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TACKLING THE CLIMATE CRISIS TOGETHER





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## **Welcome Note from the Editor-in-Chief**

Katip Çelebi once said: “The diversity of climates and nature shapes human character and actions; nature is life’s most just teacher.” This quote reminds us of how essential and valuable nature is. When we gaze at the sky, we see not only what is visible but also what lies beyond our sight: the creatures living beneath the soil, and the abiotic and biotic elements with which we share the universe. In essence, the entire cosmos must sustain and protect one another to maintain the flow of life. When this balance is disrupted, phenomena such as climate change—and the factors driving it—continue to impact us all. For this reason, we, along with our students studying the Cambridge IGCSE Biology Extended course, have taken action by publishing this e-magazine to raise awareness. We are deeply grateful to our school administration, staff, and students for their unwavering support.

Here’s to a future where we can safeguard the climate, living beings, the non-living, and the universe itself...

**Melike TEPE, Ph.D.**

# A GLOBAL THREAT: CLIMATE CHANGE AND THE LOSS OF GENETIC DIVERSITY

Today, we are facing many problems caused by the noticeable rise in climate change, and these problems affect the entire world. One significant issue is the impact of global temperature change on ecosystems (United Nations, 2025). As the climate changes, natural habitats are rapidly altering or being destroyed. Consequently, genetic diversity among living species is gradually decreasing (IPCC, 2002).

The main reason for the loss of biodiversity is actually the destruction and restriction of the habitats of living organisms by humans. However, climate change has begun to play an increasingly important role. Climate change affects marine, terrestrial, freshwater, and saltwater ecosystems around the world. Changes in ecosystems cause living organisms to lose their habitats, and therefore, local populations are decreasing. Rising temperatures on land direct animals and plants toward cooler and higher areas (United Nations, 2020). This situation changes ecosystems worldwide and increases the risk of species extinction.

Climate change not only changes ecosystems; it also affects living organisms physiologically (Australian Academy of Science, 2015). Some species cannot protect themselves against temperature changes and lose their lives. For example, the green ringtail possum, a species native to the tropical rainforests of Queensland, cannot regulate its body temperature when the environmental temperature rises above 30°C. A long-lasting heatwave in northern Queensland may lead to the death of a large part of its population (Australian Academy of Science, 2015). Besides, some problems caused by climate change also negatively affect genetic diversity in living species:

**Increases in extreme events:** Changes in the frequency and intensity of events such as wildfires, floods, and droughts cause irreversible damage to natural habitats. After these events, soil structure is disrupted, and some plant species are unable to regenerate. As the number of individuals within the same species decreases, genetic diversity also declines (Australian Academy of Science, 2015).

**Increasing CO<sub>2</sub> and plant growth:** The basic components of photosynthesis are carbon dioxide and water. An increase in atmospheric carbon dioxide increases the growth rate of many plant species. Leaf-eating animals such as koalas may not be as fortunate; increased carbon dioxide concentration can reduce the nutritional value of leaves (Australian Academy of Science, 2015).

**Sea level rise:** According to the latest IPCC report, sea levels are estimated to rise between 26 and 98 centimeters by 2100 due to the thermal expansion of the oceans and the melting of polar ice. This increase, together with natural events expected to become more severe, puts coastal ecosystems at risk (Australian Academy of Science, 2015).

In conclusion, climate change is seriously altering the lives of living organisms and their habitats, and this situation is reducing genetic diversity among living species. As genetic diversity decreases, species become extinct, and the balance of ecosystems is disrupted. If this situation continues in this way, not only individual species but entire ecosystems will suffer irreversible and permanent damage.

## AGRICULTURE AMID THE DESERTS: SEAWATER GREENHOUSE

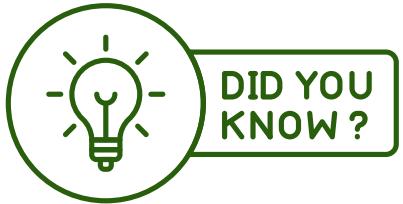
Earth is getting hotter, and droughts are on the horizon. Are all the countries affected by this in the same way and to the same level? Of course not. Some poorer and geographically disadvantaged countries are not able to reach clean water sources easily, which results in malnutrition as well as serious illnesses. How will they improve agriculture in the middle of the desert without freshwater? With the help of a special system: Seawater greenhouse.

"Let's make use of what there is enough of on the planet: Saltwater, sunlight, and deserts," says Kjetil Stake, managing director of this greenhouse project. This is a system that is actually very simple; it only combines the principles of evaporation and condensation of saltwater. The water pumped from the sea is evaporated through big cardboard pads, also known as evaporators. Evaporated water humidifies and cools the air inside the greenhouse, which decreases the amount of water plants need and creates suitable conditions for growing. At the end of this process, air moves to the condenser unit to be transformed into freshwater. The concentrated brine (too salty water) may be used for producing salt in the following steps (BBC, 2025).

Our current situation, comfort, and luxury may not last long; we should be super careful about our way of consuming water. Water is everything: It is food, it is life, and it is hope. The responsibility doesn't end when we stop wasting; there are so many things to do. Actions taken against the climate change crisis play a key role in today's world. We should invest more in this issue, follow the developments, and do whatever we can (UN, 2025).

In summary, seawater greenhouses are basic systems that help us maintain the water cycle of the environment for more fertile agriculture in deserts. As humans, we should be curious and endlessly follow what is happening in the climate change crisis and should find sustainable solutions for the problems we face.

Meryem Kılınç



Although plants have no ears, they can sense vibrations. Studies show that plants can hear the sounds of insects chewing on their leaves, and when they detect these sounds, they respond by producing chemicals for their defense systems. (Aftab, 2024).

Zeynep Güvendi

## **ALBINO CORAL REEFS: THE SILENT CRISIS BENEATH THE WAVES**

Have you ever seen the colourful things that seem like stones at the bottom of the sea? Actually, these are the animals in the ocean called “corals”. Coral reefs have a lot of crucial benefits for all the species in the world. If we consider that the ocean produces 70% of atmospheric oxygen, then it contributes significantly to oxygen production (Coralrestoration, 2025). Also, they are important for marine species and the food chain. Nevertheless, we continue to destroy them with our hands. They are losing their glamorous colours and their benefits, and then they die because of climate change. The name of this issue is coral bleaching. How can we prevent coral bleaching? What can be done to protect these little stone-like animals?

Firstly, we have to know the causes of coral bleaching. Temperature change is one of the reasons. Corals turn white when they expel the algae living inside them that provide their colour. Even a 1-2°C increase in sea temperature over a few weeks can cause this bleaching. This does not mean that bleached corals are dead; they can recover. However, if corals are bleached for prolonged periods, they eventually die (IUCN, 2025). Ocean acidification is also a reason for bleaching. Corals are becoming weaker and susceptible to stress with acidification. Most of us know that the biggest reason is “climate change”. To prevent bleaching in coral reefs, I would like to suggest several courses of action:

### **MPAs (Marine Protected Areas):**

MPAs are protected coastal and marine areas established to safeguard ecosystems and natural resources. They help preserve biodiversity and allow fish and shellfish populations to recover. By controlling pollution and sediment from surrounding watersheds, MPAs also improve water quality. When coral reef communities are protected from various stresses within MPAs, they can recover faster from disturbances (Coral, 2005), leading to increased oxygen production.

