

# The 6<sup>th</sup> International Conference on Climate Change 2022

17<sup>th</sup> – 18<sup>th</sup> February 2022 | A Virtual Conference

“Meeting Climate Challenges Amidst the COVID-19 Pandemic”



# BOOK OF ABSTRACTS

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Book of Abstracts  
The 6<sup>th</sup> International Conference on Climate Change  
2022  
(ICCC 2022)

17<sup>th</sup> and 18<sup>th</sup> February 2022

Committee of the ICCC - 2022

The International Institute of Knowledge Management (TIKM)

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# ORAL PRESENTATIONS

A1

[01]

## EFFECTS OF PHOTOVOLTAIC CELL TECHNOLOGIES ON PHOTOVOLTAIC SYSTEM PERFORMANCE

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### **ABSTRACT**

Technology is deployed to take the advantage of the ultimate energy from the sun (solar energy) to be used as heat or clean electricity. This energy is classified as “sustainable energy” or “renewable energy” because it requires a short period to naturally replenish the used energy. The application of solar energy involves the conversion of the natural energy resource into a usable form, either as heat or as electricity. The device consists of solar cells made from semiconductor materials, such as silicon, cadmium telluride, gallium arsenide and so on. Because solar potential is both location and climate-dependent, it is characterized by low energy intensity and intermittency, which limit its application; an improvement of PV system performance will facilitate more deployment of the clean electricity system. Many factors affect the performance of PV systems, which include site location, climatic conditions, PV cell material, the orientation of the panel, installation method, arrangement of the PV cells in the system. However, this study focuses on the impacts of two variables; PV cell technologies and ambient temperature. The performance of a PV system at different ambient temperatures and PV cells in a hypothetical site location at Durban, South Africa, will be examined. The performance evaluation will be based on some of these parameters rate of performance ratio (PR), capacity factor (CF), energy production and losses, and degradation. Due to the study outcomes, the study will discuss the required technical inputs to improve the PV system’s performance. This study exploits the rapidity, flexibility, and advanced process of computer-aided engineering (CAE) in executing the objectives of the study by using software applications; PVsyst and SolarGIS Prospect.

Keywords: solar photovoltaic system, solar performance ratio, PV cells, solar performance factors, solargis prospect, PV performance

A2

[02]

**IMPACT OF COVID-19 PANDEMIC ON CARBON DIOXIDE EMISSIONS IN  
COLOMBO DISTRICT, SRI LANKA (2010-2020)**

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***ABSTRACT***

Coronavirus Disease 2019 (COVID-19) is an infectious disease caused due to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). COVID-19 has impacted the environment both positively and negatively. The study focuses on the reduction in Carbon dioxide (CO<sub>2</sub>) emissions due to the COVID-19 pandemic. Carbon dioxide emission data were forecasted for the year 2020 through time-series analyses using R software considering the period from 2010 to 2020. Forecasted values were compared against the actual values. According to the statistical analyses, a significant reduction in emissions was observed during the study period. Actual emissions of CO<sub>2</sub> showed an average reduction of 45% and 2% with respect to transport and thermal-electricity consumption, compared to the forecasted data based on the past 10 years. Meanwhile, it was observed that the emission of CO<sub>2</sub> had increased compared to the past data in the post- COVID period of the first wave. A significant drop in CO<sub>2</sub> emissions to the atmosphere is visible in the COVID-19 pandemic period in 2020, mainly due to the closure of industries and restricted human activities due to the lockdown. Carbon dioxide emissions in Colombo district, Sri Lanka were reduced by approximately 420 kTCO<sub>2</sub> accounting for a 30% reduction compared to the forecasted amount. For a long-term drop in air pollutants, structural and transformational alternations should be introduced in industrial, energy, and transportation fields while approaching environmentally friendly and sustainable lifestyle practices.

Keywords: CO<sub>2</sub> emissions, COVID-19, lockdown, Sri Lanka

A3

[03]

## HOW DO BIOSPHERE RESERVES AFFECT LOCAL VULNERABILITY AND ADAPTATION TO CLIMATE CHANGE? EVIDENCE FROM INDIA

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### **ABSTRACT**

The biosphere reserves (BRs) of India are the repository of biodiversity as well as the abode of many traditional societies. Such traditional societies derive many of their livelihood requirements from the rich biodiversity around them. All the more, the BRs also contribute to food security of the people within their premises. Many of the forest-linked activities of the traditional societies are mediated through rich Traditional Ecological Knowledge (TEK). Unfortunately, while the issues of biodiversity have been addressed at length, the cultural diversity has been relegated to the point of oblivion. Climate change is becoming an ever increasing global threat which is difficult to ignore. The changing climatic conditions coupled with resource management regulations, such as those associated with the establishment of BR, can increase vulnerability and compromise individual and collective agency for adaptation. The BR management, therefore, necessitates understanding not only of ecological issues, but also socio-economic and cultural issues linked with the former. The present study looks into the development of the concept of BR and issues related with it in general terms and with respect to India in particular. We have tried to investigate how the climate change makes the communities in biosphere much more vulnerable. We have also tried to ponder over the adaptation strategies of communities of BR's in order to cope up with climate change.

Keyword: biosphere reserves, traditional ecological knowledge (TEK), vulnerability, adaptation, climate change

A4

[04]

**DARK SHADOW**

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*Marco Peroni Ingegneria, Italy**[\\*peroni@marcoperoni.it](mailto:peroni@marcoperoni.it)****ABSTRACT***

Our proposal consists of a large geostationary orbiting installation composed of an inhabited ring and a large shading screen. The screen is made up of movable elements that can open and close in order to shield the sunlight in a more or less powerful way to mitigate global warming and lower the average temperature on Earth. The screen will be composed of immense lozenges that with their surface go well beyond the size of the globe so as to shade it completely, if necessary. The same elements of the shielding are photovoltaic panels that when closed, or even in the case of their semi-closed, produce energy enough to power the entire planet Earth. The energy produced will then be sent to Earth via microwave that will be sent through an emitter that rotates synchronously with the rotation of the Earth (in an orbit apart from the plane perpendicular to the axis of the Earth) and it will send the beam to a precise collection point in the desert or in the middle of the ocean as well, so that it is then fed into the net. The surface of the photovoltaic panels will allow to produce at least 50000 Terawatt/h necessary to cover, with a large surplus, the consumption of the entire planet Earth so that, on the planet, people can avoid to produce energy by releasing CO<sub>2</sub> or using atomic energy. The overpopulation of the planet will be managed through the inhabited area of the ring that rotates of motion precisely so as to produce sufficient artificial gravity to ensure habitability and comfort in this new artificial world.

