

NAM

S&T Newsletter



A Quarterly of the
Centre for Science and Technology of the Non-Aligned
and Other Developing Countries (NAM S&T Centre)

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FROM THE DG'S DESK

Warmest Greetings to all our Esteemed Readers!!



I am pleased to convey to you the unwavering commitment of the NAM S&T Centre to fostering *South-South Cooperation in Science and Technology* in spite of different financial and organisational challenges.

During the first quarter of 2024, the NAM S&T Centre successfully organized an International Workshop on *'Impacts of Climate Change on Small Island Developing States (SIDS)'* in partnership with the Indian Ocean Rim Association (IORA) Secretariat,

Mauritius; and the Scientific Committee on Problems of the Environment (SCOPE), Delft, the Netherlands during 28-29 February 2024. This Workshop held in Virtual-mode was aimed to facilitate exchange of knowledge and foster awareness on the challenges faced by the SIDS and attended by over 60 participants from 12 countries.

The Centre has published a Fact File on **"Plastic Pollution"**, which is the fourth in the series of Fact Files being brought out by the Centre from time to time aimed at disseminating information on topics of global concern, especially pertinent to the developing world.

I am delighted to announce that our Monograph titled *'Managed Groundwater Recharge and Rainwater Harvesting: Outlook from Developing Countries'* edited by Dr. Dipankar Saha (India), Dr. Karen G. Villholth (South Africa) and Dr. Mohamed Shamrukh (Qatar), published by Springer Nature, Singapore has been released in March 2024. The book showcases success stories, research outputs and policy initiatives concerning groundwater recharge and rainwater harvesting in developing countries.

His Excellency Mr. Yudhister Munbodh, President, NAM S&T Centre and Permanent Secretary, Ministry of Education, Tertiary Education, Science and Technology of Mauritius; and Dr. Xavier Poshiwa, Executive Dean of Gary Magadzire School of Agriculture and Engineering, Great Zimbabwe University, Masvingo, Zimbabwe visited the Centre in January this year, and had detailed discussion on various priority areas of the Centre's activities.

The Centre in collaboration with the National Institute for Scientific and Industrial Research, Lusaka, Zambia; and the Ministry of Technology and Science, Zambia will be organizing an International Consultative Meeting on *'Research & Development and Technology Transfer for Sustainable Agriculture and Food Security in Low-Income Countries'* during 8-9 May 2024 in Lusaka. The Centre will also be organizing an International Conference on *'Integrated Responses to the Intensification of Extreme Climate and Weather Events in Developing Economies'* in collaboration with the School for Climate Studies, University of Stellenbosch, South Africa; Alliance for Collaboration on Climate and Earth Systems Science, South Africa; and SCOPE during 22-24 May, 2024 in Stellenbosch, South Africa.

The Centre in partnership with the Great Zimbabwe University, Masvingo, Zimbabwe also announces the organization of an International Workshop on *"Agricultural Research and Innovation for Resilient Livelihoods in Drylands"* during June 27-28, 2024 in Masvingo, Zimbabwe.

We cordially invite the interested scientists and experts from various countries to attend these scientific events of the Centre.

We eagerly seek the continued support and cooperation from our Member Countries and other stakeholders in our future S&T activities.

Happy Reading!!


(Amitava Bandopadhyay)
Director General

Centre Organised

International Workshop on
Impacts of Climate Change on Small Island Developing States
Mauritius, 28-29 February 2024
[Virtual Mode]

Small Island Developing States (SIDS) are a distinct group of island states that face unique social, economic and environmental vulnerabilities. SIDS are particularly vulnerable to the impacts of climate change and they are increasingly being affected by extreme weather events such as severe tropical storms, cyclones and hurricanes, dramatic changes in rainfall pattern, rising sea levels and other weather-related phenomena including droughts and flooding. With all it entails - loss of biodiversity (mainly fisheries that contribute to over half of the GDP of SIDS), coral bleaching, reduced agricultural productivity and food security, human health impacts, damage to property and infrastructure, threat to marine resources and tourism that can easily cripple small economies of SIDS.

In view of the above, the Centre for Science and Technology of the Non-Aligned and Other Developing Countries (NAM S&T Centre), New Delhi in partnership with Indian Ocean Rim Association (IORA) Secretariat, Mauritius and the Scientific Committee on Problems of the Environment (SCOPE), Delft, the Netherlands organized an International Workshop on **"Impacts of Climate Change on Small Island Developing States"** during **28-29 February 2024** in **Virtual-mode**.

The Workshop aimed to facilitate the exchange of knowledge, scientific findings and case studies on the impacts of climate change on SIDS and create awareness to enhance understanding of the unique challenges faced by SIDS. It also aimed to encourage networking and foster collaboration among the participants to develop effective strategies and solutions for building climate resilient infrastructure in SIDS.

The overall Workshop proceedings conducted over two days were divided into an Opening Session, 5 Technical Sessions and a Closing Session. Under the technical sessions, 3 Keynote Lectures were delivered and 26 paper presentations were made relating to various aspects of the impacts of climate change on SIDS.

The Opening Ceremony started with a Welcome Address by **Ms. Zelda Vrolick**, Director, IORA Secretariat, Mauritius. She gave an overview of "ICC-SIDS" Workshop, explaining the background and objectives and about various topics to be covered.

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Opening Remarks were given by **H.E. Dr. Salman Al Farisi**, Secretary General, IORA, Mauritius. He emphasized that the impacts of climate change on SIDS are undeniably severe and multifaceted, not only imperiling the livelihoods of the people but also the very existence of the island nations. IORA is committed to tackle climate change and its impacts on SIDS through a number of its capacity building initiatives.

Remarks were then given by **Dr. Amitava Bandopadhyay**, Director General, NAM S&T Centre, New Delhi. He thanked H.E. Dr. Salman Al Farisi, Secretary General, IORA and the other team members from IORA and SCOPE for organizing this Joint Workshop. He further mentioned that the NAM S&T Centre and IORA are important inter-governmental organizations with a commonality of interest on working towards sustainable development of the countries in the Global South and the Small Island Developing States, and a long standing mechanism of collaborative relationship is encouraged between the two sides to meet their respective objectives.

An Address was given by **Dr. Jon Samseth**, President, SCOPE, Delft, the Netherlands. He briefly mentioned that SCOPE is a non-governmental organization with an objective to serve as a source of advice with respect to the emerging ecological and environmental issues.

The Inaugural Lecture on “The Global Framework for Climate Change and its Applications in Adaptation” was delivered by **Dr. Neville Swejid**, Director, Alliance for Collaboration on Climate & Earth Systems Science (ACCESS), CSIR, Cape Town, South Africa. He highlighted that nearly 90 percent of the Least Developing Countries (LDCs) and Small Island Developing States (SIDS) have identified early warning systems as a top priority in their nationally determined contributions on climate change.

There were five technical sessions under the themes: **Impacts of Climate Change on Small Island Developing States: An Overview; Impacts of Climate Change on Resources, Impacts of Climate Change on Resources, Infrastructure and Economy in SIDS; Impacts of Climate Change on Coastal Inundation and Sea Level Rise in SIDS; Carbon Capture and Carbon Storage Technologies and Impacts of Climate Change on Agriculture and Human Health.** Sessions I and II were chaired by Ms. Zelda Vrolick, Director, IORA Secretariat (Mauritius) and following three sessions by Prof. Dr. S. Suriyanarayanan, JSS Science and Technology University, Mysuru (India).

The three Keynote speakers during the workshop were **Dr. Someshwar Das** from the South Asian Meteorological Association (SAMA) and Former Adviser, Ministry of Earth Sciences, Govt. of India, New Delhi (India); **Dr. A.S. Unnikrishnan**, Chief Scientist (Retd.), CSIR-National Institute of Oceanography, Goa (India) and **Prof. Dr. K. Pakeerathan**, Department of Agricultural Biology, Faculty of Agriculture, University of Jaffna (Sri Lanka). The respective key note addresses delivered by them were “Impact of Climate Change on Extreme Weather Events in Small Island States Speculations, Uncertainty and Reality”; “Sea Level Rise, Extreme Events and Future of Small Islands” and “Impacts of Climate Change on Agriculture and Food Supply: Challenges and Sustainable Solutions.”

