

EDITORIAL

IAAM's Pledge for Global Climate Resilience at COP 28

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ABSTRACT

During the 28th Conference of the Parties (COP28), the commitments of International Association of Advanced Materials (IAAM) to climate resilience was highlighted. The organization emphasized the importance of bolstering materials ecosystem to better cope with climate change, as this is essential for the materials community's goal of reducing greenhouse gases and pursuing United Nations Sustainable Development Goals (SDGs). With its inclusiveness, COP28 set ambitious goals to accelerate the shift to cleaner energy, revamp climate financing to achieve the past commitments, create a new economic plan, and prioritize environmental and human well-being in climate efforts. These goals underline the essential need for robust climate management and the conservation of biodiversity to ensure the welfare of humanity. The conference tackled pressing issues related to climate change, including natural disasters, the necessity for inclusivity, policy, biodiversity, and the significant role of technological innovation. The discussions seek to shed light on progressive strategies and suggestions that resonate with COP28's commitments and the SDGs. The key areas include comprehensive climate management, nature-based and socio-economic strategies, circular economies, the restoration of biodiversity, global collaboration, the advent of climate-neutral technologies, risk analysis, artificial intelligence, data analytics, and novel policy frameworks. IAAM's proactive stance at COP28 towards enhancing climate resilience is rooted in its organizational ethos, the rollout of diverse eco-friendly initiatives, and steady contributions to agenda of the United Nations Framework Convention on Climate Change (UNFCCC). This steadfast commitment not only cements IAAM's influence in the environmental domain but also paves the way for collective, forward-thinking solutions to address climate change and defend its motive of the current decade for a sustainable and green world.

The COP28 UN Climate Change Conference in Dubai, UAE, was unprecedented in scale, attracting 85,000 participants, including over 150 heads of state and government, alongside diverse stakeholders including national delegations, civil society, business, indigenous peoples, youth, philanthropy, and international organizations from 30 November to 13 December 2023 [1]. This conference was significant for completing the first comprehensive review under the Paris Agreement, revealing inadequate progress in climate efforts. Nations agreed to enhance actions by 2030, emphasizing the shift from fossil fuels to renewable energy sources like wind and solar in upcoming climate pledges [2,3]. The UN's Sustainable Development Goals (SDG) for 2030 require all sectors to adopt influential decision-making processes to achieve Eco-Neutrality. In COP28, Secretary General of the

International Association of Advanced Materials (IAAM) was lead delegation of 25 countries as observers in the various pavilions of blue and green zones to organize significant discussions and initiatives as part of the set agenda on climate change (Fig. 1). The conclusion of the first "global stocktake" of the world's efforts to combat climate change in accordance with the Paris agreement was a particularly noteworthy occasion during COP28, where countries must determine for limiting global warming to 1.5 degrees Celsius [3,4]. Countries reached a consensus on how to accelerate action in all domains of climate action by 2030, after demonstrating that progress in reducing greenhouse gas emissions, bolstering resilience to a changing climate, and providing financial and technological assistance to vulnerable nations was insufficiently rapid. This includes a request that

governments trigger significant natural systems and economies for the transition from fossil fuels to renewable energy sources, such as solar and wind power [3-5]. Despite some progress, energy transition technologies are not yet deployed at the levels needed to meet the Paris Agreement's goal, which requires strong policy, scientific research, and political decisions to transform how societies consume and produce energy [5-7]. There is a commitment to the "Advancement of Materials to a Sustainable and Green World" as part of the agenda for the decade that the IAAM

has developed [8]. IAAM continues to lead conservation and clean environment initiatives that protect human health. Climate resilience was the topic of discussion at the W119 Side Event held by the IAAM at the United Nations Water Conference in New York [9,10]. IAAM encourages collaboration and knowledge sharing among academic institutions, businesses, government officials, and members of civil society in order to combat global climate change through innovation and the pooling of resources.



Fig. 1. The IAAM Delegation's Active Participation at COP28, Dubai, UAE demonstrates their forefront role in championing climate resilience. The photograph highlights the delegation, led by the IAAM Secretary General, representing as observers in the blue and green zones. Their involvement is pivotal in driving forward discussions and initiatives focused on climate change, emphasizing sustainable practices, energy reform, and a unified approach towards enhancing both human and environmental health. This moment exemplifies their unwavering commitment to collaborative innovation and achieving global objectives of sustainability.

Solar, wind, and waterpower energy infrastructures have the potential to significantly reduce their carbon footprint and improve their sustainability if allowed to be implemented [11]. Understanding the circular economy

regional roadmap and framework model is crucial for global progress [12]. Translational research and circular materials for sustainability and the environment by business leaders. Students, researchers, and organizations

working toward a greener future are encouraged to collaborate on education and research through the IAAM, which reconnects stakeholders through "R&D World Links" [13]. IAAM establishes communities, consortiums, and councils for particular age groups and stages of scientific careers to promote scientific excellence on a global scale [14]. The IAAM has created one of the biggest materials communities for global network, excellence, education, research, subject experts, recognition, interdisciplinary collaborations, and not-for-profit publication in materials disciplines [8]. IAAM will use research, innovation, and education to focus on climate action over the next ten years in accordance with Sustainable Development Goal 13 (SDG 13). [8-10, 14-16]. Thus, IAAM is wholeheartedly committed to enhancing climate resilience, as demonstrated at the COP28.

CLIMATE CHANGE CONFERENCES

COP 28 is the designated abbreviation for the twenty-eighth session of the "Conference of the Parties" (COP) to the United Nations Framework Convention on Climate Change (UNFCCC). In the branch of international relations, COP is an abbreviation for a body established after the signing of an international treaty [1]. Annual COP is the only global platform for decision-making regarding climate change. The United Nations is the organization that organizes these conferences, and nearly every country in the world is a member (called Parties) of this conference. The COP is a forum where countries assemble to develop a consensus on approaches to combating the climate catastrophe. Potential measures may encompass the provision of support to vulnerable communities in their efforts to adapt to the consequences of climate change, the restriction of global temperature rise to 1.5 degrees Celsius, and the attainment of net-zero emissions by 2050. Assessing progress toward the objectives outlined in the Paris Agreement was the purpose of COP28. The United Arab Emirates and COP president, Dr. Sultan Al Jaber are the hosts of COP28. Dr. Al Jaber has also served as the leader of the Abu Dhabi National Oil Company.