Keywords: shadow, shading screen, photovoltaic panels

A5

[05]

**SMART SILVOFISHERY IN MANAGEMENT OF MANGROVES IN THE  
MAHAKAM DELTA, EAST KALIMANTAN**

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**ABSTRACT**

The Mahakam Delta (DM) is Indonesia's largest delta, located in East Kalimantan Province, and boasts a diverse mangrove ecosystem. Because the waterways around this DM are so productive, many people are converting mangrove land to aquaculture. As a result, Kalimantan is Indonesia's second-largest exporter of tiger prawns. Continuous land clearance alters the area's function, which has a negative impact on water and climate. The goal of this study is to evaluate the use of smart silvofishery for barramundi culture as a means of restoring the mangrove ecosystem's role as a carbon sink. Smart silvofishery in this article is environmentally friendly application of the plant extracts of *Solanum ferox* and *Boesenbergia pandurata* to improve fish growth, immunity, and resistance to water quality in Barramudi aquaculture. The findings suggest that silvofishery ponds may absorb carbon, and that can assist enhancing Barramudi production while also being environmentally beneficial, without polluting the waters for sustainable aquaculture. Smart silvofishery can be used to rehabilitate mangroves that have been unduly opened for ponds by the local community.

Keywords: smart silvofishery, white snapper, mangrove, *Solanum ferox*, *Boesenbergia pandurata*

A6

[06]

**LOCAL LAW INITIATIVE FOR PROTECTION OF MANGROVES IN DELTA MAHAKAM, EAST KALIMANTAN AS A CLIMATE CHANGE MITIGATION EFFORT**

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**ABSTRACT**

Indonesia is a country with the largest and the highest mangrove ecosystem diversity in the world, this should make a significant contribution to climate change mitigation efforts. However, mangroves are not protected because of the land use function conversion. There are 1.82 million hectares of mangroves in critical condition, including 27.243 hectares in East Kalimantan, which includes the Delta Mahakam area that only leaves 22.75% mangroves coverage. The mangrove's critical condition shows that the law has not been able to work properly in regulating human behavior. This research answers three problems; first, what is the legal situation of mangroves protection as an effort to mitigate climate change internationally, nationally, and locally; second, how to establish ideal mangroves protection regulation at the local level; and third, how is the response of the community in Delta Mahakam to the local-level regulation establishment. The research aims to find out the legal situation and the ideal form of local legal initiatives as an effort to mitigate climate change. The methodology uses socio-legal research through action research in five villages in the Delta Mahakam, East Kalimantan. The results showed that the regulation of mangroves at the international, national and local levels only regulates in general and there is no specific regulation regarding mangroves. Therefore, it is necessary to establish participatory regulations at the local level to ensure the protection of the mangroves. Five villages agreed to develop participative local legal products to protect mangroves as an effort to mitigate climate change. Thus, it can be concluded that local initiatives for the formation of legal products to protect mangroves are important in efforts to ensure climate change mitigation.

Keywords: mangrove, local law, climate change, mitigation

B1

[07]

**NEW FORMS OF ECOLOGICAL EDUCATION IN THE CONDITIONS OF THE  
PANDEMIC 2020-2021**

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**ABSTRACT**

The education system in almost all the countries of the world, faced the need for an urgent transition to a special home education regime with the pandemic situation in 2020, and could not immediately adapt to the new working conditions, since the existing ones were mostly held physically and there were unexpected problems requiring a solution of social, economic, technical, psychological, professional, personnel, etc.. However, the pool of publications devoted to this issue have mainly analyzed the negative consequences of the new educational conditions, provoking protest moods in society. Much less attention is paid to the positive impact of new unusual and “proved to be extremely effective” forms and methods of education, thanks to which many schoolchildren prepared better for the entrance exams, and the learning system transferred to the mode of individual work with the student. Existing remote platforms such as the on-line platform "Ecological Commonwealth", created in 1997 and to this day functioning at Moscow State University, turned out to be in great demand and united into a single network more than 300 educational institutions of Russia. The successful experience of conducting webinars was also useful on ecology and environmental protection for schoolchildren within the framework of the «Green school». Forced seclusion became a trigger for those who were ready to gain new knowledge without leaving home. The current situation demanded an urgent developing new work methodology, such as guidelines “Be Prepared for Different Developments” for teachers. It manages not only online classes for students, schoolchildren and teachers of ecological education, but also launches new research projects, such as #We investigate at house, dedicated to the study of the psychological state of citizens during the period self-isolation by collecting data through the platform Testograph.ru.

Keywords: ecological education, pandemic, «Green school», on-line education



**B2**

**[08]**

**PARTICIPATORY MAPPING IN THE MAHAKAM DELTA, EAST KALIMANTAN**

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**ABSTRACT**

The Mahakam Delta (DM) is Indonesia's largest delta, located in East Kalimantan Province which is in Muara Badak district and Anggana district. As a result, most of the society in Mahakam Delta is fisherman, and also, Kalimantan is Indonesia's second-largest exporter of tiger prawns. Continuous land clearance alters the area's function, which has a negative impact on the environment's water and climate. The function of participatory mapping is to increase the awareness of society on their right of land and natural resources. Participatory mapping can increase the passion for local knowledge, history, system of the institution, the local law, etc. The goal of this study is to find out the culture, the growth, also the profile of village government to the public.

