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CLOSING THE LOOP: USE OF CIRCULAR ECONOMY FOR WASTE REDUCTION AND SUSTAINABILITY

- DR. SHEFALI RATHORE

About E-magazine

"Earth Root" is an open access e-magazine in the discipline of Environmental sciences published by Earth Root Foundation. The aim of the e-magazine is to provide information and upgradation of knowledge about environmental issues on wider scale and to share ideas and resources to the readers. Using essential knowledge people can lead a healthy life, which is more sustainable and can connect with ongoing efforts for stopping catastrophically the climate change. E-magazine caters to all related environmental aspects ranging from big issues like climate change, renewable energy and pollutants in the atmosphere to the health of human and living beings on Earth. We also take topics of water resources and efforts and measurement to provide optimum use of it; including large scale atmospheric circulation linked with oceans and ecology.

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Closing the Loop: Use of Circular Economy for Waste Reduction and Sustainability

Dr. Shefali Rathore
Assistant Professor, Rajdhani College

Circular economy (CE) is a new approach to production and consumption that emphasizes restoring the value of resources used. The term CE was first introduced by Boulding, an ecological economist, in 1966. Since the 1970s, CE has gained momentum and is viewed as a multidisciplinary concept that extricates economic growth from the utilization of resources and its social implications. It is an alternative to the linear economy, which generates waste that harms the environment and human health. CE aims to keep parts, products, resources, and energy in circulation for an extended period to create economic, environmental, and social benefits.

The importance of CE lies in the fact that natural resources are limited, and their circularity and energy maximization within systems can retain value from these resources even at the end of their life (Ghisellini et al., 2016). The depletion of natural resources is a global issue, and with the expected population growth and increased wealth by 2050, the demand for resources will almost triple (Godfray et al., 2010; Meadows et al., 2004). CE adopts a systems approach that prioritizes interdependence and holism to manage finite resources effectively (Ünal et al., 2018).

According to the World Economic Forum (2014) report, the adoption of CE presents a trillion-dollar opportunity for the global economy. Macro-economically, the adoption of CE can enhance resource productivity by 3%, resulting in cost savings of 0.6 trillion euros annually, with an additional 1.8 trillion euros in other economic benefits by 2030 (McKinsey & Company, 2015).

The restorative approach of CE can also result in a net material cost and saving benefits of over 600 billion USD per year by 2025 (The Ellen MacArthur Foundation, 2013). Adopting CE can lead to increased growth, competitive advantages, innovation, and reduction in costs, energy use, and emissions, leading to better supply chain and resource utilization (World Business Council for Sustainable Development, 2017).

Initiatives at the micro, meso, and macro levels are being undertaken to implement CE principles. The micro level involves initiatives specific to individual firms, such as reducing, reusing, and recycling (Ying & Li-Jun, 2012). The meso level involves eco-industrial parks, networks, and inter-firm collaborations to optimize resource utilization. At the macro level, government and policymakers are responsible for initiatives (Geng & Doberstein, 2008). MacArthur et al. (2015) identify three principles guiding CE cycles: increasing resource and energy circularity, reducing negative production effects, and conserving natural resources.

The Ellen MacArthur Foundation (2015) outlines six business actions for implementing CE principles, known as the ReSOLVE Framework. These actions include adopting renewable resources and energy, sharing resources, optimizing production systems with technology, keeping components and materials in closed loops, virtualizing products, and exchanging non-renewable goods for renewable ones.

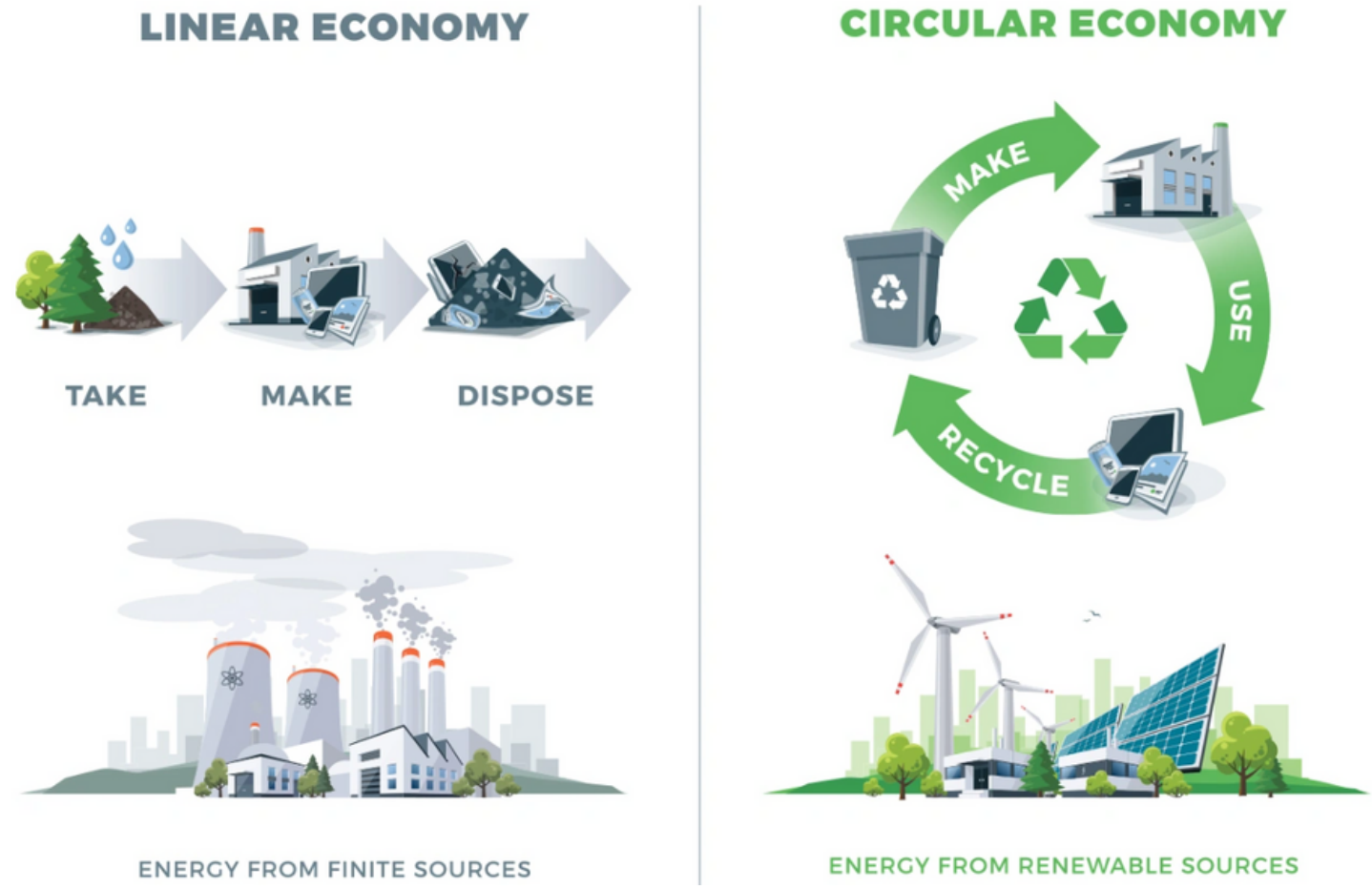

Figure 1:Linear Vs. Circular Economy (Source:https://blogs.iadb.org/sostenibilidad/en/circular-economy-now-or-never/)

The circular economy can reduce waste through a number of different mechanisms. One of the most important is the use of closed-loop systems, in which a product might be designed to be disassembled and its components reused in new products. This not only reduces waste but also helps to conserve resources, as it decreases the need for virgin materials.

