CREST AWARDS

SILVER LEVEL

iLEAPS

CLIMATE SCIENCE RESOURCE PACK

#environment
#climate
#globalwarming

COLLECTION

IN PARTNERSHIP WITH

ileaps | Integrated Land Ecosystem - Atmosphere Processes Study

NERC SCIENCE OF THE ENVIRONMENT

How to run CREST using these activities

Preparation

Ready to get going with CREST? Enter your student's Award by signing up for a CREST Account here: crestawards.org/sign-in

Create a new Silver Award project with the name of the student and the title of their project. If you don't have all the details, you can fill these in later.

Run the project

We have some super handy workbooks and profiles for your students to use when running a CREST Award. You can download these when you create your CREST account by following the link above. Encourage your students to use the workbook or profile to plan and carry out their project, keeping a record of all their amazing progress.

Make sure you consider safety and risks!

Reflection

So, your students have been hard at work and completed their CREST project, but don't let this be the end of their learning. They should now fill in any remaining sections of their profile form. This is a chance for them to reflect on all the interesting things they've learnt and the invaluable skills they have used.

Enter your project for a Silver CREST Award

Hard work deserves a reward! Celebrate and certify your student's achievements by entering their project for a CREST Silver Award. Simply:

- Log in to your CREST account at crestawards.org/sign-in
- Select the project and upload a profile form per student and other project evidence. Check the participating students have met each of the criteria on the teacher assessment page.
- Finally, complete the delivery and payment details to order your snazzy certificates. Congratulations on completing CREST Silver!

What next?

The scientific discovery doesn't need to end here. Students can have a go at the next level up – CREST Gold.

Don't keep all the fun to yourselves. Encourage others to take part in CREST projects and share the wonder of science. For free ideas on how to get started, see crestawards.org

Entering your project without a teacher or facilitator? No problem! You can enter your work yourself by following this link: crestawards.org/sign-in

Looking for some support?

Find a mentor by contacting your local STEM Ambassador hub: stem.org.uk/stem-ambassadors/local-stem-ambassador-hubs

Instructions for teachers

Choosing a project

We want young people to use their project to explore innovative ideas and solutions. Encourage them to consider project ideas that link to their every day lives. What most interests and excites them? Students can use this project idea as inspiration or use their own ideas. They could work individually or in small groups on the same project.

This pack of resources is sponsored by iLEAPS (Integrated Land Ecosystem –Atmosphere Processes Study).

Resources

The resource links on the project pages give a starting point for students to research but they could also do their own research.

Project outcomes

Your students could design and make a new product, carry out a practical investigation, do a research project or create a communication campaign for their target audience. Encourage them to consider the impact of their project on people's lives now and in the future. Students should record their work in a final project report or presentation.

Supporting students to complete their project

Each project should involve approximately 30 hours of student work from start to finish. The project should be led by the students. As a teacher or mentor your role is to:

- Act as a sounding board for students' ideas and nurture the students' work
- Check your students' project plans before they begin the next stage
- Help students see mistakes and setbacks as an opportunity for positive learning and lateral thinking (leading to creativity)
- Where relevant, support students to access professionals or experts who could support them
- Provide access to the Internet, library books and magazines
- Help students to complete their project and record their findings
- Encourage them to reflect on their own performance and learning

Use the tips on page 5 to help students complete their CREST Silver project report.

Health and safety

Students should be encouraged to make their own risk assessment before they carry out any activity, including surveys. They can use the CLEAPSS student safety sheets to help them science.cleapss.org.uk/Resources/Student-Safety-Sheets/.

They should write out their project plan, identifying the risks involved in each stage and the control measures and precautions they will take.

In all circumstances this must be checked by a competent person.

Students using specialised equipment should be supervised at all times. Students may want to set up unorthodox experiments and you may need to seek specialist advice. Contact CLEAPSS directly cleapss.org.uk for advice if you are unsure. Teachers in Scotland should refer to SSERC www.sserc.org.uk.

Unless stated, no external links have been checked by CLEAPSS.

Safety checked but not trialled by CLEAPSS.

TOP TIPS

for students completing a Silver project

1. Understand the problem

Find out more about the topic and make sure you are clear about the problem you need to solve and the time you have. If you are developing your own project idea, discuss your ideas with your teacher or mentor.

2. Plan your approach

Draw or write a plan showing how you will approach the problem, the tasks you'll complete, the resources you'll need and how long you'll spend on each task. Ask your teacher or mentor for feedback on your plan.

3. Watch out!

Identify any risks to health and safety or ethical concerns you think there will be. Decide how you will limit or overcome these risks. Show your risk assessment to your teacher.

