

**"Climate Change: Evidence and Causes: Update 2020"** is a comprehensive report jointly produced by the U.S. National Academy of Sciences and the UK's Royal Society. This document provides a detailed summary of scientific evidence concerning climate change, its causes, and potential impacts, aimed at helping the public understand the ongoing changes in Earth's climate. Below is a breakdown of the key aspects covered in this 2020 update.

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### **1. Scientific Consensus on Climate Change**

There is an overwhelming scientific consensus that climate change is real, human activities are the primary cause, and its impacts are becoming more evident. The report reaffirms that greenhouse gases, particularly carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O), are increasing in the atmosphere due to human activities, particularly the burning of fossil fuels (coal, oil, and gas) and deforestation.

### **2. Key Evidence for Climate Change**

- **Rising Global Temperatures**: Global average temperatures have increased by about 1°C since the late 19th century, with most of the warming occurring since 1970. The 2010s were the warmest decade on record.

- **Ocean Warming and Acidification**: Oceans have absorbed over 90% of the excess heat generated by global warming. This has led to rising sea surface temperatures and contributed to increased sea levels. Additionally, increased CO<sub>2</sub> absorption by the oceans has resulted in acidification, affecting marine life and ecosystems.

- **Melting Ice and Snow**: Ice sheets in Greenland and Antarctica are losing mass, glaciers are retreating globally, and Arctic sea ice is declining in extent and thickness. These changes contribute to rising sea levels and threaten ecosystems dependent on cold environments.

- **Rising Sea Levels**: Sea levels have risen by about 20 cm (8 inches) since 1900, with an increasing rate in recent decades. This is primarily due to the thermal expansion of seawater as it warms and the melting of ice sheets and glaciers.

- **Changes in Weather Patterns**: Evidence shows shifts in weather patterns, including more frequent and intense heatwaves, changes in precipitation patterns leading to increased flooding in some regions and droughts in others, and a rise in extreme weather events like hurricanes and wildfires.

### **3. Causes of Climate Change**

- **Greenhouse Gas Emissions**: Human activities, especially the burning of fossil fuels for energy and deforestation, have dramatically increased the concentrations of greenhouse gases. CO<sub>2</sub> levels in the atmosphere have increased by more than 40% since the pre-industrial era.

- **Carbon Cycle Disruption**: Human-induced changes in the carbon cycle (e.g., deforestation, land-use changes, and fossil fuel extraction) have upset the balance of carbon sinks like forests and oceans, reducing their ability to absorb CO<sub>2</sub>. This is exacerbating the buildup of greenhouse gases in the atmosphere.

- **Natural Factors**: While natural factors such as volcanic eruptions, solar variability, and natural climate cycles have historically influenced climate patterns, they cannot explain the magnitude and rapid pace of the warming observed over the past century. Human activities are the dominant force driving current climate changes.

#### ### 4. **\*\*Attribution of Extreme Events\*\***

Advances in climate modeling and data analysis have enabled scientists to link individual extreme weather events to climate change. For example:

- Heatwaves are becoming more intense and frequent as global temperatures rise.
- Increased rainfall intensity is linked to a warmer atmosphere, which can hold more moisture.
- Hurricanes are becoming more powerful due to warmer ocean waters that provide energy to storms.

#### ### 5. **\*\*Future Projections\*\***

The report outlines future climate projections under various greenhouse gas emissions scenarios:

- **\*\*If Emissions Continue Unchecked\*\***: Global temperatures are likely to rise by 3–4°C by the end of the 21st century, leading to catastrophic impacts, including more severe extreme weather, widespread ecosystem damage, and threats to food and water security.
- **\*\*If Emissions Are Reduced\*\***: Limiting warming to below 2°C, as targeted by the Paris Agreement, would require immediate and deep reductions in greenhouse gas emissions. This would mitigate the worst impacts but would still result in some level of sea-level rise, increased heatwaves, and ecosystem disruptions.