### **Reduction of Greenhouse Gas Emissions:**

We can reduce emissions by shifting to alternative technologies that either don't need gasoline (like bicycles and electric cars) or don't need as much (like hybrid cars). Using public transportation, carpooling, biking, and walking leads to fewer vehicles on the road and fewer greenhouse gases in the atmosphere (SCIED, 2025). Also, we can donate to some foundations like the Great Barrier Reef Foundation and SECORE (BarrierReef, 2025; Secore, 2025). These foundations take responsibility for protecting coral reefs and encourage others to become aware and focus on small solutions that everyone can implement to protect these corals.

In a nutshell, the bleaching of coral reefs is caused by the damage humans impose on nature, but it is within our power to change this. Therefore, small actions that everyone can implement could slow down or even stop the problem. There are many solutions, for example, using public transportation, not polluting the seas, and donating to foundations. Everyone must take on this responsibility to keep our waters colourful and leave an oxygen-rich world for future generations.

## BIGGER THAN THEY LOOK: THE INSECT PROBLEM

Climate change... We've probably all heard it and know something about it. It has been a very popular topic to discuss in the last decade. It is undeniable that natural systems are changing in the world, but it is not only about temperature - it is more than that. It changes ecosystems and habitats, too. However, I want to draw your attention to a different and interesting aspect of this issue: insects. Climate-caused heat and floods allow disease-carrying insects to spread to new places. Rising temperatures, changing rainfall patterns, and extreme weather events create ideal conditions for pathogens and their vectors, such as mosquitoes, midges, and ticks, to thrive (Gavi, 2025). We have to start thinking about this issue.

In order to understand this problem completely, we have to start from the beginning: how is climate change increasing the spread of insects? Professor Hamit Ayberk from Istanbul University-Cerrahpaşa's Faculty of Forestry emphasises that rising temperatures increase insect metabolic rates, and this ends up in faster reproduction. Climate change is having significant effects on insects and ecosystems. To demonstrate, mosquitoes reproduce more quickly in warmer environments and reach larger populations. Ayberk explained that the increase in insect populations in urban areas is due to a combination of climate change, urbanisation, environmental factors, and deficient water management.

Vector-borne diseases, which are illnesses that are transmitted to humans through vectors such as mosquitoes, ticks, or other insects, are no longer special to a specific region. For example, dengue is a kind of viral infection that is spread from mosquitoes to people. The most common symptoms are high fever, headache, body aches, nausea, and rash (WHO, 2025). In the past, dengue fever was mostly limited to tropical regions such as Southeast Asia and Latin America. Regardless, in recent years, cases have been reported in Southern Europe, including countries like Italy, Spain, and France, as rising temperatures have allowed dengue-carrying mosquitoes to survive in these regions (ECDC, 2023). Unfortunately, every year, there are more than 700,000 deaths from diseases such as malaria, dengue, and Japanese encephalitis. When we look at our country, the World Health Organization (WHO) shows Türkiye's Southeastern Anatolia region as a "malaria region".

When we look at the economic results of this issue, we understand that climate change not only expands the geographic range of disease-carrying insects and increases vector-borne diseases but also causes significant social and economic impacts on health systems and communities. For instance, in Europe, rising outbreaks of dengue and other vector-borne diseases show the broader social costs, while a study in France estimated that the economic burden of repeated mosquito-borne epidemics exceeded \$94.7 billion over 45 years (Roucaute, 2024).

In conclusion, the results of climate change are showing themselves day by day, and everyone and everything is getting affected by this. We have to seek solutions if we do not want to live in a sicker world in the future. We shouldn't forget that this is just one of the dozens of known problems of climate change.

Merve Naz Demirci

## BROKEN MIGRATION ROUTES IN A WARMING WORLD

Problems with animal migration patterns play a significant role in understanding how ecosystems function and stay balanced. However, in recent years, climate change has caused great and noticeable changes in these natural movements. One study shows that migration problems affect species behaviour, population size, and even long-term survival, so it is important to look carefully at the reasons behind this issue (Seebacher and Post, 2015).

The main problem is that climate change is happening faster than many animals can adapt to it. When spring arrives earlier, insects and plants appear earlier as well. However, many animals, especially birds, cannot change their migration timing fast enough. For example, long-term radar studies in North America show that certain bird species now migrate several days earlier because of warmer spring temperatures (Kuletz et al., 2024). This situation may create a mismatch: birds may reach their breeding grounds before food is ready, or sometimes too late to compete for good nesting places.

Marine animals face related problems. For instance, warming ocean waters have changed the routes of fish such as salmon and sardines, and some whale species have begun traveling longer distances because their feeding areas shift each year. These changes make migration more difficult, less predictable, and sometimes more dangerous.

These examples show that climate change is affecting both short-term movements and long-term habitats. Therefore, understanding these changes is necessary before looking for helpful solutions, since migration is closely connected to temperature, food availability, and seasonal cycles.

To reduce the impact of climate change on migration, we need solutions that help animals move safely in changing habitats. One effective approach is creating migration corridors—protected areas that connect feeding and breeding locations. These corridors give animals safer and more flexible routes, allowing them to change their paths when the climate shifts. Another important action is restoring damaged habitats, especially stopover sites where animals rest and find food during long journeys.

In oceans, better fishery management and temperature-based monitoring systems can support migrating species by reducing stress on their natural routes. Also, lowering greenhouse gas emissions is necessary because it slows down global warming, which is the main cause of these disruptions. The one study shows that combining local habitat protection with climate-friendly policies helps migrating species more effectively than using a single method (Horton et al., 2019).

In a nutshell, climate change is clearly disrupting the migration patterns of many species, making it harder for them to find food, safe habitats, and suitable breeding areas. These changes affect wildlife and the ecosystems that humans depend on. Therefore, protecting migration corridors, restoring key habitats, and improving management in both land and marine environments are practical and important steps for supporting species as they adapt to new climate conditions. When these actions are combined with efforts to reduce greenhouse gas emissions, they become even more effective. Research shows that such integrated strategies can help stabilize populations and reduce long-term risks in a warming world.

Yahya Bektaş, Bilal Ünal

## **CLIMATE CHANGE AND THE DECLINE OF POLLINATORS: TEMPERATURE STRESS ON INSECT PHYSIOLOGY**

One of the major dangers that faces the global ecosystem is climate change, which is caused by rising temperatures that affect living organisms at various levels of biology (Kerr et al., 2015). Some of the organisms that are most threatened by climate change are pollinators, especially insects like bees that play an essential role in sustaining the ecosystem (Potts et al., 2010). Climate change is caused by temperature stress that leads to the decline of pollinators (Le Conte and Navajas, 2008).

Insect species are ectothermic, and their body temperature depends on environmental factors (Hamblin et al., 2017). When the global temperature increases, it significantly affects the metabolism of pollinators (Hamblin et al., 2017). When temperatures are higher, it significantly increases the metabolic rates of pollinators (Hamblin et al., 2017). Metabolism becomes less effective, causing inefficiencies in energy utilization (Le Conte & Navajas, 2008). It is likely to contribute to fatigue, decreased foraging rates, or reduced lifespans (Goulson et al., 2015). If it affects bees, heat stress influences muscle performance, reducing flight endurance or nectar and pollen gathering capacities (Hamblin et al., 2017).