During five technical sessions, there were six presentations from India by **Dr. Naveen Nishant**, CSIR-Central Building Research Institute, Roorkee; **Dr. Barun Raychaudhuri**, Presidency University, Kolkata; **Dr. Kishore S. Kulkarni**, CSIR-Central Building Research Institute, Roorkee; **Ms. Neha Wachasunder**, CSIR-National Environmental Engineering Research Institute, Nagpur; **Dr. Sulagna Chattopadhyay**, LIGHTS, Bhikaji Cama Place, New Delhi and **Dr. Tarakanta Jana**, CSIR-National Institute of Science Communication and Policy Research. Their respective presentations were: “Critical Success Factors for Climate Resilience in Mauritius”; “The Potentials of Renewable Energy Harvesting in SIDS”; “Nature-based Solutions for Sustainable Built Infrastructure in the Indian Island”; “Review on Water Quality and Quantity Vulnerabilities in Small Islands Developing States due to Climate Change” and “Decades of Carbon Capture and Storage (CCS) Technology Research and Where Globe Stand Today?”.

From Malaysia, six presentations were on “Vulnerability Index for the SIDS: A Review”; “Climate Change, the Blue Economy and Sustainable Development Goals: Impact on Seaport Industry in Small Island Developing States: A Case Study of Maldives”; “Exploring the Role of Food Waste as a Confluence Factor in Sustainable Tourism Practices on SIDS: Advocating Policy Changes to Address Climate Change Impacts”; “Capacity Building of Island Community towards Sustainable Tourism Practices”; “Impacts of Climate Change on Water Resources in Kelantan, Malaysia: Challenges and Technological Adaptations” and “Analytical Prediction of Coastal Recession due to Sea Level Rise at Headland-Bay Beach”. The respective presenters were **Dr. Mohd Yusoff Ishak**, University Putra Malaysia, Selangor; **Prof. Dr. Mohamad Rosni Bin Othman**, National Defence University of Malaysia, Kuala Lumpur; **Dr. Siti Nur hayati Khairatun**, Faculty of Food Science and Technology, Universiti Putra Malaysia, Selangor; **Dr. Evelyn Lim Ai Lin**, Universiti Putra Malaysia, Selangor; **Dr. Mohamad Faiz Mohd Amin**, Universiti Malaysia Kelantan and **Dr. Mohd Shahrizal Bin Ab Razak**, University Putra Malaysia, Selangor.

Five technical papers from Mauritius were delivered by **Mr. Jacques Rudy Oh-Seng**, Ministry of Environment, Solid Waste Management and Climate Change; **Dr. (Ms.) Manta Devi Nowbuth**, Department of Civil Engineering, Faculty of Engineering, University of Mauritius, Reduit; **Dr. Preeya Vijayalakshmee Ramsamy Coolen**, University of Technology; **Dr. Toshima Makoondlall-Chadee**, School of Sustainable Development and Tourism, University of Technology and a joint paper was presented by **Dr. Jay Rovisham Singh Doorga**, **Dr. Olivier Pasnin** and **Yeshna Dindoyal**, Universite Des Mascareignes. Their respective presentations were titled “Finding Opportunities in Addressing the Challenges of Climate Change: The Case of Mauritius, A Small Island Developing State”; “Seawater Intrusion: A Growing Threat to Groundwater

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FACT FILE

Fact File: Plastic Pollution



Plastic pollution is a widespread problem affecting both the land and marine environment. It threatens our life on earth, ocean health, health of marine species, food safety and quality, human health, coastal tourism and also contributes to climate change.

The main sources of plastic debris found in the oceans are land-based, coming from single use plastics, personal care products, urban and agricultural waste, littering, inadequate waste disposal, industrial activities, construction and illegal dumping. Ocean-based plastic pollution originates primarily from the fishing and marine activities. Plastic pollution affects the habitats and natural ecosystem. Plastic debris ingested by marine species causes lacerations, infections, reduced ability to swim and internal injuries. Plastic also interferes with the body's endocrine system, causing developmental, reproductive, neurological and immune system disorders in humans. When plastic waste is incinerated, it releases carbon dioxide and methane into the atmosphere, increasing greenhouse gas emissions. Plastic waste also damages the aesthetic value of tourist destinations leading to decreased income from tourism.

Recognizing the paramount significance of this issue from both socio-economic and environmental perspectives, the NAM S&T Centre has published its fourth Fact File titled "Plastic Pollution". The Fact File has been conceptualized and edited by Dr. Ranadhir Mukhopadhyay, Former Chief Scientist, CSIR-National Institute of Oceanography, Goa, India and Prof. Dr. S. Suriyanarayanan, Associate Dean (Research), JSS Science and Technology University, Mysuru, India. The Centre has also received valuable comments and inputs from Dr. Mahua Saha, Principal Scientist, CSIR-National Institute of Oceanography, Goa, India. The document provides a comprehensive overview about plastic pollution; enormity and impacts of plastic pollution; regulatory frameworks and technological innovations towards mitigating plastic pollution in developing countries.

Document No. STT/FF/04/2024

PLASTIC POLLUTION
(A NAM S&T Centre Fact File for Dissemination of Information on Science, Technology and Innovation in NAM and Other Developing Countries)

FROM THE DG'S DESK

Warmest greetings to all our Esteemed Readers!

I am happy to present before you the fourth fact file being published by the NAM S&T Centre titled "Plastic Pollution". Plastic pollution is a widespread problem affecting both the land and marine environment. It threatens our life on earth, coastal tourism, health of marine species, food safety and quality, human health, coastal tourism and also contributes to climate change.

The main sources of plastic debris found in the oceans are land-based, coming from single use plastics, personal care products, urban and agricultural waste, littering, inadequate waste disposal, industrial activities, construction and illegal dumping. Ocean-based plastic pollution originates primarily from the fishing and marine activities. Plastic pollution affects the habitats and natural ecosystem. Plastic debris ingested by marine species causes lacerations, infections, reduced ability to swim and internal injuries. Plastic also interferes with the body's endocrine system, causing developmental, reproductive, neurological and immune system disorders in humans. When plastic waste is incinerated, it releases carbon dioxide and methane into the atmosphere, increasing greenhouse gas emissions. Plastic waste also damages the aesthetic value of tourist destinations leading to decreased income from tourism.

We are thankful to Ranadhir Mukhopadhyay, Former Chief Scientist, CSIR-National Institute of Oceanography, Goa, India and Prof. Dr. S. Suriyanarayanan, Associate Dean (Research), JSS Science and Technology University, Mysuru, India for editing this Fact File. We also appreciate our appreciation to Dr. Mahua Saha, Principal Scientist, CSIR-National Institute of Oceanography, Goa, India for her comments and inputs for editorial revisions.

(Continues from page 2)

Overview

Since its mass production began in the 1940s, plastic debris has become the most common type of pollution in the world. It is made from fossil fuels and is not biodegradable. Plastic pollution is a global problem that affects both the land and marine environment. It is made from fossil fuels and is not biodegradable. Plastic pollution is a global problem that affects both the land and marine environment. It is made from fossil fuels and is not biodegradable.

The Plastic Challenge

In addition to their major types of pollution creating havoc in the world (air, water, soil, light, and noise), plastic pollution is the most recent and most insidious. The accumulation of plastic debris and waste items (e.g. plastic bottles, bags, and containers) in the Earth's environment.

However, the problem arises when industries started to produce single-use, lightweight, inexpensive plastics. These single-use plastics (e.g. plastic bottles, water bottles, straws, bags, containers, etc.) are generating enormous garbage and contributing to an array of environmental problems. Owing to their long life

on the earth (between 400-1000 years), plastic has now become the most dangerous pollutant in nature (Fig. 1). Around eight per cent of world oil production goes to manufacturing plastics, and a similar amount is consumed as energy in the process. And with plastic use growing in volume by 12 million tons every year, plastic production is expected to reach 1.2 billion tons by 2050 (Fig. 1). Such production is expected to double by 2050. In addition, the production of plastics also emits a substantial amount of carbon dioxide and methane into the atmosphere, increasing greenhouse gas emissions. According to OECD, 1.4 billion plastic bottles are consumed every day.