#### ### 6. **\*\*Impacts on Natural Systems\*\***

- **\*\*Ecosystems and Biodiversity\*\***: Climate change is driving species toward extinction, altering ecosystems, and causing mismatches in seasonal events like plant blooming and animal migrations. Coral reefs, for instance, are highly vulnerable to warming oceans and acidification.
- **\*\*Agriculture and Food Security\*\***: Changes in temperature, precipitation patterns, and extreme weather events are disrupting food production. Some regions may benefit from longer growing seasons, but overall, climate change poses a significant threat to global food security.
- **\*\*Water Resources\*\***: Increased temperatures and altered precipitation patterns are affecting freshwater availability, with some regions facing more frequent droughts and water shortages, while others experience increased flood risks.

#### ### 7. **\*\*Human Health and Society\*\***

- **\*\*Heat-Related Illnesses\*\***: Rising temperatures increase the incidence of heat-related illnesses and deaths, particularly among vulnerable populations such as the elderly and those without access to cooling.
- **\*\*Vector-Borne Diseases\*\***: Climate change is altering the distribution of diseases spread by insects (e.g., malaria, dengue) as warming temperatures allow mosquitoes to thrive in new areas.
- **\*\*Economic Impacts\*\***: The economic costs of climate change are vast, including damage to infrastructure from extreme weather, disruptions to agriculture, and increased healthcare costs. Some estimates suggest that failing to act on climate change could result in trillions of dollars in economic losses globally.

#### ### 8. **\*\*Solutions and Mitigation\*\***

- **\*\*Reducing Greenhouse Gas Emissions\*\***: The most effective way to mitigate climate change is by reducing greenhouse gas emissions. This can be achieved through the transition to renewable energy sources like wind and solar, improving energy efficiency, reforestation, and adopting sustainable agricultural practices.

- **Carbon Capture and Storage (CCS)**: Emerging technologies that capture and store CO<sub>2</sub> before it enters the atmosphere are seen as potential tools for reducing emissions. However, the scalability and cost-effectiveness of CCS are still under evaluation.

- **International Cooperation**: Global efforts, such as the Paris Agreement, emphasize the need for collective action by countries to reduce emissions and adapt to the impacts of climate change.

#### 9. **Adaptation Strategies**

While mitigation is crucial, some level of climate change is already unavoidable. Adaptation strategies are needed to cope with the impacts:

- **Infrastructure**: Building climate-resilient infrastructure to withstand extreme weather events and rising sea levels is essential for minimizing future damage.

- **Water Management**: Improved water management techniques, including rainwater harvesting, efficient irrigation, and wastewater recycling, are necessary to address changing water availability.

- **Agricultural Adaptation**: Developing drought-resistant crops and adjusting farming practices to changing climates are key to maintaining food production.

#### 10. **The Role of Individuals and Governments**

Addressing climate change requires action at all levels, from individuals reducing their carbon footprints to governments enacting policies that promote renewable energy, sustainable practices, and carbon pricing. Public awareness and education are critical for fostering a global response.

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The **2020 Update** of this report underscores the urgency of addressing climate change and the need for immediate action to limit its impacts. The evidence provided reinforces that human activities are the primary cause of current climate change, and the potential consequences, if left unchecked, could be severe and long-lasting.

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### Global Waste Management Outlook 2024: A Detailed Overview

The *Global Waste Management Outlook 2024* (GWMO 2024), jointly published by the United Nations Environment Programme (UNEP) and the International Solid Waste Association (ISWA), presents a comprehensive analysis of global waste trends and offers solutions to mitigate the ongoing waste crisis. Released in response to various United Nations Environment Assembly (UNEA) resolutions, this report serves as an essential tool for policymakers, waste management practitioners, and businesses aiming to tackle waste challenges through sustainable practices.

#### 1. **Rising Global Waste Levels**

Global waste generation continues to rise at an alarming rate. According to GWMO 2024, the world produced around **2.1 billion tonnes** of municipal solid waste in 2023, and this figure is projected to escalate to **3.8 billion tonnes** by 2050 if current waste management practices

persist. Rapid urbanization, population growth, and rising consumerism, particularly in developing countries, are the key drivers of this increase. This trend poses a significant threat to both the environment and public health, particularly in regions where waste management infrastructure is insufficient.

#### #### 2. **\*\*Waste Management Costs and Hidden Expenses\*\***

Managing the growing waste problem comes with significant financial costs. In 2020, the estimated global cost of municipal solid waste management was approximately **\*\*USD 252 billion\*\***, covering collection, transportation, treatment, and disposal. However, the GWMO 2024 points out that this figure does not account for hidden costs, such as environmental degradation, loss of biodiversity, and health-related expenses from improperly managed waste. When these factors are considered, the actual economic cost is much higher, reaching **\*\*USD 361 billion\*\***.