Workstreams and financial support

Elucidating the intricacies of the loss and damage finance facility to assist vulnerable communities in coping with immediate climate impacts; striving for a global objective on finance that would provide financial support for developing countries' climate change initiatives; expediting an energy and equitable transition; and closing the enormous emissions gap, among others.

Limiting global warming determination

The global stocktake is a process in which countries and stakeholders take part to determine where they are and where they are not making collective progress toward achieving the goals of the Paris Climate Change

Agreement. According to the global inventory, we are falling short of our target of limiting global warming to 1.5 degrees Celsius. As the window of opportunity for significant transformation closes, the present moment demands immediate action.

The most inclusive COP

Accelerating the energy transition and reducing emissions by 2030; reorienting climate financing by fulfilling previous commitments and establishing the groundwork for a novel financial agreement; and prioritizing the well-being of nature, people, livelihoods, and existence in climate action. Whether or if nations achieve the COP26-agreed-upon target of doubling funding for climate change adaptation assistance by 2025. The fossil fuel sector attended COP27 in Sharm El-Sheikh. A key accomplishment of COP27 was the establishment of the long-awaited loss and damage fund; whether this money materializes is still to be seen, but historical evidence indicates that this is not certain.

DISCUSSION IN COP28

The achievement of a 1.5°C average global temperature increase limit may become unattainable in the absence of a substantial surge in public-private cooperation and measures to expedite emission reductions throughout global value chains.

1. Increase investments in renewable energy and electricity networks by a significant margin, while streamlining permitting and regulatory procedures. To expedite the development of renewable energy infrastructure and projects while upholding environmental norms, local communities, and a fair transition, policy reform is required.
2. Establish a precedent for public procurement. Governments are urged to establish aggressive procurement targets grounded in scientific principles in order to stimulate demand and facilitate the growth of supplier chains.
3. Turbocharge carbon reductions based on technology and nature. Given the escalating risk of exceeding 1.5°C, investments in technology and nature-based carbon removal must increase while remaining incompatible with mitigation activities. For this reason, it is of the utmost importance that governments identify appropriate targets for the removal of carbon, incorporate these targets into their National Biodiversity Strategies and Action Plans (NBSAPs) and nationally determined contributions (NDCs), and devise regulatory frameworks that make it easier to restore and preserve carbon sinks that already exist.

Roadmap and Unlocking Ambition

The principal goal of negotiators at COP28 is to enhance the instruments of Article 6 with the intention of

establishing a global carbon market that is both transparent and resilient. This will also facilitate the reduction of emissions more quickly and aid developing countries in their efforts to protect themselves from climate change. **Fig. 2** represents the graphical representation of COP28, UAE highlights and IAAM activities for Climate Action.

In coordination with the High-Level Champions and the Marrakech Partnership, "2030 Climate Solutions: An Implementation Roadmap" is a document that has been released in anticipation of the conclusion of the initial worldwide assessment at COP28. To effectively tackle the obstacles associated with bridging the gap in adaptation, reducing worldwide emissions by half, and enhancing the resilience of four billion individuals by 2030, the report outlines a set of recommendations backed by the viewpoints of an extensive range of non-Party stakeholders.

FOOD & AGRICULTURE DAY

A landmark proclamation endorsing sustainable food production and climate-resilient food systems was endorsed by 134 world leaders during the second day of COP28. This proclamation underscores the pivotal significance of food in mitigating the climate crisis. Enterprise Neurosystem is an open-source artificial intelligence (AI) community that operates for profit. The AI Innovation Grand Challenge was established in collaboration between the United Nations Climate Change Technology Executive Committee (TEC) and Enterprise Neurosystem. The purpose of the challenge is to identify and provide assistance for the development of AI-driven climate action solutions in developing nations.

28th CONFERENCE OF THE PARTIES (COP28)