A TON OF PLASTIC WASTE

Material	Volume (m³)	Weight (kg)
Plastic bottles	100	1000
Plastic bags	100	1000
Plastic containers	100	1000
Plastic debris	100	1000

Fig. 1. Production of Plastics and Generation of Plastic Waste

Chemicals added to plastics are absorbed by human bodies which causes hormonal imbalances thus leading to

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Resources in Small Basaltic Groundwater Bodies”; “Climate-Smart Transportation: The Case of Mauritius”; “An Evaluation of Coastal Vulnerability to Communities Affected by Rising Sea Levels: An Analysis of Northern Coastal Region of Mauritius Island” and “Impacts of Climate Change on Coastal Inundation: The Case Study of Rodrigues”.

Six papers from Sri Lanka were delivered by **Dr. Sewwandhi S.K. Chandrasekara**, Department of Agricultural Engineering, Faculty of Agriculture, University of Peradeniya; **Ms. Garusinghage Rashmitha Diwyanjalee**, Central Environment Authority, Southern Provincial Office, Galle; **Dr. G.P.W.A Prabhath**, Department of Science, National Institute of Education, Maharagam; **Mrs. Dinushika M. Yapa Abeywardhana**, Department of Sociology, Faculty of Arts, University of Peradeniya **Ms. S.P. Rebeira**, Food Research Unit, Department of Agriculture, Peradeniya and **Mrs. R.K.S.P.N. Ranaweera**, Department of Science, National Institute of Education, Maharagama. Their respective presentations were entitled: “Understanding the Teleconnection of Ocean-Atmospheric Oscillations and Extreme Rainfall: Mitigation Approach for Climate Change in Sri Lanka”; “Sri Lanka's Seagrass Beds: Understanding the Ecological Impacts on Coastal Biodiversity and Climate Resilience”; “Microalgae Culture: An Eco-Friendly Method for Carbon Capture”; “Intersection of Climate Change and Farming Practices in the Southern Dry Zone of Sri Lanka: A Sociological Analysis”; “Effects of Major Climatic Factors on Rice Grain Quality in Sri Lanka” and “Impact of Climate Change on Vector-borne Diseases, Especially on Dengue” .

Two technical papers from Iraq were on “Application of the IPCC Methodology in Estimating Greenhouse Gas Emissions Generated from the Transportation Sector in Baghdad” by **Dr. Basim Abdulsattar Hussain**, Ministry of Science & Technology, Baghdad, and “Effect of Global CO₂ Increase on Sea Level Rise in the Coastal Region of Iraq using Remote Sensing” by **Dr. Bassim Mohammed Hashim**, Ministry of Science & Technology, Baghdad.

One technical paper from Kenya on “Marine Spatial Plan as a Management Tool for Lake Victoria” was presented by **Mr. Samson Kidera**, State Department for Blue Economy & Fisheries, Ministry of Mining, Blue Economy & Maritime Affairs, Nairobi.

During the Closing session, it was concluded that the small nations are among the most vulnerable to the climate change impacts, which will become critical if no appropriate actions are taken in their support. Another growing concern is the increasing number and severity of extreme weather events with all they entail in terms of loss of life and damage to property and infrastructure that can easily cripple small economies. It is needed to ensure that proper action is taken to build the adaptive capacity of SID states to tackle the climate related risks through capacity building, technology transfer, financial support & investment and availability of other resources to build a more sustainable future.

Visit of His Excellency Mr. Youdhisteer Munbodh, President, NAM S&T Centre

At the invitation of the Director General, NAM S&T Centre, His Excellency Mr. Youdhisteer Munbodh, Permanent Secretary, Ministry of Education, Tertiary Education, Science and Technology of Mauritius; and the President of the 16th Governing Council (GC) of the NAM S&T Centre visited New Delhi, India during



January 15-16, 2024 for a Brain Storming Session and Review Meeting aimed at developing a comprehensive Plan for scientific activities to be taken up by the Centre during April 2024 - March 2026 as well as advising on policy, management and other matters regarding the working of the Centre.

The President started his programme with a visit to the NAM S&T Centre Secretariat on January 15, 2024 for a detailed discussion with Dr. Amitava Bandopadhyay, Director General in regard to various aspects of functioning of the Centre and its future S&T programmes. He also briefly addressed the Staff Members of the Centre.

At the outset, Dr. Bandopadhyay presented an overview of the NAM S&T Centre and its current S&T activities. He also briefed the President about how in the recent years, the Centre has been trying to align most of its activities with the UN Sustainable Development Goals – 2030. The planning of scientific activities of the Centre for 2024-26 was also discussed in details. Dr. Bandopadhyay also highlighted the recent publication projects of the Centre in collaboration with renowned International Publisher on S&T, Springer Nature, Singapore. In this context, he mentioned that the Centre has

already published 6 books/monographs through Springer Nature in the areas of *Lightning; Dryland Agriculture; Extreme Natural Events; Blue Economy; Science, Technology and Innovation Diplomacy;* and *Smart Agriculture*. In addition, publication of 5 more books are in process in the areas of *Groundwater Recharge & Rainwater Harvesting; Water Management & Sustainable Development; Emerging Trends in Leather Science & Technology; Severe Storms* and *Arsenic Remediation of Groundwater*.

During his remarks, the President appreciated the efforts of the NAM S&T Centre in terms of organising relevant and high quality scientific events as well as bringing out excellent publications. He also appreciated the Centre's efforts in aligning the activities in line with the UN Sustainable Development Goals – 2030. He further stated that Government of Mauritius is very keen in organising at least two International Workshops during their tenure of Presidentship - one event in Online Mode and one in Physical Mode on themes related to Blue Economy, Climate Change, Science Communication, Disruptive Technologies and any other topics which are of interest to the Member Countries of the NAM S&T Centre. He also emphasised the need to have more collaboration with the Member Countries including Mauritius in Blue Economy and related areas. Dr. Bandopadhyay suggested that the Centre will follow up with officials at his Ministry to plan out details including exact topics and time schedules for the upcoming events in collaboration with Mauritius.



Special Features

1. Industrial Development Report 2024: Turning Challenges into Sustainable Solutions

-The new Era of Industrial Policy (UNIDO Report Series)

In this complex and challenging world which is marked by resource scarcity, global warming and widening socio-economic disparities; disproportionately affect developing countries. Amidst these challenges, the world today is also marked by technological breakthroughs that offer unprecedented opportunities to accelerate inclusive and sustainable development.

The Industrial Development Report 2024 (IDR24) stresses the pivotal role of the industrial sector in delivering sustainable development solutions, given its strong impact on societal and environmental goals. Sustainable industrialization involves fighting climate change, accelerating economic growth, and generating millions of decent jobs, while harnessing cutting edge technologies. The report highlights that every manufacturing job creates 2.5 jobs, on average, in other sectors of the economy, with the manufacturing industry significantly contributing to green innovation compared to other sectors: 60 per cent of all green patents in the world are held by industrial firms. Accelerating sustainable industrial development is therefore crucial for achieving the Sustainable Development Goals (SDGs).

However, industrialization does not happen on its own. It requires investments, coordinated efforts and carefully designed policies. The industrial policies of the future cannot simply replicate those of the past. This report advocates for a new era of modern industrial policies with four important elements.

- First, modern industrial policies should align with the SDGs.
- Second, they should be future-ready and must consider the mega trends that are reshaping the world right from inception: the energy transition, the fourth industrial revolution, the re-balancing of global production and trade flows as well as demographic trends.
- Third, modern industrial policies should be collaborative. Governments cannot solve today's challenges on their own. Industry and business must jointly contribute to policy design and ensure effective implementation in the context of private sector development.
- Finally, such policies should be regionally coordinated to mitigate tensions and unlock the full potential for cooperation amongst neighbours.

The IDR24 introduces a new approach to comprehensively assess progress on sustainable industrialization. This approach takes several indicators into account. In addition to SDG 9 (industry, innovation and infrastructure), it considers SDG 7 (affordable and clean energy) and SDG 8 (decent work and economic growth) as well. The report analyses the latest available data from 2021. To assess the speed of progress, pre-COVID data from 2009-2019 was used, assuming that most industrial sectors have or will soon revert to pre-COVID trends. The results of the analysis are clear. Global progress towards industry related SDGs has been far too slow and has been further derailed by the COVID-19 pandemic. Urgent attention, specifically in developing countries, is required in three critical areas: **clean energy, decent jobs and innovation**.