If the world continues to follow the "business-as-usual" waste management path, these costs are expected to increase dramatically, potentially reaching **\*\*USD 640 billion by 2050\*\***. The report emphasizes the urgent need for intervention to avoid this scenario.

#### #### 3. **\*\*The Circular Economy as a Solution\*\***

One of the core messages of GWMO 2024 is the need to shift from the traditional linear economy, which follows the "take, make, dispose" model, to a **\*\*circular economy\*\***. In a circular economy, waste is minimized through strategies such as reduction, reuse, recycling, and remanufacturing. This approach treats waste as a valuable resource rather than a problem to be discarded.

The report projects that transitioning to a circular economy could lead to **\*\*annual savings of USD 108.5 billion\*\***, as fewer resources would be wasted and the negative externalities of waste, such as environmental damage, would be reduced. It presents successful case studies from countries and cities that have implemented circular economy principles, showcasing significant environmental and economic benefits.

#### #### 4. **\*\*Scenario-Based Analysis: Paths Forward\*\***

GWMO 2024 evaluates three potential scenarios for global waste management:

- **\*\*Business-as-Usual\*\***: Continuing current practices will result in escalating waste generation, rising economic and environmental costs, and worsening public health outcomes.
- **\*\*Moderate Improvement\*\***: Implementing halfway measures—such as improved waste collection and treatment—could reduce waste impacts but may not be enough to curb the negative trends entirely.
- **\*\*Full Commitment to Zero Waste and Circular Economy\*\***: This scenario represents a radical transformation of global waste systems. It involves embracing zero waste goals, maximizing recycling, eliminating single-use products, and promoting sustainable consumption patterns. The report stresses that achieving this will require systemic changes in industries, governance, and public behavior.

The report concludes that while business-as-usual practices are unsustainable, a full commitment to circular economy principles offers the best path forward for reducing waste generation, mitigating climate change impacts, and promoting sustainable economic growth.

#### #### 5. **\*\*Impact of Waste on the Environment and Public Health\*\***

Waste mismanagement has significant environmental repercussions. The report highlights that **\*\*over 90%\*\*** of waste in low-income countries is disposed of in open dumps, often without proper containment, leading to widespread pollution of air, soil, and water resources. This also contributes to greenhouse gas emissions, exacerbating climate change. For instance, landfills are one of the largest anthropogenic sources of **\*\*methane\*\***, a potent greenhouse gas.

Moreover, improper waste management poses serious health risks, particularly in poorer communities. Exposure to hazardous waste materials, such as electronic waste (e-waste) and plastic, can lead to chronic diseases, respiratory issues, and waterborne illnesses.

#### #### 6. **\*\*Technological and Policy Recommendations\*\***

GWMO 2024 provides actionable recommendations to help nations, municipalities, and industries address the waste crisis:

- **\*\*Waste Prevention and Reduction\*\***: Governments should promote policies that reduce waste at its source, such as imposing bans on single-use plastics, encouraging product longevity, and supporting waste-minimization technologies.
- **\*\*Enhanced Recycling and Resource Recovery\*\***: Investments in advanced recycling technologies, including chemical recycling and waste-to-energy plants, are critical for minimizing the amount of waste sent to landfills.
- **\*\*Incentivizing Sustainable Business Practices\*\***: The report advocates for businesses to adopt extended producer responsibility (EPR) frameworks, where manufacturers are held accountable for the full lifecycle of their products, including post-consumer waste management.
- **\*\*Global Cooperation\*\***: Tackling the global waste crisis requires international collaboration. The report calls for stronger global governance frameworks to ensure that waste management practices adhere to sustainable development goals (SDGs).

#### #### 7. **\*\*Societal Engagement and Behavioral Change\*\***

The success of waste reduction and management strategies heavily depends on societal participation. The report emphasizes that public awareness and education campaigns are essential for encouraging responsible consumption and waste disposal behaviors. Additionally, governments should implement policies that incentivize individuals to reduce their waste footprint, such as pay-as-you-throw schemes and deposit-return systems for recyclable materials.

