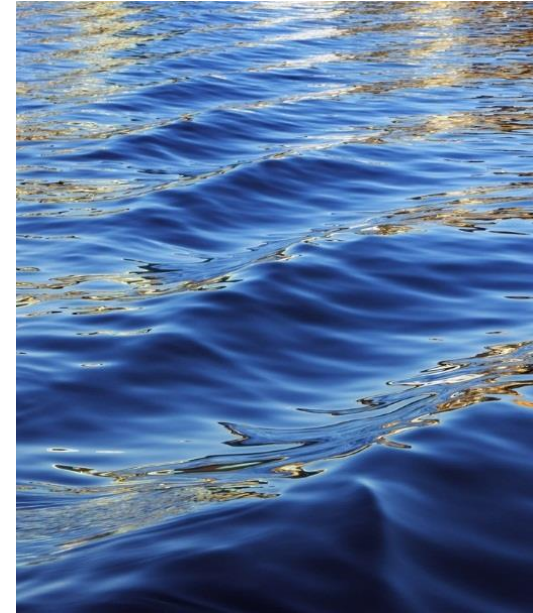




Business Sustainability & the Global Climate Change



Mahidol University
International College





IF NOT
NOW,
WHEN?
There is no PLANET B

Climate Change & Sustainability

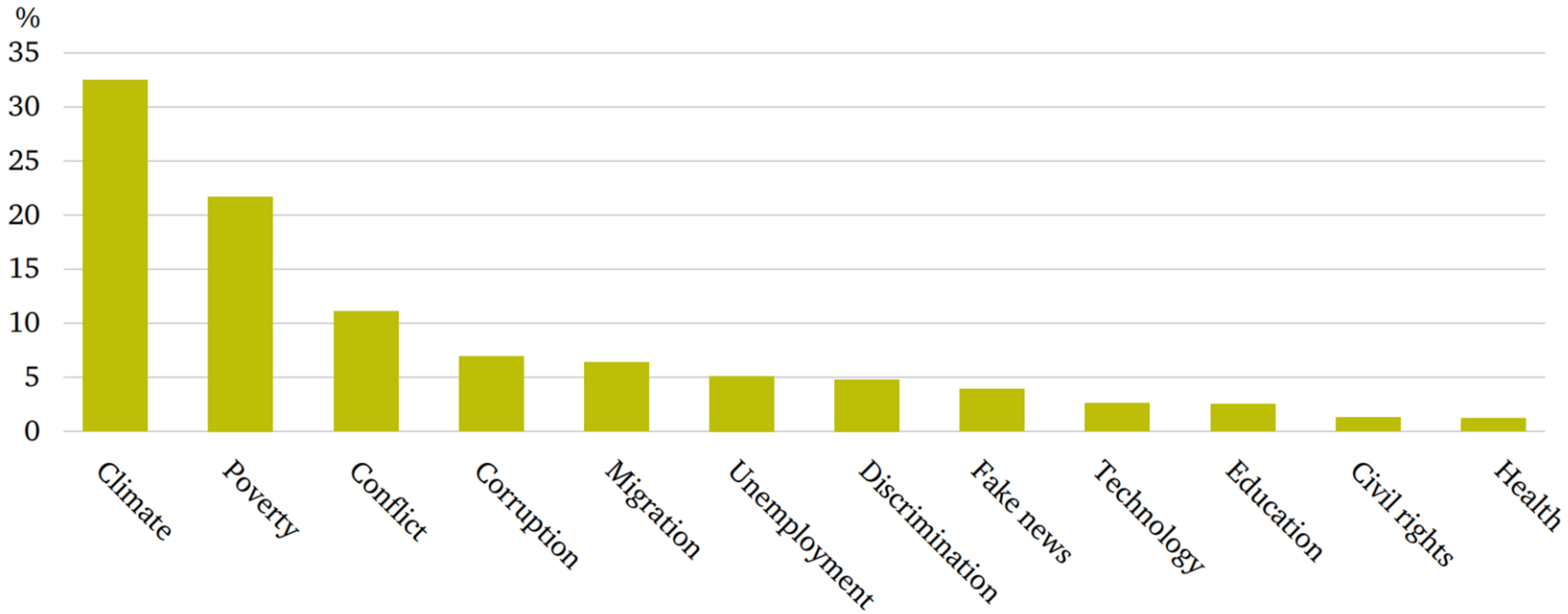
Bablu Kumar Dhar, *Ph.D., Post Doc*
Associate Professor
Business Admin. Division, MUIIC, MU



What is the world's biggest problem?

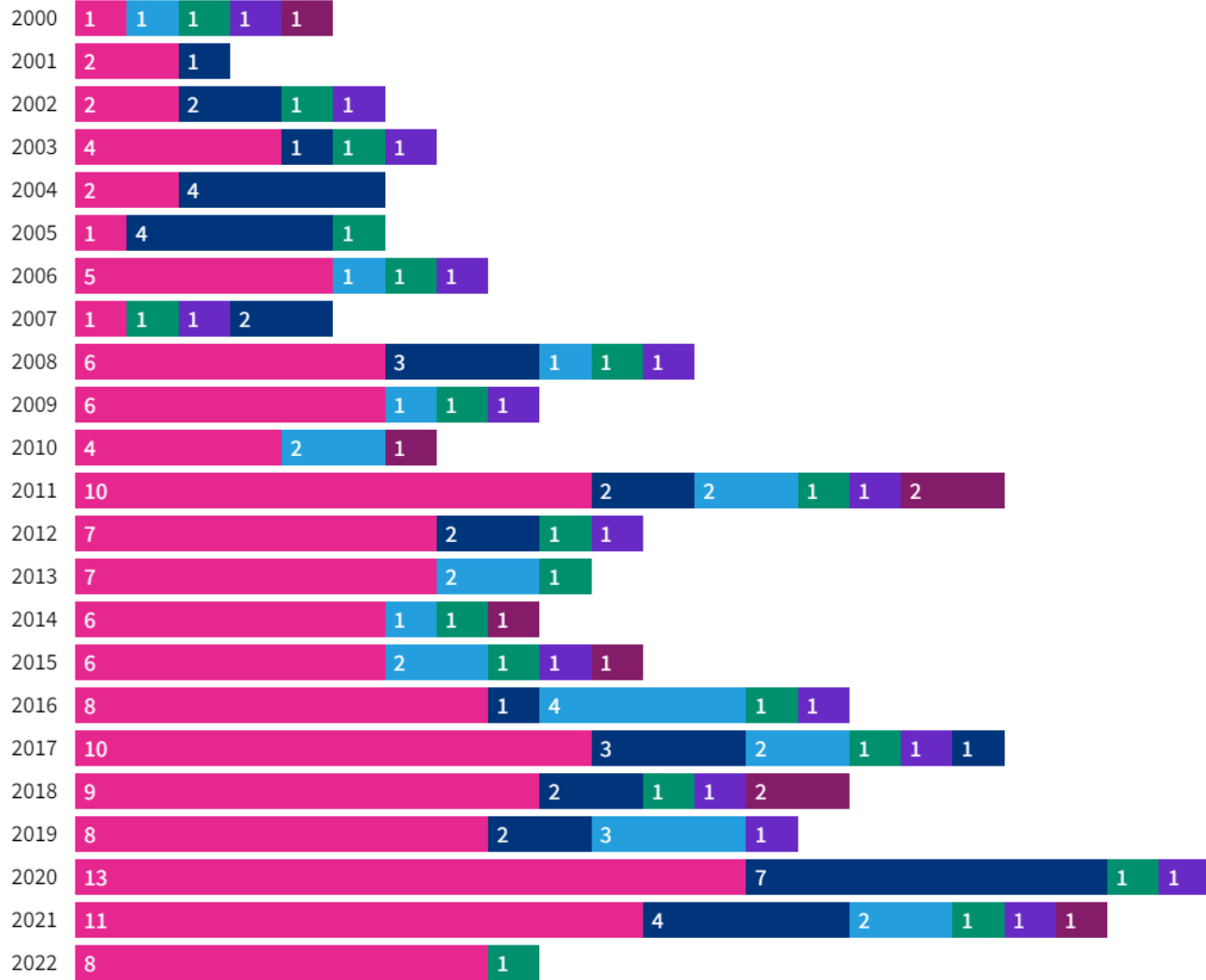
	A	B
1	Targeted Problems	No of Respondents
2	Health	
3	Civil rights	
4	Education	
5	Technology	
6	Fake news	
7	Discrimination	
8	Unemployment	
9	Migration	
10	Corruption	
11	Conflict	
12	Poverty	
13	Climate	

Is climate change the world's biggest problem?



