SERIOUS GAMES FOR CLIMATE CHANGE

APRIL 2019

PREPARED AND PRESENTED BY

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IN COLLABORATION WITH

THE ENVIRONMENTAL EDUCATION
CENTRE OF ELEFTHERIO-KORDELIO

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We are students at Worcester Polytechnic Institute (WPI), located in Worcester, Massachusetts. As part of our degree requirement, we completed a project in Social Sciences in Thessaloniki, Greece. The goal of this project was to educate Greek students on the topic of climate change, specifically using serious games as educational tools. The booklet approaches different topics that explore relationships between society and climate change. We hope to empower the future generation in order to mitigate climate change, adapt to its effects and be resilient for the years to come.

Eleni Anastasopoulou, a graduate student studying Geology at Aristotle University, acted as our co-researcher throughout this project. Eleni contributed valuable insight, dedicated hours of hard work and effort and translated for us throughout the project.

THE ENVIRONMENTAL EDUCATION CENTRE

The Environmental Education Centre of Eleftherio-Kordelio, referred to as "KPE" throughout the booklet, is located in Thessaloniki and was established by the Ministry of Education in cooperation with the Municipality of Eleftherio-Kordelio. The Centre focuses on educating schools and local communities about the environment and sustainable development.

VISION

- Aim to educate students / future citizens to be active and think critically
- Support teachers to approach Education for Sustainability in their everyday practice
- Assist citizens to actively care for the environment of their town

MEET THE TEAM

THESSALONIKI ENVIRONMENTAL EDUCATION CENTRE EMPLOYEES

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INTRODUCTION

This booklet contains a series of games that seek to educate 12-15 year old Greek students about climate change. The booklet discusses different topics that explore relationships between society and climate change. The hope is to empower future generations to mitigate climate change, adapt to its effects and be resilient for the years to come. The games can be adapted and adjusted to be played by other age groups.

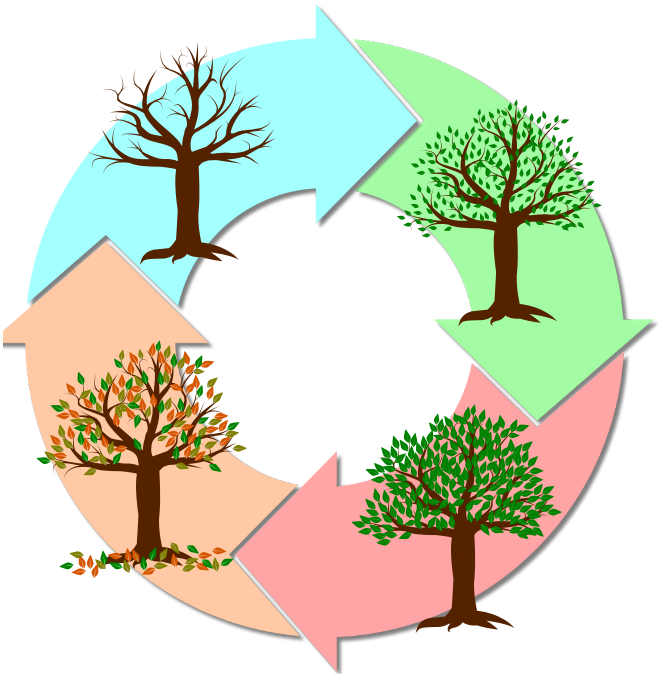
Throughout the booklet, you will notice that the games were designed to be interdisciplinary and will touch upon multiple topics. This is due to connections between various game topics and how climate change affects us in many ways.

In addition, the booklet contains a series of supportive materials that can be found as a hyperlink in our digital version as well as a website URL (Uniform Resource Locator) at the end of the hard copy booklet.

The information and games in this booklet have been inspired by and adapted from various sources which can all be found in the references section. We do not claim ownership of any material in this booklet.

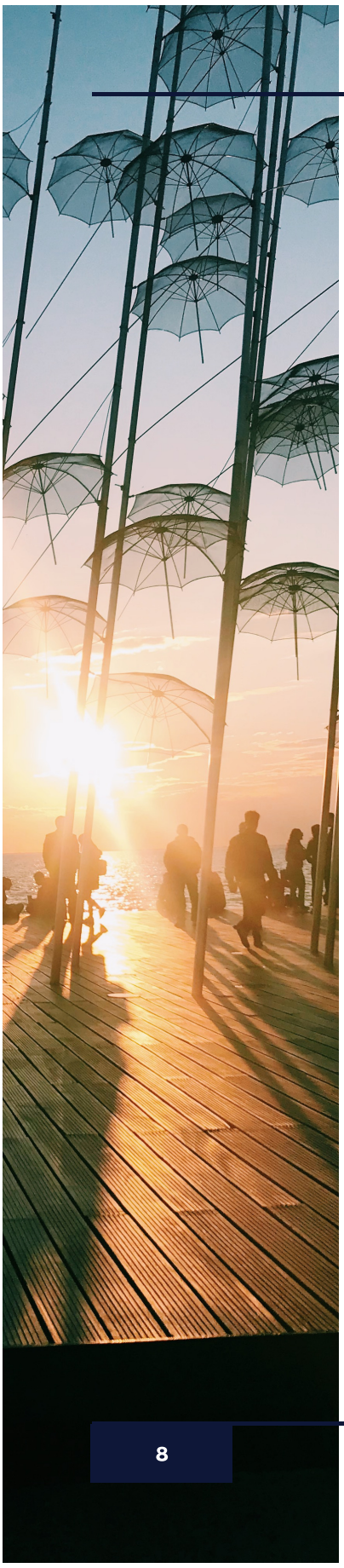
We hope you enjoy!

CLIMATE CHANGE



IT IS EXPECTED THAT SEA LEVELS WILL RISE BY 20-59CM BY 2045, WHICH WILL DECREASE THE AMOUNT OF LAND CURRENTLY IN GREECE BY 3.5%.

Climate change effects are noticeable throughout Greece. These consequences can damage the environmental and socioeconomic relationships in the country. Climate change primarily occurs when an excess of greenhouse gases are emitted into the environment, resulting in a temperature increase. Studies have shown that if climate change continues to develop at its current pace, it will have detrimental effects to the standards of living. In Greece, climate change has had many impacts including an increase in temperature, extreme weather events and rising sea levels. In particular, it is expected that sea levels will rise by 20-59cm by 2045, decreasing the amount of land currently in Greece by 3.5%. Climate change is currently not part of the mandatory Greek curriculum; students learn about climate change on a voluntary basis. A study found that a portion of Greek students do not understand certain effects that climate change will have on the world as well as what factors worsen climate change. Therefore, it is important to educate future generations of Greek citizens to expand their knowledge on climate change, mitigation and resilience strategies.



DEFINITIONS

Carbon Dioxide

A colorless, odorless, poisonous gas resulting from fossil-fuel combustion and the breakdown of organic matter

Climate

The long-term average of conditions in the atmosphere, ocean, and ice sheets and sea ice described by statistics, such as means and extremes

Climate Change

a change in global or regional climate patterns, in particular a change apparent from the mid to late 20th century onwards and attributed largely to the increased levels of atmospheric carbon dioxide produced by the use of fossil fuels

Global Warming

a gradual increase in the overall temperature of the earth's atmosphere generally attributed to the greenhouse effect caused by increased levels of carbon dioxide, CFCs, and other pollutants

Greenhouse Effect

the trapping of the sun's warmth in a planet's lower atmosphere, due to the greater transparency of the atmosphere to visible radiation from the sun than to infrared radiation emitted from the planet's surface

Greenhouse Gas

a gas that contributes to the greenhouse effect by absorbing infrared radiation. Carbon dioxide and methane are examples of greenhouse gases

Mitigation

the action of reducing the severity, seriousness, or painfulness of something

Resilience

the capacity to recover quickly from difficulties; toughness

Temperature

the degree or intensity of heat present in a substance or object, especially as expressed according to a comparative scale and shown by a thermometer or perceived by touch

Weather

the state of the atmosphere at a particular place and time as regards heat, cloudiness, dryness, sunshine, wind, rain, etc

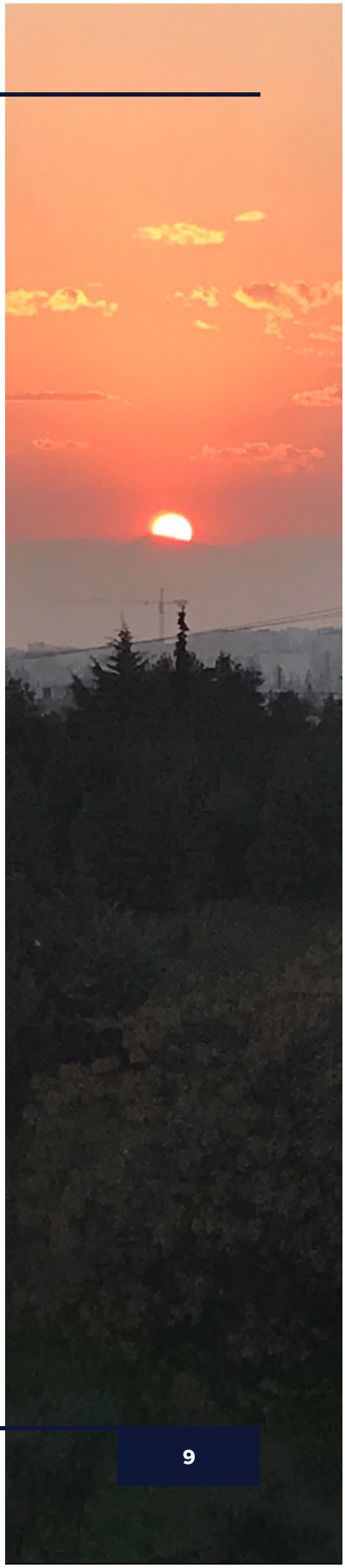
KEY TO SYMBOLS

These symbols represent 4 major climate change topics. They will be used in the title of every game to indicate the major topics that the game covers.

- Climate Change Causes
- Climate Change Impacts
- Resilience Strategies
- Mitigation Strategies

These symbols represent the estimated duration of each game, recommended number of players, recommended space size and a scale of how challenging the game is to facilitate (from 1 being not difficult at all to 5 being challenging and requires experience facilitating).