4. Research

Find a professional mentor by contacting your local STEM Ambassador hub:

stem.org.uk/stem-ambassadors/local-stem-ambassador-hubs

Find out more by doing some research using the suggested links on the project page.

Research relevant news articles, blog posts and other media sources.

5. Use your research to improve your plan and generate ideas

Use your research to help you come up with a possible solution or to select the best experiments to use in your practical work.

6. Finalise your idea and carry out practical work

Carry out any practical work including experiments, surveys, designing and making activities. When testing your ideas, make sure you make it a fair test and record all your results clearly. You could also use photos and a diary to record your project activities.

7. Concluding your project

What have you found out by doing your project?

Did you come across any problems? How did you overcome them?

What is the impact of your project for other people? How could it be developed further?

8. Choose the best way to communicate it

Tell others about what you did. You could use a written report, a digital presentation, a blog or a poster display. Make sure you include each stage from planning through to the conclusion.

Remember, science isn't just about data. The most successful projects will demonstrate good communication skills and show original ideas that address a real-world problem.

Even if things go wrong, use this to show what you have learned.

Drought detectives

RESEARCH PROJECT

ileaps

Project brief

Water is vital for sustaining life, so droughts impact people's lives in many ways. Plants and animals need it to live; we use water to grow the food we eat, keep ourselves, clothes and dishes clean, but it also plays a big part in leisure activities such as swimming. In this project, you will research how droughts could affect your local area.

Imagine you are an Environmental Surveyor from the local council. Your job is to take a closer look at how a lack of water could affect your community. Choose one area of life to focus on, such as food, agriculture, business, housing or health. Find out:

- The effects a drought would cause
- The systems in place to deal with a drought

Start by picking which area of life you want to focus on. Do some research to find out some general information about your chosen area. For example, if you choose business find out how many businesses there are in your local area and what type of businesses they are. If you choose housing, find out how many people live in your area and what kind of housing exists in your community.

Now your research has a good foundation, delve deeper into how your chosen area uses water, and how much it uses.

Next, take a look at what impact a water shortage would have to your chosen topic.

Think about ways to communicate what you have learned.

Things to think about

- How would a drought affect local ecosystems?
- Are there any long-term effects caused by droughts?
- What are the cost implications to the local community?
- What is being done to reduce the impact of droughts?
- When do temporary use bans get enforced? Do they work?

Useful resources

A report on the effects climate change has on water in the UK: nerc.ukri.org/research/partners hips/ride/lwec/report-cards/water

The Environment Agency's drought response plan: gov.uk/government/publication s/drought-management-for-england

Take a look at how your local council and water company prepares for droughts – they may have information on their website. Water companies are required to update their drought plan every five years.

Health and safety

To avoid any accidents, make sure you stick to the following health and safety guidelines before getting started:

- Find out if any of the materials, equipment or methods are hazardous using science.cleapss.org.uk/Resou rces/Student-Safety-Sheets/
- Assess the risks (think about what could go wrong and how serious it might be);
- Decide what you need to do to reduce any risks (such as wearing personal protective equipment, knowing how to deal with emergencies and so on);
- Make sure your teacher agrees with your plan and risk assessment.

Be a H_2O hero

DESIGN & MAKE PROJECT

ileaps

Project brief

With growing populations and climate change, there will be increased pressure on available water, especially during extreme weather events such as droughts. It's important to use water wisely. We can lose a lot of water doing everyday tasks, so it's vital that solutions to water waste are found. By using water sparingly, more will be available for people, animals and plants when droughts hit. In this project, you will look at ways to save water in your home.

Imagine you are an engineer tasked with making a prototype water saving device for home use. It's going to be sold in a nationwide department store. It needs to:

- Either reduce water waste, use less water or reuse water
- Be able to be mass produced

First, do some research on the different ways to save water around your home. Use this research to decide how you are going to save water and what you are going to make.

Next, draw some sketches of potential designs. Pick which design you think will work best, you could make paper models to check your ideas.

Carry out some research about the materials you'd use for your device. It's important to make sure that it's waterproof and doesn't contaminate the water. This is especially important if the water will be drunk or used in food preparation.

Make your prototype and then devise a test to ensure it's up to the job. It's down to you to decide what is important to test and how you'll put your device through its paces.

Things to think about

- What water-saving devices already exist?
- What materials will your device require, and how much time and effort will be needed to make it?
- Is a single test of your device enough?
- What maintenance will your design need?
- Will anything need to change when your device is mass produced?

Useful resources

Check out different water companies' websites to research ways they advise their customers to save water. Often, they will give devices to their customers to help them save water. You could use these as inspiration.

