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RESEARCH ARTICLE

SUSTAINABLE FUTURES: GLOBAL PERSPECTIVES ON RESEARCH AND DEVELOPMENT

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ABSTRACT

Sustainability is meeting the requirements of present generations without hindering the ability of future generations to meet their own. Principles of sustainable development include that we should conserve the earth's resources for future generations and ensure our actions have minimal impact on the environment as possible (Adham Sayed Mohamed [HYPERLINK "https://www.researchgate.net/scientific-contributions/Adham-Sayed-Mohamed-Torky-2281277927"](https://www.researchgate.net/scientific-contributions/Adham-Sayed-Mohamed-Torky-2281277927)Torky, 2024), So what decisions does the population require in order to lead humanity towards a sustainable future? In terms of biodiversity and resources we need to leave an estimated 38% of the earth's surface undisturbed to maintain a significant proportion of species beyond the next century (Li, X., Zickfeld, et al. 2020). We also need to use no more than the earth can regenerate; this means reducing CO2 emissions to the same absorption rate and only cutting the number of trees that can be replanted. The decisions that need to be made are those that consider the quality of life for future generations and not just the present. Currently in the world there is a divide between the richer and poorer nations, the richer nations live comfortable lives but are generally not sustainable, the poorer nations live sustainable lives but often have a lower quality of life. A decision needs to be made for a middle ground (Solomon, et al. 2009), The current world population is around 8 billion, with the average person living to 65 years of age. Contrast this with the statistics from 1945 where the population was approximately 2.5 billion with an average life expectancy of 46 years. This change and increase in the number of people on the planet has placed huge demands on the earth's resources, and will continue to do so in the future. We are depleting the resources at an unsustainable rate; in the past 10,000 years the earth's ecosystem has been through more disruption than the previous 65 million. To continue using the earth's resources at the current rate may lead the earth to an irreversible state, a situation where future generations will have a lower quality of life due to scarcity of resources, this is what is known as 'sustainability'.

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INTRODUCTION

Sustainability consists of fulfilling the needs of current generations without compromising the needs of future generations, while ensuring a balance between economic growth, environmental care and social well-being. The 28th session of the Conference of the Parties (COP28) to the UNFCCC took place in the United Arab Emirates in Nov-Dec 2023. The COP is the supreme decision-making body of the Convention. All states that are parties to the Convention are represented at the COP, at which they review the implementation of the Convention and any other legal instruments that the COP adopts and take decisions necessary to promote the effective implementation of the Convention, including institutional and administrative arrangements. The UAE bid was extending support in various technology options for responding to climate change and also in knowledge-based advice when facing CO2 capture and storage technology and mitigation of climate change effects in dry lands. The bid stressed that the UAE has committed to set an example to provide a systematic framework for setting up clean projects at the national level (Frölicher et al. 2014). The conference adopted a decision on the outcome of the first global stocktake under the Paris Agreement on 13 December. The global stocktake is a two-year process to review progress on mitigation, adaptation and climate finance, and outline the way forward. The parties recognise that, by 2030, global greenhouse gas (GHG) emissions must be reduced by 43% below 1990 levels to limit global warming to 1.5 °C, and commit to accelerating action in this critical decade. Parties are called upon to contribute to tripling global renewable energy capacity and doubling the global rate of energy efficiency improvements by 2030 (Welsby, et al. 2021). They must accelerate efforts towards net zero emission energy systems and towards the phasedown of unabated coal power.

They must also 'transition away from fossil fuels in energy systems, in a just, orderly and equitable manner, accelerating action in this critical decade, so as to achieve net zero by 2050'. The UAE Net Zero by 2050 strategic initiative is a national drive to achieve net-zero emissions by 2050, making the Emirates the first Middle East and North Africa (MENA) nation to do so.

Key areas and strategies for building a sustainable future (Tong, D., et al. 2019)

Sustainable Futures: SF generally refers to a concept or approach that seeks to envision and create a future that is environmentally, socially, and economically sustainable. Creating a sustainable future is a multidimensional challenge that involves addressing environmental, social, and economic aspects. Following are some key areas and strategies for building a sustainable future.