- Game Duration
- Number of Players
- Space Size
- Facilitation Difficulty



CLIMATE CHANGE CAUSES

GREENHOUSE EFFECT

THE TRAPPING OF THE SUN'S WARMTH IN A PLANET'S LOWER ATMOSPHERE, DUE TO THE GREATER TRANSPARENCY OF THE ATMOSPHERE TO VISIBLE RADIATION FROM THE SUN THAN TO INFRARED RADIATION EMITTED FROM THE PLANET'S SURFACE

The greenhouse effect is a **natural process** that occurs when an excess amount of greenhouse gases are emitted into the environment and causes the Earth's surface to warm. When the solar energy enters Earth's atmosphere, some energy is **reflected** back and the rest gets **absorbed** into the Earth. The Earth re-radiates that heat/energy and greenhouse gases, including water vapour, carbon dioxide, methane, nitrous oxide, and ozone, trap the heat within Earth's atmosphere. **Carbon dioxide** has been the main greenhouse gas contributor to climate change, and it nearly doubled in concentration in Greece's atmosphere from 1958 to 2017. The greenhouse gas effect is **intensified** by many different actions including burning fossil fuels, deforestation, and biomass burning. This phenomenon is one cause of **global warming**.

Climate change is directly influenced by the **behavior of each individual citizen** within a given region. To undergo daily actions such as food production, lighting and heating, electricity must be produced. This results in the burning of **fossil fuels** and leads to the intensification of the greenhouse effect.

CLIMATE CHANGE CAUSES

FOOD WASTE

In Greece, it is estimated that **100 kg** of food is wasted per person annually, **30 kg** being avoidable. Typically this waste can be categorized as “organic waste,” which, when decomposed, releases **carbon dioxide and methane gas** into the atmosphere. In Greece, there is an estimate of 5,672.5 Gg of carbon dioxide released annually, which can be reduced with a few lifestyle adjustments.

OVER-CONSUMPTION OF GOODS

Consumerism plays a major role in the worsening of climate change. The amount of **water and energy** needed to produce products in factories is significantly more than the amount of water and energy needed to shower or run a household. Buying products that never get used is an example of over-consumption because it is a **waste** of energy and water. Also, goods with complex packaging can affect the environment if not **recycled** properly. Over-consumption can be reduced if citizens only purchase what they need and refrain from making unnecessary purchases.

CLIMATE CHANGE IMPACTS

ECONOMICS

THE CONDITION OF A REGION OR GROUP AS REGARDS MATERIAL PROSPERITY.

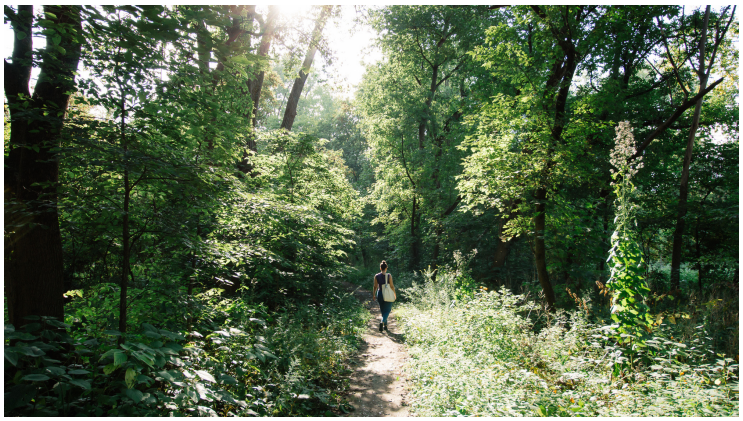
The 21st century is responsible for bringing fast paced **technological advancements**. Societies progress at a quadratic or even exponential pace. In economics for instance, markets evolve and adapt to crisis in more efficient ways and businesses prosper through innovation.

This complex web of society allows new players to be **stakeholders** in the decision making process. Climate change has been taken into consideration when governments and companies invest their time and resources into new causes and analysis of processes. Around the world, impacts of climate change have **disrupted** agricultural production, wildlife species, public health and economic standing of regions, affecting not only the macroeconomics of nations, but also the consumer's households.

Sectors of the Greek economy are concerned on how they can **mitigate** consequences of climate change. In order to surpass the economic crisis that has affected Greece since 2008, Greece needs to develop a strategy for **resilience** and **adaptation** for the effects of climate change.

CLIMATE CHANGE IMPACTS

TREES AND URBAN HEAT ISLANDS (UHI)



"TREES ARE THE LUNGS OF THE EARTH"

This sentence has perpetuated through generations, especially when it comes to lessons in environmental education. **Trees and plants** are responsible for providing the oxygen we breathe through photosynthesis.

In urban spaces, trees are not only responsible for providing oxygen, but also cooling the regions around green spaces. Urban areas have higher Greenhouse Gases Emissions, increasing the amount of carbon dioxide in the area. As a result, cities trap enough carbon dioxide to create a micro-environment with higher temperatures. This phenomenon is denominated **Urban Heat Island** (UHI).

UHIs are more easily noticed during the day and especially in low wind regions. Some cities could be 3 degrees Celsius hotter than its surrounding areas. It is important for cities to have **green spaces** because they will help to mitigate the effects of UHIs. Individuals can also reduce the effects of UHIs by creating small scale environments of green spaces in and around their homes. One example is to put plants on balconies to cool off the surrounding area.

CLIMATE CHANGE IMPACTS

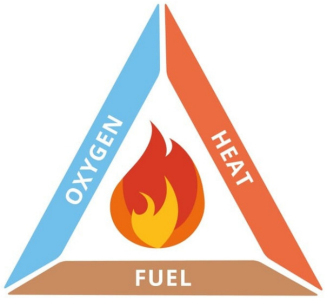
EXTREME WEATHER EVENTS

DURING THE PAST FEW YEARS, THE NUMBER OF EXTREME WEATHER EVENTS AROUND THE WORLD HAS INCREASED SIGNIFICANTLY. EXTREME WEATHER EVENTS INCLUDE UNEXPECTED, UNUSUAL, UNPREDICTABLE, SEVERE AND UNSEASONAL WEATHER. HERE ARE SOME EXAMPLES OF EXTREME WEATHER EVENTS:

Heat waves → Periods of high temperature or high heat index markings. Heat waves can occur in both humid and dry environments. In regards to climate change, the temperature of Greece is expected to increase 2.5℃ by 2045. Heat wave season is also expected to increase by 15-20 days by 2045.

Floods → An overflow of water in areas that are usually dry. Floods concern specialists in agriculture, civil engineering and public health fields. Floods may occur from extreme rainfall or an excessive flow rate of channels or other bodies of water.

Wildfires → Large, uncontrolled infernos that quickly burn and spread through wild lands. Around 90% of wildfires are human induced. For a wildfire to occur, all of the elements of the fire triangle must exist: a heat source, oxygen and fuel.



CLIMATE CHANGE IMPACTS

RISING SEA LEVELS

Since 1900, the global average sea level has been continuously rising. With the **intensification** of climate change, the average global temperature is increasing, causing polar ice caps to melt and inserting tons of water into the oceans aggravating sea level rise.

In Greece, it is estimated that in by 2045, the sea levels will rise by 20-59 cm. 90% of **tourism** infrastructures are located on the coasts of Greece and on islands, so Greece's **GDP** could significantly decrease with the loss of land. In addition, **30%** of Greece's population lives within less than 2 Km of the coast, posing a major **infrastructure** problem if sea levels continue to rise at this pace. Thessaloniki, Patra and other coastal cities populations are threatened and have to come up with plans to cope with the effects of rising sea levels.

FOOD

Food is intrinsically related to climate change. Throughout the years, changes in climate have affected **agricultural production**, reshaped the way **society wastes food** and how food **safety** has improved its technology due to more resistant plagues, viruses and bacteria.

As a consequence of increasing temperatures, the water cycle of regions is affected, reducing precipitation level and making the air drier. Moreover, the soil starts a process of desertification. These effects combined have a heavy toll in agricultural production.

RESILIENCE STRATEGIES

RESILIENCE IS DEFINED AS THE CAPACITY TO RECOVER QUICKLY FROM DIFFICULTIES AND THE ABILITY TO SPRING BACK TO SHAPE.

In other words, resilience is the characteristic associated with being **flexible** and persevere through hardships. In an ever changing climate, people and communities have to be able to **adapt and cope** with the effects of climate change.

When it comes to climate action, urban centers have found obstacles in dealing with the fast transformations and reinventing themselves in order to completely adapt to climate change effects. That is why many cities are now betting on **urban resilience** plans.

Urban resiliency is defined as the ability of a city or urban system to withstand a wide array of **shocks and stresses**, such as climate change. Typically, there are shocks and stresses derived from climate change, triggering negative **spillovers** to environments. In order to be resilient and withstand these shocks, cities use **persistence, transition, or transformation**.

Some resiliency strategies include integrating energy efficiency in municipal buildings and alternative means of transportation. In addition, cities can **collaborate** and share resources through a resiliency network in order to persevere together and cope with the effects of climate change.

MITIGATION STRATEGIES ↻

People have designed strategies to reduce or stop the advancement of climate change. Those strategies refer to climate change **mitigation**. Entire governments, cities, NGOs and private companies work on **plans** to reduce causes of climate change.

In this booklet, you will find approaches to mitigate climate change. These games seek to educate the youth of Greece on how different actions, as small as they can be, could help slow down the advancement of climate change. Some examples of climate change mitigation include: recycling, use of renewable energy, reduction of fossil fuel emissions, efficient transport, etc.