#### #### 8. **\*\*Looking Ahead: The Road to 2050\*\***

The *\*Global Waste Management Outlook 2024\** paints a sobering picture of the future if current waste practices continue. However, it also offers a hopeful vision of what can be achieved through systemic change, innovation, and global collaboration. The report urges countries to take decisive action now to avoid the worst impacts of waste mismanagement, protect public health, and safeguard the environment for future generations.

By embracing a circular economy and prioritizing sustainable waste management practices, societies can not only reduce waste but also create new economic opportunities, enhance resource efficiency, and combat the ongoing climate crisis [\[10†source\]](#) [\[11†source\]](#) .

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### ### Anthropogenic Impacts on Global Drought Frequency, Duration, and Intensity: An Overview

Droughts are becoming more frequent, severe, and prolonged across the globe, and there is increasing evidence linking these changes to human activities, particularly due to climate change and land use. Several studies and climate models suggest that anthropogenic influences, such as greenhouse gas emissions and deforestation, are altering precipitation patterns, increasing temperatures, and amplifying the risk of droughts.

#### ##### 1. \*\*Evidence of Rising Drought Frequency\*\*

Drought frequency refers to how often droughts occur in a given region over time. Historically, natural climate variability, such as El Niño and La Niña cycles, contributed to variations in drought frequency. However, anthropogenic factors are significantly influencing these natural patterns. Recent studies show a rising frequency of droughts, particularly in regions such as the Mediterranean, the western United States, parts of Africa, and Southeast Asia.

- **Global Warming**: The increase in global temperatures, driven by human activities like the burning of fossil fuels, is intensifying drought conditions. Warmer temperatures increase the rate of evaporation from soil and water bodies, which reduces water availability, even in regions with normal precipitation levels.

- **Precipitation Changes**: Greenhouse gas emissions are altering precipitation patterns, leading to less frequent but more intense rainfall in some regions, which exacerbates dry spells in between. For example, Africa and southern Europe are experiencing more frequent droughts due to decreased annual rainfall.

#### ##### 2. \*\*Drought Duration and Intensity

The duration and intensity of droughts are also influenced by anthropogenic factors. Prolonged periods of lower-than-normal precipitation, combined with rising temperatures, result in more severe and extended droughts.

- **Heatwaves and Temperature Rise**: Higher global temperatures contribute to heatwaves that not only dry out soils more quickly but also prolong droughts by reducing moisture retention in the atmosphere. This is particularly evident in regions like the American Southwest, where prolonged droughts have become more common.

- **Feedback Loops**: Droughts create feedback loops that worsen their intensity. For example, drought-affected areas often lose vegetation, which decreases the land's ability to retain moisture. This, in turn, exacerbates local warming and drought conditions. Deforestation for agriculture or urban expansion amplifies this effect, making it harder for ecosystems to recover from droughts.

#### ##### 3. \*\*Human Contributions to Regional Drought Patterns

Various human activities are making specific regions more vulnerable to droughts:

- **Deforestation**: Large-scale deforestation, especially in tropical regions like the Amazon, reduces the land's ability to retain moisture, increases runoff, and disrupts local rainfall patterns. This human-driven alteration leads to prolonged dry seasons and more frequent droughts.

- **Agricultural Practices**: Over-irrigation and unsustainable agricultural practices deplete groundwater supplies, making regions more prone to drought. In places like India and parts of the Middle East, aquifers are being drained at unsustainable rates, which leaves less water available during dry periods.

- **Urbanization**: The expansion of urban areas creates "heat islands," where concrete and asphalt surfaces retain heat and exacerbate local warming. This effect further dries out surrounding areas and increases drought severity.

#### #### 4. **Scientific Studies and Climate Models**

Multiple scientific studies provide robust evidence linking anthropogenic climate change to increased drought risk:

- A 2016 study in *Nature* found that human-induced climate change is responsible for up to 50% of the increased risk of drought in certain regions, particularly in the Mediterranean and western North America.

- The Intergovernmental Panel on Climate Change (IPCC) has highlighted that many regions are experiencing "drying trends" due to global warming. The IPCC's 6th Assessment Report (2021) notes that human activity has "unequivocally" contributed to observed changes in drought patterns, particularly in regions like southern Africa, South Asia, and Australia.