Renewable Energy: Transitioning to renewable energy sources such as solar, wind, hydroelectric, and geothermal power is crucial for reducing greenhouse gas emissions and combating climate change. Investments in research, development, and implementation of renewable energy technologies are essential (Uruguay XXI. 2022).

Energy Efficiency: Improving energy efficiency across industries, transportation, buildings, and appliances can significantly reduce energy consumption and carbon emissions. This includes adopting energy-efficient technologies, implementing smart grids, and promoting sustainable transportation options like electric vehicles.

Green Infrastructure: Investing in green infrastructure such as green buildings, green spaces, sustainable urban planning, and resilient infrastructure can enhance environmental quality, promote healthy living environments, and mitigate climate risks.

Sustainable Futures: Global Perspectives on Research and Development: Sustainable futures are being shaped by a wide range of research and development (R&D) efforts globally. Here are some key perspectives on how R&D is contributing to sustainable futures:

Renewable Energy Technologies: R&D in renewable energy is driving the development of more efficient solar panels, wind turbines, energy storage solutions, and grid integration technologies. Innovations in this sector are crucial for transitioning away from fossil fuels and achieving a low-carbon energy system (Uruguay XXI. 2022).

Green Chemistry and Materials: Researchers are focusing on developing sustainable materials, processes, and chemicals that minimize environmental impact and reduce waste. This includes biodegradable plastics, eco-friendly packaging, and green manufacturing practices.

Circular Economy Innovations: R&D plays a pivotal role in advancing circular economy concepts through innovations in recycling technologies, waste-to-energy processes, and sustainable product design. These efforts aim to close material loops, reduce resource depletion, and promote a more regenerative approach to production and consumption.

Climate Resilience and Adaptation: Researchers are working on climate-resilient infrastructure, sustainable land management practices, water conservation techniques, and disaster risk reduction strategies. These efforts help communities and ecosystems adapt to climate change impacts and build resilience against environmental challenges.

Smart Cities and Sustainable Urban Development: R&D is driving the development of smart city technologies, sustainable urban planning tools, efficient transportation systems, and green building designs. These innovations promote energy efficiency, reduce emissions, enhance livability, and foster sustainable urban development (Peterson K. Ozili 2022).

Agricultural Innovation: Researchers are developing climate-smart agriculture techniques, drought-resistant crops, precision farming technologies, and sustainable soil management practices. These innovations aim to enhance food security, improve agricultural productivity, and minimize environmental harm from farming activities.

Health and Well-being: Research in health sciences is contributing to sustainable futures by addressing global health challenges, promoting access to healthcare, advancing medical technologies, and supporting public health initiatives. A healthy population is crucial for sustainable development and resilience (Bratman, G., et al, 2019).

Cross-disciplinary Collaboration: Many sustainable futures initiatives require interdisciplinary collaboration across various fields such as science, technology, engineering, social sciences, humanities, and policy. R&D efforts that foster cross-disciplinary collaboration and knowledge sharing are instrumental in addressing complex sustainability challenges holistically.

Case-Fishing: If someone likes fish and asks for fish. If you present him/her with a very tasty and delicious fish then everyday will ask you to cook fish for me. Someday you will realize why not teach him how to catch a fish and you will teach him about fishing.

Problem: Suppose 8-billion people started fishing without any calculation or knowing their needs or without any justification then one day you will see there will be no fish for the next generation.

Solution: You have to teach someone how to fish properly by using a fish net with big loops. Once you are using a net with big loops and holes then you will fish only big fishes but not small fishes and their eggs. Leave small fishes and eggs of fishes for the next generation, called sustainability. Therefore, do not teach them how to catch a fish but teach them how to catch fish sustainably. This is the right way to complete your (Present generation) requirements without compromising next generation requirements.