MITIGATION STRATEGIES ↻

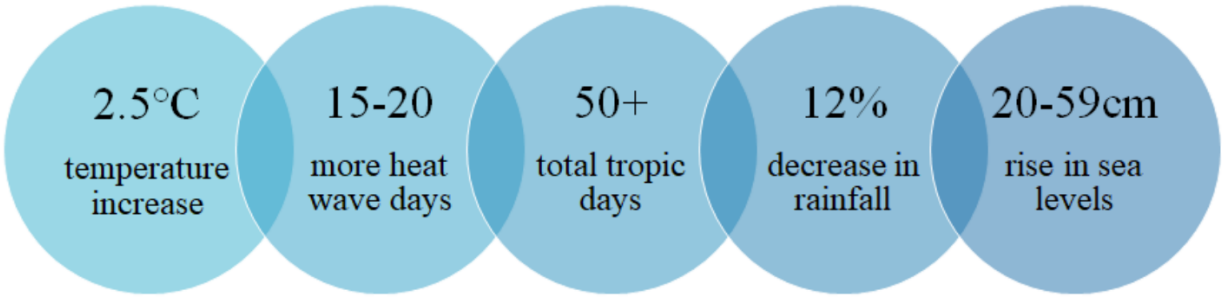
SUSTAINABILITY

Sustainability is understood as the ability to **maintain change** in a balanced environment. This concept is often related to the exploitation of resources, but can also be used to measure how much is a society thriving **socioeconomically**. The organizing principle of sustainability is sustainable development. It is understood by the capacity of meeting human development through the sustainable use of **natural systems**. In 2015, the United Nations released a series of goals for sustainable development to be reached in 2030. There are **17 goals** total, touching upon the most simple human needs up to the integration of globalized economies.

ADDITIONAL CLIMATE CHANGE INFORMATION SPECIFIC TO GREECE

CLIMATE CHANGE ESTIMATES IN GREECE FOR THE 20 YEAR TIME PERIOD OF 2045-2065:

- Temperature rise by 2.5 degrees celsius
- 15-20 more heat wave days per year
- 50 or more tropical days per year
- 12% decrease in rainfall
- 20-59 cm rise in sea levels
- 3.5% loss of land
- 90% of tourism infrastructures are located on the coast and tourism is one of Greece's main sources of income
- Extreme weather events will be more frequent and intense



KNOWLEDGE SURVEY

◯ = correct answer

GAME CONTENT WAS ESTABLISHED USING RESULTS FROM A PRE-KNOWLEDGE SURVEY WITH 126 TESTED KPE STUDENTS.

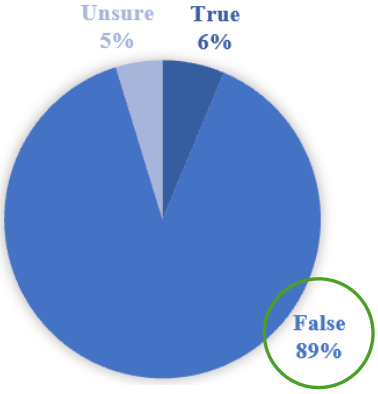
Strongest areas:

- Extreme weather events
- Farming and Food Production
- Sustainable Energy
- Habitats of Other Species

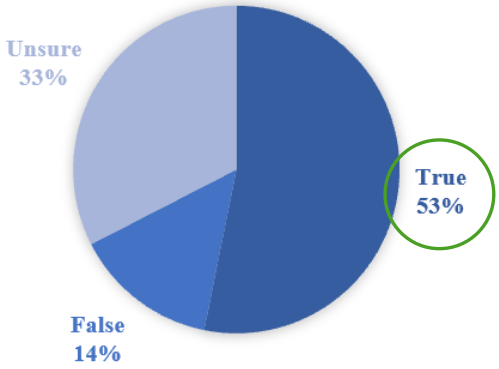
Weakest areas:

- CO2 and the Greenhouse Effect
- Change in Habitable Land
- Benefits of public Transportation
- Changes in the cost of living due to climate change

1. Climate change will not affect farming and the production of food in Greece, such as olive oil.



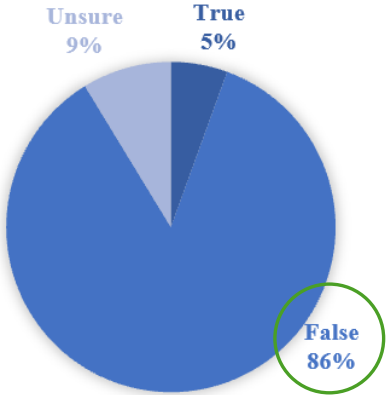
2. Carbon dioxide is a gas that has contributed to aggravating the greenhouse effect.



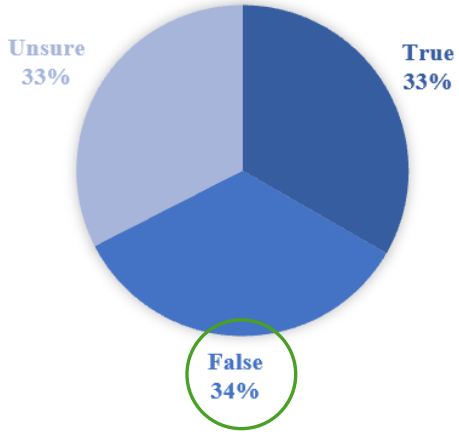
KNOWLEDGE SURVEY

= correct answer

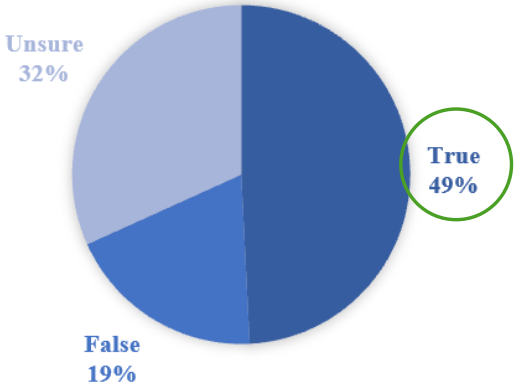
3. The use of solar and wind energy worsens the greenhouse effect.



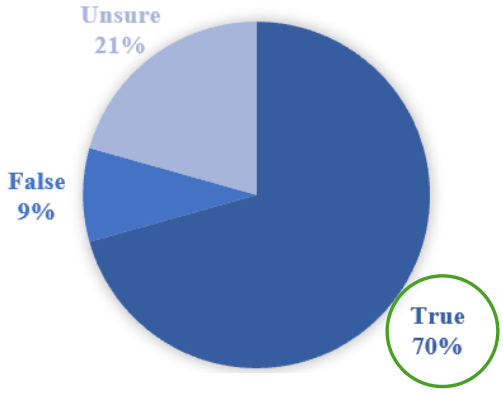
4. TV does not consume energy when it is turned off by remote control.



5. The greenhouse effect will lead to a decrease in habitable land.



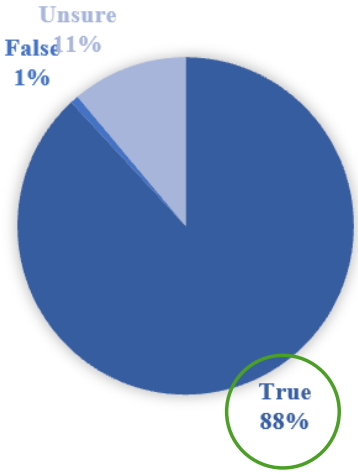
6. One of the impacts of intensifying the greenhouse effect will be the appearance of new diseases.



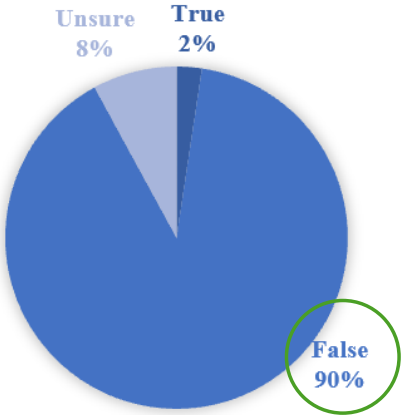
KNOWLEDGE SURVEY

= correct answer

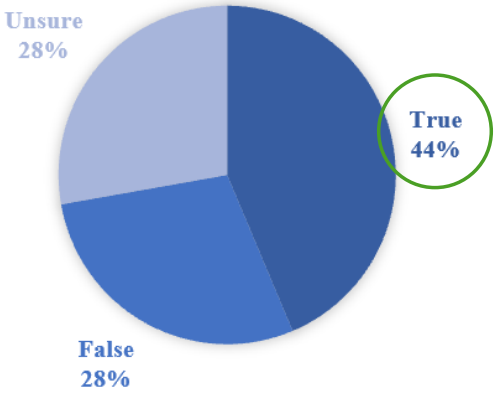
7. Extreme weather events are likely to become more frequent and intense.



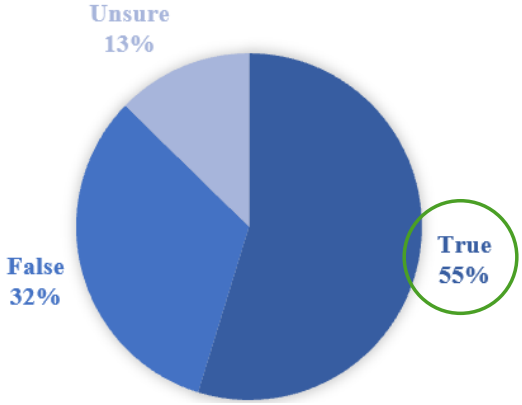
8. Climate change will not put populations of other species at risk of losing their habitats.



9. The use of public transportation can contribute to mitigating the greenhouse effect.



10. If climate change continues at this rate, the cost of living will increase.



SERIOUS GAMES

WHAT ARE SERIOUS GAMES?

Serious games are digital or hands-on games not intended to be played solely for amusement. They are meant to be educational tools to learn about various topics such as teaching and training, social inclusion, health, digital transformation and many other societal issues. Having fun while learning helps students remember information better because it is a memorable learning experience. Hands-on games teach children about important social skills and are easily accessible. Education through games provides an experiential learning environment which lets students learn by doing rather than by lecture, triggering influential emotional connections.

