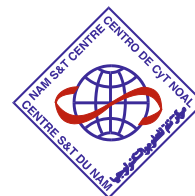


NAM

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 Readers!!



With the goodwill and support of the Focal Points of the NAM S&T Centre and from the scientific communities in its Member Countries, the Centre over the years, has taken several important initiatives on the promotion of South-South Cooperation in Science and Technology and has been continuing to assist the NAM and other developing countries for their collective self reliance.

During the second quarter of the year, the NAM S&T Centre has successfully organized an International Training Programme on 'STI Policy Making for Socio-economic Development in the Global South-2023' in collaboration with the International Science, Technology and Innovation Centre for South-South Cooperation (ISTIC) under the Auspices of UNESCO, Kuala Lumpur, Malaysia during 6-8 June 2023 in Kuala Lumpur, Malaysia. The Training Programme was attended by 37 scientists, researchers, academicians, policymakers and other professionals from 13 NAM and other developing countries. The programme provided opportunities for the participants to meet, interact, gain and share knowledge with other experts and professionals from different parts of the world.

The Centre has sponsored five scientists from its Member Countries under the **Joint NAM S&T Centre-JSS AHER, Mysuru Fellowship Programme** for the year 2023 for their affiliation with the institutes under the JSS Academy of Higher Education and Research (JSSAHER), Mysuru, India to carry out research work in the areas of Science, Technology, Engineering and Medicine for a period of up to six weeks.

The NAM S&T Centre, in partnership with the Academy of Scientific Research & Technology (ASRT), Egypt announces the organization of an International Training Programme on 'Low Cost Technologies for Arsenic Removal from Groundwater' as a part of its multilateral collaborative project entitled 'Reducing Arsenic Exposure from Food and Water in Developing Countries – A Roadmap for Technological Solutions for the Future' during 5-6 September 2023 in Cairo, Egypt. Detailed guidelines for participation are available at Centre's official website: www.namstct.org.

The activities on scientific publications have been given further push and the work to bring out a number of books and monographs on different subjects is in different stages of editing and printing. A list of publications of the Centre is available on our website. The interested institutions and individuals may contact the publishers for purchase of these books.

I would like to wholeheartedly thank our esteemed Member Countries and other stakeholders in the developing countries for their proactive participation in the scientific activities of the Centre.

Happy Reading!!

Amitava Bandopadhyay
(Amitava Bandopadhyay)
Director General

Centre Organised

International Training Programme on
**STI POLICY MAKING FOR SOCIO-ECONOMIC
DEVELOPMENT IN THE GLOBAL SOUTH – 2023**

06-08 June 2023

Kuala Lumpur, Malaysia

The crucial roles of Science, Technology and Innovation Policymaking in socio-economic growth are well demonstrated by the success stories of developed nations. Over the past few decades, countries in the Global South have realized the importance of Science, Technology & Innovation (STI) as a key issue in their policymaking agenda in order to catalyze their socio-economic development. STI policy of developing countries should particularly emphasize human resources development and institutional capacity building for education and training, research & development; creation of a strong STI driven entrepreneurial ecosystem and promoting international partnerships including South-South Cooperation and STI diplomacy.

The developing world still lacks the conceptualization of the role of STI in national economic growth & development and does not adequately address the needs of the local industry, economic conditions and also lack trained or skilled personnel who are knowledgeable and capable in developing STI Policy and its subsequent implementation. Therefore, it is vital for any developing country to have a strategically designed STI Policy and its implementation management commensurate with the challenges of the globalizing society.

In this context, the Centre for Science & Technology of the Non-Aligned and Other Developing Countries (NAM S&T Centre), New Delhi, India, in partnership with the International Science, Technology and Innovation Centre for South-South Cooperation (ISTIC) under the Auspices of UNESCO, Kuala Lumpur,



Group Photo: International Training Programme on 'STI Policy Making for Socio-economic Development in the Global South-2023

(Contd. on page 2)

(Contd. from Page 1 - Intl. Trg. Prog. on STI Policy Making.....)

Malaysia jointly organized an International Training Programme on '**STI Policy Making for Socio-economic Development in the Global South-2023**' during 6 - 8 June 2023 in Kuala Lumpur, Malaysia.

The three-day Training Programme was successfully held at **Dorsett Hartamas Hotel, Kuala Lumpur**, with the objective of providing the participants with an understanding of the basic elements of STI policy in regard to socio-economic transformation. The participants of the programme were actively involved in learning the key principles related to STI Policymaking and Management and applying the best practices in STI Policymaking to address the socio-economic challenges through Group Discussions and Presentations.

The Training Programme was attended by **37** scientists, researchers, academicians, policymakers and other professionals from **13** countries namely Egypt, India, Indonesia, Iran, Iraq, Kenya, Mauritius, Myanmar, Pakistan, South Africa, Sri Lanka, Zambia and the host country Malaysia, to develop and upgrade their skills and knowledge in STI Policymaking for socioeconomic development. The Speakers/Panel Members for the Training Programme were from Malaysia.

The Opening Ceremony was facilitated with a welcome address by **Dr. Tengku Sharizad Tengku Dahlan**, Director, ISTIC. **Dr. Amitava Bandopadhyay**, Director General, NAM S&T Centre, New Delhi welcomed the delegates and underscored the importance of STI policymaking and its strategic management in socio-economic development. **Prof. (Dr.) Mohd. Basyaruddin Abdul Rahman**, Chair, ISTIC Governing Board, in his address highlighted the importance of such training programmes in strengthening the level of STI and emphasized that such programmes are helpful to exchange knowledge and ideas and certainly are important for the socio-economic growth of developing countries. He concluded by saying that policy design formulation and development is critical for the socio-economic growth and development of any country.

Prof. Zamri Mohamed, University of Technology, Malaysia was the Keynote Speaker for the programme and delivered lectures on "Introduction to Policy", "STI and Socio-economic Development", "Role of Government and STI", "Understanding STI Policy: Policy for STI and STI for Policy", "Ideal Policymaking", "Realities in Policymaking" and "Skills for Policymaking".

The Participants of the Training Programme were divided into four groups for Group Activities, Discussions and Presentations. **Prof. (Dr.) Nor Ashikin Bt Mohamed Yusof, Dr. Shadiya Mohamed Saleh Ba Qutayan, Dr. Intan Sazrina Binti Saimy and Dr. Siti Hasliah Binti Salleh** were the Trainers/Coordinators from the University of Technology, Malaysia (UTM). Each group was asked to present an STI policy document in concern to any one of the following sustainable development goals (SDGs) - 4 (Quality Education), 5 (Gender Equality), 13 (Climate Action) and 16 (Peace, Justice and Strong Institutions) which could promote the socio-economic development of their countries. On the last day of the programme, all the groups gave final presentations of their policy documents, followed by a Question-and-Answer session.

The Certificates of Participation for STI Policy training were handed over to the participants by **Dr. Tengku Sharizad Tengku Dahlan**, Director, ISTIC. The Group that presented SDG 5 (Gender Equality) received an Award for the 'Best STI Policy Presenter'.

Open Class Room Online Lecture Series in Atmospheric and Climate Sciences (Weekly) - South Asian Meteorological Association (SAMA) & SRM Institute of Science and Technology (SRM IST)

Global warming and climate change are serious global concerns nowadays. Floods and droughts are the two most devastating consequences of the climate crisis in South Asia. Research in the areas of climate science and climate change is also very limited. Thus, a basic understanding of weather systems is important to keep the vigor of climate science and other associated climate areas at the forefront in the South Asian countries. Imparting a preliminary knowledge on meteorological observations, weather forecasting, weather monitoring through satellites and meteorological advisories to the scientific community especially students is essential to make them understand a holistic approach to tackle the weather and climate related disasters.

Recently, the NAM S&T Centre became an Institutional Member of the South Asian Meteorological Association (SAMA), a professional non-profit international scientific society having Headquarter in India for the promotion of Meteorological and Allied Sciences and their application for the safety, well-being and sustainable development of the citizens of the South Asian countries.