Find an example of a water company's water saving devices here: nwl.co.uk/your-home/saving-water/water-saving-kit.aspx

iLEAPS website: ileaps.org

Health and safety

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- Find out if any of the materials, equipment or methods are hazardous using science.Cleapss.Org.Uk/resources/student-safety-sheets/
- Assess the risks (think about what could go wrong and how serious it might be);
- Remember, no eating or drinking in a lab;
- Decide what you need to do to reduce any risks (such as wearing personal protective equipment, knowing how to deal with emergencies and so on);
- Make sure your teacher agrees with your plan and risk assessment.

Speak out about drought

COMMUNICATION PROJECT

ileaps

Project brief

The availability of water is essential for human food production, human water consumption and ecosystems. It's important for local communities to know how droughts will affect their surroundings and how best they can prepare for them. Although they can't make it rain, they can make sure they are ready to respond when water levels become low. In this project you will develop a way to speak out about drought.

Imagine you are a Communications Officer for a water charity. You are presenting findings of a recent report to your local community about drought in your area and the impact it could have. Your audience needs to know:

- The issues that are caused when droughts happen
- What the response to the issues are
- What effect it will have on your local area

Choose a target audience to share your information with. This could be young people, schools or families, for example.

Next, gather the information you need to share. Think about what your audience need to know and structure the information you share in a logical order.

You need to make sure you engage your audience while getting the information across. Think of creative ways to show your audience what they need to know. For example, you could:

- Make a model showing the impact droughts could have
- Create a game that demonstrates the consequences of different levels of water waste
- Design a computer simulation of how droughts will affect the food available

Things to think about

- What does your target audience want to know?
- How can you make your communication style suit your target audience?
- How can you make sure you don't unnecessarily worry or cause your audience concern?
- How will you structure the information to keep your audience engaged?

Useful resources

A report on the effects climate change has on water in the UK.: nerc.ukri.org/research/partnerships/ride/lwec/report-cards/water/

The Environment Agency's drought response plan: gov.uk/government/publications/drought-management-for-England

iLEAPS website: ileaps.org/

Health and safety

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- Find out if any of the materials, equipment or methods are hazardous using science.Cleapss.Org.Uk/resources/student-safety-sheets/
- Assess the risks (think about what could go wrong and how serious it might be);
- Don't include identifiable information (like your full name or where you live) on the things you make;
- Decide what you need to do to reduce any risks (such as wearing personal protective equipment, knowing how to deal with emergencies and so on);
- Make sure your teacher agrees with your plan and risk assessment.

Palmed off

RESEARCH PROJECT

ileaps

Project brief

Have you ever wondered how the food on your plate impacts the planet's rainforests? Palm oil is found in over half of the products we use. The growing and harvesting of palm oil provides jobs, it is efficient to produce, and uses less pesticides than other crops. But it was also responsible for 8% of the world's deforestation from 1990 to 2008. In this project you will investigate the use of palm oil and its effect on the rainforest.

To begin, complete some research on rainforests and their importance as an ecosystem. Use the 'Things to think about' section to help your research.

Imagine you are an Environmental Researcher working on a new television documentary that's investigating the use of palm oil and its effect on the rainforest. Find out:

- Key statistics to be reported on in the documentary
- Which areas of the rainforest have been affected so the presenter can visit them during filming
- How these areas differ to those unaffected by the use of palm oil

Raid your cupboards! Start off by finding out where there is palm oil in your own home. Check the ingredients listed on packaging of food you eat and the products you use (such as shampoo and soaps).

Find out if those containing palm oil use a sustainable source.

Look into the pros and cons of using palm oil. Even if you have a firm opinion on the use of palm oil, remember to make sure your research considers different viewpoints. Find out some statistics about how many products contain palm oil, what alternatives exist, and what makes a sustainable source of palm oil sustainable.

Next use map data to support your investigation into the industry's effects on deforestation. Where in the world should the documentary team film to get on-the-ground footage? Find out statistics such as the area of landmass affected and the wildlife impacted.

Things to think about

- What are the good things about palm oil? Why is it used so widely?
- What are the negatives of using palm oil?
- Why do we need the rainforest?
- What is being done to protect the rainforest?
- What is the solution? Should we stop using palm oil completely?