SINKING ISLAND

5-15 mins. 6+ players Large Space 2

LEARNING OBJECTIVES

- Learn about possible climate impacts
- Bonding among participants & energizing activity

MATERIALS

- Large piece of paper or cloth

SINKING ISLAND

FACILITATION GUIDELINES

1. Divide students into groups of 4-5 players.
2. Put a large sheet of paper on the floor (one for each group) and ask all group members to step onto the paper.
3. Tell the players that the paper symbolizes an island (for example a Greek island) that is affected by rising sea levels.
4. Explain the goal: The group that manages to keep everyone on the increasingly small surface/ “island” wins.
5. Give the groups 30-60 seconds to strategize before each round.
6. After they strategize, countdown from 10 to 1, if all team members remain safely on the ‘island’ by not stepping off the paper during those 10 seconds, they proceed to the next round.
7. Ask all remaining players to step off the ‘island’ and fold the paper in half. Narrative option: "You have left your island and when you get back - guess what... the sea level has risen."
    - Lines can be drawn on the paper prior to the start of the game to make the papers identical in size for every group in each round.
8. Players get back on their islands. Give them 30-60 seconds to strategize again. Then, countdown from 10 to 1 again and those who are safe proceed to the next round.
9. Reduce the size of the paper in thirds from now on.
10. Repeat steps 8-9 until you have a winning team or teams (if all teams get out in one round, all of those teams win)!

DEBRIEFING QUESTIONS

1. Did you have fun playing this game? If so, what was your favorite part? If not, what did you not like?
2. Are sea levels rising? Explain your answer.
3. What did you learn about the effects of sea levels rising that you did not know before?

ORT REPORT

10 mins. 2+ players Small Space with Tables 1

LEARNING OBJECTIVES

- Learn about the relationship between food waste and climate change
- Observe how much food waste is produced by their classmates on a daily basis
- Learn how their actions (reducing their personal food waste) can mitigate the issue
- Have fun with classmates → friendly competition
- Increase enthusiasm about limiting food waste

MATERIALS

- Two buckets per group
- Bucket 1 → for food waste
- Bucket 2 → liquid waste
- Scale to measure the food and liquid waste

ORT REPORT

FACILITATION GUIDELINES

1. First undergo a small food waste activity, such as a fact about food waste, to educate students about the issue and how it relates to climate change.
2. Encourage groups to finish their snacks/ meals.
3. Collect all food and liquid waste and place it into the designated bucket (group and type of waste).
4. Weigh the food and liquid waste.
5. Prior to announcing the results, sing the "ort report song" to encourage enthusiasm and excitement amongst students.

   ♪ Oo, Ah, Ort Report. I said Oo, Ah, Ort Report ♪
6. Announce the results and present the first and last teams with their incentive and "punishment" accordingly.
7. Game winners/ last place:
   - The team with the least amount of waste left over are the winners and will be given an incentive (i.e. they can be the first to walk to lunch/ snack time next time, they can be first to undergo a different activity throughout the day, they can be the first to walk to the bus at the end of the day, etc.).
   - The team with the most amount of waste left over are the last place team and will get a "punishment" (i.e. they have to clean up the lunch/ snack room).

DEBRIEFING QUESTIONS

1. Did you have fun playing the game? If so, what was your favorite part? If not, what didn't you like?
2. Does food waste affect climate change?
3. What did you learn about the effects of food waste on climate change that you didn't know before?
4. What actions can you take to control the amount of food waste produced?

BEFORE THE STORM

Time Card

1 week

1 week

Forecast Card

Forecast!

Expected snowstorm with 20-30cm of snow.

Action Card

Store Food!

Harvest and/or buy food to store in case food becomes inaccessible!

10+ mins. | 4+ players | Small Space with Tables | 3

LEARNING OBJECTIVES

- Discussion-based activity
- Learn about extreme weather events
- Practice making decisions to prepare for disasters
- Friendly competition

MATERIALS

- Before the Storm deck of cards (included in the back of the booklet)

BEFORE THE STORM

FACILITATION GUIDELINES

1. Ask for a volunteer from each group to be the judge for the game.
2. Shuffle the time cards and have the judge place one on the table. This represents the lead-time of a forecast: how much time is expected to elapse between the issue of the forecast and the actual occurrence of the forecast event. When groups go through all 3 time cards, reshuffle and then continue playing.
3. Shuffle the forecast cards and have the judge place one in front of/ next to the time card.
4. Shuffle the action cards and distribute four cards to each player (except the judge). Some cards might be blank, tell the players that that is OK!
5. Inform players that they should play just one action card per turn, face down. The action cards correspond to recommending a plan for disaster preparedness in response to the forecasts and time given to prepare. The aim is to have a card that will be chosen by the judge as the most appropriate action for that lead time.
    - Note: When a player writes their own card, they must only write down one action (not multiple actions).
6. Have the judge shuffle and review the action cards. Players can try to convince the judge that their card is the best.
7. The judge awards 1 point to the best choice (that player keeps the action card in their score pile).
    - If two players have the same winning card, they both keep it and get 1 point each.
8. Continue play for 6+ rounds (1 forecast card is 1 round). The player with the most cards in their score pile wins. Ties are friendly (multiple winners result in a tie).

DEBRIEFING QUESTIONS

1. Did you have fun playing this game?
2. What did you learn that you didn't know before?

ANSWER WITH YOUR FEET

Numerical Arrangement

E.g. Favourite decade

Cluster Arrangement

E.g. Favourite food

Circle Arrangement

Eg. Step in if you ride a bike to work

5+ mins. 6+ players Medium Space 2

LEARNING OBJECTIVES

- Energizer / introductory exercise
- Opinion-based learning

MATERIALS

N/A

FACILITATION GUIDELINES

1. Clear the room and make sure there is space for people to move around.
2. Ask all participants to stand up.
3. Ask a series of questions and ask participants to self-organize along a spectrum (Agree, disagree, or I don't know areas/If they do something step inside the circle, if they don't stay on the outside of the circle).
4. With each question, ask 2-3 participants to share the details of their answer and ask follow-up questions if necessary.

ANSWER WITH YOUR FEET

EXAMPLE QUESTIONS

NUMERICAL ARRANGEMENT (Yes/Don't Know/No):

1. Are sea levels rising, specifically in Greece?
2. Do you think TV's use energy when they are turned off by remote control?
3. Do you think food waste contributes to climate change?
4. Do you think food production will be damaged by climate change?
5. Do you think Thessaloniki's infrastructure will be damaged due to climate change?
6. Can climate change affect Greece's economy?
7. Do you think the pollution in the bay will increase due to climate change?

NUMERICAL ARRANGEMENT (Spectrum):

8. How worried are you about the climate changing? (spectrum question)
   --> One side: very worried
   --> Middle: Worried, but not much
   --> Other side: not worried at all
9. How do you think climate change will affect extreme weather events?
   --> One side: they will become more frequent and intense
   --> Middle: They will not be affected
   --> Other side: they will become less frequent and intense

CLUSTER ARRANGEMENT:

10. What do you think is the biggest threat to Greece?
    --> Wildfires
    --> Rising sea levels
    --> Extreme rainfall

CIRCLE ARRANGEMENT:

11. Step in the circle if you use renewable energy in some way.
12. Step in the circle if you use the stairs instead of the elevator.
13. Step in the circle if you buy things that you don't use.
14. Step in the circle if you prefer local products.
15. Step in the circle if you turn on the fan instead of the AC when it gets hot.

DEBRIEFING QUESTIONS

1. What did you learn during this exercise about your classmates or about yourself?
2. Was it hard to go against the majority for some questions?
3. Have any of your opinions changed after this exercise? If so, which ones and how?

CONNECTING DOTS

OPTION 1

10-15 mins. 4+ players Small Space 4

LEARNING OBJECTIVES

- Learn about the indirect effects of a climate change phenomenon on aspects of a city or specified location (e.g. Thessaloniki)
- Incentivize reflection from students, stimulating teamwork and collaboration

MATERIALS

- String

CONNECTING DOTS

OPTION 1

FACILITATION GUIDELINES

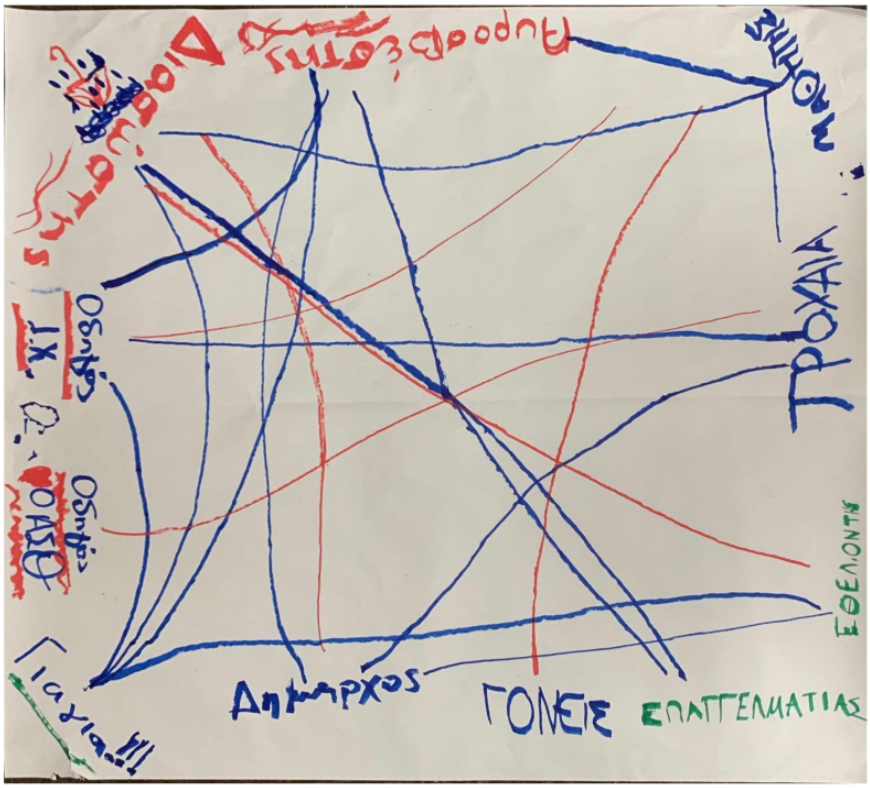
1. Ask players to gather in a circle around the facilitator.
2. Present a climate change event to the students.
3. Ask students to pick a stakeholder that is affected by the climate change event and discuss how the event affects them (only a couple stakeholders for this).
4. Have the remaining players pick a stakeholder that is affected by one or more of the already existing stakeholders.
5. Have the players discuss how the particular event will affect their stakeholder and how other stakeholders affect them.
6. Every time there is a connection from one stakeholder to another or from a stakeholder to the climate change event, the players will give each other a string that they will have to hold throughout the game, representing their connection.
7. At the end of the game, when all connections are made, the climate change event/facilitator will pull on the string and the players will feel the pull/impact that the event has on their stakeholder.
8. Players will play many rounds with other climate change phenomena to see the different impacts.
9. After finishing the game(s), explain to the players that there are many things that are not directly connected to climate change, but they still feel the impacts that climate change has.