In view of the above, the NAM S&T invited Scientists, Technologists, Environment Professionals, Policymakers and other experts to join the "**Open Class Room Online Lecture Series in Atmospheric and Climate Sciences (Weekly)**" which was organized by South Asian Meteorological Association (SAMA), New Delhi in collaboration with SRM Institute of Science & Technology (SRM IST), Chennai, Tamil Nadu, India during 7th January-24th April 2023. The series covered interesting lectures on the fundamentals of climate and atmospheric sciences delivered by eminent academic faculty in the field and were targeted to early career scientists, research scholars and masters students pursuing career in meteorology, atmospheric sciences, climate and earth sciences. The Lecture Series were open to the scientists from the Member Countries of the NAM S&T Centre and the Members of NAM S&T – Industry Network.

Under this program, four lectures in every month were organized virtually by selecting the topics from standard text books. The target audience of the lectures were early career scientists, research scholars and masters students pursuing career in meteorology, atmospheric, earth and climate sciences and other related areas.

Project on “Reducing Arsenic Exposure from Food and Water in Developing Countries – A Roadmap for Technological Solutions for the Future”

PROGRESS REPORT

Sustainable Development Goal (SDG) – 6 aims to achieve universal and equitable access to **safe and affordable drinking water** for all by 2030 and improve water quality by *reducing pollution, eliminating dumping and minimizing the release of hazardous chemicals and materials*. Arsenic in drinking water is a widespread concern. Chronic arsenic exposure is associated with many human health risks, including skin lesions and cancers of the liver, lung, bladder and skin and with many non-cancer health conditions, such as cardiovascular diseases, adverse reproductive outcomes, neurological disorders and impaired cognitive development in children. Due to the lack of awareness about the problem, the silent presence of higher arsenic content in groundwater is left un-noticed creating a latent magnification of the problem in the African as well as in many other developing countries.

With the above in view, a multilateral collaborative project entitled- “*Reducing Arsenic Exposure from Food and Water in Developing Countries – A Road Map for Technological Solutions for the Future*” is being undertaken by the Centre for Science and Technology of the Non-Aligned and Other Developing Countries (NAM S&T Centre) since January 2022, in order to address the adverse issues related to arsenic contamination of groundwater. The project has been partially supported by the Group of 77 (G-77) under its Perez-Guerrero Trust Fund for South-South Cooperation (PGTF). The implementation of the project is being coordinated by the UN Office for South-South Cooperation (UNOSSC), New York. Fourteen Member Countries of the NAM S&T Centre, viz. **Bhutan, Egypt, India, Iran, Malaysia, Mauritius, Myanmar, Nepal, Nigeria, Palestine, South Africa, Sri Lanka, Togo and Zambia** are participating in this collaborative project.

The project aims to cope with the serious consequences of Arsenic contamination of groundwater in developing countries and provide a roadmap for low cost technological solutions for the removal of Arsenic from the groundwater in order to minimize the exposure of people to this toxic element through food and water.

The project is being completed in the following parts:

- i) The NAM S&T Centre had successfully organized a 3-days International Workshop on “**Water Purification Technologies, Arsenic Removal from Groundwater and Integrated Water Management**” in partnership with the CSIR-Central Salt and Marine Chemicals Research Institute (CSIR-CSMCRI), Bhavnagar, India during **28-30 June 2022** (in **Hybrid Mode**). Altogether **139** researchers, scientists, experts, academicians and policymakers from **20** countries including Bhutan, Burkina Faso, Egypt, Ethiopia, India, Indonesia, Kenya, Madagascar, Malaysia, Malawi, Mauritius, Mongolia, Myanmar, Nepal, Palestine, South Africa, Sri Lanka, Togo, United Kingdom and Zambia had participated in the Workshop. This included invited speakers, guests, nodal officers for the G-77 project from the participating developing countries, and scientists and experts from other countries.
- ii) The Centre is organizing a 2-days International Training Programme on “**Low Cost Technologies for Arsenic Removal from Groundwater**” in Cairo, Egypt during **5-6 September 2023** in partnership with the Academy of Scientific Research & Technology (ASRT), Cairo, Egypt (in **Physical Mode**) to facilitate the exchange of knowledge and expertise; enhance the capacity building of the innovators, technopreneurs, scientists and policymakers of the developing countries and to facilitate the transfer of low cost technologies for Arsenic removal from groundwater.
- iii) A ‘**State-of-the-Art**’ Report will be prepared that will act as the “**Roadmap for Technological Solutions for the Future towards Reducing Arsenic Exposure in the Developing Countries**”. The report will comprise of the country status papers presented during the Workshop/Training programme on the extent and severity of the problem of Arsenic contamination and the present remedial measures. The report will also contain a set of recommendations for the developing countries on the achievable technological options for Arsenic removal. The report will be published and disseminated to various NAM and other developing countries which will help them in undertaking suitable policy measures to tackle the problem of Arsenic exposure to their population.

In order to accomplish the objectives of the project, an edited publication on “**Reducing Arsenic Exposure from Food and Water in Developing Countries**” is also being planned and the NAM S&T Centre proposes to bring out this publication through a reputed international publisher. The book is expected to contain about 16-18 papers that are currently in the final stages of editing by an international editorial board.

Joint NAM S&T Centre – JSS AHER, Mysuru, India Fellowship Programme - 2023

In pursuance of its objectives to promote South-South Cooperation in Science and Technology and to achieve Sustainable Development Goals, the NAM S&T Centre had announced 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. The response to the Fellowship Programme was fairly good in terms of number of applications received by the Centre. Based on the academic background and screening of the applications by the Selection Committee, the following five candidates have been sponsored by the NAM S&T Centre under the Joint NAM S&T Centre – JSS AHER, Mysuru, India Fellowship Programme 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.

Dr. Marwa Abd Elhamied Kamel Ismael, Researcher at National Research Center (NRC), **Egypt**, will carry out her research work on the proposal titled “**Evaluating the Genetic Diversity of Human Rotavirus in Local Indian Community through Full Genome Sequencing of VP6 and VP7 Genes, and Phylogenetic Analysis**” under the supervision and guidance of Dr. Akila Prashant, Professor & Head, Department of Biochemistry, JSS Medical College, Mysuru, India.



Dr. Mohammad Kafi, Professor in Crop Physiology, Department of Agronomy and Plant Breeding, Ferdowsi University of Mashhad, Azadi square, Mashhad, **Iran**, will carry out his research on the topic “**To compare essential oil contents and other useful analytical traits as well as anatomical and agronomic characteristics of Indian and Iranian Cumin Seeds and to focus on investigation of anticancer properties of this seed plants**” under the supervision of Dr. Subba Rao M.V.S.S.T, Professor, Department of Biochemistry, JSS Medical College, Mysuru, India.

Ms. Liyana Pathirana Sithara Vinodani, Research Assistant, University of Sri Jayawardenepura, **Sri Lanka**, will carry out her research work on the proposal titled “**Thin-layer Chromatography (TLC), High Performance Thin-Layer Chromatography (HPTLC) and Fourier Transform Infrared Spectrophotometer (FTIR) of Amurhashtakakwatha and its Raw Plant Materials**” under the supervision and guidance of Dr. B. M. Gurupadaya, Professor & HOD, Department of Pharmaceutical Chemistry, JSS College of Pharmacy, Mysuru, India.



Dr. Yasamen Raad Humudat, Associate Chief Biologist, Ministry of Science & Technology- Environment and Water Directorate, Al- Jadiriah, **Iraq**, completed her research work titled ‘**Evaluating the Efficacy of Allium Sativum against Uropathogenic Escherichia Coli Isolated from Urinary Tract Infection: A Comprehensive In vitro, Ex ovo and In silico Approach**’ under the supervision and guidance of Dr. Ashwini P., Associate Professor, Department of Microbiology, JSS AHER, Mysuru, India.

Mrs. Pooniam Cathan Govinden, Agricultural Superintendent, Ministry of Agro Industry and Food Security, **Mauritius**, completed her research on the topic “**Use of NIR to Analyze the Chemical Composition and Physical Properties of Foods**” under the supervision and guidance of Dr. Krishnaveni Nagappan, Professor, Department of Pharmaceutical Analysis, JSS College of Pharmacy, Ooty, India.



