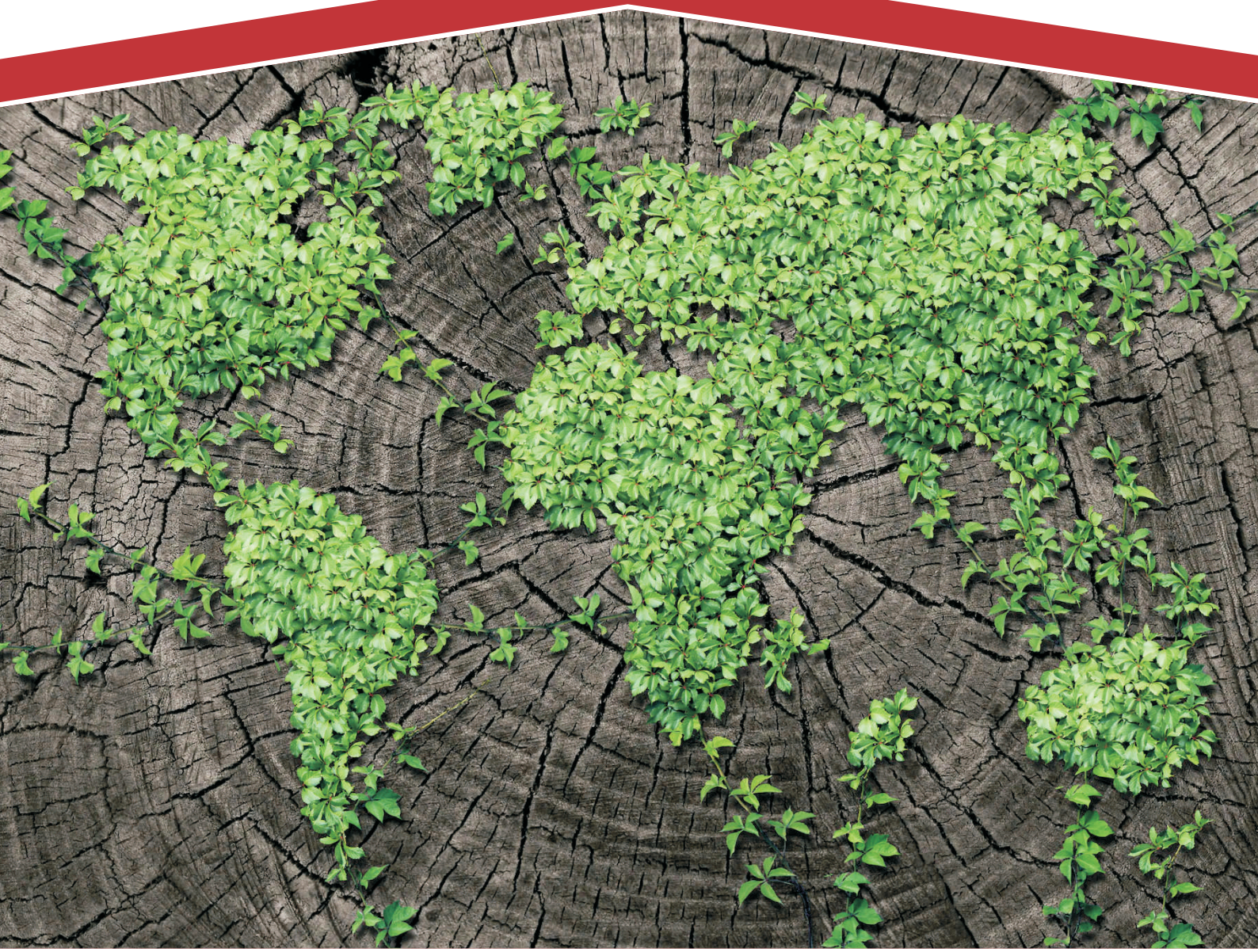
Climate Change Research Institute

Azadi Ka Amrit Mahotsav

Report & Activity Highlights 2020-2021

Project COVID-19 Series



Climate Change Research Institute

Science & Technology Solutions for Sustainable Energy Future

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From President Desk

Greetings from Climate Change Research Institute!

The years 2020 and 2021 are marked with the pandemic COVID-19; the whole world came to standstill in March 2020, being shaken by SARS-CoV2 virus. At that time no one knew to what extent the virus would affect and what is the remedy? There was a lockdown worldwide, leading to millions/ billions of people confined to their houses. Mobility came to standstill. The healthcare system of the countries collapsed. According to the reports 450 million people were affected worldwide, India had 44 million cases reported altogether.

The Climate Change Research Institute (CCRI) took initiatives to enlighten Youth about the ecosystem changes, linkages of COVID-19 with climate change & biodiversity, sustainable Development Goals and adapting to S&T solutions to minimize the impacts. In last two years considerable effort has gone into holding virtual events. The COVID-19 Series became an amazing project for CCRI and is placed before you in two chapters. We uploaded the e-Newsletters and launched e-Magazine for Climate Change Youth Forum of India. We took initiatives towards science campaigns for addressing societal challenges and meeting national goals of *Atmanirbhar Bharat* and *Azadi ka Amrit Mahotsava.* Major highlights include;

- Our Star Book publications
- Launch of Climate Change Youth Forum of India
- Deliberations on Post COVID-19: Future of Biodiversity
- Webinar on COVID-19 and 3Es of *Atmanirbhar bharat*
- Campaign on Ecosystem Restoration: Ocean and COVID-19
- Knowledge Sharing

I am happy to present before you the activity highlights of CCRI - COVID-19 series for the years 2020-2021. These activities have led to build a responsible and environmental citizenship among the targeted audience.

With best wishes

Dr. Mrs. Malti Goel
President

CONTENTS

About CCRI

The Climate Change Research Institute (CCRI) is a registered not-for-profit society, founded with a vision to promote understanding of climate change, mentoring and developing human resources for taking action through science based solutions. Aiming at sustainable development the institute addresses wide strata of society and as many stakeholders as possible through Awareness Campaigns in schools and Capacity Building/ training for college students and researchers.

It organizes awareness and capacity building workshops, scientific events of international relevance, lectures, campaigns on topics of scientific & societal interest in energy and environment for students, teachers, researchers and community members. It disseminates science & technology research in the field of environment and climate change mitigation & adaptation to stakeholders and policy makers. The Institute is internationally renowned whose activities focus on research for finding out solutions to mitigate climate change impacts, in addition policy advocacy on national priorities. Awareness on scientific & technological measures for implementation of UN Sustainable Development Goals for environment protection and economic growth are undertaken.

Main Objectives and Activities

Promoting environment education and teaching in climate change among wide strata of society.

- To create scientific awareness through workshops, conferences, lectures, capacity building programmes on the topics of environment and sustainable development.
- To develop educational tools on emerging topics of societal interest; such as energy, health and water in the climate change context.
- To undertake studies in energy sector: clean coal, carbon capture and utilization, renewable sources and in achieving Sustainable Development Goals, through science & technology solutions.
- To enter into collaborations with other national, international organizations with similar objectives and also encourage study groups on various environmental aspects.
- To disseminate scientific information through publications of newsletters, magazines, bulletins and books on priority thrust areas on national importance.

Vision and Mission

To become a Centre for Excellence in developing human resources through science based solutions and technical capacity building in the area of ecosystem changes and climate change

Glimpses of our activities can be seen at *www.ccri.in*

Chapter 2020

By polluting the oceans, not mitigating CO_2 emissions, and destroying our biodiversity, we are killing our planet. Let us face it, there is no planet B

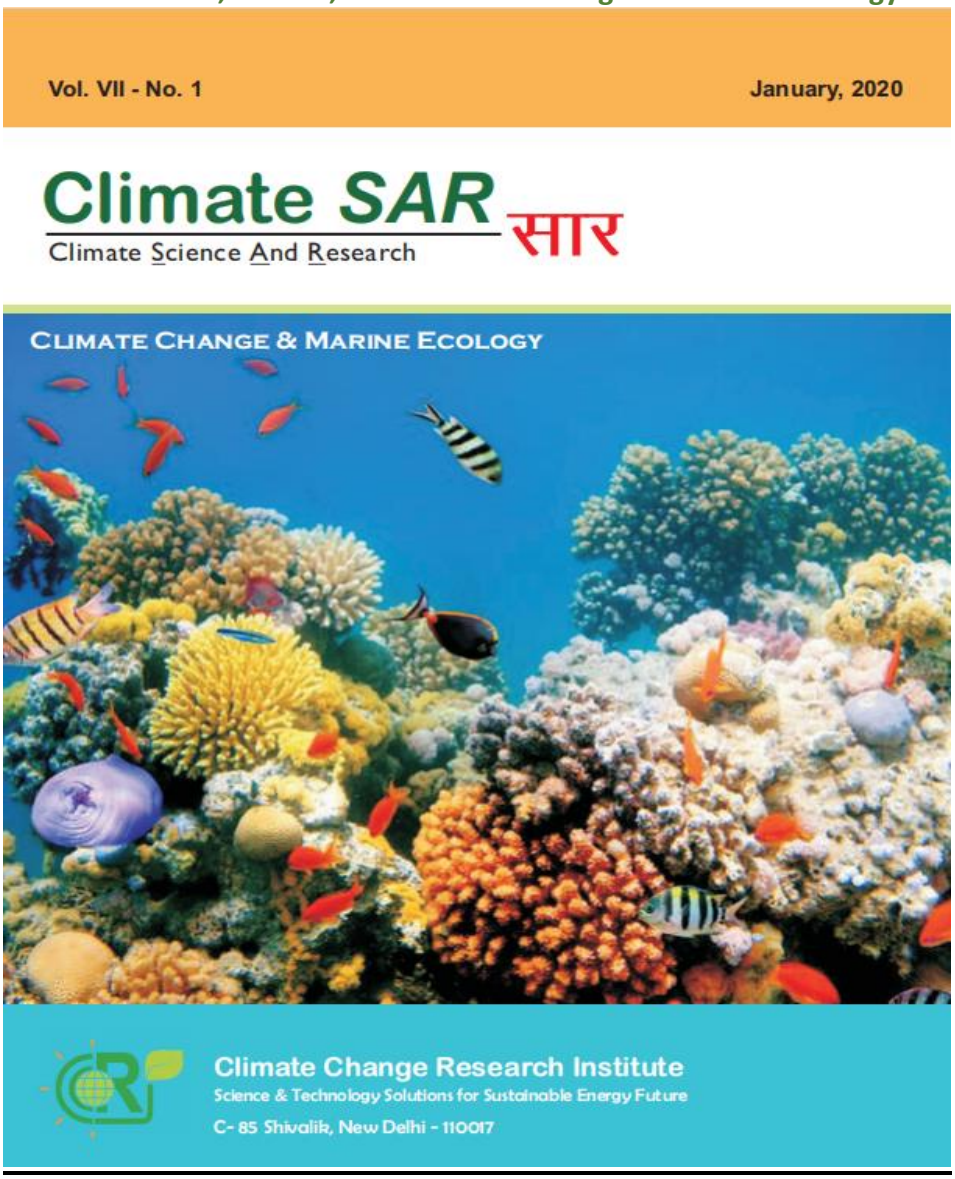
- Emmanuel Macron, President of France

The year that was 2020 -
A month wise chronology of events held on a virtual platform