DEBRIEFING QUESTIONS

1. For this climate change event, who do you think is impacted the most?
2. How would you prevent this disaster from happening?
3. From the solutions you just told me, how can we apply them to our everyday lives?

CONNECTING DOTS

OPTION 2



10-15 mins. 4+ players Small Space 4

LEARNING OBJECTIVES

- Learn about the effects of climate change in people's everyday lives
- Incentivize reflection from students, stimulating teamwork and collaboration

MATERIALS

- Large piece of paper
- Markers/writing utensil

CONNECTING DOTS

OPTION 2

FACILITATION GUIDELINES

1. Gather players in a circle around the large paper.
2. Present the students with a climate change event.
3. Each player will pick a different person in the community that would be affected by the climate change event.
4. Have players discuss how the particular event will affect their stakeholder. After successfully identifying how the event would impact their stakeholder, have them write their stakeholder on the paper by the side closest to them.
5. Have players discuss how other stakeholders affect them.
6. Every time a connection is made, draw a line connecting the people together on the paper. Continue this until no more connections can be made.

DEBRIEFING QUESTIONS

1. What did you learn from this activity? (Try to get them to explain how climate change can directly or indirectly impact everyone)
2. For this climate change event, who do you think is impacted the most?
3. How would you prevent this disaster from happening?
4. From the solutions you just told me, how can we apply them to our everyday lives?

TRAFFIC JAM

10-15 mins. 15+ players Large Space 4

LEARNING OBJECTIVES

- Explore the relationships between efficient transportation and carbon dioxide emissions
- Explore approaches to climate change mitigation

TRAFFIC JAM

MATERIALS

1. Chalk or signs to show where the different forms of transportation should go
2. Name Tags for the students representing vehicles (optional)
   --> Car
   --> Bus
   --> Bicycle
3. 4 buckets, 3 labeled:
   --> Car
   --> Bus
   --> Bicycle
4. Colored paper with point values written inside and crumbled into balls
   --> Red (worth 2 points)
   --> Yellow (worth 1 point)
   --> Green (worth 0 points)

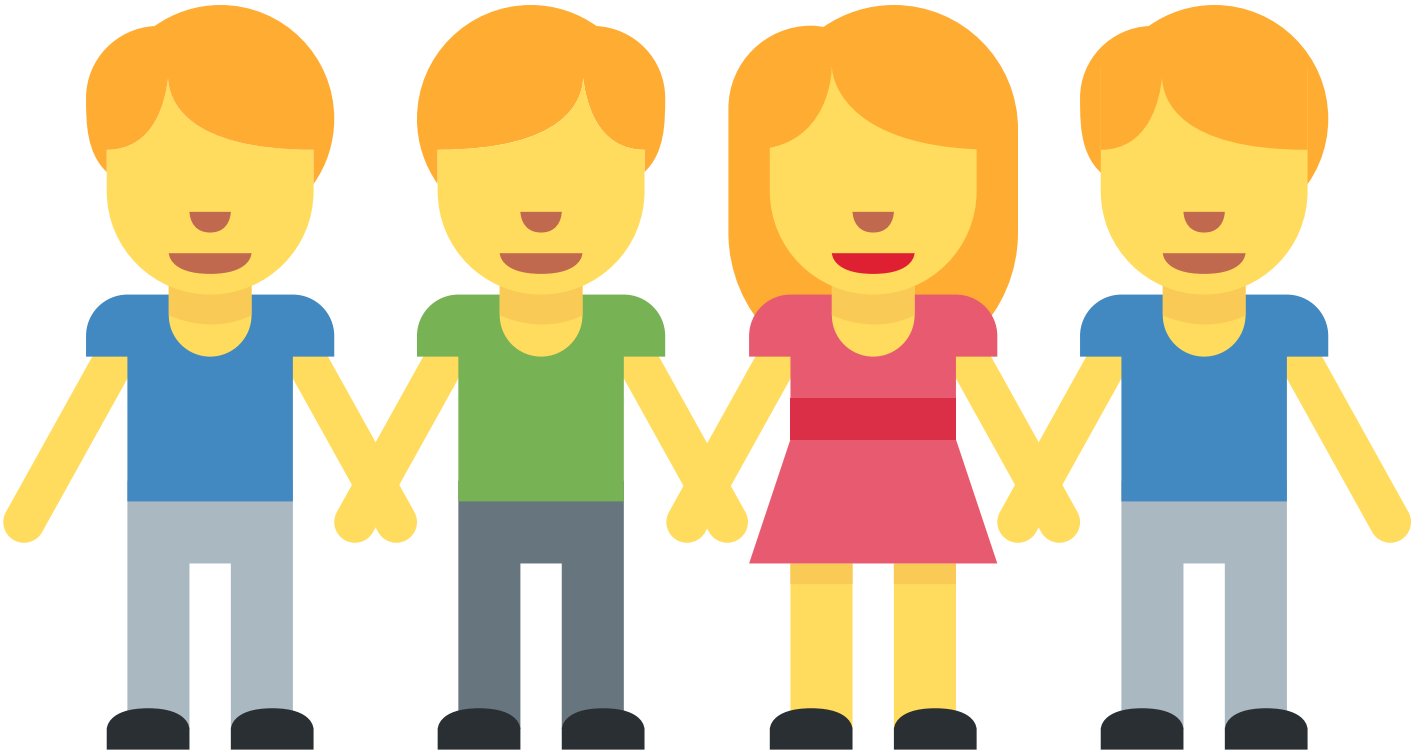
FACILITATION GUIDELINES

1. Draw a pathway representing streets with chalk or put up signs to show the pathways. If possible, make intersections for fun.
2. Separate players into groups and assign each player a vehicle.
   --> 1 car = 1 student
   --> 1 bicycle = 1 student
   --> 1 bus = 6-8 students
3. Each car will receive one yellow ball, each bus will receive one red ball total, each bicycle will receive one green ball.
4. Players will walk around the course and put their ball in the bucket at the end of the lap, then pick up another ball (of the same color) at the start.
5. Repeat for a predetermined number of laps.
6. Have players gather back into their 3 groups (cars, buses and bicycles) and hand back their balls to them.
7. Have them open their papers and count up the number of point their group has.
8. Write down the total point value for each group and the number of people that were in the group for everyone to see. Explain that each point is carbon emission, so the group with the highest number of points emits the most pollutant gases.

DEBRIEFING QUESTIONS

1. Why does the bus have a lower carbon footprint?
2. Why should we use bikes when possible?
3. Thessaloniki is a city with a lot of traffic. Why does public transportation seem to be a good alternative?

EXTREME WEATHER TAG



5-10 mins. 10+ players Large Space 2

LEARNING OBJECTIVES

- Learn about how extreme weather events can affect people
- Be active and energetic
- Demonstrate the domino effect of climate change topics (extreme weather events in this case)
- Learn about how when a plan is not in place (not resilient) prior to an extreme weather event, everything becomes chaotic and more people will be negatively impacted

MATERIALS

N/A

EXTREME WEATHER TAG

FACILITATION GUIDELINES

1. Pick one player or have one volunteer to be the “tagger,” who will represent an extreme weather event.
2. The player who is the “tagger” runs around trying to tag the other students.
3. Once a player is tagged, they become a “tagger” in addition, and hold hands or link arms with the student who is already it (now both players represent an extreme weather event).
4. The more players tagged, the longer the line of students becomes, showing how weather intensifies and grows.
5. When all players have been tagged, the game is over. The last player remaining wins.

DEBRIEFING QUESTIONS

1. What did you learn about the growth of extreme weather events?
2. How does the scalability of the event affect isolated populations?
3. Did you have fun playing this game?
4. How should you prepare for extreme weather events?

SURVIVOR

10-20 mins. 10+ players Medium Space 4

LEARNING OBJECTIVES

- Survive extreme weather events
- Climate change resilience
- Teamwork

MATERIALS

N/A

SURVIVOR

FACILITATION GUIDELINES

1. Tell the group of students to stand in a clump in the center of the room/area.
2. Explain the rules:
   --> If there is a flood, you must get in a “boat” with the specified number of people and pretend to row.
   --> If there is a hurricane, you must cross your arms and link hands with the specified number of people.
   --> If there is a wildfire, you must run to the opposite side of the room than the fire is coming from (opposite of where the facilitator points to).
   --> If there is a heatwave, you must crouch to the ground with your hands covering your head.
3. The last person to complete these tasks or the people that are unable to complete the task (do not fit in a group) get out and stand off to one side of the room, out of the way of the players still in.
4. Each round, pick a new number and/or task. As people get out, the total group gets smaller.
5. Keep playing until there is 1 person left - they are the survivor!