#### #### 5. **Future Projections: The Role of Climate Change**

Looking ahead, climate models predict that anthropogenic factors will continue to drive more frequent and severe droughts. The IPCC projects that by the end of the 21st century, many regions will experience significantly longer droughts, especially if global temperatures rise above 2°C compared to pre-industrial levels.

Regions that already experience water stress, such as the Middle East, North Africa, and parts of South Asia, are particularly vulnerable. These areas are expected to see a dramatic increase in both the frequency and duration of drought events due to anthropogenic climate change.

#### #### 6. **Mitigating the Impact**

To mitigate the impacts of droughts, adaptation and resilience strategies are crucial. These include:

- **Sustainable Water Management**: Reducing water consumption, enhancing irrigation efficiency, and protecting water sources are critical to adapting to future droughts.

- **Reforestation**: Restoring forests can help improve local rainfall patterns and reduce the severity of droughts by increasing soil moisture retention.

- **Climate Action**: Reducing greenhouse gas emissions is vital for limiting global warming and mitigating the long-term risk of droughts. The Paris Agreement, which seeks to limit global temperature rise to well below 2°C, is a key framework for achieving this.

#### ### Conclusion

There is now substantial evidence linking human activity to increased drought frequency, duration, and intensity. Global warming, driven by fossil fuel emissions, and unsustainable land and water use are intensifying droughts worldwide. While the future looks challenging, effective climate mitigation and adaptation strategies can help reduce the worst impacts of droughts. Long-term planning and international cooperation will be critical to addressing this pressing issue.

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### ### Statistical Review of World Energy 2024: A Comprehensive Overview

The *Statistical Review of World Energy 2024*, produced by the Energy Institute, presents a detailed analysis of the global energy landscape. As the world grapples with climate change, the review provides essential insights into how energy production, consumption, and emissions trends are evolving, shedding light on both progress and challenges in transitioning to sustainable energy systems. This year's report underscores the complex interplay between fossil fuels, renewable energy, and the pressing need for decarbonization to meet climate targets.

#### #### 1. **Global Energy Consumption and Production**

Global energy consumption rose by about **2%** in 2023, maintaining the trend of increasing energy demand driven by population growth and economic development. The report highlights significant regional differences in energy use, with Asia, particularly China and India, leading the growth in demand. China, already the world's largest energy consumer, continues to expand its energy infrastructure, though it is also investing heavily in renewables.

On the supply side, **fossil fuels still dominate** the global energy mix, accounting for **81.5%** of total energy production. Despite the rapid growth of renewable energy sources like wind and solar, the world remains highly dependent on coal, oil, and natural gas. Oil production saw a slight increase in 2023, primarily driven by the recovery of global transport demand post-pandemic, and natural gas usage surged due to its role as a "transition fuel" in many economies.

- **Fossil Fuel Dependency**: Coal remains a major concern, especially in countries like India, where **96%** of new power additions in 2023 were coal-based. This reliance on fossil fuels is a significant contributor to global carbon emissions, complicating the world's ability to meet climate goals.

- **Renewable Energy Growth**: While fossil fuels dominate, renewable energy has grown rapidly. Renewables, including wind, solar, and hydropower, saw a **9.6%** increase in 2023, but their share of the global energy mix remains limited. Renewables now account for **12.7%** of the global energy supply.

#### #### 2. **Carbon Emissions and the Climate Challenge**

One of the report's most critical findings is the continued growth in **energy-related CO<sub>2</sub> emissions**, which increased by **2%** in 2023. This rise is in stark contrast to the targets set by the Paris Agreement, which seeks to limit global warming to well below 2°C. The review highlights that despite efforts to decarbonize energy systems, global emissions have not yet peaked, largely due to the persistent use of coal and oil in power generation and transportation.

- **Regional Disparities**: Emissions patterns vary significantly across regions. Europe, for instance, managed to reduce its emissions slightly, thanks to the increased deployment of renewable energy and a shift away from coal. However, these reductions are often offset by rising emissions in developing economies where fossil fuel use is growing rapidly.

- **Exported Emissions**: The report also touches on the phenomenon of "exported emissions." Many developed countries, particularly in Europe, appear to reduce their domestic emissions by outsourcing manufacturing and resource extraction to countries like China, thereby shifting the emissions burden elsewhere.