Another way in which the circular economy can reduce waste is through the use of product-service systems. In these systems, consumers pay for access to a product rather than for ownership of it. This incentivizes manufacturers to design products that are durable and long-lasting, as they will need to remain in use for longer periods of time. This approach can also reduce waste by encouraging manufacturers to take responsibility for the end-of-life of their products and to design them so that they can be easily repaired or recycled.

In addition to reducing waste, the circular economy can increase sustainability by reducing the demand for finite resources and decreasing the environmental impact of production processes. By keeping materials in use for longer periods of time, the circular economy can help to conserve resources and reduce the need for virgin materials. This can lead to a more sustainable use of resources and a decreased reliance on environmentally damaging extraction processes.

Furthermore, the circular economy can decrease the environmental impact of production processes by incentivizing the use of renewable energy and reducing harmful emissions.

By designing products to be recyclable and by utilizing closed-loop systems, the circular economy can reduce the amount of waste that is sent to landfills and incinerators.

This, in turn, can decrease the amount of greenhouse gases that are produced and help to mitigate the impacts of climate change. While challenges are still to be addressed in implementing a circular economy, such as designing products for circularity and creating the necessary infrastructure for recycling and reuse, the potential benefits are clear. By embracing the principles of the circular economy, we can create a more sustainable and resilient future for ourselves and for the planet.

In addition to reducing waste, the circular economy can increase sustainability by reducing the demand for finite resources and decreasing the environmental impact of production processes. By keeping materials in use for longer periods of time, the circular economy can help to conserve resources and reduce the need for virgin materials. This can lead to a more sustainable use of resources and a decreased reliance on environmentally damaging extraction processes.
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SOURCE- Research gate

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Car Emission Effects on Global Warming

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With increasing car sales in India, exposure to vehicular exhaust emissions is rising daily. By 2030, annual car sales in India are to be at a high of 10.5 million. 20-30% of particulate matter (PM) 2.5 present in the environment is due to the direct contribution of vehicular emissions. 8% of total Greenhouse Gas Emissions in India are from vehicles, and in Delhi, particularly, it exceeds 30%

The transport and road sectors account for the highest degree of vehicular emissions. The road sector alone is responsible for about 15% of total CO2 emissions. 45% of CO2 is emitted from passenger vehicles. If similar situations prevail, these numbers predict a very high percentage of greenhouse gas emissions by 2050.

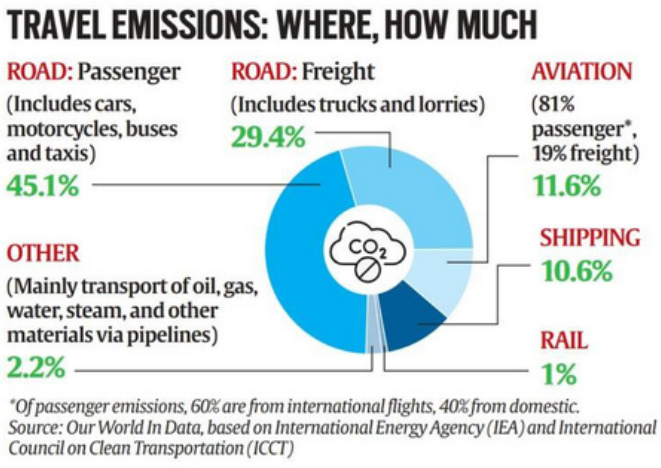

Figure 1 (Source: Express news service, 2021)

What are Car Emissions?

Automobile emissions are a major source of Carbon. Car emissions are chemicals and particulates that are produced by burning fuel in an engine. Major gases present in car exhaust are carbon dioxide, ozone, benzene, nitrogen oxide, and carbon monoxide.

These gases can cause damage to humans if inhaled directly. The world is set on reducing carbon emissions. To combat global warming, reducing car emissions is the key.

Along with CO2, cars produce other pollutants that contribute to global warming, for example, nitrogen oxides (NOx) and particulate matter. NOx can react with other pollutants to form ground-level ozone, which further contributes to global warming. Particulate matter can absorb and reflect sunlight, contributing to changes in climate patterns.

Other factors like the model of the car, the age of the car, and how much it has been driven also affect emissions produced by the car. Older cars generally produce more emissions than newer cars. Older cars are less technologically advanced and are less fuel-efficient. Cars driven at higher speeds produce more emissions than those driven conservatively.

Car emissions are the second largest greenhouse gas emitters in the world. People use cars for traveling and fulfilling their day-to-day needs. The average global temperature is rising, and greenhouse gases contribute hugely to this rise. Greenhouse gases trap the heat in the atmosphere and increase the temperature of the planet. This temperature rise is causing impacts on the environment like heat waves, droughts, heavier rainfalls, hurricanes, etc.

Greenhouse gases are also being actively emitted due to human activities. Majorly gases like carbon dioxide and methane are huge greenhouse gas contributors.