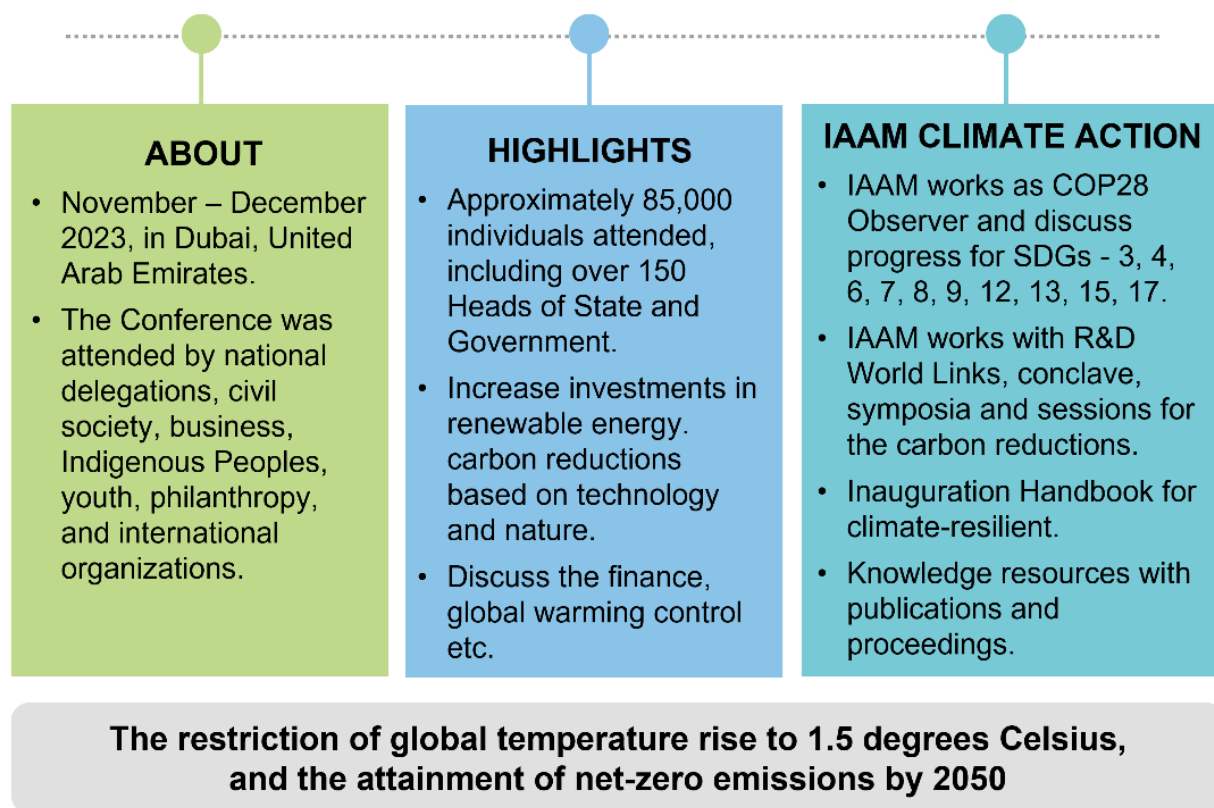


Fig. 2. COP28, UAE Outcomes and IAAM's Role in Advancing Climate Action – A comprehensive overview of IAAM's pivotal contributions to climate resilience at COP28 in Dubai, underscoring the organization's efforts in fortifying material ecosystems against climate change for sustainable development and global warming mitigation. The figure encapsulates COP28's inclusive objectives for cleaner energy, revamped climate finance, and the enhancement of natural and human well-being, alongside IAAM's initiatives in climate management, biodiversity conservation, and the integration of innovative technologies and policies for a sustainable future.

A considerable number of existing food systems are deemed unsustainable due to their detrimental effects on the environment and the depletion of valuable resources [17].

It is possible to argue that the food consumed today is equivalent to a fossil fuel resource due to the severity of this issue. Similar to the Internet as we know it today, the

development of an Internet of Food—a pre-competitive platform upon which business models can be constructed—will necessitate agreed-upon vocabularies and ontologies for reasoning and computing across the escalating volumes of data [17]. The successful integration of sustainable food systems will require several adjustments. Among these, the application of internet technology, particularly in the shape of an "Internet of Food," global resources, support rural livelihoods, build resilient systems, and facilitate responsible governance by leveraging information and communication, commerce, education, and computation, without any limitations on access or expertise required essentially [18].

Sustainable food and agriculture (SFA) contribute significantly to the advancement of all four pillars of food security—access, utilization, availability, and stability—and the sustainability dimensions (environmental, social, and economic) [18]. In order to achieve sustainability, agriculture must concurrently fulfill the requirements of present and future generations, guarantee profitability, promote environmental health, and uphold economic and social equity. In the current era, when over three billion people lack access to nutritious diets and one-third of all food produced worldwide is lost or wasted, the question of how to trade, consume, and produce food in a sustainable fashion has gained prominence. The food system, which is in a state of disarray due to the ongoing increase in the global population, is falling short of its fundamental objective of ensuring food security and nutrition for all and eradicating hunger [19].

The food systems must advocate for nutritious food, biodiversity, regeneration, equity, and human health [20]. Regenerative agriculture generates nutrient-dense, high-quality food through the cultivation of healthy soil. Strengthening local and circular food systems contributes to the preservation of vital nutrients, minerals, and natural resources. In addition to offering superior environmental solutions, circular agribusinesses reduce countries' reliance on imports and generate employment. In order to position farmers at the vanguard of a worldwide regenerative revolution and enable them to drive solutions, we must integrate them into policy discussions. Greater consumer awareness and public policies that prioritize nourishing diets, a healthy environment, and farmers who practice regenerative agriculture are required to get things back on track. Collaboration among farmers, consumers, funders, governments, businesses, and NGOs is essential for this to be possible.

A challenge was presented at COP28 to apply artificial intelligence towards mitigating climate change in developing countries. "There is mounting evidence that artificial intelligence could serve as an indispensable tool in the fight against climate change." "Although we remain cognizant of the risks and difficulties associated with AI, the Innovation Grand Challenge is a promising step toward empowering innovators in developing nations and

harnessing the power of AI," said Simon Stiell, executive secretary of the United Nations Framework Convention on Climate Change.

NATURE, LAND & OCEANS DAY

Water and nourishment are provided by the land, ocean, and nature to every species on the planet. Moreover, they play a crucial role in the regulation of the atmosphere. However, they are threatened by land degradation and ocean pollution. The attainment of each of the Sustainable Development Goals is contingent upon nature. We can create effective solutions for peaceful, prosperous, and equitable societies through collaboration with nature [21]. "Nature in all the Goals" demonstrates how nature-based solutions can deliver sustainable development for all and contribute to the achievement of all the Sustainable Development Goals. The achievement of SDG targets necessitates deliberate actions toward systemic change that reestablish power dynamics and confront fundamental inequities. A prosperous, secure, and well-being-oriented future for all—not exclusively for the privileged few—requires a paradigm shift in authorities, establishments, and countries [22]. A thriving terrestrial existence serves as the bedrock for our existence on this planet. We have severely damaged the planet's ecosystem through deforestation, habitat loss, and land degradation, of which we are all a component [23]. It is not a cause to advocate for the sustainable use of ecosystems and the conservation of biodiversity. It is critical to our continued existence.