#### #### 3. **Renewable Energy and Grid Infrastructure**

The review highlights substantial progress in renewable energy deployment, with **wind and solar** leading the charge. China, in particular, added more renewable capacity in 2023 than the



rest of the world combined. However, the report warns that **infrastructure limitations** are preventing renewables from reaching their full potential.

- **Grid Constraints**: In many regions, the energy grid is not equipped to handle the variable nature of renewable energy generation. This results in energy curtailment, where excess renewable energy is wasted because the grid cannot absorb it. Investments in grid modernization, storage technologies, and transmission infrastructure are essential for maximizing the impact of renewable energy.
- **Energy Storage**: The report emphasizes the need for **energy storage solutions**, such as batteries, to manage the intermittency of renewables. While the costs of energy storage technologies have declined, deployment is still limited, and greater investments are needed to support the energy transition.

#### 4. **Green Hydrogen and Emerging Technologies**

Green hydrogen is highlighted as a key technology for decarbonizing sectors that are hard to electrify, such as heavy industry and long-haul transport. Despite its promise, the review notes that **green hydrogen production remains limited**, accounting for less than **1%** of global hydrogen production in 2023. This is due to high production costs and the lack of infrastructure for storage and transportation.

- **Government Investments**: Many governments have invested heavily in green hydrogen projects, but the technology has yet to scale. The report calls for more targeted policies and incentives to accelerate the development and deployment of green hydrogen.

#### 5. **Energy Security and Global Dynamics**

The 2024 review also addresses the issue of **energy security**, which has become a top priority for many countries due to geopolitical tensions and supply disruptions, particularly in Europe following the Russia-Ukraine conflict. The disruption of natural gas supplies from Russia in 2023 led to a global scramble for alternative energy sources, with many European countries increasing their reliance on liquefied natural gas (LNG) imports.

- **Energy Security vs. Sustainability**: The need for energy security has, in some cases, led to a short-term increase in the use of fossil fuels, as countries prioritize energy access over sustainability goals. The review stresses the importance of balancing these competing priorities to ensure both reliable and sustainable energy systems.

#### 6. **Future Outlook and Recommendations**

Looking ahead, the *Statistical Review of World Energy 2024* emphasizes that achieving the goals of the **Paris Agreement** will require a more rapid and ambitious transition to low-carbon energy. The report outlines several key recommendations to accelerate the energy transition:

- **Accelerating Renewable Deployment**: Governments must continue to support the deployment of renewable energy through subsidies, tax incentives, and regulatory reforms. The focus should be on scaling up wind and solar while addressing grid constraints and enhancing storage capabilities.
- **Phasing Out Fossil Fuels**: The global phase-out of coal must be prioritized, particularly in regions like India and Southeast Asia, where it remains a dominant energy source. Carbon pricing and emissions trading schemes could help incentivize a shift away from fossil fuels.
- **Investment in Technology and Innovation**: Breakthroughs in energy storage, grid technologies, and hydrogen production are crucial for achieving a decarbonized energy system. Greater investments in research and development, as well as public-private partnerships, will be key to driving innovation.

#### Conclusion

The *Statistical Review of World Energy 2024* paints a nuanced picture of the global energy landscape. While progress is being made in renewable energy deployment and emissions reductions in some regions, the world remains heavily dependent on fossil fuels, and emissions continue to rise. The report calls for urgent action to accelerate the energy transition, emphasizing the need for stronger policies, greater investments in infrastructure, and a focus on emerging technologies like green hydrogen. Only through these measures can the world meet its climate goals and ensure a sustainable energy future.

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### ### World Programme for the Census of Agriculture (WCA): A Comprehensive Overview

The *World Programme for the Census of Agriculture (WCA)* is a global initiative led by the *Food and Agriculture Organization of the United Nations (FAO)*, designed to improve the quality, reliability, and availability of agricultural data. Established in *1950*, the program offers a standardized framework for conducting agricultural censuses across countries. It helps policymakers, researchers, and international bodies gain a clear understanding of agricultural systems worldwide, which is critical for food security, rural development, and sustainable resource management.

The latest edition, *WCA 2020*, covers the period from *2016 to 2025* and introduces innovative data collection methods to address the evolving needs of agriculture in the 21st century. The census focuses on a range of new topics like gender roles in agriculture, environmental sustainability, and climate change impacts.