The survey report of thousands of **young people**

Is climate really changing?

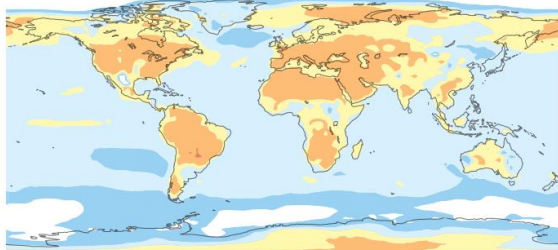


Global average temperatures have increased by about 1 degree Celsius

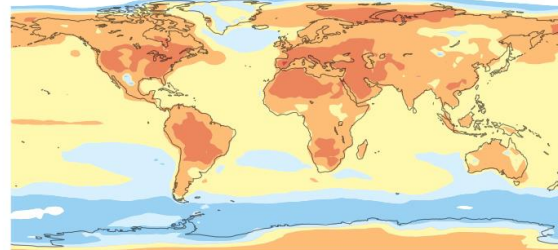
(1.8 degrees Fahrenheit) since the late 19th century.

This is the fastest rate of warming in the past 10,000 years.

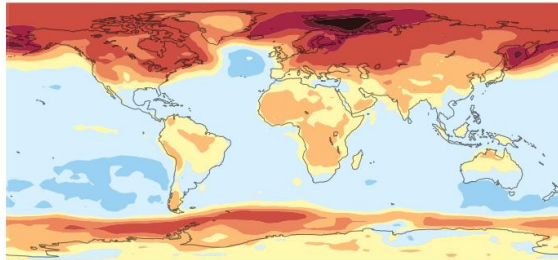
+ 1.5°C: Change in average temperature of hottest days



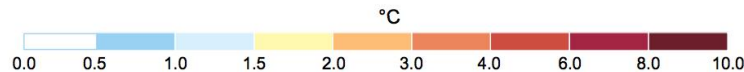
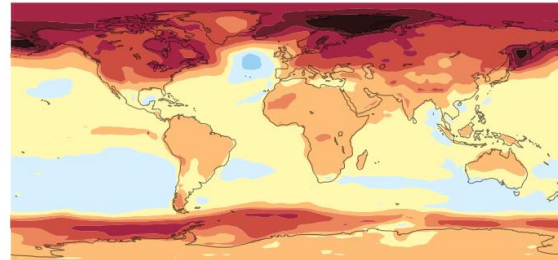
+ 2.0°C: Change in average temperature of hottest days



+ 1.5°C: Change in average temperature of coldest nights

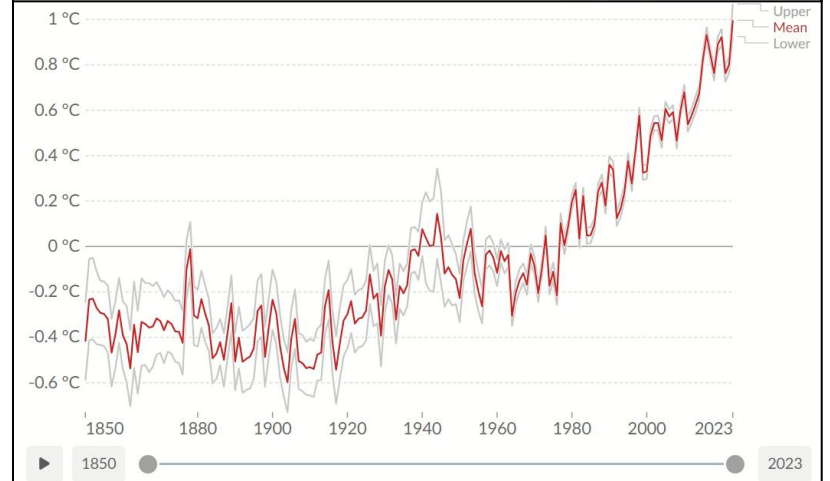
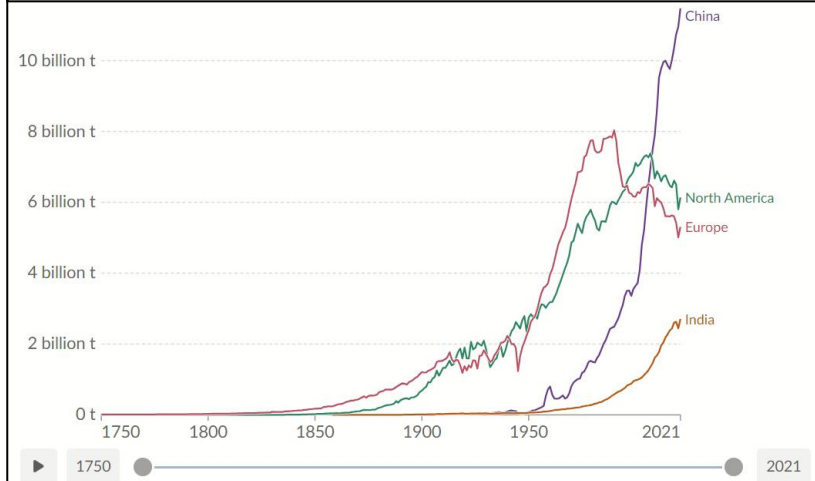
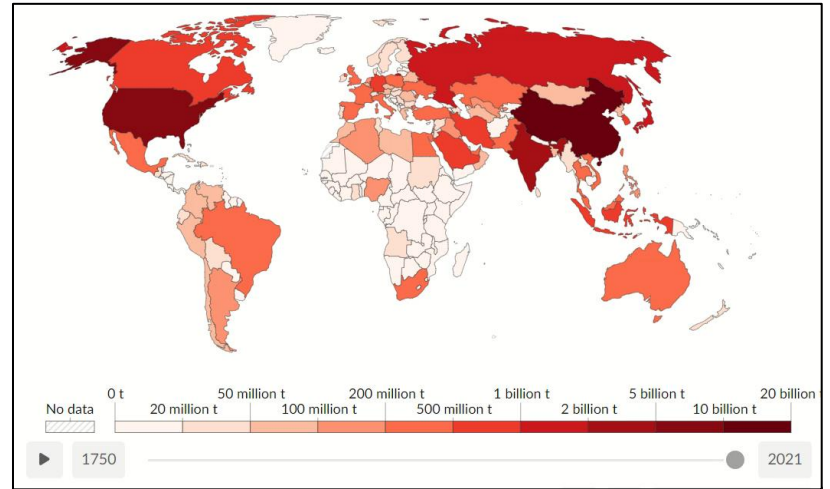
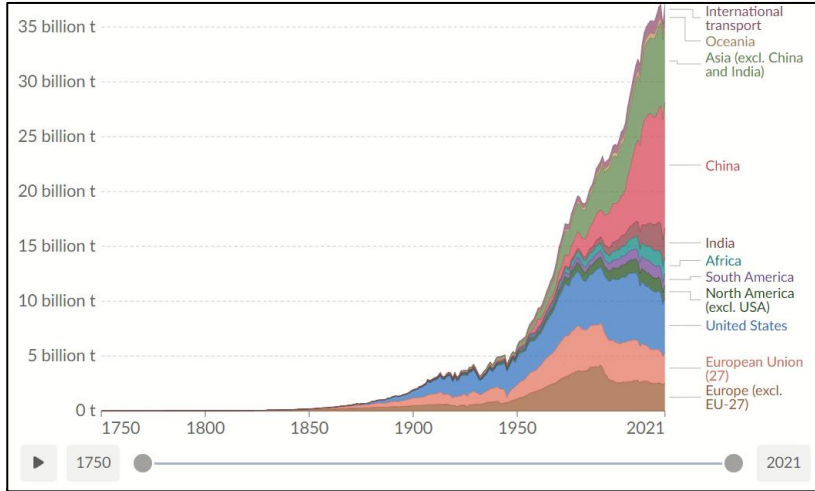


+ 2.0°C: Change in average temperature of coldest nights



*Is there any relationship
between
climate change & human activities?*

Relationship between climate change & human activities



Greenhouses gases like **CO₂, CFC and methane** trap **heat** heading out from the Earth, leading to warming. Since the **Industrial Revolution**, average global temperatures have **increased by around 1°C, with most of the warming coming after 1980**.