In 2021, developing countries lagged behind innovation-related-targets for 2030 by 80 percentage points and pre-COVID progress was also disappointingly sluggish. Meeting the targets would have taken more than a century, as only 0.33 percentage points of the gap towards the goal was reduced annually. Thus, even with a return to pre-COVID-19 trends, achieving the targets is beyond reach at this pace. A similar picture emerges for employment and clean energy.

Assessing regional progress highlights that priority areas for investment and intervention differ across regions. This fact needs to be accounted for when designing future industrial policies. For example, 90 per cent of the population in developing countries, on average, had access to energy in 2021, compared to only 60 per cent in Africa. This highlights the urgent need to channel targeted investments on the African continent to energy access. Moreover, the fact that industrial sector performance in countries in Latin America and the Caribbean is decreasing, while the region was already approaching the 2030 targets, is particularly concerning. Now, the region is showing signs of premature de-industrialization, while developing countries were generally making progress in closing the gap on the industry-performance targets.

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Effective modern industrial policies alone are insufficient without an entirely new level of international cooperation and solidarity. This necessitates the transfer of expertise and technologies. It also calls for investments with the long-term vision of creating real structural change. The international community needs to commit to increased and sustainable financing, as well as to transforming the global financial system with a focus on fairness and developing countries' needs. Moreover, we need to invest more in our biggest asset, namely providing the world's youth with the skills they need to have a promising future.

<https://www.unido.org/sites/default/files/unido-publications/2023-11/IDR24>

2. State of the Global Climate 2023-A World Meteorological Organisation Report

Climate change indicators reached record levels in 2023

The State of the Global Climate report was released in time for World Meteorological Day on 23 March. Dozens of experts and partners contributed to the report, including UN organizations, National Meteorological and Hydrological Services (NMHSs) and Global Data and Analysis Centers, as well as Regional Climate Centres, the World Climate Research Programme (WCRP), the Global Atmosphere Watch (GAW), the Global Cryosphere Watch and Copernicus Climate Change Service operated by ECMWF.

The publication provides a summary on the state of the climate indicators in 2023 with sections on key climate indicators, extreme events and impacts. The indicators include global temperatures, greenhouse gas concentration, ocean heat content, sea level rise, ocean acidification, Arctic and Antarctic sea ice, Greenland ice sheet and glaciers and snow cover, precipitation and stratospheric ozone, with an analysis of major drivers of inter-annual climate variability during the year including the El Niño Southern Oscillation and other ocean and atmospheric indices. The highlighted extreme events include those related to tropical cyclones and wind storms; flooding, drought and extreme heat and cold events. The report also provides most recent finding on climate related risks and impacts including food security and population displacement.

Key messages from the report are :

- a) **Greenhouse gases:** Observed concentrations of the three main greenhouse gases – carbon dioxide, methane, and nitrous oxide – reached record levels in 2022. Real-time data from specific locations show a continued increase in 2023. CO₂ levels are 50 % higher than the pre-industrial era, trapping heat in the atmosphere. The long lifetime of CO₂ means that temperatures will continue to rise for many years to come.
- b) **Temperature:** The global mean near-surface temperature in 2023 was 1.45 ± 0.12 °C above the pre-industrial 1850–1900 average. 2023 was the warmest year in the 174-year observational record. The ten-year average 2014–2023 global temperature is 1.20 ± 0.12 °C above the 1850–1900 average. The long-term increase in global temperature is due to increased concentrations of greenhouse gases in the atmosphere. The shift from La Niña to El Niño conditions in the middle of 2023 contributed to the rapid rise in temperature from 2022 to 2023.
- c) **Ocean heat:** Ocean heat content reached its highest level in 2023, according to a consolidated analysis of data. Warming rates show a particularly strong increase in the past two decades. It is expected that warming will continue – a change which is irreversible on scales of hundreds to thousands of years. More frequent and intense marine heatwaves have profound negative repercussions for marine ecosystems and coral reefs. At the end of 2023, most of the global ocean between 20° S and 20° N has been in heatwave conditions since early November. Ocean acidification has increased as a result of absorbing carbon dioxide.
- d) **Sea level rise:** In 2023, global mean sea level reached a record high in the satellite record (since 1993), reflecting continued ocean warming (thermal expansion) as well as the melting of glaciers and ice sheets. The rate of global mean sea level rise in the past ten years (2014–2023) is more than twice the rate of sea level rise in the first decade of the satellite record (1993–2002).

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- e) **Cryosphere:** Antarctic sea-ice extent reached an absolute record low for the satellite era (since 1979) in February 2023 and remained at record low for the time of year from June till early November. Arctic sea-ice extent remained well below normal. Regarding Glaciers, the preliminary data for the hydrological year 2022-2023 indicate that the global set of reference glaciers suffered the largest loss of ice on record (1950-2023), driven by extremely negative mass balance in both western North America and Europe.

Glaciers in the European Alps experienced an extreme melt season.

- f) **Extreme weather and climate events:** Extreme weather and climate events had major socio-economic impacts on all inhabited continents. These included major floods, tropical cyclones, extreme heat and drought, and associated wildfires.
- g) **Socioeconomic impacts:** Weather and climate hazards exacerbated challenges with food security, population displacements and impacts on vulnerable populations. They continued to trigger new, prolonged, and secondary displacement and increased the vulnerability of many who were already uprooted by complex multi-causal situations of conflict and violence. One of the essential components for reducing the impact of disasters is to have effective multi-hazard early warning systems.

The Early Warnings for All initiative seeks to ensure that everyone is protected by early warning systems by the end of 2027. Development and implementation of local disaster risk reduction strategies have increased since the adoption of the Sendai Framework for Disaster Risk Reduction.

The report cites figures that the number of people who are acutely food insecure worldwide has more than doubled, from 149 million people before the COVID-19 pandemic to 333 million people in 2023 (in 78 monitored countries by the World Food Programme).

Protracted conflicts, economic downturns, and high food prices, further exacerbated by high costs of agricultural inputs driven by ongoing and widespread conflict around the world, are at the root of high global food insecurity levels. This is aggravated by the effects of climate and weather extremes.

There is, however, a glimmer of hope.

Renewable energy generation, primarily driven by the dynamic forces of solar radiation, wind and the water cycle, has surged to the forefront of climate action for its potential to achieve decarbonization targets. Worldwide, a substantial energy transition is already underway. In 2023, renewable capacity additions increased by almost 50% from 2022, for a total of 510 gigawatts (GW). Such growth marks the highest rate observed in the past two decades and indicates, demonstrates the potential to achieve the clean energy goal set at COP28 to triple renewable energy capacity globally to reach 11 000 GW by 2030.

- h) **Climate Financing:** There is a large financing gap. In an average scenario, for a 1.5°C pathway, annual climate finance investments need to grow by more than six times, reaching almost USD 9 trillion by 2030 and a further USD 10 trillion through to 2050.

The cost of inaction is even higher. Aggregating over the period 2025-2100, the total cost of inaction is estimated at USD 1,266 trillion. Adaptation finance continues to be insufficient. Though adaptation finance reached an all-time high of USD 63 billion in 2021/2022, the global adaptation financing gap is widening, falling well short of the estimated USD 212 billion per year needed up to 2030 in developing countries alone.

<https://library.wmo.int>
WMO-No. 1347, 2024

<https://wmo.int>
WMO-press release, March 19, 2024

Brief News

African birds of prey under threat

Dozens of species of African birds of prey are in steep decline, with many now considered at risk of extinction. These include secretary birds (*Sagittarius serpentorius*) the population of which dropped by 85 per cent over three generations.