Fossil Energy Sources and its effects on climate change: Fossil energy sources including Oil, Coal and Natural gases. Power is produced by burning fossil fuel. When we are burning huge quantities of fossil fuel means we are producing huge quantities of carbon dioxide. Fire Flame produced by oil fields. These are gases so we can't store these gases even though we can't directly produce these gases in the environment because they are greenhouse gases (GHG). These gases are dangerous for human beings up to 40 to 50 km. These are killer gases so we are burning these gases. By burning these gases, we can minimize chances of human death (Luderer, G. et al. 2018), (UN Framework Convention on Climate Change, 1992).

Climate Change: Climate change is very dangerous for the environment, economy and society. Climate change issues are due to current industrial activities which are uncontrollable because each country has their own policy. All authorized bodies can't control their industrial activities. If there are policies so they can't implement it properly because each country has their own policies. When you burn more fossil fuel then you will produce more GHG and carbon dioxide (Oh, J.-H. 2023).

Climate change, change in weather patterns, hurricanes, heat waves, draughts, wildfire, rise in sea level does not require visa or cross immigration to take approval to enter into any country or continent. It has its own principles taught and gifted by humans. The effects of human caused global warming are happening now, are irreversible for people alive today, and will worsen as long as humans add greenhouse gases to the atmosphere. Earth will continue to warm and the effects will be profound. Scientists predict global temperature increases from human-made green-house gases will continue. Severe weather damage will also increase and intensify (Li, X., et al. 2020), (Xie, S.-P. et al. 2010), (UN Framework Convention on Climate Change, 1992).

Air Conditions (ACs) and its effect on Greenhouse (GH): ACs are producing huge quantities of GHG and CO₂. There is a greenhouse (G)H from 40-50km away from earth in the atmosphere which one damaged by GHG, CO₂ etc. GH is like a tree or umbrella. When we sit under the shadow of a tree or umbrella then you feel relaxed because it's a shelter to provide us protection from sun rays or sun heat. If someone damages the leaves of a tree or makes holes in the umbrella then sunlight directly will come to hit us. Greenhouse gases (GHG) and carbon dioxide CO₂ made holes in the umbrella or damaged the leaves of trees called ozone (U.S. EPA. 2023b).

The OZONE Layer: The ozone layer sits in the stratosphere between 15km and 30km above the earth and shields us from other living things from the sun's harmful ultraviolet radiation.

Chlorofluorocarbons gases (CFC): CFC gases are the most harmful to the ozone layer. There are three most harmful gases which may destroy the ozone layer.

- Chlorofluorocarbons
- Hydrochlorofluorocarbons
- Halons

Chlorofluorocarbons containing atoms of carbon, chlorine and fluorine. These compounds react with the ozone layer in the stratosphere and cause the ozone to decrease. It allows more alpha rays from the sun to reach the surface of the earth which may lead to skin cancer. Ozone gas O₃ has three molecules of oxygen, therefore 3rd molecule is called FREE molecule.