Why is addressing climate change important?

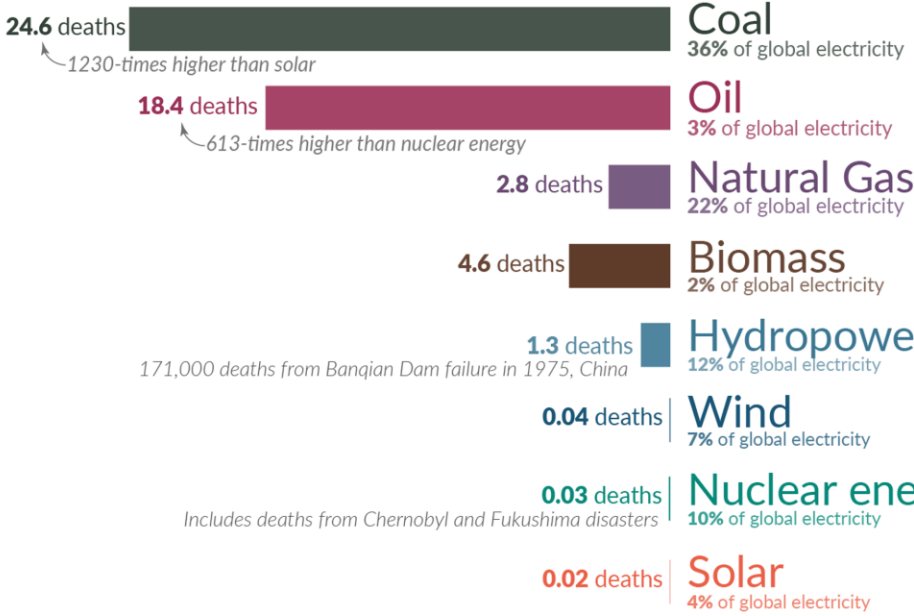
- How much greenhouse gas we emit
- How much warming those emissions will cause
- The impact of a given level of warming

What are the **safest** and **cleanest** sources of energy?



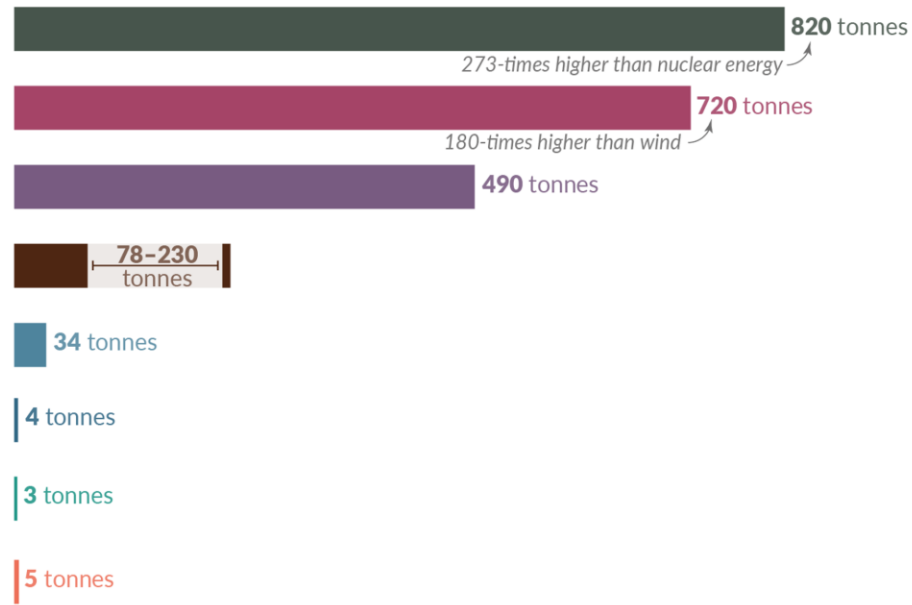
Death rate from accidents and air pollution

Measured as deaths per terawatt-hour of electricity production. 1 terawatt-hour is the annual electricity consumption of 150,000 people in the EU.

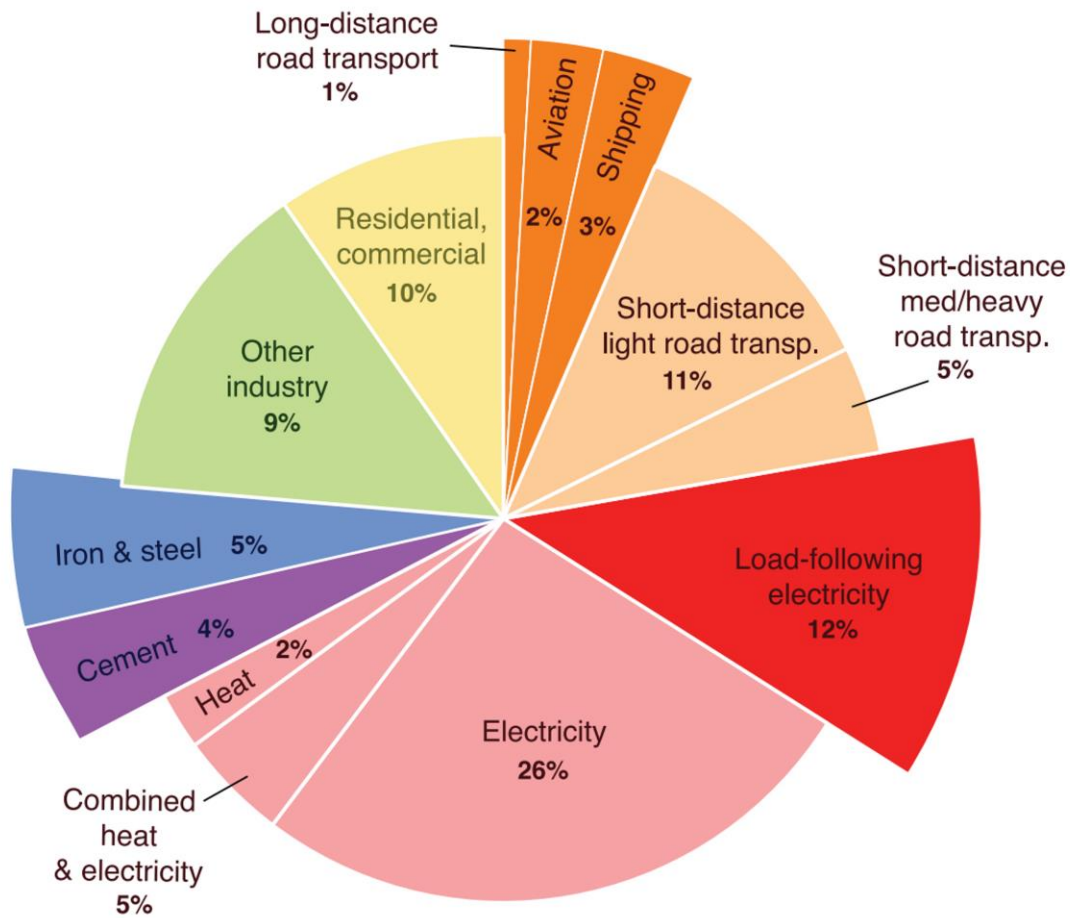


Greenhouse gas emissions

Measured in emissions of CO₂-equivalents per gigawatt-hour of electricity over the lifecycle of the power plant. 1 gigawatt-hour is the annual electricity consumption of 150 people in the EU.