New Scientist: page 19, January 13, 2024

New Antibiotic targets a drug resistant bacterium

Infections caused by drug resistant strains of bacterium *Acinetobacter baumannii* have been hard to treat in the clinic. A new class of antibiotics has been identified with the potential to tackle these microbes. The antibiotic called **Zosurabalpin** can kill *A. baumannii*

Nature 625: page 451, January 18, 2024

Eu New Zealand take on contaminants in cosmetics

The EU on January 29 provisionally agreed on a proposal to revise its Urban Water Treatment Directive, with a focus to enable removal of more nutrients and micropollutants from urban wastewater, particularly those coming from toxic cosmetics and pharmaceuticals. The new directive will protect human and environmental health and provide more access to clean water and sanitation services. For the first time, it will implement the polluter pays principle for water: the most polluting industries, cosmetics and pharmaceuticals, will be required to pay at least 80 per cent of the cost for micropollutants removal from urban wastewater. These chemicals can accumulate in the body and are associated with cancer.

Down To Earth: page 11, February 16-29, 2024

Genetically modified bananas approved for the first time

Regulators in Australia and New Zealand have given the go-ahead to a genetically modified strain of banana altered to be resistant to a fungal disease. It is for the first time a modified banana has been approved for growing on farms. The team led by James Dale at Queensland University of Technology, Australia created the Fusarium (TR4) resistant strain of Cavendish banana called QCAV-4 by adding a gene from wild banana. Countries where TR4 is more of a problem may decide to adopt the genetically modified banana.

New Scientist: page 924, February 2024

Smart Stickers check tumor growth and shows you in an app

A smart sticker that clips to skin can monitor the size of some tumors and send the information to an app, the set-up could lead to real-time continuous tracking of how well certain cancers respond to treatments. Hsing-Wen Sung at National TsigHua University focused on measuring the size of tumors that exist just under the skin. They built a wearable device as "smart, flexible sticker". Since the sticker rests atop the skin, the device wouldn't work for tumors deeper inside the body and will require further work to become universally useful.

New Scientist: page 15, February 3, 2024

The Great Barrier Reef Bleaching due to Global Heating

It is confirmed by the Marine Park Authority that The Great Barrier Reef in Australia has suffered its fifth mass coral bleaching event in eight years, linked to global heating. Aerial surveys by the authority and Australian Institute of Marine Science cover 300 reefs, revealing widespread bleaching across two-thirds of the reef. This 2300 km long reef system has faced repeated bleaching since 1998, reflecting record high ocean temperature globally.

Down to Earth: page 11, March 16-31, 2024

Air pollution may make it harder for pollinators to find flowers

Air pollution may blunt the signature scents of some night-blooming flowers, jeopardizing pollination.

Field and lab tests show that when the aroma of a pale evening primrose encounters certain pollutants in the night air, the pollutants destroy key scent molecules. As a result, moths and other nocturnal pollinators may find it difficult to detect the fragrance and navigate to the flowers as reported by researchers in the Feb. 9 *Science*. The finding highlights how air pollution can affect more than human health. It's really going deeper and ultimately affecting ecosystems and food security.

<https://www.sciencenews.org>, March 7, 2024

Bird Flu Detected in Polar Bears for first time

The death of a polar bear in Northern Alaska has shown that bird flu has made the jump into yet another mammal species. Highly pathogenic avian influenza –the bird flu has different strains of varying severity. It primarily affects birds, sometimes it spills over mammals populations. In Alaska, the polar bear is the fourth mammal known to have been infected following red foxes and a brown and a black bear. Exposure to the carcass of an infected bird (which are migratory) provides the risk for infection as the migratory birds carrying the H5N1 share the same habitat across the state.

BBC Wildlife page 12, March 2024

Science, Technology & Innovation News

NUCLEAR ENERGY

Scientists reached nuclear fusion 'ignition' for the first time

In December 2022, researchers at Lawrence Livermore National Laboratory in California created fusion reactions, in which the energy produced by the fusing of atomic nuclei exceeds that needed to kick the fusion off—a first. In the experiment, 192 lasers blasted a small chamber, setting off fusion reactions in which smaller atomic nuclei merge to form larger ones that released more energy than initially kicked them off. It's a milestone known as “ignition,” and it has been decades in the making.

Now, the details of that experiment have been released by researchers in papers published online February 5 in *Physical Review Letters* and *Physical Review E*. The feat demanded an extraordinary level of finesse, tweaking conditions *just so* to get more energy out of the lasers and create the ideal conditions for fusion. Scientists also discovered a long-predicted heating effect that could expose the physics of other violent environments, such as exploding stars called supernovas. The road to nuclear fusion's is a big break.

Fusion, the same process that takes place in the sun, is an appealing energy source. Fusion power plants wouldn't emit greenhouse gases. And unlike current nuclear fission power plants, which split atomic nuclei to produce energy, nuclear fusion plants wouldn't produce dangerous, long-lived radioactive waste. Ignition is the first step toward harnessing such power.

After all the adjustments, the ensuing fusion reactions yielded 3.15 million joules of energy about 1.5 times the input energy. Another experiment in July 2023 used a higher-quality diamond capsule and obtained an even larger energy gain of 1.9, meaning it released nearly twice as much energy as went into the reactions. In the future, NIF researchers hope to be able to increase the lasers energy from around 2 million joules up to 3 million, which could kick off fusion reactions with a gain as large as 10.

The researchers also discovered a long-predicted phenomenon that could be useful for future experiments: After the lasers heated the hohlraum, it was heated further by effects of the fusion reactions, physicist Mordy Rosen and colleagues reported in *Physical Review Letters*.

Following the implosion, the ignited fuel expanded outward, plowing into the remnants of the diamond shell. That heated the material, which then radiated its heat to the hohlraum. “This is exactly the collision that's happening in this hohlraum,” says Rosen, of LLNL, a coauthor of the study. In addition to explaining supernovas, the effect could help scientists study the physics of nuclear weapons and other extreme situations. After decades of slow progress on fusion, scientists are beginning to get their atomic orchestras in sync.

<https://www.sciencenews.org>, February 16, 2024

TECHNOLOGY / HEALTH

A new sensor detects harmful “forever chemicals” in drinking water.

The technology could offer a cheap, fast way to test for PFAS, which have been linked to cancer and other health problems.

Massachusetts Institute of Technology (MIT) chemists have designed a sensor that detects tiny quantities of perfluoroalkyl and polyfluoroalkyl substances (PFAS) chemicals found in food packaging, nonstick cookware, and many other consumer products. These compounds, also known as “forever chemicals” because they do not break down naturally, have been linked to a variety of harmful health effects, including cancer, reproductive problems, and disruption of the immune and endocrine systems.

Using the new sensor technology, the researchers showed that they could detect PFAS levels as low as 200 parts per trillion in a water sample. The device they designed could offer a way for consumers to test their drinking water, and it could also be useful in industries that rely heavily on PFAS chemicals, including the manufacture of semiconductors and fire fighting equipment.

“There's a real need for these sensing technologies. We're stuck with these chemicals for a long time, so we need to be able to detect them and get rid of them,” says Timothy Swager, the John D. MacArthur Professor of Chemistry at MIT and the senior author of the study, which appears in the *Proceedings of the National Academy of Sciences*. Other authors of the paper are former MIT postdoc and lead author Sohyun Park and MIT graduate student Collette Gordon. Coatings containing PFAS chemicals are used in thousands of consumer products. In addition to nonstick coatings for cookware, they are also commonly used in water-repellent clothing, stain-resistant fabrics, grease-resistant pizza boxes, cosmetics, and fire fighting foams. These fluorinated chemicals, which have been in widespread use since the 1950s, can be released into water, air, and soil, from factories, sewage treatment plants, and landfills. They have been found in drinking water sources in all 50 states.

To create a cheaper and faster way to test for PFAS, the MIT team designed a sensor based on lateral flow technology—the same approach used for rapid Covid-19 tests and pregnancy tests. Instead of a test strip coated with antibodies, the new sensor is embedded with a special polymer known as polyaniline, which can switch between semiconducting and conducting states when protons are added to the material. The researchers deposited these polymers onto a strip of nitrocellulose paper and coated them with a surfactant that can pull fluorocarbons such as PFAS out of a drop of water placed on the strip. When this happens, protons from the PFAS are drawn into the polyaniline and turn it into a conductor, reducing the electrical resistance of the material. This change in resistance, which can be measured precisely using electrodes and sent to an external device such as a smartphone, gives a quantitative measurement of how much PFAS is present. This approach works only with PFAS that are acidic, which includes two of the most harmful PFAS—PFOA and perfluorobutanoic acid (PFBA).

