick at least one of the following:

- A visual model (3D or diagram)
- A digital prototype (wireframe/app layout/mockup)
- An awareness campaign (poster, slogan, social media concept)
- A video pitch or digital story

Use art! Try a collage, make a short skit, colors, symbols, storytelling or even write a mini-song to explain your solution. Design is also about emotion and impact.

Step 5: Design and build your prototype

Using your worksheet:

- Define the problem in one sentence.
- Describe your solution.
- In your prototype, add a quote or picture of a woman or diverse person working in climate science or engineering.
- List materials or tools used.
- Show how it works (step-by-step or visually).
- Explain who it's for and how it helps.

***Don't** just say "a garden"—explain how it will stay watered, who maintains it, and why it matters.

Step 6: Integrate equity and gender perspective

- Add a visual or story element highlighting the role of women or underrepresented communities in urban innovation.
- Think of names for your prototype that reflect inclusivity and purpose.
- Include accessibility in your design—use ramps, clear language, easy access.

Bonus: Name your prototype after a real woman in climate science!

Step 7: Peer feedback and revisión

- Exchange with another team. Ask:
  - What works?
  - What's unclear?
  - Does the solution help the people it aims to help?

- Make changes based on feedback to improve your idea.

Step 8: Final presentation prep

- Get ready to pitch your idea with visuals, data, and storytelling.
- Include:
    - Title and logo
    - Visuals (drawings, models, mockups)
    - Data that inspired your idea
    - Inclusion and sustainability features
    - A brief narrative (1–2 minutes) about your design's purpose

COMMUNICATE

Now it's time to share your team's solution with others! This is your chance to showcase your hard work, creativity, and research findings. You will explain your idea, demonstrate how it works, and show why it matters, especially for your community and vulnerable groups affected by urban heat.

Your team will prepare a presentation that includes:

- A clear explanation of your prototype and what problem it solves.
- Visuals: Your infographic, storyboard, diagram, or mockup.
- A short pitch (2–3 minutes) describing:
    - What inspired your idea (refer to your data and observations).
    - Who the solution helps to and how.
    - What materials, technologies, or strategies you used.
    - How your idea is inclusive, accessible, and gender aware.

You are encouraged to use:

- Artistic storytelling to make your message impactful (use color, drawings, video clips, etc.).
- Data visualization (charts, icons, maps) to support your analysis.
- A comparison with existing real-world examples (e.g., community cooling spaces, climate apps, street redesign projects).
- A reference to a real woman or underrepresented innovator in science, design, or climate who inspired your work.

Reflection prompts for your talk:

- Why is your design relevant for your school or city?
- How is it different or better than existing solutions?
- What would you improve if you had more time or funding?
- How does your design reflect fairness, diversity, and sustainability?

It is time to share!

In this section different social media will be presented in order to upload your activity result.

#nameoftheactivity

- LinkedIn: https://www.linkedin.com/company/steambrace-project/posts/?feedView=all
- Instagram: https://www.instagram.com/steambrace_eu/
- X: https://www.instagram.com/steambrace_eu/

KEEP ON LEARNING

How can I make a similar project by myself?

Your investigation doesn't end here. The skills and knowledge you use, measuring data, analyzing problems, creating inclusive solutions—can apply to many real-life challenges. Take a moment to reflect and think ahead.

Reflection Questions

- Discuss or write your responses to these prompts:
- What was the most surprising thing you discovered about your environment?
- What challenges did your team face while designing your prototype? How did you overcome them?
- How did you apply gender-inclusive and sustainable thinking to your solution?
- What would you do differently if you had more time, more tools, or a bigger space?
- How did this experience change the way you see urban environments or your own role as a changemaker?

Here are some ideas for continuing your learning or action:

- **Make it real**: Try building a small version of your prototype or testing it with classmates.
- **Go digital**: Use online tools to make your infographic or awareness campaign interactive.
- **Get involved**: Join a local youth environmental group, climate march, or urban gardening project.
- **Explore careers**: Research jobs in climate tech, urban planning, or sustainability that align with your interests.

Which are other connected projects?

- Design a smart cooling material test using household items and sunlight exposure.
- Create a green roof prototype for your school building or local shelter.
- Research biodegradable insulation or recycled materials in urban construction.

LINKS FOR FURTHER INFORMATION

- **ESA - European Space Agency**: Satellite views on UHI and climate effects https://www.esa.int/Applications/Observing_the_Earth/Greenhouse_effects_also_on_other_planets
- **NASA Earth Observatory**: Urban heat visualization and research https://earthobservatory.nasa.gov
- **Global Cool Cities Alliance**: Solutions and tools to cool cities http://globalcoolcities.org

Educational Videos and Explorations

- **Climate Kids by NASA** (great for younger peers or deeper exploration): https://climatekids.nasa.gov/

Youth Innovation and Action

- **Young Reporters for the Environment** – Youth-led investigations and climate stories https://www.yre.global
- **EarthEcho International – OurEcho Challenge**: Climate action competitions and support https://www.earthecho.org
- **UN Habitat – Urban Sustainability Projects**: https://unhabitat.org

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