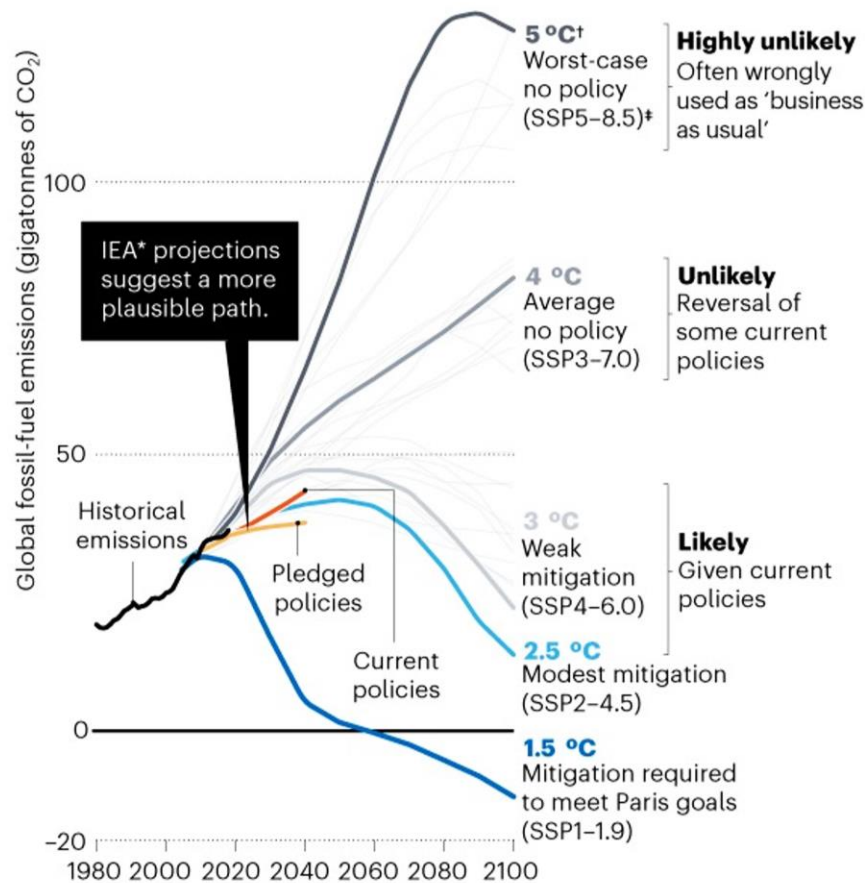


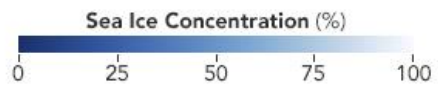
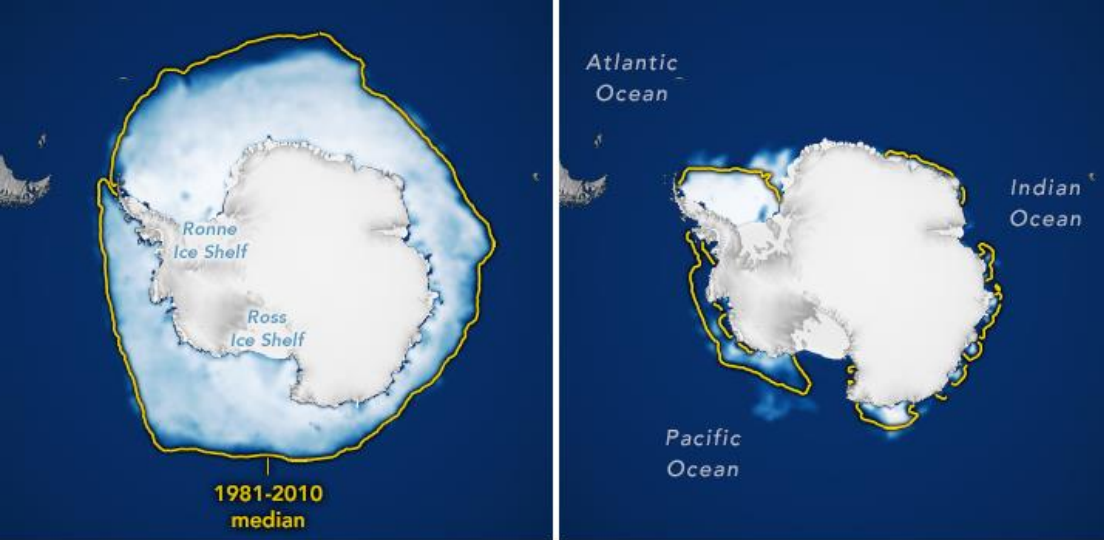
Death rates from fossil fuels and biomass are based on state-of-the-art plants with pollution controls in Europe, and are based on older models of the impacts of air pollution on health. This means these death rates are likely to be very conservative. For further discussion, see our article: [OurWorldinData.org/safest-sources-of-energy](https://ourworldindata.org/safest-sources-of-energy). Electricity shares are given for 2021. Data sources: Markandya & Wilkinson (2007); UNSCEAR (2008; 2018); Sovacool et al. (2016); IPCC AR5 (2014); Pehl et al. (2017); Ember Energy (2021).



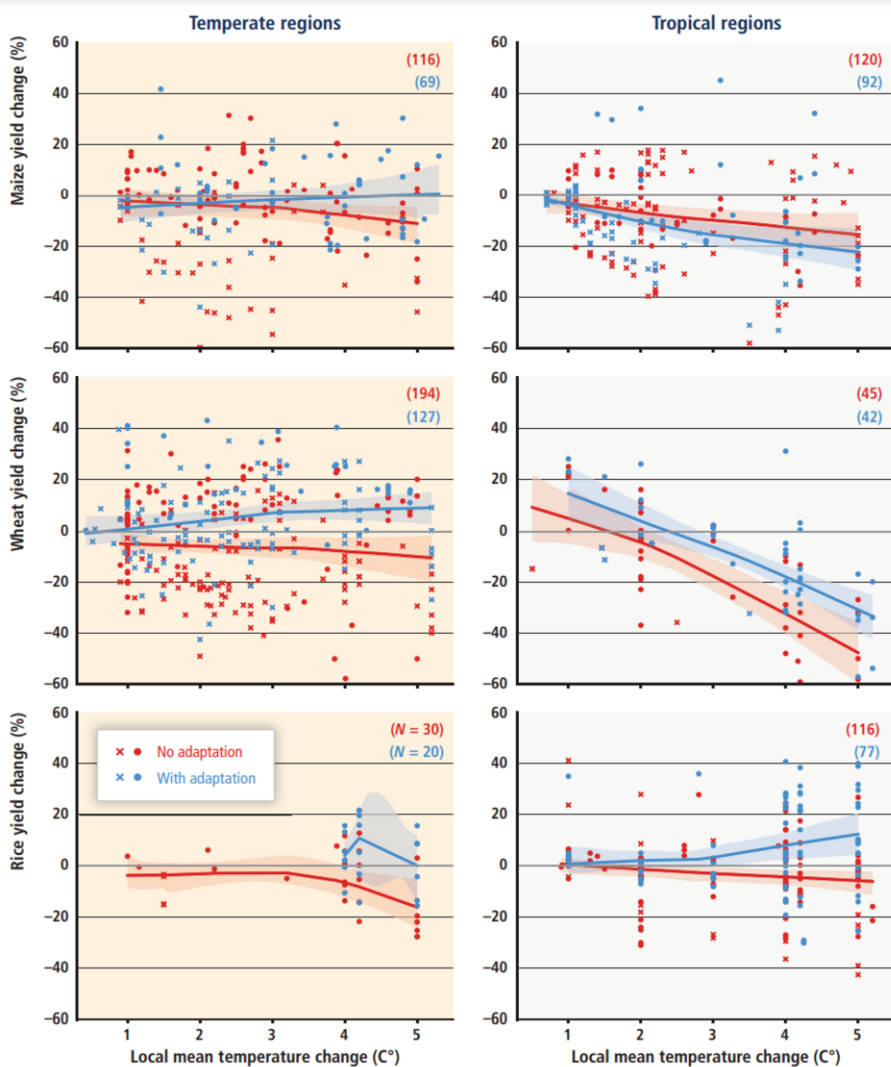
A Global fossil fuel & industry emissions, (33.9 Gt CO₂)

How much warming do we expect?