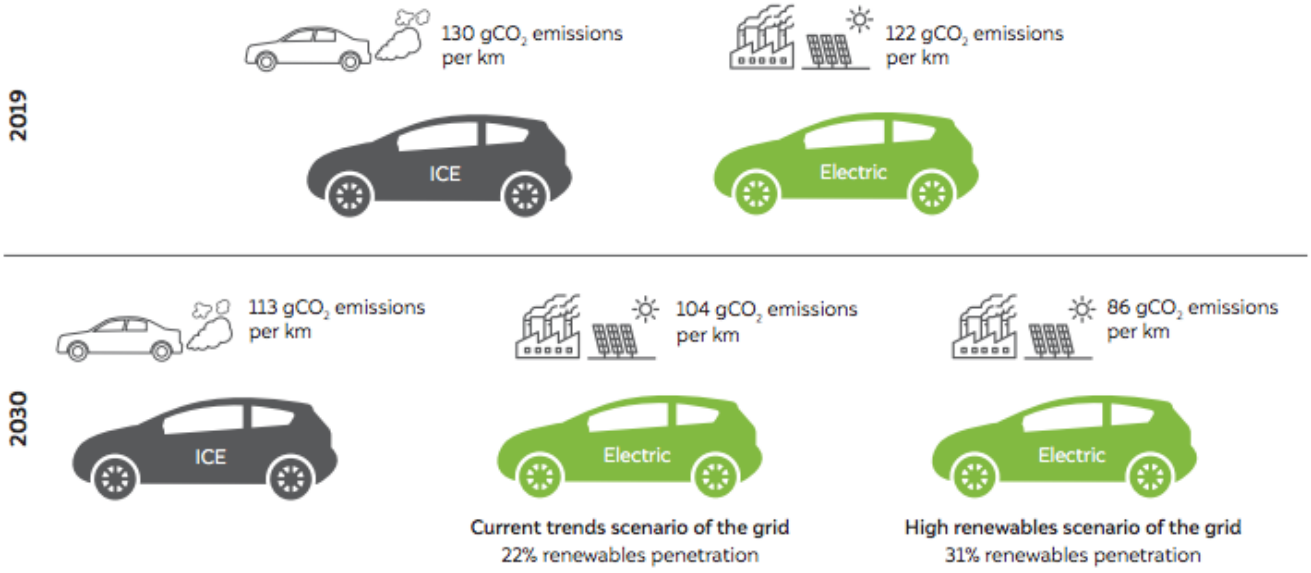

Figure 2 (Source: CEEW, Soman, Ganesan, and Kaur, 2019)

Every 3.7 liter of gas used by cars emits about 24 pounds of greenhouse gases. In the US, greenhouse gas emissions from transportation account for about 27% of total US greenhouse gas emissions. The transportation department is the largest contributor to US GHG emissions.

Climate change caused by car emissions has a range of impacts on the environment:

1. Rising global temperatures: As more greenhouse gases are being released into the atmosphere, the Earth's temperature increases leading to more frequent heat waves, droughts, etc.
2. Changes in weather patterns: Global weather patterns can differ, leading to more frequent storms, hurricanes, and flooding.
3. Rising sea levels: As global temperature rises, icecaps and glaciers are melting leading to rising sea levels. Coastal cities and ecosystems can become highly influenced by this pattern.
4. Biodiversity loss: Climate change caused due to car emissions can also lead to biodiversity loss as ecosystems are disrupted by changing temperatures and weather patterns.

Initiatives to combat car emissions and global warming:

- Electric and hybrid vehicles: Electric cars produce no emissions, and hybrid vehicles produce lower emissions than traditional vehicles. Switching to electric and hybrid vehicles is one of the most effective ways to reduce emissions from cars.
- Fuel efficiency standards: Governments have the power to impose fuel efficiency standards on automakers. Automakers can produce cars that use less fuel and emit fewer pollutants.
- Alternative fuels: Fuels like biodiesel, ethanol, and hydrogen can be used to power cars, reducing their emissions.
- Public transportation: Spreading awareness and encouraging the public to use public transportation, such as buses and trains, to reduce the number of cars on road, and henceforth the emission.
- Carpooling and ride-sharing: These programs reduce the number of cars on road, and hence reduce the emission.

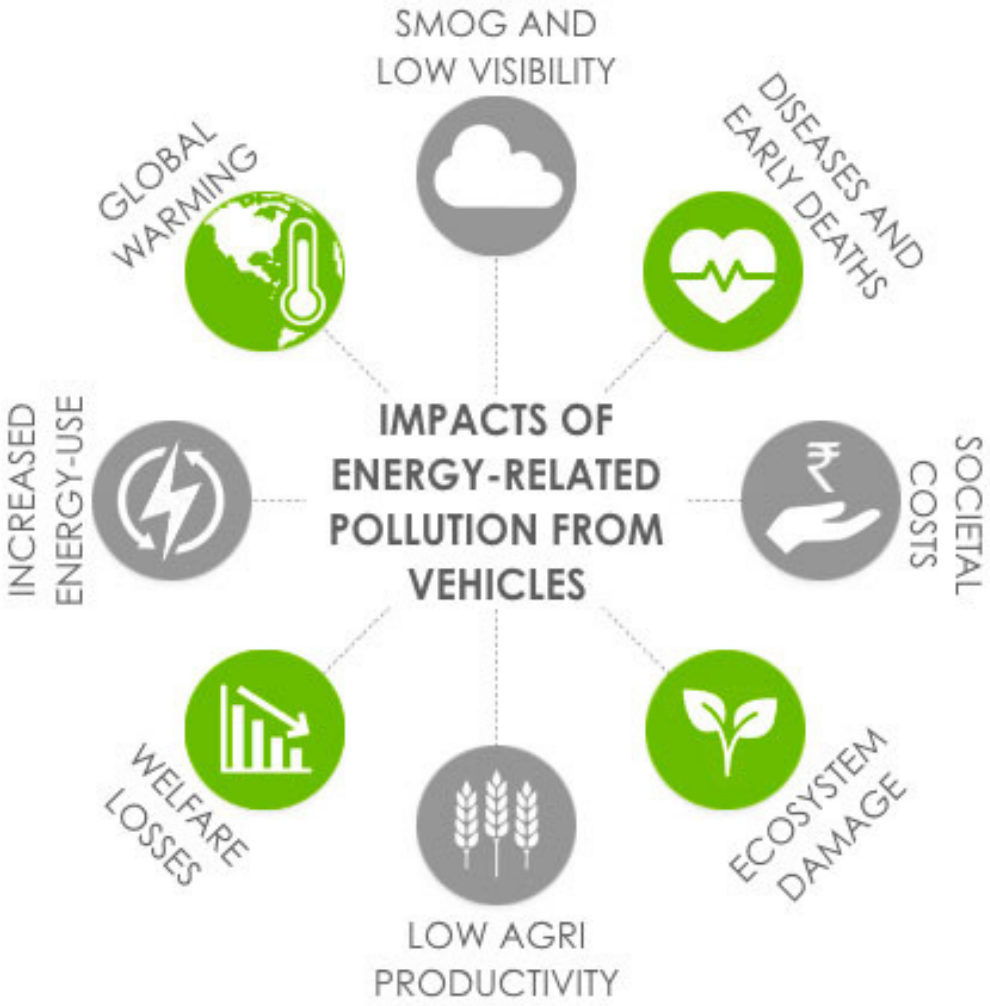

Figure 3 (Source: AEEE, 2021)

- Carbon taxes and cap-and-trade systems: Government can implement carbon taxes or cap-and-trade systems to put a price on carbon emissions and incentivize companies and individuals to reduce their emissions.
- Infrastructure improvements: Improving infrastructure like bike lanes, pedestrian paths, and public transportation can encourage people to use these sustainable modes of transportation and reduce the need for cars.
- Education and awareness: Increasing public awareness about the impacts of car emissions on global warming and promoting sustainable transportation options can encourage people to make environmentally-friendly choices.