Such a device could offer a less expensive, rapid alternative to current PFAS detection methods. If PFAS are detected in drinking water, there are commercially available filters that can be used on household drinking water to reduce those levels. The new

(Contd. on page 10)

(Contd. from Page 9 - STI News)

testing approach could also be useful for factories that manufacture products with PFAS chemicals, so they could test whether the water used in their manufacturing process is safe to release into the environment.

<https://news.mit.edu>, March 11, 2024

CLIMATE AND ENVIRONMENT

Effects of Climate Change to Migratory Species

Migratory species globally are facing critical challenges, with nearly half in decline and over 20 per cent threatened with extinction, a landmark UN report has pointed out. Of most concern is the threat to migratory fishes, with 97 per cent of the species on the brink of extinction.

The two greatest threats to all migratory species are overexploitation and habitat loss due to human activity, according to the first-ever 'State of the Worlds Migratory Species report' released on 12 February 2024.

Amy Fraenkel, head of the Convention on the Conservation of Migratory Species of Wild Animals (CMS) secretariat, highlighted the importance of specific habitats. "They regularly travel, sometimes thousands of miles, to reach these places. They face enormous challenges and threats along the way, as well at their destinations where they breed or feed," she said.

The report also emphasized the impact of climate change, not only as a direct threat, but also an "amplifier" of other threats, such as pollution and invasive species. The impacts of climate change on biodiversity are expected to rise considerably in the coming decades, the report noted, explaining that changing temperatures can cause migratory species to arrive too early, too late or not at all. Furthermore, higher temperatures can skew sex ratios, such as for sea turtles, where sex determination is dependent on temperature.

It can also reduce foraging time such as for African Wild Dogs, which forage less in extreme heat and have fewer pups in warmer temperatures as compared to cooler times.

While highlighting the concerning situation of many species, the report also shows that population and species-wide recoveries are possible, provided there is strong coordinated action at all levels. Success stories include a bounce back for bird populations in Cyprus due to concerted local action to outlaw illegal bird netting, and integrated conservation and restoration work in Kazakhstan, which brought the Saiga Antelope back from the verge of extinction.

The report highlighted a clear call to action, providing a set of priority recommendations. These include strengthening and expanding efforts to tackle illegal and unsustainable taking of migratory species; increasing actions to identify, protect and better manage important sites for migratory species; and tackling light, noise, chemical and plastic pollution.

<https://news.un.org/en>, February 12, 2024

BIOTECHNOLOGY

Unveiling Inaoside A: An antioxidant derived from mushrooms

*Researchers discover a new antioxidant compound Inaoside A in the edible mushroom, *Laetiporus cremeiporus**

Natural products have unique chemical structures and biological activities and can play a pivotal role in advancing pharmaceutical science. In a pioneering study, researchers discovered Inaoside A, an antioxidant derived from *Laetiporus cremeiporus* mushrooms. This breakthrough sheds light on the potential of mushrooms as a source of therapeutic bioactive compounds.

In a ground breaking study, researchers led by Assistant Professor, Atsushi Kawamura from the Department of Biomolecular Innovation, Institute for Biomedical Sciences, Shinshu University, along with other researchers recently discovered the antioxidant compound derived from *L. cremeiporus*. The researchers collected fresh fruiting bodies of *L. cremeiporus* from the Ina campus of Shinshu University. The obtained extracts were concentrated and partitioned between water and ethyl acetate. After this, the extracts were subjected to advanced chromatographic techniques, which led to the successful isolation of Inaoside A, a new antioxidant phenolic compound, along with three other well-characterized bioactive compounds, i.e., 5'-S-methyl-5'-thioadenosine (MTA), nicotinamide, and adenosine. They reported their findings in an article that was made available online on 20 January 2024 and subsequently published in the journal *Heliyon*.

"Our study marks the pioneering discovery of Inaoside A from an extract of the edible mushroom *Laetiporus cremeiporus*. To date, there has been only one prior report on the biological function of an extract of *L. cremeiporus*. We are the first to uncover the isolation of an antioxidant compound from *L. cremeiporus*," states Professor Kawamura, highlighting the breakthrough research. He reveals, "We are now focusing on investigating the chemical compositions and biological properties of natural compounds obtained from mushrooms. Our goal is to uncover the potential of edible mushrooms as functional foods through this discovery."

The identification of Inaoside A as an antioxidant from *Laetiporus cremeiporus* marks a significant breakthrough in natural product research, highlighting the potential of mushrooms as a source of therapeutic bioactive compounds. These findings may lead to the development of novel antioxidant-based therapies for various health conditions. Further studies should focus on synthetic research and detailed investigations into the biological activity of Inaoside A, aiming to harness its potential as a pharmaceutical lead compound.

<https://www.sciencedaily.com>, March 11, 2024

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AGRICULTURE

Researchers uncover a key link in legume plant-bacteria symbiosis

Legume plants have the unique ability to interact with nitrogen-fixing bacteria in the soil, known as rhizobia. Legumes and rhizobia engage in symbiotic relations upon nitrogen starvation, allowing the plant to thrive without the need for externally supplied nitrogen.

Symbiotic nodules are formed on the root of the plant, which are readily colonized by nitrogen-fixing bacteria. The cell-surface receptor SYMRK (symbiosis receptor-like kinase) is responsible for mediating the symbiotic signal from rhizobia perception to formation of the nodule. The activation mechanism of the receptor was until recently unknown.

In the study, published in *Proceedings of the National Academy of Sciences*, researchers have identified four essential phosphorylation sites that act as the catalyst for the symbiotic relationship between legume plants and nitrogen-fixing bacteria. The initial steps of the symbiotic pathway at the cell surface are well characterized; however, understanding of how the signal is relayed downstream has eluded the research field for years. The discovery of these essential phosphorylation sites is an important step towards translating the ability to form symbiotic relations with nitrogen-fixing bacteria into crop plants.

"We knew that the receptor and its activity is essential for the establishment of symbiosis, but we didn't know how or why. Phosphorylation is a common mechanism for regulating kinase activity, so we theorized that SYMRK function was tied to specific phosphorylations," Nikolaj Abel explains. Through collaborations with the lab of Ole Nørregaard Jensen at the University of Southern Denmark, several phosphorylation sites were identified in distinct regions of the SYMRK kinase. The researchers were able to narrow down the essential sites by depleting or mimicking phosphorylations in vivo. Specifically, four sites in the N-terminal region of SYMRK gave strong phenotypes when mutated.

"We explore the impact of site-specific mutations by creating receptor variants and reintroducing them into plants lacking the functional SYMRK receptor. Observing either spontaneous nodulation without rhizobia or the absence of nodulation despite their presence indicates that we've targeted an element crucial to the symbiotic pathway," Abel says.

To understand where the identified phosphorylation sites were situated on the SYMRK kinase, the researchers determined the structure of the intracellular domain of SYMRK. Researchers needed to be able to map the phosphorylation sites onto a structural model of the SYMRK kinase to truly understand how these phosphorylation sites enable downstream signaling. They identified a structurally conserved motif in the N-terminal alpha-helical region which they termed 'the alpha-I motif.' This region contains the four conserved phosphorylation sites.

The long-term goal is to enable root nodule symbiosis in important crops like barley, maize and rice. With the successful identification of phosphorylation sites crucial to initiating the nodulation program in legume plants, the researchers believe this new found knowledge holds promising implications for translating nitrogen-fixing traits into crops.

<https://phys.org>, February 12, 2024

Mixing up root microbes can boost tea's flavour

Dosing dirt with nitrogen-metabolizing bacteria boosted synthesis of a taste-enhancing amino acid.

The quality of a cup of tea can be enriched by modifying the microbial community that populates the plant's roots, researchers report February 15 in *Current Biology*. The secret is to inoculate roots with bacteria that boost the synthesis of the amino acid theanine, the chemical that help us to sleep.

Zhenbiao Yang, a plant cell biologist at the Shenzhen Institute of Advanced Technology in China and colleagues analyzed the microbial communities inhabiting the roots of two oolong tea plant varieties: a sweet, low-theanine cultivar called maoxie and a cinnamon, high-theanine variety called rougui. On the rougui roots, they found more microbes that metabolize nitrogen, a nutrient tea plants convert into theanine.

