

ePlanet in-class challenge-based modules

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Introduction

Challenge-based learning modules encourage students to apply their knowledge to real-world scenarios and to delve deeper into a topic. ePlanet has developed four challenge-based modules related to planetary health that can be used to deepen students’ understanding and application of the concepts they have learned in the ePlanet game. The modules are specifically designed to foster active learning and critical thinking, encouraging students to engage with the material in a collaborative and hands-on manner. By working in groups, students can share diverse perspectives and apply transdisciplinary approaches to problem-solving, enhancing their understanding of complex issues. These interactive challenge-based learnings not only reinforce the knowledge gained through the game but also cultivate competencies such as teamwork and communication, systems thinking, “futuring”, advocacy and applying concepts like equity to the context of health care. As students grapple with these challenges, they will become more adept at connecting theory to practice, empowering them to become effective advocates for sustainable practices within their communities and future healthcare environments.

Each module takes around 60-90 minutes to complete.

This document contains each of the challenge-based modules in which the first part is meant for use by the students and can be sent to them digitally or printed for their own use. The teachers guide following the challenge-based module is meant for use by teachers.

Challenge-based module 1: Sustainable health care

Introduction

The healthcare sector plays a critical role in managing and improving public health, but it also has a significant environmental impact. As of recent estimates, the healthcare sector is responsible for roughly 4.4% of global greenhouse gas (GHG) emissions ([health care climate footprint report](#), 2019). These emissions contribute to global warming and climate change, posing risks not only to the environment but also to public health. To effectively address and mitigate these impacts, it's important to understand where emissions come from and how they are managed within healthcare facilities.

Greenhouse gas emissions are divided into three distinct categories, known as Scopes. These categories help in understanding and managing emissions from various sources within a sector or organization.

Scope 1: Direct Emissions: Emissions directly connected to the operation of healthcare facilities from sources that are directly owned or controlled by the healthcare facility (i.e. emissions from patient transport in vehicles owned by the facility, anesthetic gases, combustion of fossil fuels on site).

Scope 2: Indirect Emissions from Purchased Energy: Emissions stemming from the energy supply needed to run the healthcare facility (i.e. energy needed for electricity to operate medical equipment and HVAC systems). The emissions occur at the power plants that produce the electricity or energy.

Scope 3: Indirect Emissions from the Supply Chain: Emissions that occur in the supply chain of the healthcare facility, including emissions from the production, transport and disposal of medical supplies.

Step-by-step assignment instructions for students

Prepare a Powerpoint presentation aimed at the healthcare facility board members to inform them about the biggest sources of emissions and possible mitigation efforts to reduce these emissions. To inform this presentation, identify the biggest sources of greenhouse gas emissions at your healthcare facility.

1. Review Pre-Read Materials & Discussion (10 minutes)

Start by discussing any questions regarding the pre-read materials on greenhouse gas emissions and their scopes. Ensure you understand how emissions are categorized and measured.

2. Identify the five biggest emission sources (20 minutes)

Identify sources of information about your facility's GHG emissions. Look for a department dedicated to sustainability or information about sustainability in the annual corporate report. Alternatively, if this is unavailable try to find information from similar institutions that published reports on this information. Look for scientific publications.

Determine the five biggest sources of emissions in your facility. Categorize these sources into Scope 1, Scope 2, and Scope 3.

Include this information with figures and citation of sources on your slides.

3. Develop Mitigation Strategies (20 minutes)

Based on your findings, develop 3-5 recommendations for reducing the chosen facility's GHG emissions. Use the "reduce, reuse, recycle" approach.

- Reduce: Suggestions for minimizing emissions, such as energy efficiency improvements or process changes.
- Reuse: Ideas for reusing resources or products to minimize waste.
- Recycle: Recommendations for recycling materials or waste management improvements.

Consider the feasibility of your recommendations and highlight the added benefits, such as cost savings, improved efficiency and/or patient safety, or enhanced sustainability. Identify potential concerns related to the implementation of your recommendations and propose solutions.

4. Finalize PowerPoint Presentation (10 minutes)

Prepare up to 6 slides (excluding the title slide) summarizing your findings of the biggest emission sources and recommendations for mitigation. Make sure to address potential co-benefits and concerns around your proposed solutions.

Ensure slides are not text-heavy and use visuals like charts, graphs, and images where appropriate. Follow your institution's standard slide format.

5. Presentation to the Board Members (20 minutes)

Present your findings and recommendations. The presentation should be max. 15 minutes long followed by a Q&A session.