Keywords: participatory mapping, village government, culture, society

B3

[09]

**THE FORGOTTEN ISSUE OF ENVIRONMENT SUSTAINABILITY IN INDIAN  
POLITICS: RHETORIC AND REALITY**

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**ABSTRACT**

Can sky be owned? This billion-dollar question raises a very important point that the common assets like sky, water, air belong to all or privileged few? This research article highlights the important issue of Environment Sustainability and its omission in the Indian Politics. Election time is the most happening time in India. During every election campaign every political party presents a rosy picture of a developed India in order to fetch as many votes as it can. But, none of them dare to answer a question on what the cost will be of this development? Moreover, how sustainable will be this development? It isn't possible in a country like India to separate issues of livelihood and environment, this paper talks about that unfortunately no major political party has taken a serious note of this. None of the party manifestos have touched on the environmental crisis in the real sense. This paper analyses the manifestoes and the common minimum program of the major national political parties in the last two general elections as well as the mention of the words like environment, sustainability and climate change in their official twitter handle over the same period i.e., from 2014 to till present. In a democratic country like India, Political Parties are the agents of Political education as well as Socialization and these parties are expected to take note of important issues, but it has been observed that there has to be a calamity for politicians to take notice and this is a freighting trend.

Keywords: environment, elections, manifestoes, political parties, sustainability

B4

[10]

**CORRELATION OF WATER QUALITY, UV-VIS ABSORBANCE, AND  
FLUORESCENCE MEASUREMENTS OF LAGUNA RIVERS DURING MONSOON  
PERIOD**

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**ABSTRACT**

The Santa Rosa watershed is composed of Santa Rosa city, Biñan city, Cabuyao city, and Silang, Cavite. Water samples were collected from the Santa Rosa River, Cabuyao River, and tributaries for water quality, absorbance, and fluorescence measurements from November 2019 to February 2020. These measurements were used to analyze and characterize dissolved organic matter (DOM) in river systems. High correlations were observed between water quality and absorbance measurements of DOM sources. Protein-like and humic-peak fluorescence measurements showed a strong correlation with water quality measurements such as dissolved organic carbon, and suspended solids. It has been observed that some of the factors affecting water quality are land use (such as domestic sewage, commercial and industrial waste), and climate change (such as heavy rains). The results of this study can be used to develop optical systems for environmental monitoring systems in natural waters.

Keywords: optical systems, dissolved organic matter, Laguna watershed, fluorescence, water quality, absorbance

B5

[11]

**MONITORING OF CLIMATE EXTREMES AND FUTURE PROJECTION OF RAINFALL AND TEMPERATURE IN THE WETTEST PARTS OF SOUTHWEST ETHIOPIA UNDER FOUR REPRESENTATIVE CONCENTRATION PATHWAYS**

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**ABSTRACT**

Ethiopia is categorized as one of the most vulnerable countries to climate extremes. A better understanding of climate extremes at short and long timescales is crucial to minimize the potential impacts of these extremes. The present study aimed to characterize the frequency and severity of agricultural and hydrological drought in southwestern parts of Ethiopia over the period 1971 to 2020. Satellite blended/gridded and historical observed monthly rainfall, maximum temperature and minimum temperature data of nine stations (Arjo, Bako Tibe, Bedele, Didessa Dildey, Gedo, Gimbi, Sekoru, Serbo and Nekemte) were obtained from Ethiopia National Meteorological Agency. We used standardized evapotranspiration index (SPEI) to calculate the dry and wet condition at 3-, 6-, and 12-months timescales. Besides, past climate change analysis, future rainfall and temperature were projected under four representative concentration pathways (RCP) of CMIP5 for the near and mid-term (2041-2060) and end of the twenty-first century (2081-2100). Our results showed that the frequency of drought in the short timescales is much higher than that of the longer timescales. In the present study, a total of 108 and 111 drought months were observed at Bedele and Nekemte, respectively at SPEI 3 and both stations recorded a total of 101 at SPEI 6. An increase in projected mean minimum and maximum temperature by 1.2°C was observed by the end of 21st century comparative to the reference time (1986-2005) under a high emission scenario (RCP8.5). Projected changes in rainfall showed a slight increase over the periods 2041-2060 and 2081-2100 under RCP4.5, RCP6.0 and RCP8.5, while projected trends under RCP2.6 indicated a slight decrease. The results of this study provide evidences for policy makers towards climate change adaptation and mitigation in the southwestern parts of the country.

Keywords: agricultural drought, climate change, drought indices, standardized evapotranspiration index, climate change projection

C1

[12]

## EFFECT OF BIOCHAR ON WATER RETENSION AND LEACHING OF NUTRIENTS IN A SANDY LOAM SOIL

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### **ABSTRACT**

Nutrient leaching causes agronomic and environmental problems in intensively cultivated soils. We evaluated the effect of biochar on retention and the quantity of nutrient leached in a sandy loamy soil. The experiment was a randomized complete block with 4 replications. Treatments included a control, 90:60:60 kg NPK/ha (MF), 3 sources of biochar (corn cobs, groundnut shell and poultry manure); the biochar materials were repeated with the addition of 45:30:30 kg NPK/ha (0.5MF). 5 t ha<sup>-1</sup> biochar was applied. Upland rice was grown in each lysimeter. Leachate from each lysimeter was collected at three weeks intervals up to 24 months. For the two years running biochar significantly decreased the volume of water leached. Control and MF treatments showed higher concentrations of NO<sub>3</sub>-N and K in the leachate. At a depth of 70 cm leaching significantly reduced with three different sources of biochar 0.5MF and MF. Our results indicated that biochar+0.5MF could be appropriate as a sustainable agronomical approach.