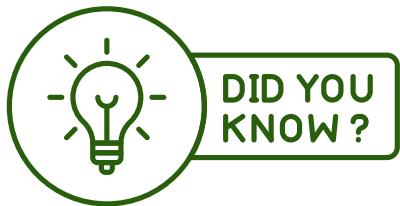
Temperature stress also influences the nervous systems of pollinators, especially with regard to their ability to navigate (Le Conte & Navajas, 2008). Bees use complex nervous system abilities to analyze visual signals, polarized light, and magnetic signals for navigation (Potts et al., 2010). Temperature stress can impede nervous signals and perceptions, thereby impairing return rates to the nests or hives (Hamblin et al., 2017). This leads to reduced worker numbers among bees, making the colony less resilient (Goulson et al., 2015).

Reproductive rates among pollinators constitute yet another physiological process threatened by warmer temperatures (Le Conte & Navajas, 2008). This is attributed to the influence of temperature on hormone regulation as well as the development of gametes, with the end result being low reproduction rates (Le Conte & Navajas, 2008). Poor reproduction among social organisms such as bees can significantly contribute to reduced colony growth (Potts et al., 2010). This eventually translates to population declines that cannot be easily reversed (Kerr et al., 2015).

Biological impacts of temperature stress on pollinators not only occur at the organismal or species levels but also occur at the ecosystem level (Potts et al., 2010). This is attributed to reduced pollination efficiency, which eventually influences plant reproduction by decreasing crop yields and plant biodiversity (Potts et al., 2010). This is because many flowering plant species rely heavily on pollinators to maintain genetic diversity (Potts et al., 2010).

Therefore, climate change is a biological threat to pollinators, with influences on their metabolism, nervous systems, and reproduction (Le Conte & Navajas, 2008; Goulson et al., 2015). It is important to appreciate the significance of these physiological processes, since the loss of pollinators represents more than the extinction of a single group of species; it threatens the stability of entire ecosystems (Potts et al., 2010).

Enes Yiğit Cebeci



### Who Really Drives the Climate Crisis?

The problem of climate change is believed to be the consequence of individual actions. For example, the concept of a “carbon footprint” suggests individual responsibility when, in fact, evidence shows the opposite. According to the Carbon Disclosure Project, 71% of total carbon emissions from the industrial sector since 1988 can be traced back to 100 fossil fuel companies, meaning that the problem is not primarily in individual actions but systemic. Instead, the problem is cloaked in a structure of misleading information, rather than a moral failure (Oxfam, 2023).

Hüseyin Selim Bilgin

## DECREASE IN AGRICULTURAL GOODS YIELD

Since the start of the industrial revolution, the production of agricultural goods has changed and is still changing with the advancing technology. Consumer goods are increasing proportionally with the human population. Yet it doesn't mean that the welfare of the people could go up proportionally with the skyrocketing increase in the human population. The research made by Garibaldi and his friends (2011) states that during the last 50 years, the human population increased 128% from 3.0 to 6.9 billion people, whereas cultivated area and crop yield increased globally by 33% and 57%, respectively. They also state that human welfare depends on the amount, stability, and efficiency of agricultural goods, as determined by crop yield and cultivated area (Garibaldi et al., 2011).

According to TableDebates (2025), the agricultural good yield means "the average net output of agricultural product (e.g., in kCal, grams protein, or net profit) per unit of farmland per year" (TableDebates, 2025). Declining yield growth with increased inputs prompts conversion of more land to cultivation, but at the risk of eroding ecosystem services, and the quality of agricultural products mostly depends on the yield for agricultural production. With the growing population of Earth, the Capital system (co-operation-based capitalist and free trade world system) needs more consumer goods to feed those people. Yet the earth is finite, and the capital has to develop new technologies to produce more nutrients. It happens because urbanisation and expanding cities are limiting free land for agriculture. The newly developed technologies, such as Genetically Engineered (GE) crops, provide these needs to the system. However, as the results show, GE crops start to lose their efficiency as time passes (Henry et al., 2006).

Genetically modified crops have clearly improved certain agronomic features, including pest resistance and herbicide tolerance, and therefore made it possible for farmers, at least partially, to increase productivity. For example, herbicide-tolerant and pest-resistant crops have reduced the need for pesticides and pest control, thus increasing farm revenues in specific areas. However, the evidence suggests that these productivity levels are not maintained in the long term or even in all environmental conditions, and the overall annual contributions of GE crops solely towards increasing productivity are small, at least in comparison to the pre-adoption era and rates of progress realized by traditional breeding. This, in turn, suggests that GE technology by itself is not necessarily the tool that guarantees continuous and consistent growth (National Academies Press, 2016).

Additionally, there may be ecological threats that might affect the sustainability and efficiency of genetically engineered (GE) crops. This might involve gene flow from GE to relatives or non-GE crops. This would lead to a reduction in biodiversity and might affect agro-ecosystems. In addition, impacts on non-target species, soils, and biodiversity might still require additional research to be understood. The complex relationships between GE crops, agri-practices, and agro-ecosystem processes highlight that gene technologies are not panaceas. Effective sustainability of gene technology will, therefore, involve comprehensive management (Arvas and Kaya, 2019).

Mahmut Sami Yılmaz, Eşref Vatansever

## EARTH IN DANGER: CLIMATE CHANGE AND THE LOSS OF BIODIVERSITY

Nowadays, we face a crucial issue: climate change. It affects many aspects of life and leads to various secondary issues. We all probably know that biodiversity is significant for living organisms- especially humans, but why? Mainly, different and rich ecosystems provide essential resources. Each type of ecosystem plays distinct roles on Earth, and they are in perfect harmony with each other.

One of the most important solutions to biodiversity loss is 'biodiversity conservation'. Biodiversity can be conserved by two main methods: in situ conservation and Ex-situ conservation. In-situ conservation means protecting species in their natural environments by conserving habitats, like forests, oceans, and deserts. There are four methods of in-situ conservation: 'National parks', which are protected areas managed by the government to conserve wildlife and the environment, where human activities are completely restricted. 'Wildlife sanctuaries' were designed to protect and conserve species in their natural habitat. The capture, killing, and poaching of animals are strictly forbidden. 'Biosphere reserves' are large protected areas for the conservation of wildlife, plant and animal resources. 'Sacred groves' are protected forest areas preserved by local communities due to religious or cultural beliefs (GeeksforGeeks, 2025).

Ex-situ conservation is the protection of species outside their natural habitat, typically when their natural environment is threatened. There are also four methods: 'Zoological parks', places where animals are kept for public viewing and for conservation. 'Botanical gardens' are gardens specially meant for the collection, cultivation, preservation, and display of a wide variety of plants. 'Gene banks' will preserve the genetic diversity of wild and domesticated plants and animals. 'Cryopreservation,' which is the long-term process of keeping live cells, tissues, and other biological samples frozen at sub-zero temperatures for storage and preservation (GeeksforGeeks, 2025).

In conclusion, biodiversity loss is a global issue that affects both ecosystems and human life. It can be prevented with small changes at the personal level. However, action at the societal level is also necessary for long-term solutions. Conserving biodiversity and protecting habitats are essential to provide a sustainable future for both humans and nature.