Useful resources

A group called the Roundtable on Sustainable Palm Oil (RSPO) formed in 2003 to help the palm oil industry work together to stop palm oil damaging the planet: rspo.org/about

A project of the Malaysian Palm Oil Council (MPOC), dedicated to promoting the benefits of Malaysian Palm Oil: theoilpalm.org

The world's leading independent conservation organisation. Their mission is to create a world where people and wildlife can thrive together. It helped set up the RSPO: wwf.org.uk

iLEAPS website: ileaps.org

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- Find out if any of the materials, equipment or methods are hazardous by using science.Cleapss.Org.Uk/resources/student-safety-sheets/
- Assess the risks (think about what could go wrong and how serious it might be)
- Take care with cleaning products and any which display hazard symbols.
- Decide what you need to do to reduce any risks (such as wearing personal protective equipment, knowing how to deal with emergencies and so on)
- Make sure your teacher agrees with your plan and risk assessment.

In the air

PRACTICAL PROJECT

ileaps

Project brief

Have you ever wondered about what is in the air you breathe? Here, there and everywhere – air is all around us. Globally, air pollution is a growing problem to health and the environment. So, what can we do when we can't even see the issue that is literally under our nose? In this project you will investigate air pollution levels.

Conduct some research into air pollution, its causes and its effects. Use this research to think about why pollution might be worse in some areas compared to others.

Imagine you are an Air Quality Consultant working for a clean air initiative investigating air pollution levels. You need to:

- Measure air pollution levels in two locations
- Compare your results to tree coverage in the areas

Research and design an experiment to measure air pollution at your chosen locations. You could use sticky tape to collect samples of pollution from different surfaces, leaving them there for a period of time, then using a magnifying glass to count the particles that have stuck to the sticky tape.

Make sure the locations you use aren't too close together to ensure you get two separate sets of data. You may want to have a control set of data for comparison.

Test your experiment to check it works. Are there any areas where you know the pollution levels will be different? You could use these to check your experiment can tell the pollution levels apart.

Once you've tested your idea, devise a way to improve your method to make your measurements more accurate. Using your improved method, go to your chosen locations and get your data.

Head online and find satellite images of your two locations. Compare the data you collected with the tree coverage shown in the satellite images.

Things to think about

- How can you make sure your experiment is fair?
- How many samples will you take at each location?
- How long will you take to collect each sample?
- What are the variables in your experiment that could affect your results?
- How will you compare your findings to the tree coverage?
- What changes would you need to make to your experiment to track air pollution over a long period of time?

Useful resources

Government publications on air pollution: gov.uk/government/collections/air-quality-and-emissions-statistics

Department for Environment, Food and Rural Affairs' annual air quality reports: uk-air.defra.gov.uk/library/annualreport/

An interactive map showing results of Urban Forest Canopy assessments: urbantreecover.org

iLEAPS website: ileaps.org

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- Assess the risks (think about what could go wrong and how serious it might be)
- Be aware of what's happening around you. Only do your experiment when it's safe to do so.
- Plan your route before you go and always follow the green cross code.
- Decide what you need to do to reduce any risks (such as wearing personal protective equipment, knowing how to deal with emergencies and so on)
- Make sure your teacher agrees with your plan and risk assessment.

Go green

COMMUNICATION PROJECT

ileaps

Project brief

Cities are both one of the biggest causes of climate change and one of the most affected areas. Green spaces and 'greening the urban environment' have a number of environmental benefits, including providing refuge from air pollution and cooling temperatures in cities. In this project, you will design your own green urban space and think about the best way to communicate your ideas.

Imagine you are a city planner who has been asked to add a green space in the city. The space will counteract air pollution, help cool the city and provide a green environment for people to travel through and spend time in.

First, carry out some research on green spaces, including their benefits and what they usually contain. This might include specific plants and water spots. Get an idea of where you'd like your green space to be, and why.

Once you have an idea of what you'd like to be included in your green space, draw some designs of how you'd like it to look and what materials you'd like to use. You probably need a few different designs to ensure you get the most out of the green space.

Once you have chosen your design and materials, think about creating it either as a model or using a design programme on the computer. You ideally want to find the best way to present your ideas.

Create a proposal for the council of the city you have chosen, explaining the research and science behind your ideas. Think about the best way to present these ideas, including the background to the research.

Things to think about

- What green spaces already exist in your chosen city?
- How will you sell the idea of your green space?
- What key information are the council likely to need to persuade them to choose your green space?
- Will you need planning permission for your green space?
- Think about the benefits your green space will provide. Could different elements of the green space provide different benefits?

Useful resources

Research on urban cooling:
forestresearch.gov.uk/research

Planting greenery on roofs:
domain.com.au/news/planting-greenery-on-roofs-can-help-improve-air-quality-inside-buildings-study-829794/

Urban trees:
fastcompany.com/40589994/urban-trees-can-store-almost-as-much-carbon-as-tropical-rainforests

Urban trees:
mnn.com/earth-matters/climate-weather/blogs/trees-are-not-so-secret-weapon-keeping-our-cities-cool

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Managed by

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