January 2020

Our Quarterly Publication – Climate SAR

Climate SAR, Vol. VII, No. 1 Climate Change and Marine Ecology

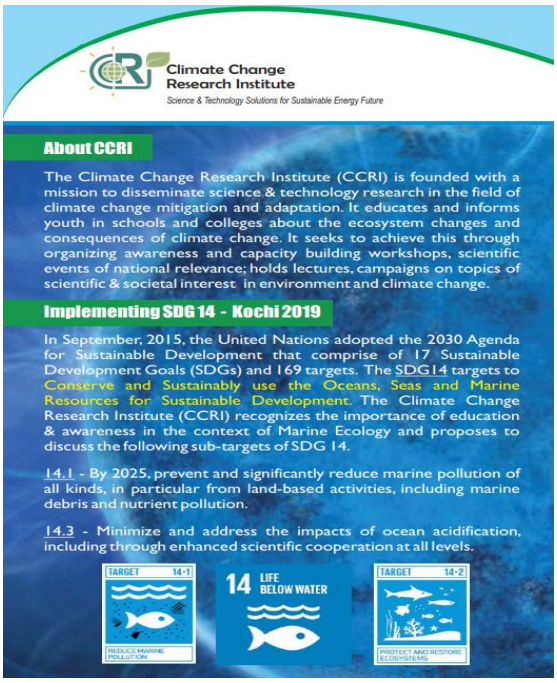


Key Messages

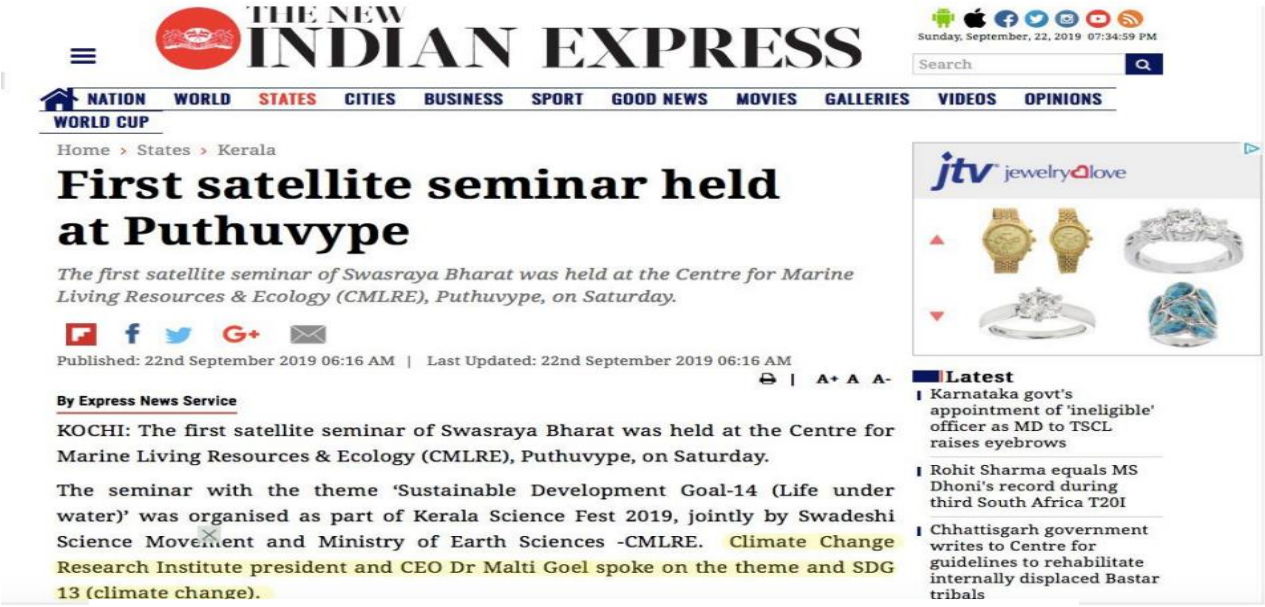
1. **Ocean and Climate Change:** Oceans cover 71% of the Earth's surface, and are storehouses for 97% of water on Earth**……**
2. **Plastic Waste and Marine Debris:** More than 1.5 trillion plastic bags are used worldwide in a year…….
3. **Ocean Acidification and Marine Ecology:** Many ocean-related benefits to society such as coastal protection or provision of food and income are getting affected by these…….
4. **Ozone Depletion and Marine Ecosystem:** The most severe effects of climate change and solar UV-B radiation exposure are; decreased reproductive capacity and impaired larval development……..

5. Implementing Sustainable Goal 14 (SDG 14) - Life below Water:

The CCRI organized theseminar on '**Marine Ecology: Implementing Sustainable Development Goals 14'** Puthuvype, Kochi promoted by Centre for Marine Living Resources & Ecology (CMLRE), Ministry of Earth Sciences and the Swadeshi Science Movement (SSM). It was attended by more than 200 graduate, postgraduate and research students from various Universities. An Information brochure on **Implementing SDG14** and **Climate Change – Drivers & Impacts; Solutions & Actions** was shared with participants. The event conveyed the message to protect ocean.



Media Highlights



The Climate SAR can be accessed online at: https://bit.ly/3pLPkbE

March 2020

Live Mint Quoted on COVID-19

About Live Mint

Representative of an integrated newsroom, www.livemint.comis Mint's online portal and is among the fastest growing news website in India. Mint provides daily national, international and business news, tracks market movements and detailed coverage of significant events.

mint

Home >News >India >COVID-19: Will summers make the virus less contagious?

COVID-19: Will summers make the virus less contagious?

High temperature and relative humidity can reduce the transmission of COVID-19, as was the case during SARS outbreak in 2002-03, according to a new study. **(PTI)**

mint

While this would help contain the outbreak in northern hemisphere, the situation may worsen for countries like Australia and South Africa in southern hemisphere, it added.

The argument is based on a few assertions. Firstly, influenza virus is more stable in cold temperature since respiratory droplets tend to remain airborne longer in cold and dry air. Secondly, cold and dry weather tends to weaken immunity and make people more susceptible to attack from viruses.

There is no denying that transmission of viruses is affected by climatic conditions. “Cold weather is generally favored by viruses and as temperature rises to 25-26°C, they start becoming less effective," said Dr. (Mrs.) Malti Goel, former adviser, Ministry of Science and Technology.

This document can be accessed online at: https://bit.ly/3mf8JzR

April 2020

World Earth Day 2020

A Snippet from Google Doodle for the World Earth Day, 2020

Earth Day celebration falling on 22nd April was a very special event in 2020 being the 50th Anniversary of the World Earth Day. The theme for the Earth Day 2020 was **"Climate Action"**. The CCRI planned science campaign in association with the **India International Centre (IIC),** had to be cancelled due to pandemicCOVID-19and worldwide lockdown.

In a digital celebration Dr. (Mrs.) Malti Goel, President CCRI sent Earth Day Message to all invitees, quoting from Pope Francis-

"*The global pandemic might be one of nature's responses to man-made climate crisis*".

She said the pandemic has brought about an unprecedented situation which has halted many communities, services, and programmes worldwide. By April it was reported that COVID-19 wave has almost infected more than 200 countries, with first case of officially reported by the WHO on 31st December 2019 at Wuhan, China. The President'smessage to school children narrated the LESSONS from this episode about the need to conserve energy.Saving oil, using electricity efficiently and doingfew other things by staying at home, should be the goal viz.,

- **Plant a sapling at your house**
- **Learn more about the native plants, shrubs and birds or attend webinars online**.
- **Utilize your Lockdown time by reading and learning new skills**
- **Look for more sustainable options in day-to-day life by using**
- **Stay at home and prevent wasting food and water.**
- **Practice reuse and recycling at home**.

The CCRI prepared in-house video film covering these goals and suggesting how to reuse waste in homes and shared it. COVID-19 reminds of an Indian Proverb for environment protection which could be written as

"Only When the Last Tree Has Died, And the Last River Been Poisoned and the Last Fish Been Caught, Will We Realize We Could be Attacked by Covid-19!"

Glimpses of the Video

You-Tube link **https://bit.ly/3vKQ7uw**

May 2020

Article Published in NESA Newsletter e-Version

President and CEO of Climate Change Research Institute, contributed an article for NESA, e-Version on the topic **"COVID-19 and Climate Change"**

COVID-19 AND CLIMATE CHANGE

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The whole world is taken aback by COVID-19. The new coronavirus case at Wuhan, China was first reported by World Health Organization (WHO) on 31st December 2019. In India first case was reported in Kerala on 30th January 2020. The WHO acknowledged it a health emergency and on 11th March[1], declared it a pandemic. The new coronavirus disease named as COVID-19 is a zoonotic disease. Zoonotic diseases already comprise roughly 70 percent of all human infections. In 2007 WHO had warned that emerging infectious diseases are becoming a growing threat in the face of increasing urbanization, antimicrobial resistance and climate change. In 2003 outbreak of SARS-CoV – Severe Acute Respiratory Syndrome coronavirus created havoc. Middle East Respiratory Syndrome (MERS) virus and Zika virus, a mosquito-borne virus caused other epidemics invaded Middle East and many Asian countriesin 2015-16.

A lot has changed with the new coronavirus SARS-CoV2 leading to COVID-19. Lockdown across the world and social distancing are the ways to stay safe. All mobility came to a stop. With 212 countries under the grip of virus, More than three lakhs deaths have been reported in last four months. It is shown that about 80% of infected people get mild to moderate disease, while 14% have severe symptoms and 6% have life threatening episodes of respiratory failure or organ failure. Among the vulnerable population children made up of 2% of the cases, not got severely ill, but aged population above 80 were affected the highest 22%.

A number of studies are appearing about investigating climate change relationship with COVID-19. In this article we examine the atmospheric science and climate change linkages with this global COVID-19 epidemic. The three pronged approach of nexus between COVID-19and climate could be in terms of (i) Environment, (ii) Weather& climate and (iii) Climate change.

(i) Linkage with Environment

Most attention grabbing finding about the environment linkage is that as a result of stay home with the pandemic COVID-19 outbreak; the streets, water bodies and the air all are much cleaner than what we can imagine in our dreams. This year water quality of the rivers *Ganges* and *Yamuna* has improved at an incredible level. Himalayan Ranges are visible from a distance of 200 km. More emphasis has been given to air quality in the world's most polluted and busiest cities and it is seen that pollution has dropped like never before. Many cities that had high pollution level are seeing remarkably less air pollution and are breathing clean air. Urban Tree leaves are green and no longer laden with dust and pollution.

NASA pictures released in early March clearlyshowed that according to the calculations made by the Center for Research on Energy and Clean Air the greenhouse gas emissions in the atmosphere had come down by 25% in the month of February when COVID-19 was at the peak in Wuhan, in comparison to the same period last year. At the same time is no coincidence that NCR of Delhi in India has suffered three earthquakes, though of low intensity, during this period.