Betül Tanrıverdi

## GREEN LIES: CLIMATE CRISIS OR GLOBAL CONTROL?

The world is facing a bigger crisis every day and is preparing its own end. Today, the biggest threat is called the climate crisis. The average temperature of the Earth is increasing; living creatures and plants are losing their habitats; and global disasters such as droughts, heavy rainfall, floods, and storms are occurring. However, none of these disasters is new. Their main cause goes back to the steam engines that began to be used during the Industrial Revolution.

In this essay, I will discuss why this problem, although its roots go back a long time, has started to be used as a propaganda tool by international organizations such as the United Nations, companies, and many foundations. Nowadays, it is almost impossible to find someone who has no idea about this issue. Most people believe that this is a very serious problem and that the main responsibility belongs to themselves and to all humans. However, while large companies pollute the world much more than a single person ever could through their waste and carbon emissions, why do most people think that they themselves are the main ones responsible?

The reason is that the climate crisis has turned into a tool for hiding the mistakes of companies. These companies have convinced people that the carbon they emit is a serious problem and have introduced a project called "carbon footprint measurement", claiming that emissions can be reduced and limited in this way. People have ignored the emissions caused by these companies and started to believe that this project is necessary to save the world. However, the basis of this project is built for a purpose very different from preventing climate change.

First, let's look at the economic reasons behind this project. In a statement made by the IMF Managing Director after the coronavirus pandemic, it was suggested that a new monetary system should be established in which people have digital accounts at central banks instead of private banks, and digital money is used instead of cash (Georgieva, 2022). Along with this system, it is aimed to introduce a tax system called "carbon tax," where people would pay money based on all the carbon they consume, from the meat they eat to the vehicles they use. In short, large and wealthy international powers are planning a new world order in which they use climate change and carbon footprint as an excuse to exploit people's money and limit their lives according to their own interests.

When we look further back, we see that this plan is older than we think and goes back about 50 years to the Club of Rome. The Club of Rome is an elite group founded by businessmen. In 1972, the club published a report called *The Limits to Growth*. In the first point of the conclusions section of the report, the following statement is included: "If the present growth trends in world population, industrialization, pollution, food production, and resource depletion continue unchanged, the limits to growth on this planet will be reached sometime within the next one hundred years." (Meadows et al., 1972)

According to the report, one of the main steps to prevent climate change is reducing the world population and organizing people's consumption habits accordingly. As can be seen from this text, the responsibility is not placed on the massive production of companies, but on constantly growing and consuming people. After its first report, the Club of Rome published another report in 1991 called *The First Global Revolution*. In this report, the statement "In searching for a new enemy to unite us, we came up with the idea that pollution, the threat of global warming, water shortages, famine, and the like would fit the bill." draws attention (King and Schneider, 1991).



From this sentence and their previous claims, it can be understood that these groups, knowing that people would not accept the idea of reducing the world population, almost admit that they use global warming and climate change as an excuse. As another example, when we look at the video titled "8 Predictions for 2030" published by the World Economic Forum, it is stated that there will be a fee based on carbon, and we will have to pay taxes for it (WEF, 2016). Therefore, habits such as eating meat or traveling by plane will not be done very often. However, these restrictions will apply to ordinary people with limited budgets, while international companies and their owners will continue to pollute the world.

In conclusion, while trying to take part in the fight against climate change, we should be careful not to become a tool of the propaganda prepared by global companies that only serve their own interests. Many of the stories told aim not to protect the world, but to manipulate people. However, this careful attitude does not mean ignoring everything that is happening. As individuals, we should always fulfill our responsibilities to protect the Earth and avoid being overly consuming or wasteful.

Elif Gökkaya

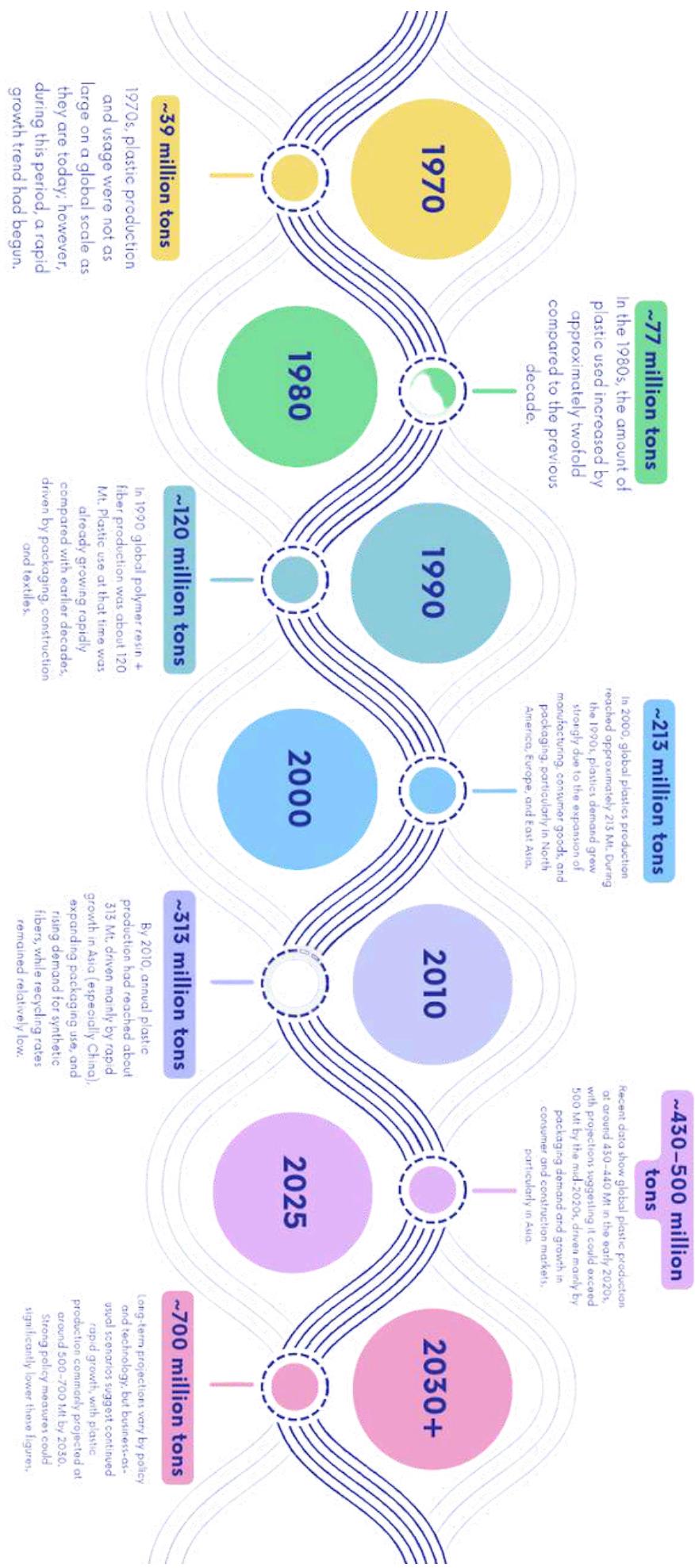
## OCEAN TEMPERATURES AND CORAL REEFS' STRUGGLE FOR SURVIVAL

Climate change is common problem in the whole world. As carbon pollution is emitted into Earth's atmosphere, it traps heat and causes a worldwide temperature increase, extreme weather conditions, and unusual ocean temperatures. Changes in ocean temperature significantly affect coral reefs, which are rich and diverse ecosystems that are important to marine life. This matters to us because we depend on coral reefs for fishing and tourism.