Joint NAM S&T Centre – JSS AHER, Mysuru, India Fellowship Programme - 2023

Research Completion Report of Dr. Yasamen Raad Humudat, Iraq



Dr. Yasamen Raad Humudat, Associate Chief Biologist, Environment and Water Directorate, Ministry of Science & Technology, Baghdad, Iraq was sponsored by the NAM S&T Centre under its Joint NAM S&T Centre – JSS AHER, Mysuru, India Fellowship Programme for the year 2023 to carry out her research on “**Evaluating the Efficacy of *Allium Sativum* against Uropathogenic *Escherichia Coli* Isolated from Urinary Tract Infection: A Comprehensive *In vitro*, *Ex ovo* and *In silico* Approach**” under the guidance of **Dr. Ashwini P.** from **May - June 2023** at the School of Life Sciences, JSS Academy of Higher Education and Research, Mysuru, India.

Urinary tract infection (UTI), a serious public health problem is caused by a variety of bacteria, the most frequent of which are *Escherichia coli*. Higher recurrence rates and increasing antibiotic resistance among uropathogens pose a significant threat to the economic burden of these infections. The prevalence of bacteria isolated from urinary tract infection (UTI) in the patients and the antibiotic susceptibility patterns of the gram-negative bacteria was determined. *E. coli* strain was isolated from the peritoneal patients suffering from UTI. Urine was cultured and bacterial proteins were isolated through centrifugation. The results of *E. coli* isolates from urine showed the concentration of the protein 0.416 µg/ml and expression of the 37-kDa subunit in *E. coli*. To evaluate the predicted 3D structure of the homology model, Ramachandran's plot of the model was constructed to determine the stereochemical quality of the protein structure by analyzing residue-by-residue geometry. The PROCHECK report showed that nearly 88.2% residues are present in core and nearly 11%, 0.4% are having torsion angles with allowed phi and psi values. Bacterial protein was then injected *in vivo* into an 11-day old chick embryo. *In silico* molecular docking and chorioallantoic membrane of chick embryo was utilized for antimicrobial efficacy screening. The model predicted at the SWISS-MODEL workspace was adequate to take docking in the P-loop of the active site of allicin for designing a drug against *E. coli*. Garlic contains diverse bioactive compounds, such as (Allin, (Z) – ajoene, Allicin, Diallyl-disulfide -2.8) with binding infinity (-5.6, -3.5, -3.1, and -2.8 respectively) and was compared with the antibiotic tetracycline. It was found that the best of them was Allin where the value of the binding infinity with ligand was -5.6. A molecular docking simulation of the target compounds and the alline ligand into the protein active site was carried out with binding infinity -5.6.

In silico molecular docking studies provided valuable insights into the interaction of antibiotic ligands with pathogen protein motifs *In silico* approaches provided a platform for screening putative therapies' action against molecular targets, assisting in the selection of those with the highest potential activity for subsequent *in vitro* and *in vivo* experiments. Automated modeling and evaluating model quality using SWISS-MODEL and Ramachandran plots ensured acceptance for protein-ligand docking experiments. Injection of bacterial *E. coli* protein and Triton X-100 into the main vessel of chick embryo is one of the most widely used nonionic surfactants for lysing cells to extract protein as control in connection vessel.

Joint NAM S&T Centre – ICCBS Fellowship Programme on “Natural Products Chemistry, Drugs and Pharmaceuticals”- 2023

Research Completion Report of Dr. Sajjan Lal Shyaula Shrestha, Nepal



Dr. Sajjan Lal Shyaula Shrestha, Principal Scientist, Faculty of Science, Nepal Academy of Science and Technology, Khumaltar, Lalitpur, Nepal was sponsored by the NAM S&T Centre under its Joint NAM S&T Centre – ICCBS Fellowship Programme on “Natural Products Chemistry, Drugs and Pharmaceuticals” for the year 2023 to carry out his research on “**Analysis of Anthocyanins and Flavonols in Petals of *Rhododendron arboreum* by LC-MS/MS**” under the supervision of **Prof. (Dr.) M. Iqbal Choudhary** from **26th January to 10th March 2023** at the HEJ Research Institute of Chemistry, International Center for Chemical and Biological Sciences, University of Karachi, Karachi, Pakistan.

Metabolite profiles of *Rhododendron arboreum*, an evergreen small tree and the national flower of Nepal, were qualitatively analyzed using LC-ESI-MS/MS approach. Eleven compounds were identified by LC-ESI MS/MS from the different crude fractions prepared by solvent-solvent extraction process. The MS/MS fragmentation patterns of each compound of *R. arboreum* were determined and proposed. The isolated compounds belonged to flavonoids, anthocyanins, triterpenoids and phosphatidylcholines. Flavonoids and anthocyanins are usually distributed in genus *Rhododendron*. All the data have been analyzed in the positive mode in an Ion Trap mass spectrometer. The precursor ions of compounds were fragmented into daughter ions and were found to be characteristic to the compounds and were used for the complete or partial identification of the compound structure. For qualitative analysis, the crude methanolic extract was separated by solvent-solvent extraction process. There was a significant difference in metabolites for different fractions. The compounds peaked at *m/z* 163, 478, 518 and 520 eluted at 1.67, 15.28, 15.57 and 17.64 min respectively, and were common to all fractions. The methanolic extract showed characteristic intense peaks for flavonoids and anthocyanins at *m/z* 449 and 433 at 5.5 and 5.9 min respectively. These classes of compounds need to be further studied for the development of pigments. Phosphatidylcholines compounds have not been previously reported from the petals of rhododendron species. Further isolation by column chromatography had supported for the detailed verification.

Special Features

THE 2023 SDG SUMMIT - THE RESCUE PLAN

The Sustainable Development Goals (SDGs) and their 169 associated targets are among humanity's best chance of dealing with global crises, from climate changes to economic hardships. The world leaders agreed the goals in 2015 and set 2030 as the deadline to achieve them. However, by this year, at half way point, it looks likely that none of the goals and just 12% of the targets will be met.

In September 2023, the world leaders will gather in New York for **The 2023 SDG Summit** to come up with a rescue plan (Nature, 2023). The 2023 SDG Summit will take place on 18-19 September 2023 in New York. It will mark the beginning of a new phase of accelerated progress towards the SDGs with high-level political guidance on transformative and accelerated actions leading up to 2030. Convened by the President of the General Assembly, the Summit will mark the half-way point to the deadline set for achieving the 2030 Agenda and the SDGs. It will be the centerpiece of the High-level Week of the General Assembly. It will respond to the impact of multiple and interlocking crises faced by the world and is expected to reignite a sense of hope, optimism and enthusiasm for the 2030 Agenda.

At the midway towards the 2030 Agenda, there has been a lot of concern towards the progress on SDGs at international level. The present article tries to reflect through the following few reports about the various recommendations/suggestions being made ahead of **The 2023 SDG Summit** to be held:

1. The UN Secretary-General has released a special edition annual report on SDG progress called the **“Progress towards the Sustainable Development Goals: Towards a Rescue Plan for People and Planet”** to sound the alarm on the lack of SDG progress, stating specifically that: “only 12% of the SDGs are on track and nearly 50% are off track, and approximately 30% have actually regressed below the 2015 baseline.” Under current trends, the report warns of the challenges remaining across many of the SDGs.

SDG Progress Report Recommendations- Ahead of the High-Level Political Forum (HLPF) and the SDG Summit, the UNSG's report makes the following recommendations to Member States to rescue these SDGs and accelerate progress between the present time and 2030:

- All Member States to recommit to action to achieve the SDGs at national and international levels between now and 2030;
- Governments to set and deliver ambitious national benchmarks to reduce poverty and inequality by 2027 and by 2030;
- A commitment from all countries to end the war on nature;
- Governments to strengthen national institutions and accountability and
- Greater multilateral support for the UN development system and decisive action at the 2024 Summit of the Future.