Good news about lock down is about energy saving. With closure of offices and industry, the electricity 'peak demand' had fallen by 25% on average after March 22 in India, the day India began fight against COVID-19 with *Janta Curfew*. The NTPC has recently reported that the demand for power has reduced by as much as 45%. By stopping the use of personal cars and other transport means, oil consumption has fallen significantly. Oil is the energy resource which our country imports as much as 85% to meet mainly transport needs. We can save on our imports bill, by investing in renewable energy and avoiding unnecessary travels.

(ii) Weather and Climate and COVID-19

The second is, its connection with weather & climate that might be having a role in the growth of virus. Although the origin of corona virus is yet to ascertained and the whether it is natural or man-made, is a topic of high debate, it was believed that with the coming of summer, COVID-19 might also stop, as is the case with many other viruses, including the common cold, bird flu or influenza occurring during the colder months. Cold weather and humidity are favored by the viruses and as the minimum temperature starts rising above 25-26oC, it starts becoming ineffective. But nothing is proven yet for the new corona virus.

(iii) COVID-19 and Climate Change

Are COVID-19 and climate change impacts are linked in any way? The climate change and COVID-19 may not have same origin, but both are global crises and have produceddisaster over Homo sapiens. One line of thought is that climate change has led to many wildlife species migrating toward higher altitudes. This potentially is putting animals in contact with new diseases to which they haven't evolved resistance. The change in migratory patterns of the animals could lead to a lower respiratory system in animals. With the environmental devastation these microorganisms which animals host are now being transferred to humans. Bat has been associated with the cause of new coronavirus.

Another theory is that according to findings of Ohio State University scientists from a study of two ice cores extracted from Guliya Ice Cap, northwestern Tibetan Plateau, China and using gene-sharing network is that melting of glaciers giving rise new species of viruses[2]. They found that the microbes differed significantly across the two ice cores, presumably representing the very different climate conditions at the time of deposition. These viruses and bacteria trapped from thousands of years and are still present in the glaciers although in a dormant state. As global temperature raises the re-emergence of ancient viruses threatens present day species lacking immunity to these old world pathogens.

To conclude,with the ongoing debate on whether COVID-19 is natural or man-made, one thing is for sure that in addition to non-communicable diseases and vector borne diseases, viral outbreaks of similar nature would become more common in future with the progression of the climate crisis.

References

1. **Cucinotta D. Vanelli M.** WHO Declares COVID-19 a Pandemic, *Acta Biomed*. 2020 Mar 19;91(1):157-160. doi: 10.23750/abm.v91i1.9397.
2. **Zhi-Ping Zhonga**, *et. al.*, Glacier ice archives fifteen-thousand-year-old viruses, Jan 2020,https://www.biorxiv.org/content/ 10.1101/2020.01.03.894675v1.full.pdf, Preprint accessed on 11.3.2020

The document can be accessed online at: https://bit.ly/3ba4SOb

April-June 2020

Knowledge Sharing

e-Newsletter COVID-19 and Climate Change

The Corona crisis is hundred meters race and climate crisis is a marathon. We have to run both at the same time.

- *Victor Gataz, Stockholm Resilience Center*

When the whole world was gripped by the microscopic organism, Climate Change Research Institute (CCRI), launched quarterly e-Newsletter for knowledge dissemination on COVID-19, to help the audience keep up with the latest research.

President of CCRI, Dr. (Mrs.) Malti Goel quoted, *"We are amidst corona virus threat. Pandemic COVID-19 crisis has taken the world by surprise. How climate change and COVID are connected, is uppermost dilemma before those concerned with environment? Are we heading to sixth mass extinction as the number of species are becoming extinct, is another vital concern?"*

Key Messages in five Sections

Biodiversity and COVID-19: "Since 1978, over 750,000 square kilometres of Amazon rainforest have been destroyed with an increasing proportion of deforestation driven by industrial activities and large-scale agriculture."

How Endemics and Pandemics are related to Climate and Climate Change?: "According to the US Agency for International Development, 75% of new emerging diseases at the start of the 21st century have been transmitted from animals, often because deforestation has brought them closer to the human environment."

COVID-19, CO2 Emissions and Renewables: Global Energy Review, IEA quoted,

"*Beyond the immediate impact on health, the current crisis has major implications for global economies, energy use and CO_2 emissions*"

Climate Action -Sustainable Development Goal 13: In 2020, due to corona crisis impacts, the nationally determined contributions of countries could become achievable with larger goals, after 2019 being second warmest year on the record.

Post COVID-19 Action Plan: Message from Secretary General, Antonio Guterres on World Environment Day stated "*It is time to act decisively. My message to governments is clear: tax pollution, end fossil fuel subsidies; and stop building new coal plants. We need a green economy not a grey economy*

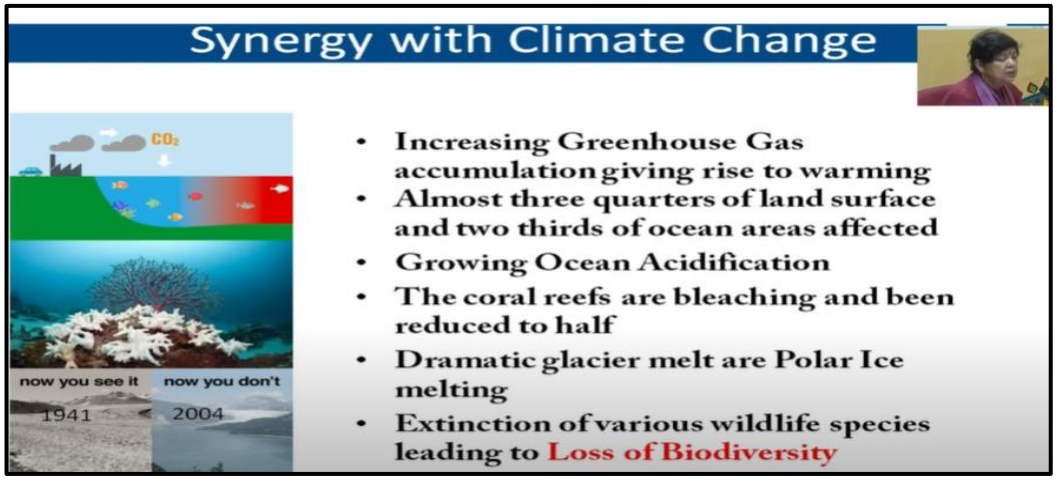
The e-Newsletter can be accessed online at: https://bit.ly/3vKRkSA

June 2020

Post COVID-19: Future of Biodiversity

The celebration of World Environment Day falling on 5th June has been a Flagship event of the **Climate Change Research Institute** every year**.** The CCRI has made noteworthy contribution towards the eco-system changes and S&T solutions by interacting with the students, with the teachers, with the professionals and with the scientists in novel ways.

To celebrate **World Environment Day 2020** Dr. (Mrs) Malti Goel delivered the theme talk on "Post COVID-19 Future on Biodiversity'' in collaboration with **India International Center**. Shri V S Verma, Distinguished professor & Member Central Electricity Regulatory Commission, Delhi welcomed all, sharing the background on Environment Day.



Key Messages

COVID-19: COVID-19 was declared as Pandemic on 11th March 2020. *"*Is Nature sending us any message for taking care of the planet?" is the key question.

Biological Diversity: "We have already recorded that there are 8-9 million species, possibly 100 million and 1.7 million varieties of animals, plants, and fungi respectively" – and these are endangered.

Causes of HIPPO Decline in Biodiversity:

H- Habitat loss is a greatest threat to biodiversity.

I- Invasive species is non-native organism negatively impacting native species.

P- Pollution and influx of carbon dioxide affecting the health of individual species

P- Population increases are threats to biodiversity causing habitat loss, pollution, and land-use changes.

O- Over-harvesting i.e., extraction of resources including trees, plants, and animals

Future of Biodiversity: relies on threefold actions

(i) Grassroots level *active participation of local community in preserving biodiversity and increasing awareness on human role in introducing conservation education*;
(ii) Scientific studies *by remote sensing and plant diversity are helping in species distribution modeling;* and
(iii) Synergy *between biodiversity and climate change and taxonomy studies and documentation.*

The environment day lecture can be accessed online at: https://youtu.be/LLrlWxU1WBI

July 2020

Article Published in Social Action Journal

On invitation to write in the Special Issue on Climate Change of Social Action Journal, we contributed the article on 'Climate Change, COVID-19 and Cities: Social Transformation'. It appeared in the July-September 2020 issue of the Journal. The abstract is as follows.

CLIMATE CHANGE, COVID-19 AND CITIES: SOCIETAL TRANSFORMATION

Malti Goel & Neha G. Tripathi***

Abstract

Urban planning has a critical role in energy consumption in cities and therefore in climate change mitigation. With increasing urbanization, cities have grown in numbers and in population with ever increasing demand for energy resulting in hotter weather, global warming and climate change manifestations. As governments are making choices about managing the risks and opportunities associated with climate change, COVID-19 has taken people by surprise and shock. This article is focused on the challenges for integrating city planning interventions based on pandemic induced impacts on lifestyles. The pandemic's impact on energy demand is seen to be directly proportional to the duration and stringency of measures meant to curb the spread of the virus. Work from home, virtual schools, shift in transport and change in lifestyles became major drivers to achieve people centric approach leading to climate resilience. It suggests accelerated implementation of smart cities and strategies for taking a quantum jump towards fourth Industrial revolution not only to control the spread of pandemic but also provide solutions for post COVID-19 city planning and ecological sustainability.

Keywords: Climate change, Covid-19, Urban planning, Societal transformation

Introduction

Global warming and climate change are manifestations of the Anthropocene era. By Anthropocene, we mean the current geological epoch started with the first industrial revolution of the 18th century. It represents the period during which human activities have a dominating influence on the environment and climate. The Anthropocene is proposed as a sub-division of Holocene, an era of 12,000 years of stable climate since the last ice age. During this Holocene epoch beginning with the agricultural revolution,

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The Social Action Journal is a "Quarterly Review" of Social Trends, approved by UGC-CARE, captures the social dimension of Independent India.

Full paper can be accessed online at: https://bit.ly/3ntkjGW

August 2020

Knowledge Dissemination

e-Newsletter Bio-Medical Waste, COVID-19 and SDG3


E-Newsletter July-Sept. 2020

Bio-Medical Waste, COVID-19 and SDG3

"Corona has exposed the fragility of healthcare systems, the inefficiency of social protections frameworks, and the lack of economic resilience."

-John Hopkins University and Medicine – Coronavirus Research Centre, May 2020

Bio-Medical waste, according to BMW Rules 2016 means any medical waste, which is generated during the diagnosis, treatment or immunisation of human beings or animals or research activities pertaining thereto or in the production or testing of biological or in health camps and in other categories. According to the Rules Bio-Medical waste treatment and disposal facility means any facility wherein treatment, disposal of bio-medical waste or processes incidental to such treatment and disposal is carried out, and includes common Bio-Medical waste treatment facilities.

