

EDITORIAL

Advancement of Materials to Sustainable & Green World

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The International Association for Advanced Materials is optimistic that the United Nations' Sustainable Development Goals (SDGs) can be achieved through scientific consideration of circular materials and embracing new green technological advances, as well as by keeping global commitments to reduce climate change, adapt to it, and come up with new ways to deal with it. The present green transition projects rely heavily on the accessibility of biodiversity, climate, and net-zero technologies leading to a sustainable future. A sustainable and green world refers to a global society that operates in harmony with nature, respects ecological limits, and ensures social and economic well-being for present and future generations. It is characterized by responsible resource management, reduced environmental impact, social equity, and the protection of ecosystems. In the context of effective climate resource management, it is necessary to recognize the value of natural materials and incorporate them into ongoing practices and processes. Understanding materials selection, along with leveraging nature-based solutions and renewable technologies, plays a significant role in driving the world's circular economy while ensuring sustainability. Addressing pollution, reducing reliance on non-renewable energy sources, adopting low-carbon materials, and eliminating plastics and harmful chemicals are essential steps toward creating a circular market that connects materials in a circular manner. This approach aligns with SDGs along with the Conference of the Parties (COP), and European Green Deal (EGD), which also emphasizes sustainability, net-zero, and circular processes. In this quest, advancements in climate-efficient materials science and technology, coupled with waste resource innovations, have potential usefulness towards all-in-one green solutions. Thus, it is crucial for the research community to focus on green R&D practices, and topical consortiums as much as possible. By prioritizing climate-efficient materials, promoting sustainable practices, and fostering innovation, the advanced materials world community can work towards materials development goals for a sustainable and green world.

The International Association of Advanced Materials (IAAM, Org. 802503-6784) was established as a non-profit research organization on Wednesday, January 20, 2010. Since then, it has actively engaged worldwide in various endeavors and accomplishments, committed to the United Nations Sustainability Development Goals [1]. In 2015, all UN member states adopted the 2030 Agenda for Sustainable Development Goals, aiming to promote peace, prosperity, and environmental sustainability for both present and future generations [2]. IAAM's agenda for the decade is committed to the "Advancement of Materials to Sustainable and Green World", which signifies a substantial undertaking in global policy and governance [3]. IAAM's primary focus for 2030 is on advancing materials towards the development of green technologies and contributing towards the building of a 'Climate Neutral Society' through a circular process of environmental restoration. It is worth noting that since 1970, the Asia-Pacific emerging

economies have quadrupled the global materials footprint, which has plateaued since 2014 [4]. IAAM emphasizes the importance of inclusive sustainable principles with embedding the advancement of climate-efficient materials. The combined biomass, fossil fuels, and mineral extraction increased from 48 to 69 billion metric tons between 1995 and 2008 [5]. This outcome indicates that secular structural changes and technological advances alone are insufficient to limit material use.

Recognizing the significance of IAAM's climate activities, the 2023 United Nations Water Conference has accredited the association for its water and climate change activities related to UN SDG Goal 6 [6]. These activities align with the action plans of the water conference, which aim to ensure global water sustainability. **Fig. 1** represents IAAM's activities at the UN 2023 Water Conference held in New York. The conference is persistent on Sustainable Development Goal 6, addressing climate

resilience in the context of droughts and floods. By promoting the convergence of advanced materials in water and climate research, IAAM has facilitated global collaboration and generated valuable insights and initiatives toward achieving net-zero emissions. Throughout the conference, the importance of water to sustainable development was highlighted by referencing

the International Decade for Action on Water for Sustainable Development, 2018-2028.

This editorial article aims to discuss the climate impact of eco-friendly materials within this context and provide an overview of climate resilience for a green world. The articles also outline the important tasks of materials in attaining the UN Sustainable Development Goals 2030.



Fig. 1. IAAM led prominent initiatives at the 2023 United Nations Water Conference in New York. The prominent efforts and contributions of the IAAM to the Sustainable Development Goals were discussed during the conference.

GLOBAL SUSTAINABILITY AGENDA

The IAAM facilitates open discussions, knowledge sharing, and collaborative efforts among academia, industry, policymakers, and civil society organizations. Its objective is to enhance coordination among governments, academic institutions, industries, NGOs, policymakers, and other stakeholders, with the aim of generating innovative ideas and pooling resources to effectively combat global climate change.

Advancement of materials underlines SDGs

IAAM primarily promotes the UN's Sustainable Development Goals (SDGs) combining its materials' commitment to global excellence [3,6]. Advanced materials are replacing traditional materials in numerous green applications day by day. They play a vital role in accomplishing the UN's SDGs as they are utilized in manufacturing processes across various sectors, including healthcare, energy, water, and more. Businesses in different industries are enhancing their processes and manufacturing techniques by incorporating intelligent materials. Therefore, SDG categories and details were provided to facilitate a better interpretation of the process. IAAM aims

at several major SDGs based on materials advancement and green world initiatives. The key Goals are all interconnected with the advancement of materials; therefore, it is important that all stakeholders must achieve them by 2030. The important associated goals are highlighted below:

SDG 3. Good health and well-being

Advanced Materials have abundant applications in the healthcare sector and can help enormously in ensuring healthy lives for people around the world [3]. By leveraging materials science and innovation, we can create safer, more efficient, and sustainable solutions that promote well-being, improve healthcare outcomes, and ensure healthy lives for all. Materials advancements are facilitating therapeutics and medical devices. New materials with improved properties are advancing medication, medical equipment, and devices, enabling functionality that was previously thought impossible. Healthcare needs are driving experts to engineer and create new materials.

SDG 6. Clean water and sanitation

Many recent developments in advanced materials have presented new approaches to deal with the challenges of

water contamination and disinfection [3]. The field has great potential to meet global clean water demand. For example, nanofibrous membranes are investigated to purify water more efficiently. IAAM is involved in wastewater management and developing efficient water purification technologies. IAAM is privileged to be at the forefront of the water community to rigorously discuss water-related issues. Since 2011, IAAM congresses and events have given a special focus on Water Technologies and discussed the challenges and opportunities [1]. To enrich the area, IAAM also published proceedings and the thematic issues on ‘advanced materials in water decontamination’.

SDG 7. Affordable and clean energy

Advanced Materials are indispensable to fulfilling the demand for clean energy and making possible a sustainable world [3]. Materials are accelerating the efficiency of photovoltaic harnessing for solar energy production. Polymer matrix composites also make wind turbines. Enhanced geothermal systems require new materials and technologies. Advanced materials can transform nuclear energy and reduce fossil energy fuel consumption and greenhouse gas emissions with structural ingredients, advanced ceramics, and fuel coatings. Corrosion-resistant coatings, carbon fiber composites, Phase change materials, and optical metamaterials will also help energy transportation, storage, and buildings. IAAM collaborates with energy companies and experts to translate new materials for a clean and sustainable energy future.

SDG 9. Industry, innovation, and infrastructure

Materials are responsible for innumerable valuable innovations around us [3]. Cars and physicists' lasers use advanced materials. These resources are also heavily used in automotive, aerospace, electronics, metals, energy, healthcare, telecommunications, chemical, and other industries. Green materials innovation and technology can improve the circular economy and sustainable infrastructure in many industries. IAAM hosts business-academia consortiums and symposia for collaboration to improve net-zero business innovation.