Corals have algae which live inside their tissues together. These algae give corals their color and provide sugars that are produced through photosynthesis. More than 90% of corals' energy requirements come from these algae. This energy is used to build their calcium carbonate, or limestone, skeletons. However, these algae are very vulnerable to even very small temperature changes. Temperatures that are 1-2°C above the normal summer maximum for only a few weeks can create heat stress. When corals are stressed, algae leave their tissues, and then the coral starts to bleach. Though corals can recover from bleaching, if stressful conditions continue for a few weeks, corals cannot live any longer. The death of corals damages marine life because animals such as fish populations, invertebrates, and other organisms rely on coral reefs for food, shelter, and breeding. (CORAL, 2015).

There are no historical records of large-scale coral bleaching events. That is why scientists say that past bleaching events occurred locally and tended to occur because of freshwater runoff after storms or extreme low tides. However, after 1990, climate change began to show its impact on oceans, especially on coral reefs (NOAA, 2024) This creates a serious risk for local economies and livelihoods through tourism, fishing, and coastal protection. The increasing frequency of coral bleaching events in recent decades threatens the future of these ecosystems and the biodiversity they sustain. (WWF, 2018) Reducing pollution and protecting coral reefs are necessary to prevent further bleaching and coral death, and to support the recovery of damaged reefs before irreversible damage occurs (NOAA, 2024).

Ahmet Selim Kurşun



Yusuf Alim

## **RETHINKING VECTOR CONTROL IN A CHANGING CLIMATE :**

Since insects are cold-blooded creatures, their distribution is closely related to climate. Rising temperatures accelerate the physiology of insects, leading to faster development and increased reproductive capacity (Yaşar et al. 2021). Vector-borne diseases are increasing due to factors such as climate change, centralisation, and pesticide resistance (WHO, 2020). Currently applied techniques for combating these vectors can be categorised under Chemical Control, Biological Control, Mechanical Control, Cultural Control, and Integrated Pest Management.

### **Chemical Control**

This aims to provide rapid and effective results against pests through the use of synthetic poisons. However, these substances remain in nature for a long time without decomposing, polluting water sources and harming other organisms besides the targeted pests, among many other negative effects. Insecticide spraying is not a long-term solution because it leads to the development of resistance in vectors (Dos Santos GR et al., 2022).

- Long-Term Insecticide-Impregnated Nets: A cost-effective tool used especially for malaria vectors (WHO, 2020; Kumar et al., 2024). New generation nets (e.g., synergistic or with different chemical mixtures) have been developed to overcome the resistance problem (Kumar et al., 2024).
- Indoor Residue Treatment: An effective method for vector control in high-risk areas, but new insecticides (e.g., clothianidin) should be used to reduce resistance development (Rani et al., 2023; Kumar et al., 2024).

### **Ecological and Environmental Management**

- Source Area Elimination: This involves eliminating, altering, or manipulating the breeding grounds of vectors (stagnant water pools for mosquitoes, grassy areas for ticks, etc.). (Rani et al., 2023) As an alternative method, Cuminum cyminum (green cumin) seeds have increased larval mortality and improved water quality in waters where mosquitoes breed (such as clean, stagnant, and wastewater) (Murugan et al. 2024).
- Modifying Human Habitats: Screening homes (screening mosquito nets), regulating water storage practices, and improving solid waste management reduce vector-host interaction (Rani et al., 2023).

### **Biological Control**

This is a sustainable control method that causes little or no harm to the environment. Innovative strategies supported by biotechnology and genetic approaches are being developed against insecticide resistance and environmental factors (Ojayli et al., 2022; Rani et al., 2023).

- Natural Predators and Pathogens

Using predatory species (e.g., some fish species, tadpoles that eat the young) or pathogenic microorganisms (e.g., biological larvicides such as *Bacillus sphaericus*) to reduce mosquito populations (Huang et al., 2017); Rani et al., 2023).

- Wolbachia Method

This is a biological method applied by spreading Wolbachia endosymbionts that prevent the development and transmission of disease pathogens (e.g., Dengue virus) in mosquito populations (Burt, 2014). Developed by the World Mosquito Program (WMP), this method reduces the ability of mosquitoes to transfer disease instead of killing them. Wolbachia, a naturally occurring bacterium found in approximately 50% of insects, is implanted into female *Aedes aegypti* mosquitoes to prevent disease transmission. These mosquitoes are then released into areas endemic to mosquito-borne viruses, where they mate with wild mosquitoes. The number of Wolbachia-carrying mosquitoes increases over time and becomes permanent in the population. This method is safe for humans, mosquitoes, and the environment; it is self-sustaining and cost-effective.

### Genetic Approaches

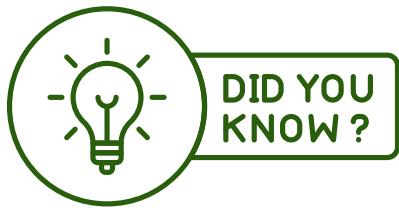
- Sterile Insect Technique: Releasing large quantities of sterilised (usually radiation-treated) male insects into the environment aims to reduce the population by causing unfertilized eggs to form as a result of mating with female insects (Burt, 2014).

- Genetic Modification: Releasing genetically engineered mosquitoes into the environment to reduce the vector's disease transmission capacity (making them resistant to the pathogen) or to control the population (Burt, 2014).

- Vector and Pathogen Surveillance

Continuous monitoring of insect population dynamics, pathogen presence, and insecticide resistance levels is necessary for the effective adaptation of health policies and intervention strategies (Namukasa Mugerwa, 2025).

Azra Betül Aksay



Climate change has traditionally been viewed through the lens of individual action, where communities are encouraged to collectively think about personal responsibility through concepts such as the “carbon footprint.” There is, however, evidence to counter such views. According to the Carbon Disclosure Project, about 71% of total carbon emissions from industry since 1988 are traceable to just 100 fossil fuel companies. This set of data indicates that the main cause of climate change lies not in people, but in big businesses, as well as the infrastructure on which big businesses thrive. Nevertheless, blame has shifted towards people through stories told, often in an indirect manner, for the climate changes, which belong in reality to big business. Consequently, blame is interiorized, and structural explanations of the crisis are effectively exempt from challenge. Climate change, in other words, needs to be perceived less as an issue of personal ethical failure and more as a structural issue framed through deceptive discourse that conceals structural sources of responsibility (Oxfam, 2023).

Hüseyin Selim Bilgin



## THE DISRUPTION OF THE CARBON CYCLE

If nature could be described by one word, what would it be?

In natural systems, nothing is truly wasted; matter is constantly reused. To illustrate, water constantly circulates from the atmosphere to the lithosphere.

In this context, “balance” can be a descriptive word. However, nature’s “balanced” system is now facing a great issue: global warming. Since the devastating effect of climate change on nature’s balance can not be explained in one single essay, we will be focusing on one core element’s cycle, which is disrupted. It has become a major reason for climate change: the carbon cycle.

Carbon is the fourth most plentiful element in the universe after hydrogen, helium, and oxygen. (NASA, 2011) From the rocks in the mountains to the oceans, it can be found everywhere on Earth. And the most pivotal thing is, it is the backbone of life on Earth. Carbon in the atmosphere is usually found as carbon dioxide. During photosynthesis, by using energy from sunlight, plants use carbon dioxide in order to produce glucose and oxygen. Living things use glucose as energy and structural raw material. Once consumed, carbon, in the form of glucose, circulates throughout the food chain. Herbivores eat plants, and carnivores eat herbivores. Then, it is either released into the atmosphere through respiration or from the dead bodies of animals into the soil. Now.. What is the issue?

