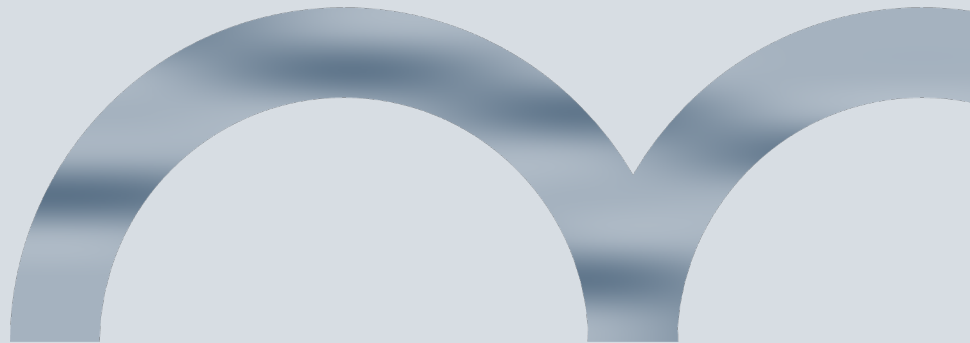




ÉDUCATION AU CHANGEMENT CLIMATIQUE: DÉFIS ET OUTILS

Gabriel Brunnich Dunand, Responsable stratégie, Office for Climate Education

Les champions d'éducation "Éducation et transition écologique"
23 novembre 2021



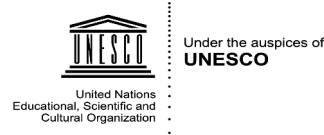
Qui sommes nous ?

Qu'est-ce que l'Office for Climate Education ?

<https://www.oce.global>



Une fondation sous l'égide de



Un membre observateur de



Partenaires institutionnels principaux en France



Réseau international
~ 70 partenaires dans ~ 30 pays





**Malgré le consensus sur le besoin d'éducation
au changement climatique de qualité....**

...ET UN CONTEXTE INTERNATIONAL FAVORABLE...

ARTICLE 12

Les Parties coopèrent en prenant, selon qu'il convient, des mesures pour améliorer **l'éducation**, la formation, la sensibilisation, la participation du public et l'accès de la population à l'information **dans le domaine des changements climatiques**, compte tenu de l'importance que revêtent de telles mesures pour renforcer l'action engagée au titre du présent Accord.



Headline messages

- Education, especially science education, must play an essential role in preparing present and future generations to understand climate change and to respond adequately to adapt to and mitigate its impacts.
- Inquiry-based science education (IBSE), developed over the last two decades, has demonstrated an effective way to learn science at primary and secondary school levels and also to inspire higher education worldwide. It provides a firm basis to develop inquiry a specific, interdisciplinary climate change education programme.
- Climate change education must consider the need to provide teachers, in developed as well as in developing countries, with up-to-date facts, new and innovative teaching processes, new resources for the classroom, and new ways to empower their students to 'agents of change'.
- Climate change and associated events will disproportionately impact the poorest 2 billion of the global population, whose including is far from adequate. Climate justice calls for supporting these schools and their teachers with specific initiatives.
- International collaboration, through the involvement of the science community, will greatly enhance the mobilization of educational systems. As the Intergovernmental Panel on Climate Change (IPCC) is producing periodic Assessment Reports, accompanied by 'Summaries for Policy Makers', the scientific community should use the material from the IPCC reports to produce 'Resources & Tools for Teachers'.

1. Science education at the forefront

Humanity faces a serious climate crisis, which will impact the whole world during the 21st century and beyond. Dealing with this crisis will depend heavily on the more people who are today in schools and could become 'agents of change'. The international legal framework to tackle climate change, i.e. the United Nations Framework Convention on Climate Change (UNFCCC, 1992) and the Paris Agreement (PA, 2015), recognize this point by stating that "The development and implementation of education and training programmes – in particular for developing countries" (UNFCCC, Art. 6.1.3) and "Parties should take measures... to advance climate change education" (Paris Agreement, Art. 6.1.2).

Understanding the Earth's climate, the impact of greenhouse gas emissions on the system, as well as assessing the strategies for mitigation / fighting against the causes and adaptation / coping with the effects, from global to local levels, require scientific knowledge and critical thinking. Climate science brings together specific issues that are currently not widely recognized by science curricula schools and universities.