Start a discussion about:

- The most significant sources of emissions identified.
- The feasibility and impact of the proposed recommendations.
- How different strategies could be implemented in real-world settings.

Mandatory pre-reading materials:

[Waste from one surgery](#)

[Health care's response to climate change: a carbon footprint assessment of the NHS in England](#)

Optional pre-read materials:

[Health Care's Climate Footprint](#)

[UK Health Alliance on Climate Change – Green Surgery](#)

Sustainable health care - Teachers Guide

Background

The healthcare sector emits roughly 4.4% of global greenhouse gas emissions (GHG). Reducing the environmental impact can be achieved by primarily trying to reduce the use of all products, but also by reusing/repurposing or recycling the materials. Healthcare system use and the predominant healthcare system approach (e.g. curative vs. preventative) are underlying drivers of all emissions. Greenhouse gas emissions are divided into three scopes.

Scope 1: Direct Emissions: These are the most direct forms of emissions and often stem from day-to-day operational activities. They can be managed through improvements in energy efficiency and changes in operational practices.

Scope 2: Indirect Emissions from Purchased Energy: Although not directly produced by the facility, these emissions are significant because they account for the energy consumed. Reducing Scope 2 emissions can be achieved by using renewable energy sources or improving energy efficiency.

Scope 3: Indirect Emissions from the Supply Chain: Scope 3 emissions often represent the largest share of total emissions for many organizations (around 70%). They are more challenging to control directly but can be addressed by engaging sustainable suppliers, optimizing logistics, and implementing waste reduction strategies.

Summary

By focusing on strategies to manage and reduce Scope 2 and Scope 3 emissions, healthcare facilities can make the most substantial impact on their overall greenhouse gas footprint, yet scope 1 interventions can sometimes be easier to implement as they are under the direct influence of facilities.

Learning objectives:

After completion of this module, the student will be able to:

- Identify and evaluate trustworthy and reliable sources of information on sustainability and GHG emissions in the healthcare sector.
- Develop transdisciplinary and systems thinking skills by analyzing sources on sustainability practices in healthcare.
- Synthesize literature findings into a coherent presentation aimed at influencing hospital leadership.
- Engage with sustainability issues within their educational institution or place of study.
- Advocate for more sustainable practices within healthcare facilities by presenting recommendations.

Prerequisite:

Students should be familiar with basic scientific literature research strategies in citation databases. 4th semester or higher/graduate students.

Lesson overview

Students Assignment	Teachers Guide
Discuss questions regarding the pre-read materials (10 min)	
Group discussion: Identify sources of information to find out about your facilities emissions (10 min)	Ideas/directions if needed: <ul style="list-style-type: none"> - does your institution have a designated <u>department for sustainability</u> matters that students could call and request further information? - Are there <u>annual corporate reports</u> that give information about the institutions emissions and sustainability efforts? - If none of these are available what are other sources of reliable information? → <u>Scientific publications</u> from citation databases like <u>pubmed</u> or <u>Scopus</u>, <u>grey literature</u> from trusted sources like WHO, <u>Healthcare Without Harm</u>, Planetary Health Alliance or academic hospitals that have mapped their emissions sources
What are five of the biggest sources of emissions? (20 min)	To be extracted from literature search i.e. purchased goods like pharmaceuticals; employee, patient and visitor travel/commutes; waste management; anesthetic gases; facilities' energy supply; health care utilization
Prepare up to 6 power point slides summarizing your findings. Make sure to cite your sources (20 min)	Avoid text heavy slides and possibly use the standard format of institutions. Clearly state the issue, list your recommendations, where possible make suggestions on how to reduce the environmental impact. Focus on the <i>reduce, reuse, recycle</i> approach. Suggestions to switch to different products/methods are welcome. Focus on added benefits and address potential concerns.
Present the slides (20 min)	Discuss the feasibility of the presented options and try to focus on the possible impact of proposed measures. Most importantly is that students feel engaged and empowered to make a positive change regarding sustainability.

Challenge-based module 2: Healthy and Sustainable Diets: From a lose-lose diet to a win-win diet

Introduction

Food and nutrition play a crucial role in maintaining and promoting health. However, the current Western diets are unhealthy and a major contributor to premature morbidity and death. The food sector as a whole (including the food production, processing, distribution, retailing, consumption and waste management) emits a staggering 27% of global GHG emissions. Changing our dietary patterns and moving towards a sustainable food production has co-benefits for people and the planet.