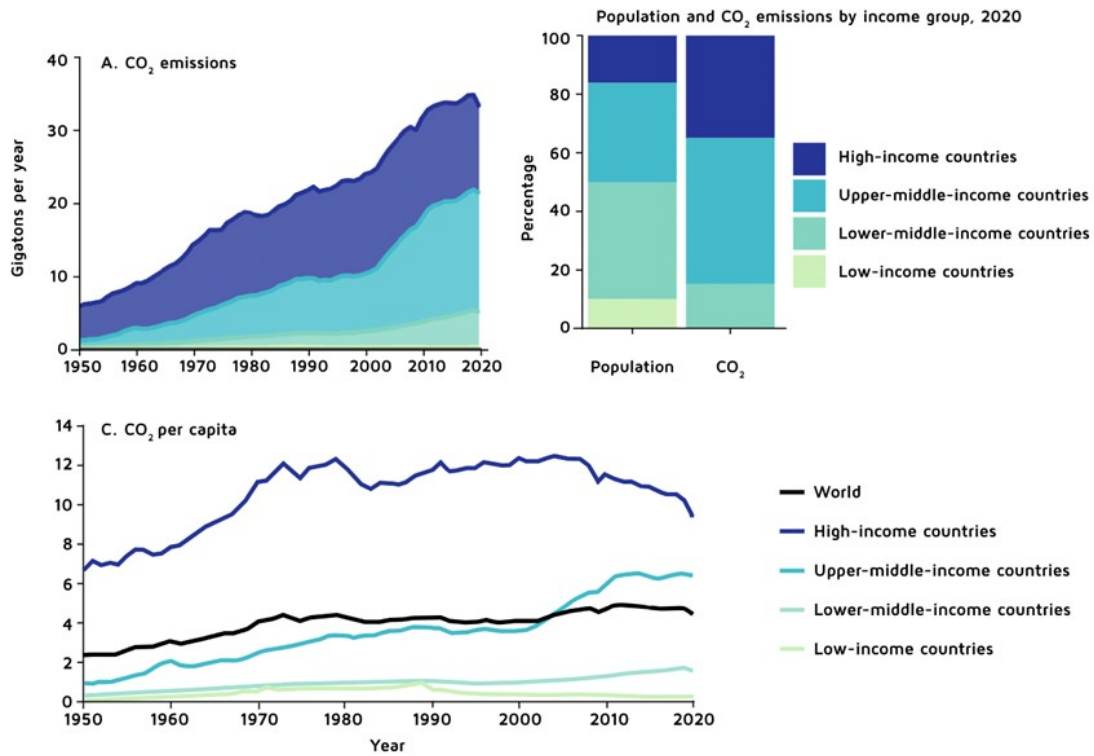
The 3rd molecule can have a reaction with any other gas for example; AC is producing a gas called chlorofluorocarbon, when these gases go up it will make cloriendioxide and this will break the ozone. Cloriendioxide is a very dangerous and killer gas for the ozone. Ozone breaking is a continuous process.

Fluorine will react with oxygen and also make fluorien dioxide (O₂F₂) which is also dangerous and carbon again reacts with oxygen and will make carbon monoxide. It means the reaction is incomplete so again it will take one O from Ozone and will make carbon dioxide (Velders, G.J.M., et al. 2022).

World Population and CO₂ Emissions Contribution by Income group, 2020

Wealth Nations: Major CO₂ Emission contributors: Simply Wealthy Nations. Global Warming Contributors: High income/wealthy nations.

Low-Income Nations: Global warming price is paid by Low Income Nations. Some Low-Income Nations could face serious issues that are linked to sustainable development and these countries are already at risk since most have limited adaptability and resilience to the effects of climate change.