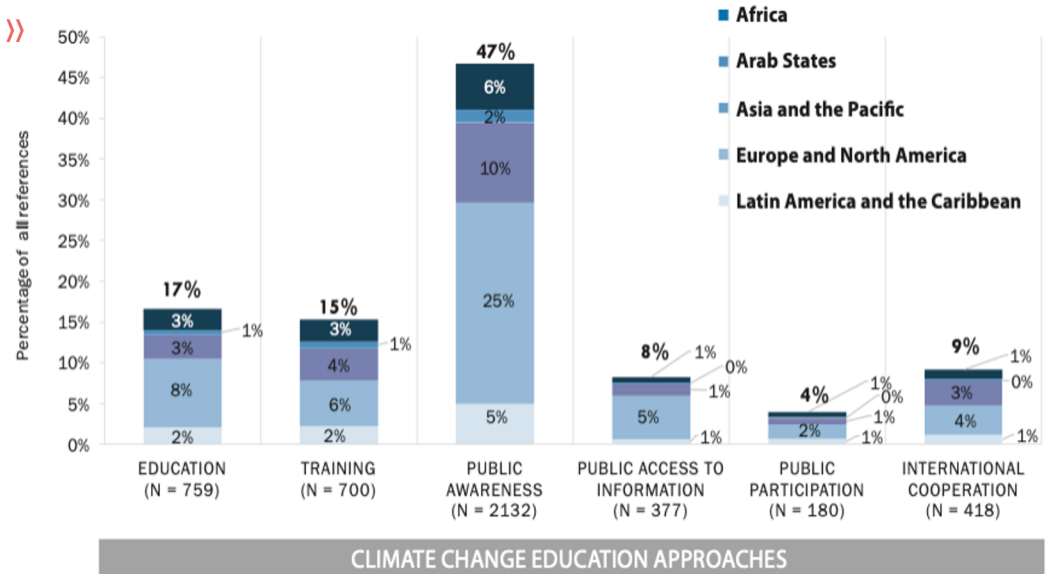
Practitioners of traditional disciplines, such as physics, chemistry, Earth sciences, the sciences, mathematics, social sciences and economics, etc., must collaborate in an interdisciplinary manner to address these issues across the curriculum, even at the elementary level. In addition, there is a need to understand how these complex interactions between natural and social systems (e.g. risk management) connect local actions with global consequences

OBJECTIFS DE DÉVELOPPEMENT DURABLE



... TROP PEU SE FAIT DANS LA RÉALITÉ.

- Le plupart des pays « préfèrent » la sensibilisation du public à l'éducation formel



The percentages sum to 100% overall.

UNESCO (2019)



... TROP PEU SE FAIT DANS LA RÉALITÉ.

- Le plupart des pays « préfèrent » la sensibilisation du public à l'éducation formel
- Le plupart des enseignants « préfèrent » d'autres thématiques en matière d'éducation au développement durable que le changement climatique

Themes chosen by Eco-schools in France (2020)



Waste 38%



Biodiversity 27%



Food 10%



Water 8%



Solidarity 6%



Health 5%

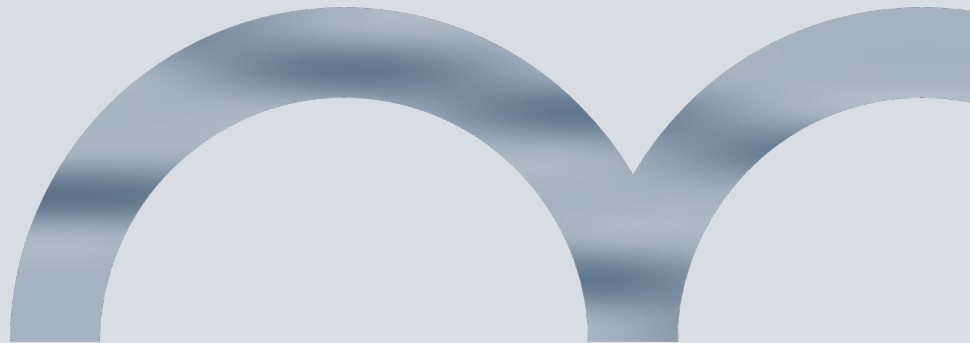


Energy 4%



Climate 2%

Teragir & Foundation for Environmental Education (2021)



Pourquoi est-ce si difficile ?

Pourquoi est-ce si difficile ?

- **Sociétal:** Le changement climatique: un sujet controversé ?



Pourquoi est-ce si difficile ?

- **Sociétal:** Le changement climatique: un sujet controversé ?
- **Didactique:**
 - Un thématique complexe

« En quoi consiste selon vous l'effet de serre ? » (résultats du codage de la question ouverte).
“In your opinion, what is the greenhouse effect about ?” (coding results of the open question).

| Intitulé de la catégorie : | La pollution, les déchets | Couche d'ozone | Des gaz, le CO ₂ | Chaleur, réchauffement | Le manque d'air | Autres réponses | Sans réponse |
|----------------------------|---------------------------|----------------|-----------------------------|------------------------|-----------------|-----------------|--------------|
| 2000 | 11 | 19 | 12 | 22 | 1 | 5 | 30 |
| 2001 | 15 | 15 | 14 | 25 | 1 | 3 | 27 |
| 2002 | 18 | 27 | 10 | 21 | 1 | 4 | 19 |
| 2003 | 24 | 22 | 13 | 18 | 1 | 3 | 19 |
| 2004 | 21 | 24 | 13 | 16 | 1 | 5 | 20 |
| 2005 | 25 | 25 | 14 | 13 | 1 | 3 | 19 |
| 2006 | 24 | 26 | 12 | 18 | 2 | 4 | 14 |
| 2007 | 23 | 24 | 17 | 18 | 2 | 3 | 13 |
| 2008 | 24 | 25 | 17 | 16 | 2 | 3 | 13 |
| 2009 | 20 | 23 | 17 | 21 | 2 | 5 | 12 |
| 2010 | 20 | 21 | 16 | 17 | 1 | 6 | 19 |
| 2011 | 28 | 22 | 14 | 18 | 1 | 3 | 14 |
| 2012 | 28 | 23 | 13 | 16 | 1 | 3 | 15 |