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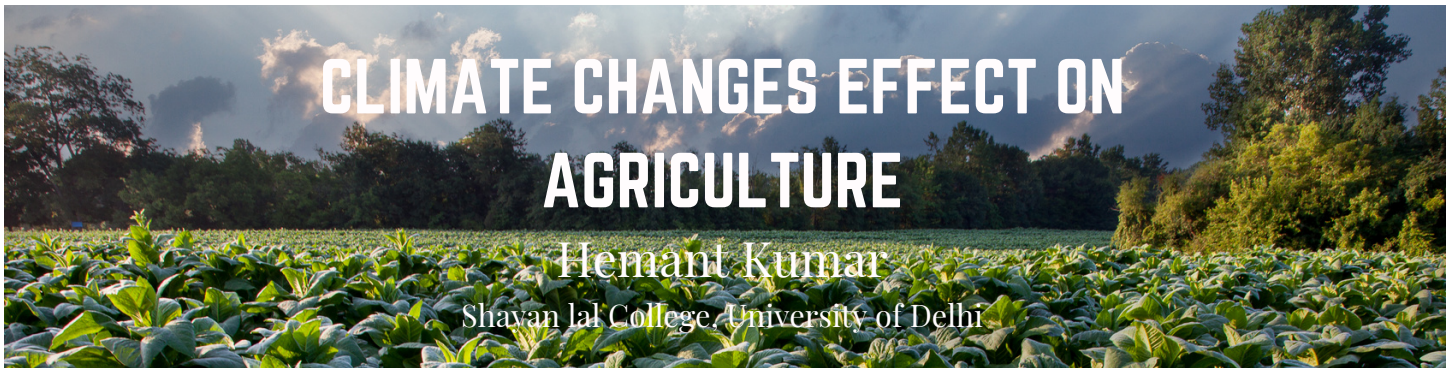


CLIMATE CHANGES EFFECT ON AGRICULTURE

Hemant Kumar
Shayan lal College, University of Delhi

INTRODUCTION

Climate change and agriculture are two interconnected processes that occur on a global scale. Changes in average temperatures, rainfall, and climate extremes (e.g., heat waves), changes in pests and diseases, changes in atmospheric carbon dioxide and ground-level ozone concentrations, changes in the nutritional quality of some foods, and changes in sea level all have an impact on farming. Climate change is already having an impact on agriculture, with the effects being unevenly distributed around the world. Future climate change will almost certainly have a negative impact on crop production in low-latitude countries, while the effects in higher latitudes may be positive or negative. Food insecurity is likely to increase for some vulnerable groups, such as the poor, as a result of climate change. For example, South America may lose 1–21% of its arable land area, Africa 1–18%, Europe 11–17%, and India 20–40%.

Warming will cause rapid many microbial processes in the soil-floodwater system, affecting the C and N cycles. Crop residue decomposition patterns are subject to change. Increased soil temperature may also increase autotrophic CO2 losses from the soil due to root respiration, exudates, and fine-root turnover. Rising sea levels will have an impact on rice production as a result of climate change. For a temperature increase of 2-3.5°C, most studies predict lower yields in non-irrigated wheat and rice, as well as a loss in farm-level net revenue ranging from 9% to 25%. Aggarwal and Mall (2002) discovered that a 2°C increase resulted in a 15-17% decrease in rice and wheat grain yield. Pathogens such as fungi and bacteria are also expected to worsen.

In areas where precipitation increases, fungal and bacterial pathogens are likely to become more severe. Cereals would be more susceptible to pest and disease outbreaks under warmer and more humid conditions, reducing yield.

Predicted effect of climate change on Agriculture over the next 50 years

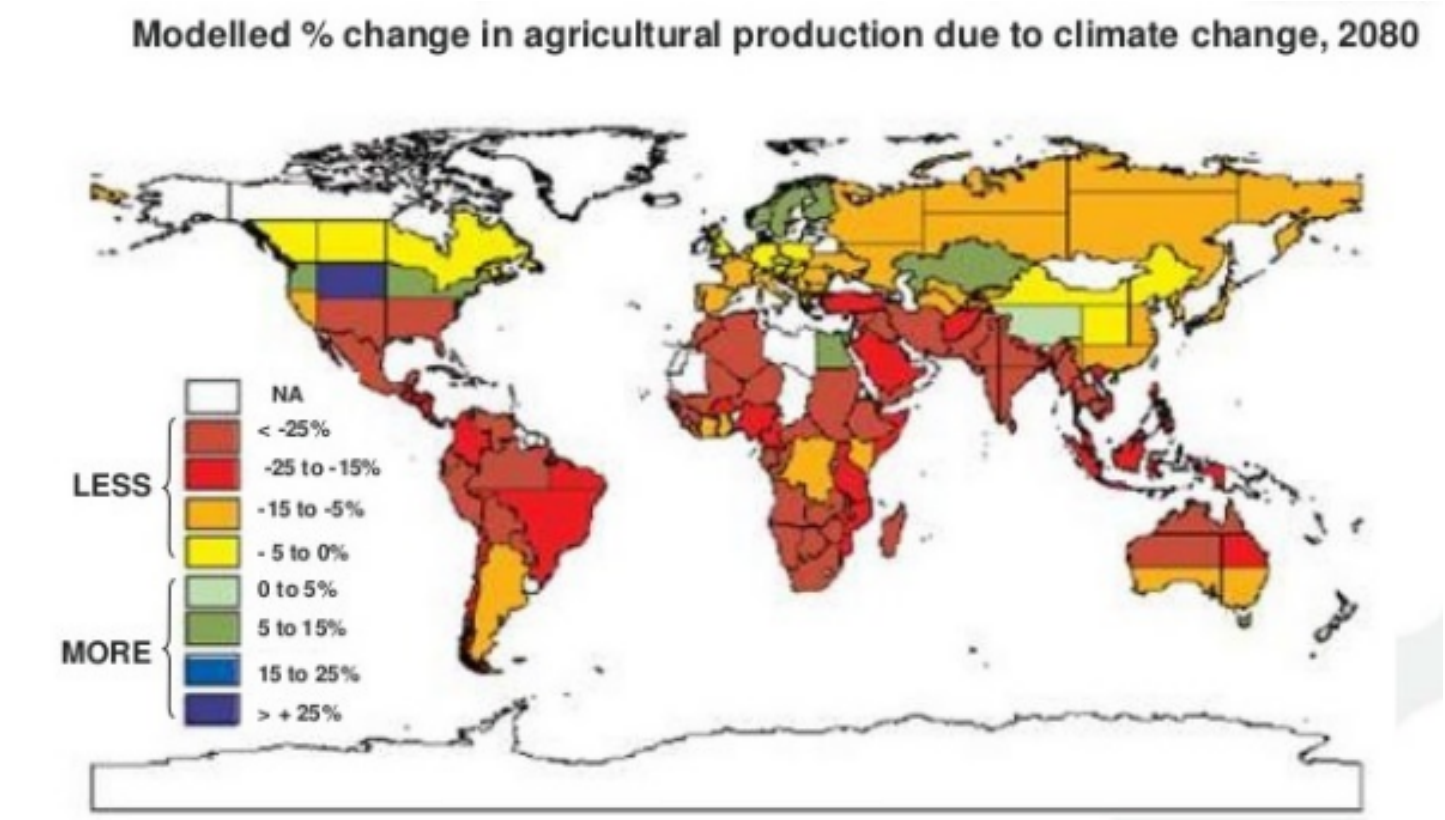
Climate element	Expected change by 2050	Confidence in prediction	Effect on agriculture
CO2	Increase from 360 PPM to 450 – 600 PPM	Very high	•Good for crops •Increased photosynthesis •Reduced water use
Sea level rise	Rise by 10-15cm	Very high	❖Loss of land ❖Coastal erosion ❖Flooding ❖Salinization of ground water.
Temperature	Rise by 1-2 °C Increased frequency of heat waves	High	➢ shorter growing seasons ➢Heat stress risk ➢Increased Evapotranspiration
Precipitation	Seasonal changes by + or – 10%	Low	•Drought •Soil problem •Water logging
Storminess	Increased wind speeds, more intense rainfall events	Very high	✓Lodging ✓Soil erosion ✓Reduced infiltration of rainfall