Keywords: lysimeter, leaching, nutrient, biochar, inorganic fertilizer, moisture retention

C2

[13]

**SOIL ORGANIC CARBON IN DIFFERENT MANGROVE ECOSYSTEMS IN  
MUARA BADAK, MAHAKAM DELTA, INDONESIA**

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**ABSTRACT**

The mangrove ecosystem is an important coastal ecosystem that ensures the ecological security of the coastal area as well as the livelihood security of coastal fishermen. Furthermore, because a large amount of carbon is stored in below-ground biomass, it plays an important role in carbon sequestration. The role of mangroves in various ecosystems in carbon stocking has not been thoroughly studied, either globally or nationally. The current study aims to quantify the soil organic carbon stock of mangroves associated with natural regeneration, restored, abandoned, and silvofishery ponds in Muara Badak, Mahakam Delta. The soil organic carbon stock of three soil layers (0–50 cm, 50–100cm, 100–150cm) from natural regeneration in the river border, restored, and abandoned ponds were 25.87 (Mg C ha<sup>-1</sup>), 106.38 (Mg C ha<sup>-1</sup>), 65.52 (Mg C ha<sup>-1</sup>); 44.59 (Mg C ha<sup>-1</sup>), 109.63 (Mg C ha<sup>-1</sup>), 81.41 (Mg C ha<sup>-1</sup>); 58.84 (Mg C ha<sup>-1</sup>), 120.07 (Mg C ha<sup>-1</sup>) and 44.44 (Mg C ha<sup>-1</sup>), respectively. The study found that soil organic carbon stock was higher in mangrove restored areas than in abandoned ponds and natural regeneration along the river's edge. Mangrove restoration and rehabilitation are required in this regard to preserve the ecologically important mangrove ecosystem and mitigate the effects of climate change.

Keywords: soil organic carbon, mangrove ecosystem, abandoned ponds

C3

[14]

**THE UNTOLD CAPACITY OF TROPICAL SALT MARSHES IN CARBON  
CAPTURE AND STORAGE – A CASE STUDY FROM WEDITHALATHIVU  
NATURE RESERVE, SRI LANKA**

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**ABSTRACT**

Compared to terrestrial carbon sinks, coastal wetlands indicate a greater potential for carbon capture and storage. Hence, the main coastal wetland ecosystems: mangroves, seagrasses, and salt marshes are incorporated into national and regional level climate change mitigation action plans. However, salt marshes remain poorly evaluated in South Asia and a major research gap exists on the carbon storage potential of tropical salt marsh ecosystems. The total organic carbon (TOC) quantifications require comprehensive estimates from vegetative and sediment compartments, and location-specific values enhance the accuracy of the approximation. The present study aims to calculate the TOC stocks in salt marshes on the Northwestern coast of Sri Lanka. Vegetation and soil samples (up to 50 cm depth) were collected from four sites representing the Wedithalathive Nature Reserve. Organic carbon estimates of the aboveground and belowground components were quantified using species-specific allometric relationships and the Loss-on-ignition method respectively and, were combined to generate the TOC estimates. The TOC stock of Wedithalathive Nature Reserve ranged between  $49.24 \pm 5.62$  Mg C ha<sup>-1</sup> and  $112.30 \pm 8.56$  Mg C ha<sup>-1</sup> with an average value of  $73 \pm 14.47$  Mg C ha<sup>-1</sup>. The aboveground vegetation nearly accounted for 2% of the TOC stock. Even though the soil samples extracted from vegetated plots displayed higher values of soil organic carbon than the samples from the unvegetated plot, no statistical significance was observed between the two test groups. Our study showcases the prominence and importance of soil components in retaining carbon. This estimation will improve the regional and tropical saltmarsh carbon estimates, by providing baseline data to promote further research.

Keywords: coastal wetlands, salt marshes, total organic carbon

C4

[15]

## INFLUENCE OF BIOCHAR AND INORGANIC FERTILIZER ON UPLAND RICE-COWPEA INTERCROP COMPETITIVE INDICES

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### **ABSTRACT**

We conducted a trial to evaluate the competitive indices of upland rice-cowpea intercrop. Sole cropping of the two crops was also done. The experiment was a randomized complete block with 4 replications. Treatments included a control, 90:60:60 kg NPK/ha (MF), 3 sources of biochar (corn cobs, groundnut shell and poultry manure); the biochar materials were repeated with the addition of 45:30:30 kg NPK/ha (0.5MF). 5 t ha<sup>-1</sup> biochar was applied. The crops were arranged in a 3:1 rice-cowpea ratio. In this study, intercropping system gave higher land equivalent ratio (LER). Biochar poultry manure+0.5MF exhibited higher rice aggressivity (2.43), relative crowding coefficient (1.74) and competitive ratio (4.11). Rice was more productive in terms of competitive ratio when it was in association with cowpea. In terms of nutrient use efficiency nitrogen was high with intercrops, but was very low in sole crop. Intercropping of rice with cowpea gave higher economic advantage (9544.5), income equivalent ratio (403.1), production and cost benefit ratio (2.68) for biochar poultry manure+0.5MF than MF (8534.4, 301.86, 2.52) respectively. Intercropping rice and cowpea will be more beneficial for small holder farmers.

Keywords: land equivalent ratio, intercropping, nutrient use efficiency, biochar, inorganic fertilizer



D1

[16]

## ALGAL ORGANIC MATTER MEASUREMENTS OF SPIRULINA USING UV-VIS ABSORBANCE AND FLUORESCENCE SPECTROSCOPY

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### ABSTRACT

The occurrence of algal blooms in the Philippine waters are alarming which causes health-related illnesses to the community. In this study, we present the algal organic matter characterization of Spirulina using UV-Vis absorbance and fluorescence measurements at varying concentrations. Different absorbance ratios were used to characterize algal organic matter composition of Spirulina. Fluorescence indices and peaks were incorporated as an additional assessment using the 3D excitation-emission matrix (EEM) for each concentration. Protein-like and humic-like peaks were measured for comparison with the absorbance ratios. Lastly, we have estimated the chlorophyll-a concentration of Spirulina using absorbance, and EEM fluorescence methods. High correlation was observed between the standard method of chlorophyll-a estimation and the EEM fluorescence measurement. This study provides preliminary measurements that can be used to develop a fluorescence lidar system for algal organic matter measurements and algal monitoring in natural waters.