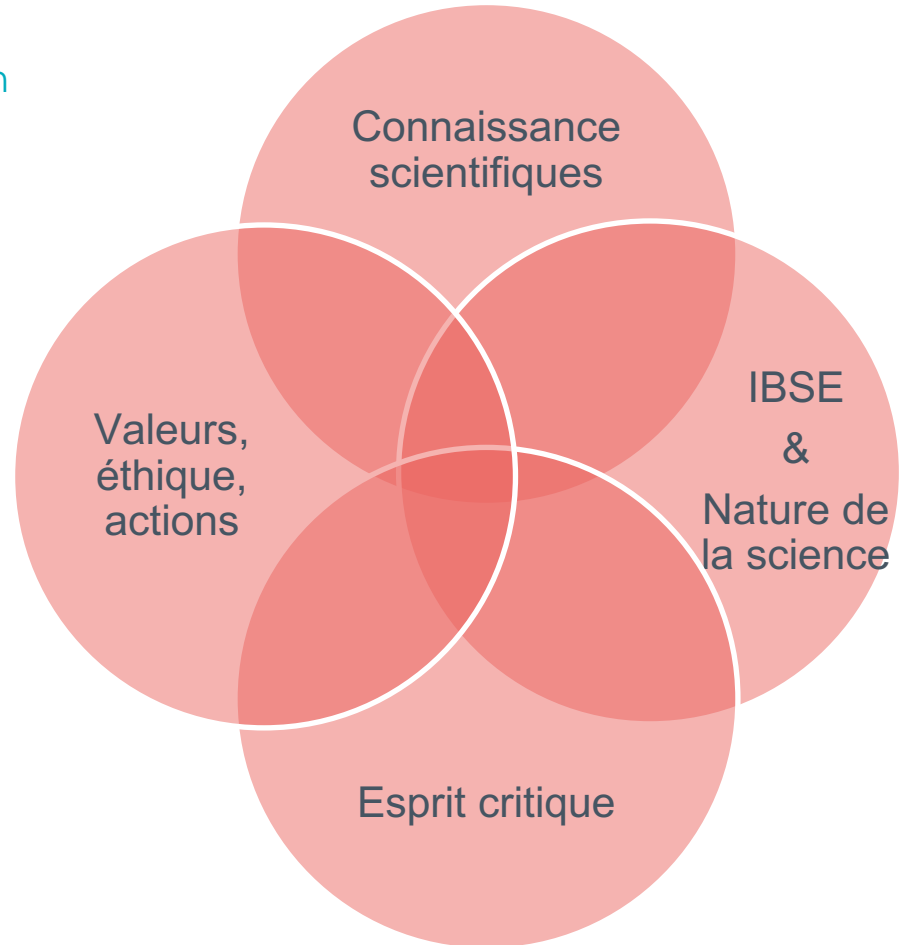
Pollution, trash Ozone Layer CO2 and GHG Heating Lack of air Others No answer

Pourquoi est-ce si difficile ?

- **Sociétal:** Le changement climatique: un sujet controversé ?
- **Didactique:**
 - Un thématique complexe
 - A grande échelle et à long terme

Pourquoi est-ce si difficile ?

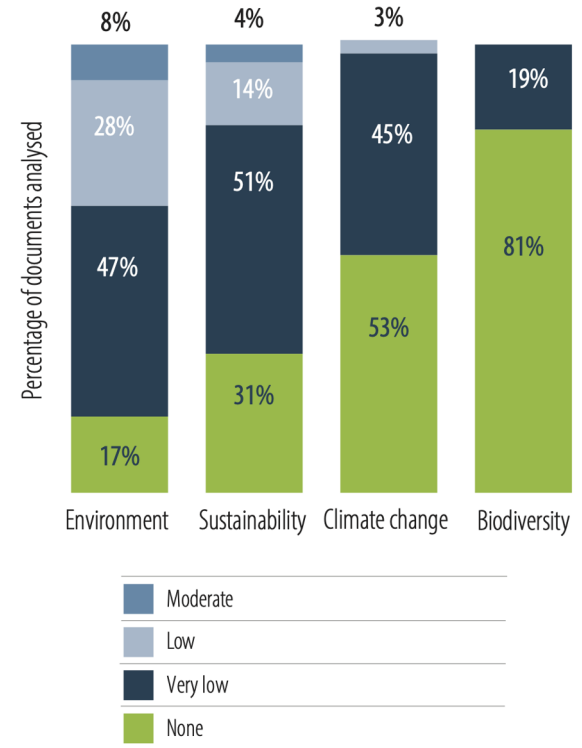
- **Sociétal:** Le changement climatique: un sujet controversé ?
- **Didactique:**
 - Un thématique complexe
 - A grande échelle et à long terme
 - Objectifs et démarches d'enseignement multiples



Pourquoi est-ce si difficile ?