IPCC 2001

EFFECTS

Climate change will impair farm production in many poor countries and regions

Climate change, combined with global population and income growth, poses a global threat to food security. Climate change poses a significant threat to agriculture. Higher temperatures eventually reduce crop yields while encouraging weed and pest growth. Pest management becomes less effective, requiring higher pesticide rates to achieve the same levels of control. Heat waves can cause extreme heat stress in crops, limiting yields if they occur at specific times in the plant's life cycle (pollination, pod or fruit set). Furthermore, heat waves can cause wilted plants (due to increased transpiration rates),



Source: Cline WR, 2007: Global warming and agriculture: Impact estimates by country. Washington, D.C.: Center for Global Development, Peterson Institute for International Economics (cited in von Braun J (IFPRI), 2007

which can lead to yield loss if not mitigated by irrigation. Heavy rains, which frequently cause flooding, can also be harmful to crops and soil structure. Most plants cannot survive in prolonged waterlogging because their roots require oxygen. The overall effects of climate change on farming are anticipated to be detrimental, endangering the security of the world's food supply.

A number of African nations already struggle with semi-arid conditions that make agriculture difficult, and climate change is likely to shorten the growing season and put large areas of marginal agriculture out of business. By 2020, yields in some nations could be reduced by up to 50%, and crop net revenues could decline by up to 90% by 2100, with small-scale farmers being the most adversely affected.

Climate changes may also affect the availability of water and the amount of water required for agriculture. The need for irrigation may rise in the future if temperatures rise and there are more sporadic rainfall events as a result of global warming.

Plant breeders are currently working to create new crop varieties that are thought to be drought tolerant and more adaptable to varying levels of temperature and moisture in anticipation of these changes.

Effects of global warning on agriculture

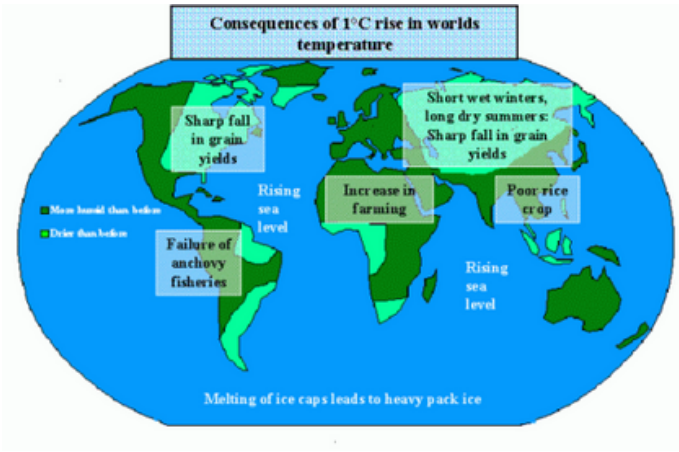
By emitting greenhouse gases (GHGs) and converting non-farm land (like forests) into farmland, agriculture contributes to climate change. In 2010, the combined effects of agriculture, forestry, and land use change accounted for 20 to 25% of global annual emissions.

However, investments in the right agricultural innovations are required right away because some of the best strategies to combat climate change, such as more resilient crop varieties and livestock breeds, can take up to 20 years to develop. Food production in vulnerable areas can still be profitable. Even though it is urgent, our efforts to lessen the effects of climate change will not have much of an impact over the next 50 years.

Past greenhouse gas emissions have already started the changes that will take place during this time.
Limiting greenhouse gas emissions will only affect climate change in the long-term (beyond 50 years). So we must learn to adapt to the changes in climate that will occur over the next 50 years.

CLIMATE CHANGE – MITIGATION AND ADAPTATION IN AGRICULTURE

1. Assist farmers in coping with current climatic risks by providing value-added weather services to farmers.
Farmers can adapt to climate changes to some degree by shifting planting dates, choosing varieties with different growth duration, or changing crop rotations.
2. An Early warning system should be put in place to monitor changes in pest and disease outbreaks. The overall pest control strategy should be based on integrated pest management because it takes care of multiple pests in a given climatic scenario.
3. Participatory and formal plant breeding to develop climate-resilient crop varieties that can tolerate higher temperatures, drought and salinity.
4. Developing short-duration crop varieties that can mature before the peak heat phase sets in.
5. Selecting genotype in crops that have a higher per day yield potential to counter yield loss from heat-induced reduction in growing periods.
6. Preventive measures for drought that include on-farm reservoirs in medium lands, growing of pulses and oilseeds instead of rice in uplands, ridges and furrow system in cotton crops, growing of intercrops in place of pure crops in uplands, land grading and leveling stabilization of field bunds by stone and grasses, graded line bunds, contour trenching for runoff collection, conservation furrows, mulching and more application of Farm yard manure (FYM).



CONCLUSION

The result of "Global Warming," climate change, has begun to have an impact everywhere. The main factor affecting agricultural productivity, which has a direct impact on food production all over the world, is climate. As a result of the fact that the world's population is ageing, the world's population is becoming more and more reliant on technology. A rise in the average seasonal temperature can shorten the growing season for many crops, lowering their final yield.
Climate change, including variations in temperature and precipitation, has a significant impact on food production systems because it can cause pest and disease outbreaks, reduce harvests, and ultimately jeopardise the nation's ability to eat.