Terrestrial ecosystems provide food, construction and energy raw materials, and a variety of ecosystem services, including erosion control, carbon sequestration, maintenance of soil quality, and habitat provision for biodiversity [24]. Consequently, terrestrial ecosystems contribute to agricultural productivity, climate regulation, and the mitigation of natural disaster risks (e.g., floods and landslides). These ecosystems make a substantial contribution to initiatives aimed at mitigating and adapting to climate change. The United Nations designates June 8 as World Oceans Day, an occasion annually observed on that date. In observance of this day, various activities are planned that highlight significant achievements in the pursuit of a sustainable global ocean [25]. Oceans comprise a substantial area of the Earth's surface and serve as a critical hub for the fundamental processes that support life. The United Nations designates June 8 as World Oceans Day, an occasion annually observed on that date. In observance of this day, various activities are planned that highlight significant achievements in the pursuit of a sustainable global ocean [25].

Presently, the focus of COP28 will be on the critical actions that are required to ensure a sustainable future in terms of ocean life, thriving biodiversity, and land use. To promote advanced materials for global excellence,

Fig. 3 refers to the Geographical Impact carried out by the IAAM across the continents. IAAM held a meeting in the United Arab Emirates to discuss the agenda and climate action plans for a more resilient earth.

YOUTH, CHILDREN, EDUCATION & SKILLS DAY

As a means of guaranteeing a sustainable future, classrooms and communities are becoming more receptive to the demands of young people for immediate and ambitious climate action. Along with addressing the concerns of young people, Youth Day at COP28 will also advocate for increased educational opportunities in order to provide children and young people with the knowledge and resources necessary to address the climate crisis. The age range of 15–24 years old accounts for sixteen percent of the total population of the world. Young people need to participate in sustainable development initiatives to achieve sustainable, inclusive, and stable societies by the deadline and to prevent the most significant challenges to sustainable development, which include climate change, unemployment, poverty, gender inequality, conflict, and migration [26]. Young people are active architects of the

2030 Agenda and are involved in its implementation, follow-up, and review frameworks and processes [27].

As the preeminent source of information on children worldwide, UNICEF maintains databases containing hundreds of internationally valid and comparable indicators. Education is essential for self-respect, enables the imagination to flourish, and liberates the intellect. It enables each individual to contribute to a progressive and healthy society; it unlocks a universe of possibilities and is the key to prosperity. Education is advantageous for all individuals and ought to be accessible to all [28]. Annually, on July 15, UNESCO-UNEVOC participates in worldwide observances to promote awareness regarding the significance of youth skills development and World Youth Skills Day [29]. This day, which has been designated by the General Assembly of the United Nations, is an occasion to recognize the accomplishments of young people who have benefited from skills training and to advocate for greater global youth access to high-quality training and skill development. YOUNGO, the UNFCCC's youth constituency, provides a forum for the participation of young people in global climate policies. A variety of youth-led side activities, workshops, and interactive sessions are planned for the youth demographic exclusively at COP28.



Fig. 3. IAAM held a meeting across the four continents to discuss the agenda and climate action plans for a more resilient earth. With the goal of promoting advanced materials for global excellence, the IAAM is making a geographical impact across the continents. Representatives of the International Association of Advanced Materials convene in a multi-continental meeting to deliberate on agendas and climate action plans aimed at fostering a more resilient Earth. Highlighting the commitment to leverage climate efficient materials for circular economy, the IAAM demonstrates its climate commitment and dedication to sustainable development across the world.

It is the mission of the IAAM Youth Council to facilitate the growth and development of young people and to assist them in becoming outstanding leaders, particularly in the field of science [30]. IAAM believes that knowledgeable and self-sufficient young researchers of today have the potential to alter the course of history if they are provided with the appropriate direction. IAAM makes use of this extensive network of seasoned researchers in order to offer career services and opportunities to students that are specifically tailored to the stage of their careers that they are currently in.

INDIGENOUS PEOPLES AND CLIMATE ACTION

Fashion is present in all directions. Cross-border in scope, its political, economic, and cultural influence is immense. Furthermore, a significant amount of greenhouse gas emissions can be ascribed to this industry. A Fashion Charter event is being coordinated by UN Climate Change for COP28. Its purpose is to convene policymakers, brands, suppliers, and non-governmental organizations to evaluate the fashion industry's critical transformation levers, encompassing finance and accountability, policy and regulation, and ethics.

The participation of indigenous peoples in the pursuit of climate solutions is crucial. Established amidst challenges to adaptation for millennia, they have developed strategies for adapting to changing environments that foster resilience and can strengthen ongoing and future adaptation efforts. The UN General Assembly adopted "Transforming Our World: the 2030 Agenda for Sustainable Development," on September 25, 2015 [31]. The agenda guarantees that all individuals will be included and prioritizes those who are the most far behind [31]. The agenda will remain in effect for the subsequent fifteen years, commencing on January 1, 2016. Featuring 169 associated targets and 17 Sustainable Development Goals, it is a comprehensive and all-encompassing policy agenda that is characterized as indivisible and integrated. Since then, Indigenous Peoples have actively participated in national, regional, and international initiatives pertaining to the SDGs. The primary aim is to advance the acknowledgment, safeguarding, and actualization of the rights, welfare, and dignity of Indigenous Peoples, while also bolstering their contributions to sustainable development [32].

"Indigenous Peoples are on the frontlines of the climate crisis. They are well placed to lead just transitions based on their time-honoured values, knowledge and world-views"

- Simon Stiell

Executive Secretary, UN Climate Change

WOMEN AND CLIMATE ACTION

The involvement of women in natural resource management at the local level is correlated with improved

outcomes in resource governance and conservation. Particularly at the local level, women possess distinctive knowledge and experience; therefore, their participation in decision-making processes is essential for effective climate action [33]. Observations are the foundation for weather and climate comprehension, monitoring, and forecasting. Systematic observation serves as the cornerstone of a climate services value chain, which establishes a link between observations and decision-making in order to facilitate comprehension of climate change and provide support for actions taken to address it. In addition to enhancing food security and agricultural output, increasing women's access to productive resources can help mitigate carbon dioxide emissions. The provision of equitable access to productive resources for all women smallholders could potentially increase their farm yields, thereby alleviating the need for further land deforestation and related emissions. IAAM has established a number of councils and consortiums that are geared toward a specific age group of members of the scientific community and provide them with the opportunity to gain exposure on a global scale [34]. These councils assist their members in advancing their careers and gaining access to opportunities of a world-class calibre. IAAM groups cover several young women and honored several women scientists for their excellent contributions in the materials world. Furthermore, the groups encourage an increasing number of young people all over the world to pursue a career in the field of science that they are passionate about.