Keywords: algal organic matter, Spirulina, excitation-emission matrix, fluorescence lidar system

D2

[17]

**EVOLUTIONARY TRENDS IN POSTARABLE SOILS TOWARDS THE  
BACKGROUND OF MODERN CLIMATE CHANGE (THE CENTRAL PART OF THE  
EAST EUROPEAN PLAIN)**

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***ABSTRACT***

Numerous studies of abandoned lands in the southern taiga show that they have a good potential for self-restoration. However, current climate warming can trigger a change of the typical scenario of their postagrogenic evolution. We have monitored soils located in the Upper Volga basin (Centre of the Russian Plain). The first survey was carried out in 1980-1990<sup>th</sup> and the second one was carried at the same points in 2018-2020<sup>th</sup>. During the period between surveys, temperature changes in the study area were noted in all months of the year. The increase in the average annual temperature is more than 1.5° C over 30 years. The duration of the growing season increased by a week. A change in the intra-annual course of precipitation was also observed. Soil, as a fairly stable environment component, does not immediately respond to changing climatic conditions. However, we have already been observing a soil response to regionally specific climatic trends. An increase in surface waterlogging and the appearance of conditions for moisture stagnation were diagnosed. In Gleysols on lacustrine sediments, mineralization of organic matter increases, and C/N ratio decreases. In peat soils, there is a decrease in the content of carbon and nitrogen, and an increase in ash content is observed. In some soils under study, during the warm climatic trend, there was an accumulation of carbonates from groundwater solutions. The secondary transformation of carbonates and migratory carbonate were diagnosed. Signs of stagnic conditions, ferruginous nodules, and gley cutans appeared. To sustainable land use it is necessary to conduct a modern agroecological assessment of soils and understand the direction of their evolution in response to new landscape and soil-climatic conditions.

Keywords: abandoned lands, climate change, Southern taiga

D3

[18]

## AGRICULTURAL DIVERSIFICATION DURING DRY GROWING SEASONS OF BANGLADESH IN THE CONTEXT OF CLIMATE CHANGE

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### ABSTRACT

Crop diversification program was taken in Bangladesh during the early nineties of the twentieth century when the areas under traditional crops were being replaced by high-yield varieties. However, the rate of crop diversity is gradually decreasing in Bangladesh despite the initiatives taken by the government. This paper analyzes the pattern of crop diversification in Bangladesh especially during the dry season in terms of global climate change. Production information of 17 major crops during the last 10 years (from 2011 to 2020), as well as rainfall, temperature, and soil moisture measurements of the same time period, were used to reveal this pattern. Simpson Index (SI) was used for identifying agricultural diversification. Both descriptive and inferential statistics were used for analyzing factors influencing crop production. The result shows a strong correlation between agricultural diversity and climatic factors i.e. temperature, rainfall, and soil moisture. Regions even in rain and sufficient soil moisture are generally fertile and characterized by high crop diversification rate. Regions where these three factors are at their extreme, the SI value is low or near to 0 (zero). These results indicate that climate change plays a vital role in agricultural diversification besides the well-known socio-economic factors such as open market, high input, profitability, and culture of growing specific crops in Bangladesh. Bangladesh has an opportunity of practicing agriculture in a sustainable way, which is expected to maximize crops diversification. If Bangladesh can ensure agricultural diversification taking climate change vulnerabilities into account, more employment and development can be added to the agricultural sector. This can eventually play important roles in eradicating poverty and food security through ensuring sustainability in agriculture.

Keywords: agricultural diversification, climatic factors, food security, sustainable agriculture

D4

[19]

## IMPACT OF CLIMATE CHANGE ON AGRICULTURE OF KUTCH REGION OF GUJARAT, INDIA

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### **ABSTRACT**

Sea levels in the coastline of India are rising at a much faster rate than elsewhere in the world, endangering the ports, increasing the chances of coastal flooding in low-lying areas, and impacting the livelihoods of millions of people who live near the seashore and river deltas. Parallely, the threats from accumulated greenhouse gas emissions in the atmosphere, have created high pressure on natural resources and the same is adversely impacting the livelihood of coastal inhabitants. The state in focus, Gujarat, has a vibrant climate that is diverse and changing. The territory is facing the challenges to sustain rapid economic growth, urbanization, and dealing with the global threat of climate change. The objectives of this study were to understand the status and perspective of the coastal farmers on the impact of climate change on coastal farming and the mitigation strategies adopted by the community to sustain the same. The study also has evaluated the initiatives taken by the government to control the same. The study found that the repeated episodes of the cyclone, coastal floods, changing patterns of rain, salinity ingress are impacting the cultivation in the coastal region. Farmers are adopting change of pattern of crop as one of the solutions. There is basic awareness of climate change and that it will impact them, but only a marginal segment is aware of 'how' and 'what is to be done.' The study has found that there is a great need for mitigation activities in the coastal regions especially the connection between Sea and inline riverine body should be isolated through an embankment of suitable size between the bank of the river and the sea.

Keywords: coastal farming, Kutch coast, right to livelihood, article 39A of Indian constitution, salinity ingress

D5

[20]

**IN VITRO ASSESSMENT OF THE INHIBITORY EFFECT OF SLUDGE AGAINST  
*Fusarium oxysporum* F. SP. *CUBENSE* (SMITH) SNYDER ET HANSEN**

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**ABSTRACT**

One challenge resulting from wastewater treatment is the production of sludge as a by-product of the treatment process. Consequently, the global generation of sludge is continuously increasing and is estimated to exceed 10,000 tons per day. Such amount produced can become a challenge in terms of its treatment and disposal. Recent literature has shown that sludge may elicit an inhibitory response against soil-borne pathogens, which may be valuable in managing soil infections. However, there is a need to conduct more research to understand the mechanisms of sludge's inhibitory properties, primarily in the local setting. The study determined the physico-chemical characteristics of sludge and assessed its inhibitory activity against *Fusarium oxysporum*. Each sludge extract produced from different air-drying times was tested for an inhibitory response using In vitro setup. Identification of organisms with inhibitory properties was also done, and correlational analysis was also conducted. The highest Relative Inhibition Zone Diameter (RIZD) ( $p < 0.05$ ) is 78.30% in sludge extract from two months of drying, which also showed an increased amount of humic acid (10.29 C-mg<sup>2</sup>/mL), total Nitrogen (2.83 ± 0.09 %), and microbial respiration (8.51 C-mg/mL). The co-relational analysis revealed that total bacterial count, total N, K, and microbial respiration contribute to the highest positive correlation among the parameters. Despite showing high inhibitory potential, sludge must still undergo other treatment processes to produce mature sludge that passes regulatory standards set by the Philippines (PNAS/BF 40:2016). Moreover, it was determined that the biotic component positively affects the inhibition of sludge against *F. oxysporum*.