Plants are now not enough to incorporate rapidly released excess carbon into their own cycle. In addition, by removing forests ( deforestation ), we are also eliminating plants that can take carbon out of the atmosphere, and everything is starting to get stuck in a deadlock.

Oceans can indeed absorb enormous quantities of carbon, but it doesn’t mean that they can cleanse Earth’s atmosphere. When carbon is dissolved, it turns into carbonic acid, which increases the acidity of water. The pH level of the ocean’s surface has already dropped by 0.1 since 1750. This means a 30% change in acidity since the industrial era. (NOAA, 2020) Moreover, marine life is harmed by this issue. For instance, acidification makes carbonate ions -which are used by some organisms to make their shells or skeletons- less available. Scientists decided that global warming is mainly caused by human activity. Specifically, carbon emissions. 20% of the greenhouse effect is caused by carbon dioxide. (NASA, 2011)

Before it gets too late, investigations that aim to resolve the issue should be encouraged. If not now, when?

Elif Ahsen Soylu



# GAME BIONEST





## THE WAY OF DECARBONISATION:

### DIRECT AIR CAPTURE SYSTEMS AND ORCA

The issue of global warming is one of the most complex issues from all sides, with its interdisciplinary effects. Particularly, in consideration of the rise in the global surface temperature, the recruitment of new ways of generating energy is highly demanded amongst many due to the carbon dioxide from conventional fossil energy resources or carbon dioxide, which causes the greenhouse effect (Haenn, Wilk and Harnish, 2016). So, a new construction, called Orca, has been launched recently, which seeks to suppress the effects of the overall rise in the world's temperature. .

Orca is a direct-air-capture (DAC) installation developed by the company Climeworks. It was launched in September 2021. The facility is located in Iceland next to the Hellisheiði Geothermal Power Plant, where it captures atmospheric CO<sub>2</sub> and stores it permanently underground through mineralisation (TechCrunch, 2021).

Direct-air-capture system is a climate mitigation technology designed and enhanced to segregate carbon dioxide directly from ambient air, from the atmosphere itself. A carbon dioxide source capture system, which aims to capture carbon dioxide before it is released into the atmosphere, does not need to be placed in large industrial emission points. It functions with big fans that pull the outside air in. Then the air traverses sorbents such as liquid solvents or solid filters, which can bind with carbon dioxide chemically. The captured CO<sub>2</sub> is subsequently compressed and injected deep underground, where it is permanently stored through mineralization. (Nordic Investment Bank, 2023)

Basically, Orca is officially the largest DAC system in the world with a permanent storage facility. It segregates the air from CO<sub>2</sub> and transports the CO<sub>2</sub> underground for mineralization after releasing the remaining carbon into the ambient. To understand how capable Storeca is, it can capture 4000 tons of CO<sub>2</sub> and store it underground. Additionally, since the CO<sub>2</sub> is mineralized, the removal is permanent, which turns CO<sub>2</sub> into nothing but rock (TechCrunch, 2021). Besides, Orca has been validated to meet the high standards for the removal of CO<sub>2</sub>, which facilitates to ensure credibility. Nonetheless, Orca is severely cost-intensive. For instance,

- The process is energy and cost-intensive. Although Orca uses geothermal energy, the running fans, heating filters, and used substances are not negligible. Economic sustainability and energy supply are primary concerns. (Techcrunch, 2021)
- 4000 tons per year is estimated for global emissions. To commence a serious dent in the reduction of CO<sub>2</sub>, many facilities such as Orca would be needed. (Nordic Investment Bank, 2023)

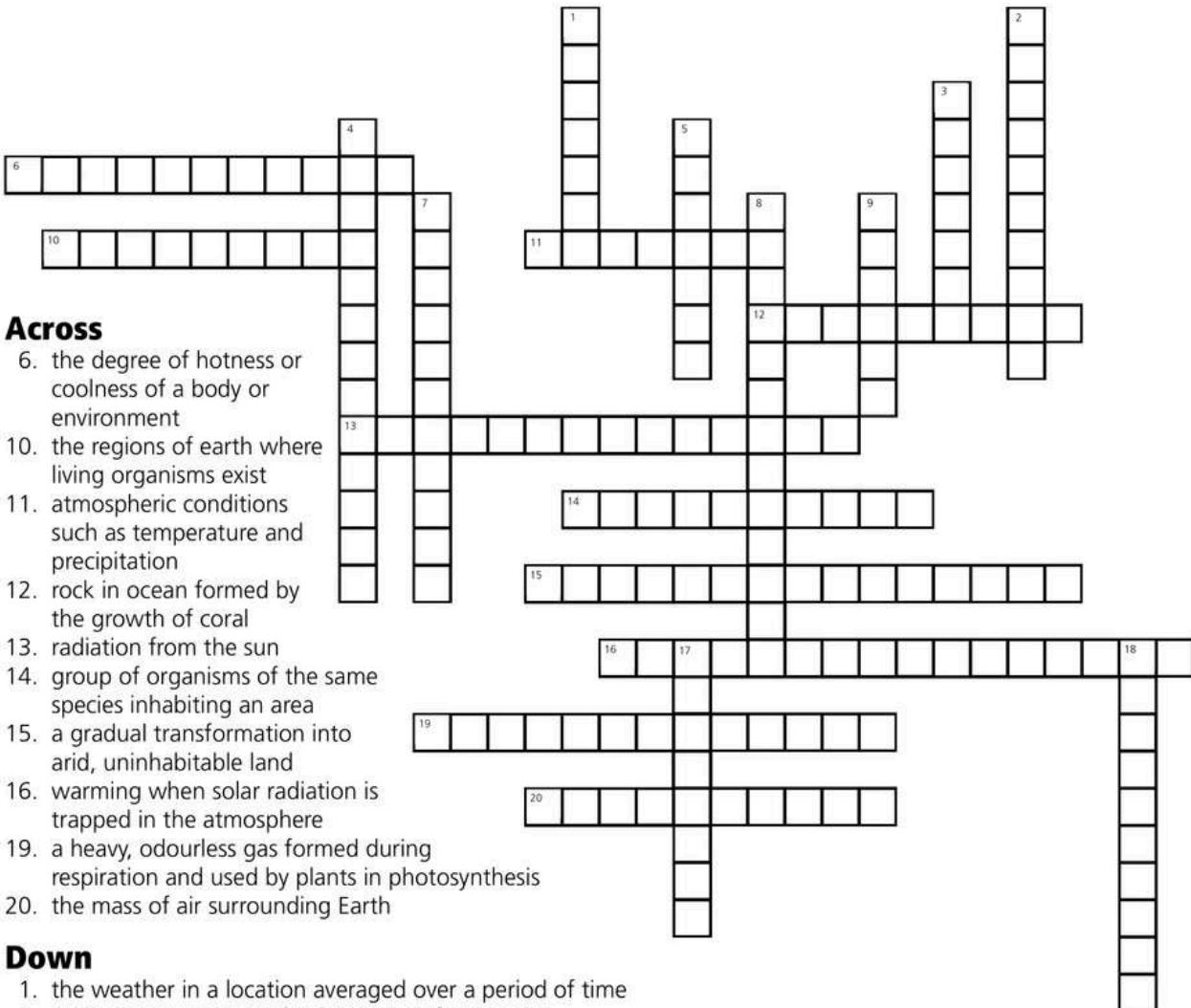
- The geology of the location matters significantly since the mineral storage process counts on appropriate underground formations such as basalt, and not every place has those suitable conditions. (Bipartisan Policy Center , 2021)