#### #### 1. *Purpose of the Agricultural Census*

The primary objective of the agricultural census is to collect detailed, reliable, and up-to-date data about agricultural structures. This data helps governments:

- *Formulate agricultural policies* and rural development strategies.
- *Assess food security* and track agricultural productivity.
- *Monitor land use*, including farm sizes, land ownership, and tenure arrangements.
- Understand the *socio-economic characteristics* of farmers, such as household size, education levels, and access to technology.

The census provides a comprehensive snapshot of the agricultural sector, enabling policymakers to make informed decisions about resource allocation, land governance, and the agricultural labor market.

#### #### 2. *Census Methodology: Standardized and Flexible*

The WCA adopts a *modular approach*, introduced in the *WCA 2010*, which allows for flexibility in data collection while maintaining international standards. This ensures that national agricultural censuses, regardless of a country's specific context, can collect comparable data.

- *Core Data*: Every country is required to collect essential information (such as land use, crop and livestock production, irrigation, and farm labor).
- *Supplementary Modules*: Countries can collect additional information on specific areas of interest like forestry, aquaculture, or agro-environmental indicators.

- **Complete vs. Sample Enumeration**: While some countries conduct a full agricultural census (complete enumeration), others rely on sample surveys, which focus on large-scale farms but also gather data on smaller holdings.

#### #### 3. **Innovative Data Collection Techniques**

The WCA encourages countries to adopt **digital and geospatial tools** for data collection. For example:

- **Computer-Assisted Personal Interviews (CAPI)** systems are being used to reduce data collection errors and speed up processing.
- **Geospatial technologies** like satellite imagery help in assessing land use and mapping agricultural holdings. These tools can provide real-time data on land degradation, crop yields, and water usage.

Countries are also encouraged to synchronize the agricultural census with **population and housing censuses**. This integration improves data collection efficiency and helps link demographic factors to agricultural activity.

#### #### 4. **Focus on Emerging Issues**

The **WCA 2020** recognizes the need to address pressing global challenges that affect agriculture. These include:

- **Climate Change**: The census collects data on agro-environmental variables, helping track the impacts of climate change on agricultural systems, land degradation, and water resources.
- **Gender in Agriculture**: Gender-disaggregated data is crucial to understanding the role of women in agriculture. This is particularly important as women constitute a significant portion of the agricultural workforce, especially in developing countries. The census tracks the roles women play in farm decision-making, ownership, and labor.
- **Sustainability**: Sustainability indicators, such as greenhouse gas (GHG) emissions from farming, are now part of the census. Data on organic farming practices and the use of eco-friendly inputs are also being collected to promote sustainable agriculture.

#### #### 5. **Importance for Land Governance and Food Security**

The **WCA** plays a critical role in **land governance**, providing insights into land ownership, tenure systems, and farm productivity. For smallholder farmers, who produce a large share of the world's food, the census data helps in:

- Understanding land tenure security, which is linked to **higher productivity** and **investment in land fertility**.
- Informing policies that aim to improve **access to land** and resources for vulnerable populations, including rural women and marginalized communities.

For **food security**, the census provides data on the types of crops and livestock raised, levels of productivity, and market access, helping governments monitor trends in agricultural production and plan for potential food shortages.

#### #### 6. **Participation and Global Coverage**

The **WCA** involves collaboration between the FAO and the governments of **127 countries and territories**. Each country is responsible for conducting its national agricultural census within the broader guidelines provided by the FAO. These censuses are typically conducted every **five to ten years**, with the results providing a snapshot of national agricultural systems over a ten-year period.

Data from these censuses is gradually disseminated by the FAO and made available through its platforms, helping researchers and policymakers at all levels make data-driven decisions about agriculture and rural development.

#### #### 7. \*\*Challenges and the Future of the WCA\*\*

While the WCA has helped standardize agricultural data collection worldwide, it faces several challenges:

- **Financial and Technical Constraints**: Many developing countries struggle with the high costs of conducting comprehensive censuses, as well as a lack of technical expertise.
- **Data Gaps**: In some regions, particularly in conflict zones or remote areas, data collection is difficult, leading to gaps in the global dataset.
- **Climate and Technological Change**: As agriculture is increasingly affected by climate change and rapid technological advances, there is a growing need to adapt census methodologies to capture these dynamic trends more effectively.