The exposure to global environmental factors will determine the overall impact of food security. The exposure to global environmental change and the ability to adapt to and recover from global environmental change will determine the overall impact of food security. Careful resource management, including the management of soil, water, and biodiversity, will be necessary to deal with the effects of climate change on agriculture. India will need to take action at the international, regional, national, and local levels to address the effects of climate change on agriculture and food production.

Effects of Excessive Mining on the Environment

Saumya Dhingra
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Mining is an important activity that has been the backbone of industrialization and economic growth for many decades. The effects of excessive mining on the environment, however, have been alarming. The mining industry has had a negative impact on the environment in many different ways. The extraction of minerals and resources from the earth's surface has caused various environmental issues that affect the health and well-being of all living beings on the planet. Global concerns have been raised regarding the damaging impact of excessive mining on the environment as the United Nations Environment Programme (UNEP) estimated that the mining industry is responsible for 10% of global energy consumption and generates around 50% of global waste.

The mining industry is one of the largest emitters of greenhouse gases, contributing to global warming and climate change. In addition, mining activities can lead to soil erosion, loss of biodiversity, deforestation, water pollution, and degradation of air quality. Mining activities cause extensive environmental damage that can have lasting consequences. One of the most significant issues caused by mining is soil erosion. The removal of topsoil during mining activities leads to soil erosion, which can have long-term effects on soil quality and fertility. Soil erosion also leads to the siltation of water bodies, causing water pollution and the destruction of aquatic habitats.

Mining activities also lead to deforestation, which is a significant contributor to climate change. Trees absorb carbon dioxide and release oxygen, making them essential in regulating the earth's temperature. Deforestation caused by mining activities results in a decrease in the number of trees, leading to increased greenhouse gases in the atmosphere, contributing to global warming. This also leads to the loss of biodiversity, the extraction of minerals and resources from the earth's surface disrupts the ecosystems, leading to the loss of habitats for various species of flora and fauna. The loss of biodiversity definitely has long-term effects on ecosystems, not only leading to the extinction of various species, but also affecting the food chain and the functioning of ecosystems.

Excessive mining activities can also have severe impacts on human health. The harmful pollutants released into the air, water, and soil can have toxic effects on humans and animals. For example, mining activities lead to a release of heavy metals such as lead, mercury, and cadmium, which are known to be toxic to humans and cause health problems such as cancer, respiratory issues, and neurological damage.

In addition, mining activities if not done properly while following correct steps of disposal can also lead to water pollution, and contaminated water sources can lead to the spread of water-borne diseases, affecting the health of people and animals who rely on these water sources. Mining activities can also lead to increased air pollution, as dust and particulate matter released during mining operations can cause lung damage, asthma, and other respiratory issues.

India is a developing country that is rich in mineral resources, such as coal, iron ore, bauxite, and limestone.

The mining industry in India has witnessed a significant increase in the past few decades due to the growing demand for minerals and resources.

According to a report by the Centre for Science and Environment (CSE), mining activities in India have caused severe environmental damage, particularly in areas such as Goa, Jharkhand, and Chhattisgarh. Mining has led to the destruction of forests, contamination of water sources, and loss of biodiversity.

The report further states that the mining industry in India operates without proper regulations and monitoring, leading to uncontrolled environmental degradation.
The lack of regulation has also led to the exploitation of labour and the violation of human rights. The local population has little say in the mining activities, and their voices are often ignored.
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The report further states that the mining industry in India operates without proper regulations and monitoring, leading to uncontrolled environmental degradation. The lack of regulation has also led to the exploitation of labour and the violation of human rights. The local population has little say in the mining activities, and their voices are often ignored. The construction of mines often requires a large area of land, and these areas are often the location of previously undisturbed natural habitats. This results in the removal of large areas of habitat (usually forest) to build the mine, followed by other negative impacts from the presence of many people moving to, living, and working around the mine.

SOURCE- Lynne

Mining refers to removing geological resources from the Earth, usually used as raw material. Mining for a wide range of materials occurs in many different parts of the world. Coal, gold, iron, and sand are some of the most commonly mined resources. Humans have been mining for thousands of years, with the earliest known mine found on Eswatini's Bomvu Ridge. This mine, the Ngwenya Mine, is over 40,000 years old, based on radiocarbon dating. Despite being very useful to humans, mining often has a detrimental effect on the surrounding environment and animal species, including the surrounding human populations. In the following, we will go over the environmental impact of mining, including both negative and positive effects, and provide some examples.

CORALS OF CLIMATE CHANGE?

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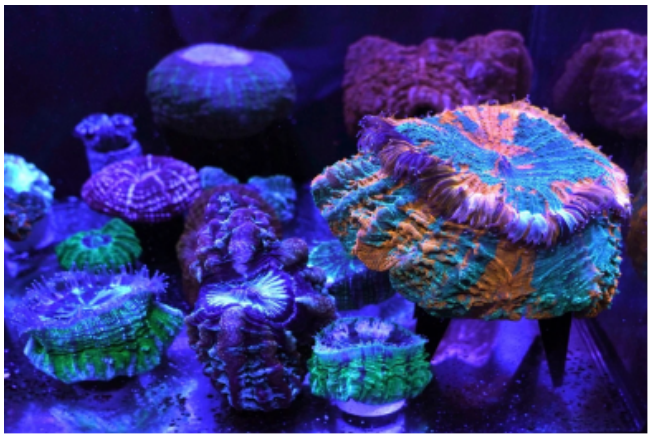
Life on earth exists in myriad forms and places. From the highest heights to the deepest depths of our planet, fascinating creatures inhabit it, and corals are one such fascinating creature that inhabit the oceans.

What are Corals?

Corals are marine organisms that inhabit the ocean in colonies made up of hundreds to thousands of individual animals called polyps. They are neither plants nor rocks, but rather animals of the phylum Cnidaria.

At shallow depths along the edges of islands and continents, free-swimming coral larvae present in ocean water attach to submerged rocks and form corals. They grow by building calcium carbonate exoskeletons, resulting in the formation of coral reefs. These coral reefs create a one-of-a-kind underwater ecosystem. The coral reef's biodiversity is often referred to as the sea's rainforest. They make up less than 1% of the ocean but are home to nearly 25% of all marine life. Reefs are classified into three structural types: fringe, barrier, or atoll. The primary difference between corals and coral reefs is that corals are living animals, whereas reefs are physical structures formed by coral polyp colonies.

Corals of diverse species can be found in all the world's oceans. Most reefs are found between the Tropics of Cancer and Capricorn, Pacific and Indian Oceans. These marine invertebrates are extremely fascinating creatures, owing to the array of colours they exhibit. Their distinct colours are caused by a symbiotic relationship with algae.