Keywords: inhibition, sludge, wastewater treatment

D6

[21]

**FOOD DIETS AND ENVIRONMENTAL BEHAVIOUR DURING THE COVID-19  
CONFINEMENT IN UNDERGRADUATE UNIVERSITY STUDENTS IN THE  
REGION OF APURIMAC, PERU**

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***ABSTRACT***

For the development of healthy lifestyles and reduce the environmental impact it is advisable to consume organic foods, free of genetic modification and grown locally. The aim of the research was to compare the dietary habits and environmental behaviour of university students during the Covid-19 lockdown. A cross-sectional study was conducted using data collected online through an anonymously resolved questionnaire, scheduled from July 18 to August 30, 2020 in the Apurimac-Peru region. In which 390 undergraduate students between the ages of 18 and 28 participated. The questionnaire was divided into 03 sections: sociodemographic characteristics, dietary practices and behavior related to the environment during the Covid-19 confinement. It was found that 65.8% of students reported healthier dietary practices during confinement, in the comparison by gender women consistently consumed tubers (85.7%), vegetables (73.5%), fruits (61.2%), Andean grains (49.0%), compared to men who reported lower consumption. Regarding environmental behavior, respondents indicate that organic foods were healthier and more environmentally friendly than local foods.

Keywords: organic food, local products, dietary practices, healthy living

E1

[22]

**ASSESSING THE IMPACTS OF CLIMATE CHANGE ON PERFORMANCE OF  
INLAND CULTURE-BASED FISHERIES WITH SPECIAL REFERENCE TO  
*Oreochromis niloticus* IN PERENNIAL MINOR RESERVOIRS OF  
ANURADHAPURA AND AMPARA DISTRICTS WITHIN THE LAST DECADE  
(2011-2019)**

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**ABSTRACT**

Climate change is becoming a serious global challenge, creating a significant impact on global food production worldwide especially on the culture-based fisheries sector which plays a key role in global food security. The present study has focused on the impacts of weather changes due to climate change and identifying methods to minimize those impacts on the overall fish production of Tilapia species (*Oreochromis niloticus*). The weather parameters considered were changes in rainfall pattern and air temperature. The study was conducted using fifty-six perennial minor reservoirs in Anuradhapura and Ampara districts of Sri Lanka representing twenty-eight reservoirs from each district. Monthly rainfall and air temperature data of both districts and monthly stocking and harvesting data of *Oreochromis niloticus* in selected reservoirs were collected during the study period from 2011 to 2019. The ratios between monthly fish production per hectare and fish stocking per hectare were calculated and statistically analyzed with rainfall intensity and air temperature by developing regression model relationships. The results indicated that both current month rainfall and air temperature five months before the current month have a negative regression relationship with fish production: fish stocking ratio in both districts. Thus, Rainfall intensity has a negative impact on *Oreochromis niloticus* fish harvest; high rainfall can reduce fish catch per unit effort due to the impact of increased water level. Increase in air temperature also leads to an increase in the water temperature, causing negative impacts on the growth of *Oreochromis niloticus*.

Keywords: culture-based fisheries, weather changes, fish production: fish stocking ratio

E2

[23]

**CLIMATE CHANGE, RIVER EROSION AND IMPACTS**

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Riverbank erosion at the Gandak-Gangetic Plain in Bihar, India, is primarily caused by climate changes and affects the lives and livelihood of people, especially the Musahar community a poor and marginalized community. Due to the excessive siltation of the river bed, its drainage capacity and channels get disturbed, which makes it difficult for the river to maintain its equilibrium flow and forces the river to find a new course affecting many. Analysing the vulnerability implicit in ‘everyday life’ is essential to understand the disaster and its impact (Wisner et al, 1994; Quarantelli, 2005). The study brings out the narratives from the ‘periphery’ to the centre by understanding Musahars who, with pre-existing socio-economic vulnerabilities, live with katav. The study was conducted over a period of seven years and carried out in different phases (floods and non-flood times) to unearth and understand the phenomenon. It used purposive heterogeneous sampling, with the application of the principle of ‘maximum variation’ for data gathering. Altogether about 100 stakeholders (76 affected people). The study delves deep looking at aspects like the long-term impact brought upon by social exclusion-led discrimination, exploitation, and injustice on the marginalised in the post-disaster setting. In the context of climate change led floods and erosion, the study draws attention on the need for a specific context-based approach in the implementation of Disaster Risk Reduction (DRR) and Disaster Risk Management (DRM) programs.

Keywords: vulnerability, adaptation, resilience, Musahars, river erosion, displacement



E3

[24]

## IDENTIFICATION OF THE TREND OF OCCURRING LANDSLIDES IN BADULLA DISTRICT, SRI LANKA

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### ABSTRACT

Landslide is a common natural hazard in many areas of the world and it can be identified as the mass movement of soil or rock down a slope. Annually landslides cause many fatalities and damages to the environment. The National Building Research Organization (NBRO) in Sri Lanka has prepared maps to identify landslides prone districts in the country and Badulla District is one of them. The slope, elevation, and the annual rainfall data of the area evidenced for high susceptibility for landslides. This study focuses on identifying the pattern of landslides in this area over 40 years (1980-2020). Data on landslide occurrence were taken from Sri Lankan Disaster Management Center Information System. The results revealed that there is an increasing trend ( $y = 0.2584x + 2.55$ ) in the occurrence of landslides in the study area. The maximum number of landslides (123) was reported in the year 2006 and there have been more landslides annually during the recent decades. As per the scientific literature, changing land use pattern and land cover, soil erosion due to improper agricultural activities are the main reasons for landslides during rainy seasons. Receiving heavy rains due to predicted climate change is also inevitable and it will definitely aggravate the situation in the future. Therefore community-based awareness programs should be conducted by the respective authorities to minimize land clearing and avoid unnecessary constructions on slopy lands along with establishing new rules and regulations towards effective land conservation. Further studies are required to clearly identify the highly susceptible areas at Grama Niladari division level through detailed soil analysis and initiate resettlement programs on those areas to reduce the damage.