- Ministry of Environment & Forests, 28th March 2016

With a view that Pandemic COVID-19 crisis has given rise to generation of new biomedical toxic waste and its management has become the uppermost challenge before the nations. With the rapidity of spread of COVID-19 disease, the waste has grown manifolds and its proper handling has been a dilemma before those concerned with human health and environment, the newsletter throws light on following sections.

(i) How is India handling its Bio-Medical Waste?
(ii) Why Corona Bio-Medical Waste need Better Management?
(iii) Coronavirus Outbreak is Piling Pressure on India's BioMedical Waste Disposal System
(iv) How Different States are handling their COVID-19 Waste?
(v) SDG3 (Good Health and Well-Being) and COVID-19

The e-Newsletter can be accessed online at: https://bit.ly/3iCnLhs

September 2020

National Teachers' Day

COVID-19 and 3Es of *Atmnirbhar Bharat*

The Climate Change Research Institute organized a webinar workshop on "**COVID-19 and 3Es for Atmnirbhar Bharat**" on 4th September 2020 to mark the Teachers Day. The event was in collaboration with the Universal Public School. Young children of the school opened the event by singing beautiful *shlokas*. Major highlights of the workshop are as follows.

Prof. D. P. Agrawal, Chairman Governing Council, CCRI extended warm welcome said that it is important for teachers to create continued awareness among students and parents about safety from corona virus. Elaborating on 3Es challenges being faced at the national level he suggested Youth to develop capacity to fight COVID-19 and plan to live simple and frugal life, taking a vow not to waste. Do not forget "When there are difficulties, we develop capacity to fight it all".

Dr. (Mrs.) Malti Goel, President CCRI introduced the theme and said Education, Environment and Economics of Health are the three challenges before us arising from pandemic COVID-19. She interacted with the students and the teachers on a creative note. In her lecture on 'Challenges in Nature's Healing: Climate Change and COVID-19' she touched on the important aspects of the air pollutants, their types, ozone pollution; and their impact, climate change, COVID-19 and *Atmnirbhar Bharat*.

Prof. G.D. Sharma, Former Secretary UGC and Ex-Director CEC delivered the Guest Address by quoting from Mahatma Gandhi and linked 3Es through the process of psychomotor skills to be given to the students and by planting trees and saplings for protecting the environment. He said that self study is very important especially in COVID-19 era and virtual lectures are becoming the norm. New 'normal' mode of education could be mixed mode of education, of digital material, applications, Study from Home (SFH) and be self-reliant.

Mrs. Maya Gupta, Director- Principal, Universal Public School (UPS), Preet Vihar delivered the keynote address on "Linking COVID-19 with Education". She talked about

how the education system in India has evolved since the ancient times and transformed from traditional *Gurukuls* to Schools. During corona times there have been many new challenges being faced for School Education. The COVID-19 has changed the dynamics of schooling, but no year can be called a "zero learning year". There is a big responsibility in front of educational institutes, the educationalist, thinkers, and intellectuals.

Dr. Neha Tripathi, Assistant Professor, School of Planning and Architecture, described the need for Environmental awareness among youth and said that corona pandemic is the biggest global health challenge of 21st century. On impact of corona virus she quoted CNN article which reported how Air Travel had dropped to *96%, which was the lowest in 75 years*. She presenting results of a survey conducted among youth and ended with a quote *"A good education is one the most valuable tool to create sustainable tomorrow"* and so Barbara Woods has said that *"we have only one earth and one life".*

Dr. Bhawana Awasthi, Chief Medical and Clinical Oncology, Indian Spinal Injuries Centre, talked about "How to recover from COVID-19: Economic Packages from Hospitals". She shared many challenges faced by the doctors during corona times. Elaborating on the risk factors responsible for spread of the virus, she gave a detailed introduction on COVID-19 transmission. She said there has been a huge economic impact on health care system. Social wellbeing is directly linked to the health wellbeing of the people in the country. She ended with a quote "*An agile healthcare system and a healthy population are keys to the economic and social wellbeing of a country. The absence of that can be psychologically debilitating and can sap the confidence of the citizen and the nations*''

Webinar Recommendations

1.1. COVID-19 has put a big responsibility in front of educational institutes, the educationists, thinkers and intellectuals to impart online education. The students, parents and teachers should work to make it a success.

1.2. For students the key to ***Atmanirbhar Bharat*** is finding your area of interest and work for inter-dependence and creating a win-win situation, thinking and applying your ideas and thoughts, solving your own problems.

1.3. COVID-19 has highlighted beyond our comprehension as how fragile and interconnected, precious life is; and about the relationship between environment and people. The role of science is important in environment protect.

1.4. The COVID-19 has thrown greatest challenge to 3Es: Economy, Education and Environment. Major contributors to air pollution are economic and energy sectors namely; agriculture, transportation, industry, construction and others.

1.5. The important take away to fight climate change are use of solar energy and waste minimization. The waste should be recycled, reused and reduced. Planting of saplings, minimize automobiles use to save fuel, save energy by using more efficient household appliances, reduce consumption of material resources and saving water are other sustaining activities.

1.6. Clinical symptoms of COVID-19 on human health are many. To tackle the crisis healthcare infrastructure has been enhanced like; addition of new beds, availability of PPE kits and masks, requisitioning portions of private hospitals and use of telemedicine has emerged having economic implications on smaller health care systems.

1.7 The message - Youth should develop capacity to fight COVID-19 and plan to live simple and frugal life, taking a vow not to waste.

"*When there are difficulties, we develop capacity to fight it all*".

The webinar can be accessed online at: https://youtu.be/pFqUamiqYKc

December 2020

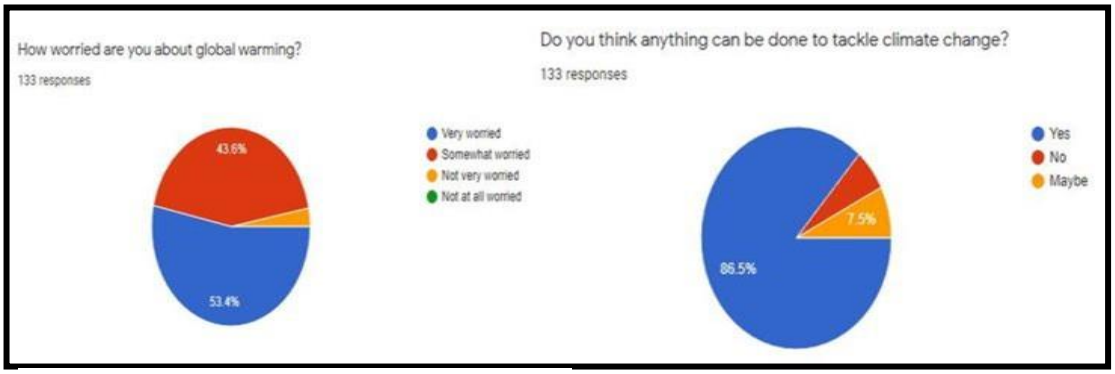
Launch of Climate Change Forum for Youth in India (CCFYI)

The core mission of CCRI is creating awareness, education and mentoring the youth, and wide strata of society about climate change. The CCRI has been working towards the environment and science of climate change by holding meetings and workshops with students, teachers and researchers. Flashback of the activities included, organizing campaign mode experts' lecture series, ozone day competitions and workshops for youth for past few years. In a partnership with the Royal Society of Chemistry an Activity Based Learning Workshop in Chemistry for School Teachers on June 6-7, 2019, was greatly appreciated.

The CCRI has launched "Climate Change Forum for Youth in India" with the idea to have more interaction amongst youth about climate change through virtual platforms or direct participations. In the virtual workshop held in the honor of Teachers Day, which falls on 5th September to share post COVID-19 challenges of 3Es (Education, Environment, Economy of health) being faced by people of India and to create awareness for *Atmanirbhar Bharat* (Self Reliant India) at the national level. Membership to the Forum from youth (age 15-35 years) is invited through Google forms.

Celebrating Youth Climate Action Day–5th December

The **Climate Change Forum for Youth in India (CCYFI)** conducted its first survey for spreading awareness about climate change among the youth in Delhi. The results of Survey clearly showed that youth are concerned and willing to work on individual level for the climate change control action. The changing weather, rising temperature, unseasonal rainfall, floods, droughts etc., are understood as the impacts of the climate change and youth indicated willingness to participate in more debates and webinars on this topic.



Survey response

Chapter 2021

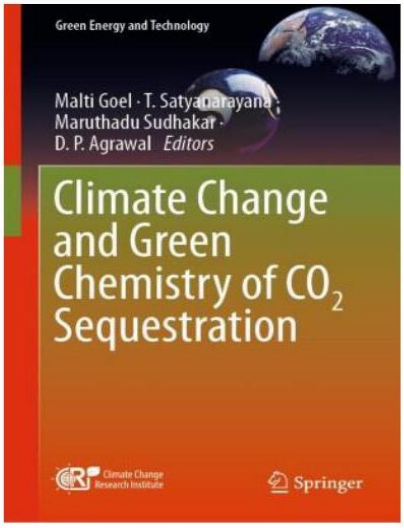
The solutions are clear. Inclusive and green economies, prosperity, cleaner air and better health are possible for all if we respond to this crisis with solidarity and courage.

- António Guterres, Secretary-General, UN

Major Highlights 2021 -
Building a strong base for CCRI

Our Star Publication

The CCRI brings out a book on **Climate Change and Green Chemistry of CO2 Sequestration** published by **Springer-Nature** in 2021.



The Climate Change Research Institute presents a book on "Climate Change and Green Chemistry of CO2 Sequestration".

Foreword by Sh. Suresh Prabhu, former Union Minister of Civil Aviation, Railways, Industry and Commerce Government of India

Discusses advances in carbon dioxide capture and green chemistry of conversion in the context of global climate change

Focuses on CO2 sequestration opportunities and challenges for India's energy security and provides an inter-disciplinary outlook for academic exchange of current research

© 2021

Eds: Malti Goel, T. Satyanarayana, M. Sudhakar, D. P. Agrawal

This book is part of the "Green Energy and Technology" Book Series of Springer Singapore.

Book Climate Change and Green Chemistry of CO_2 Sequestration being released by Shri Suresh Prabhu on 24th June 2021

Chapter 3

An Assessment of CO_2 Reduction Potential from Carbon Sequestration Versus Renewable Energy Targets in India

Malti Goel, Rupali Pal, and Aditya Sharma

Abstract Carbon management from the energy sector is a key challenge before the nations. India as a nation is undergoing rapid economic and social transitions requiring diversified energy resources to meet basic energy needs of the people. India is having a 7% share in the world coal resources, and coal has been the dominant fuel for energy. Several policies that work toward climate change control by reducing or avoiding greenhouse gas emissions, exist. This chapter describes India's energy scene, trends in coal consumption, and India's renewable energy targets. To assess the potential of CO_2 sequestration—carbon capture, utilization, and storage, in mitigating emissions from the Indian industry—CO_2 emission scenarios need to be generated. Using basic assumptions from Coal Vision 2030, the CO_2 emission projections in three scenarios of high coal, business-as-usual, and high renewable energy, without and with CO_2 sequestration are calculated for 2017–2030. The current national and international CO_2 sequestration research is highlighted.