Source: UNDESA

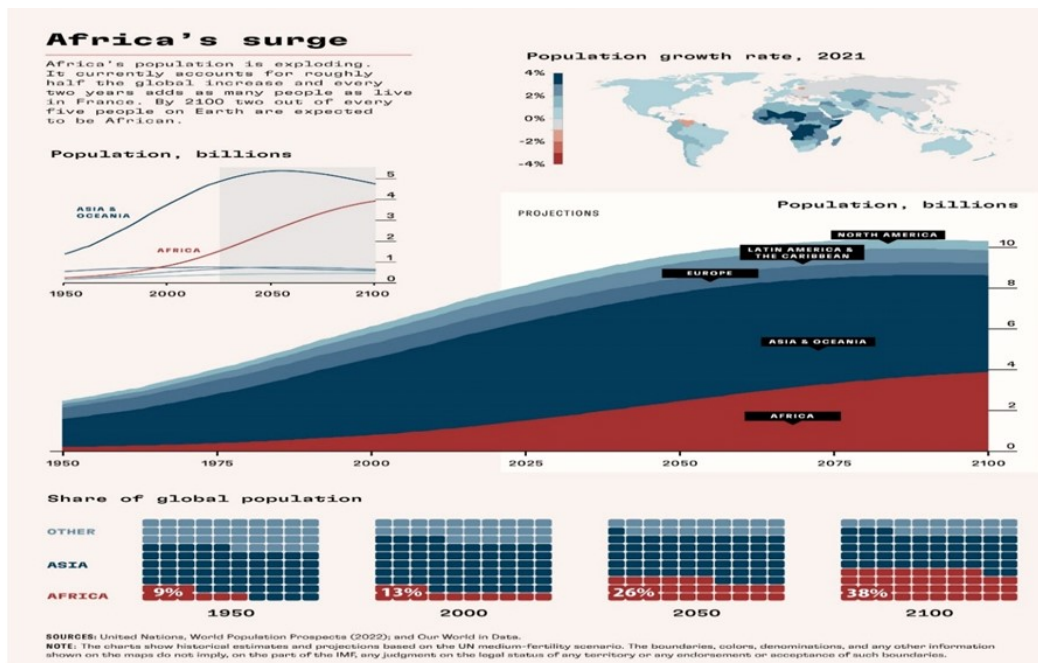
World Population

World population: 8 billion, Nov., 15, 2022
By 2030: 8.5 billion
By 2050: 9.7 billion
By century end: 10 billion

Higher Population is a ticking bomb on an un-expanding planet with fixed circumference. We have only one planet earth to live in. <https://www.un.org/en/desa/world-population-reach-8-billion-15-november-2022>

Expected Population Growth in Africa only: It is expected that population growth will mainly occur in low- and lower-middle-income nations. African continent population: 1.4 billion people.

African continent expected population by 2050: 2.5 billion people



Directorate-General for Communication (European Commission, 2024), The EU in 2023, General report on the activities of the European Union.

Countries with Higher CO2 and GHG emissions

- China, the United States, India, the EU27, Russia and Brazil were the six world largest GHG emitters in 2022. Together they account for 50.1% of global population, 61.2% of global Gross Domestic Product (GDP), 63.4% of global fossil fuel consumption and 61.6% of global GHG emissions.
- Among these top emitters, in 2022 China, the United States and India increased their emissions compared to 2021, with India having the largest increase in relative terms (5%).
- The EU27, Russia & Brazil decreased their emissions in 2022, with Russia showing the largest decrease i.e., 2.4%.
- Global GHG emissions per capita have slightly increased in 2022 (0.4%) bringing to 8.3%.
- its overall increase between 1990 and 2022 (from 6.24 t CO₂ eq/cap to 6.76 t CO₂ eq/cap).
- Global emissions intensity per GDP PPP in 2022 reached its 52-year minimum value of 0.386 CO₂ eq/k USD, 2% lower than in 2021.
- Even in 2022, global GHG emissions primarily consisted of CO₂ resulting from the combustion of fossil fuels (71.6%). CH₄ contributed 21% to the total, while the remaining share of emissions comprised N₂O (4.8%) and F-gases (2.6%) (European Commission, 2023, 2024).

EU27 CO2 and GHG emissions: In 2022, several EU27 countries experienced a decrease in their emission levels compared to the previous year, with the largest relative drops observed;

Luxembourg (-11.1%),
 Belgium (-6.4%),
 Lithuania (-6.3%),
 Estonia (-6.3%), and,
 Netherlands (-6.1%).

On the other hand, the largest GHG increase in 2022 was observed in;

Bulgaria (+8.0%),
 Spain (+7.4%),
 Portugal (+3.7%),
 Greece (+3.4%),
 Ireland (+2.2%), and
 Malta (+2.0%)

(IEA GHG,2022), (Grassi.G. et al, 2022)

EU27 Sector wise GHG Decrease



GHG emissions of all world countries 2023 report

The UAE Consensus and Consequences: To ensure that we do not lose momentum, the UAE Consensus includes multiple actions that will be taken forward throughout the COP28 Presidency: (Kristian Coates Ulrichsen, et al. 2024).

- GST - First annual GST dialogue to be convened at the next UNFCCC meeting in June 2024, where countries will share best practice on using the GST outcome to inform their next NDCs. "Road map to Mission 1.5oC" to be taken forward by the UAE, Azerbaijan and Brazil Presidencies to help ensure that international cooperation stimulates ambition in those NDCs.
- (Hamideh Farzaneh, 2023).
- Emirates Framework for Global Climate Resilience - A work programmed to further strengthen the indicators at the heart of the new framework will kick off in 2024. Countries need to provide written inputs to help inform this by March 2024.
- Just Transition Work Programmed - At least two dialogues to be convened before COP29 in a hybrid format to ensure inclusivity, and countries to provide further written evidence and inputs for the work programmed by March 2024.
- Mitigation Work Programmed - Two global dialogues to be held through 2024, with countries submitting proposals for the topics they address by February 2024.
- Presidency Youth Climate Champion - COP28 and COP29 Presidencies will appoint the first official Youth Climate Champions after the role was institutionalized at COP28 (UNEP, 2023).