Keywords: climate change, heavy rains, increasing trend, landslides, land use pattern

E4

[25]

**ECOSYSTEMS OF MOUNTAIN PASTURES: REGIONAL FEATURES,  
MANAGEMENT MECHANISMS, FORECAST**

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***ABSTRACT***

This work was supported by the State task of Moscow State University. Mountains are getting close attention due to new challenges and environmental threats to humans and the biosphere that have appeared in the 21st century and are mostly due to global climate change and the expansion of natural disasters, a shortage of freshwater, and a rise in ocean level at low altitudes. Pastures are part of the natural and cultural heritage of mountain regions. The focus of the study was the mountain pastures of the Northern Tien Shan (Kyrgyzstan), located in different vertical zones: wormwood steppes on chestnut soils, forb-cereal meadow steppes on mountain chernozems, and subalpine and alpine meadows on mountain meadow soils. The research methods included the determination of the bulk chemical composition of soils, in samples of aboveground and underground parts of plants - raw ash by the method of dry ashing and subsequent determination of the content of ash elements and nitrogen. Natural processes of climate change and anthropogenic use of the territories of the Northern Tien Shan led to a change in the direction of the natural evolution of plant communities (changed their structure, ranges, etc.), but did not have a significant impact on the direction of evolution of mountain ecosystems due to the preservation of the type of biological cycle of elements. The main supply of elements falls on the roots, moreover, in the 0-25 cm layer. In all natural zones, K, Ca, Mg, Si prevails in the ash composition. Forbs are distinguished by a higher ash content and coming out on top in the ranks of the predominance of K, Ca, Mg, while in cereals Mg is replaced by Si. The generally identical nature of the biological cycle for both cereals and forbs provides high stability of ecosystems in transitional landscapes.

Keywords: mountain soils, pastures, high-mountain ecosystems, biological cycle of elements

E5

[26]

## TOWARD A STUDY OF CLIMATE CHANGE AND RESPIRATORY HEALTH IN THE EASTERN AUSTRALIA

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### **ABSTRACT**

Droughts and tropical storms have become more common as a result of climate change. Hotter weather has resulted in a longer pollen season as well as more wildfire smoke particles; heavier rainfall and flooding can lead to an increase in mold growth. Pollen, wildfire smoke, and mold are linked to respiratory health, particularly allergic asthma. Thus, the objective of this research is to study the effects of climate change on respiratory health, especially in eastern Australia: Far West, Murrumbidgee, Northern New South Wales, Southern New South Wales, and Sydney, between 2001 and 2019. Data on chronic obstructive pulmonary disease hospitalizations by Local Health Districts and air quality were collected and done period-over-period to examine the climate change impacts. Seasonal variation in respiratory admissions, as well as multiple factors related to climate change, were also analyzed in this study and compared to the previous years. The findings reveal that the overall prevalence of asthma has risen in accordance with the effects of climate change. As a result, climate change can have an impact on not only storms, heat waves, and melting glaciers, which can directly harm animals and habitats but it can also be one of the factors that affect human health.

Keywords: respiratory health, climate change, air quality, rainfall, temperature, Australia

E6

[27]

**ASSESSMENT AND BIAS CORRECTION OF CORDEX REGIONAL CLIMATE MODELS PRECIPITATION DATA FOR CLIMATE CHANGE MONITORING IN WADI CHEMORA BASIN (NORTHEAST OF ALGERIA)**

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**ABSTRACT**

This study aims to investigate the performance of four Regional Climate Models (RCMs) used in Coordinated Regional Climate Downscaling Experiment (CORDEX), before and after the bias correction to characterize the precipitation patterned in Wadi Chemora Basin (northeastern of Algeria) for the period of (1970 to 2005). This assessment compares available observed datasets of seven ground stations against the historical data of the four RCMs (RCA4v1 driving by ICHEC-EC-EARTH and NOAA-GFDL-GFDL-ESM2M from Middle East and North Africa domain MNA-CORDEX with intermediate resolution (25km, 0.22°) and CNRM-ALADIN52 v1, ICTP-RegCM4-3v1 from Mediterranean domain MED-CORDEX with high resolution(12km, 0.11°)) by using statistical measures such as Root mean square error, Mean error, Pearson correlation coefficient, Relative bias, standard deviation, and trend analysis in different time steps ( Annual, Seasonal, Monthly, and Daily). Results indicated that RCMs overestimated precipitation in totals, especially at smaller amounts, except for (ICTP-RegCM4-3v1) model which underestimated the precipitation in July and August, unlike CNRM-ALADIN52v1, which greatly exaggerated the estimation of precipitation in JJA. However, the performance of the four RCMs shows a great improvement after applying distribution mapping (DM) bias correction especially ICTP-RegCM4-3v1 model, which we conclude is the best model in terms of estimating precipitation in our study area.

Keywords: precipitation, CORDEX, regional climate models, performance, bias correction, Northeastern Algeria

**POSTER  
PRESENTATIONS**

P1

[28]

## LIFE CYCLE ASSESSMENT OF A CONCRETE REINFORCED WAINSCOTING BUILDING

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### ABSTRACT

Life cycle assessment yields the most holistic approach in investigating the environmental impacts arising from human activities. With the increasing human population, the construction sector together with its environmental problems is expanding day by day. The aim of this study is to investigate the environmental impacts generated during the construction and end of life phases of a concrete reinforced wainscoting building. The modeling is performed by using GaBi software and the professional database of this software. The impact assessment is evaluated according to CML 2001 method. The functional unit is "Usable living area", in other words all the results are given per square meter. The environmental impact categories are: Abiotic Depletion/fossil (ADPf), Acidification (AP), Eutrophication (EP), Freshwater Aquatic (FAETP), Global Warming (GWP), Human Toxicity (HTP), Photochemical Ozone Creation (POCP), and Terrestrial Ecotoxicity (TETP) potentials. During the construction phase the alternative usage of insulating materials, namely rock wool and Expanded Polystyrene (EPS) are examined. When EPS is used instead of rock wool, increases in ADPf and POCP together with a decrease in TETP are obtained. The other categories are not significantly affected from this change. The scenarios related to the end of life phase show that secondary usage of PVC windows and glasses, and a part of the wood together with applying recycling of steel and certain metals significantly improved ADPf, AP, EP, FAETP, GWP, HTP, and POCP