Step-by-step assignment instructions for students

You work as a general practitioner at a health center in a low-income neighborhood of a metropolitan city. The area is a food desert, meaning affordable, healthy, and fresh food options are scarce. Many of your patients have a high average body mass index (around 33 kg/m²), indicating obesity, and suffer from lifestyle-related diseases like hypertension, diabetes, insulin resistance, and metabolic dysfunction-associated steatohepatitis (MASH). When you start investigating you notice that the diets of your patients primarily consist of ready-to-eat packaged foods, sugary drinks, processed meats, and red meat (consumed more than five times a week). There is a common belief that daily meat intake is necessary in a healthy diet. Most patients do not consider the environmental impact of their diets.

As a healthcare professional, you aim to improve your patients' dietary habits and bring awareness to the connection between food choices, health, and climate change, working collaboratively with a dietitian in your practice. The focus will be on helping patients shift from a “lose-lose diet” to a “win-win diet.”

Prepare a presentation of up to 5 slides addressing the following points:

1. Explain the differences between “lose-lose” and “win-win” diets and their impact on health and the environment using 2 example meals.
2. Compare the carbon footprint of meals representing both diets.
3. Identify actions for reducing the environmental impact of specific foods.
4. Address barriers and solutions for adopting a “win-win” diet in a low-income, food desert setting that is accessible and affordable for your patients.

1. Explain “Lose-Lose” vs. “Win-Win” Diets and create two example meals (30 minutes)

Create slides that describe 5 key differences between a “lose-lose diet” (e.g., Western dietary pattern) and a “win-win diet” (e.g., Mediterranean, New Nordic, plant-based diets). For each difference, explain its impact on both health and the environment.

Present two dinners, one representing a “lose-lose” meal and one representing a “win-win” meal. This can be a breakfast, lunch or dinner meal representing an actual meal from your own country.

2. Visualize the Environmental Impact (15 minutes)

Create a graphic comparing the carbon footprint of the “lose-lose” meal vs. the “win-win” meal. Use data from OurWorldinData to illustrate the impact of different food products.

Use a figure template to illustrate the difference in carbon emissions between both meals.

3. Practical Actions to Reduce Carbon Footprint with Barriers and Potential Solutions (20 minutes)

Identify the 2 foods in the “lose-lose” dinner with the highest carbon footprint. Suggest alternatives from the “win-win” diet to replace them with lower carbon footprint options. Present the environmental and potential health impact of the products. Discuss 2-3 main barriers to switching from a “lose-lose” diet to a “win-win” diet in the context of your low-income patients, and propose 2-3 practical solutions.

4. Present PowerPoint (15 minutes)

Each group has 5 minutes to present with 1-2 minutes for 1 or 2 questions. Ensure clarity, conciseness, and persuasive communication, targeting healthcare providers with practical, actionable solutions. Cite any research or figures used (e.g., dietary guidelines, carbon footprint data).

5. Conclusion and Reflection (10 minutes)

After all presentations, participate in a discussion on the challenges of promoting sustainable diets in food deserts, and how healthcare professionals can play a role in encouraging healthier, environmentally friendly eating habits.

Mandatory pre-reading materials

[Food, Planet and Health – EAT Lancet Commission](#) (specifically the introduction, pages 4 to 8, Figure 2, session Target 1 – healthy diets)

[Food in the Anthropocene](#)

For calculating carbon footprint of foods, use <https://assets.plateupfortheplanet.org/carbon-calculator/>

Take a look at our world in data on food systems: <https://ourworldindata.org/environmental-impacts-of-food>

Healthy and Sustainable Diets - Teachers Guide

Background

Food is one of the most powerful tools we have to improve human health and ensure environmental sustainability. Currently, approximately 27% of global greenhouse gas emissions come from the food sector, making dietary choices a critical factor in tackling climate change and other environmental problems like biodiversity loss and land-use change. Transitioning from a “lose-lose diet” to a “win-win diet” can significantly reduce these environmental impacts while promoting better health outcomes.

A **win-win diet** emphasizes plant-based eating, where more than 50% of protein comes from plant sources, with meals centered around fresh, locally sourced ingredients that are culturally appropriate. Examples of win-win dietary patterns include the Mediterranean diet, Okinawan diet, New Nordic diet, and the DASH (Dietary Approaches to Stop Hypertension) diet. These diets prioritize fresh, seasonal foods and minimize reliance on processed and pre-packaged items.

In contrast, **lose-lose diets** are typically dominated by animal proteins, especially red and processed meats, and ultra-processed foods that often have a high environmental cost. These foods are frequently transported over long distances, contributing to higher emissions, and are linked to significant food waste. The Western dietary pattern is a prime example of this environment- and health-damaging approach.