SUSTAINABLE FOOD SYSTEMS

Food played a central role in COP28's historic declaration on agriculture, food, and climate action, which 134 world leaders endorsed. Over \$2.5 billion will be spent on food security and climate change. A growing global population necessitates the development of food systems that are more equitable, resilient, and fair. Despite adequate food production, nearly one in ten people go hungry, and three billion cannot afford a healthy diet [35]. Similarly, one-third of food production and its natural resources are wasted. Reforming food systems from "low cost" to "true cost" and transitioning from low-cost to "true cost" can strengthen food systems for the benefit of humanity, the environment, and future generations. More than 5.7 billion people and nearly 500 million farmers reside in the 134 signatory countries, which are also accountable for 76 percent of all emissions from global food systems and 70 percent of the food we consume [1]. The inaugural "UAE Declaration for COP28 on Sustainable Agriculture, Resilient Food Systems and Climate Action" will aid in the reduction of global emissions, the enhancement of food system resilience, the strengthening of food systems against climate change, and the advancement of the global fight against hunger.

Indigenous youth roundtable and climate policy

Although Indigenous Peoples comprise a mere 6% of the global population, they are responsible for preserving an estimated 80% of the remaining biodiversity on earth. Indigenous Peoples, despite their negligible contribution to global emissions, find themselves at the forefront of the climate crisis. Presently, approximately 6 percent of the world's population, or nearly 500 million individuals, are Indigenous members. These people inhabit more than a quarter of the world's landmasses, which are home to eighty percent of the planet's remaining biodiversity [36]. For millennia, these communities have maintained intimate connections with their surroundings, fostering sustainable lifestyles, safeguarding natural ecosystems, and adjusting to fluctuations in climate and anthropogenic catastrophes. Spirituality, traditions, and indigenous cultures are inextricably linked to their environment. As a result of land dispossession, colonization, invasions, and, in some instances, forced migrations, numerous Indigenous communities have been deprived of their rights, forced to endure poverty, and compelled to reside in regions ill-equipped to withstand the climate crisis.

Climate action deliverables

At the inauguration of COP28, UN Climate Change Executive Secretary Simon Stiell delivered a rousing address in which he urged delegates to expedite climate action. The immediate implementation of measures to combat climate change and its effects is required by Goal 13. It is intertwined with all sixteen of the other Sustainable Development Goals that are included in the 2030 Agenda. The Paris Agreement was ratified by countries in order to keep the increase in global temperature to well below 2 degrees Celsius [37]. Failure to act will likely increase the global average surface temperature beyond 3 degrees Celsius this century, with some regions experiencing even greater warming. Those who are most vulnerable and impoverished are being impacted the most [38]. Our current approach to natural resource management is unsustainable; therefore, a fundamental shift in our political and economic decision-making processes is required to rectify the situation.

"It's great that over 160 world leaders are coming, but COP28 cannot be just a photo-op. Leaders must deliver in Dubai – the message is clear. And as leaders leave Dubai after the opening Summit, their message to their negotiators must be equally clear: don't come home without a deal that will make a real difference,"

- Simon Stiell

Executive Secretary, UN Climate Change

IAAM acknowledges the significance of materials professionals in working toward a more sustainable future; consequently, through climate diplomacy, it is possible to achieve global eco-neutrality and energy technology transformation earlier [39,40].

2023 UN Global Climate Action Award

Two young individuals were bestowed with the UN Global Climate Action Awards during COP28. Sebastian Mwaura of Kenya and Michelle Zárate Palomec of Mexico were selected in recognition of their exceptional efforts to promote sustainable, resilient, and equitable living environments in their respective communities [1]. They were selected from hundreds of candidates from 120 countries. Due to climate change, the increasing unpredictability of the weather poses a threat to the food security of millions of people.

Handbook for climate-resilient

The International Association of Advanced Materials participated as an observer at COP28 and organise important discussions and initiatives as yearly agenda. Knowledge sharing and information networking are two of the most important aspects of the IAAM Sustainable Agenda, which is a target that is in line with the Sustainable Development Goals of the United Nations [8]. The focal point of the COP28 meeting is the unveiling of the publication titled "Rolling Out Climate Neutral Materials & Sustainable Innovations", a comprehensive handbook on Materials Science and Technology dedicated to fostering climate-resilient innovations and achieving net-zero objectives. Authored by Dr. Ashutosh Tiwari, this book spans fourteen chapters that pave the way for a climate-neutral future, as illustrated in Fig. 4, which was introduced at the 28th Conference of the Parties. The handbook delves into the innovative use of advanced materials to tackle climate challenges, encompassing a wide array of topics such as green technology, achieving climate neutrality, net-zero research and development, sustainable development goals, climate diplomacy, decentralized facilities, energy technologies, hydrogen energy, electric vehicles, artificial intelligence, and nanotechnology. It aims to guide the development of environmentally friendly products, practices, and technological advancements, with a special focus on renewable energy, sustainable agriculture, waste management, recycling, water conservation, purification, and recycling, thereby minimizing environmental impact.

"Climate-neutral materials refer to materials that have no net impact on the climate in terms of greenhouse gas emissions throughout their lifecycle. This means that for every amount of carbon dioxide or other greenhouse gases that are emitted during their production, use, or disposal, an equivalent amount is absorbed or offset. It can be achieved through a combination of using renewable resources, efficient manufacturing processes, and offsetting mechanisms like carbon sequestration or carbon credits,"

- Ashutosh Tiwari

Secretary General,

International Association of Advanced Materials



Fig. 4. Unveiling of 'Rolling Out a Climate-Neutral Future: Materials and Sustainable Innovations' at COP28 - A pivotal moment at the 28th Conference of the Parties in Dubai, where IAAM's dedication to climate resilience was highlighted. This handbook, featuring fourteen chapters dedicated to climate neutrality, aligns with IAAM's mission to fortify materials ecosystems against climate change, advocating for sustainable development and the reduction of global warming. Emphasizing comprehensive climate management, biodiversity conservation, and the integration of technological innovation, the handbook embodies the ambitious goals set at COP28 for a cleaner, more inclusive, and sustainable future.