SDG 12. Responsible consumption and production

The competence of processes is directly connected to the consumption of resources [2,3]. The utilization of advanced materials has significantly enhanced the effectiveness of energy extraction from fossil fuels. Reports indicate that the efficiency of coal power plants can increase by up to 42% with the implementation of new power plant technologies. Technological advancements in coatings have resulted in improved fuel efficiency. Advanced materials are also instrumental in driving resource conservation initiatives in various other fields. Advanced rubber composites have prolonged the lifespan of tires, and low-emissivity windows and eco-friendly insulation have led to substantial energy cost savings. The IAAM is dedicated to conserving natural

resources through the enhancement of green materials, structural materials, and cooperation with energy experts. Furthermore, our commitment to making literature freely available online is aimed at educating the public about their role in promoting environmental sustainability.

SDG 13. Climate action

Advanced materials and nanotechnology are powerful tools that can help us tackle this impending global disaster [3]. Commercial vehicles can save fuel by using lightweight nanocomposite materials. Nano-coatings are the best tool for reducing emissions and producing clean energy. Nano-structured materials like aerogels can also reduce building heat transfer and heating system loads.

SDG 14. Life below water

The development of materials for marine conservation and restoration efforts, such as artificial reefs and sustainable aquaculture systems, can help protect and restore marine ecosystems. Additionally, potential hazards like microplastics and essential nutrients should be removed from the aqua system for healthy aquatic life. By adopting a materials perspective, IAAM is trying to contribute towards the sustainable management and preservation of our oceans and marine resources.

SDG 17. Partnership for the goals

It emphasizes the importance of partnerships and collaborations to achieve sustainable development goals. IAAM is dedicated to contributing to SDG 17 by fostering collaboration among stakeholders in the materials science and engineering field. This includes partnerships between academia, industry, governments, and non-governmental organizations to share knowledge, resources, and expertise. Collaborative efforts can accelerate research and development of sustainable materials, promote technology transfer, and support capacity building in developing countries. By fostering partnerships, we can leverage collective strengths, mobilize resources, and drive innovation to address global challenges and achieve all the sustainable development goals.

Conference of the parties

The highest decision-making body, the Conference of the Parties (COP), includes all convention parties of the states. This conference makes convention implementation decisions. In 1995, the first COP meeting was held in Berlin. The United Nations Framework Convention on Climate Change (UNFCCC) assesses climate change with the COP and evaluates the goals of the convention, as well as the national communications and emission inventories that have been submitted by parties [7]. During COP21 in 2015, the world agreed to restrict global warming to 1.5°C. Every year, COPs discuss the climate agenda and establish a climate action plan to guide overall efforts. In 2023, COP 28 will be organized in Dubai, UAE to discuss the status of

the goals set by the Paris Agreement [8]. IAAM's overarching vision at COP is to promote global materials sustainability by fostering international collaboration, advocating for climate-efficient materials policies, and implementing circular innovative resolutions to address climate change and environmental issues.

Overarching vision at COP

The stability of the world's ecosystems is threatened by the climate crisis. The principles of equity, sustainability, and resilience serve as the foundation for IAAM's vision. The association envisions a world in which all countries, regardless of their economic standing, collaborate to reduce greenhouse gas emissions, prepare for the effects of climate change, and promote sustainable development. To achieve COP's vision of promoting sustainable materials development, IAAM has set the following goals:

- Assessing the latest climate change research.
- Promoting biodiversity and climate rejuvenation.
- Signing international agreements for advanced technology.
- Implementing oversight for climate-related pledges, i.e., air, water, and earth.
- Promoting cooperation, training, and dialogue for climate change mitigation and rejuvenation.

The IAAM fosters international cooperation and collective action to combat climate change, promote sustainable development, and protect the planet for future generations. IAAM focuses on circular innovations and translational research to advance materials to global excellence in emerging fields like health, energy, and climate. Advancing Materials towards Climate Neutrality is important to attain within the given time schedule [9]. Advanced materials support lightweight composites, alloys, electronic controls, high-density batteries, and more [10,11]. However, many of these materials technologies in the production, energy, and water fields are not sustainable and require redirection towards more environmentally friendly pathways. IAAM actively participates in global issues, such as biodiversity loss, deforestation, waste disposal, air pollution, water issues, the burden of plastics, global warming induced by fossil fuels, and climate change, by promoting advanced materials technologies. Bioplastics are very useful in addressing several environmental issues [12]. Despite their pivotal role, advanced materials often go unnoticed by end-users who benefit from advancements in technology. Thus, materials innovations are crucial to achieving the Sustainable Development Goals [13]. This editorial discusses the climate impact of eco-friendly materials in this context and provides an overview of climate resilience for a green world. The articles delve into the value proposition of sustainable products and outline strategic approaches to prioritize sustainability, highlighting the

necessary role of materials in achieving Sustainable Development Goals.

MATERIALS POLICY FOR SUSTAINABILITY AND GREEN WORLD

IAAM upholds a comprehensive global perspective on trends in materials sustainability. It evaluates organizational processes related to materials against evolving standards, such as those for net-zero policies and sustainability regulations, to determine the subsequent steps to be taken in addressing climate change. Effective management can adopt all recommended policies and objectives, ensuring that the industry progresses towards a carbon-neutral and net-zero ecosystem for green growth. The global economy has consumed an excessive number of materials, exceeding 100 billion tons in 2019 [14]. However, the concept of the 'Circularity Gap' aims to reduce consumption levels and address climate change. Through the implementation of various changes, new innovations can evolve more sustainable systems and foster a circular economy that operates in harmony with nature. The goal is to shift our economy towards a regenerative and natural approach that promotes resource shifting, reusability, and recycling. Greenhouse gas emissions come from materials manufacturing.

In 2015, materials production emitted 11 billion tons of CO₂ equivalent, a 120 percent increase from 1995 [14]. Materials efficiency and the circular economy are promoted to reduce emissions, but our understanding of materials-connected greenhouse gas emissions is restricted. By harnessing diverse resources and embracing recycling and regeneration, the advanced materials community can develop sustainable solutions that contribute to a circular economy framework. The construction and housing sector urgently needs to consider the impact of materials on climate-neutral ecosystems. Currently, the infrastructure built, including roads, bridges, buildings, and homes, outweighs the natural biomass found in trees and animals. To mitigate the environmental burden associated with these civil and structural requirements, circular economy strategies must be employed, and building practices should prioritize harmonization with nature. This sector alone is responsible for emitting billions of tons of greenhouse gases annually. The commitment of IAAM over the decade in developing policies and management for environmentally friendly materials, biodiversity, digitalization, renewable energy resources, carbon-neutral technology, and green chemistry approaches are greatly benefitting the implementation of the SDGs, the Conference of the Parties, and European Green Deal. **Fig. 2** references the United Nations' Sustainable Development Goals, green technology, and the circular economy, highlighting their roles in advancing materials toward a sustainable and green world.



Fig. 2. The figure depicts the interconnection between the United Nations' Sustainable Development Goals (SDGs), green technology, circular economy, and the advancement of materials towards creating a sustainable and green world. The figure shows how the UN's SDGs, circular economy, green chemistry, carbon-neutral technology, renewable energy, digital technology, biodiversity, and eco-friendly materials for advancement interact. It shows health and environmental interdependence.