[Source: *Report on Progress Towards The Sustainable Development Goals Towards a Rescue Plan for People and Planet – Report of UN Secretary General (Advanced Unedited Version) available (<https://hlpf.un.org/sites/default/files/2023-04/SDG%20Progress%20Report%20Final%20Version.pdf>) and the final version will be available in September 2023*].

2. SDG Progress Update: Technology as a Transformational Driver of the SDGs

During May 3-4, 2023, the UN interagency task team on Science, Technology and Innovation (STI) for the SDGs (IATT), convened by UN-DESA and UNCTAD, and the 10-Member Group of high-level representatives appointed by the UN Secretary General, hosted the eighth annual Multi-Stakeholder Forum on STI for the SDGs (STI Forum) to facilitate the discussion on how STI can contribute to and accelerate progress in achieving the SDGs.

The 2023 STI Forum was held under the theme of “Science, technology and innovation for accelerating the recovery from the corona virus disease (COVID-19) and the full implementation of the 2030 Agenda for Sustainable Development at all levels”. The Forum brought together UN agencies, government, academia, private sector, technical experts, advocates, policymakers, NGOs and youth to highlight the current gaps and challenges of STI, share technological learnings and successful case stories, and call for political action to enable technology as a transformational driver of the SDGs.

STI Forum Key Takeaways:

- Strengthen trust in the science-policy interface and demonstrate the value of robust scientific facts and understanding for policymaking and related actions.
- Integrate tech solutions to address interconnected issues in the climate, land, energy and water (CLEW) nexus.
- Think global, act local-promote people and community led innovation and tech infrastructures to develop and enhance “smarter” and inclusive cities.

(Contd. from Page 6 - Special Features.....)

- Close the gender and geographic digital divide—make innovation ecosystems more inclusive and representative and ensure an equitable digital future for all.
- Facilitate knowledge-sharing through developing multi stakeholder global cooperation, investing in capacity building and fostering public-private partnerships for research & development.

(<https://www.unsdsn.org/highlights-from-the-eighth-annual-multi-stakeholder-forum-on-science-technology-and-innovation-for-the-sdgs-sti-forum-technology-as-a-transformational-driver-of-the-sdgs>, May 16, 2023)

3. Global Sustainable Development Report (GSDR)

Recently, an independent group of science advisers to UN proposed a way forward. Their Global Sustainable Development Report (GSDR) summarizes where the SDGs are failing and what can be done to rescue them. It reiterates the need for transformational change to get the world onto a sustainable path. Crucially, it recognizes the interconnectedness of the goals and targets. The authors recognize that the path to sustainability must also include abolishing unsustainable practices, while taking into account the social and economic pain this can cause. For example, increasing the availability of renewable energy will not tackle the climate change its own; fossil fuels must also be phased out. There is an active resistance to this move and a genuine need to support affected communities, such as those who have relied on the coal industry for decades. Such scenarios do not apply only to reaching energy and climate goals. The GSDR represents welcome progress on the 'what' of meeting the SDGs. It also proposes what to do on the 'how'.

Implicit- and to a degree explicit- in all this is changing how science itself has done. The report argues that the actions that steer the world towards a sustainable path must be rooted in science that is multidisciplinary, equitable and inclusive, openly shared and widely trusted and “socially robust”- in short, responsive to social contexts and social needs. For this to happen, the global science needs to evolve and knowledge needs to be more accessible.

Editorial: We Must Now act To Save Sustainability, Nature 618 : 647 pg 2023, (22 June 2023)

UN Adopts First High Seas Treaty

The United Nation's 193 Member States adopted a landmark legally binding marine biodiversity agreement on 19 June 2023 to protect the high seas and preserve marine biodiversity in international waters, marking a milestone after nearly 20 years of effort, U.N. Secretary-General Antonio Guterres announced on 19 June 2023.

The adoption followed an agreement reached in March by more than 100 countries on the text of the High Seas Treaty, also known as the Biodiversity Beyond National Jurisdiction treaty (BBNJ), after more than 15 years of discussions and five rounds of U.N. led negotiations. In approving the text, Member States have "pumped new life and hope to give the ocean a fighting chance," Guterres said in a statement.

Following five key points highlight the importance of this treaty around the world :

- 1. Fresh protection beyond borders:** While countries are responsible for the conservation and sustainable use of waterways under their national jurisdiction, the high seas now have added protection from destructive trends such as pollution and unsustainable fishing activities.
- 2. Cleaner oceans:** Toxic chemicals and millions of tons of plastic wastes are flooded into coastal ecosystems, killing or injuring fishes, sea turtles, seabirds and marine mammals and making their way into the food chain and ultimately being consumed by humans. The treaty aims at strengthening resilience and contains provisions based on the polluter-pays principle as well as mechanisms for disputes.
- 3. Sustainable management of fish stocks:** More than one third of global fish stocks are being over-exploited, according to the UN reports. The treaty underlines the importance of capacity building and the transfer of marine technology, including the development and strengthening of institutional capacity and national regulatory frameworks or mechanisms. This includes increasing collaboration among regional seas organizations and regional fisheries management organizations.
- 4. Lowering temperatures:** Global warming is pushing ocean temperatures to new heights, fuelling more frequent and intense storms, rising sea levels and the salinization of coastal lands and aquifers.

Addressing these urgent concerns, the treaty offers guidance through an integrated approach towards ocean management that builds ecosystem resilience to tackle the adverse effects of climate changes and ocean acidification and maintains and restores ecosystem integrity, including carbon cycling services.

(Contd. from Page 7 - Special Features.....)

5. Vital for realizing 2030 Agenda: The new agreement “is critical for addressing the threats faced by the ocean, and to the success of ocean-related goals and targets, including the **2030 Agenda**”, the UN Chief said on 19 June 2023. Some of the goals and targets include Sustainable Development Goal (SDG) **14**, which aims at, among other things, preventing and significantly reducing marine pollution of all kinds by 2025, and ending overfishing through science-based management plans in order to restore fish stocks in the shortest feasible time.

The new agreement will enable the establishment of area-based management tools, including marine protected areas, to conserve and sustainably manage vital habitats and species in the high seas and the international seabed area. The treaty also considers the special circumstances facing small-island and landlocked developing nations.

The agreement will be open for signature in New York for two years starting from September 20, the day following a summit on the U.N. Sustainable Development Goals. It will take effect after 60 countries ratify the agreement, according to the U.N.

The pact is a key plank in efforts to put 30% of the world's land and sea under environmental protection by 2030, a goal set in December.

Among other provisions, the legally binding agreement would govern sharing benefits derived from the marine genetic resources beyond national jurisdictions, creating protected areas on the high seas and establishing a framework for assessing any environmental damages.

<https://news.un.org/en/story/2023/06/1137857>

<https://www.reuters.com/world/un-adopts-worlds-first-treaty-protect-high-seas-biodiversity-2023>

579 Developments in NAM Member Countries

MAURITIUS

Achievements in Science, Technology and Education in Mauritius

1.0 Background

The Government of Mauritius has undertaken reforms across all sub-sectors of education. At the primary and secondary school level, the nine-year continuous basic education has been introduced and pathways have been defined for students to progress in their studies both in academic and technical stream. At the higher education level, there has been a promulgation of the Higher Education Act which caters for a better regulation of the sector aimed at transforming Mauritius into an Education Hub for the region and beyond.

Primary and secondary education is free in Mauritius and since 2019, tertiary education has also been rendered free. From an education perspective, Mauritius has made great strides in science and technology education in the past decades, improving its curriculum and offering more advanced materials and instruction to its students. Science education continues to be a priority in Mauritius, evidenced by the widespread availability of scientific resources and initiatives implemented both at educational and country level.

At primary and secondary education level, integrated science is mandatory up to grade 9 ensuring that all students are exposed to basic scientific concepts and approaches. After nine years, students can opt to continue with the pure sciences such as physics, chemistry and biology or even continue with technology stream.