By utilizing both platforms, researchers and business owners have the opportunity to gain access to a vast range of knowledge and expertise. Sharing one's thoughts and experiences helps to cultivate a culture of global collaboration by facilitating the cross-pollination of innovative solutions and the dissemination of successful practices. R&D world links and decentralized facilities improve financing and resource access Advancing materials toward climate neutrality by 2050 [42-44].

COP28 and IAAMs CLIMATE ACTION

As a result of the agreement that was reached at COP28 today, the "declination" of the fossil fuel era has been effectively initiated. This is accomplished by instituting a transition that is swift, fair, and balanced, which is supported by significant reductions in emissions and increased financial resources.

To ensure universal access to nutritious food, Food and Agriculture Day at COP28 emphasizes the significance of investing in innovation and prioritizing sustainable agricultural practices. A convocation of negotiators representing around 200 parties was held in Dubai as a demonstration of global solidarity. IAAM provides extensive support for the advancement of materials, which highlights the United Nations' Sustainable Development Goals to achieve global excellence and sustainability [2,8,45]. IAAM has reported the most progress on the

following ten Sustainable Development Goals, which are listed below:

- Goal 3: Good health and well-being
- Goal 4: Quality education
- Goal 6: Clean water and sanitation
- Goal 7: Affordable and clean energy
- Goal 8: Decent work and economic growth
- Goal 9: Industry, Innovation, and Infrastructure
- Goal 12: Responsible consumption and production
- Goal 13: Climate action
- Goal 15: Life on land
- Goal 17: Partnership for the goals

An interesting fact to take into consideration is that the International Association of Materials (IAAM) has identified the following as its top five priorities: sustainable consumption and production; climate action; industry and innovation; affordable and clean energy; decent work and economic growth. All of these priorities are incorporated into the organization's agenda for the decade beginning in 2030, which is titled "Advancement of Materials to Sustainable and Green World" and includes R&D World Links [8]. **Fig. 5** depicts the participation and active involvement of IAAM in climate actions and the United Nations, the United States of America, and COP28, the United Arab Emirates in the year 2023.



Fig. 5. In 2023, the IAAM aimed to create practical outcomes for climate initiatives and took an active part in events hosted by the United Nations, which took place in New York, USA, and Dubai, United Arab Emirates, respectively. Moving forward to 2030, the IAAM is dedicated to implementing its climate action strategy.

GLOBAL CLIMATE ACTION STRATEGIES FOR A RESILIENT EARTH

The United Arab Emirates hosts the COP28, which assesses the advancements achieved in the pursuit of the Paris Agreement. Constantly dispatching representatives to advocate for prompt and ambitious action to tackle the climate crisis is the mission of climate organizations like Global Witness. Conversely, environmental advocates and civil society organizations often encounter challenges that can be categorized as physical, legal, or economic in character. They are impeded from reaching their maximum capacity for participation due to these challenges.

To bring about change, we must collaborate and make it simpler to accept decisions that will ensure the continuation of our world. Rather than continuing to act as if there are no boundaries, or as if our actions have no repercussions, we must embrace decisions that will sustain our world.

ASIAN LEADERS AND ACCOUNTABILITY

The leaders of Asia presided over several high-level events that were centered on important topics such as the elimination of fossil fuels, climate justice, the protection of mountain ecosystems, and climate finance. During COP28, the Asia-Pacific region voiced their concern regarding the

accountability and implementation mechanisms for climate pledges and initiatives. During the high-level segment of the COP28, Asian leaders, such as the Prime Minister of India, Modi, the President of Indonesia, Joko Widodo, and the Prime Minister of Japan, Fumio Kishida, shared their perspectives and strategies for combating climate change [46]. Xie Zhenhua, China's Special Envoy on Climate Change, announced that China plans to release its 2035 national climate targets under the Paris Agreement's framework in 2025. In a manner that is analogous to India's position in the Global South, China's Vice Premier Ding Xuexiang emphasized the significance of safeguarding the rights of developing nations to advance their development [46].

New Initiatives and Alliances

At the COP28, many developing countries focused their attention on the connection between climate finance and the requirement for increased action. António Guterres, the Secretary-General of the United Nations, has emphasized the importance of transparency regarding developed countries' climate finance in 2023 [46].

At the beginning of the high-level segment, statements were made by the President of the United Arab Emirates, Dr. Sultan Al-Jaber, and the Prime Minister of India, Narendra Modi. During his welcome address, Simon Stiell,

the executive director of the United Nations Framework Convention on Climate Change, did not mince words. He stated, "This is not the moment for empty promises, photo-ops," while simultaneously calling for global leaders to take bold and united action. The climate action strategies for a

resilient earth are depicted in Fig. 6. These strategies were shaped by leaders from around the world through discussion, financial commitments, and dialogue at the COP28 conference, which took place in the United Arab Emirates.



Fig. 6. At COP28 in the United Arab Emirates, world leaders talked about, made financial promises to, and shaped climate action plans for a more resilient earth.

When he was speaking at the significant portion of the United Nations climate conference that was held in Dubai, where heads of state from all over the world were present, he mentioned that India has demonstrated to the rest of the world how to strike a balance between development and environmental protection.