Despite all of those challenges, while Orca demonstrates the potential of direct air capture (DAC) to remove carbon dioxide directly from the atmosphere, it provides a greater direction of view for carbon capture technologies. The more commonly used point-source capture systems are placed at the source of CO<sub>2</sub>, such as power plants, cement factories, etc., where CO<sub>2</sub> concentrations are significantly higher. Unlike DAC, point-source capture primarily prevents new emissions from entering the atmosphere rather than reducing past carbon. Although point-source systems are generally more energy and cost-efficient due to the concentrated nature of emissions, they cannot achieve the negative emissions necessary to reverse the accumulation of greenhouse gases. (TechCrunch,2021) Therefore, it is doubtful which capturing system is greener.

In a nutshell, as DAC technologies like Orca keep advancing, they can offer a tangible way to reduce emissions and support global decarbonisation efforts more. But today, in the meantime, Orca and other DAC projects, including Climeworks' Mammoth plant and Carbon Engineering's pilot facilities, illustrate a modular approach to atmospheric carbon removal. Together, these technologies (PSC and DAC) form complementary strategies. Point-source capture mitigates ongoing emissions while DAC provides a mechanism to actively reduce existing atmospheric CO<sub>2</sub> levels. (TechCrunch,2021)

Abdullah Selim Demir

# Climate Change Crossword



## Word List

Agriculture	Glacier
Atmosphere	Greenhouse Effect
Biosphere	Greenhouse Gas
Carbon Dioxide	Impact
Carbon Sink	Methane
Climate	Population
Coral Reef	Precipitation
Desertification	Solar Radiation
Emission	Temperature
Fossil Fuel	Weather

## **THE WORLD IS LOSING ITS BREATH: THE EFFECTS OF CLIMATE CHANGE ON PHOTOSYNTHESIS**

"To protect to environment, we should plant trees!" is a sentence most of us have probably heard before. Trees and plants help protect the environment through a process called photosynthesis, which converts carbon dioxide into oxygen. This process not only cleans the air but also provides the oxygen necessary for life on Earth. However, climate change is heavily disrupting photosynthesis, putting ecosystems and human life at risk. While photosynthesis is a crucial factor for the Earth's ecosystem, humans damage the natural cycle of oxygen and carbon dioxide, harming all living things—including ourselves—due to the climate change we cause. This short article aims to answer the following question: How does climate change affect the photosynthesis cycle?

Global climate change has a direct impact on plant production, photosynthesis, carbon dioxide levels, drought, and environmental stress. An increase in atmospheric carbon dioxide generally increases the photosynthetic rate and carbon assimilation. At the same time, rising temperatures shorten plant growth periods, lead to early maturation, and cause yield losses, especially during flowering, pollination, and grain-filling stages (Yavaş and Ünay, 2018). Thus, while increasing carbon dioxide levels may initially benefit photosynthesis, rapid temperature rise not only cancels out these positive effects but also begins to damage the process itself. Additionally, extreme heat can damage plant enzymes that are essential for photosynthesis, reducing efficiency and slowing plant growth. Heat stress may also cause plants to allocate more energy toward survival rather than growth (Mishra et al., 2023).

There are several indirect effects of climate change on photosynthesis. Drought conditions cause plant stomata to close, reducing carbon dioxide uptake and limiting photosynthesis. Soil degradation further weakens the soil structure, reducing its ability to retain water and nutrients, which in turn impairs root growth, water uptake, and nutrient absorption (Oishi et al., 2025). Also, changes in rainfall patterns due to climate change also increase stress on plants. While some regions experience flooding, others face prolonged droughts. These unpredictable conditions make it difficult for plants to maintain normal photosynthetic activity, ultimately reducing growth and productivity (Kajrolkar, 2025).

Increasing levels of carbon dioxide pose significant risks to life on Earth, as they contribute to rising global temperatures and exacerbate extreme natural disasters, including floods, tornadoes, and tsunamis. As discussed in this article, they also disrupt the photosynthesis process. Photosynthesis is essential for all living organisms because it is the only effective, natural, consistent, and sustainable source of oxygen and nutrients on Earth. Therefore, when climate change negatively affects photosynthesis, humanity is directly impacted as well.

Mustafa Salih Dillii

## **WORLD'S % 71% IS IN DANGER: OCEAN DEOXYGENATION**

What if I told you that water sources worldwide are becoming increasingly scarce and unusable? After the Industrial Revolution, it facilitated people's work by utilizing machines. However, it brought tons of problems with it due to people's negligence. Those problems became bigger and bigger, which led to Climate Change in the long run. However, I wanted to talk about the ocean in water.

First of all, we need to know the amount of elements in water, such as phosphorus and nitrogen, to find a more efficient solution. Since deoxygenation reduces oxygen in the water, other harmful elements might increase. For example, microbes in the water could not find a sufficient amount of energy to conduct aerobic respiration, and instead, they conduct denitrification to obtain energy, a process that produces N<sub>2</sub>O, a harmful greenhouse gas(UNESCO, 2025). However, it is really important to detect carefully both horizontally and vertically, and find an appropriate solution for all different deoxygenations and how to solve them.

Ocean Deoxygenation is caused by Climate Change. Climate Change has gradually made and is still making our world warmer. Warming increases the microbial consumption of oxygen and also reduces the supply of oxygen at the same time, which increases stratification(UNESCO,2025), the state of water separating into layers according to temperature differences, and decreases the solubility of oxygen and amounts of harmful elements.

As you can see, it is impossible to tell every solution for different amounts. However, there is one thing that should be done in all: Taking control of overfishing. People hunt fish not only for eating or selling, but also, and especially, they hunt them for more money. Even though they earn tons of money, they disrupt the balance of acid and oxygen, which leads to more marine deaths and also disrupts the food chain. If we do not act properly and let this happen, it will eventually affect human life as well. In contrast, if we can detect the amount of harmful elements in water, it will be much easier to monitor the areas where fishing needs to be reduced. This would help us to protect both the food chain and the balance of acid and oxygen in our oceans.

Last but not least, we need to inform people about climate change, its causes, consequences, and impacts as much as we can to solve this huge issue (UNESCO, 2025). We can inform people via websites, advertisements, and journals like ours. It would not be easy and also require a long time to demonstrate its impacts, of course, but if we reach more people, we can save and protect our world for our next generations.

In conclusion, ocean deoxygenation is a harmful consequence for human life caused by climate change and warming temperatures. Solving this issue won't be easy and will require lots of time. However, if we can detect the amount of harmful elements, take control of overfishing, and inform people as much as we can. We can overcome this huge and harsh global issue (OCEAN DECADE, 2023).

Faruk Eymen Deniz



## **EFFECTS OF GLOBAL WARMING ON LIVING ORGANISMS**



## THE EFFECT OF PEOPLE ON THE CARBON CYCLE

Carbon is an element and is found in glucose, which is necessary for energy. Carbon circulates around the Earth through the “carbon cycle”. The carbon cycle is the movement of carbon, in the form of carbon dioxide, into and out of the atmosphere.