DEBRIEFING QUESTIONS

1. What did you learn from playing this game?
2. Did you have fun?
3. How does this relate to your life?

HOP 'TIL YOU DROP

5-10 mins. 4+ players Large Space 5

LEARNING OBJECTIVES

- Learn about urban resilience plans and which are most effective

MATERIALS

- Chalk
- Game cards (index cards)

HOP 'TIL YOU DROP ☀️☂️✎↻

FACILITATION GUIDELINES

1. Split the students into "X" groups of 3-8 players each.
2. Draw "X" paths using the chalk (try to make them similar distances from start to finish and the same number of left and right turn options. If you can make the paths identical, that would be ideal). Assign a different group to each path.
3. Place the game cards with the questions facing up at each intersection where students must make a choice.
   - Write the resilience plan questions on one side with the 2 options for answers. On the other side, write which answer corresponds to which direction on the path. The better answer should correspond to the shorter path.
   - Example question: If strong winds are predicted to occur, would you first:
     a. Secure any loose outdoor items
     b. Buy food to store
     --> The best answer is "a", secure any loose outdoor items. Winds could cause items to damage homes or injure people while storing food is not as important in this particular situation.
4. Explain to the students that there are different climate change disasters that are about to occur, so they will be tasked with the decision of which resilience plan to use in each disaster situation. Tell them that they are in a race to complete the path the quickest. They should be trying to answer correctly so that you can take the fastest route to the finish.
5. Explain to the students that they must complete the course by hopping (decide if you'd prefer them to hop on one foot or both feet).
6. Have the students get to their starting point on the paths and once they are all in positions, let them know that they may begin.
7. If possible, have the students tell the teachers/instructors what their decision is at each intersection before moving on during the game (best scenario is if one instructor is assigned to each group).
8. After the students have informed their instructor, have them flip over the index card to reveal which direction corresponds to which answer and have them follow the corresponding direction for their answer.
9. Have the students continue hopping and answering the index card questions at each intersection until they have completed the entire path.
10. Congratulate the team that completes the game the quickest, but allow the other groups to complete their path so that they are able to answer all of the questions/scenarios.

DEBRIEFING QUESTIONS

1. The group that finished the fastest, what decisions did you make? The group that finished last, what decision did you make?
2. Are there any decisions that you would change now that the game is over?

CAUSE AND EFFECT

Πυρκαγιές	Αύξηση διοξειδίου του άνθρακα στην ατμόσφαιρα	Ξηρασία

10 mins. 2-6 players Small Space with Tables 3

LEARNING OBJECTIVES

- Help students rationalize causes and consequences of climate change and brainstorm solutions by stimulating critical thinking
- Practice thinking and decision making

MATERIALS

- Cards: Could be pre-labeled cards (located in the back of the booklet) or created by the students as a warm up exercise for the game
- Permanent marker

CAUSE AND EFFECT

FACILITATION GUIDELINES

1. Split the students in groups of 5-6 and have them sit in a circle.
2. Shuffle the cards and deal 4 cards to each student.
   - If the cards need to be made, label them with numerous causes and effects of climate change, mitigation strategies and urban resilience
3. Place the remainder of cards in a pile face down in the middle of the circle and flip over the top card so everyone can read what it says.
4. The student who goes first will have the option of picking up the face-up card or choosing a new card from the stack. The object of each turn is to match a "cause" card with an "effect" card.
5. Cards that have matching causes and effects will be pairs.
6. Players must discard one card into the face-up stack after each turn. Players should always have 4 cards in their hands.
7. When a player thinks she's made a match, he/she must show the matching cards to his/her opponent. If the match makes sense, the match will be approved. If not, then she'll have to try for a new match during her next turn.
8. The student with the most correct matches wins.

DEBRIEFING QUESTIONS

1. Did you have fun playing this game?
2. What did you learn that you didn't know before?

RACE FOR RESILIENCE

10+ mins. 4+ players Large Space 5

LEARNING OBJECTIVES

- Discussion based activity
- Learn about climate change causes, mitigation strategies and resilience plans
- Practice thinking and decision making under pressure
- Incentivize reflection from students, stimulate teamwork and collaboration

MATERIALS

- Cards (located in the back of the booklet)
- Permanent marker
- Tape

RACE FOR RESILIENCE

FACILITATION GUIDELINES

1. Split players into teams of 4-5 people.
2. Present each team with the same climate change issue/ topic (i.e. rise in temperatures with an increase in CO2 in the environment and decreased food production) and have them start the obstacle course.
3. The first obstacle will involve the pairing of the given climate change cause with it's particular impacts. A variety of climate change causes and impacts will be labeled on cards. Teams will be presented with one climate change cause. Each team will have to select 3 impacts to pair with that cause. You must approve their cards before each team can move on. Once approved, tell the team that they can move to the next obstacle.
4. The second obstacle involves the identification of mitigation strategies. Ask each team to come up with 3 mitigation strategies. Teams will write their strategies on a piece of paper. You must approve their strategies before each team can move on. Once approved, tell the team that they can move to the final obstacle.
5. The final obstacle involves the identification of a resilience plan for the given climate change issue/ topic. The resilience plan will be presented in the form of a scavenger hunt. Hide the resilience plan steps throughout the space available. Disperse different resilience plans throughout and assign each team one of them. The plans will be numbered, so have the teams follow the steps on their designated numbered card. The cards when placed together will display a resilience plan to help cope with the given climate change issue/ topic.
6. The team who finishes the obstacle course first wins.

DEBRIEFING QUESTIONS

1. What did you learn?
2. Which resilience plan will be most effective for the given climate change issue/ topic?

SURVIVAL OF THE M&M'S

10+ mins. 2+ players Small Space with Tables 4

LEARNING OBJECTIVES

- Learn how to use resources in an efficient way
- Practice thinking and decision making under pressure
- Learn how to plan and prepare for expected climate change events.

MATERIALS

- M&Ms
- Straws
- Plates

SURVIVAL OF THE M&M'S

FACILITATION GUIDELINES

1. Give players 2 of each colored M&M. Each color represents a different resource:
   --> Green M&Ms represent trees
   --> Red M&Ms represent food
   --> Yellow M&Ms represent money
   --> Brown M&Ms represent land
   --> Blue M&Ms represent water
   --> Orange M&Ms represent shelter
2. Present players with a different climate change event each round (i.e. rise in sea level) in which particular resources are necessary to stay alive. If a player does not have the necessary resources to survive the event, they are out of the game.
3. Each round, have players put aside 2 M&M's (the resources they may not need for that particular event). They will have to strategically select which M&M's to keep and which to put aside. M&M's can be moved by sucking through a straw to pick them up from the plate.
4. Each round M&M's will "reproduce" by doubling (for example, if a player keeps 2 green M&M's, the next round they will have 4 green M&M's, if they keep 1 green M&M, the next round they will have 2 green M&M's). Players will not be able to foresee what climate change event will happen next. As a result, they must strategically select which M&M's to put aside and which to keep and "reproduce" to account for whatever may happen in the future.
5. The game will have a specified number of rounds (players will be presented with a set number of climate change events).
6. The player with the highest number of M&M's (resources) at the end wins.

DEBRIEFING QUESTIONS

1. What did you learn?
2. Is it better to use up all your resources when you need them, or to save them in order to plan and prepare for potential climate change events?

GREENHOUSE GAS EFFECT

20+ mins. 16-25 players Large Open Space 4

LEARNING OBJECTIVES

- To understand how the greenhouse effect works, what human activities affect it, and how it affects the increase in Earth's temperature
- Learn about how to reduce greenhouse gas emissions, avoid greenhouse gases and mitigate climate change
- Critical thinking and combine information to find solutions

MATERIALS

- Name Tags (Laminated paper with sunlight and CO2 molecules labels separately)
- Colored chalks

GREENHOUSE GAS EFFECT

FACILITATION GUIDELINES

1. Select a volunteer to represent the Earth.
2. Select 5-8 students to represent the CO2 molecules (have them wear the CO2 name tag).
3. Select 10-16 students to represent the Sun's rays (give them the corresponding name tag). Note: The number of students representing the sun's rays should be about twice as high as the number of CO2 molecules.
4. Have the student, who represents the Earth, sit at the center of the space. From a certain distance from the Earth (about 3-4 steps), draw a circle and then draw another circle with a different chalk color at a greater distance (about 7-8 steps) from Earth.
5. Have the students representing the sun rays stand around in the outer circle and tell them that they can only move in a straight line.
6. Tell the first part of history (before the Industrial Revolution). Have 2 CO2 students take their place in the inner circle.
7. Tell the students representing the sun's rays to move to Earth. Tell the CO2 students that they must stand in their spot with their hands down.
8. Tell the sun ray students to return back to their original place in "space". Tell the CO2 students that they can try to tag the sun rays (without moving their feet). During this, if the sun rays hit a CO2, have them stop and remain close to Earth.
9. Count how many rays are trapped near Earth. Explain that this heat provides the Earth with a mild average temperature and allows life to still develop. Students place 1-2 jackets on the "Earth" to represent this increase in temperature.
10. Have all students representing sun rays return to the outer circle. Now, tell the second part of the story (industrial revolution). Ask students if CO2 is increased in the atmosphere. 1-2 more CO2 students should now take their place in the inner circle.
11. Repeat steps 7 & 8.
12. Measure how many rays are now trapped near the Earth and compare with the previous round. Ask the students what impact this has on Earth's temperature. Students place 1-2 more jackets on the "Earth."
13. Tell all students representing the sun rays to return to the outer circle. Tell the third part of the story (oil discovery). Ask students if CO2 is increased in the atmosphere. Have 1-2 more CO2 students take their place in the inner circle.
14. Repeat steps 7 & 8.
15. Count how many rays are now trapped near the Earth and compare with the previous round. Ask what impact this has on Earth's temperature. Students place 2-3 more jackets on the "Earth."

GREENHOUSE GAS EFFECT

FACILITATION GUIDELINES CONTINUTED

16. Tell all students representing the sun rays to return to the outer circle. Now tell the fourth part of history (today's era). Ask students if CO2 is increased in the atmosphere. Have 1-2 more CO2 students take their place in the inner circle.
17. Repeat steps 7 & 8.
18. Count how many rays are now trapped near the Earth and compare with the previous round. Ask what impact this has on Earth's temperature. Students place 2-3 more jackets on the “Earth.”
19. Tell all students, except the “Earth,” to return to their positions. Ask them what conclusions they made. Ask the student representing the Earth how he/she feels under all of the jackets.
20. Have students propose solutions to reduce greenhouse gas emissions. When a student proposes a correct solution, ask him/her to remove a jacket from the “Earth.”
21. The game ends when all jackets have been removed.

DEBRIEFING QUESTIONS

1. Did you have fun playing the game?
2. Did you learn anything from playing this game? What did you learn?
3. What are your final conclusions after playing this game?
4. What can we do to reduce the production of CO2 and greenhouse gases?

GREENHOUSE GAS EFFECT

STORY

First Part:
Imagine 2-3 thousand years. In the atmosphere of the Earth, among other gases, there is also a small amount of CO2. It comes mainly from volcanic eruptions and fires. The plants absorbed it to live, and what was left in the atmosphere kept the sun's rays on Earth. So the Earth maintained a satisfactory temperature and hosted life. Otherwise we will freeze ....