Green practices and renewable technologies

Nature-based solutions and renewable technologies play a crucial role in mitigating the environmental impact of society. The implementation of solar, wind, and water power in low-energy infrastructures can significantly reduce their carbon footprint. Solar and wind energy not only improve drought resilience but also contribute to groundwater sustainability [15]. Therefore, the utilization of lightweight local resources and low-carbon building materials helps decrease energy consumption in infrastructure. Nature-based solutions, such as green roofs, living walls, and the use of materials like wood, straw, and hemp, not only lower energy demands but also increase biodiversity and regenerate ecosystems [16]. These solutions improve resource performance, water management, biodiversity, and air quality. In addition to nature-based solutions, renewable technologies can also have a substantial impact on the circularity of materials and green energy use. Incorporating innovative design principles can reduce the need for mechanical space heating, cooling, and ventilation. For example, constructing net-zero modular climate-neutral homes that utilize upcycled and locally sourced materials is the best way to counterbalance pollution. Net-zero homes can also integrate sustainable features like rainwater harvesting and passive cooling, contributing to the overall goal of achieving a circular economy. Both businesses and consumers should prioritize bio-based alternatives, eco-friendly materials, and biofertilizers to reduce

environmental degradation [16]. It is imperative to prioritize sustainable materials for chemical-free consumables to reduce environmental toxins and pollutants.

Non-renewable energy

In the framework of the Sustainable Development Goals, it is essential to acknowledge the limitations of non-renewable energy sources and their contribution to greenhouse gas emissions [17], given the increasing demand for affordable energy to drive industrialization and development. Considering the uneven global distribution of energy sources, immediate action is required to implement changes in energy generation and distribution, guided by sustainability principles. This includes the adoption of strategies aligned with SDGs, such as nuclear power, carbon capture and storage, and biofuels. To achieve climate neutrality, it is vital to develop innovative approaches that regulate carbon emissions, reduce the costs of renewable energy, and advance the development of environmentally friendly, cost-effective, and scalable energy production and storage technologies [18,19]. These technologies should prioritize the utilization of abundant and recyclable materials and employ clean and affordable processes.

Promoting circular materials for achieving SDGs

To align with the Sustainable Development Goals, it is essential to prioritize the recycling of consumables when

other options such as refusal, repair, and refurbishment have been exhausted. By closing loops and fostering secondary markets, we can establish a circular consumables market that promotes sustainability. The ‘Circularity Gap Report’ provides evidence of how a circular economy reduces consumption and mitigates climate change [20]. Government agencies play a critical responsibility in facilitating the recycling of various materials, including plastics, synthetic fibers, paper, wood, and by-products. They can enforce regulations that mandate the use of recycled content and encourage the substitution of raw materials with recycled materials. It is imperative to address the issue of excessive plastic production and strive for its reduction. According to the ‘Circularity Gap Report 2022’, these collective efforts have the potential to save 2.18 billion tons of materials and reduce greenhouse gas emissions by 1.23 billion tons on a global scale [12,20]. Recent research highlights that chemical pollution stemming from plastics and agricultural fertilizers is among the most pressing concerns. We must acknowledge that the products we utilize, and discard do not simply vanish. An integral aspect of the circular economy is its influence on climate mitigation and the establishment of fair societies through resource reallocation and the adoption of reusable and recycling models.

Adopting bio-products and remediation

Despite recycling efforts, plastic waste continues to accumulate in the biosphere. Therefore, there is a need to develop sustainable materials like bioproducts as alternatives to synthetic plastics. The food-packaging industry, which is gradually phasing out plastics, can serve as a model for adopting bioproducts [21]. Advancing bio-based materials for sustainable solutions in health and food are the best way to achieve sustainability [16,22]. Rapid research and commercialization are necessary to bridge the knowledge gaps in this field. Numerous climate-efficient materials-based solutions offer unprecedented opportunities for remediating environmental issues. Environmental remediation utilizes nanotechnology-based materials, such as inorganic, carbon-based, and polymeric materials, to remove heavy metals, dyes, chlorinated, organophosphorus and volatile organic compounds, halogenated herbicides, and more [23]. These materials can effectively treat various components in air, water, and soil through pollutant adsorption/catalysis, hydrogen production and storage, and waste management. They form the foundation for implementing advanced climate-efficient material-based strategies to improve environmental health.

Advancing materials for circular economy

Current and future research aligns with the UN's SDGs, enabling technological solutions to combine with interdisciplinary innovation and natural methods, accelerating progress towards these SDG goals. In the

pursuit of sustainability, materials science emphasizes targeted solutions, technology translation, and the circular economy, and sets examples of successful goal implementation [24]. Circular economies protect the environment and resources while promoting sustainable growth, health, and jobs. Nanotechnology plays a significant role in advancing global sustainability efforts [25]. **Fig. 2** refers to the SDGs of the United Nations and highlights the role of the circular economy in developing an environmentally friendly world. By translating technological advancements into practical applications, the field of advanced materials effectively implements sustainable practices in sectors such as energy, water, agriculture, and healthcare. Through targeted research and development, nanotechnology offers innovative solutions to address various sustainability challenges. Intelligent Nanomaterials provide advanced nanotechnology that can transform the perspective toward climate neutrality [26-28]. Closed metal cycles contribute to green high-tech products by decreasing CO₂ emissions in their production. By embracing net-zero technology, the circular economy, and integrating nature-based solutions with renewable technologies, we can transform our economy and mitigate the environmental impact [24-29].

Understanding the regional roadmap and framework model of the circular economy is important for the world's developmental process [29,30]. Europe's framework tracks the EU's progress toward a circular economy and considers how it can pay to climate neutrality, resilience, and sustainability. The United Nations Environment Programme (UNEP) is the top comprehensive agency on the environment, and its circularity platform provides an understanding of the circularity concept for sustainable consumption and production patterns [31]. Natural resource use threatens Earth's carrying capacity. The transition from a linear, i.e., take, make, dispose to a circular, i.e., renew, remake, share economy is expected to help achieve the SDGs, especially SDG 12 on responsible consumption and production [32]. Our consumer-driven society is putting enormous pressure on the planet. Sustainable production and consumption, along with a global resource-efficient circular economy, offer practical solutions for long-term development [33]. Understanding the approach and experience in building circularity is important for the energy sector too, particularly in the recycling of batteries [34]. These circularity actions are essential for building a more resilient future based on health, the environment, and the energy sector, ensuring a greener world [29-34].

DELIVERABLES FOR MATERIALS SUSTAINABILITY

The International Association of Advanced Materials (IAAM, www.iaamonline.org) was established as a non-profit research organization with a head office in the natural environment of Ulrika, Östergötland, Sweden and engaged

worldwide in various endeavors and accomplishments related to materials advancement and sustainability agenda [35]. IAAM hosts councils for these communities and consortiums to collaborate, and share knowledge, and

research. IAAM supports academia, businesses, youth, women, social organizations, and governance. Scientific professionals can network, share knowledge, and form lasting partnerships at IAAM [36].