Keywords Carbon management · Energy security · CO_2 reduction · Renewable energy · CO_2 sequestration

Abbreviations

ADB	Asia Development Bank
BAU	Business as Usual
BCS	Best case Scenario

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M. Goel et al. (eds.), *Climate Change and Green Chemistry of CO_2 Sequestration*, Green Energy and Technology, https://doi.org/10.1007/978-981-16-0029-6_3

Springer link: https://link.springer.com/book/10.1007/978-981-16-0029-6.

Webinar on Restoring Earth Resources

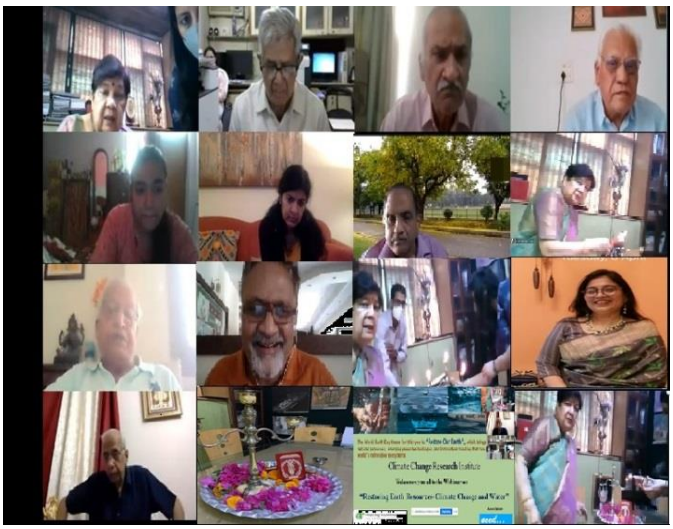
The Climate Change Research Institute (CCRI) held a Science Awareness Campaign on the World Earth Day 2021 on April 27th. The webinar was attended by youth in large number and the registration exceeded one hundred participants. It was 51st Earth Day and CCRI held it in collaboration with SEED. The theme of the event **Restoring Earths Resources: Climate Change and Water** had a focus on the most precious resource of the earth - WATER, without which survival is next to impossible. This was in line with the World Earth day theme for the year 2021 "**Restore Our Earth**" which brings attention to natural processes, emerging green technologies, and innovative thinking that can restore the world's vulnerable ecosystems.

Dr Malti Goel, Chief Executive and President, CCRI in her introductory remarks cited ancient practices and current policies in water management. She said India's National Water Mission 2009 and Jal Jivan Missions 2019 aim to conserve water and reach every household by 2024. The presentation is at: https://bit.ly/3biuGaF

Prof. G. D. Sharma Former Secretary, UGC presided over. In the opening address he shared his experience about *Bund-Bund Bachayen* and described practices adopted in the desert regions with the precise water management techniques.

Prof N. K. Goel, Department of Hydrology, IIT Roorkee delivered the guest address on 'Impact of Climate Change on Water Resources'. He said climate change is felt primarily through changes in water. He explained various impacts of climate change on water resources, mitigation measures and how children can contribute towards environment and save water.

Dr. Rina Surana Associate Prof. MNIT, Jaipur in the special address touched on the Role of Water Bodies in Physical Planning. She elucidated how growth & development lead to encroachment on catchments & reclamation of water bodies. Future physical planning needs were explained.



Two other highlights of the event are (i) **A Water Quiz**- A google link to the quiz on WATER designed for the event was shared with the participants after the webinar. After 10 minutes the responses were compiled and results were announced, (ii) **Release of e-Magazine** - First issue of e-Magazine (January-February 2021) of the Climate Change Forum for Youth in India was released. It has informative articles on climate change, e-news alert sand contributions from the youth in the age group of 15-35 years.

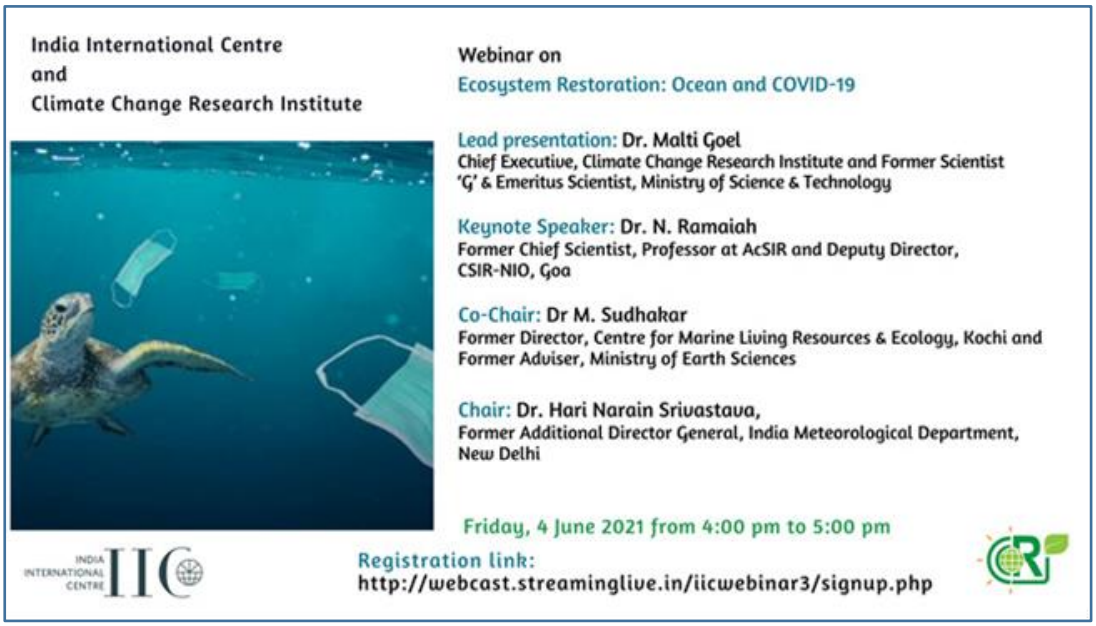
The webinar can be accessed online at: https://youtu.be/S8K3XZph5-Y

Science Campaign and Capacity Building Workshop
World Environment Day 2021

The **World Environment Day 2021** theme this year was **"Ecosystem Restoration".** The CCRI Science Campaign was held on 'Ecosystem Restoration: Ocean and COVID-19'in collaboration with the India International Centre **on 4th June** 2021 having eminent speakers.

Dr. Hari Narain Srivastava, Former Additional Director General, India Meteorological Department, New Delhi chaired the event. He observed that our efforts should be to reduce plastic waste and find new material which could be recycled and made use of in fighting COVID.

Dr. M. Sudhakar, Former Director, Centre for Marine Living Resources & Ecology, Kochi and Adviser, MoES as co-chair andmoderator observed that COVID -19 provided an opportunity to study oceans and collect a very important and critical data set.



Dr. (Mrs) Malti Goel, President CCRIas lead speaker introduced the theme. She said oceans are well known feedbacks to climate system on earth as o*ceans store thousand times more heat than the atmosphere and act as climatic buffers.*She recalled important programmes of DST to address these concerns namely MONTBLEX and TOGA-I executed way back in 1990s. The Sagarmala project has been launched by Govt. of India for comprehensive development of 7500km coast line. She said that Ocean, Climate, Human health, marine ecosystem, and Biodiversity are interlinked and Ecosystem restoration demands ***"One Planet, One Ocean, One Health!"***

Dr. Ramaiah Nagappa, **Former Chief Scientist, Professor at AcSIR and Former Deputy Director, CSIR-NIO, Goa** delivered **keynote address** on 'Post COVID-19 Measures for Sustainable Harnessing of Marine Bioresources. He said the world enjoys 620000km boon of coastal length of which India has a share of less than 1% (0.8%). Indian Ocean with 70 million km^2 area has nearly 7500km of coastline. India's

exclusive economic zone (EEZ) is about 2.01 million km^2. For every kilogram of seafood sold, Carbon Footprint of Product (CFP) left is ~1.44Kg CO_2.

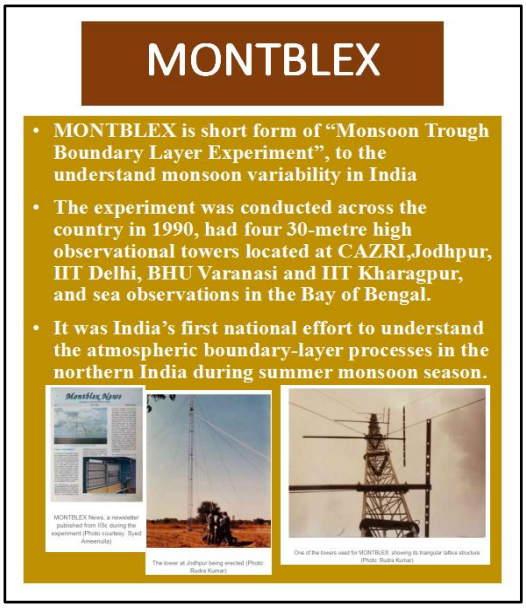
Dr Nagappa pointed out that apart from the impact of COVID-19, the biological resources at sea are facing many other threats, like ENSO Events (El Nino- Southern Oscillation) which occur every two-to-three years, cyclones, tsunami, deficit resolve, policy vacuum, and relegation. For the health of our seas, and sustained outcomes, we need to have national cooperation to take pollution control measures. He concluded by highlighting the 5Isas *Institute, Implement, Impart, Innovate and Ideas.*

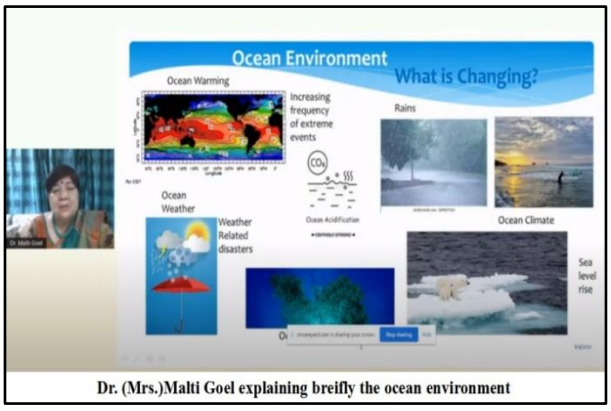
He concluded with following poem written by his colleague, Mr. Simon

Man wishes to live long and stay agile,
The irony, he made his very environment fragile!
Oh! Now he denied clean air to breathe like a juvenile
And it forced him to fall prematurely senile!