The researchers then isolated 21 bacterial strains from rougui roots to concoct an experimental microbial medley, which they called SynCom. They disinfected the roots of seedlings of several tea plant varieties, grew them in sterilized vermiculite soil for a few weeks, and then inoculated soils with live or dead SynCom. They also added a nutrient solution that was either low or high in nitrogen.

After 20 days, Yang's team found that the addition of live SynCom boosted theanine levels in each of the varieties. The effect was especially pronounced under the lower nitrogen conditions — leaves of maoxie plants inoculated with living SynCom contained almost 0.007 milligrams per gram of theanine, 0.005 mg/g higher than maoxie inoculated with dead SynCom.

The next step will be to refine SynCom to facilitate its production and distribution, Yang says. "If we have only like one or two [strains], it will be really easy."

<https://www.sciencenews.org>, February 15, 2024

JOINT NAM S&T CENTRE- ZMT BREMEN (GERMANY) FELLOWSHIP PROGRAMME - 2024

The Joint NAM S&T Centre– ZMT Bremen Fellowship programme was initiated in the year 2008 for providing opportunities to the scientists from the developing countries to affiliate themselves with the Leibniz Centre for Tropical Marine Research (Leibniz- Zentrum für Marine Tropenforschung- ZMT), Bremen, Germany [www.leibniz-zmt.de] in order to upgrade their research skills, conduct joint research in Ecology, Biogeochemistry, Modelling and Tropical Coastal Marine Systems and undertake short-term Joint Research Projects with senior researchers and faculty members at ZMT, Bremen for a period of up to 3 months. Research proposals in the area of Blue Economy were highly encouraged to strengthen research on solutions.

The response to the fellowship scheme for the year 2024 was fairly good with an ample number of applications received by the Centre. Out of these, following four candidates are being sponsored by the NAM S&T Centre under the Joint NAM S&T Centre – ZMT, Bremen fellowship programme on '**Blue Economy in Tropical Coastal Marine Research**' for the year 2024 to carry out their research work at Tropical Coastal Marine Research (ZMT), Bremen, Germany for a period of up to 3 months.

Ms. Merlyn Maria Antony, Ph.D. Scholar at Dr. B.R. Ambedkar University, Kashmere Gate, Delhi, India, will carry out her research work on the proposal titled 'Socio-ecological Linkages of Marine Fishing in the Andaman Islands' under the supervision of Dr. Michael Kriegl, WG Resource Management and WG Institutional & Behavioural Economics, Leibniz Centre for Tropical Marine Research (ZMT), Bremen.



Dr. Wee Kim Shan, Assistant Professor at the School of Environmental and Geographical Sciences, University of Nottingham, Malaysia, will carry out her research work on the topic 'Environmental DNA as a Tool to Track Functional Recovery of Mangroves' under the supervision and guidance of Dr. Véronique Helfer, Senior Scientist/Mangrove Ecology, Leibniz Centre for Tropical Marine Research (ZMT), Bremen.



Dr. Amila Sandaruwan Ratnayake, Dean, Faculty of Applied Sciences at Uva Wellassa University, Sri Lanka, will carry out his research studies on the topic 'Blue Carbon Storage Capacity in Tropical Mangrove Wetlands, Southwest Coast of Sri Lanka' under the supervision and guidance of PD Dr. Tim Jennerjahn, WGL Leader, Ecological Biogeochemistry, Editor-in-Chief Estuarine, Coastal and Shelf Science, Leibniz Centre for Tropical Marine Research (ZMT), Bremen.



Dr. W J Arachchillage Banukie Nirosha Jayasuriya, Senior Lecturer, Department of Pharmacy and Pharmaceutical Sciences, Faculty of Allied Health Sciences, University of Sri Jayewardenepura, Sri Lanka, will carry out his research studies on 'Isolation and Characterization of Medicinally Important Secondary Metabolites from Upsides-down Jellyfish (*Cassiopea andromeda* Forsskål)' under the supervision and guidance of Dr. Andreas Kunzmann, Head WG Experimental Aquaculture, Leibniz Centre for Tropical Marine Research (ZMT), Bremen.



Visitors to the NAM S&T Centre



Dr. Xavier Poshiwa visited the NAM S&T Centre from 26 January to 8 February 2024. During his visit, Dr. Xavier Poshiwa held meetings with the Director General of the NAM S&T Centre, Dr. Amitava Bandopadhyay and also interacted with S&T staff of the Centre. The discussion held with Dr. Bandopadhyay was on the book "*Leveraging Innovations for Infrastructure Development and Sustainable Industrialization*" in which Dr. Poshiwa is working as the corresponding editor. The Centre entrusted with Dr. Poshiwa a major responsibility of reviewing 8-10 chapters for the book in order to ensure that the book is published in the third quarter of 2024. There were discussions held on co-hosting the International conference on "*Agricultural Research and Innovation for Resilient Livelihoods in Drylands*" to be held at Great Zimbabwe University (GZU) from the 26th to 28th of June 2024. During the meeting, modalities and responsibilities between the GZU and the NAM S&T Centre for the workshop were discussed in detail.

Dr. Poshiwa also made a presentation particularly about GZU's work at the Innovation Centre for Dryland Agriculture (ICEDA) to NAM S&T Centre staff members. A very fruitful discussion ensued after the presentation where useful ideas were proffered for the benefit of GZU ICEDA. Dr. Poshiwa gave a commitment to work with the NAM S&T Centre on a fact file by working with staff members from Gary Magadzire School of Agriculture and Engineering. The advantage of producing fact files is that it will be read by a wider audience since it will be circulated by the Centre to its Member Countries. There were agreements made on a joint publication by the NAM S&T Centre and the GZU.

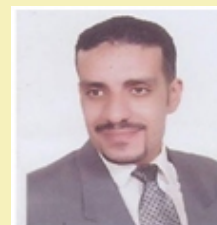
The NAM S&T Centre also organized Dr. Poshiwa's visits to Central Research Institute of Dryland Agriculture (CRIDA) in Hyderabad and JSS College of Pharmacy (Academy of Higher education and Research) in Mysuru. Dr. Poshiwa interacted with Scientists in dryland agriculture, climate change specialists and engineers of agricultural tools and equipment at CRIDA and scientists specializing in ethnobotany in Mysuru. Based on all the interactions and visits to specialized laboratories in Mysuru, he recommended to Great Zimbabwe University to make use of the NAM S&T Centre's networks to facilitate linkage with CRIDA and JSS College of Pharmacy to enable strengthening GZU's research and innovation activities at ICEDA in Chivi. JSS College of Pharmacy is also critical to GZU to strengthen the herbal medicine research and commercialization of products from Simon Mazorodze School of Medical and Health Sciences.

Joint NAM S&T Centre – JSS AHER, Mysuru, India Fellowship Programme - 2024

In pursuance of its objectives to promote South-South Cooperation in Science and Technology and to achieve Sustainable Development Goals, NAM S&T Centre had initiated yet another Fellowship Programme, titled “**Joint NAM S&T Centre – JSS AHER, Mysuru, India Fellowship Programme**” in partnership with the JSS Academy of Higher Education & Research (JSS AHER), Mysuru, Karnataka, India in 2022 to carry out research work in the areas of Science, Technology, Engineering and Medicine including other areas of expertise available at JSS AHER such as: Indian System of Medicine, and Medicinal and Herbal Plants for the year 2023 at the affiliated institutes of JSS AHER for a period of up to six weeks. This year, proposals in the areas such as Pharmaceutical Sciences; Drug Discovery and Molecular Simulation; Maternal and Child Health; Molecular Genetics; Preclinical Studies; Bioinformatics; Gut Microbiome Studies; Cancer Biology; Neurobiology; Protein Engineering; Analytical Chemistry and Materials Science were preferred.

The response to the Fellowship Programme was fairly good in terms of number of applications received by the Centre. Out of these, following five candidates are being sponsored by the NAM S&T Centre under the Joint NAM S&T Centre – JSS AHER, Mysuru, India Fellowship Scheme to carry out research work for the year 2024 at the affiliated institutes of JSS AHER for a period of up to six weeks.