With regards to research, the country has invested significantly in scientific research and development. In a bid to boost academic research, a Research Fund has been set up where academics can avail funds to carry out various research activities. The research is targeted in topical areas with potential to create impact and ensure benefits to the economy and society which include, amongst others, renewable energy, traditional medicine, AI, sustainability and climate change. There has been an overwhelming demand for the research fund by the public Higher Education Institutions. The academics do also make application and seek funding at the level of the Mauritius Research and Innovation Council which basically caters for applied research.

2.0 Higher Education Institutions

The Higher Education Institutions play an active role in building the human, intellectual, business and social capital needed for Mauritius to meet the challenges of Industry 4.0 and to develop a knowledge-based and innovation-led economy.

It is noteworthy that the Higher Education Institutions have close ties with the industry and the community and they have signed Memorandum of Understanding with Ministries and private sector organisations for capacity building, research and collaboration in higher education. The Higher Education Institutions have also agreements with foreign universities for collaboration in scientific research. All these help the local universities to have an international outlook and many foreign students are presently in Mauritius pursuing studies in, *inter-alia*, medicine and engineering.

As an illustration of collaboration with international stakeholders, it was noted that there were keynote speeches and presentations

(Contd. from Page 8 - S&T Dev. in Member Countries.....)

from local universities and research organisations during a virtual International Workshop on 'Smart Agriculture' organised in August 2021 by the Ministry of Education, Tertiary Education, Science and Technology in collaboration with the NAM S&T Centre which also witnessed participation from various foreign experts.

2.1 University of Mauritius (UoM)

The UoM is the oldest and one of the largest universities in the country in terms of student enrolment and curriculum offered. The University of Mauritius works in close collaboration with both the public and the private sector to offer Programmes.

UoM has always been a strategic partner in building the required human and intellectual capital for the socio-economic development and progress of Mauritius. After more than half a century's existence, UoM remains the largest provider of undergraduate, taught postgraduate and doctoral education in the country, offering programmes in a wide range of study areas. In order to address the challenges faced by the labour market, UoM is focusing more and more on the offer of niche Degree and Masters programmes in collaboration with the public and private sectors, thus participating fully in capacity building and also in addressing the upskilling and reskilling needs as required by employers.

UoM is now ranked in the Times Higher Education World University Rankings 2023! UoM is ranked in the 1001- 1200 band (out of 2352 universities ranked) in the global ranking and 51st among African Universities. This is the first time in its history that UoM has been ranked in the Times Higher Education and is among the few African Universities ranked for the first time and has entered the global stage as a university that meets rigorous international academic benchmarks.

The University has also been ranked among the top institutions worldwide in the field of tourism and hospitality as per the 2021 Shanghai Global Ranking of Academic subjects.

2.1.1 International Accreditation of UoM Programmes

The accreditation of the UoM Engineering degree programmes by the Engineering Council of South Africa is another step forward towards UoM's goal to align its programmes with international standards and Washington Accord.

These endeavours help UoM in not only promoting the international mobility of graduates, but also in attracting international students to the UoM.

2.1.2 International Collaborations

As part of its internationalisation strategy, UoM also works closely with several foreign partners in the offer of collaborative programmes. Some examples are:

- Doctor of Medicine (MD) – Bachelor of Medicine and Master of Medicine with University of Geneva, Switzerland;
- Dual Degree Programme - Bachelor of Applied Science in Cyber Operations (with Emphasis in Defence/Forensics) with the University of Arizona, USA

2.1.3 University –Industry ties

Through the Knowledge Transfer Office, UoM gets closer to Industry and engages in innovative projects to find solutions to local problems.

Through a quadruple helix model of innovation, UoM collaborates closely with the public sector, the private sector and the community, establishing itself as a pivotal partner for development. UoM focuses on priority research areas aligned with national agendas, such as agriculture, life and marine sciences, health, energy, digital technologies and socio-economic tourism. The UoM's strategy takes into account the UN Sustainable Development Goals (SDGs) while also institutionalising research and establishing research teams through Poles of Research Excellence and Poles of Innovation. UoM adopts both a bottom-up as well as a top-down approach to address impactful research, prioritising solutions to local problems.

2.1.4 Achievements of UoM

Examples of achievements in the field of science are abounding at the University of Mauritius. It has set up the Faculty of Medicine and Health Science and there have been several publications made by the faculty especially those in the field of biopharmaceutical sciences and marine sciences where research undertaken has been fruitful in documenting marine species associated with Mauritius coastal waters and their characterization.

The University has set up **the Centre for Biomedical and Biomaterials Research (CBBR)** which is prominent in carrying out research and has an unique expertise on nanotechnology, phytochemicals, nutraceuticals, amongst others. The Centre has been deeply involved in publishing research articles.

2.1.5 Some activities of the CBBR



(i) Research & Development

CBBR consists of two Units: the Biomaterials, Drug Delivery and Nanotechnology (BDDN) Unit and the Biopharmaceuticals Unit.

The main research thrusts of the BDDN Unit are biomaterials engineering and nanomedicine. Researchers engineer biomaterials from land and marine resources into tissue engineering scaffolds for tissue regeneration and scaffolds for cancer regenerative medicine specifically designed to target/kill cancer cells while accelerating wound healing. The Unit uses hydro gels for the generation of cellular spheroids for drug screening and insulin secretion.

The Biopharmaceutical Unit over the years has been a catalyst for improving health and wellbeing guided by its



scientific development and validation of innovation products and approaches. It has unique knowledge and expertise in the area of phytochemicals, pharmacognosy, nutraceuticals and functional foods in chronic disease prevention and management.

(ii) Expert services

CBBR offers access to state-of-the-art equipment in the area of nanofiber fabrication, microscopy imaging, chemical/elemental analysis, mechanical testing, thermal analysis, vitamin and minerals profiling, *in vitro* studies among others. CBBR also conducts *in vivo* studies on small animal models in collaboration with its partner Cyclotron Réunion Océan Indien (CYROI), La Réunion. In the last 5 years, CBBR has worked with leading Mauritian Industries and SMEs and help guide them through the Research and Development process for product innovation.

(iii) Capacity building

A major activity of CBBR includes capacity building. Capacity building helps empower young scientists for the upcoming Biotech industry ecosystem in Mauritius. Since its inception, CBBR has trained more than 50 undergraduate students, 10 Masters Students and 30 PhDs. It also provides advanced training in scarcity areas to Post Docs and Research Assistants.

2.2 Université Des Mascareignes

Another public Higher Education Institution, the Université Des Mascareignes, has already engaged in offering programmes in emerging futuristic areas and has set up a Robotics Laboratory for AI and Robotics programme. The Artificial Intelligence and Robotics laboratory at Université des Mascareignes is a publicly funded facility that is unique in Mauritius. It boasts an array of advanced technologies, including Unmanned Aerial Vehicles (UAVs), underwater UAV submersibles and Vector autonomous mobile UAVs, as well as state-of-the-art Turtlebots and collaborative robots such as the Panda and Baxter models. Additionally, the lab houses advanced humanoid robots, such as the Pepper and NAO models.

The mission of this laboratory is multifaceted, encompassing several key objectives, including:

2.2.1. Education and Training

To facilitate the dissemination of knowledge and skill sets in the field of robotics and artificial intelligence, the laboratory provides comprehensive education and training programs. This is done through classes, workshops, and training sessions covering fundamental topics such as programming, electronics, machine learning and robotics. Furthermore, the lab offers hands-on opportunities to gain practical experiences with various robotics and AI systems. By sharing expertise with students and professionals, the lab has the potential to advance the field of robotics and AI and inspire the next generation of innovators and researchers. Training sessions with secondary schools have also been organised.

2.2.2. Research

The laboratory serves as a dedicated research facility for the Masters in AI and Robotics programme, providing students with access to advanced robotics equipment for their research projects and internships. In addition, the lab is also utilized by Ph.D. students and researchers collaborating with NGOs, among other organizations.

The primary research goal of this laboratory is to develop systems using robotics and AI that can exhibit flexible and adaptable behaviour acquired autonomously through learning. Achieving this objective requires a deep understanding of learning algorithms, robotics and computer vision.