<https://www.cop28.com/en/> (UNEP, 2023)

Consequences

- Rise in food demand
- Resource shortages, Pressure on land, water and energy
- Use of chemicals, fertilizers and pesticides
- Soil deterioration due to use of chemicals
- Deforestation
- Higher CO2 emissions
- Agricultural land conversion into housing colonies
- Growing population impacts on agriculture, leads to habitat loss
- Negative impact on biodiversity
- Average income rise increase in food consumption patterns such as more need for resource-intensive foods such as beef, dairy, poultry, eggs etc, causing more greenhouse gas emissions, loss of biodiversity, water& soil contamination due to poor environmental mitigation
- Climate change with rising global temperatures

State of Climate Action 2023 and Presidential Actions COP28: COP28 catalyzed a shift to accelerate decarbonization with policymakers, technical experts, civil society, philanthropies, sub-national and financial actors, and launched a series of landmark initiatives designed to speed up the energy transition and reduce global emissions, support resilience and adaptation measures aimed at keeping lives and livelihoods at the center, and mobilizing over \$85 billion in funding, setting the pace for a new era of climate actions that leaves no one behind. With a \$100 million contribution for the Loss and Damage fund, more than \$30 billion in private climate finance through ALTERRA and \$500 million in different commitments on Special Drawing Rights (SDR), water scarcity and health for African youth, the UAE sent a clear signal on the high ambitions needed for this Action Agenda. The State of Climate Action 2023 provides the world's most comprehensive roadmap of how to close the gap in climate action across sectors to limit global warming to 1.5°C. It finds that recent progress toward 1.5°C-aligned targets isn't happening at the pace and scale necessary and highlights where action must urgently accelerate this decade to reduce greenhouse gas emissions,

scale up carbon removal and increase climate finance. <https://www.wri.org/research/state-climate-action-2023>
<https://www.cop28.com/en/the-uae-consensus-presidential-action-agenda>

DISCUSSION AND RESULTS

Transforming Climate Change

OBJECTIVES

- ▶ Delivering on Past Commitments
- ▶ International Financing
- ▶ Private Sector Funding:

PLEDGED FUNDS

- ▶ \$792 million was pledged to fund and funding agreements for Loss & Damage.
- ▶ Multilateral Development Banks signaled a step change in announcing \$180 billion in additional climate finance commitments through multi-year programs.
- ▶ UAE launched \$30 billion catalytic climate fund "ALTERRA"

Source: COP28UAE

Focusing on Nature, People, Lives and Livelihoods: COP28 saw an unprecedented set of policy and finance commitments from across the public and private sectors to put nature, lives, and livelihoods at the heart of the climate agenda, bolstering and humanizing the response to the GST (Mohammed Barhouma 2023).

- **Food & Water**
 - \$3.2 billion pledged to help implement the declaration on Sustainable agriculture, resilient food systems and climate action.
- **Health, Relief, Recovery, Peace**
 - \$2.9 billion with WHO support pledged for climate & health solutions.
- **Nature**
 - Nature-rich countries & their partners announced \$2.7 billion. Commitment of \$1 trillion was announced for Amazon Rainforest preservation