Fig. 3. The UN 2023 Water Conference, held at the UN headquarters in New York during 22 - 24 March 2023, showcased the association's decade-long efforts in alignment with the UN Sustainable Development Goals. IAAM organized a W119 side event on Climate Resilience: Addressing drought and flood in collaboration with the People's World Commission on Drought and Flood, Bronx Community College (BCC), City University of New York (CUNY), and Columbia University.

Materials sustainability and R&D world links

The IAAM's 'R&D World Links' initiative encourages students, researchers, and organizations working toward a greener future to collaborate on education and research. Business leaders' contributions to translational research and circular materials for a sustainable and environmentally friendly future are recognized by IAAM. IAAM creates communities, consortiums, and councils for specific age groups and career stages to promote global scientific excellence [36]. IAAM's focus is to establish an interconnected and interdisciplinary materials network, facilitating inter-trans-disciplinary collaborations through R&D World Links [37]. IAAM facilitates the exchange of information, research collaboration, education, and international outreach, thereby expanding the global network and collaborations among IAAM members. IAAM develops water action plans and resolutions in line with the United Nations SDGs agenda, promoting sustainable practices and environmental protection. **Fig. 3** depicts an

IAAM delegation discussing the association's next decade's UN SDGs during the UN 2023 Water Conference held from 22 to 24 March 2023, at the UN headquarters in New York, USA. Through sustainability initiatives, IAAM's aim is to contribute to society by advancing scientific knowledge, fostering innovation, and addressing global climate challenges. The European Union models track the circular economy through indicators such as material footprint, resource productivity, and waste avoidance. It also considers greenhouse gas emissions from production, material imports, and raw materials information. To succeed in materials development and promote a sustainable climate, monitoring is essential. All organizations utilize climate diplomacy to achieve global eco-neutrality [38,39]. Together, we can create a world where scientific advances and responsible practices address our most pressing issues. Our goal is to establish a sustainable and regenerative system by focusing on resource efficiency, waste reduction, and material recycling.

Deliverables of IAAM over a decade

The International Association of Advanced Materials has created one of the largest global networks for the advanced materials community [40]. IAAM provides highly interactive international networks that serve as forums of collaboration for the advancements of materials science, engineering, and technology. The following specifies an overview of the key activities undertaken to achieve excellence:

Global network for materials' excellence: IAAM's activities for the advancement of materials to global excellence are focused on sustainability and how materials shape the future. With a membership of over 80,000 individuals from more than 130 countries, IAAM aims to support translational research collaborations and partnerships in the field of R&D [41]. As IAAM sets out on this journey, its main objectives are to foster collaborative efforts, inspire innovation, and acknowledge remarkable accomplishments in the advancement of sustainable materials.

International consortium and forums for global impact: IAAM strongly believes that comprehensive challenges require global solutions through a group of complementary experts [36]. Engaging in 2000+ translational research opportunities on advanced materials and technology for a sustainable and green future. Sustainable development can be accelerated through the promotion of international partnerships, collaborative projects, and information sharing. The association has always planned the consortium in such a way that they present the ideal combination of significant research fields and offer delegates a truly multidisciplinary experience. By working together, experts can pool their unique experiences, knowledge, and resources to effect positive change on a global scale.

IAAM Education and Research: Education and research opportunities play a crucial role in advancing sustainable development and achieving the various Sustainable Development Goals (SDGs). IAAM is committed to promoting education and research activities with its institutions in interdisciplinary advanced materials fields. So far, the organization has established two institutes, started various courses for master's, Pre-PhD, and PhD students, and provided research funds, fellowships, travel grants, and training courses (Fig. 4).

Hosting esteemed global expert networks: The IAAM platform brings together leading experts, researchers, and industry professionals to collaborate on innovative solutions. IAAM has successfully curated a collection of 7500+ lectures delivered by famous speakers and has hosted over 18000 esteemed delegates from around 125 countries across the globe [40]. These gatherings have taken place in more than 75+ IAAM conferences, comprising over 1600+ sessions & symposia (Fig. 4).

Recognition and accolades: The association takes great pride in its award program, which has been dedicated to advanced materials for over a decade. These researchers are presented with IAAM awards and honors, such as Laureate, Fellow, Medal, and Scientist Award, among others, to enhance the quality of contemporary research [42]. To date, more than 2,500 researchers from over 75 countries have been honored and recognized until December 2022 [40] (Fig. 4). This recognition acknowledges their unwavering dedication, innovative contributions, environmental impact, and advocacy for sustainability [42]. Nominations are welcomed from around the world, and the winners will be acknowledged for their exceptional efforts during the IAAM Annual Conference. The Materials Sustainability Award and Innovation Award specifically celebrate the achievements of materials innovators.

Interdisciplinary collaborations for synergistic impact: The IAAM promotes global research, education, and industry collaboration. The IAAM council promotes transformative interdisciplinary approaches to sustainability through dialogue, joint research, and knowledge sharing. These councils promote cooperation, innovation, and sustainability.

Not-for-profit publication across disciplines: The association has found synergistic solutions to environmental, social, and economic problems by encouraging collaborations between materials science, engineering, biology, and social sciences. Three journals support 25+ books and 50+ proceedings. IAAM promotes non-profit open-access publishing and innovations [40]. IAAM is one of the pioneering non-profit scientific publishers. This decade, IAAM has become the leading organization for advanced materials publications. Advanced Materials Letters facilitates access to important and insightful scientific research [43]. IAAM's open-access model allows authors to publish journals and books without processing or publication fees [44]. Another international journal that publishes materials science and technology conference proceedings and peer-reviewed articles is IAAM's Advanced Materials Proceedings [45]. IAAM disseminates scientific research and knowledge about advanced materials to researchers worldwide by eliminating associated costs, including the use of audio-visual journals and video proceedings. Video Proceedings of Advanced Materials is an open-access, peer-reviewed video journal that publishes state-of-the-art research advancements in materials science, engineering, and technology [46]. The journal covers advanced materials research, innovation, and technology in an audio-visual format.