Shifting from a lose-lose diet to a win-win diet could reduce greenhouse gas emissions by up to 70%, representing a significant step toward achieving global sustainability goals. In fact, 8 out of the 17 United Nations Sustainable Development Goals (SDGs) are closely connected to the food system, emphasizing that how we produce, transport, consume, and discard food has major implications for environmental sustainability and societal well-being.

With this in mind, “the power is on your plate.” By making conscious food choices, we can contribute to a healthier planet and foster a more healthy and equitable society. Here are five key principles for adopting a sustainable and health-promoting diet:

1. **Eat consciously** – choose foods that are beneficial for your health and the planet.
2. **Cook at home** – prioritize home-cooked meals over pre-packaged, ready-to-eat options.
3. **Choose plant-based proteins** – opt for plant-based protein sources rather than animal-based ones.
4. **Buy local and seasonal** – select fruits and vegetables that are grown locally and in season.
5. **Reduce food waste** – plan your meals to minimize waste and make the most of what you purchase.

Learning Objectives

By the end of this module, students will be able to:

- Identify high-carbon, low-nutrition foods typically found in “lose-lose diets,” and explore healthier, lower-carbon alternatives that align with “win-win” principles.
- Analyze the challenges posed by current food systems and identify how dietary changes can promote both environmental and human health benefits through conscious food choices.

- Discuss equity issues related to food access and choices, particularly for patients and communities in lower-income settings.
- Advocate for sustainable and health-conscious food choices within healthcare environments and beyond

Prerequisite: Students should be familiar with basic scientific literature research strategies in citation databases. 3th semester or higher/graduate students

Lesson overview

Students Assignment	Teachers Guide
Explain “Lose-Lose” vs. “Win-Win” Diets and create two example meals (30 minutes)	<ul style="list-style-type: none"> - Have students create slides that describe 5 key differences between "lose-lose" and "win-win" diets (e.g., Western vs. Mediterranean, New Nordic, or plant-based diets). - Each difference should include explanations on its impact on both health (e.g., risk of chronic diseases) and the environment (e.g., carbon emissions from food production). - Have students present two actual meals from their country, one representing a "lose-lose" diet and one a "win-win" diet. Meals can be breakfast, lunch, or dinner.
Visualize the Environmental Impact (15 minutes)	<ul style="list-style-type: none"> - Have students create a graphic comparing the carbon footprint of the "lose-lose" meal vs. the "win-win" meal. - Encourage students to use reliable data sources like OurWorldinData to illustrate the impact of different food products. - Provide or have students create a figure template to clearly show the difference in emissions between both meals.
Practical Actions to Reduce Carbon Footprint with Barriers and Potential Solutions (20 minutes)	<ul style="list-style-type: none"> - Students should identify the 2 highest carbon-emitting foods in the "lose-lose" meal and suggest alternatives from the "win-win" diet with a lower environmental impact. - Ensure students explain both the environmental and health benefits of these alternatives. - Ask students to discuss 2-3 barriers (e.g., cost, access, cultural preference) to switching to a win-win diet, and propose 2-3 practical solutions to overcome these barriers, especially in the context of low-income patients.
Present PowerPoint (15 minutes)	<ul style="list-style-type: none"> - Each group presents their slides in 5 minutes, with 1-2 minutes allocated for questions. - Ensure students focus on clear, concise communication, targeting healthcare providers with practical and actionable solutions. - All research, dietary guidelines, and carbon footprint data should be properly cited.

Conclusion and Reflection (10 minutes)	<ul style="list-style-type: none">- After all presentations, hold a group discussion on the challenges of promoting sustainable diets in socially disadvantaged communities- Discuss the role healthcare professionals can play in supporting healthier, environmentally conscious food choices
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Challenge-based module 3: Air pollution and health advocacy

Introduction

Air pollution is one of the most significant environmental threats to human health, contributing to millions of premature deaths each year. It impacts the climate, exacerbates respiratory and cardiovascular diseases, and disproportionately affects vulnerable populations. Your task in this assignment is to explore the relationship between air pollution and public health, identify key sources of air pollution in your community or region, and propose actionable strategies to reduce these emissions and their health impacts.

Step-by-step assignment instructions for students

Prepare a social media campaign aimed at a group of community leaders or policymakers, with the goal of informing them about the most significant sources of air pollution and recommending measures to mitigate these emissions to improve public health and address climate change.

1. Explore the Health Impacts of Air Pollution and Reflect on Pre-read Materials (10 minutes)

Discuss the readings provided, which examine the link between air pollution and public health, with a focus on how pollution also contributes to climate change. Reflect on how these materials might apply to your local or regional context. Consider the vulnerable populations most affected by air pollution.