Looking ahead, the WCA aims to expand the use of **remote sensing**, **artificial intelligence**, and **big data** analytics to further improve data collection and analysis.

#### ### Conclusion

The **World Programme for the Census of Agriculture** is a vital tool for understanding global agricultural systems and their relationship with land use, food security, and rural development. By providing standardized, high-quality data on farm structures, land ownership, and labor, the WCA helps governments and international organizations make informed decisions about sustainable agriculture, climate resilience, and resource management. The ongoing WCA 2020, with its focus on new challenges like climate change and gender equality, continues to push the boundaries of agricultural data collection to address the emerging needs of the global agricultural community.

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#### ### The State of Global Air 2024: An In-Depth Analysis

The *State of Global Air 2024* report, released by the **Health Effects Institute** (HEI) in partnership with **UNICEF**, provides a crucial examination of air quality and its profound health impacts worldwide. This fifth annual edition highlights alarming statistics, trends, and the urgent need for collective action against air pollution.

#### #### 1. **Global Air Pollution Landscape**

Air pollution remains a significant public health crisis, contributing to an estimated **8.1 million premature deaths** globally in 2021, making it the second-largest risk factor for mortality after high blood pressure [\[45†source\]](#) [\[43†source\]](#). The burden of air pollution is particularly acute in regions such as South Asia and parts of Africa, where environmental and socio-economic factors exacerbate exposure to harmful pollutants.

#### ##### **Key Pollutants**

The report focuses on three primary pollutants:

- **Fine Particulate Matter (PM2.5)**: These tiny particles penetrate deep into the lungs and are associated with severe health issues, including cardiovascular and respiratory diseases.

- **Ozone (O3)**: Ground-level ozone, formed by chemical reactions between pollutants, is known to cause respiratory problems and affect lung function.
- **Nitrogen Dioxide (NO2)**: For the first time, the report includes NO2 data, which primarily comes from vehicle emissions and is linked to respiratory illnesses [45†source] [44†source] .

## #### 2. **Health Impacts and Vulnerable Populations**

The *State of Global Air 2024* underscores that air pollution significantly affects vulnerable populations, particularly children. It is linked to over **700,000 deaths among children under five**, accounting for approximately **15%** of global deaths in this age group [43†source] . The long-term exposure to polluted air has detrimental effects on children's development, increasing the risk of chronic health conditions later in life.

### ##### **Trends in Child Mortality**

While the report highlights a **53% reduction in air pollution-related deaths among children under five** since 2000, the ongoing threat remains substantial, especially in low- and middle-income countries. These countries often struggle with high levels of pollution and limited resources to address public health challenges [45†source] .

## #### 3. **Geographic Disparities in Air Quality**

The report provides a detailed examination of air quality across different regions:

- **South Asia**: Countries like **India, Pakistan**, and **Bangladesh** continue to report the highest levels of PM2.5, with mortality rates linked to air pollution remaining alarmingly high.
- **Africa**: While urbanization and industrialization are increasing, many African nations still face significant air quality challenges, particularly from household pollution due to reliance on solid fuels for cooking [44†source] [45†source] .
- **Europe and North America**: These regions have made progress in reducing air pollution levels, yet disparities exist. Certain areas still experience high pollution levels due to local industrial activities or traffic congestion [43†source] .

## #### 4. **Call to Action and Policy Recommendations**

The *State of Global Air 2024* serves as a clarion call for immediate action. The report emphasizes the importance of:

- **Stricter Emissions Regulations**: Governments are urged to implement and enforce tighter regulations on emissions from vehicles and industries.
- **Promotion of Clean Technologies**: Investment in renewable energy sources and clean transportation options can significantly reduce air pollution.
- **Public Health Initiatives**: Increasing public awareness about the health impacts of air pollution and encouraging community engagement can drive change [44†source] [45†source] .

## #### 5. **Conclusion: The Path Forward**

As the world grapples with the ongoing challenges of air pollution, the findings of the *State of Global Air 2024* report underscore the critical need for collective action. Addressing air quality is not only a public health imperative but also a vital component of achieving sustainability goals. By prioritizing cleaner air, governments, organizations, and communities can work together to protect public health and enhance quality of life for future generations.