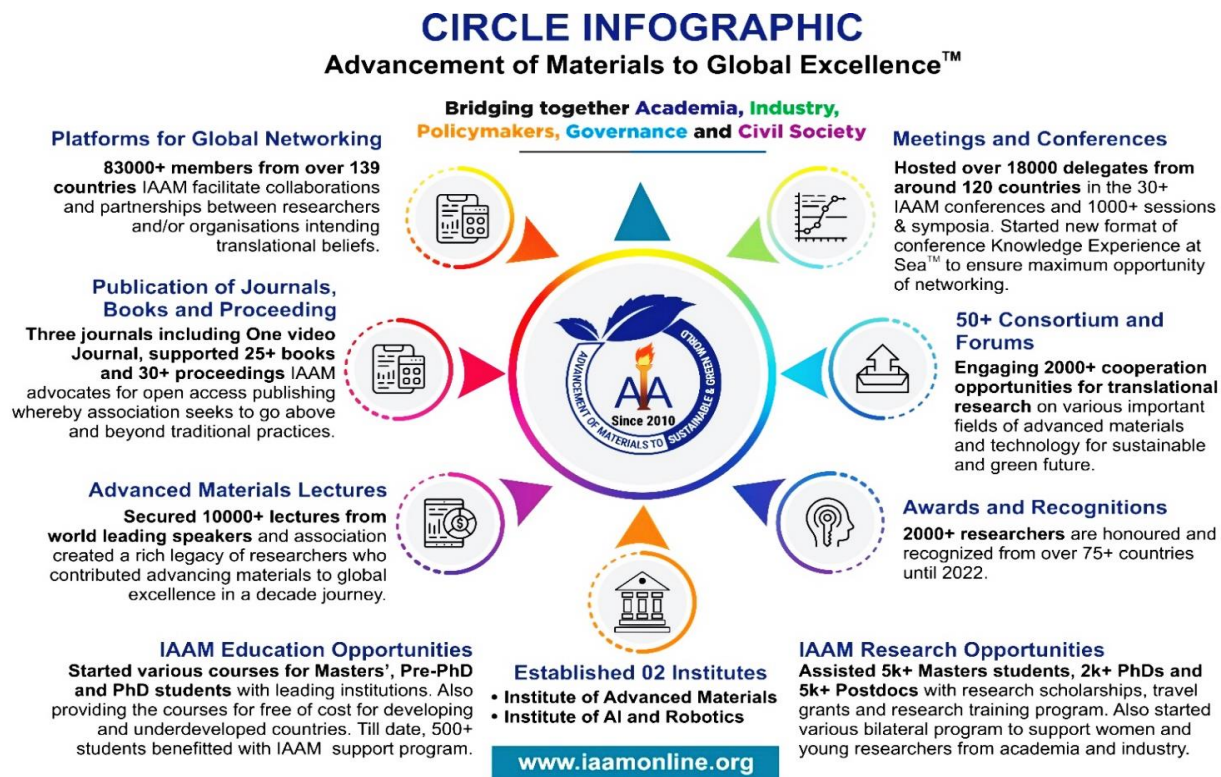


Fig. 4. Circle infographic IAAM, showing the activities of IAAM towards the advancement of materials to global excellence.

Decentralized R&D and centralized education

International Association of Advanced Materials, IAAM's activities for 'Materials Global Excellence' revolve around fostering collaboration, inspiring innovation, and recognizing exceptional achievements in the pursuit of sustainable materials. Through R&D World Links, IAAM conducts research, innovation, and technological development and educates through two institutions: Institute of Advanced Materials and Institute of AI and Robotics, both located at Ulrika, Östergötland, Sweden [35,47,48]. IAAM's mission is to accelerate the development of sustainable materials and to shape a future that places a premium on environmental stewardship and resource efficiency through its many internal initiatives including R&D, innovation, education, etc.

R&D world links

IAAM promotes sustainable materials research and development. IAAM world R&D decentralized initiatives are based on the belief that collaborations inspire translational innovation by enhancing new methods and technologies in materials sustainability, health, energy, and the environment [3,37]. To bolster and facilitate the interdisciplinary participation of global researchers and scientists in Translational Research & Innovation activities, the Institute of Advanced Materials has established a network of R&D labs and decentralized facilities [37,47]. The institute serves as a hub for health, energy, and environmental research by coordinating translational

research projects and bringing together a wide range of subject experts: <https://iaam.se/translational-research>. The decentralized Labs allow expert scientists from all over the world, having a set of resources, and data to collaborate efficiently and work on prolonged R&D projects.

Aims, objectives, advocacy, and policies

Our network of decentralized facilities, R&D World Links, and consortiums is aimed at supporting innovative research projects and partnerships [36-39]. For a sustainable and climate-neutral future, the Institute serves as the central coordinator for a number of related consortia, expert groups, and translational research programs. IAAM's mission is to shape policies that encourage the use of sustainable practices and foster the growth of a circular economy by providing scientific insights and expertise. IAAM works with policymakers, industry leaders, and stakeholders to promote sustainable materials through below initiatives:

- Networking
- Generating results
- Creating collaborations
- Intensive discussions
- Finding solutions
- Develop policies
- Mapping out future
- Managing consortium

Multi-lateral collaborations, partnerships, and consortiums

IAAM members network and collaborate to foster partnerships, research consortia, and joint projects to address sustainability issues and innovate [36-41]. Our decentralized facilities and consortiums act as global

interface centers and incubators for ideas to develop into products. The Institute R&D World Links promotes translational research and innovation by bringing diverse expertise together. Institute of Advanced Materials forms consortia and projects that hold the potential to transform the future. IAAM welcomes diverse collaborations.

Educational initiatives

The Institute of Advanced Materials and the Institute of AI and Robotics prioritize sustainable materials education and training. Workshops and seminars train materials scientists and engineers. Scientists, engineers, and researchers must fund, collaborate, and share knowledge.

Institute of Advanced Materials

The Institute of Advanced Materials was founded in the year 2015 with collaborative attempts of the International Association of Advanced Materials [35,47]. The institute has been working to empower industries and startups by translating research and innovation. We offer services that are highly focused on advanced R&D, innovations, and net-zero technologies. Institute of Advanced Materials works to promote translational research & innovations in the sectors of health, energy, environment, and many more.

Institute of AI and Robotics

Institute of AI and Robotics offers its technological innovation services in AI-enabled smart technologies [35, 48]. The institute hosts a consortium to discuss the issues. AI-enabled Smart Healthcare is now a major research area. Institutes use IAAM technocrats and healthcare experience to develop robotics industry ideas.

Interactive global materials community

The objective of the IAAM organization is to rapidly advance the field of advanced materials by bringing together all current and future scientists under one umbrella. Since its inception, IAAM has been striving to establish an extremely interactional global community (Fig. 5). IAAM has organized thematic sessions on all five continents (America, Europe, Asia, Australia, and Africa) to facilitate discussions and planning on nanomaterials, functional, environmental, structural, and composite materials for high-tech applications [49]. Meetings and symposiums held worldwide focus on recent trends and promote profound awareness in various areas, such as Electronic, Magnetic, Optical, Nano, Bio, Green, Quantum, Engineering, Smart, Functional, Interface, Electrolytic, Tissue Engineering, Energy, Healthcare, Devices, and more. IAAM conducts advanced materials conferences, symposia, meetings, training, and workshops through the initiatives below:

Advanced Materials Congress (AMC)

An international platform with unparalleled prestige for academia and industries to indulge in extensive scientific discussions to establish a highly interactive Advanced Materials Community [50]. Ten years of its establishment, Advanced Materials Congress has actively created a global forum straddling across Europe, Asia, Australia, Africa, and America to achieve together the agenda of the decade, 2030, 'The Advancement of Materials for a Sustainable and Greener World'. Up to 2023 April AMC assemblies, IAAM conducted 53rd assemblies of this congress.



Fig. 5. IAAM works in multiple interdisciplinary areas through cross-disciplinary discussions and consortium models with experts. The IAAM consortium, congresses, and symposia bring the advanced materials community together to solve pressing problems through innovation and cooperative efforts. These platforms foster complementary cooperation and facilitate the exchange of ideas among experts.

Baltic Conference Series (BCS)

BCS is a comprehensive forum meant to showcase the latest trends in Climate Neutral Research, Innovations, and Technology across various sectors [51]. The forum calls biannual meetings on the Baltic Sea to discuss the advancements of smart innovation and technology for a clean and sustainable society. The motto of BCS is to promote “Climate Neutral R&D and Green Tech”. In 2023, IAAM celebrates the 7th Anniversary of the BCS.