2. Investigate Air Pollution Sources in Your Community (20 minutes)

Identify where air pollution in your area comes from, based on available data and identify the 3-5 biggest contributors to air pollution in your community.

Use government reports, data from environmental agencies (e.g., the World Health Organization (WHO), Environmental Protection Agency (EPA)), or local health and environmental authorities to investigate air quality. If direct data is unavailable, find reliable alternative sources, such as research articles or case studies from comparable regions.

3. Develop a Social Media Awareness Campaign (30 minutes)

Create an impactful social media post to raise awareness about air pollution and its effects on public health, encouraging action from community members and policymakers.

Design a social media post that includes a compelling graphic, or a series of posts summarizing your findings. You may use generative AI tools, such as ChatGPT, to help brainstorm ideas, refine your messaging, or generate graphics and content for the campaign. Critically appraise AI generated outputs and adapt if necessary.

Ensure the post includes:

- A **brief overview** of the issue, focusing on the local context and emphasizing the impacts on health and the environment.
- 1-2 of the **top source(s) of air pollution** specific to your area, with clear data presented through infographics or bullet points.

- 1-3 **actionable recommendations** to reduce these emissions, focusing on strategies aligned with sustainable practices.
- The **benefits** of implementing these strategies, such as improved public health, lower healthcare costs, and increased resilience to climate change.
- The potential **challenges** in implementing your recommendations, such as cost or policy barriers, and how they could be overcome. These don't need to be included in your social media post.

4. Present Your Social Media Campaign (20 minutes)

Share your campaign with the class, simulating a real-world advocacy scenario where you're pitching to community leaders or policymakers.

Present your social media post in 3-5 minutes, explaining the thought process behind your campaign and how you tailored it to engage the community or decision-makers. Discuss the feasibility of your recommendations, including their potential impact on public health and how they align with climate action goals.

6. Conclusion and Reflection (10 minutes)

Participate in a closing discussion on how healthcare professionals, community leaders, and environmental advocates can work together to promote cleaner air and healthier environments for all.

Mandatory pre-reading materials:

[American Lung Association, "Environmental Justice and Air Pollution"](#)

[The Lancet, "Air Pollution and Health Inequity"](#)

[American Lung Association, State of the Air, People at Risk](#)

Air pollution and health advocacy – Teachers Guide

Background

Air pollution is one of the most serious environmental threats to human health, causing millions of premature deaths each year and leading to a range of debilitating diseases. According to the WHO, air pollution is responsible for 4.2 million deaths annually, primarily due to respiratory and cardiovascular conditions like asthma, chronic obstructive pulmonary disease (COPD), stroke, and heart disease. In addition to these direct health impacts, sources of air pollution usually also significantly contribute to greenhouse gas emissions and in this way to climate change. Fine particulate matter (PM_{2.5}) and ground-level ozone are pollutants with the highest health impacts, while nitrogen dioxide (NO₂), sulfur dioxide (SO₂), and carbon monoxide (CO) also play major roles in both health impacts and environmental damage.

The primary sources of air pollution include emissions from transportation (e.g. cars, trucks, and buses), energy production (e.g. coal-fired power plants), industrial activities (e.g. factories, chemical processing plants), and agriculture (e.g. methane emissions from livestock and fertilizer use). In many urban areas, vehicle emissions are the leading contributor to air pollution, while industrial emissions dominate in more industrialized or manufacturing regions. Residential wood burning, heating, and cooking with solid fuels are also significant sources of air pollution, particularly in rural areas and developing regions. These pollutants not only affect local air quality but can also travel long distances, impacting populations far away from their source.

Air pollution disproportionately impacts vulnerable populations, including low-income communities, children, the elderly, and people with pre-existing health conditions. In many cases, these populations are more likely to live near major sources of pollution, such as highways, industrial plants, and power stations. Additionally, people in low-income communities often have limited access to healthcare, making them less able to manage chronic conditions exacerbated by poor air quality. Children are especially vulnerable because their lungs are still developing, while the elderly face heightened risks of cardiovascular and respiratory complications.

Environmental justice is a crucial aspect of addressing air pollution. By reducing emissions from key sources, we can improve health outcomes for these at-risk groups, while also advancing climate resilience. In this assignment, students will explore how air pollution affects public health, identify major pollution sources in their community, and create an advocacy campaign to promote cleaner air and healthier environments.