2.3 University of Technology, Mauritius (UTM)

The University of Technology, Mauritius, plays an important role in sharing and creating knowledge on the challenges set out in Agenda 2030. As one of the universities in sustainable development, UTM is tackling the SDGs in four inter-related ways: through research, public engagement, learning and students and operations.

The UTM offers a wide range of course units including interdisciplinary units open to all students that ensure sustainable, inclusive and equitable education. The Masters programme in Educational Administration and Technology specially caters to the present needs of tutors in the practical and theoretical issues of education and technologies in educational settings.

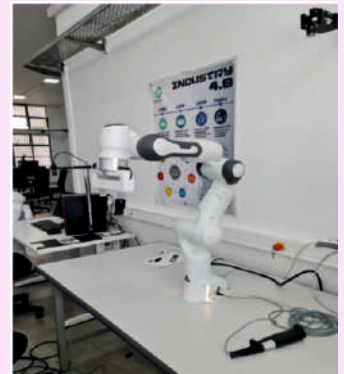
The UTM has civic partnerships with other universities across the world to share ideas and to enhance the knowledge of students. Examples include the Institution of Occupational Safety & Health of UK, the Business Graduates Association and Anna Medical College.

UTM is committed to empowering students with the knowledge and skills required to address the SDGs through partnerships with public, private and civil society organizations.

UTM partners with several organizations to carry out meaningful public engagement with diverse audiences on sharing ideas and on research activities.

3.0 The Rajiv Gandhi Science Centre

The Rajiv Gandhi Science Centre, on the other hand, has been actively promoting science in Mauritius and among its activities, the centre organises National Science Week annually with the aim of increasing awareness and understanding among the students and the community on the important role that Science and Technology plays in our life and hence aiming at a scientifically literate country. The event comprises an exhibition on Science and Technology and a series of thematic seminars, conferences, talks and workshops on Science and Technology.



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

Meeting with Officials of the Ministry of Higher and Tertiary Education, Innovation, Science and Technology Development (MHTEISTD), Govt. of Zimbabwe, Harare

Dr. Amitava Bandopadhyay, Director General, NAM S&T Centre visited the Ministry and met Mr. C. Muwuduri, Chief Director (Admn. and Finance), MHTEISTD, Govt. of Zimbabwe on May 8, 2023 and had wide ranging discussion on various collaborative S&T activities between the Govt. of Zimbabwe; S&T and academic institutions in Zimbabwe and the NAM S&T Centre. The meeting was also attended by Mr. Charles Musari, Deputy Director (Projects and Technology Transfer) and Mr. Cain Bure, Principal Science and Technology Officer (Projects and Technology Transfer).



Director General, NAM S&T Centre with the Officials of MHTEISTD, Govt. of Zimbabwe, Harare

Dr. Bandopadhyay briefed the Ministry Officials about the current joint activities of the NAM S&T Centre with Great Zimbabwe University (GZU), Masvingo, Zimbabwe and National University of Science and Technology (NUST), Bulawayo, Zimbabwe. The NAM S&T Centre has an extensive collaboration with GZU in the past and have already organized a joint International Workshop on “Dryland Agriculture” and have published a book titled “Climate Change Adaptations in Dryland Agriculture in Semi-Arid Areas”. The book was published by the leading International Publishing House, Springer Nature, Singapore. The Centre has also organized another international workshop jointly with MHTEISTD and NUST on “Leveraging Innovations for Infrastructure Development and Sustainable Industrialization” in November 2022 in Hybrid Mode and is also working on a book on “Sustainable Industrialization” based on the papers presented during the workshop and other invited papers from subject experts.



Director General, NAM S&T Centre with the Officials of Great Zimbabwe University, Masvingo, Zimbabwe

Dr. Bandopadhyay also visited the Great Zimbabwe University, Masvingo during May 9-12, 2023 and had wide ranging discussion with Dr. Xavier Poshiwa and his colleagues in the Gary Magadzire School of Agriculture, GZU, Masvingo. He also attended Research Seminar organized by the International Centre of Excellence in Dryland Agriculture (ICEDA) at GZU and interacted with Faculty Members, Researchers and Students. During the discussion with Prof. Poshiwa, it was decided that the NAM S&T Centre and GZU with appropriate support from the Ministry will organize a joint International Workshop tentatively titled “Agricultural Research and Innovation for Resilient Livelihoods in Drylands” during June 5-7, 2024 in Masvingo, Zimbabwe. During the visit Dr. Bandopadhyay also met Prof. E. Chikodza, Actg. Pro-Vice Chancellor, GZU and his senior colleagues and briefed them about the Centre's joint S&T activities with Great Zimbabwe University.

Meeting with Officials of the Department of Science and Innovation (DSI), Pretoria, South Africa

Dr. Amitava Bandopadhyay, Director General, NAM S&T Centre visited Pretoria, South Africa and met Mr. Daan du Toit, Deputy Director General, International Cooperation and Resources, Department of Science and Innovation (DSI), South Africa and held wide ranging discussion on future S&T collaboration between DSI and the NAM S&T Centre during 2024-25. Other senior officials of DSI – Ms. Mampei Chaba, Chief Director; Dr. Dumisani Mathembu, Director and Mr. Selby Modiba, Deputy Director (Multilateral Collaboration) were also present.

Dr. Bandopadhyay also delivered a lecture titled “Multilateral STI Diplomacy and Achieving Sustainable

(Contd. from Page 11 - DG NAM S&T Centre Meets and Visits)

Development Goals through Partnerships – Roles of NAM S&T Centre” on May 15, 2023 at the invitation of Mr. Daan. The lecture was organized in CSIR International Convention Centre, Pretoria. The lecture was attended by DSI Officials, Scientists and Technologists working in the area of Science Diplomacy and Diplomats from a few Embassies/High Commissions in Pretoria. The lecture was organized under the Forum “Science Diplomacy Capital for Africa (SDCfA)”, Pretoria.

Mr. Daan and Dr. Bandopadhyay also discussed the possibility of enhanced collaboration between DSI and NAM S&T Centre in the area of “Hydrogen Economy”. Dr. Bandopadhyay proposed that NAM S&T Centre and DSI may plan a Joint International Workshop in Pretoria tentatively on “Hydrogen Economy: Perspectives from the Global South” sometime in the second half of 2024. Mr. Daan also invited NAM S&T Centre to participate in Science Forum South Africa – 2023.

Dr. Bandopadhyay and Mr. Selby Modiba also visited the Human Science Research Council (HSRC), Pretoria on May 16, 2023 and had detailed discussion with Dr. Thokozani Simelane and his senior colleagues. The possibility of organizing a Joint Workshop on “Role of STI in Poverty Alleviation and Improving Quality of Life” by HSRC and NAM S&T Centre tentatively in August 2024 was discussed.



Director General, NAM S&T Centre with Mr. Daan du Toit and other participants of Science Diplomacy Lecture organised at CSIR International Convention Centre, Pretoria, South Africa

Meeting with Officials of the Ministry of Science, Technology and Innovation (MOSTI), Kuala Lumpur, Malaysia and the International Science, Technology and Innovation Centre for South-South Cooperation (ISTIC) under the Auspices of UNESCO, Kuala Lumpur, Malaysia

Dr. Amitava Bandopadhyay, Director General, NAM S&T Centre visited Kuala Lumpur, Malaysia during June 4-6, 2023 to participate in the International Training Programme on “STI Policy Making for Socio-economic Development in the Global South - 2023” jointly organized by the NAM S&T Centre, New Delhi and ISTIC, Kuala Lumpur. Dr. Bandopadhyay also visited the Ministry of Science, Technology and Innovation (MOSTI), Putrajaya, Kuala Lumpur, Malaysia and had detailed discussion with Mr. Teoh Phi Li, Under Secretary, International Division, MOSTI; Ms. Ungku Aida Farzana, Asst. Secretary, International Division and other senior colleagues from the International Division.