Green Credit Initiative and Global South

The Green Credit Initiative was presented by Prime Minister Narendra Modi during the COP28 summit, and it was met with support from several different world leaders who were present at the event. The Ministry of Environment, Forest, and Climate Change of India launched the Green Credit Initiative on October 13, 2023 [47]. The initiative is centered on two primary focal points, which are as follows: The conservation of water and the planting of trees. One of the primary goals of the Green Credit Initiative is to encourage people to engage in environmental activities of their own volition. These

activities include things like the planting of trees, the conservation of water, the cultivation of sustainable agriculture, and the management of waste. Using this forward-thinking approach that is driven by the market, the objective is to encourage individuals, communities, and the private sector to participate in voluntary environmental efforts across a wide range of sectors.

As an overarching council of the Prime Minister of India is responsible for evaluating the current state of a variety of science and technology-related issues, gaining an understanding of the challenges that are being faced, developing interventions, creating a roadmap for the future, and providing the Prime Minister with advice in accordance with these findings. The Deep Ocean Exploration Mission, the Artificial Intelligence (AI) Mission, the National Quantum Mission, the Waste to Wealth Mission, the National One Health Mission, the Electric Vehicle Mission, and the AGNI Mission are some of the missions that have been given the go-ahead to be implemented [48].

The African Union and resource mobilization

On December 2, 2023, at the COP28 in Dubai, the African Union Commission, in conjunction with the United Nations Economic Commission for Africa (ECA), the African Development Bank (AfDB), African member states, and other regional partners, host the event, which discuss issues that are of common concern and to reiterate Africa's status for a successful COP28 [49].

The continent of Africa is disproportionately affected by the adverse effects of climate change, even though it is responsible for less than five percent of carbon emissions worldwide. Therefore, combating the effects of climate change is an urgent matter for African countries, and it is a matter of survival. Important points such as domestic resource mobilization, foreign investments for energy transition, resilient agriculture and food systems; Free Trade Area; minerals for energy; and the Great Green Wall Initiative were covered.

European Union commitments and actions

The Global Pledge on Renewables and Energy Efficiency, efforts accelerate the transition faster for fossil fuels and reduce emissions by 43 percent by the year 2030, and able to reach net zero emissions by the year 2050 [50]. Support for the energy transition in the European neighborhood and around the world will come from the budget of the European Union, which amounts to €2.3 billion. Over 400

million euros in funding from the European Union and its member states to activate a new loss and damage fund for climate emergencies, in addition to 175 million euros in financial support from the EU and its member states to reduce methane emissions [50]. The first two clean technology projects in Europe to receive funding from the EU-Catalyst partnership in order to assist the European Union in meeting its climate goals for the year 2030. A financial contribution of twenty billion euros from Team Europe to the Africa-EU Green Energy Initiative, a new initiative from Team Europe that focuses on value chains that do not involve deforestation.

"We stand ready to do more, and we know that more must be done. For example, COP28 has also been the opportunity to discuss carbon pricing with other Parties, so that more countries start to put a price on pollution. And we have also been able to lay the ground for broader financial reforms, new innovative sources of funding, and aligning all financial flows with the Paris Agreement."

- Ursula von der Leyen
President of the European Commission

The climate action strategies for a resilient earth that were shaped by world leaders at the 20th Conference of Parties (COP28) in the United Arab Emirates are referred to in Fig. 7. International leaders have committed to taking action on climate change and discussing the strategies.



Fig. 7. At COP28 in the United Arab Emirates, world leaders came up with plans for acting on climate change to make the earth more resilient. The leaders of the world agreed to take action on climate change and talked about the plans.

EU's priorities for COP28

The European Union worked for even more ambition and action in this crucial decade during the climate negotiations that took place at COP28 [50].

- Increasing the capacity of renewable energy sources and improving energy efficiency while gradually eliminating fossil fuels.
- During this decade, there will be a greater emphasis placed on reducing emissions.
- Getting ourselves and our partners ready to take on the challenges of climate change adaptation.
- The provision of climate finance to compensate for losses and damages for all those who are able to pay.

Climate leaders for action

Voices from a wide range of communities, including Indigenous and people of color communities, with critical ecological and climate justice perspectives are prominently featured in the environmental movement, which is markedly influenced by the determination of youth activists.

Alliance of CEO

Before COP28, more than 100 CEOs and senior executives from the Alliance of CEO Climate Leaders sent an open letter to world leaders [51]. The ACLCL employs 12 million people and generates \$4 trillion. The race to net zero requires transformative policies and actions. Every fraction of a degree counts. Every alliance member has set 2030 emission reduction goals of one gigaton of CO₂. Sustainable greenhouse gas emission reduction could change society's climate change trajectory.

Youth activists

By instituting the role of Youth Climate Champion, the COP28 conference leaves a legacy that will last for generations to come. In the official text that was negotiated at the COP28, the parties have reached an agreement to institutionalize the role of the Presidency Youth Climate Champion (YCC) within the process of the UNFCCC for enhancing the representation of youth in future COP-related events [52]. 110 young people from all over the world have been given the authority to drive climate action and negotiation as part of the COP28 Youth Climate Delegates Program.

Honoring the unwavering dedication of activists to addressing environmental issues is the purpose of Climate Action Day. Particularly movements led by young people and young leaders of color, these commemorations provide an excellent opportunity to recognize the work that has been done by environmental leaders [52]. In circumstances in which systemic problems call for systemic solutions, it is of the utmost importance that we emphasize the interconnectedness of climate to all other social issues. Having acknowledged this fact, we agree with a few specific actions that, when combined with more comprehensive legislative and systemic approaches, have the potential to cultivate a sustainable environment. Supporting and following these activists requires more than just using social media; it also requires gaining knowledge from and putting the perspectives of those who are most affected by the climate crisis at the forefront of the conversation.

The COP28 Youth Climate Delegates Program is the largest initiative to date to expand youth participation in the COP process. At the COP28 in the United Arab Emirates, 110 young people from all over the world were given the authority to drive climate action and participate in the COP negotiation. **Fig. 8** was published to illustrate this.



Fig. 8. The COP28 Youth Climate Delegates Program is the biggest effort to date to get more young people involved in the COP process. At COP28 in the United Arab Emirates, 110 young people from around the world were given the power to drive climate action and take part in COP negotiations.