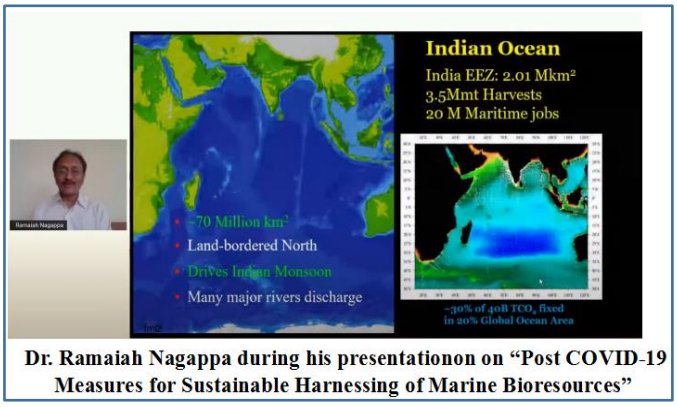
For Ecosystem Restoration and health of our seas, national & international collaborations are vital. Sustained outcomes demand pollution control measures, more scientific observations in seas and reducing single use plastic.

Glimpses of presentations in the Webinar





Dr. (Mrs.)Malti Goel explaining breifly the ocean environment

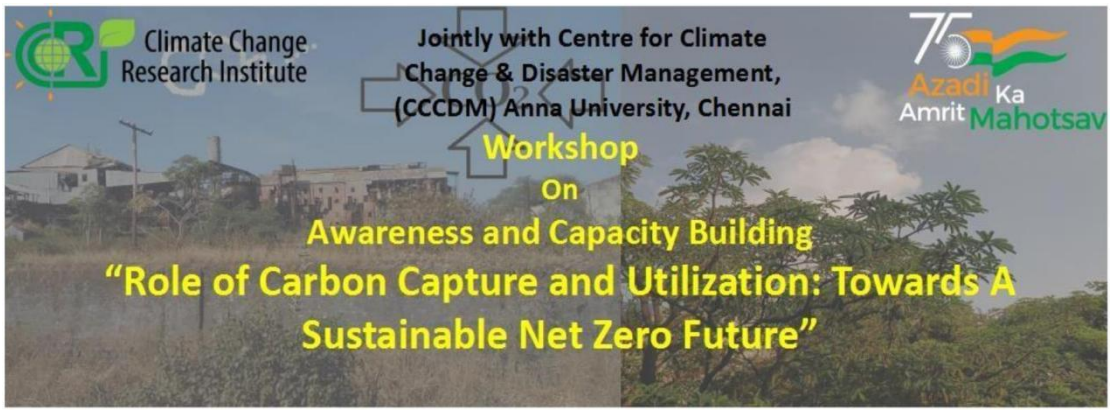


Dr. Ramaiah Nagappa during his presentationon on "Post COVID-19 Measures for Sustainable Harnessing of Marine Bioresources"

The webinar can be accessed online at: https://bit.ly/3mdChh6

Capacity Building Workshop

5th Awareness Workshop on Carbon Capture and Utilization 2021



(ACBCCS 2021)

Climate Change crisis is becoming crucial for the planet with climate emergency looming high requiring accelerated actions for environment protection. Carbon Capture and Utilization (CCU) is a critical technology for reducing concentration of GHGs in the atmosphere. In the 26th meeting of UN Conference of Parties (COP 26) held in Glasgow in early November 2021, world leaders have agreed to take intense climate change mitigation actions to achieve net-zero emission targets by 2050. The CCU was seen as one of the key energy technology and it is vital to understand natural and manmade carbon sinks on land and air.

The CCRI in response to India's 75th year of *Azadi ka Amrit Mahotasava*, held its 5th Awareness and Capacity Building workshop on "Role of Carbon Capture & Utilization: Towards A Sustainable Net Zero Future" (ACBCCS-2021) on a Virtual Platform on 7th December in association with Centre for Climate Change and Disaster Management, Anna University, Chennai**.** Topics included Importance of development of new solvents, direct capture of CO2 from air, CO2 utilization & storage options and coastal zone carbon sequestration.

Shri V S Verma, Shri Gautam Sen, Shri L.K. Bansal and Shri Neeraj Gupta were among the distinguished guests/members attended the workshop physically.

Distinguished speakers

Dr. K. Palanivelu, Director, **Centre for Climate Change and Disaster Management** & **Professor, Centre for Environmental Studies**, Anna University, Chennai

Prof. Mohamed K. Aroua, Head, CCDCU, Sunway University, Malaysia

Shri Gautam Sen, Ex-Sr. VP Reliance, and Ex-ED, ONGC

Dr. Abhijit Mitra, Director, Techno India University, West Bengal, and Ex-Head, DMS, University of Calcutta

The webinar began on high pitch in hybrid mode, with speakers joining from Chennai, Kolkata, Malaysia and other places. More than 150 participants connected from across the country from various organizations. However, due to technical faults the event could not proceed ahead and was rescheduled on 4th February, 2022.

Awards, Achievements and Partnerships on Sustainability

Climate Change Research Institute (CCRI) receives 'Global NGO Expo (GNE) Award of Excellence' on June 28, 2021 designated as one of the Best NGOs in India for setting up and promoting impactful social practices.

The CCRI was designated to support the Sustainable Development Goals (SDGs) Algorithm project of Springer Publications for SDG 13: Climate Action to create strong and representative search engines for generating Training Modules in Machine Learning model.

***Shaastra*, a Science Magazine of IIT Madras interviewed Dr Malti Goel, President CCRI on Carbon Capture and Utilization in India**

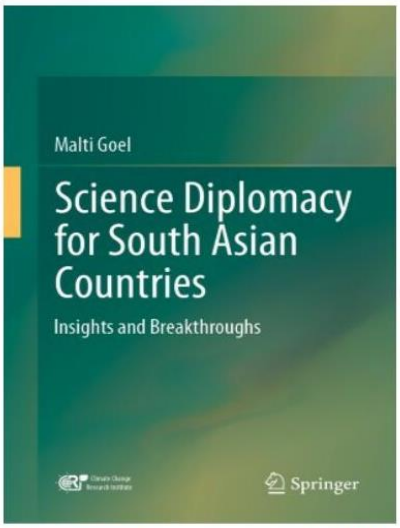
Cleaning up their act

Aditi Jain

Quoted Malti Goel on Carbon Utilization 'CCU is an energy-intensive and costly affair because the process takes place at a given pressure and temperature and in the presence of a catalyst, points out Dr Malti Goel, chief executive at the Climate Change Research Institute, New Delhi. "Therefore, the initial emerging economy, India has set ambitious renewable energy target of achieving 175GWcapacity from renewable energy by 2022. The Paris Agreement on Climate Change represents one of the biggest climate change milestones and a total of 196 Parties at the 21st Conference of the Parties (COP 21) in 2015 agreed to take drastic measures to fight against climate change (UNFCC, 2020). India's Nationally Determined Contributions (NDCs) under the Paris Agreement is to reduce the emission intensity of its economy by over 33-35 per cent by 2030, compared with 2005 levels. Another significant transition is achieving non-fossil fuel-based energy share of 40 per cent in the total installed capacity by 2030. The CO2 sinks are expected to increase by 2-3 billion tonnes per annum. While there is a global drive to adopt clean technology solutions due to the current and future impacts of climate change, barriers in energy transition.

A Book on 'Science Diplomacy' Published

The CCRI published a book on **Science Diplomacy for South Asian Countries: Insights and Breakthroughs** in December 2021. The book is aimed to provide information on a new tool for international cooperation among the South Asian region.



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Author: Dr. (Mrs.) Malti Goel

Dr Malti Goel, Ph.D, D.I.I.T, IIT Delhi, Former Adviser, Govt. of India &CSIR Emeritus Scientist publishes a book on Science Diplomacy with Springer Singapore

Covers science diplomacy for Afghanistan, Bangladesh, Bhutan, India, Maldives, Myanmar, Nepal, Pakistan and Sri Lanka

Elaborates on the current state of bilateral cooperation in technology and research of India with neighboring South Asian countries

Brings together the latest information on international governance models, mega-science projects, sciencepolicy and science diplomacy in India

Foreword by Prof. Dorairajan Balasubramanian
Vice President, TWAS, Italy

Science diplomacy is the tool to build international collaborations among countries and regions to address common issues using scientific and technological knowledge. The World Academy of Science (TWAS) recognizes the importance of science diplomacy for regional cooperation, and science diplomacy is one of its flagship programmes launched in 2011. The TWAS has offered summer courses, thematic meetings, and regional workshops to scientists, scholars, policymakers, diplomats, and other stakeholders from developing countries. Through these activities, the TWAS has made incredible contribution towards capacity building in science diplomacy for aspirants in developing countries.

The genesis of the programme is the Center for Science Diplomacy established by American Association for Advancement of Sciences (AAAS) in 2008. The AAAS Centre has been a leader in bringing science diplomacy to limelight as a critical aspect of science and international relations for building bridges between the nations. It has been documenting and sharing experiences, developing an intellectual framework and providing trainings to support the practice of science diplomacy. Science diplomacy calls for multidisciplinary roles from the *institutions* both government and non-government and a closer interaction between the *scientists* and *diplomats*, who are specialists in their fields. We need 'diplomats' with scientific appraisal and 'scientists' conversant with the art of diplomacy.

The book on *Science Diplomacy for South Asian Countries: Insights and Breakthroughs* is a laudable and brave attempt to catalyze understanding of science diplomacy cross-cutting concepts among the scientists and diplomats in South Asian countries. The need for the book is apparent. Among the developing countries, there is a realization that science diplomacy is less known, and new initiatives are beginning. Therefore, it is the right time to address the challenges of growth and development in South Asia, a lesser integrated part of the world. The book introduces concepts and contours of science diplomacy with international examples. India's current S&T collaborations and future of science diplomacy with neighbouring countries are discussed. In practice, science diplomacy could mean several things. It would require understanding, mutual trust, cooperation, engineering skills, and diplomacy to find a solution for the real problems and the people's aspirations.

I compliment the author for her pioneering effort to take the first step to unravel the disparities and difficulties in cooperation, with possible strategies for adopting science diplomacy in south Asian countries. She does a great job creating awareness among the researchers, scientists, diplomats, and policymakers to take it forward. Readers from countries in South Asia and others would find the book an excellent research resource material.

Prof. Dorairajan Balasubramanian
Vice President, The World Academy of Sciences, Trieste, Italy
Former President, Indian Academy of Sciences, Bengaluru, India
Director Research, Prof. Brien Holden Eye Research Centre, L. V. Prasad Eye Institute, Hyderabad, India
Deputy Director, Centre for Cellular and Molecular Biology, Hyderabad, India

Foreword by Prof. D. P. Agrawal
Chairman, Governing Council, CCRI

Science diplomacy is at the crossroads between science and technology and foreign affairs. L. S. Dand and R. S. Patman, in their book *Science Diplomacy: New Day or False Dawn?* (2015) write, '*As modern foreign policy and international relations encompass more and more scientific issues, we are moving towards a new type of diplomacy, known as Science Diplomacy*'. The statement is valid for developed countries, though even after six years science diplomacy is a much less-known concept among the developing countries.

As the progress is being made in documenting and sharing skills, science diplomacy is recognized as the 'soft power' of science requiring mutual trust and understanding against the 'hard power' of technology involving defence-related interventions and economic sanctions. Unlike traditional diplomacy pursued secretly, science diplomacy aims to raise awareness and promote common interest towards a goal. It is open diplomacy hoping that it could help build regional coherence in scientific communities and improve relationships between the countries.