Fluorescent solitary stony corals at the Coral Morphologic lab, Miami.
Source : Lynne Sladky / AP

Corals provide algae with protection in sunlit, shallow seas in exchange for the algae producing energy through photosynthesis, which the corals use to survive and build their skeletons. The stability of this symbiotic relationship is essential to the survival of corals. As a direct consequence of ongoing global warming and climate change, these remarkably captivating corals are now among the most threatened ecosystems on the planet.

The link between climate change and coral reefs:

According to the IUCN Report 2015, one-third of the world's reef-building corals are threatened with extinction. Corals thrive at an ideal temperature of 20 degrees Celsius. With the earth's atmosphere warming primarily due to anthropogenic greenhouse gas emissions, the global surface temperature has increased by approximately 1°C since pre-industrial times, resulting in ocean warming. A 1-2°C increase in ocean temperatures over a long period of time has a significant impact on the survival of these marine organisms.

It causes bleaching, which turns corals white or colourless. Corals become endangered and eventually perish if they are bleached for a prolonged period.

The coral bleaching phenomenon due to the temperature rise in ocean water causes corals to expel the symbiotic algae living in their tissues, responsible for their colour and food. The coral is compelled to expel its mutually beneficial partner because the heat stress causes the algae inside the coral to release oxygen free radicals that damage coral tissue. Some corals begin to emit vibrant colours in a last-ditch effort to survive the rising ocean temperatures, an occurrence known as 'glowing corals' that signals the adverse conditions faced by these soon-to-be dying corals. Over the past few years, unprecedented mass coral bleaching events have occurred worldwide. Ocean warming brought on by climate change has led to the destruction of around 50% of the corals on the Great Barrier Reef in Australia due to bleaching in the span of a single year (2016–2017). The issue is made worse by other climate change-linked phenomena such as tropical storms and altered precipitation patterns.

The Northwestern Hawaiian Islands in the United States have undergone the worst bleaching ever recorded in human history. Climate change alters oceanic currents, which cause nutrient cycling to fluctuate near their coastlines. Lack of food results in an uneven distribution of coral larvae and has an overall negative impact on coral health. Additionally, the change in the chemistry of ocean water due to increased carbon dioxide absorption results in a lowering of the pH.

Ocean acidification reduces the rate of calcification in organisms that create reefs, further deteriorating the corals' structural strength by hampering their development rate. Corals are smothered in shallow ocean bottoms due to sedimentation caused by rising sea levels.

Algal blooms are brought on by increased runoff of nutrients and land-based pollutants; this contributes to murky water conditions that block sunlight, inhibiting coral growth.

Together, all these impacts significantly change how coral ecosystems operate and the services they offer to underwater organisms and people worldwide. According to UNESCO, all 29 reef-containing World Heritage Sites would lose their coral reefs by the end of the century if greenhouse gas emissions continued at the existing rate.

Healthy Coral (left) vs. Bleached Coral (right)

Importance of Coral:

HOME OF MARINE BIODIVERSITY

Coral reefs have the richest biodiversity of any ecosystem globally. They are home to several marine creatures with more than one-quarter of all marine fish species. Corals serve as both a habitat and food source for numerous other species, including algae and echinoderms.

VALUABLE ECOSYSTEM SERVICES

Reefs offer a wide range of ecosystem services, including food. They act as break-walls, shielding from floods and high waves. Coral reefs are breeding grounds for fish and support the fishing and tourism sectors.

DYNAMIC VALUE

Over 500 million people are estimated to rely on coral reefs directly or indirectly for their daily needs. The journal Global Environmental Change, 2014 reveals that coral reefs are worth $1 trillion in terms of their social,

cultural, and economic contributions. Furthermore, a 2015 report by the WWF predicts that by 2100, the loss of reef ecosystem services due to climate change will cost at least US$500 billion annually.

ECOSYSTEM HEALTH INDICATORS

Coral reefs also act as key indicators of ecosystem health. Corals that are deteriorating serve as a warning sign for what may happen to other vulnerable ecological systems, such as river deltas. Upon crossing the coral reef survival threshold, other ecosystems would begin to deteriorate more rapidly and irreversibly.

RECREATION AND TOURISM ATTRACTION

Large variety of marine species found on the coral reefs delights tourists. These species are a wonder to watch via snorkeling or scuba diving. Underwater adventures provide for recreational activities, enhance tourism, and contribute to the economy.

Action and Awareness:

According to the Global Coral Reef Monitoring Network's ‘Status of Coral Reefs of the World’ report, the world has lost 14% of its coral reefs since 2009.

It is critical to keep the global average temperature rise well below 2°C for the survival of coral reefs worldwide. Dedicated efforts must be made to limit the temperature rise to 1.5°C, in accordance with the Paris Agreement on climate change. Additional steps such as addressing local pollution and practicing sustainable fishing practices must also be combined.

Global commitments must be reinforced via the Sustainable Development Goals for protecting and preserving coral ecosystems. SDG 13 (combat climate change) and SDG 14 (life below water) must continue to work towards conserving and sustainably using the oceans, seas, and marine resources for sustainable development.

Traditional linear models of economic production must change and evolve into circular economies. SDG 8 (inclusive and sustainable economic growth) and SDG 12 (sustainable consumption and production patterns) both highlight the need for this shift.

To protect and preserve coral reefs, innovations and investments must support research in the field of coral biology. Like GMOs, the field of genetic hybrids can be explored for the genetic selection of heat-resistant corals that can withstand rising global temperatures. Governments all over the world must view corals as economic assets, and their management and restoration must make sound financial sense to motivate them to make long-term investments for coral preservation.

On a global scale, the ‘Glowing Glowing Gone’ campaign was launched to raise awareness about coral protection.

The campaign was inspired by the "Coral Glowing" phenomenon, which occurs when bleached corals begin to glow in luminescent colours of blue, yellow, and purple—all to protect themselves from the underwater heat waves brought on by climate change. These glowing colours in bleached corals act as a protective layer like sunscreen when the symbiotic micro-algae are lost.

This captivating but tragic phenomenon serves as a warning that not only the corals, but the planet as a whole has hit a tipping point, and we are now on the verge of losing not just another species but an entire ecosystem that supports life.

Coral reefs are on the front lines of the impacts of climate change, and it is not too late to work towards protecting these fascinating marine creatures of our beautiful blue planet.

Large variety of marine species found on the coral reefs Delight tourists.

MOVIE RECOMMENDATION: BEFORE THE FLOOD (2016)

Synopsis

Ten years ago the Oscar-winning actor Leonardo DiCaprio sat down with Al Gore and learned about the scary and imminent dangers of climate change. This sober-minded young man is serious about understanding the global problem and wants to shed light on what can be done to save the planet from the greed, the self-absorption, and the many missteps which have harmed humanity and the good Earth.