World Congress Series (WCS)

An International Scientific Carnival to create cross-disciplinary World R&D Links and consortiums in Health, Energy, and Environment [52]. In the ten glorious years of its establishment, the International Association of Advanced Materials (IAAM) in its initiative of World Congress Series (WCS) has taken the prestigious conferences to different parts of the world to stimulate and ignite the interest of advanced science and technology in the local population of different areas to achieve the goal of a building a sustainable world for the future generation.

Advanced Materials Lecture Series (AMLS)

AMLS is an onsite and online hybrid open-ended lecture series aimed at promoting open and informed discussions on issues pertaining to Advanced Materials Science, Engineering & Technology and encouraging scientists to address the social aspects of their research [53]. All the lectures of the series are recorded for possible publication in the open-access audio video literature, Video Proceedings of Advanced Materials [46]. IAAM has a rich legacy of world-

renowned high-profile scientists who have delivered talks in the Advanced Materials Lecture Series.

These events provide a platform for experts to discuss awareness, knowledge, problems, and potential solutions. IAAM has analyzed significant findings, limitations, and prospects in climate neutrality and circular sustainability strategies.

Decadal milestone and pace of excellence

IAAM has surpassed a decade of extraordinary and tremendous advancements in the field of advanced materials. It has become a global leader in publication, networking, materials R&D, and education through cooperation and collaboration. IAAM's Advanced Materials Congress has set the bar for academia and industry with its innovative format and timely themes. As part of our commitment to global excellence, IAAM is forming councils to address the health, energy, and environmental applications of advanced materials. IAAM recommends nanotechnology, cross-disciplinary work, and global collaboration to accelerate the transition to a sustainable future. The International Association of Advanced Materials (IAAM) released its 13th Annual Book during the UN 2023 Water Conference at the UN headquarters in New York on March 22 [1,40]. The 13th Annual Book of the IAAM (ISBN 987-91-88252-39-5) details the association's work in line with the UN SDGs agenda. **Fig. 6** demonstrates IAAM delegates releasing the IAAM decadal activities in accordance with global Sustainable Goals for Materials advancement and a green world.



Fig. 6. IAAM decadal activities in accordance with the global Sustainable Goals for Materials advancement and a green world. IAAM released its 13th Annual Book (ISBN 987-91-88252-39-5), detailing the association's work in line with the UN SDGs agenda, during the UN 2023 Water Conference at the UN headquarters, New York on 22 March 2023 [40].

PROGRESS AND INDICATORS FOR THE SUSTAINABLE DEVELOPMENT GOALS

Indicators and reports on the progress towards achieving the Sustainable Development Goals in 2023 will provide valuable insights into the current status of the world and the necessary actions to make the 2030 Agenda for Sustainable Development a reality. These reports track regional and international development progress across each of the 17 SDGs, using in-depth analyses of selected indicators. To ensure the success of the SDGs and drive meaningful progress for people and the planet by 2030, a global indicator framework is essential [54,55].

The Sustainable Development Goals Report 2022, using the most up-to-date data and estimates, offers a comprehensive overview of the implementation of the 2030 Agenda for SDGs [56]. The report highlights areas such as food and nutrition, health, education, the environment, and security, which are impacted by climate change and war. Each year, the United Nations Department of Economic and Social Affairs (UN DESA) compiles the latest estimates and data from over 200 countries and territories to produce the SDG Report.

Climate change, COP report, action: The COP26 report urges governments and policymakers to act quickly to address climate and health crises [57]. Global climate action strategies aim to drive ambition, deliver action, and ensure accountability by fostering collaboration in the implementation of transformative change. Given that the world is at a tipping point concerning climate issues [58], the outcomes of COP 27 focus on addressing the adaptation gap, strengthening resilience, and establishing interconnected action priorities. The SDGs require adaptation, resilience, and climate action finance. Accelerating holistic zero-carbon development, leveraging nexus areas, tailoring to local and regional conditions, and providing managed financed transitions are considered best practices. Other key aspects include tracking and reporting progress, establishing economic ground rules, and building credibility and accountability.

Priorities for reforming the financial sector: The United Nations SDG report for 2023 outlines six priorities for reforming the financial sector, including SDG investments, sustainability metrics, banking, sustainable finance, national planning, regulation, reporting, oversight, and the development of new mechanisms to enhance international cooperation's quality and the effectiveness of the SDGs [59]. Although some progress was made globally toward achieving the SDGs between 2015 and 2019, these efforts are deemed insufficient [59]. Even in countries largely responsible for climate and biodiversity crises, progress on environmental and biodiversity goals, such as SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action), SDG 14 (Life Below Water), and SDG 15 (Life on Land), is slow. To achieve the SDGs, the global community needs to increase the overall amount invested

and change the current investment practices. The SDG index report ranks 116 countries based on their efforts to achieve all 17 SDGs, with the top 10 countries predominantly located in northern Europe - Scandinavia, while nations in central Africa record the lowest scores [60].

The Sustainable Development Solutions Network (SDSN): It is an international coalition of organizations that pool their scientific and technological resources to advance the implementation of the SDGs and the Paris Climate Agreement [61]. The SDSN was established in 2012 to unite research institutions worldwide in support of the SDGs [61]. Currently, over 1,900 institutions, primarily universities, are connected through the SDSN's global network, consisting of 53 national and regional chapters. The SDSN facilitates discussions on SDG implementation at the international, regional, and national levels by providing evidence-based pathways and analytics. SDSN will continue working diligently to encourage governments, businesses, and civil society across the world to adopt and align with the SDGs.

INFLUENTIAL POLICIES AND COUNTRIES

To understand the progress made in sustainable development, it is important to delve into the influential policies and approaches adopted by various countries and groups. The SDSN's global survey provides insights into government efforts and commitments towards the SDGs, highlighting key differences across nations, including those in the G20, BRICS, SARC, and African countries groups, in terms of their SDG strategies and dedication.

The Group of Twenty (G20): It consists of major economies such as Argentina, Australia, Brazil, the European Union, France, India, Indonesia, Italy, Japan, Canada, China, Mexico, Russia, Saudi Arabia, the United Kingdom, South Africa, South Korea, Turkey, the United States, and Germany. The G20 focuses on discussing and formulating influential action plans encompassing policies and financial measures [62].

The European Commission: It adopts a holistic approach in collaboration with the United Nations to foster a better, safer, and more sustainable world for all. Sustainable development is established as a fundamental principle and primary goal in all EU policies, both domestically and internationally [63]. The EU and its Member States are committed to implementing the 2030 Agenda for Sustainable Development. They have also introduced climate, energy, transport, and taxation policies to mitigate environmental degradation, combat climate change, and reduce greenhouse gas emissions by 55% from 1990 levels by 2030.

The European Green Deal: It encompasses a wide range of initiatives aimed at improving the present and future well-being of society. It focuses on various aspects such as clean air, water, soil, biodiversity, energy-efficient buildings, healthy food, clean transportation, cutting-edge

clean technologies, recycled products, resilient employment, and training in the industry [64]. The European Union (EU) aims to achieve a climate-neutral continent by 2050 through its focus on clean energy, environmental protection, sustainable agriculture, eco-friendly transport, green industrial strategies, research, innovation, and sustainable investments. By analyzing the influential policies and strategies of countries and groups like the G20, BRICS, SARC, and African countries, and considering initiatives like the European Commission's holistic approach and the European Green Deal, we can gain valuable insights into global efforts towards sustainable development.