In this cycle, plants turn carbon dioxide into glucose through photosynthesis. By eating plants, animals take glucose and release carbon dioxide into the air through respiration. As a result, the amount of carbon dioxide in the atmosphere is kept balanced.

The carbon cycle is divided into two parts:

Carbon sink: It is a system that takes in more carbon from the atmosphere than it releases, such as plants, oceans.

Carbon source: It is a system that releases carbon to the atmosphere, such as fossil fuel combustion, volcanoes, and animals.

All right, so what is the problem?

Since the Industrial Revolution, humans have used carbon-based fossil fuels to make energy in factories. However, these factories emit carbon dioxide into the air. Already, animals and other living organisms are giving out carbon dioxide into the atmosphere, so when factories are added, the amount of carbon dioxide in the air increases. This carbon dioxide is also a greenhouse gas, meaning that this excess accumulating in the atmosphere traps heat reflected from our planet, leading to global warming.

If we had increased the amount of forests on the Earth, maybe this problem would not have arisen. However, because of deforestation, we attack the cycle from both sides. We decrease carbon sinks while we are increasing carbon sources. It exceeds the capacity of the carbon cycle and accelerates climate change by causing greenhouse gas levels in the atmosphere to reach record levels.

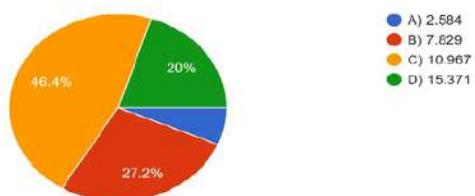
In conclusion, the carbon cycle is not just a topic of natural sciences; it is closely related to both our and Earth's future. To protect this perfect balance, we should reduce carbon emissions and preserve forests. Let's not forget that only by understanding our role in the carbon cycle can we save our future (Leigh , 2024).

Melek Ataoğlu

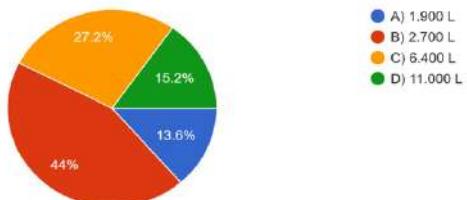
## STUDENT VOICE SURVEY

In this research, our aim was to learn how much knowledge students at different grade levels in our school have about climate change and to gain ideas on how we can raise awareness about this issue. After preparing five questions related to climate change, we completed a survey with 125 people by conducting a digital questionnaire and face-to-face interviews. As a result, we measured people's level of knowledge on this topic, which was our initial goal, and reached some ideas on raising awareness.

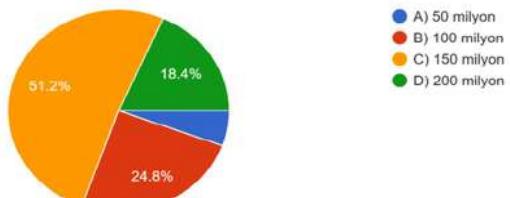
1- How many species on the IUCN Red List are affected by climate change?



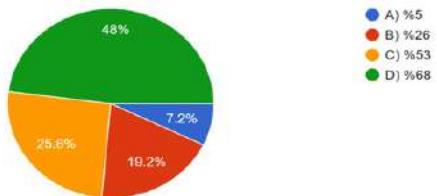
2- How much water is needed to produce a single cotton T-shirt?



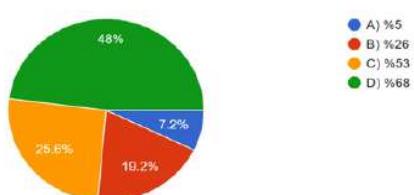
3- At least how many trees are cut down annually due to the fashion/textile industry?

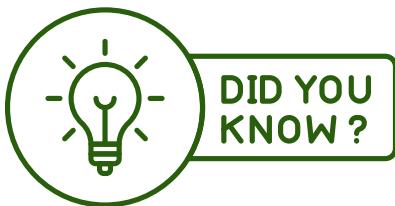


4- What percentage of the world's freshwater is stored in glaciers, polar ice caps, and permanent snow?



5- How much has global sea level risen since 1995?





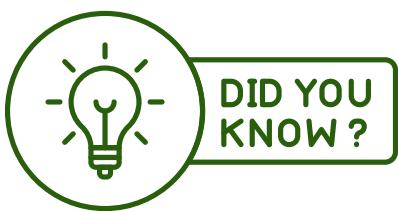
Vast forests, solar panels and wind turbines are what we thought would play roles in tackling climate change when we first heard it. Moreover, while everyone reputed plants are organisms which reduce carbon-dioxide the most, actually there is something else. However, the biggest actors do not live in the depths of the forest but swim in the darkness of the ocean. The ones that have the most enormous bulk and the ones that are the microscopic giants of the ocean. Whales and phytoplankton.

Whales are the biggest mammals in the world both biologically and also in carbon-dioxide circulation. They feed and go to the surface of the ocean to breathe since they do not have gills. This process is called "Whale Pump". In this situation they excrete enormous amounts of feces into the water. The feces include a large number of basic nutrients such as iron, nitrogen and phosphorus which phytoplankton feed on, grow and reproduce.

Phytoplankton's photosynthesis is just like plants on land. Surprisingly they produce at least 50% of the oxygen in our atmosphere (NASA, 2016). As whale numbers increase, phytoplankton increase as well which leads to decrease in carbon levels. Studies show that whale rich areas include significantly high phytoplankton presence (Roman and McCarthy, 2010).

Whales are not just the giants of the ocean, at the same time they are huge storages of carbon. When a whale dies, it sinks to the bottom of the ocean which is called The Whale Fall. This causes the carbon that was taken from air in the whale to be imprisoned on the bottom of the ocean for centuries. According to data, a whale carries approximately 33 tones of carbon to the ocean floor. When comparing this to a tree which can only absorb 22 kg of carbon in a year, we understand the importance of whales (Chami, et al., 2020).

Zeynep KARAKAŞ



### Plants "Call for Help" Using Chemical Signals

When attacked by an insect, plants are not passive victims. Special receptors in their leaves recognize chemicals in the insect's saliva. This triggers the plant to immediately release volatile organic compounds into the air. These chemical signals attract natural enemies of the attacking insect (such as parasitoid wasps), providing an indirect form of defense (Heil and Bueno, 2007).

### Your Brain Contains Specialized Cells That Help You Navigate

Deep within your brain, an internal mapping system is at work. Place cells become active when you are in a specific location. Grid cells transform your environment into a virtual coordinate system, encoding distance and direction. Head-direction cells act like a compass, tracking which way you are facing. This trio of systems represents a fundamental discovery worthy of the 2014 Nobel Prize (Moser et al., 2008).

### Tardigrades (Water Bears) Can Withstand the Extreme Conditions of Space

The microscopic creatures known as tardigrades show incredible resilience to extreme environments. Through a process called "cryptobiosis," they can almost completely shut down their metabolism and survive desiccation. In this "tun" state, they have been experimentally shown to survive exposure to the vacuum of space and high levels of radiation, reviving once returned to suitable conditions (Jönsson et al., 2008).

Münir Salih Tekin

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