- **Sociétal:** Le changement climatique: un sujet controversé ?
- **Didactique:**
 - Un thématique complexe
 - A grande échelle et à long terme
 - Objectifs et démarches d'enseignement multiples
- **Systémique:**
 - 'Très peu' ou 'pas d'intégration' du changement climatique dans les programmes scolaires

Relative levels of focus in documents, by theme



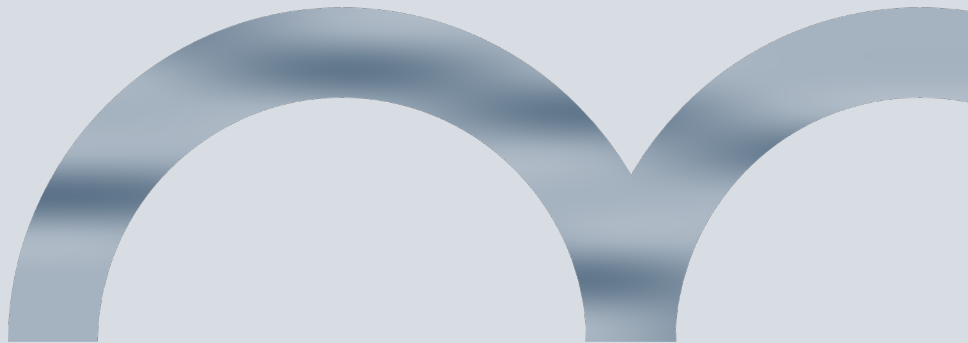
UNESCO (2021)



Pourquoi est-ce si difficile ?

- **Sociétal:** Le changement climatique: un sujet controversé ?
- **Didactique:**
 - Un thématique complexe
 - A grande échelle et à long terme
 - Objectifs et démarches d'enseignement multiples
- **Systemique:**
 - 'Très peu' ou pas d'intégration du changement climatique dans les programmes scolaires
 - Le plupart des programmes ignorent le changement climatique et l'océan (mieux en 2020)
- **Temps moyen nécessaire pour modifier des pratiques éducatives: 20 ans**
=> Commencer maintenant !





Que faire ?

Conclusions clés d'ALLEA, UNESCO, IAP et l'expérience de l'OCE

1. Porter l'accent sur l'éducation formelle

1. Commencer dès l'école primaire



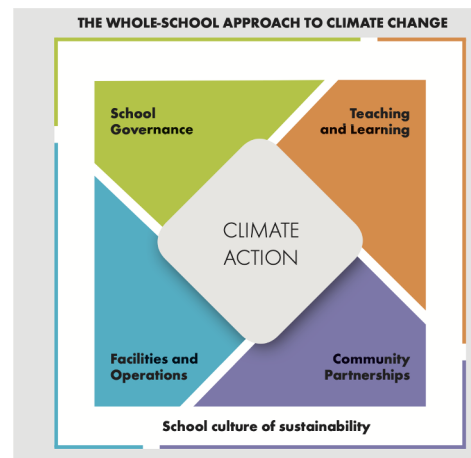
1. Soutenir les enseignants
(ressources + développement professionnel)

1. S'appuyer sur les rapports du GIEC



Conclusions clés d'ALLEA, UNESCO, IAP et l'expérience de l'OCE

5. Utiliser des pédagogies actives (démarche d'investigation, pédagogie de projet...)
6. Mettre l'accent sur l'atténuation et l'adaptation
7. Insister sur les solutions et diminuer l'éco-anxiété
8. Impliquer le système éducatif entier: pas uniquement les enseignants





**Outils pour l'éducation au changement climatique:
Le développement professionnel des enseignants**



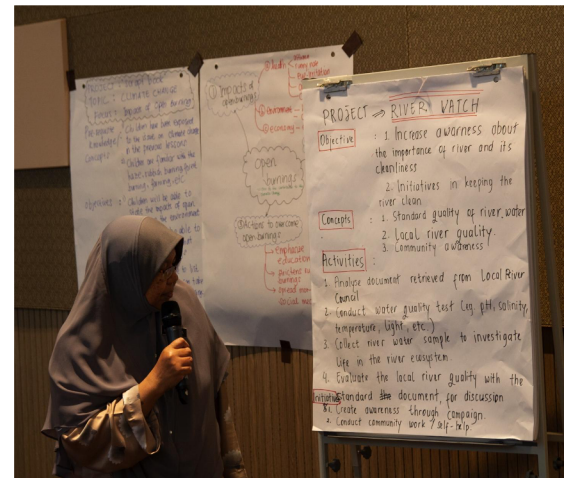
Aspect clé: Le Développement professionnel des enseignants

Concepts et enjeux du climat

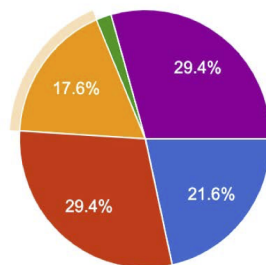
Mises en situation

Démarche pluridisciplinaire

Développer des projets éducatifs pertinents localement



Length of CCE teachers' PD modules



- Less than 2 hours
- 2 - 5 hours
- 6 - 10 hours
- 10 - 20 hours
- More than 20 hours

Il faut y passer du temps !
> 30 heures

Commencer par former des formateurs d'enseignants





Exemple de ressources pédagogiques

“Climat, océan et cryosphère”