GLOBAL MATERIALS POLICY

Through knowledge-sharing and dialogue, IAAM aims to develop strategies that leverage innovation in materials to combat climate change, address resource scarcity, improve water treatment technologies, and promote inclusive education for a more sustainable and equitable world.

Global relevance of sustainable materials: In order to fulfill carbon reduction commitments and address the issue of sustainable materials, the United Nations and affiliated organizations engage in monitoring and follow-up activities. Adopting low-emission materials, working towards greenhouse gas reduction targets, and implementing production methods that decarbonize emissions from materials are essential for achieving global sustainability. **Fig. 7(a)** defines the indicator numbers, SDG targets, and their descriptions [65]. Analysis with JRC SDG Mapper reveals that the United Nations report for 2023 identifies the top ten SDG progress in the following order: SDG 13, SDG 1, SDG 2, SDG 10, SDG 3, SDG 15, SDG 7, SDG 8, SDG 5, and SDG 6 respectively [65]. The United Nations' top 10 progress in SDGs is observed in the following goals in decreasing order:

- Goal 1: No poverty
- Goal 2: Zero hunger (No hunger)
- Goal 3: Good health and well-being
- Goal 5: Gender equality
- Goal 6: Clean water and sanitation
- Goal 7: Affordable and clean energy
- Goal 8: Decent work and economic growth
- Goal 10: Reduced inequality
- Goal 13: Climate action
- Goal 15: Life on land

Realms of sustainable materials: IAAM is deeply invested in the sectors of Energy, Environment, and Health. Making optimum usage of the sphere of Advanced Materials and pushing the boundaries of technology and innovation [66]. Developing goals and resources that support Sustainable Development is essential if we are going to achieve the SDGs on time (source: <https://iaam.se/sustainable-materials>). IAAM's monitoring of comprehensive progress in SDGs to achieve the 2030 Agenda holds global relevance [2, 66]. The top 10 SDG

agendas currently focused on by IAAM activities belong to SDG 03, SDG 04, SDG 06, SDG 07, SDG 09, SDG 11, SDG 12, SDG 13, SDG 15, and SDG 17 [1,3,66].

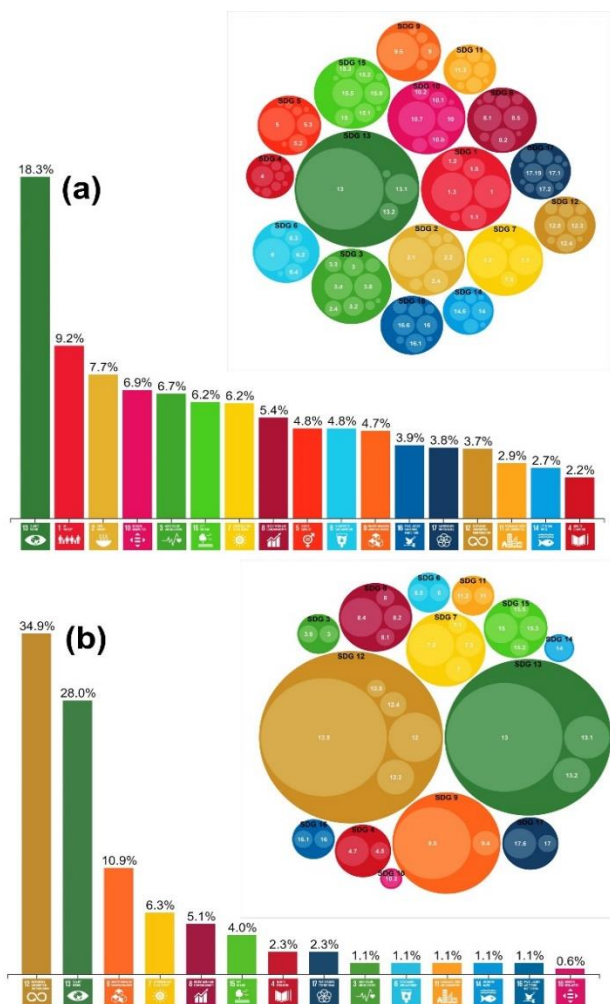


Fig. 7. (a) The work of the UN encompasses the delivery and strategies in numerous interconnected and transdisciplinary fields of materials science and technology, which establish the domains of sustainable materials. This SDG mapping has been carried out using the JRC SDG Mapper, developed by the Joint Research Centre of the European Commission [64]. (b) The delivery and strategies of the International Association of Advanced Materials (IAAM) define the domains of sustainable materials in multi-interdisciplinary areas of materials science and technologies. This SDG mapping has been conducted using the JRC SDG Mapper, developed by the Joint Research Centre of the European Commission [65].

Together, we can accelerate the adoption of sustainable materials, advanced global sustainability goals and create a world that thrives on responsible resource management and environmental stewardship. Nanotechnology, interdisciplinary collaborations, and international cooperation can accelerate progress toward a sustainable future. **Fig. 7(b)** and **Table 1** define the indicator numbers in order and SDGs targets, along with their descriptions [65]. Analysis with the JRC SDG Mapper shows that IAAM activities mostly focus on the top ten

SDG progress in SDG 12, SDG 13, SDG 9, SDG 7, SDG 8, SDG 15, SDG 4, SDG 17, SDG 3, SDG 6, respectively [65]. Below are the ten SDGs for which the most progress has been reported by IAAM:

- 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

Intriguingly, the IAAM's top five priorities—sustainable consumption and production, climate action, industry, and innovation, affordable and clean energy, and decent work and economic growth—all fall under the umbrella of the organization's "Advancement of Materials to Sustainable and Green World" agenda for the decade beginning in 2030 [3].

Table 1. Indicator numbers in order and SDGs targets, along with their details [65].