Dr. Moursi Hosni Ali Abubieh, Researcher at Photochemistry Department, National Research Center, Cairo, Egypt will carry out his research work on 'Preparation, identification, and characterization of different types of laboratory prepared based doped TiO₂ photocatalysts' under the supervision and guidance of Dr. Gowthamarajan K, Professor & Head, Department of Pharmaceutics, JSS College of Pharmacy, Ooty, India.



Dr. Abdi Wira Septama, Senior Researcher at the National Research and Innovation Agency (BRIN), Indonesia will carry out his research on the topic 'Evaluation of Anti-Quorum Sensing Activity of Flavonoid Artocarpin through Inhibition of the N- Acyl-Homoserine Lactone (AHL) System in *Pseudomonas aeruginosa* and *Chromobacterium violaceum*' under the supervision of Dr. Archer Ann Catherine, Assistant Professor, Department of Microbiology, JSS AHER, Mysuru, India.



Dr. Ainaa Nadiyah Binti Abd Halim, Lecturer at the Universiti Malaysia Sarawak, Malaysia will carry out her research work on 'Construction of Potential Anticancer or Antimicrobial Drugs and the Investigation of Structure-Activity Relationships (SAR) using Advanced Computational Techniques; under the supervision and guidance of Dr. B. R. Prashantha Kumar, Associate Professor, Department of Pharmaceutical Chemistry, JSS College of Pharmacy, Mysuru, India.



Dr. Deegendra Khadka, Senior Scientific Officer at the Nepal Academy of Science and Technology (NAST), Nepal will carry out his research work titled 'Discovery of a Potent Protein Tyrosine Phosphatase 1B (Anti diabetic and Anti obesity) Inhibitor from the Medicinal of Nepal' under the supervision and guidance of Dr. M.V.S.S.T. Subba Rao, Professor, Department of Biochemistry, JSS Medical College, Mysuru, India.



Dr. Gavini Dilkhushi Liyanaarachchi, Research Scientist at the Industrial Technological Institute, Sri Lanka will carry out her research on the topic 'Immuno Modulatory Properties of Therapeutic Targets for the Development of Pharmaceuticals' under the supervision and guidance of Dr. Vikas Jain, Associate Professor, Department of Pharmaceutics, JSS College of Pharmacy, Mysuru, India.



Meetings and Visits of Director General, NAM S&T Centre

Meeting with the Vice Chancellor, Nepal Academy of Science and Technology (NAST), Lalitpur, Nepal

Dr. Amitava Bandopadhyay, Director General, NAM S&T Centre met Prof. Dr. Dilip Subba, Vice Chancellor, Nepal Academy of Science and Technology (NAST), Lalitpur, Nepal; Dr. Rabindra Prasad Dhakal, Secretary, NAST and other senior colleagues in the office of the Vice Chancellor on 26th March 2024 and had wide ranging discussion to explore scientific collaboration between NAST and NAM S&T Centre in the near future.



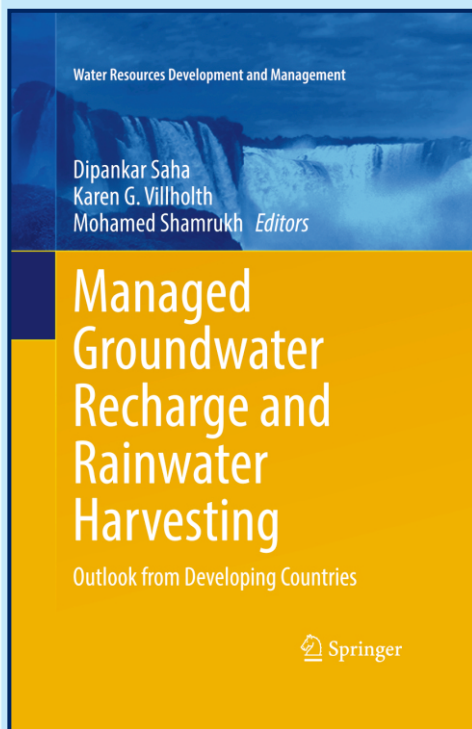
Prof. Subba in principle agreed to organise an International Workshop jointly between NAST and NAM S&T Centre sometime during March/April 2025 in Kathmandu. The exact date and topic will be finalised through mutual consultation. In addition, Prof. Subba also agreed to explore possibility of joint publications including bringing out “Fact Files” in areas of expertise of NAST.

Dr. Bandopadhyay also shared with Prof. Subba about the books and monographs being published by the NAM S&T Centre through Springer Nature, Singapore.



New Publication

MANAGED GROUNDWATER RECHARGE AND RAINWATER HARVESTING: OUTLOOK FROM DEVELOPING COUNTRIES



Water is a crucial resource for the survival of mankind and the nature. The World Economic Forum has already identified water crises amongst the top five global challenges. Considering groundwater, it is a critical natural resource for efficient and cost-effective supply of domestic, agricultural and industrial water in both urban and rural areas. However, gradually over-exploitation of groundwater resources is a global phenomenon, particularly in the arid and semi-arid areas. Thus sustainable management of freshwater resources is a global issue and is of growing concern in both policy and practice levels. Artificial recharge to groundwater by increasing the natural supply of groundwater has emerged as a vital management approach.

Keeping in view the above issues, the Centre for Science and Technology of the Non-Aligned and Other Developing Countries (NAM S&T Centre), New Delhi has gone ahead to bring out the Monograph - **Managed Groundwater Recharge and Rainwater Harvesting: Outlook from Developing Countries** with an aim to highlight the efforts being undertaken in developing countries to address water resource sustainability and climate change resilience through traditional and innovative groundwater recharge, rainwater harvesting, and water storage methods.

The book through its nineteen chapters is a testimony to the benefits accrued to a multitude of stakeholders engaged in managed groundwater recharge and rainwater harvesting, through real-life cases from varied terrain, geology, land use and water use profiles. The volume encompasses contributions made by fifteen developing countries spanning across the globe.

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Centre Announces

International Workshop on AGRICULTURAL RESEARCH AND INNOVATION FOR RESILIENT LIVELIHOODS IN DRYLANDS

June 27-28, 2024
Masvingo, Zimbabwe

Agricultural research and innovation play pivotal roles in fostering resilient livelihoods, particularly in regions characterized by drylands. Drylands constitute 40% of the world's land area, are home to approximately 2 billion individuals and encompass 44% of the world's cultivated systems, supporting a diverse array of ecosystems, biodiversity, cultures and livelihoods. However, despite this scenario, drylands are faced with a complex combination of climatic and anthropogenic challenges, which if left unaddressed may cause poverty, food insecurity, malnutrition, frequent droughts and environmental degradation. As the world strides into the epoch of the fourth industrial revolution, defined by innovation and cutting-edge industrial advancements, it becomes imperative not to exclude agricultural systems in drylands from this transformative drive. Drylands should become citadels of innovations and industrialisation activities that feed the globe rather than becoming fortresses of hunger and poverty or the chief recipient of aid. With appropriate investment in education, innovation, research and development, which embraces indigenous systems, drylands can feed the globe and provide adequate resources for industrialisation.

In this context, the Centre for Science & Technology of the Non-Aligned and Other Developing Countries (NAM S&T Centre) in partnership with the Great Zimbabwe University (GZU), Masvingo, Zimbabwe will be organizing an International Workshop on “**Agricultural Research and Innovation for Resilient Livelihoods in Drylands**” during **June 27-28, 2024 in Masvingo, Zimbabwe** to facilitate knowledge-sharing among various scientists, researchers, development practitioners, research institutions, academia, civil society organizations, policymakers and other stakeholders to drive forward-thinking research agendas, facilitate technology transfer and promote inclusive innovation ecosystems tailored to the unique needs of dryland communities.

The Workshop will be hosted and organized by GZU in Masvingo, Zimbabwe.

Scientists and experts desirous of participating in the Workshop from the Member Countries of the NAM S&T Centre should send their applications to the NAM S&T Centre at namstcentre@gmail.com.

Applicants from Zimbabwe should, however, submit their requests directly to the Executive Dean, Gary Magadzire School of Agriculture and Engineering, Great Zimbabwe University (GZU), Zimbabwe at drylandagriculture@gzu.ac.zw.

**More details about the Workshop are available at NAM S&T Centre's Official
Website: www.namstct.org.**

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