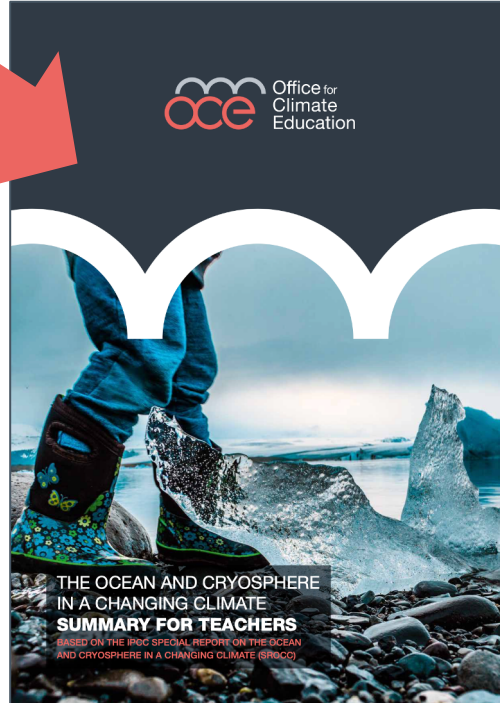
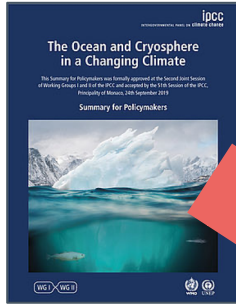
L'adaptation des rapports du GIEC pour les enseignants du primaire et du secondaire

Simplifier

Expliquer

Illustrer

Exemplifier



1 Warming atmosphere

2 Warming ocean

3 Melting glaciers

4 Ocean thermal expansion

5 Melting ice sheets

6 Sea level rise

FIGURE 1 How a warming atmosphere and a warming ocean cause sea level rise.

FIGURE 2 Due to projected global mean sea level rise, local sea levels that historically occurred once per century are projected to become at least annual events at most locations during the 21st century.

FIGURE 3 Sea level rise is projected to continue, and at an increasing rate. Due to the slow response of the ocean associated to its thermal inertia, global sea level will continue to rise even after global temperature has stabilized.

FIGURE 4 Under RCP2.6, sea levels in 2100 could reach 29–59 cm above the 1990s level and at a rate of 2–6 mm/year. In contrast, under RCP8.5, sea level in 2100 could rise by 61–110 cm and will be rising at 1.2 cm/year. Compared to the previous IPCC sea level assessment (in the last main IPCC report AR5), this projection is 10 cm higher, due to the inclusion of a larger ice loss from the Antarctic ice sheet. Moreover, ice sheet instabilities could increase Antarctica's contribution to sea level rise to substantially higher values over the next century and thereafter. Under RCP2.6, models project a sea level rise of about 1 m, compared to up to 5 m by 2300 in RCP8.5.

As sea level rises, extreme sea level events will occur more often (see Figure 15). Events that historically occurred only once per century are projected to occur at least annually by 2100 under both scenarios.

FIGURE 5 The loss of the cryosphere in high mountains already impacts and will continue to impact tourism (skiing, glacier tourism, hiking and mountaineering). Snowmaking technologies in ski resorts will become increasingly ineffective as the atmosphere warms further.

FIGURE 6 The past two decades have seen an increase in Arctic shipping activity associated with sea ice decline. In 2011, four ships crossed the northeast passage. In 2016, 227 took the same route. The rise in shipping activities increases the risk of introducing invasive species and pollution, if actions to implement new regulations do not keep pace.

ADAPTATION options are available, and some have already been implemented. In the Arctic, community leaders help increase food security. Arctic communities have also adjusted the timing of their activities to respond to changes in seasonality and unsafe ice travel conditions.

In high mountains, adaptation measures include coordinated water management of various scales and industries as well as the diversification of tourism activities. In both the Arctic and high mountain areas, adaptation has been made easier thanks to the knowledge held by indigenous peoples and local populations.

TO SUM UP

Future loss of cryosphere components on land will have an impact on water resources and their uses, such as hydropower and agriculture irrigation in and downstream of high-mountain areas, as well as livelihoods in the Arctic. Increased risks from floods, avalanches, landslides and ground destabilization will affect infrastructure, tourism and safety.

CLASS ACTIVITY # ACTIVITY

Arctic people have a very large number of words for snow. Can you name 5 of them? How can you explain why many countries around the world only have one word? You can find some examples by clicking on the link: <https://www.thecryosphere.com/en/words-for-snow-and-ice>

Do you know what a hummock is? What does it mean in English?

Answer: A hummock means "a mountain". A hummock is a mound of soil rising above an ice field.

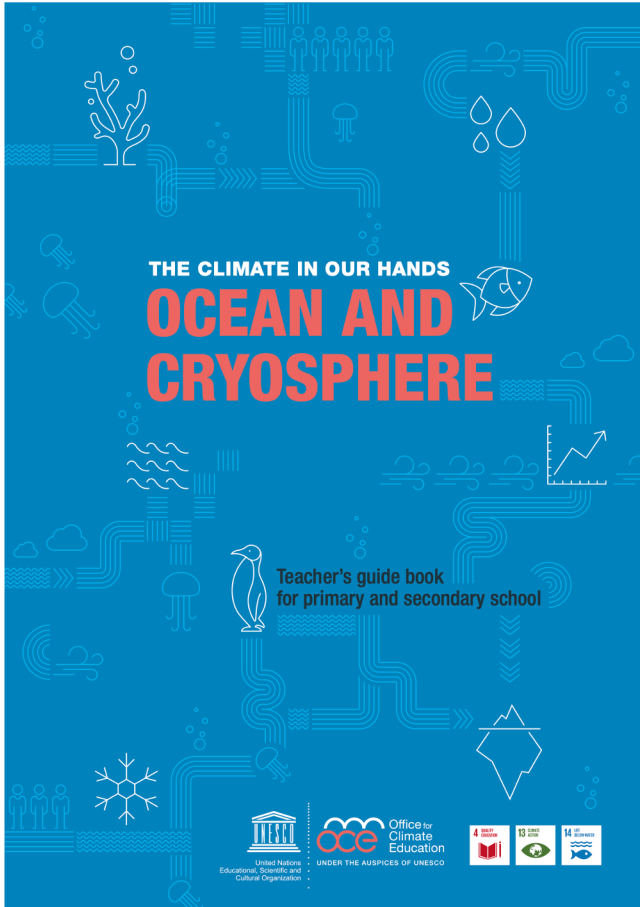
Discuss the link between the cryosphere and certain human cultures.