Indicator number and SDG	Target and indicator description
12.5.1,12,12.5	National recycling rate, tons of material recycled
9.5.1,9,9.5	Research and development expenditure as a proportion of GDP
9.5.2,9,9.5	Researchers (in full-time equivalent) per million inhabitants
7.2.1,7,7.2	Renewable energy shares in the total final energy consumption
13.1.1,13,13.1	Number of deaths, missing persons, and directly affected persons attributed to disasters per 100,000 population
13.1.2,13,13.1	Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework 2015-2030
13.1.3,13,13.1	The proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national strategies
8.4.1,8,8.4	Material footprint, material footprint per capita, and material footprint per GDP
8.4.2,8,8.4	Domestic material consumption, domestic material consumption per capita, and domestic material consumption per GDP
12.2.1,12,12.2	Material footprint, material footprint per capita, and material footprint per GDP
12.2.2,12,12.2	Domestic material consumption, domestic material consumption per capita, and domestic material consumption per GDP
13.2.1,13,13.2	Number of countries with nationally determined contributions, long-term strategies, and national adaptation plans
13.2.2,13,13.2	Total greenhouse gas emissions per year
4.7.1,4,4.7	The extent to which education for global citizenship, sustainable development, national education policies, and teacher training involved
17.6.1,17,17.6	Fixed Internet broadband subscriptions per 100 inhabitants, by speed
7.3.1,7,7.3	Energy intensity measured in terms of primary energy and GDP
8.2.1,8,8.2	Annual growth rate of real GDP per employed person
9.4.1,9,9.4	CO2 emission per unit of value added
12.4.1,12,12.4	Number of parties to international multilateral environmental agreements on hazardous waste, and other chemicals
12.4.2,12,12.4	Hazardous waste generated per capita and proportion of hazardous waste treatment
15.3.1,15,15.3	The proportion of land that is degraded over the total land area
3.9.1,3,3.9	Mortality rate attributed to household and ambient air pollution
3.9.2,3,3.9	Mortality rate attributed to unsafe water and lack of sanitation and hygiene
3.9.3,3,3.9	Mortality rate attributed to unintentional poisoning
4.5.1,4,4.5	Parity indices (female/male, rural/urban, bottom/top wealth quintile and others disability status, indigenous peoples, conflict-affected)
6.5.1,6,6.5	Degree in integrated water resources management
6.5.2,6,6.5	The proportion of transboundary basin area with an operational arrangement for water cooperation
7.1.1,7,7.1	The proportion of the population with access to electricity
7.1.2,7,7.1	The proportion of the population with primary reliance on clean fuels and technology
8.1.1,8,8.1	Annual growth rate of real GDP per capita
10.2.1,10,10.2	The proportion of people living below 50 percent of median income, by sex, age, and persons with disabilities
11.2.1,11,11.2	The proportion of the population that has convenient access to public transport, by sex, age, and persons with disabilities

12.8.1,12,12.8	The extent to which education for (i) global citizenship, SDGs (a) national policies, curricula, teacher and student assessment done
15.2.1,15,15.2	Progress toward sustainable forest management
15.5.1,15,15.5	Red List Index
16.1.1,16,16.1	Number of victims of intentional homicide per 100,000 population, by sex and age
16.1.2,16,16.1	Conflict-related deaths per 100,000 population, by sex, age, and cause
16.1.3,16,16.1	The proportion of the population subjected to (a) physical violence, (b) psychological violence, and (c) sexual violence in the previous 12 months
16.1.4,16,16.1	Proportion of population feels safe walking alone around the area they live

Responsible consumption and production: IAAM is focusing on Sustainable Development Goal 12, which emphasizes responsible consumption and production. Recognizing the importance of materials in advancing sustainable development, IAAM will facilitate an innovation activity aimed at deepening our understanding and fostering actionable insights in these areas. This activity will bring together industrial researchers, leaders, educators, policymakers, and practitioners to explore the intersection of materials science, natural conservation, and educational initiatives [3,36,66,67].

Climate action through carbon-neutral systems: IAAM believes that carbon-reducing sustainable heating systems are essential for understanding the future. IAAM leads a zero-carbon heating technology project with leading experts and industry pioneers. This project aims to explore a possible future where carbon-neutral heating is achieved using renewable energy and cutting-edge materials. In line with the emphasis of SDG 13 on climate action, IAAM has prioritized this topic for the next decade through research, innovation, and education [3,36,37,41].

Materials for sustainable and innovative solutions: Nanotechnology offers a granular level of control over matter, presenting an opportunity for sustainability research. Industry, innovation, and infrastructure are the focus of Goal No. 9. IAAM's consortiums and council provide a forum for academics, scientists, and business leaders to network, discuss advancements in the field, and collaborate on the development of game-changing technologies [3,36,37,41]. Nanomaterials, nanodevices, and nanosystems have the potential to enable sustainable solutions that increase energy efficiency, allow for cleaner production processes, and enhance healthcare delivery.

Affordable and clean energy: Ensuring universal access to affordable, reliable, and up-to-date energy services under a sustainable model can improve the environment. This goal can be achieved by increasing funding for research and development of clean energy sources such as renewables and energy efficiency measures, as well as by encouraging investments in these resources. SDG 7 focuses on providing access to reliable, low-cost, and renewable energy while improving the capacity of the energy sector to meet global demand. IRENA's World Energy Transitions Outlook

demonstrates that a climate-safe future is possible. By utilizing electrification, efficiency, renewables, hydrogen, and sustainable biomass, the 1.5°C pathway accelerates the global energy transition [68]. By the second half of this century, the energy sector must transition from fossil-based to zero-carbon sources to mitigate climate change and limit global warming to 1.5°C above pre-industrial levels [68]. Advanced computational setups with machine learning, data analytics, and cloud systems aid in clean energy data processing and monitoring. Integrating technology into energy research and innovation supports investment and policy decisions. Technology helps customers reduce costs, risks, and carbon emissions, while green technologies create renewable energy jobs [69]. IAAM's efforts in developing new aspects of innovation, management, energy sources, performance, societal behavior, and infrastructure have resulted in affordable and clean energy [3,36,37,69,70].

Materials circularity and economic growth: The SDG Knowledge Hub provides daily updates on the 2030 Agenda for Sustainable Development, including articles, blog posts, and event listings [71]. Government agencies can mandate recycled content and encourage raw material substitution by recycling plastics, synthetic fibers, paper, wood, and byproducts. Multilateral Environmental Agreements (MEAs), such as the Stockholm and Minamata Conventions, regulate global contaminants like persistent Organic Pollutants (POPs) and mercury [72]. The Strategic Approach to International Chemicals Management (SAICM) focuses on reducing and eliminating environmental risks, such as lead in paint, harmful chemicals, knowledge, and stakeholder engagement [72]. SAICM has published a report detailing actions and recommendations on circularity in the electronics sector in Central and Eastern Europe (CEE) [73]. Circular Economy for the Electronics Industry in Central and Eastern Europe evaluates current practices and suggests improvements for electronic product end-of-life waste. Roadmap to a circular economy in electronics considers product design, manufacturing phases, materials of concern, durability, repairability, recyclability, and reusability patterns [73]. Working toward economic growth in line with SDG 8 involves reducing unnecessary materials production.

Policy and climate pledges for a green world: IAAM urges the materials community to renew its commitment to excellence and sustainability to reconnect our transition to restoration. By prioritizing environmentally friendly practices, resource efficiency, and responsible material sourcing, we can create a green world where materials are designed, produced, and utilized sustainably. IAAM actively promotes and recognizes initiatives that demonstrate a strong dedication to environmental stewardship, circular economy principles, and social responsibility. Over the past decade, IAAM has made massive efforts in facilitating significant climate-neutral research for the end user. Together, we can harness the power of nanotechnology, foster interdisciplinary collaborations, and nurture international cooperation to accelerate progress toward a sustainable future. We invite you to join IAAM's policy, climate pledges, and specialized councils, and contribute your knowledge, insights, and passion toward shaping a sustainable world. To become a part of the most vibrant community of Advanced Materials researchers in the World membership is open on a digital portal [74]. Your contributions go a long way towards building the scientific community of tomorrow through donation [75]. Important events and news circulated through blogs [76] and newsletters. Overall, IAAM invites the materials community to participate in these transformative activities and contribute expertise, insights, and innovations to shape the sustainable future of our planet.

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