Climate Change & Food Production

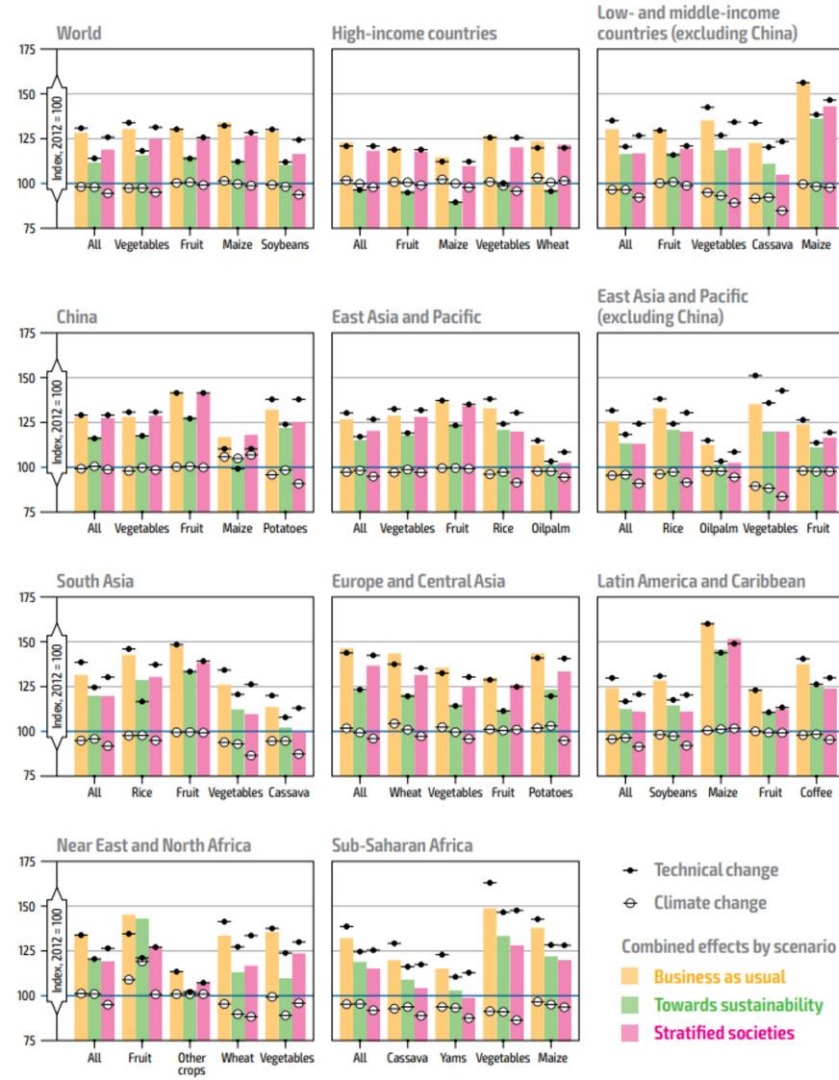


The chart anticipates mixed, but **largely negative**, consequences from increased temperature on crop yields. The effect is most severe in tropical regions, and less bad (but still negative) in temperate regions. The chart only shows agricultural impacts of up to 5°C of warming; studies on even more extreme warming are scarce, but generally suggest that impacts increase as warming increases.

Climate change would also have some **positive effects on agriculture by freeing up frozen land at higher latitudes.**

Climate Change & Food Production

Modelling studies suggest that climate change will damage crop yields, but that overall yields will improve due to technological progress. The Food and Agriculture Organization and others have found that technological change up to 2050 will outpace the effect of climate change for almost all scenarios: almost all crops, almost all agricultural systems, and all regions.



Trends of Food Production

World

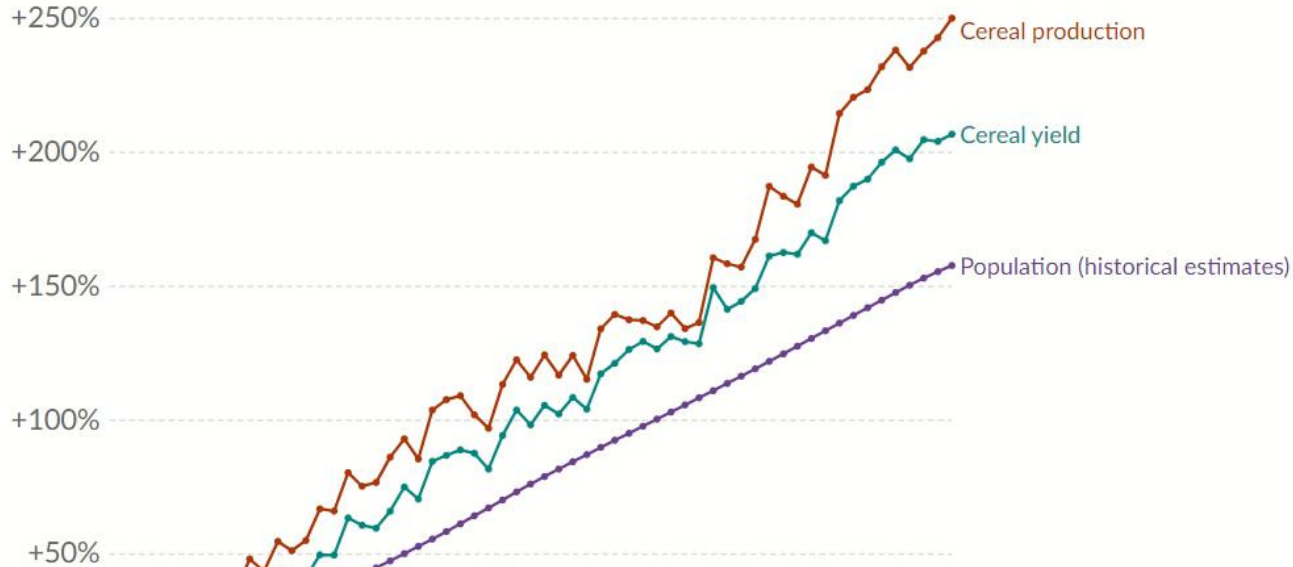
In Data

All figures are indexed to the start year of the timeline. This means the first year of the time-series is given the value zero.

Table Chart

Change country or region

Settings



Land used for cereal

How the production level is raising?