Learning Objectives:

After completion of this module, the student will be able to:

- Recognize the health effects of air pollution, with a specific focus on vulnerable populations.
- Investigate and identify the primary sources of air pollution in the local context using credible scientific sources.
- Develop actionable recommendations to mitigate air pollution and associated health impacts with a focus on disadvantaged communities.
- Use digital platforms (e.g., social media) for advocacy in public health and environmental issues.

Prerequisite: Students should be familiar with basic scientific literature research strategies in citation databases. Suitable for 4th semester or higher/graduate students.

Lesson overview

Student Assignment	Teachers Guide
<p>Explore the Health Impacts of Air Pollution and Reflect on Pre-read Materials (10 minutes)</p>	<ul style="list-style-type: none"> - Ask students to reflect on the readings and how air pollution contributes to health inequity. Guide the discussion towards understanding how vulnerable populations, such as children, the elderly, and low-income communities, are disproportionately affected. - Encourage students to share their thoughts on how the pre-read materials might apply to their local or regional context. Use examples from real-world scenarios to illustrate these concepts.
<p>Investigate Air Pollution Sources in Your Community (20 minutes)</p>	<ul style="list-style-type: none"> - Guide students in investigating the top sources of air pollution in their local community or region. - If students are struggling to find direct local data, suggest looking at reports from government agencies (e.g., WHO, EPA, or local environmental agencies), or exploring alternative sources like case studies or scientific literature from similar regions. - Instruct students to identify 3-5 key sources of air pollution in their area (e.g., transportation, industry, energy production, agriculture, residential wood burning).
<p>Develop a Social Media Awareness Campaign (30 minutes)</p>	<ul style="list-style-type: none"> - Explain that students will design a social media post focusing on addressing the effects of air pollution on health, specifically focusing on vulnerable populations. Make sure they understand they can use AI to create campaign ideas, generate content, or produce visuals. - Ensure students focus on one or two specific sources of pollution, such as emissions from vehicles or industrial processes. They should present 1-3 actionable recommendations (e.g., advocating for cleaner energy, improving public transportation). - Encourage creativity in messaging while maintaining scientific accuracy and relevance to the community. Remind students that the goal is to make the post accessible and target a specific non-expert

	audience, such as community leaders or policymakers.
Present the Social Media Campaigns (20 minutes)	<ul style="list-style-type: none"> - Ask students to present their social media campaign in 3-5 minutes, simulating a pitch to community leaders or policymakers. Encourage them to clearly articulate their message, emphasizing the local context and the health/environmental impacts of air pollution. - Provide feedback on the clarity, persuasiveness, and scientific accuracy of their posts. Focus on how well the students have tailored their message to the audience, and how actionable and realistic their recommendations are.
Conclusion and Reflection (10 minutes)	<ul style="list-style-type: none"> - Conclude the assignment by facilitating a class discussion on the broader implications of air pollution and health. - Ask students to reflect on how healthcare professionals, community leaders, and policymakers can collaborate to promote cleaner air and healthier communities. Guide the discussion to focus on strategies for advocacy and community engagement, especially in vulnerable populations.

Challenge-based module 4: Adapting to climate change induced flooding to reduce health impacts

Introduction

One of the major effects of climate change is the increasing frequency and severity of **flooding** events. In July 2021, heavy rains caused catastrophic flooding in countries like Germany, Belgium, and the Netherlands. Rivers overflowed, devastating communities. The floods caused more than 200 deaths, thousands were displaced, and public health systems were struck by an increase in waterborne diseases, contaminated drinking water, and mental health crises. These floods revealed the urgent need for **climate-resilient health systems**, sustainable infrastructure, and **nature-based solutions**—like restoring natural wetlands to help absorb excess water.

For more information on this flooding event, you can refer to:

BBC News: <https://www.bbc.com/news/world-europe-57858829>

Step-by step assignment instructions for students

Flooding events like those seen in 2021 are predicted to become more frequent and severe. You are stepping into the roles of public health experts, and as such have been asked by a **parliamentary commission** to provide recommendations on how to address the health impacts of flooding and prevent future crises by 2050.

You will work in groups to:

1. **Identify the key public health challenges** posed by flooding (e.g., infectious diseases and mental health).
2. **Envision a sustainable, healthy future society** in 2050 where health systems and infrastructure are resilient to flooding.
3. **Develop actionable policy recommendations** for public and planetary health that ensures **resilient healthcare systems**
4. **Present your recommendations** to the parliamentary commission (the rest of the class).

1. Group Formation & Role Assignment (5 minutes)

- Form small groups of 4-5 students. Each group represents a team of public health experts.
- In your group, choose a note-taker and a presenter.