Note: Toutes les ressources sont disponibles sur le site web de l'OCE.



1 Guide pédagogique clé-en-main



200 pages

Gratuit

Disponible en 4 langues : français, anglais, espagnol, allemand

Testé en classe et validé par des scientifiques

Eclairages scientifique et pédagogique

17 leçons clé-en-main

3 exemples de projets locaux

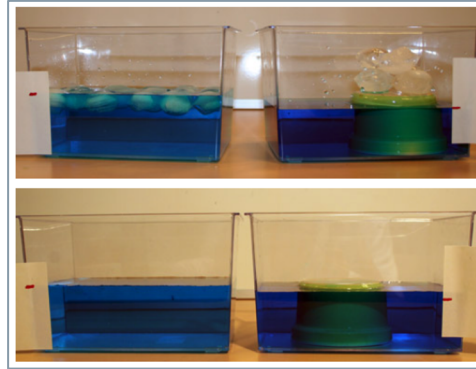
Documents et animations multimédia



Démarche pédagogique

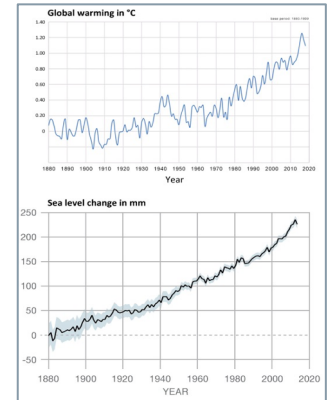
Pédagogies actives

- Démarche d'investigation scientifique
- Pédagogie de projet
- Axé sur l'action
- Pluridisciplinaire



Activités diverses

- Expériences / modélisation
- Jeux de rôle
- Débats
- Etudes documentaires
- Mise en œuvre de projets locaux



3 Protocoles pour le développement professionnel des enseignants



WORKSHOP Understanding the greenhouse effect

This resource is a guide for a professional development workshop for teachers, about the greenhouse effect. Teachers carry out different experiments in order to understand the greenhouse effect and the role of infrared radiation.

OVERVIEW

After expressing their conceptions of the greenhouse effect mechanism, the participants look for a way to demonstrate it through a simple experiment.

They then realize that there is no experiment feasible in the primary or middle school classroom capable of demonstrating it, and that the phenomenon can be studied in several ways: by means of an analogy, by means of a document review, or by means of an experiment highlighting the role of certain materials that are transparent for visible light and opaque for infrared light.

They discuss the benefits and limitations of each approach and develop a better understanding of the greenhouse effect.

This simulation also provides a good introduction to science teaching using an inquiry-based approach.



Pedagogical approach
Experimentation
Inquiry-based learning



Resource
1st through 9th grades teachers
Duration: 3H + 1H optional

Subjects
Natural sciences
History



WORKSHOP Ocean and climate change

This resource is a guide for a professional development workshop for teachers, about the relationship between the ocean and the climate, and specifically about the consequences of climate change for the oceans. Teachers carry out experiments to investigate glacier and sea ice melting, sea level rise, ocean acidification, and its consequences for biodiversity.

OVERVIEW

Participants wonder about the consequences of climate change for the oceans. They realize, using simple experiments, that the melting of continental ice and the thermal expansion of water lead to a rise in sea level, but not the melting of sea ice. On the other hand, they discover that the melting of sea ice is responsible for an amplification and acceleration of global warming, due to the albedo of ice, which is very different from the ocean's.

Participants also highlight, with experiments, the dissolution of CO₂ in water, and its consequences in terms of ocean acidification. They understand the consequences of this acidification for biodiversity, particularly for corals and phytoplankton.

Two extensions are suggested, one on the thermal inertia of the oceans, the other on marine currents, and their possible disruption due to global warming.

These different simulations also provide a good introduction to science teaching using an inquiry-based approach.

Summary

- 3 Overview and required material
- 4 Initial representations
- 5 Sea level rise: ice melting
- 8 Sea level rise: thermal expansion
- 10 Sea ice melting and albedo
- 12 Ocean acidification
- 14 Consequences of ocean acidification on marine biodiversity
- 17 Follow-up workshops
- 17 Attached documents



Pedagogical approach
Experimentation
Inquiry-based learning



Resource
1st through 9th grades teachers
Duration: 3H + 2H optional

Subjects
Natural sciences
Geography



WORKSHOP Developing a sequence of lessons from a conceptual framework

The goal of this professional development activity is to learn how to design an educational project that uses inquiry-based learning.

This activity is aimed primarily at professional development providers, education advisors, curriculum managers, inspectors, etc. However, it can be attended by experienced teachers.