During the meeting, various topics related to S&T collaboration between MOSTI, Malaysia and the NAM S&T Centre were discussed. Dr. Bandopadhyay briefed Mr. Teoh and his colleagues about recent scientific activities of the NAM S&T Centre and future plans. Dr. Bandopadhyay commended Malaysia for being an active contributor to NAM S&T Centre's publications. Mr. Teoh mentioned that Malaysia can further contribute articles for Newsletter/Books related to STIE subjects by reaching through the university researchers, experts and Fellows from Academy of Sciences Malaysia (ASM) especially in areas of Blue and Green Economy. The possibility of launching a Joint Fellowship Programme was also discussed.



Director General, NAM S&T Centre with the Officials of MOSTI, Malaysia

Dr. Bandopadhyay also took this opportunity to discuss with Dr. Tengku Sharizad Tengku Dahlan, Director, ISTIC about future opportunities for S&T collaboration between the ISTIC and the NAM S&T Centre. NAM S&T Centre and ISTIC are also exploring the possibility of renewal of their Memorandum of Understanding (MoU) for S&T collaboration. Dr. Bandopadhyay also had the opportunity to discuss with Prof. Dr. Mohd. Basyaruddin Abdul Rahman, Chairman of ISTIC Governing Board about taking up a joint publication project. Dr. Bandopadhyay also presented a copy of the 30th Anniversary Compendium of the NAM S&T Centre to Prof. Abdul Rahman and Dr. Tengku Sharizad Tengku Dahlan.

Science, Technology & Innovation News

BIOCHEMISTRY

Artificial Photosynthesis Transforms Carbon Dioxide (CO₂) into Food

Researchers at the Technical University of Munich (TUM) have developed a sustainable method to create L-alanine, an amino acid, from CO₂. The process uses artificial photosynthesis, which converts CO₂ to methanol and then to L-alanine. This new method requires less space than traditional agriculture, highlighting the potential of combining bio-economy and hydrogen economy for a more sustainable future.

Ensuring the supply of food to the constantly growing world population and protecting the environment at the same time are often conflicting objectives. However, the researchers at the Technical University of Munich have successfully developed a method for the synthetic manufacture of nutritional protein using artificial photosynthesis. The animal feed industry is the primary source for high demand of large volumes of nutritional protein, which is suitable for use in meat substitute products as well.

A group led by Prof. Volker Sieber at the TUM Campus Straubing for Biotechnology and Sustainability (TUMCS) has succeeded in producing the amino acid L-alanine, an essential building block in the biosynthesis of proteins, from the environmentally harmful gas CO₂. This indirect biotechnological process involves methanol as an intermediate. As of now, protein for animal feed has been typically produced in the southern hemisphere with large-scale agricultural space requirements and negative impacts on biodiversity. CO₂, which is removed from atmosphere, is first turned into methanol using green electricity and hydrogen. The novel method then converts this intermediate into L-alanine in a multi-stage process using synthetic enzymes. The method is highly effective and generates surplus yields. L-alanine is one of the most important components of protein, which is essential for both human and animal nutrition.

Prof. Sieber, of the TUM Professorship for Chemistry of Biogenic Resources, explains: "Compared to growing plants, this method requires much less space to create the same amount of L-alanine, and the energy used comes from solar or wind power sources. The more efficient use of space means a kind of artificial photosynthesis can be used to produce the same amount of foodstuffs on significantly fewer acres. This paves the way for a smaller ecological footprint in agriculture."

The researchers further added that the project is a good example for demonstrating how bio economy and hydrogen economy in combination can achieve more sustainability.

<https://scitechdaily.com>, May 1, 2023

ENERGY & GREEN TECHNOLOGY

Engineers tap into Good Vibrations to power the Internet of Things

In a world starving for clean energy, engineers have created a new material that converts simple mechanical vibrations around us into electricity to power sensors in everything, from pacemakers to spacecrafts.

The first of its kind and the product of a decade of work done by the researchers at the University of Waterloo and the University of Toronto; the novel generating system is compact, reliable, low-cost and very green.

"Our breakthrough will have a significant social and economic impact by reducing our reliance on non-renewable power sources," said Asif Khan, a Waterloo researcher and co-author of a new study on the project. The system, Khan and his colleagues developed is based on the piezoelectric effect, which generates an electrical current by applying pressure, for example mechanical vibrations, to an appropriate substance. The problem now arising is the limited capacity of these traditional piezoelectric materials to generate electricity. They also often use lead, which Khan describes as "detrimental to the environment and human health."

The researchers solved both the problems. They started growing a large molecular single crystal of a metal-halide compound called dabco copper chloride using the Jahn-Teller effect, a well-known chemistry concept related to spontaneous geometrical distortion of a crystal field. Khan said that piezoelectric material was then used to fabricate the nanogenerators" with a record power density that can generate tiny mechanical vibrations in any dynamic circumstances, from human motion to automotive vehicles" in a process requiring neither lead nor any forms of non-renewable energy.

The nanogenerator used is tiny, 2.5 centimetres square and about the thickness of a business card and could be conveniently used in numerous situations. It has the potential to power sensors in a vast array of electronic devices, including billions needed for the Internet of Things (IoT), the burgeoning global network of objects embedded with sensors and software that connect and exchange data with other devices.

Dr. Dayan Ban, a researcher at the Waterloo Institute for Nanotechnology, said that in future, an aircraft's vibrations could power its sensory monitoring systems, or a person's heartbeat could keep their battery-free pacemaker running". The study is published in the journal Nature Communications.

<https://techxplore.com>, May 3, 2023

INFORMATION SCIENCE

Study Uncovers Social Cost of using AI in Conversations

A group of Cornell researchers has found that the people have more efficient conversations, use more positive language and perceive each other more positively while using an artificial intelligence-enabled chat tool.

(Contd. from Page 13 - STI News)

Post doctoral researcher, Jess Hohenstein is the lead author of "Artificial Intelligence in Communication Impacts Language and Social Relationships," published in *Scientific Reports*. Co-authors are Malte Jung and Rene Kizilcec (Cornell Bowers CIS).

Generative AI is poised to impact all aspects of society, communication and work. Each day brings new evidences of the technical capabilities of large language models (LLMs) like Chat GPT and GPT-4, but the social consequences of integrating these technologies into our daily lives are still poorly understood.

AI tools have potential to improve efficiency, but they also have negative social side effects associated with it. Hohenstein and colleagues examined how the use of AI in conversations impacts the way the people express themselves and view each other. "Technology companies tend to emphasize the utility of AI tools to accomplish tasks faster and better, but they ignore the social dimension," Jung said. "We do not live and work in isolation, and the systems we use impact our interactions with others."

In addition to greater efficiency and positivity, the group also found out that when the participants think their partner is using more AI-suggested responses, they perceive their partner as less cooperative, and feel less affiliation towards them.

For their first experiment, co-author Dominic DiFranzo, developed a smart-reply platform called "Moshi" (Japanese term for "hello"), patterned after the now-defunct Google "Allo" (French term for "hello"), the first smart-reply platform, unveiled in 2016. Smart replies are generated from LLMs to predict plausible next responses in chat-based interactions.

Hohenstein said "While AI might be able to help you write, it's altering your language in ways you might not expect, especially by making you sound more positive". This suggests that by using text-generating AI, you're sacrificing some of your own personal voice. According to Jung, "What we observe in this study is the impact that the AI has caused on social dynamics and some unintended consequences that could result from integrating AI in social contexts. This suggests that whosoever is in control of the algorithm may have influence on people's interactions, language and each other's perceptions".