Tomato



Tomatoes have been genetically modified, but they are not being grown commercially at this time

Alfalfa



GMO alfalfa is contaminating non-GMO alfalfa crops at a rapid rate

Cotton



At least half of cotton grown in the world is GMO

Rice



GMO rice has been approved but is not yet being used commercially

Wheat



Unapproved GMO has contaminated wheat fields, and we don't yet know the extent of it

Sweet Corn



More than 70 percent of corn grown in the United States has been genetically engineered

Sugar Beets



90% of Sugar Beets (used to make 50% of our sugar) are GMO

Summer Squash



Farmers don't like GMO squash but some experts say GM squash have blended with wild squash

Salmon



GMO salmon has not been approved by the FDA, but it will be very soon

Soy



More than 93% of soybeans the United States produces are genetically modified

Canola Oil



87% of canola grown commercially, and 80% of wild canola is GMO

Peas



Peas have been genetically modified but are not approved or available

Yeast



GMO yeast for wine has been approved

Hawaiian Papaya



Most Hawaiian papaya is GMO, even many organic crops are contaminated

How the production level is raising?

Eggplant after 1,700 years of genetic modification



WILD

Eggplants once came in a wide array of shapes and colors, from blue to yellow, and some were round. Primitive varieties had a spine.



MODERN

Selective breeding has left us with the familiar oblong purple vegetable. The spine is gone and its stem now connects to its flowers.

Carrots after 1,100 years of genetic modification



GMO FOODS,
ARE THEY
GOOD OR BAD?

Corn after 1,100 years of genetic modification



WILD

The North American sweet corn was bred from the barely edible teosinte plant. It was likely very dry when it was first domesticated.



MODERN

Modern corn is much bigger and easier to grow and peel. Settlers from Europe kickstarted these changes after the 15th century.

Bananas after 7,000 years of genetic modification



WILD

Cultivated at least 7,000 years ago in Papua New Guinea, bananas were starchy and hard. They had large, tough seeds.



MODERN

Today's tastier bananas are hybrids of two wild banana varieties, *Musa acuminata* and *Musa balbisiana*.

Watermelon after 400 years of genetic modification



WILD

Judging by paintings of watermelons from the 17th century, the seeds were once arranged in swirly geometric patterns.

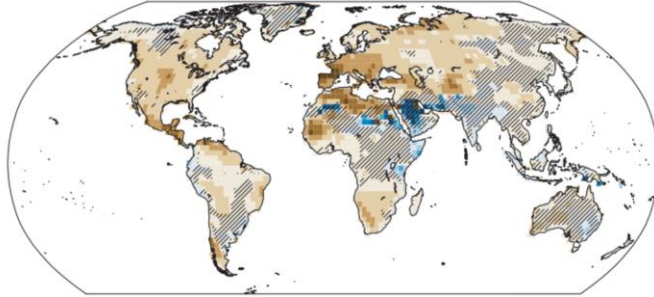


MODERN

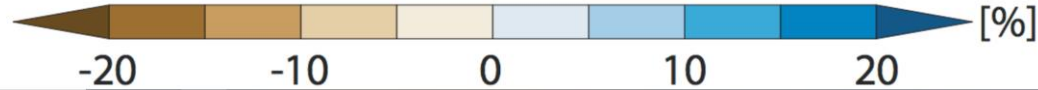
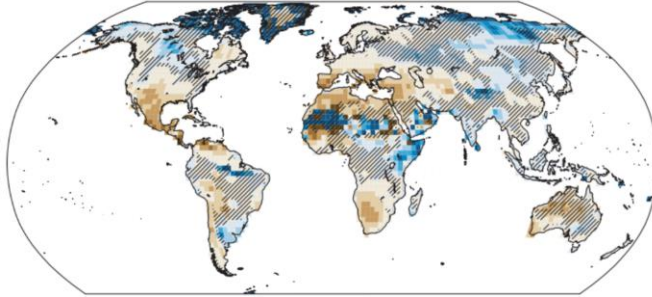
Today's watermelons have a bright red, juicy interior. The seeds are often removed to prevent the plants from being pollinated.

Impact of Global warming on Soil

Δ SUMMER TOP SOIL MOISTURE



Δ SUMMER TOTAL SOIL MOISTURE

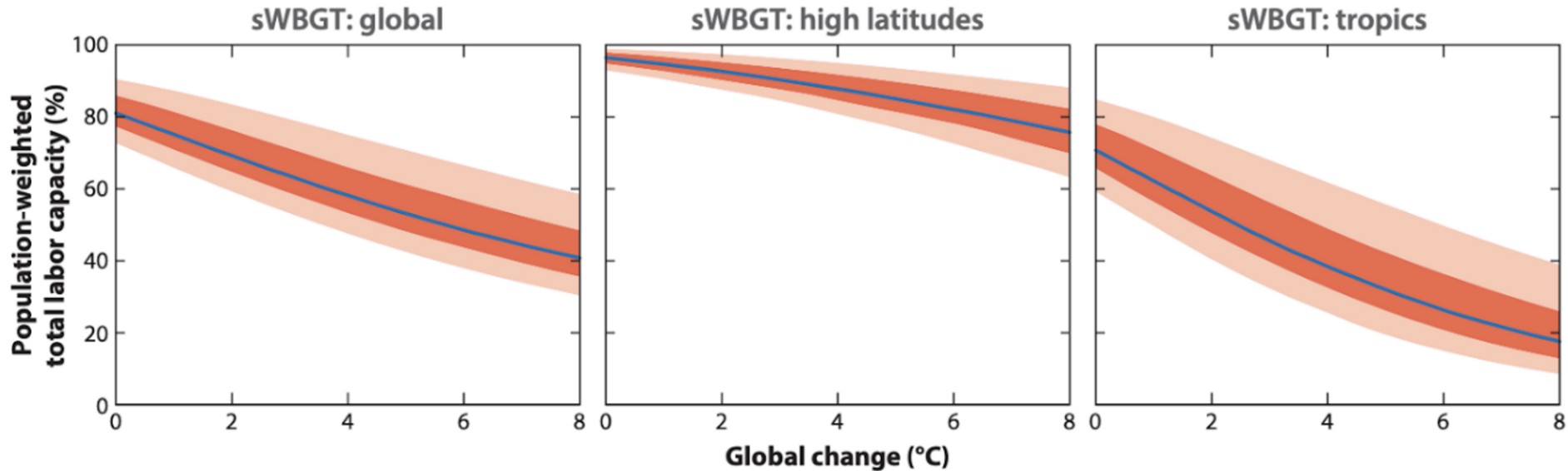


The effect of climate change on drought is determined by changes in precipitation and higher temperatures, which increase the rate of evaporation and soil moisture loss.

Models suggest that climate change will have mixed effects on precipitation, but will generally dry out soils due to faster evaporation. The chart below shows the effect of global warming of 4–5°C relative to today.

One way to adapt to droughts is irrigation. In India, 38% of agricultural land is irrigated and 60% in Bangladesh, so even relatively low-income countries can use this technology.

Global warming and impact on Income level



People are less productive in warm and humid conditions, so global warming would start to create problems for people working outdoors. The chart shows how rising heat stress would affect current labor capacity in different regions, as the global population is currently distributed, and without adaptation. Tropical regions are currently at 75% of their labor capacity. However, 3°C of warming would decrease this to 50% of its potential, while 8°C of warming would decrease it to 20%.

Climate Change & Health

Direct Impact

Heatwaves:
Can we adapt?



Climate Change & Health

In-direct Impact

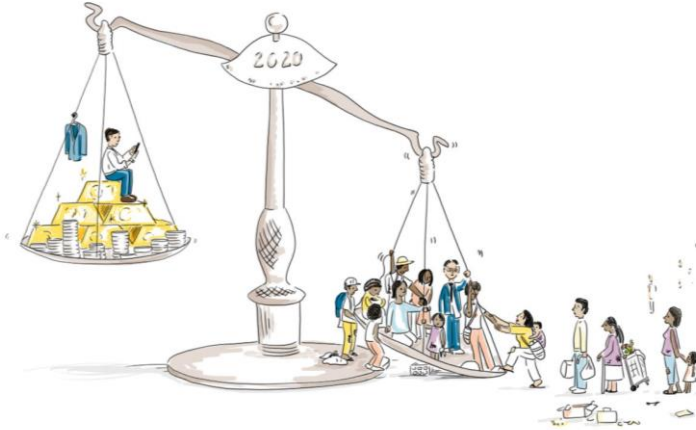


Climate Change & Health

In-direct Impact



Climate Change & More In-direct Impact



Who is most at risk of health effects due to climate change?