2. Background Review & Brainstorming (10 minutes)

Identify the key health risks associated with flooding and start imagining the future.

- Begin by discussing the public health impacts of the 2021 Western Europe floods:
 - How did flooding affect public health and healthcare systems? (Think about diseases, mental health, clean water, etc.)
 - What vulnerabilities in the health system did these floods reveal?

- Now think ahead to 2050, taking into account that with uncontrolled climate change extreme weather events and flooding will become more likely:
 - What health challenges will arise in flood-prone areas in 2050? Consider:
 - Healthcare infrastructure accessibility.
 - Outbreaks of infectious diseases
 - Displacement of vulnerable communities and mental health crises.

3. Visioning the Future (20 minutes)

Imagine a resilient and equitable society in 2050 that can withstand flooding events. Work together as a group to brainstorm innovative and practical solutions for the health risks of flooding events, especially focusing on healthcare resilience.

- Discuss with your group:
 - What does a climate and health-resilient society in 2050 look like?
- Try to identify innovative approaches for:
 - Adapting healthcare infrastructure and practice to deal with climate change induced flooding
 - Preventing and managing infectious diseases caused by flooding.
 - Preparing and protecting vulnerable communities from health impacts

As you brainstorm, consider the 2021 Western Europe floods as a key reference point, thinking about the public health challenges exposed during that event.

4. Drafting Policy Recommendations (15 minutes)

Use AI tools (e.g., ChatGPT or other generative AI platforms) to further refine your proposed policy recommendations in a statement to present to the parliamentary commission. Make sure to critically appraise AI generated texts and edit them if needed.

Draft a 1-page policy recommendation statement that includes:

1. **Health Challenges:** Describe the primary public health risks posed by flooding in 2050. Use the 2021 Western Europe Floods as a key example.
2. **Vision for 2050:** Present your group's vision for a healthy, sustainable society where the health system and infrastructure are resilient to climate-related flooding events.
3. **Policy Recommendations:** Provide 2-3 specific, actionable policy recommendations
4. **Implementation Strategies:** Explain how your solutions can be put into practice by 2050, addressing equity to ensure that vulnerable populations are protected.

5. Prepare and Finalize Your Oral Presentation (5 minutes)

Get ready to present your recommendations. Each group should choose a presenter to deliver the main points from their policy recommendations. This presentation does not have to be supported by a powerpoint presentation. Remember, you are public health experts. Your goal is to convince the commission that your solutions are necessary and realistic.

6. Present to the Parliamentary Commission (20 minutes)

Present and advocate for your group's policy recommendations.

- Each group will have 5 minutes to present their recommendations to the parliamentary commission (the rest of the class).
- After each presentation, the commission will have 1-2 minutes to ask questions or provide feedback.

7. Reflection & Class Discussion (15 minutes)

Reflect on the ideas presented and discuss key takeaways. After all presentations were held, discuss the following points:

- Which solutions were the most innovative or feasible?
- How well did the groups take into account the most vulnerable populations

Think about what you, as future health professionals, can do today to help make these ideas a reality.

Mandatory pre-reading material:

Watch the [video](#) by the Wellcome Trust on the health impacts of flooding

[WHO operational framework](#) for building climate resilient health systems

Adapting to climate change induced flooding to reduce health impacts

- Teachers Guide

Background

Climate change is one of the most pressing global challenges of our time, with profound implications for human health. As the planet warms, the frequency and intensity of extreme weather events, such as flooding, are increasing. These floods can have devastating effects on public health, including outbreaks of water-borne diseases like cholera, the spread of vector-borne diseases such as malaria and dengue fever, and significant mental health impacts due to displacement and loss. Physical trauma and injuries from flood-related incidents also strain healthcare systems, often leading to the disruption of essential health services, especially in vulnerable communities

This assignment introduces students to the health risks posed by climate change-induced flooding and equips them to develop policy recommendations for public health adaptation. Students will assume the role of public health experts advising a parliamentary commission, with the goal of envisioning a sustainable and resilient future in 2050. They will explore innovative and equity-based strategies to adapt health systems against the impacts of climate change induced floods.

Learning objectives

After completion of this module, the student will be able to:

- Understand the interconnection between climate change and health, with a specific focus on health impacts of climate-induced flooding.
- Explore solutions to healthcare systems resilience and reduce inequalities that are exacerbated by climate-induced flooding.
- Envision sustainable healthy futures by applying “futuring” skills to anticipate and plan for effective climate change adaptation measures for increased healthcare system resilience.
- Utilize generative AI tools to assist in brainstorming and drafting public health policy recommendations, and refining strategies to adapt healthcare systems to climate change-induced risks.