South Asian countries are rich in human and natural resources, yet economic development in the region has lagged compared to other world regions. During my tenure as Chairman, Union Public Service Commission in India, we began a dialogue between all the Chairmen of the respective public service commissions of SAARC members about the role of public service commission in influencing the youth of the country through the route of education, science and technology, and development. In the very first meeting, the realization was that the members did not appreciate India's big brotherly attitude. Mutual respect is a critical issue to overcome the prevailing mistrust.

I am happy that the book *Science Diplomacy for South Asian Countries: Insights and Breakthroughs* is a thought-provoking attempt to introduce role of science in international affairs for the growth of the region. I commend this work for its original scholarship and praise the author. The foreign policy relationships in future will give significant recognition to scientific professionals and science diplomacy for finding solutions to global challenges contributing to the region's sustainable growth. Breakthroughs in science and technology collaborations will take place and bring the nations in South Asia closer. India needs to take action to develop strategies to make it a win-win situation for the partners. Therefore, it is most reasonable for the Ministry of External Affairs (MEA) to come forward by creating an arm on science diplomacy for South Asia.

I am confident that the book will be a valuable resource for students, researchers, and policymakers.

Prof. D. P. Agrawal
Chairman, Governing Council, CCRI, India
Ex-Chairman, Union Public Service Commission, India
Founder Director, IIITM, Gwalior, India
Former Professor and Dean, IIT Delhi, India

Chapter 1
Introduction to Science Diplomacy

1.1 Science and Inquiry

Science and scientific discoveries have contributed to our understanding of the mysteries of nature from the time immemorial. The Royal Society of London founded in 1660 exemplified the role of science among people. This 'learned society', and a world's oldest academy dedicated to science, has the motto 'Nullius *in Verba*', meaning '*Take nobody's word for it*', i.e. verify the facts through knowledge or scientific inquiry [1]. The resurgence in society about 'science' and 'inquiry' came with the Copernicus scientific theory of heliocentric universe. Nicolaus Copernicus (1473–1543 AD), a Polish scientist challenged the Ptolemy's existing geocentric theory and prevailing thought that the planet earth is the centre of the universe. He stated that the Sun is in the centre[1] and the earth and other planets revolve around the Sun. Copernicus, was condemned vehemently by the religious authority of the Roman Catholic Church. His work explaining the theory was not allowed to be published and the helieocentric texts were banned. The famous Italian scientist Galileo Galilei (1564-1642 AD), who supported Copernicus theory was put under house arrest. In this cacophony the Royal Society continued to promote scientific inquiry for improving natural knowledge independent of political or religious interferences. Religious leadership dominated the western societies until the first Industrial Revolution of the eighteenth century, which provided a major breakthrough to realize a scientific enterprise.

On the other hand, ancient eastern civilizations had been more cooperative and had zeal for scientific reasoning. Greek Geographer Eratosthenes of Cyrene in the second century BC had foretold that the earth is round and its circumference is (todays' equivalent of) 40,000 km. He calculated the earth circumference by using the differences in the observed angles of the Sun from two different locations. According

[1] The work as De revolutionibus orbium coelestium libri vi ("Sixth Book Concerning the Revolution of the Heavenly Orbit") was published as a book in 1543.

M. Goel, *Science Diplomacy for South Asian Countries*,
https://doi.org/10.1007/978-981-16-3025-5_1

Springer link: https://link.springer.com/book/10.1007/978-981-16-3025-5

Our Publications

Bimonthly e-Magazine

The Climate Change Research Institute has started the e-Magazine for a wider outreach among the society. The following Issues of the e-Magazine have been published by the Institute during the period of Report

- e-Magazine Issue-1, January–February 2021 – **CLIMATE CHANGE**
- e-Magazine Issue-2, March-April 2021 - **RESTORING EARTH RESOURCES**
- e-Magazine Vol.-I, Issue-3, May-June 2021 – **ECOSYSTEM RESTORATION**
- e-Magazine Vol.-I, Issue-4, July-August 2021 – **AZADI KA AMRIT MAHOTSAV**
- e-Magazine Vol.-I, Issues-5&6 **– CLIMATE ACTION**

E-Newsletters

- Climate SAR, Vol. VIII, no.1 - Climate Change and Marine Ecology
- COVID-19 and Climate Change, April-June 2020
- Biomedical Waste, COVID-19 and SDG 3, July –September 2020

Books Published

- Climate Change and Green Chemistry of CO2 Sequestration, Eds **Malti Goel,** T. Satyanarayana, M. Sudhakar, D.P. Agrawal, 2021, **Springer Nature,** Green Energy and Technology Series, ISBN 978-981-16-0029-6
- Science Diplomacy for South Asian Countries: Insights and Breakthroughs, **Malti Goel,** 2021,**Springer Nature**, ISBN 978-981-16-3024-8

Scientific articles

Published in the International and national journals of reputes

- **Clean Energy Transitions and Role of Science Diplomacy** Malti Goel, in **SCIENCE DIPLOMACY REVIEW**| Vol. 2, No. 1| March 2020, pp 27-34.
- **Building Bridges between Science and Diplomacy to Address Global Challenges**, Malti Goel, in South Asia in **SCIENCE DIPLOMACY**, October-December 2021, Vol. 5. P 9-12, ISSN: 2456-5318.
- **Climate Change, COVID-19 and Cities: Social Transformation**, Malti Goel and N.G. Tripathi, in **SOCIAL ACTION JOURNAL**, July-September 2020. Vol. 79, no.3 pp206-215.
- **Citizen-Centric Smart Planning: Case Study San Diego**, California, Neha G. Tripathi and Malti Goel, in the book Smart Master Planning for Cities, Springer Nature, Under Publication

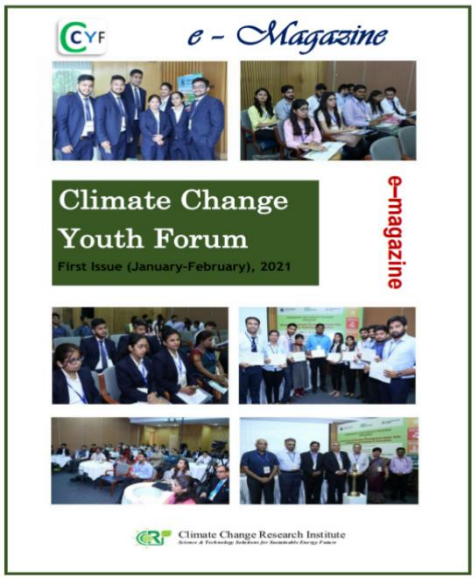
CCFYI Bi-monthly e-Magazines

Knowledge is Power. Knowledge shared is power multiplied

- Robert Boyce

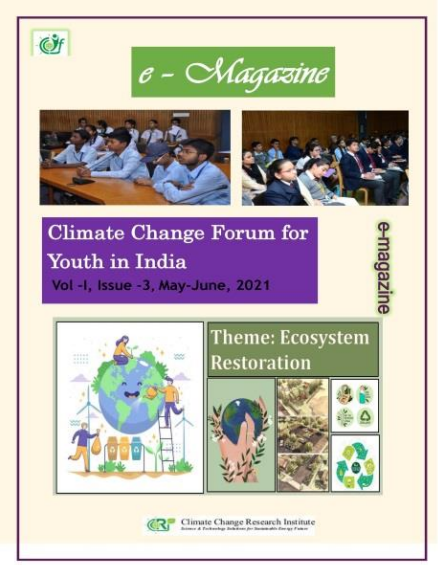
To impart knowledge on various dimensions of climate change The Institute has launched a **Bi-monthly e-Magazine** for Climate Change Forum for Youth in India. As future generation Youth would suffer most from the planetary calamities and have an important role to play; they hold the responsibility to safeguard the earth from getting the destruction caused.

The aim of this e-magazine is to build a responsible and environmental citizenship among the targeted audience using an interwoven integration of environmental and climate change knowledge, a sense of responsibility and self- awareness about scientific solutions to mitigate the ongoing climatic impacts.

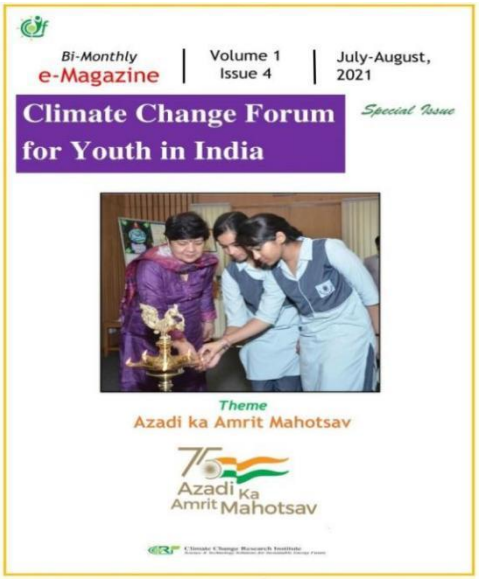


The inaugural issue of e-magazine- **Jan-Feb issue** was released on World Earth Day 2021. It aimed to disseminate knowledge on scientific solutions to climate change, to share their perception, queries and articles on climate change, and to inform them national priorities. The issue having special sections on Members' contribution, e-News Alerts on Climate Change and information on the Chamoli Disaster in Uttrakhand, which occurred in the month of February was shared as knowledge storehouse among the members of CCFYI. http://ccri.in/e-Magazine/e-Magazine-Jan-Feb-2021.pdf

E-magazine **Vol. 1 –No.2 (March-April 2021)** has a theme of World Earth Day describing the role of oceans on climate change and impact of pollution caused by increasing CO_2 emissions and solid plastic waste as new threats to Marine Ecology. It has special sections on Members' contribution, Report on Earth Day celebration, Climatology of smart city- Delhi, e-news on Climate Change, Earth Day Quiz on Water with objective questions related to earth and water, and the response. http://ccri.in/e-Magazine/e-magazine_March-April-2021.pdf



E-magazine Vol. 1 –No.3 (May-June 2021) has a theme of World Environment Day. It has special sections on the Members' contribution, highlights of webinar on Ecosystem Restoration: Ocean and COVID-19 describing role of plastic pollution in oceans; World Environment Day Quiz on Ecosystem restoration. The quiz had a set of 20 questions, sub-divided under four different heads Environment day, Atmospheric Pollution, Water pollution and Ecological restoration. http://ccri.in/e-Magazine/e-magazine-May-June-2021.pdf



E-magazine Vol. 1 –No.4 (July-Aug 2021) is a special issue. To celebrate Azadi ka Amrit Mahotsava in the 75th year of India's independence, the *Special Issue* aimed to reach out the youth of the nation with the best of the knowledge is published. It has sections on CCFYI Members contribution, e-news on climate change and a survey conducted for school teachers about the awareness on climate change. In this issue, decade journey of Climate Change Research Institute from 2010 - 2020 is included. http://ccri.in/e-Magazine/e-magazine-July-Aug-2021.pdf