Source: International Affairs journal: Celebrating 100 years

The fact is that we have almost ten years since the Paris agreement but we have not reached global warming to 1.5 degree Celsius and the world is producing huge quantities so it would be difficult to control temperature by 2030. It will go out of control. According to recent scientific research to limit long-term warming to 1.5 degrees, the remaining quantity of CO₂ is around 200 billion tones. That is the maximum amount of carbon dioxide that the earth's atmosphere can take if we are to have a fighting chance of staying within the limit. The fact is this we are burning around 40 billion tons of carbon dioxide a year. At this rate, the entire carbon budget will be busted before 2030 but on the other side global emissions need to fall nine per cent every year until 2030 to keep the 1.5-degree limit alive but we are going in the wrong direction. Last year we saw 1% increase instead of decrease. The World Meteorological Organization reports today that there is an eighty per cent chance the global annual average temperature will exceed the 1.5-degree limit in at least one of the next five years. In 2015, the chance of such a breach was near zero. Destroying lives, pummeling economies, and hammering health; Al ready this year, a brutal heatwave has baked Asia with record temperatures – shriveling crops, closing schools, and killing people.

We have seen drought disasters declared across southern Africa. Extreme rains flood the Arabian Peninsula, East Africa and Brazil. That bill will keep growing. Even if emissions hit zero tomorrow, a recent study found that climate chaos will still cost at

least \$38 trillion a year by 2050. Renewables are booming as costs plummet and governments realize the benefits of cleaner air, good jobs, energy security, and increased access to power. Renewables already make up thirty percent of the world's electricity supply. At COP28, countries agreed to align those plans with the 1.5-degree limit. These national plans must include absolute emission reduction targets for 2030 and 2035. They must cover all sectors, all greenhouse gases, and the whole economy. And they must show how countries will contribute to the global transitions essential to 1.5 degrees – putting us on a path to global net zero by 2050; to phase out fossil fuels; and to hit global milestones along the way, year after year, and decade after decade. By 2030, contributing to cutting global production and consumption of all fossil fuels by at least thirty percent; and making good on commitments made at COP28 – on ending deforestation, doubling energy efficiency and tripling renewables. Every country must deliver and play their rightful part. Plans aligned with 1.5 degrees, and the recommendations of the UN High-Level Expert Group on Net Zero (Ürge-Vorsatz, et al, 2020, World GBC, 2021, WBCSD and Arup, 2023). Stop playing with nature we cannot fool nature. We need high integrity carbon markets that are credible and with rules consistent with limiting warming to 1.5 degrees. We have to encourage scientists and engineers to focus urgently on carbon dioxide removal and storage – to deal safely and sustainably with final emissions from the heavy industries hardest to clean and also, we urge governments to support them. We must protect people and economies. Every person on Earth must be protected by an early warning system by 2027. We urge all partners to boost support for the United Nations Early Warnings for all action plan. All developed countries must honor their commitment to double adaptation finance to at least \$40 billion a year by 2025. The International Energy Agency reports that clean energy investments in developing and emerging economies beyond China need to reach up to \$1.7 trillion a year by the early 2030s.

In simple words, we need a massive expansion of affordable public and private finance to fuel ambitious new climate plans and deliver clean, affordable energy for all but none of this will be enough without new, innovative sources of funds. It is high time to put an effective price on carbon and tax the windfall profits of fossil fuel companies. By COP29, we need early movers to go from exploring to implementing solidarity levies on sectors such as shipping, aviation, and fossil fuel extraction – to help fund climate action.

In 2023, the oil and gas industry invested a measly 2.5 percent of its total capital spending on clean energy.

CONCLUSION

The sustainable futures are being shaped by a diverse array of R&D endeavors that prioritize environmental stewardship, social equity, economic prosperity, and long-term resilience. Collaboration, innovation, and knowledge exchange are key drivers in creating a more sustainable and inclusive world for present and future generations. Research and Development play a critical role in driving innovation, fostering economic development, and addressing complex challenges facing society, ranging from healthcare and energy to environmental sustainability and beyond (Peterson K. Ozili 2022). Our global society is facing challenges of unprecedented scale, such as climate change, food insecurity, disease, access to safe and reliable water, and growing economic inequality. Addressing such challenges will require interdisciplinary and transdisciplinary approaches from various backgrounds and fields. Researchers and Engineers can play pivotal roles in addressing these challenges by reducing the progression of climate change, mitigating the impact of global emergencies, and advancing toward the United Nations (UN) 2030. According to data from the United Nations (UN), in 2050 around 68% of humanity will live in cities. These represent only 3% of the planet's surface, but consume 78% of energy and produce 60% of greenhouse gas emissions. We have to reduce the consumption of oil by reducing the oil consumption we can reduce the production of carbon dioxide and GHG. Because of the damage of GHs, sunlight directly comes to earth and temperature will go up. Sea water is salty because of high temperature steam will go up in the shape of clouds. Because of clouds in some countries the weather will be rainy and as a result there will be heavy rain, flood etc.