Vulnerability to the Health Impacts of Climate Change at Different Life Stages



Mothers and babies

Adverse pregnancy outcomes such as low birth weight and preterm birth have been linked to extreme heat events, airborne particulate matter, and floods.



Infants and toddlers

Young children's biological sensitivity places them at greater risk from asthma, diarrheal illness, and heat-related illness.



School age and older children

The behaviors and activities of older children increase their risk of exposure to heat-related illness, vector-borne and waterborne disease, and respiratory effects from air pollution and allergens.



Bablu Kumar Dhar

MUIC, Mahidol University

Verified email at mahidol.ac.th - [Homepage](#)

Organizational Performance Environmental Management Corporate Social Responsi... COVID-19 Sustainability



TITLE

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Climate Change and Aging Health in Developing Countries

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Climate Change and Aging Health in Developing Countries

Sabrina Maria Sarkar,* Bablu Kumar Dhar,* Mochammad Fahlevi, Selim Ahmed, Md. Jamal Hossain, Mohammad Meshbahur Rahman, Md. Abu Issa Gazi, and Ranjithkumar Rajamani

The climate of the Earth has changed throughout history. Climate change negatively impacts human rights in a wide range of ways. The study aims to find out the impact of climate change on aging health in developing countries. The study found that public health will be devastated if climate change continues unabated. Countries that are least responsible for global warming are most susceptible to the effects of higher temperatures, such as death and disease. In low- and middle-income countries, disasters are more likely to happen to people aged 60 and over. Although climate change affects all of us, older people are especially at risk from it, as evidenced by a growing body of research. The study also offers countermeasures and suggestions to develop aging health in developing countries affected by climate change.

result of increased carbon dioxide emissions into the atmosphere and other human activities, the planet's average surface temperature has risen $\approx 2.12^{\circ}\text{F}$ (1.18°C) since the late 19th century.^[1] Most of the warming took place in the last 40 years, and the seven hottest years occurred in the last seven years. The hottest years on record are 2016 and 2020.^[2] Earth stores 90% of the extra energy in the ocean, which has absorbed much of the extra heat. The top 100 meters of the ocean have been warming by more than 0.6°F (0.33°C) since 1969.^[3] In the last century, the sea level rose by ≈ 8 inches (20 cm). In the last two decades, however,

1. Introduction

In recent centuries, the Earth's surface has become warmer due to global warming. The climate of the Earth has changed throughout history. Since the last ice age ended 11 700 years ago, the planet has experienced seven cycles of glacial retreat and advancement, with the abrupt end of the last ice age marking the beginnings of the modern climate era, and civilization as well.^[1] As a

the growth rate has been nearly double what it was in the last century, and it has been accelerating every year.^[3]

Temperatures worldwide have increased by 1.2°C since pre-industrial times. According to the World Meteorological Organization (WMO),^[6] Figure 1 shows that the mean global temperature in 2021 was $\approx 1.09^{\circ}\text{C}$ greater than the average of 1850–1900 (based on data from January to September). In June 2021, global surface temperature was 0.88°C (1.58°F) because of greenhouse

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Relationship between Climate Change and happiness






Global Environmental Change

Volume 23, Issue 6, December 2013, Pages 1467-1475



Climate change, income and happiness: An empirical study for Barcelona

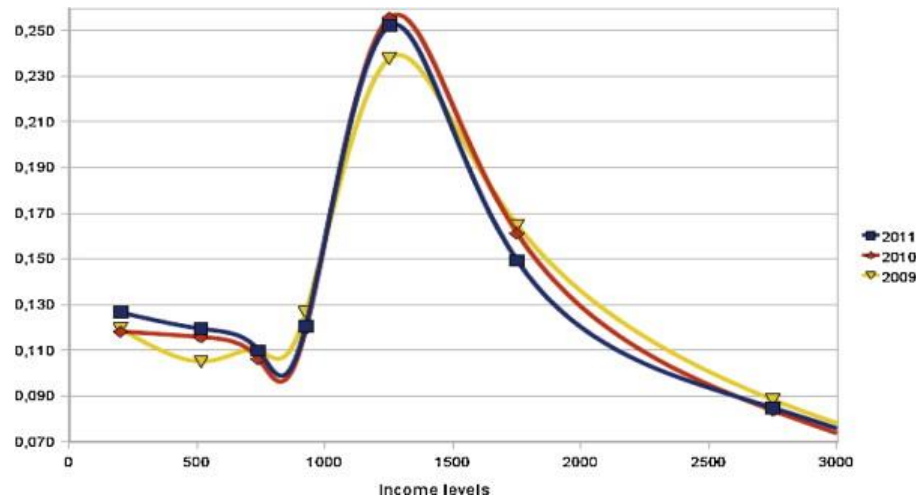
Filka Sekulova^a  , Jeroen C.J.M. van den Bergh^{a b c} 

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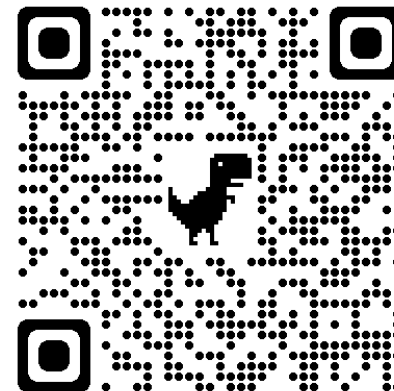
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Sustainability, Well-Being, and Happiness: A co-word Analysis

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Abstract

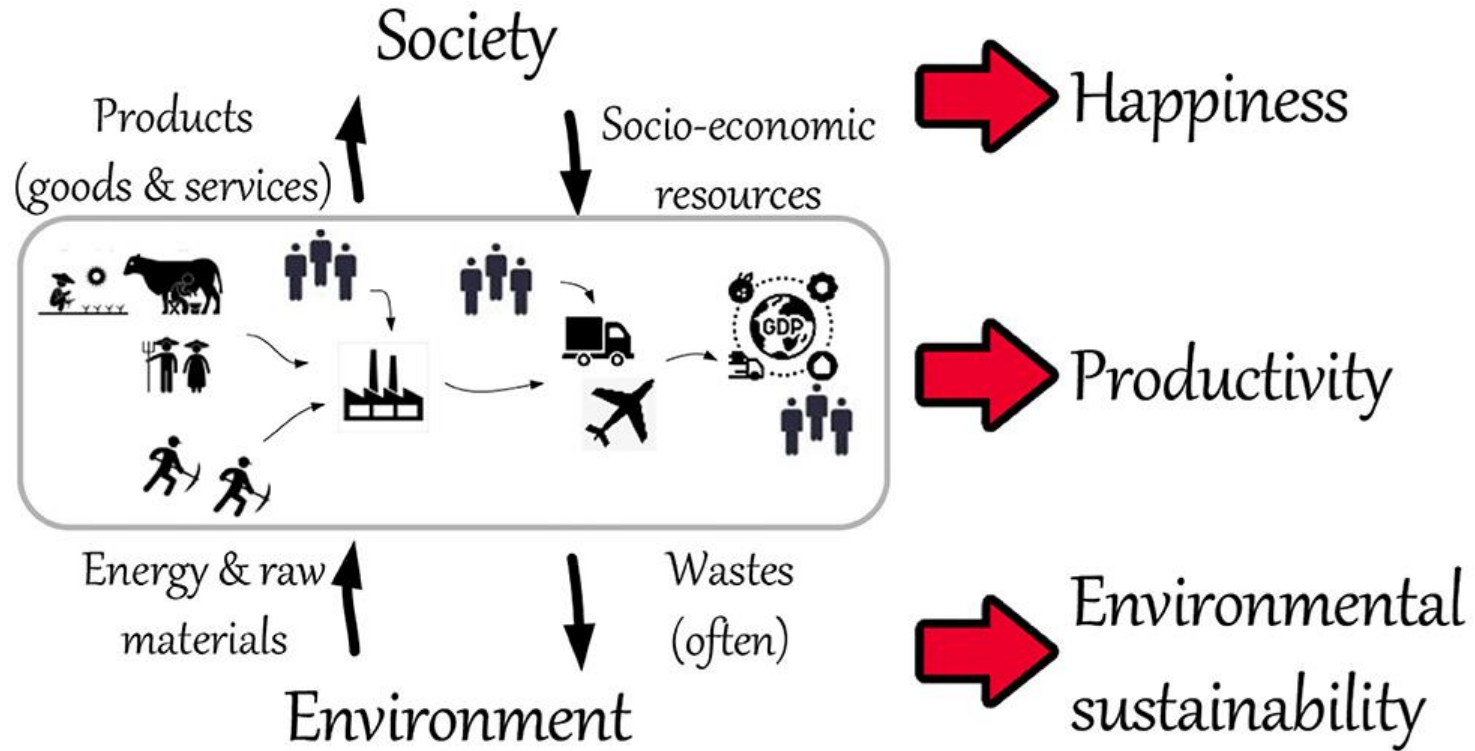
Sustainability has become increasingly essential due to its potential to address future challenges that will affect societies and economies. While a considerable amount of literatures has focused on environmental and economic factors, there is space for more studies on how sustainability can interact with well-being and happiness as new paradigms for individuals, communities, and organizations. With the aim of deeply analyzing this aspect, the paper, through a co-word analysis and a narrative literature review, explores the trend of academic papers and identifies a new field of research, extending previous studies introducing well-being and happiness as new drivers for sustainable behavior.