Second Part:
The years have passed ... we reached the industrial revolution for centuries, around 1750. The man discovered the machine and the use of coal to produce energy and movement. He built trains, boats, factories that all burned coal for their engines to work and produce or produce. And as the charcoal was burning, the CO2 grew ... and slowly raised to the upper layers of the atmosphere ...

Third Part:
We are in 1900. We discovered something more precious than coal ... oil, black gold! We used oil to work the factories, to move ships and trains, to heat the buildings, build cars and planes. Movements were multiplied, the products produced by the factories as well. People spread and grew up, needed timber to build their homes and more land to cultivate, and they began to cut forests.

Fourth Part:
We arrive to today. The earth's population has surpassed 7 billion and is rising rapidly. We use more energy than ever! In homes for lighting, heating, work for appliances, in the city, in stores, in services, in factories to produce more and more products, to transport products from every corner of the earth to move ... Every family has one or more cars, we travel with airplanes more and more often since they are inexpensive! And of course, we use fossil fuels ... coal, oil, gas. And we consume too much, even if we do not get used to everything we buy. And we produce a lot of food, we throw a lot of food, we eat much more meat and we cut the forests to spread our crops. Scientists warn: CO2 has grown a lot and will grow more and more if we do not take action! We move to self-destruction ...

FIND SOMEONE WHO

10+ mins. 10+ players Small Open Area 2

LEARNING OBJECTIVES

- Introductory exercise
- Opinion-based learning
- Understand what people currently do in relation to climate change and why/how they should make changes

FIND SOMEONE WHO

MATERIALS

- Pen/pencil
- Clipboard (not necessary but helpful)
- Piece of paper with the “find someone who…” statements
- These statements include:
- Find someone who has heard that ice caps are melting.
- Find someone who feels like the seasons have changed.
- Find someone who has a way to reduce energy consumption.
- Find someone who uses solar panels to warm water (boiler?).
- Find someone who uses the stairs instead of an elevator.
- Find someone who turns off the lights when they leave or when they do not need them on.
- Find someone who buys things that they do not use.
- Find someone who has a personal story about climate change or the impacts of climate change.
- Find someone who prefers local products.
- Find someone who worries about climate change.
- Find someone who has ideas about what causes climate change.
- Find someone who has heard that there have been many fires over the last few years.
- Find someone who uses a fan instead of an air conditioner to cool down.
- And any other “find someone who” statements that you would like to add.

FACILITATION GUIDELINES

1. Hand out one statement paper (and the clipboards if available) to every student.
2. Instruct them to stand up and find 3 people who match their statements.
3. Have them write down a description/explanation of why the person matches that statement.
4. The students continue until time is up..

DEBRIEFING QUESTIONS

1. What were some interesting or good answers for question 1? question 2? And so on…
2. Did you enjoy this game? What did you like about it?

TIPS FOR DESIGNING SERIOUS GAMES

- Create games that relate to your audience.
- Think about what content you would like to teach your students first, then decide which mechanics would be more effective for that specific content. Pair more complex mechanics with information-heavy content.
- Make sure the game clearly gets your intended objective across.
- Don't make the game overly educational. Have a good balance of education and fun.
- When designing games, take into consideration the space that you will be using and the number of students that will be participating. Many times this will impact the game and adjustments will need to be made.
- Continuously test and adjust your game to improve.

ENVIRONMENTAL EDUCATION ADVICE VIDEOS

The importance of climate change education:

https://youtu.be/s9WgWEgUzP4

Advice on facilitation and student engagement:

https://youtu.be/-vKtQ-lQhjw

How to overcome challenges associated with climate change education through serious games:

https://youtu.be/p49hH0P0_Lk

CONTACT INFORMATION FOR EMERGENCY RESOURCES IN GREECE

- Emergency: 112
- Ambulance: 166
- Fire Department: 199
- Police: 100
- Anti-drug Police: 109
- Coast Guard: 108
- Tourist Police: 171
- Pharmacies: 107
- Hospitals: 106
- Forest Fire Authority: 191
- Traffic Police: 10400
- Weather Service: 148
- International Phone Assistance: 139
- General Telephone Information: 11888

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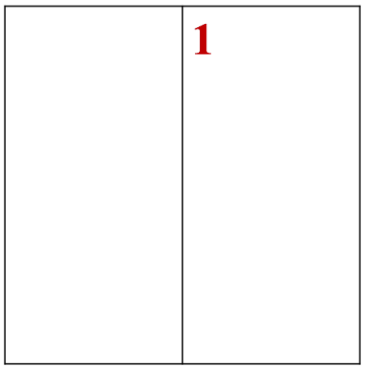
APPENDIX

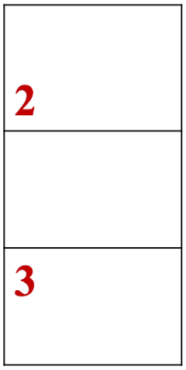
CARDS AND FACILITATION RESOURCES

- Sinking Island Material Guidelines
- Before the Storm Cards
- Cause and Effect Cards
- Race for Resilience Cards

SINKING ISLAND MATERIAL



First round: use the entire sheet of paper
Second round: fold the paper on the line labeled “1”



Third round: fold the paper on the line labeled “2”
Fourth round: fold the paper on the line labeled “3”

Fifth round: fold the paper on the line labeled “4”
Sixth round: fold the paper on the line labeled “5”

BEFORE THE STORM CARDS

Negotiate!

Seek funding from international sources

Repair Roads!

Repair / check flood structures (roads, routes, etc)

Review!

Assess what was done in the last storm and adjust accordingly

Play Sports!

Things seem calm so have fun!

Store Food!

Harvest and/or buy food to store in case food becomes inaccessible!

Gather Families!

Move families to safe shelter. Pack only essentials.

Evacuate!

Make sure to evacuate areas that have flooded in the past.

Prepare!

Practice evaluation routes and meeting locations.

Communicate!

Broadcast weather warnings on the Television and Radio.

BEFORE THE STORM CARDS

Herd!

Move animals to a safe place.

Communicate!

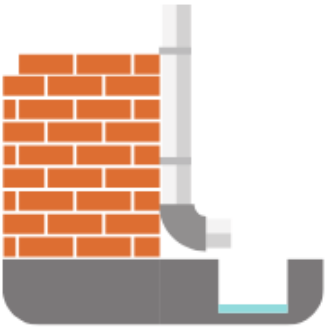
Check to make sure communication devices are working properly.

Satellite!

Check the weather for a more detailed forecast.

Prepare!

Store drinkable water.

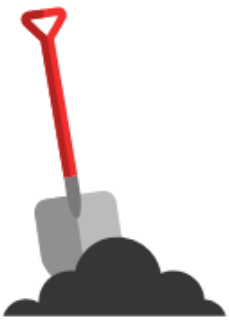


Clean Up!

Make sure the gutters and down-pipes are clean and free of waste.

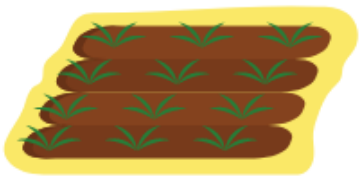
Check Supplies!

Check and restock emergency supplies.



Dig Ditches!

Dig drainage ditches to reroute water.



Tend to Fields!

Prepare the fields for growth.

Relax!

Socialize with friends, play with pets or play games.

BEFORE THE STORM CARDS

Recover!

Acquire seeds and tools to replant any damaged crops.

Prepare!

Move valuables to higher ground or a secure location.

Help Out!

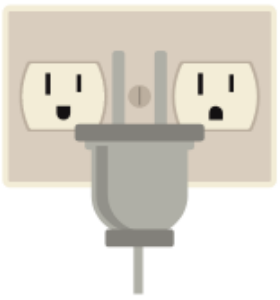
Take care of people in the community that may not be able to help themselves.

Prepare!

Have a flashlight handy and buy extra batteries.

Monitor!

Check weather again in one week.



Unplug!

Unplug electrical appliances and switch them off at the circuit board.

Monitor!

Check the weather every week to see if there's any change.

Prepare!

Fill vehicles with gasoline and fill extra gas cans.

Secure Items!

Secure any loose outdoor items.

BEFORE THE STORM CARDS

Prepare!

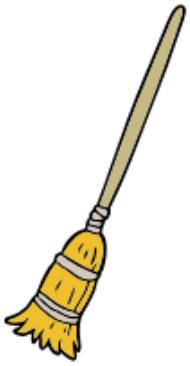
Seal windows and doors to prevent leaks!

Trim Trees!

Trim trees so they don't fall on your house.

Prepare!

Have a list of emergency contacts ready.

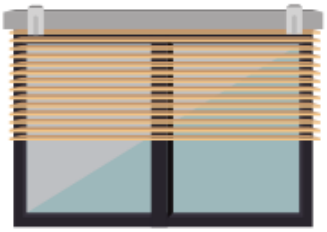


Clear Drains!

Remove debris and objects from outside drains.

Prepare!

Make a first aid kit and get trained on basic first aid procedures.



Cover!

Cover windows that receive a lot of direct sunlight.

Stay Inside!

Stay indoors until it is safe to go outside.

Communicate!

Call your neighbors, friends and family to check in on them.

BEFORE THE STORM CARDS

24 hours ..... 24 hours	**3 days** ..... 3 days	**1 week** ..... 1 week
Forecast! Skies are partly-cloudy and you can see dark clouds in the distance.	**Forecast!** It is a nice day, and will most likely remain a nice day.	**Forecast!** Strong winds. There is a 70% probability that winds will blow in excess of 120 km per hour.

BEFORE THE STORM CARDS

Forecast!

Heavy rains expected for 3 consecutive days.

Forecast!

Light showers are very likely to occur.

Forecast!

Regions west of here are experiencing unprecedented rains.

Forecast!

Accumulated rainfall expected to reach 40% above normal. The likelihood of severe flooding is 30%.

Forecast!

Up to 35mm of rain likely to occur in this region, with 90% probability for a duration of 24 hours.

Forecast!

Temperatures are expected to rise above 40°C.

Forecast!