Before the Flood is a feature-length documentary presented and produced by DiCaprio, who has been appointed by Ban Ki-Moon as the United Nations messenger of peace on climate change. With the energy of his youth and ample financial resources and contacts, he has put together the most comprehensive film on the subject since An Inconvenient Truth.

DiCaprio chronicles his three-year excursion around the world seeking solutions to the problem which is unfolding more swiftly than many scientists had predicted. He says that in the back of his mind is the "nightmarish" painting which hung over his bed as a child. It was Hieronymus Bosch's "Garden of Earthly Delights" with its depiction of a place that has been dominated and brutalized by human beings before the Flood. In Canada and Greenland, DiCaprio witnesses the devastating impact of the addiction to fossil fuel in the United States and other nations. Years ago, activists for the environment believed that small individual acts like changing the type of light bulbs used in our homes and offices could begin to turn things around.

DiCaprio responds: "It's pretty clear that we are way beyond that now. Things have taken a massive turn for the worst." What does that mean? Jason Box, a geology professor, believes that if the climate remains at the temperature that it's been in the last decade, Greenland will be completely submerged beneath water. DiCaprio speaks to marine biologist Jeremy Jackson who predicts that our actions will kill off coral reefs all over the world. In Florida and the Pacific islands, measures are being taken right now to protect people who live by the ocean and face massive floods. In one of the cogent moments in the documentary, Indian environmental activist Sunita Narain challenges DiCaprio's America-centric view in asking India to make sacrifices that the citizens of the United States have not made.

Source: -https://www.e-education.psu.edu/geog430/sites/www.e-education.psu.edu.geog430/files/Lesson_01/Images/beforetheflood.jpg

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The Perilous Thaw

Jagriti Hinduja

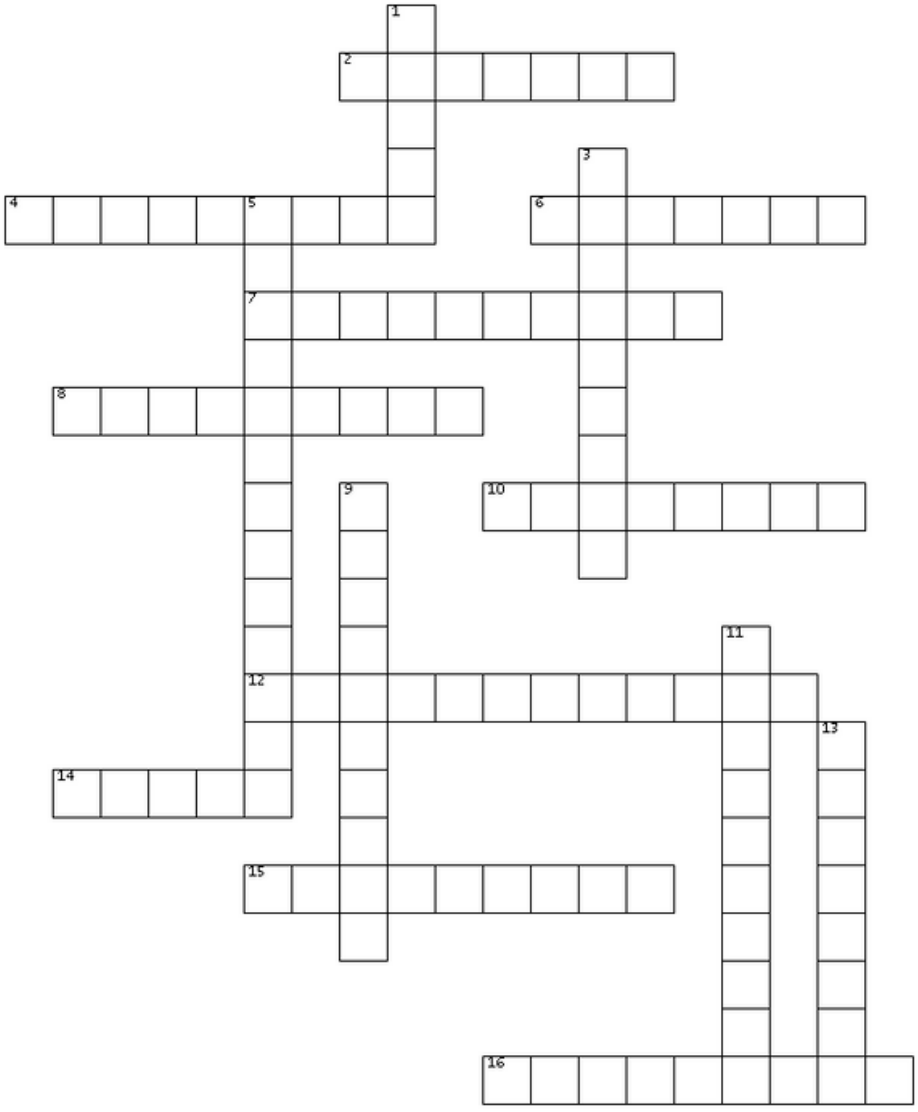
Tick-Tock, Tick-Tock
Time keeps passing by
Tragedy draws nigh
Yet people seem unheeding.

With each second slipping
The ice caps melt away
Sea levels rise up
A future in chaos
Tick-Tock, Tick Tock.

But let not fear destroy us
Let hope brighten up our way
For we hold the ability to act
To save the earth we love.

Let's take action right now
To let our planet restore
The smile on its face
And promise to make it
eternal.

Jagriti Hinduja



ACROSS

2. A geographical area within which the air frequently is confined or channeled, with all parts of the area thus being subject to similar conditions of air pollution.

4. The part of the Earth in which life can exist, whether on land, in the air, or in water.

6. The place or type of place where a plant or animal naturally or normally lives or grows.

7. An industrial or commercial site that is idle or underused because of real or perceived environmental pollution.

8. The relationship between two different kinds of living things that live together and depend on each other.

10. A device that produces a continuous electric current directly from the oxidation of a fuel, as that of hydrogen by oxygen.

12. The protection of animals, plants, and natural resources.

14. A form of oxygen that is found in a layer high in the earth's atmosphere.

15. Everything that exists in a particular environment.

16. The organisms that interact with one another in a similar location.

DOWN

1. An environment that has all the things that a particular plant or animal needs in order to live

3. The area of land that includes a particular river or lake and all the rivers, streams, etc., that flow into it

5. A vehicle which uses two or more distinct types of power

9. The state or situation that results when something (such as a plant or animal species) has died out completely

11. The number of organisms of the same species that live in a particular geographic area at the same time, with the capability of interbreeding.

13. A source of pollution that issues from widely distributed or pervasive environmental elements

HINT...POPULATION,COMMUNITY,BIOSPHERE,SYMBIOSIS,NICHE,HABITAT,CONSERVATION,EXTINCTIO N,BROWNFIELD,OZONE,WATERSHED,AIRSHED,NONPOINT,HYBRIDVEHICLE,FUELCELL

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