Support climate research

In order to identify and implement solutions to climate change that are based on scientific evidence, scientists need to conduct rigorous research over an extended period of time about the dangers and effects that a changing climate will have on our ecosystems. The Copernicus Interactive Climate Atlas, which was recently made available by the Copernicus Climate Change Service, is an interactive tool that is both powerful and easy to use [53]. It allows users to investigate the history of our climate as well as the most important projections for the future. Policymakers and others who need to visualize and analyze climate change data will benefit from this new resource. To assist scientists in their research on the effects of climate change and the implementation of innovative solutions, researchers might want to think about joining a worldwide networks expedition. With the growing presence and significance of the global economy, as well as the ongoing trade competition, experts are developing new trade relationships and the challenges of maintaining digital trade governance. In order to achieve climate control, a significant amount of data, artificial intelligence, and automation is required.

Traditional Knowledge and Indigenous Innovation

The project is centered on the role that intellectual property, traditional knowledge, and genetic resources that are held or used by indigenous peoples play, as well as the implications that these factors have for innovation on a global and domestic scale. The Indigenous Initiative conducts a round table discussion with the Business leaders to investigate the potential contributions that Indigenous peoples to the economy and to trade in the region.

One intriguing aspect is how to create new 'global assemblages' by forming external and village-level partnerships and networks. Innovation is the ability of local stakeholders to actively create innovative knowledge to improve local health practices and environmental conservation [54]. By fostering community resilience to extreme weather events like droughts and floods through community-driven nature rejuvenation, the objective is to lessen the likelihood of harm coming to people's lives, their means of subsistence, and the surrounding ecosystems [55, 56]. For this reason, it is essential to understand how social capital can be improved at the village and network levels to comprehend how traditional knowledge can be utilized as a tool for development and innovation.

Emerging pledges for climate action

A persistent challenge for the COP is to reach a consensus on difficult topics such as the transition away from fossil fuels and energy transition. To ensure that the objectives of the Paris Agreement are met, it is not sufficient for leaders to merely make promises; this is because implementation is required. As a result of this reality, there are gaps in commitment from Asian economies, and there is a

requirement for actions that are both more ambitious and more concrete.

A contradiction in the climate action taken by the region was brought to light by the pledges made by Asian leaders. The key players such as India and China must embrace more ambitious global targets for climate and developing economies. It is possible that voluntary pledges could be nothing more than greenwashing if they are not supported by transparency and regular reporting. This is especially true for nations that are still increasing their consumption of fossil fuels.

A contradiction in the climate action taken by the region was brought to light by the pledges made by Asian leaders. Keeping the 1.5°C target within reach, in accordance with the Paris Agreement, the European Union campaigned for a significant increase in global climate ambition and collaborated with other partners who shared similar goals to ensure a successful outcome at the COP28.

Sustainable finance action plan

A key policy goal of the global action plan is to manage risks associated with environmental, social, and governance challenges while leveraging financial markets to enable sustainable economic growth in America and Europe [57, 58]. Manufacturing and processing products and materials causes 90% of biodiversity loss and 40% of greenhouse gas emissions. To meet our climate goals, stop biodiversity loss, and give everyone a dignified existence within our planet's limits, we must change how we create, design, use, and recover materials and things. The US Treasury will lead and support this critical agenda utilizing its considerable policy influence. Together with other federal agencies, foreign governments, and international financial institutions, it will promote worldwide action on climate change, environmental justice, and preventing climate-related economic and financial disasters [57]. The European Commission's Action Plan on Sustainable Finance, adopted in March 2018, is being implemented with support from four legislative measures approved in May 2018. These measures include a unified EU classification system, investor duties and disclosures, low-carbon benchmarks, and improved sustainability advice for clients [58].

Navigating sustainability reporting through platform

The Corporate Sustainability Reporting Directive (CSRD) replaces the EU's legacy ESG reporting program, the NFRD, and raises the bar for sustainability reporting. Starting in 2025, large and listed companies must disclose information on risks and opportunities related to their Environmental, Social, and Governance practices, with a focus on the impact of their activities on people and the environment [59, 60].

Sustainable Finance Disclosure Regulation (SFDR), integrated into investing strategy. Indicators of the Principal Adverse Impact can be reported and compliance with SFDR can be achieved considerably more quickly if the appropriate platform is utilized [61].

CONCLUSION

The findings of the two-week event at COP28 are evidence that the humanitarian community needs to exert even more effort in order to assist those individuals who are most susceptible to the climate crisis. The following are the four most important outcomes that are important to the aid community [62]:

- A warming threshold of 1.5 degrees Celsius is likely to be exceeded by us.
- Secondly, it is imperative that we advocate for the Loss and Damage Fund.
- We need to increase our investments in areas such as anticipatory action and adaptation.
- At COP28, the Humanitarian Hub served to amplify the voices of aid organizations.

Following the Paris Agreement, the conclusion of the COP28 marked the completion of the first Global Stocktake, which is the primary mechanism for evaluating progress made in accordance with the agreement. With the first Goods and Services Tax, the goal was to assist in aligning efforts on climate action, which included measures that need to be put into place to bridge the gaps in progress. UNEP's engagement at COP28 focused on the following areas [63]:

- The financing of climate change
- The adaptation to climate
- Both loss and damage
- Methods of climate change

The requirements of communities for a transition that is both equitable and justified ought to be at the forefront of the priorities. The United Arab Emirates Presidency of the COP28 provided support for a wide range of activities and topics, including but not limited to cooling, methane, food systems, nature, and land use.

To improve the efforts that are being made to mitigate the effects of climate change by the end of this decade, a consensus was reached regarding the preliminary "global stocktake". These efforts are being undertaken with the overarching objective of ensuring that the global temperature limit of 1.5 degrees Celsius can be attained. The International Association of Automotive Manufacturers Research and Development network places a significant emphasis on the positive effects that can be accomplished through collaboration. IAAM has the potential to create a future that is both more resilient and more sustainable if it makes use of the synergies that exist between R&D World Links and distributed facilities using the available synergies.

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