<https://phys.org>, April 4, 2023

SCIENCE POLICY NEWS

USDA Science & Research Strategy Released

U.S. Secretary of Agriculture, Tom Vilsack, announced the release of the "USDA Science and Research Strategy, 2023-2026: Cultivating Scientific Innovation" during the opening plenary of the AIM for Climate Summit. This Strategy will drive USDA's (United States Department of Agriculture) science priorities for the next three years to establish a scientific framework in transforming the U.S. food system and providing support to farmers, ranchers, producers and foresters. The Strategy focuses on the following 5 priorities:

1. **Accelerating Innovative Technologies and Practices:** To sustain agricultural and forestry production for a growing global population, USDA must rapidly catalyze the development of new technologies and practices that are innovative, resilient and commercially viable.
2. **Driving Climate-Smart Solutions:** USDA will advance research that addresses risks from long-term and acute climate stressors, generates new revenue streams and improves climate resiliency while bolstering sustainable markets for bio products.
3. **Bolstering Nutrition Security & Health:** USDA will deliver science-based information to support food and nutrition security, personalized food choices, food safety, food accessibility while continuing to drive innovative solutions.
4. **Cultivating Resilient Ecosystems:** USDA strives to create a healthy, viable production ecosystem that provides food, feed, fuel and fiber for all and enhances the quality of life and conserves natural resources for future generations.
5. **Translating Research into Action:** To drive the greatest impact, USDA science and research must respond to the needs of the diverse communities we serve, be equally accessible and translated into action in communities across the nation.

<https://www.crops.org>, May 17, 2023

AGRICULTURE/ENVIRONMENT

Nitrogen-producing bacteria slash fertiliser use on farms

Microbes that produce nitrogen have made a big difference for reducing fertiliser-related emissions and pollution across millions of acres of farmland in the US. The microbes can be applied directly to the soil or as a coating on seeds.

Nitrogen-fixing microbes can dramatically reduce the fertiliser-related emissions and pollution from farms. Nitrogen fertiliser plays an essential role in industrial agriculture, but it comes at a steep environmental cost. The production and use of synthetic nitrogen is responsible for contributing around 5 per cent of global greenhouse gas emissions. Excessive use of fertiliser also adds to air pollution and water contamination.

In addition to finding greener ways to produce nitrogen fertiliser, researchers and farmers are looking for more ways to use fertiliser more efficiently, without sacrificing crop yields. One approach taken by US-based Company Pivot Bio is to introduce bacteria to crops that take nitrogen from the air and fix it in soil as nitrates which can be used by plants. "Microbes are freeloading

(Contd. from Page 14 - STI News)

couch potatoes when nitrogen is around,” says Karsten Temme, the company's CEO. If the soil has synthetic fertiliser, bacteria will use that rather than pulling out nitrogen from the air.

Using genetic engineering, Pivot Bio developed two bacteria-based treatments that continue to produce nitrogen even when high levels of nitrogen are already present in the soil. Temme says the treatments, which can be applied as a liquid directly to the soil or as a powder to coat seeds, can replace about a quarter of the synthetic nitrogen used without affecting crop yield. Pivot Bio says its products are now being used on more than 3 million acres (1.2 million hectares) of farmland in the US, predominantly on corn crops, and also on wheat, sorghum, barley, millet, oats and sunflower crops.

According to initial estimates, the treatment helped to avoid 32,000 tonnes of synthetic fertiliser on farms in 2022. The firm estimates that resulted in a reduction of greenhouse gas emissions equivalent to 220,000 tonnes of CO₂, about the same as burning 1200 rail cars full of coal. About a third of those avoided emissions came from not producing the synthetic fertiliser. The other two-thirds come from the avoided nitrous oxide emissions from soil.

A number of other companies have also developed similar microbial treatments for plants.

<https://www.newscientist.com>, June 21, 2023

TECHNOLOGY AND SOCIETY

How a Rural Community in Armenia built their own Internet

In the mountainous village of Shaghap, the Armenian region of Ararat, over 170 families live in a quiet area far from urban centers. Agriculture and husbandry have been their main source of income, with other activities complementing it: a tobacco factory, a small pastry shop and a bed and breakfast for tourists who are eager to venture into the Armenian mountains. But the lack of new opportunities has led to the exodus of Shaghap's youth to the capital city of Yerevan and other larger cities, where they can find jobs and create better opportunities for their future.

Lack of opportunities was partly due to the limited Internet access available in Ararat: the whole village relied on mobile connectivity with data caps to connect online. Left behind by service providers because of their remote location and costly infrastructure investment, high-speed Internet remained just a dream. Entertainment options were also scarce, limited to a handful of TV channels that were also the main source of information.

But this started to change when the village came together to build a fiber community network—after learning from similar experiences in the region.

Becoming Part of a Global Movement—driven by Kristine Gyonyan, Director Union of Operators of Armenia, the people in Shaghap saw an opportunity when they learned about community networks during the **2019 European Community Networks Summit**. During the summit, people from all over the region working with community networks shared their experiences. The event also shared how to leverage public and private investment for these types of networks, and how to create an enabling regulatory environment allowing them to grow and thrive.

People in Shaghap had thought about connecting underserved areas with fiber optic cables. Learning about the experiences of others who had set up community networks made it seem more realistic. They started by kicking off conversations with members of the community, network operators, the Union of Operators of Armenia and the Armenian government. The idea was eventually supported by the Ministry of High-Tech Industry of Armenia and the Public Services Regulatory Commission. This led to a pilot project developed by the Union of Operators of Armenia to deploy its first community network.

After delays due to local conflicts and COVID restrictions, the project finally took off in 2021. The Union of Operators of Armenia established the Community Networks Foundation to lead this project and partnered with a local network operator, Arpinet, and the Armenian Electronic Network for the infrastructure planning and use. The community installed over 18 kilometres of fiber optic cables to bring connectivity to Shaghap from the nearby village of Vedy, and then covered another two kilometres within the village to connect several homes and buildings, including the local school.

Connectivity brought the developments that the community was seeking: the school was finally able to organize online lessons for its students, allowing them to expand their learning experiences beyond the classroom. It also helped make the case for an investment by Rostelecom to create a robotics lab at the school, helping children combine the learning of new skills through the Internet with local innovation. The local pastry shop saw an increase in business and safety: they were able to deploy video monitoring for the store, and tourists are now staying longer and ordering more as they have access to Wi-Fi. Last but not the least; people are happier with more entertainment options at home. The improved Internet connection is also helping people with research.

After going through the experience of deploying a successful community network, Kristine is now working to share the experiences of the people of Shaghap and foster collaboration during other community networks summit, this time in Armenia.

<https://www.internetsociety.org>, May 22, 2023

Centre Announces

International Training Programme on Low Cost Technologies for Arsenic Removal from Groundwater 5-6 September 2023 Cairo, Egypt

The **Sustainable Development Goal (SDG) – 6** aims to achieve universal and equitable access to safe and affordable drinking water for all by 2030 and improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and pollutants. The Goal also calls for the implementation of integrated water resources management at all levels.

So far, very few efforts have been made on the removal of Arsenic from groundwater in many developing countries. While a number of technologies for Arsenic removal have been developed in different parts of the world, variations in sources and characteristics of Arsenic polluted groundwater should be considered in order to find appropriate and cost-effective technological solutions for the same. Based on the assessment, efforts should be made for improving the effectiveness of Arsenic removal, making the technology user friendly, overcoming maintenance problems, reducing the cost of the system and resolving the toxic sludge management issues.

In order to address the above issues, the Centre for Science and Technology of the Non-Aligned and Other Developing Countries (NAM S&T Centre) is implementing a multilateral collaborative project entitled “**Reducing Arsenic Exposure from Food and Water in Developing Countries – A Roadmap for Technological Solutions for the Future**” with partial financial support from G-77 under its Perez-Guerrero Trust Fund (PGTF). The project aims to cope with the serious consequences of Arsenic contamination of groundwater in developing countries and provide a roadmap for low cost technological solutions for the removal of Arsenic from the groundwater in order to minimize the exposure of people to this toxic element through food and water. The implementation of the project is being monitored by the UN Office for South-South Cooperation (UNOSSC), New York, USA.

As a part of the Project, the NAM S&T Centre is organizing an International Training Programme on “**Low Cost Technologies for Arsenic Removal from Groundwater**” in partnership with the Academy of Scientific Research & Technology (ASRT), Egypt **during 5-6 September 2023 in Cairo, Egypt**. The programme will be organised with participation of experts and policymakers from various developing countries including the scientists and researchers from the Egyptian institutions.

The Training Programme will be organized and hosted by ASRT in Cairo, Egypt.

**More details about the Training Programme are available at
Centre's Official Website: <https://www.namstct.org>.**

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