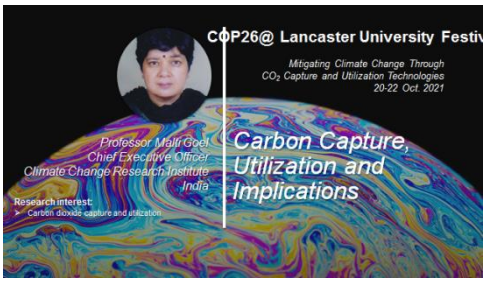
E-magazine Vol. 1–No.5&6 (Sept-Dec 2021) is a combined issue with a theme - Climate Action. On the auspicious occasion of the 75th Anniversary of Indian Independence, Hydrogen mission was launched. The Mission will play a very crucial role in helping the nation to achieve energy independence and to mitigate the Climate Change. The issue has sections on Members contribution, news on International Climate Summit held in New Delhi and The UN Conference of Parties (COP 26) on Climate Change held in Glasgow, besides e-news alerts on climate change. http://ccri.in/e-Magazine/e-Magazine-Sept-Dec-2021.pdf

COP26 Lancaster University Festival on CCU Technologies

'India's determined and proactive interventions against COVID-19 as well as our leadership in the COP26 summit have shown that we are ready to anchor sustainability at the global level'

Dr (Mrs) Malti Goel, President Climate Change Research Institute was invited as lead speaker in the the virtual seminar on **" Mitigating Climate Change Through Carbon Dioxide Capture and Utilization Technologies** " organized by Sunway University on 20-22 October 2021, 9.00 a.m. to 12.00 p.m. (UK Time) as a part of the COP26@ Lancaster University Festival. These seminars by the Centre for Carbon Dioxide Capture and Utilization (CCDCU) sparked debate and showcased leading specialists and research relating to climate change in the run-up to the United Nation's COP26 in Glasgow.

In the Session on Day 1: Green Technologies for CO2 capture, Dr Malti Goel delivered the talk on 'Carbon Capture, Utilization and Implications' covering the need for Carbon Capture and Utilization; new technologies, large-scale CCUS projects, achievements in them and major technical, market & policy challenges. Amount of CO2 utilized depends on the demand for the products and their market acceptance. Need for adoption of science based targets for energy intensive industries was highlighted. CO_2 Capture- the Quest for Green Solvents by Prof. Mohamed Kheireddine Aroua, and Application of machine learning approaches for the sustainable development of CO2 mitigation processes by Dr. S. Mazari were other highlights of the day. The presentation is available at https://youtu.be/GeDjPvcS63k



Concluding Remarks

The Climate Change Research Institute during the COVID-19 crisis in past two years has participated and organized several awareness campaigns. The Institute has held capacity building workshops, EEC lectures and interacted with the students, teachers, researchers, policy makers and professionals. Topics such as Climate Change, SDGs, COVID-19, Oceans and Biodiversity are discussed. We partnered with the Centre on Climate Change, Society for Environment & Education, Universal Public School and India International Centre.

In these two years, major effort has gone into holding virtual events, environment education and dissemination of information. The Climate change Forum for Youth in India (CCFYI) was launched. The national targets such as Atmanirbharata and 75th year of Azadi ka Amtrit Mahotsava have been the focus. The Report spotlights the activities and programs organized and managed by the Climate Change Research Institute (CCRI), INDIA starting from January 2020 to December 2021. These are, but a few examples of the many ways in which the Climate Change Research Institute has been working and progressively contributing to create a transformative impact among youth about S&T solutions to emerging challenges in climate change.

Acknowledgements

Prof. D. P. Agrawal, Chairman, GC, Ex-Chairman UPSC, Founder Director, IIITM, Gwalior

Dr Ramaiah Nagappa, Prof. at AcSIR, Ex- Chief Scientist& Ex- Deputy Director, CSIR-NIO, Goa

Prof N.K. Goel, Department of Hydrology, & Dean of Students' Welfare, IIT Roorkee

Prof G.D. Sharma, Ex-Director, CEC and Former Secretary UGC

Shri V. S. Verma, Member GC, Ex-Member, CERC and Member (Planning) CEA

Mrs. Maya Gupta, Director –Principal, Universal Public School

Prof K. Palanivelu, Director, CCCDM &Professor Anna University, Chennai

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Dr. M. Sudhakar, Director, CMLRE, Cochin, Ex- Adviser, Ministry of Earth Sciences

Dr Reena Surana, Associate Prof. MNIT, Jaipur

Dr Neha G. Tripathi, Assistant Professor, School for Planning & Architecture (SPA)

Dr Bhawana Awasthy, Chief Medical and Clinical Oncology, Indian Spinal Injuries Centre

Esteemed GC and EC Members

Our Collaborators

India International Centre (IIC)

The India International Centre is premier cultural organization situated in New Delhi, India. Membership of the IIC includes artists, academicians, senior government officials, judges, jurists, parliamentarians, doctors, ministers, governors, social activists, journalists and persons from scientific domains, whomeet to initiate the exchange of new ideas and knowledge in the spirit of international cooperation.

Society for Education and Economic Development (SEED)

SEED is a registered society under Society Reg. Act and has been working since 1992. The object is link Education and economic development. It has several centers namely; Centre for Higher Education studies and training, Centre for economic analysis and Women empowerment through micro enterprise Shiksha for adults and children education. It has forum of colleges India named as Indian colleges forum. Centre for WTO studies. Its focus is on research and development.

Universal Public School (UPS)

Universal public School aims to be an institution that empowers each child with a sound foundation of knowledge, values, and life skills. An innovative, contemporary and skill-based education that meets global standards is the hallmark of the school. Itendeavors to craft socially conscious and responsible individuals who like to serve the society.' The school aims at nurturing individuals with paramount values and multivalent competencies. This task is accomplished by virtue of a dynamic curriculum that envisions not only academic excellence but effective skills and the art of living. A comprehensive education system coupled with a passion for sincerity, dedication and excellence drives us towards creating global leaders who will take on the mantle of tomorrow.

CCCDM, Anna University

Anna University's world-leading scientific expertise and experience, its unmatched facilities for multi-disciplinary research, its leadership-class computational systems, and its decades-long history of leading-edge scientific research and analysis of complex systems, provide a unique foundation for Centre for Climate Change and Disaster Management to lead future advances in climate change research.

Participation and Lectures delivered in the Seminars by Dr (Mrs) Malti Goel, President CCRI

Attended ORF Dialogue with Mr Ashok Mullick on Foreign Policy, Policy Adviser, MEA on 3rd January 2020.

Participated in National DD TV Channel Panel Discussion on ***'Samadhan Carbon ka'*** in Hindi on DD Science on 16th January 2020.

Delivered the presentation on **KUSUM Scheme: Opportunities & Challenges** in India Energy Forum Summit on Renewable Energy Trajectories held on 17th January 2020.

Lecture on **Physics of Global Warming and Strategies for Mitigating Climate Change Crisis** at MIT Meerut under INSPIRE Programme of DST on 23rd Jan 2020.

Panelist in the **World Petro Coal** conference in the Session on Future Energy Systems: Fuel Markets Global Opportunities on 17th February 2020.

Chief Guest address on **'Women in Science'** on **National Science Day** celebration on 28th February at the HSTC college, Mathura.

Member, NCCF and Technical Working Group (TWG) of Carbon Registry of the **Network for Certification and Conservation of Forests**

Environment Day lecture on **"Post COVID-19: Future on Biodiversity"** at the India International Centre (IIC), to celebrate 5th June 2020 on a virtual platform.

Lecture on **Coal as Energy Fuel in Thermal Power Plants** for the ICED trainings '**Audit of Environmental Management in PSEs (Steel and Power Plants)**', Jaipur held on 25th June 2020 on a virtual platform.

Lecture on **CleanCoal Technology and Environment Audits in** the ICED Training on 'Audit of Environmental Management in PSEs', Jaipur.

Participatedas Jury for, NIT Calicut thesis evaluation of the **Masters in Planning Graduates** on a virtual platform held on 22nd August 2020.

Convener IEF *Urja Vichar Manch* on importance of forecasting in Renewable Energy (RE) development held on 22nd October 2020.

Lecture in virtual mode on '**Challenges in Nature's Healing: Climate Change and COVID-19**'in the webinar "**COVID-19 and 3Es for Atmnirbhar Bharat**"

Invited talk on ''32 years and Healing'' – Our Planet, Our Environment" in the seminar on "Ozone Layer & Climate Change: Human Efforts" organized by STE on 19th September 2020.

Deliveredlecture on **CCS Status and Challenges' in** IEF Webinar on ''Challenges Facing Integrating Renewable Energy In Electricity Grid and Reducing Carbon Footprints" on 22nd Jan 2021.

Lecture on **Woman in Science** in the event **'She Inspires'** organized by IITDAA on 11th March 2021 to celebratethe International Women Day.

Lecture on "Plastic Pollution and Control" in the **NOSTC programme '100 Schools, 100 lectures'** at Modern Public School, Shalimar Bagh on 19th March 2021.

Convener Joint webinar organized by the **International Solar Alliance** and the India Energy Forum on 27 April 2021.

Theme lecture on **"Restoring Earth Resources-Climate Change and Water"** in CCRI workshop in collaboration with SEED on 27nd April, 2020.

Delivered the talk on **Ecosystem Restoration: Ocean and Pandemic** in the virtual Webinar on Environment Day at **India International Center** on 4th June 2021.

Keynote Lecture in the **Inauguration** of the **International Conference on Recent Advances in Mechanical Infrastructure** (ICRAM – 2021) by IITRAM, Ahmedabad on August 6-8, 2021.

Chief Guest lecture on **UN Sustainable Development Goal 7- Affordable and Clean Energy** in **Self-Actualized Leadership Network Global Summit 2021** (SALN) by **Defined Values Consultants Pvt Ltd. on 21st August 2021.**

Participated in the **International Climate Summit 2021** of the PHD Chamber of Commerce and Industry, at Taj Palace, New Delhi. jointly with Team **Norway** on 3rd Sep 2021.

Lead talk on Carbon Capture, Utilization and Implications in International Seminar organized by **Sunway University**, Malaysia on 20-22 Oct 2021

Presented Carbon Capture, Utilization in IRON & STEEL Industry: Outlook and Implications in the **IIM ATM 2021 & International Conference on** 13-15 Nov 2021.

Delivered a lecture on **Stay Smart-Love Green-Go Clean** in the IITDelhi**Annual Alumni Day-cum-Festival seminar** held on '**Equitable Growth and Sustainable Development'** held on 26-27 December 2021.

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Vision

Mission

Innovate and become a Center of Excellence in Environment and Climate Change education.

Organizers

Climate Change Research Institute is founded with a mission to promote environment and climate change education, innovation and teachings. It aims to address wide strata of society about the consequences of climate change on our lives and taking control measures. Institute is taking initiative to create awareness on energy security and sustainability through lectures in schools and college, workshops and internet reach. Its future work plan includes development of educational tools on topics of scientific and societal interest; such as energy, health and water in the climate change context. Research and studies would be undertaken on science & technology measures aimed at climate change mitigation and ways of reducing the emission of CO_2.