Strong chance of severe thunder and lightening.

Forecast!

Expected snowstorm with 20-30cm of snow.

Forecast!

Heatwave predicted with no rainfall for 1 month.

CAUSE AND EFFECT CARDS

Ξηρασία

Ξηρασία

Λιώσιμο των πάγων στους πόλους

Λιώσιμο των πάγων στους πόλους

Αύξηση διοξειδίου του άνθρακα στην ατμόσφαιρα

Αύξηση διοξειδίου του άνθρακα στην ατμόσφαιρα

Επιδείνωση του φαινομένου του θερμοκηπίου

Επιδείνωση του φαινομένου του θερμοκηπίου

Έντονες βροχοπτώσεις

Έντονες βροχοπτώσεις

Περισσότεροι καύσωνες

Περισσότεροι καύσωνες

Αύξηση της θερμοκρασίας του πλανήτη

Αύξηση της θερμοκρασίας του πλανήτη

Αλλαγές στα φυτά και ζώα μιας περιοχής

Αλλαγές στα φυτά και ζώα μιας περιοχής

Μείωση παραγωγής τροφίμων

Μείωση παραγωγής τροφίμων

CAUSE AND EFFECT CARDS

Καύση ορυκτών καυσίμων Καύση ορυκτών καυσίμων	Αύξηση θερμοκρασίας ωκεανών Αύξηση θερμοκρασίας ωκεανών	Μετακινήσεις ανθρώπων με κάθε είδους οχήματα Μετακινήσεις ανθρώπων με κάθε είδους οχήματα
Αλλαγή του κλίματος της περιοχής Αλλαγή του κλίματος της περιοχής	Εξαφανίσεις ειδών (φυτά, ζώα) Εξαφανίσεις ειδών (φυτά, ζώα)	Μεταφορές προϊόντων με κάθε είδους οχήματα Μεταφορές προϊόντων με κάθε είδους οχήματα
Άνοδος στάθμης της θάλασσας Άνοδος στάθμης της θάλασσας	Καταστροφή αγροτικής παραγωγής Καταστροφή αγροτικής παραγωγής	Καταστροφές σε υποδομές (δρόμοι, γέφυρες κλπ) Καταστροφές σε υποδομές (δρόμοι, γέφυρες κλπ)

CAUSE AND EFFECT CARDS

Μείωση της αγροτικής παραγωγής

Μείωση της αγροτικής παραγωγής

Καταστροφές περιουσιών (σπίτια, αυτοκίνητα κλπ)

Καταστροφές περιουσιών (σπίτια, αυτοκίνητα κλπ)

Απώλειες ανθρώπινων ζωών

Απώλειες ανθρώπινων ζωών

Πιο έντονοι καύσωνες στις πόλεις

Πιο έντονοι καύσωνες στις πόλεις

Μετανάστευση ανθρώπων

Μετανάστευση ανθρώπων

Πλημμύρες

Πλημμύρες

Χαλάζι – Ανεμοστρόβιλοι

Χαλάζι – Ανεμοστρόβιλοι

Εκπομπή διοξειδίου του άνθρακα από οχήματα

Εκπομπή διοξειδίου του άνθρακα από οχήματα

Αύξηση τιμών τροφίμων

Αύξηση τιμών τροφίμων

CAUSE AND EFFECT CARDS

Εκπομπή αερίων θερμοκηπίου από θέρμανση

Εκπομπή αερίων θερμοκηπίου από θέρμανση

Εκπομπή διοξειδίου του άνθρακα από παραγωγή ηλεκτρικής ενέργειας

Εκπομπή διοξειδίου του άνθρακα από παραγωγή ηλεκτρικής ενέργειας

Αύξηση των έντονων καιρικών φαινομένων

Αύξηση των έντονων καιρικών φαινομένων

Πυρκαγιές

Πυρκαγιές

Συγκρούσεις για το νερό/έδαφος

Συγκρούσεις για το νερό/έδαφος

Καταστροφή κοραλλιών από αύξηση θερμοκρασίας νερού

Καταστροφή κοραλλιών από αύξηση θερμοκρασίας νερού

Υπερκατανάλωση

Υπερκατανάλωση

Καταστροφή δασών

Καταστροφή δασών

Σπατάλη τροφίμων

Σπατάλη τροφίμων

CAUSE AND EFFECT CARDS

Μείωση γλυκού νερού

Μείωση γλυκού νερού

Επιπτώσεις στην υγεία

Επιπτώσεις στην υγεία

Περιοχές κοντά στην θάλασσα θα πλημμυρίσουν

Περιοχές κοντά στην θάλασσα θα πλημμυρίσουν

Χιονοδρομικά κέντρα ίσως μειώσουν την λειτουργία τους

Χιονοδρομικά κέντρα ίσως μειώσουν την λειτουργία τους

Νησιά θα κατακλυστούν από θάλασσα

Νησιά θα κατακλυστούν από θάλασσα

Δημοφιλείς παραλίες θα κατακλυστούν από τη θάλασσα

Δημοφιλείς παραλίες θα κατακλυστούν από τη θάλασσα

Επιπτώσεις στην οικονομία

Επιπτώσεις στην οικονομία

Φτώχεια

Φτώχεια

Περισσότεροι καύσωνες

Περισσότεροι καύσωνες

CAUSE AND EFFECT CARDS

Πυρκαγιές

Πυρκαγιές

Αύξηση τιμών τροφίμων

Αύξηση τιμών τροφίμων

Ξηρασία

Ξηρασία

Εξαφάνιση ειδών

Εξαφάνιση ειδών

Λιώσιμο πάγων

Λιώσιμο πάγων

Άνοδος στάθμης της θάλασσας

Άνοδος στάθμης της θάλασσας

Πλημμύρες

Πλημμύρες

Μετακίνηση πληθυσμών

Μετακίνηση πληθυσμών

Αύξηση της θερμοκρασίας του πλανήτη

Αύξηση της θερμοκρασίας του πλανήτη

CAUSE AND EFFECT CARDS

Αύξηση διοξειδίου του άνθρακα στην ατμόσφαιρα

Αύξηση διοξειδίου του άνθρακα στην ατμόσφαιρα

Επιδείνωση του φαινομένου του θερμοκηπίου

Επιδείνωση του φαινομένου του θερμοκηπίου

Καταστροφή δασών

Καταστροφή δασών

Ξηρασία

Ξηρασία

Άνοδος στάθμης της θάλασσας

Άνοδος στάθμης της θάλασσας

Πλημμύρες

Πλημμύρες

Αύξηση διοξειδίου του άνθρακα στην ατμόσφαιρα

Αύξηση διοξειδίου του άνθρακα στην ατμόσφαιρα

Πυρκαγιές

Πυρκαγιές

RACE FOR RESILIENCE CARDS

Cause

Air pollution

Cause

Cities not designed to deal with climate change

Cause

Poor waste treatment

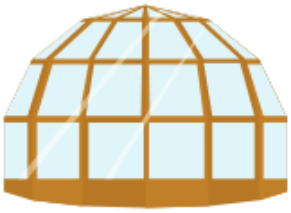
Cause

Pollution

Cause

Lack of green spaces

Cause



Greenhouse effect

Cause

Overconsumption

Cause

Overpopulation

Cause

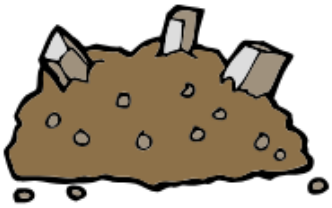
Deforestation

RACE FOR RESILIENCE CARDS

Cause

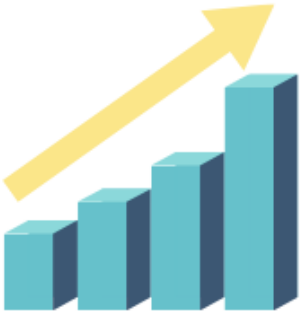
Burning Fossil Fuels - CO2 Emission

Impact



Drier soil

Impact



Extreme weather events incident increases

Impact

Droughts

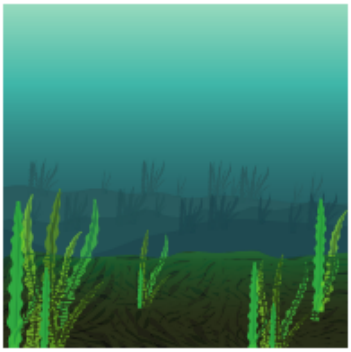
Impact

Ozone layer hole

Impact

Increase in ocean temperature

Impact



Change in ecosystems

Impact

Reduction in humidity

Impact

Polar caps melting

RACE FOR RESILIENCE CARDS

Impact

Some species will become endangered/extinct

Impact

Ocean acidification

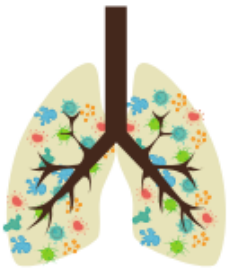
Impact

Urban heat islands

Impact

Rising temperatures

Impact



Respiratory diseases

Impact

Release of toxic substances in land, air and bodies of water

Impact

Higher energy consumption

Impact

Floods

Impact

Extreme rainfall

RACE FOR RESILIENCE CARDS

Impact

Sea level rise

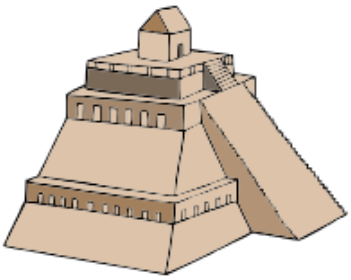
Impact

Hurricanes

Impact

Acid rain

Impact



Increased erosion in archeological sites

Impact

Declining food production

Impact

Traffic jam and emission of gases

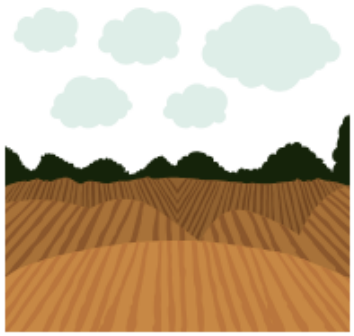
Impact

Tourism decreases

Impact

Price of goods increase

Impact



Damaged agricultural production