Keywords: sustainability, well-being, happiness

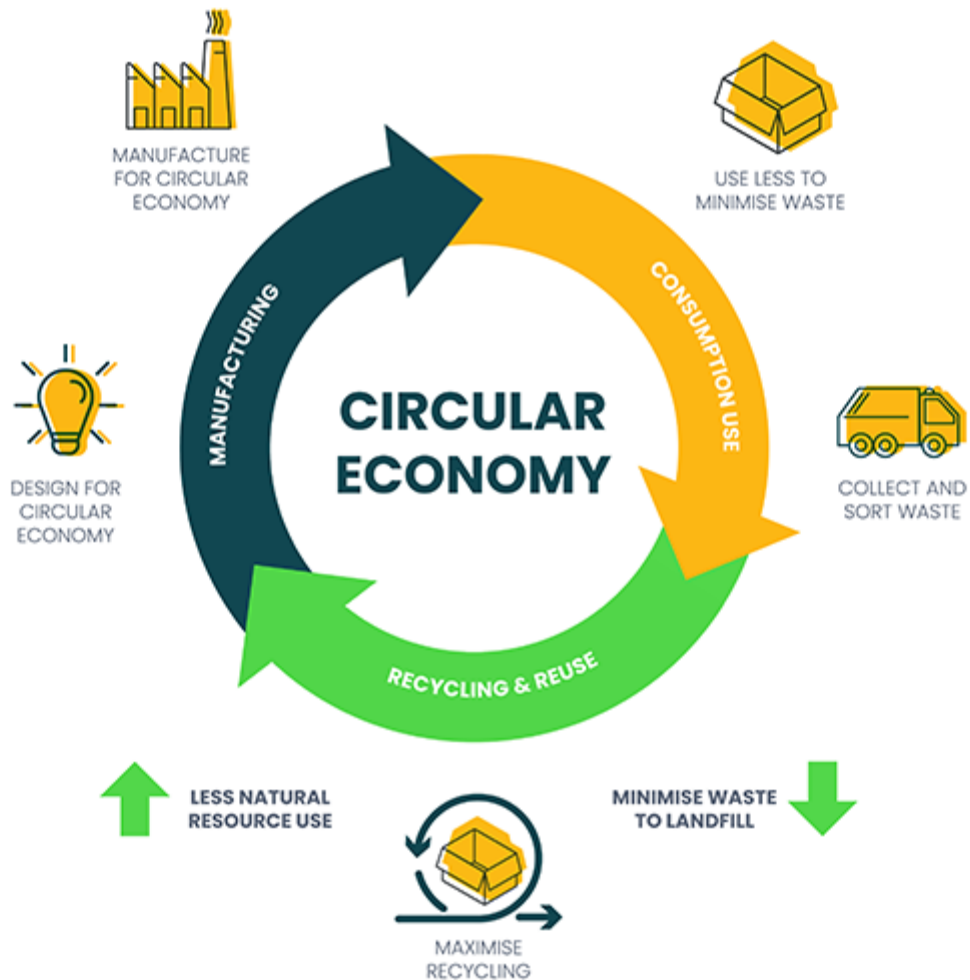
1. Introduction

The concept of sustainability comes from the simple principle that everything needed for survival and well-being depends, either directly or indirectly, on the environment in a broad sense (natural, social, political, cultural, economic, etc.) In this view, sustainability creates and sustains the conditions under which human beings can exist in harmony, by fulfilling the social, economic, and other requirements of present and future generations.

Dettori, A., & Floris, M. (2019)



Giannetti et al. (2021)



What should we do?








Journal of Cleaner Production

Volume 424, 20 October 2023, 138806



The contribution of circular economy practices on the resilience of production systems: Eco-innovation and cleaner production's mediation role for sustainable development

[Thanh Tiep Le](#)^a  , [Alberto Ferraris](#)^{b c}  , [Bablu Kumar Dhar](#)^d 



1. Explain the entrepreneurial and sustainable dimensions of Freitag.
2. What is the difference between a Freitag bag and a mass-produced bag?
3. Can two customers have exactly the same bag? Explain!
4. What can we learn from Freitag's entrepreneurial and sustainable approach?



1 NO POVERTY



2 ZERO HUNGER



3 GOOD HEALTH AND WELL-BEING



4 QUALITY EDUCATION



5 GENDER EQUALITY



6 CLEAN WATER AND SANITATION



7 AFFORDABLE AND CLEAN ENERGY



8 DECENT WORK AND ECONOMIC GROWTH



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



10 REDUCED INEQUALITIES



11 SUSTAINABLE CITIES AND COMMUNITIES



THE GLOBAL GOALS

For Sustainable Development

12 RESPONSIBLE CONSUMPTION AND PRODUCTION



13 CLIMATE ACTION



14 LIFE BELOW WATER



15 LIFE ON LAND



16 PEACE AND JUSTICE STRONG INSTITUTIONS



17 PARTNERSHIPS FOR THE GOALS



Case Studies for the next class

Choose any **one Research Paper**



5 Students = 1 Team = 1 Case = 10 min

1. Matos, S., Viardot, E., Sovacool, B. K., Geels, F. W., & Xiong, Y. (2022). Innovation and climate change: A review and introduction to the special issue. *Techovation*, 102612.
2. Yang, M., Chen, L., Wang, J., Msigwa, G., Osman, A. I., Fawzy, S., ... & Yap, P. S. (2023). Circular economy strategies for combating climate change and other environmental issues. *Environmental Chemistry Letters*, 21(1), 55-80.
3. Abbass, K., Qasim, M. Z., Song, H., Murshed, M., Mahmood, H., & Younis, I. (2022). A review of the global climate change impacts, adaptation, and sustainable mitigation measures. *Environmental Science and Pollution Research*, 29(28).
4. Leal Filho, W., Ng, A. W., Sharifi, A., Janová, J., Özüyar, P. G., Hemani, C., ... & Rampasso, I. (2023). Global tourism, climate change and energy sustainability: assessing carbon reduction mitigating measures from the aviation industry. *Sustainability Science*, 18(2), 983-996.
5. Megura, M., & Gunderson, R. (2022). Better poison is the cure? Critically examining