Using better technology increases the efficiency of the engines and saves resources for the next generation or use calculated resources and save resources for the next generation. We have to decrease the dependency on oil. Adnoc produces Hydrogen gas from oil and supplies to different countries through the gas tankers. When we are using or burning hydrogen gas then it is producing water not carbon dioxide. We have to make production of carbon dioxide zero (0) by 2050 (Griscom, B.W. et al.2017). We have to make this production zero to make the environment green. Usage of Oil by Automobile (Cars) like Car-A efficiency is 10km per liter, Car-B efficiency is 20km per liter. The Car-B is more efficient and powerful than the Car-A. This means we have to work on an engine, called technology. Three gases chlorine dioxide (ClO₂), fluorine dioxide (O₂F₂) and carbon dioxide (CO₂) are dangerous for the Ozone layer. In result you will see in some countries very heavy rainfall and few countries dryness, land will be dry (Zhou, S., et al. 2022). Due to heavy rains and high temperatures, the sea water surface will go up to 1.5 meters. It means the volume of water will increase up to 1.5 meter. The reason for the increasing 1.5 meters volume of seawater is that glaciers, ice start melting. Ice hills (glaciers) start melting and surface volume will increase up to 1.5 meters and also earth temperature already increased up to 0.5 centigrade. We have to control all these things back to 20th century. By controlling these things then sea level will not go up. Also, we have to reduce the load of ACs in different malls and buildings from 2000 tons to 200-ton cooling.

The earth, the only living planet, is under destruction by human activities. To protect and make earth livable for our generations without compromising on our needs. Rising temperatures, heavy rains, draughts, floods, water table drop, rise in sea level. An extreme or wild weather patterns and glaciers are melting heavily, releasing ice to sea, increasing sea level. Across our planet crucial connections are being disrupted (First Light, 2023), (Griscom, B.W., et al. 2017).

Summer of 2023 was Earth's hottest summer on record, 0.41 degrees Fahrenheit (F) (0.23 degrees Celsius (C)) warmer than any other summer in NASA's record and 2.1 degrees F (1.2 C) warmer than the average summer between 1951 and 1980. Climate change encompasses not only rising average temperatures but also natural disasters, shifting wildlife habitats, rising seas, and a range of other impacts. All of these changes are emerging as humans continue to add heat-trapping greenhouse gases, like carbon dioxide and methane, to the atmosphere (Frölicher, et al. 2014).

The State of Climate Action 2023 provides the world's most comprehensive roadmap of how to close the gap in climate action across sectors to limit global warming to 1.5°C. It finds that recent progress toward 1.5°C-aligned targets isn't happening at the pace and scale necessary and highlights where action must urgently accelerate this decade to reduce greenhouse gas emissions, scale up carbon removal and increase climate finance. <https://www.wri.org/research/state-climate-action-2023>

Suggestions

- We would advise financial institutions to stop bankrolling fossil fuel destruction and start investing in a global renewable's revolution.
- Many in the fossil fuel industry have shamelessly green washed, even as they have sought to delay climate action with lobbying, legal threats, and massive ad campaigns. Fossil fuels are not only poisoning our planet they are toxic for your brand.
- Many governments restrict or prohibit advertising for products that harm human health like tobacco. Some are now doing the same with fossil fuels. We would advise every country to ban advertising from fossil fuel companies and also, we advise news media and tech companies to stop taking fossil fuel advertising.

ACKNOWLEDGEMENT

United Arab Emirates for its leadership in sustainability and climate action. The UAE hosted the successful COP28 summit in 2023 and launched the \$30 billion **ALTERRA** catalytic climate fund, demonstrating its commitment to a greener future for all.

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