OVERVIEW

The participants, divided into groups, identify topics they would like to explore in the classroom.

Each group works on a topic, for a specific level (age group). The groups start by developing a conceptual framework: this means formulating their theme's fundamental concepts, using simple and clear sentences ("student formulation"), organised spatially and linked together by logical links.

After presenting their conceptual frameworks to the other groups, and discussing possible improvements, they complete them and then use them to produce a "turnkey" sequence of lessons.

Summary

- 3 Overview and required material
- 4 Introduction
- 7 Identifying global topics
- 9 Building the conceptual framework
- 11 Developing a sequence of lessons
- 12 Presentations of the educational projects and conclusion
- 12 Attached documents



Resource
920 providers
Duration: 6 to 9 hours or more

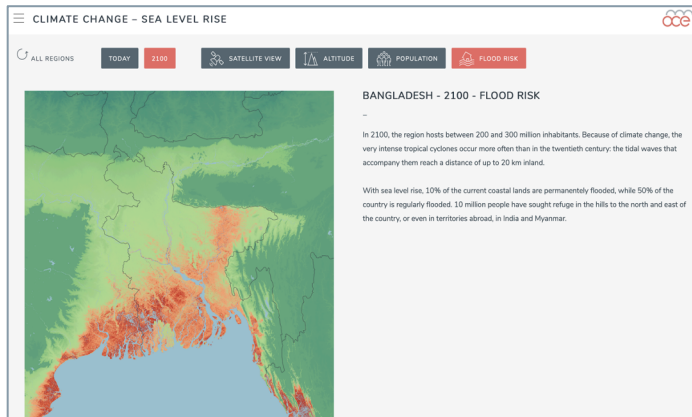
Subjects
All subjects

Pedagogical approach
Group assignment
Brainstorming

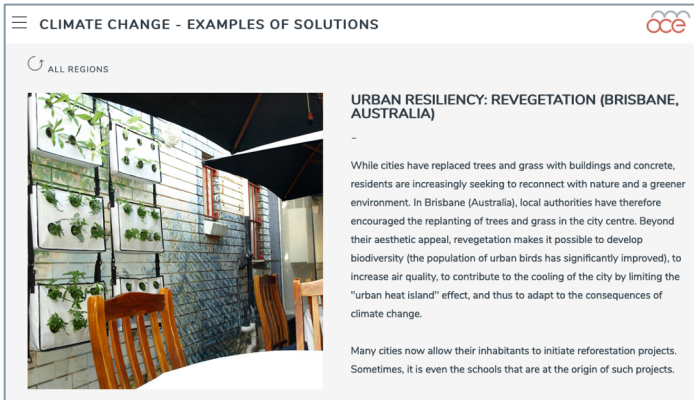
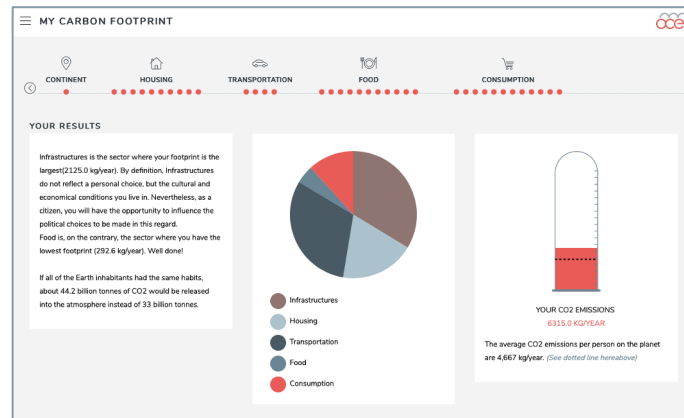


Animations multimédia

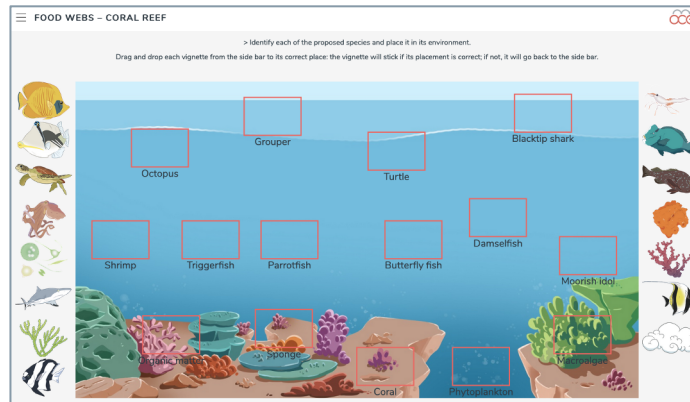
L'élévation du niveau des mers



Mon empreinte carbone




Exemples de solutions



Réseaux trophiques



10 vidéos courtes + 1 vidéo longue



CLIM

THERMOHALINE CIRCULATION

JEAN-BAPTISTE SALLÉE
CNRS RESEARCHER, OCEAN
OCEANOGRAPHER

10 SHORT VIDEOS (2-MINUTE-LONG) suitable for use in the classroom, in which experts speak about specific issues related to the ocean or cryosphere, in the context of climate change. These videos are the first in a series called CLIM, created by the OCE, Dorothée Adam-Mazard, Claire Adam-Mazard and the production company Wattson. They are available in English, French, Spanish and German.