Assessment Tips:

- Evaluate each group based on the clarity and feasibility of their recommendations.
- Ensure that equity and vulnerability of communities are addressed in their strategies.

Prerequisite: Students should be familiar with basic understanding of health impacts of flooding and able to communicate complex topics effectively. 5th semester or higher/graduate students

Lesson overview

Students Assignment	Teachers Guide
<p>Introduction & Group Formation (5 minutes)</p>	<p>Introduce the assignment</p> <p>Have students form groups of 4-5.</p> <p>Ensure each group has a laptop or tablet for research and drafting their policy recommendation. Ensure access to AI tools like ChatGPT for assistance during the assignment.</p> <p>In each group, they should assign roles:</p> <ul style="list-style-type: none"> - Note-taker to document key points. - Presenter to deliver the group’s final recommendations.
<p>Background Review & Brainstorming (10 minutes)</p>	<p>Ensure students have completed the pre-class reading/viewing assignments. Students should then identify key health risks associated with flooding and discuss the vulnerabilities of the healthcare system in the context of the 2021 Western Europe Floods.</p> <p>Prompt Discussion:</p> <ul style="list-style-type: none"> - How did the 2021 Western European floods affect public health (infectious diseases, mental health, water access)? - What vulnerabilities did these floods reveal in existing healthcare and emergency response systems? - How will climate change amplify these challenges by 2050 (more frequent floods, displacement of communities)? <p>Encourage students to think critically about the key health challenges such as:</p> <ul style="list-style-type: none"> - Disease outbreaks (cholera, leptospirosis). - Displacement of vulnerable communities. - Mental health crises due to trauma and loss. - Challenges in accessing healthcare.

<p>Visioning the Future (20 minutes)</p>	<p>Students envision a resilient, equitable society in 2050 that is well-prepared to manage flood-related health impacts.</p> <p>Group Discussion Prompts:</p> <ul style="list-style-type: none"> - What does a climate-resilient health system look like in 2050? - How can the healthcare system adapt to ensure accessibility and service delivery during flood events (e.g., telemedicine, mobile health units)? - How can vulnerable communities be better protected?
<p>Drafting Policy Recommendations (15 minutes)</p>	<p>Use generative AI to refine the group’s policy recommendations and draft a statement for the parliamentary commission.</p> <p>Instructions: Have students use generative AI tools (such as ChatGPT or similar) to help refine their policy recommendations. Students should develop a concise, 1 page policy recommendation that includes:</p> <ul style="list-style-type: none"> - Health Challenges: Identify the major public health risks posed by flooding in 2050, using the 2021 Western Europe floods as a key reference. - Vision for 2050: Present the group’s vision of a healthy, sustainable society where health systems and infrastructure are resilient to climate-related flooding events. - Policy Recommendations: Provide 2-3 specific, actionable recommendations - Implementation Strategies: Propose how your recommendations can be implemented by 2050, while ensuring equity for vulnerable populations. <p>Encourage students to use the AI tools to refine their language and draft the statement, try to limit their use to after some initial thoughts are on paper. Ensure students check critically the AI generated content.</p>
<p>Prepare and Finalize before Presentations (5 minutes)</p>	<p>Groups should review their policy recommendation statement and ensure their presenter is prepared to:</p>

	<ul style="list-style-type: none"> - Introduce the group’s vision for a climate-resilient, health-focused society in 2050. - Outline the main health risks identified and the group’s key recommendations. - Discuss their proposed strategies for implementation, especially focusing on the protection of vulnerable communities.
<p>Present to the Parliamentary Commission (20 minutes)</p>	<p>Each group will have 5 minutes to present their recommendations to the rest of the class, acting as the parliamentary commission.</p> <p>After each presentation, the class will have 1-2 minutes to ask questions or provide feedback.</p> <p>Encourage students to use clear language, as they are acting as public health experts trying to convince policymakers of the importance of their solutions.</p>
<p>Reflection & Class Discussion (15 minutes)</p>	<p>Reflect on the ideas presented and discuss key takeaways.</p> <p>Lead a class discussion following the presentations. Some guiding questions might include:</p> <ul style="list-style-type: none"> - Which solutions were the most innovative or feasible? - Did the solutions adequately address the needs of vulnerable communities? - What can healthcare professionals do today to work toward these future goals? <p>This is a good time to reflect on the students’ learning experience, encouraging them to think about their role in shaping future public health policies and how they can be proactive in addressing the health impacts of climate change.</p>