1 LONG VIDEO (14-MINUTE-LONG) in partnership with the French Youtuber Sébastien Carassou and *La main à la pâte*, which explains to teachers how to work on the topic of cryosphere in primary school. The French video was published in February 2019.

Translated versions in English, Spanish and German are expected in 2020.



Le Groenland

L'Antarctique

Projet ALEC: América Latina para la Educacion climatica

Projet de 5 ans

Mexique et Colombie

12 partenaires coordonnés par l'OCE

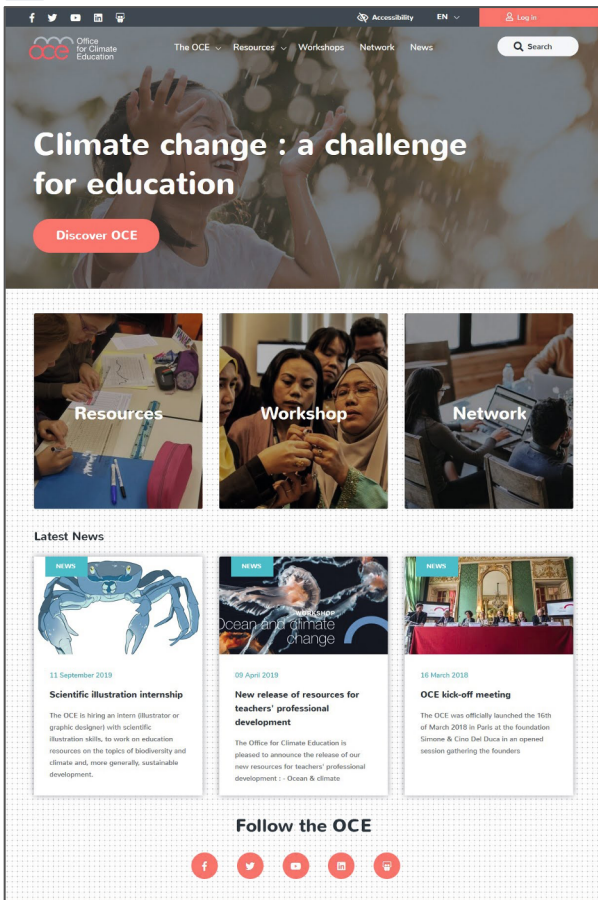
Ressources de l'OCE adaptées au contexte local

Formations d'enseignants et de formateurs d'enseignants



Où trouver les ressources ?

<https://www.oce.global>



The screenshot shows the homepage of the Office for Climate Education (OCE). At the top, there is a navigation bar with the OCE logo, social media icons, and a search bar. The main header features a large image of a young girl with her hands raised, with the text "Climate change : a challenge for education" and a "Discover OCE" button. Below this, there are three columns of images labeled "Resources", "Workshop", and "Network". The "Latest News" section contains three articles: "Scientific illustration internship" (11 September 2019), "New release of resources for teachers' professional development" (09 April 2019), and "OCE kick-off meeting" (16 March 2018). At the bottom, there is a "Follow the OCE" section with social media icons for Facebook, Twitter, YouTube, Instagram, and LinkedIn.

Ressources gratuites en 4 langues

Ateliers

Réseaux

Projets





Construire une communauté de
pratiques



Toute première #TeachersCOP

Objectif ?

Donner aux enseignants l'opportunité de se faire entendre

Partager leurs idées et besoins pour une ECC de qualité

Qui a participé?

Des centaines d'enseignants du monde entier

Quand était-ce ?

30 octobre 2021 (participation virtuelle, live depuis Glasgow)

Autres questions?

Contactez Djian Sadadou: djian.sadadou@oce.global



Séminaire international sur l'éducation au changement climatique

17 – 21 janvier 2022 (Paris)

Objectif ?

Faciliter le dialogue entre pays et parties prenantes (scientifiques, responsables éducatifs, enseignants, etc...).

Promouvoir le développement de l'ECC dans les programmes scolaires nationaux

Cible?

Une cinquantaine de décideurs, formateurs d'enseignants et enseignants de systèmes éducatifs étrangers (non français) souhaitant découvrir et se familiariser avec les dernières tendances, méthodologies et outils de l'ECC.



UNDER THE AUSPICES OF UNESCO
AND THE FOUNDATION LA MAIN À LA PÂTE

Sous l'égide de



Membres fondateurs



Avec le soutien de



Quelques références

- UNESCO (2021), Getting every school climate-ready: how countries are integrating climate change issues in education
- UNESCO (2021), Apprendre pour la planète: un examen mondial de l'intégration des questions environnementales dans l'éducation
- ALLEA (2020), A snapshot of climate change education initiatives in Europe
- UNESCO (2020), Progrès nationaux en matière d'éducation, de formation et de sensibilisation du public aux changements climatiques
- UNESCO (2017), L'Éducation en vue des Objectifs de développement durable: objectifs d'apprentissage
- UNESCO (2017), Faire face au changement climatique: guide sur l'action climat destiné aux établissements scolaires
- Jonasson (2016), Educational change, inertia and potential futures. Why is it difficult to change the content of education?
- Borde, Léna & Lescarmontier (2020), Education as a strategy for Climate Change Mitigation and Adaptation
- Léna (2020), Educating for Sustainable Development & Climate Change: a Challenge for Science Academies