Keywords: environmental impacts, construction, end of life, life cycle assessment, sustainability

P2

[29]

## APPRAISAL OF ENVIRONMENTAL BURDENS FOR PROFILE PIPE MANUFACTURING

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### **ABSTRACT**

Nowadays, choosing a manufacturing process that is not only economical but also environmentally friendly is of importance. Furthermore, developing strategies to lower the environmental burdens for a process gains prominence. In conclusion industries have to adopt measures to decrease unwanted environmental impacts while producing a good. The objective of this study is to investigate environmental impacts of manufacturing three different profile pipes via life cycle assessment methodology. For this purpose production of three profile pipes that are 40 mm wide, 40 mm high and 6 meters long are examined. Two profile pipes are made up of black material; while the raw material of the third one is galvanized sheet. These pipes have different wall thicknesses of 1.5 mm and 3 mm. GaBi software, Ecoinvent database and CML 2001 methodology are used for the life cycle assessment. Global warming (GWP), abiotic depletion elements (ADP-elements), abiotic depletion fossil (ADP-fossil), acidification (AP), eutrophication (EP), freshwater aquatic ecotoxicity (FAETP), human toxicity (HTP), ozone depletion (ODP), photochemical ozone creation (POCP) and terrestrial ecotoxicity (TETP) potentials are the examined impact categories. As expected scrap recycling reduces the environmental impacts. For the pipes made from black material, transportation creates the main impact on ODP. For galvanized pipe production on the other hand, ODP is mostly arise due to boron oil usage. Apart from ODP, for all the other impact categories, energy requirement has the main share. When wind energy is used instead of grid electricity environmental impacts are decreased as expected.

Keywords: environmental impacts, profile pipe, life cycle assessment, manufacturing, sustainability.

P3

[30]

**ENVIRONMENTAL IMPACT MANAGEMENT FOR A SUPERMARKET**Kahveci S<sup>1</sup>, Turkmen BA<sup>2</sup> and Babuna FG<sup>1\*</sup><sup>1</sup>*Environmental Engineering Department, Istanbul Technical University, Turkey*<sup>2</sup>*Chemical Engineering Department, Bilecik Seyh Edebali University, Turkey**\*germirliba@itu.edu.tr***ABSTRACT**

In supermarkets, most of the environmental impacts are generated by energy consumption and waste management. The aim of this study is to evaluate the environmental impacts of a supermarket and develop strategies to lower these unwanted burdens. For this purpose life cycle assessment methodology was adopted. GaBi 7.3 software was used in modelling with CML 2001 methodology. Investigated impact categories are: global warming, abiotic consumption (elements and fossil), acidification, eutrophication, freshwater and terrestrial ecotoxicities, human toxicity, ozone depletion, photochemical ozone formation potentials. Data collected from an actual supermarket for about a year was used as input to modelling. The study is mostly focused on the effects of energy consumption and waste management. The annual food waste of the store is about 6600 kg and the annual energy requirement is around 437 566 kWh. In all environmental impact categories investigated, the role of energy consumption has more than 96% share. In case of global warming potential the energy requirement composes more than 98% of the total impact. Using a new energy saving system (that involves lighting, HVAC, cold room and refrigerated vertical cabinets) reduces energy consumption by 50%, yielding substantial decreases in environmental impacts. Obtaining energy from wind farms rather than using grid electricity is observed to lower the unwanted impacts. Sending wastes to landfills, composting and anaerobic digestion are evaluated as alternative waste management scenarios. Sending wastes to either composting or anaerobic digestion instead of sanitary landfills results in decreasing impacts apart from acidification potential.

Keywords: environmental impacts, supermarket, life cycle assessment, energy, waste management



# **SYMPOSIUM PRESENTATIONS**

F1

[31]

## CITIZEN SCIENCE AND THE CIRCULAR ECONOMY: INSPIRING COMMUNITIES TO ACT ON PLASTIC WASTE

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### **ABSTRACT**

Acting on the plastic pollution problem is dependent on determining the types of plastic waste that comes from the source, and those that end up in polluted sites. Considering the extent and diversity of the different sources and sites, an inclusive approach that mobilizes and empowers the individuals that are involved in producing plastic waste and those that come into contact with it is more efficient. Through the #EcoSquadGoals project, more than 130 Filipino households have participated in a citizen science study that assesses the types of plastic waste generated during the pandemic. Their perspectives on the use of plastic was assessed, and they were given opportunities to contribute create interventions to lessen the plastic waste produced in their communities. Data collected using a modified WACS approach suggests that an average Filipino household in Metro Manila produces 1.9 + 0.9 kg of plastic waste a month during the Christmas holidays, and 1.5 + 0.4 kg during a regular month. There were nine types of plastic found, with the most abundant being those used as outer wrapping, 313.8 + 255 g, and those related to food, 244 + 207 g. Common interventions from participants include more selective choices of products and greater effort in recycling. Eco-anxiety was observed among the participants due to an awareness that they have limited options for plastic waste mitigation due to the Covid-19 pandemic. It is paramount that industries involved in packaging and distribution of goods create alternative packaging and better processes for recycling. At the moment, #EcoSquadGoals is being modified to assess plastic waste at pollution sites, and will soon be implemented in the Pasig River.

Keywords: citizen science, circular economy, plastic pollution, solid waste management

F2

[32]

## OPTIMIZATION OF ENHANCED WEATHERING NETWORKS

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### **ABSTRACT**

Enhanced weathering of alkaline rocks and minerals is a potentially scalable climate change mitigation technique. Such materials can be crushed into fine particles to increase surface area, and then spread on application sites where exposure to the elements leads to accelerated reaction with carbon dioxide and water. In the future, gigaton-scale carbon dioxide removal can be achieved using engineered enhanced weathering networks of crushing plants and application site. Mathematical models for optimizing industrial supply chains can be adapted for planning the operations of such carbon dioxide removal systems. In this talk, I will discuss the highlights of my recent series of papers on the development of these models.

Keywords: carbon dioxide removal, negative emissions, process systems engineering

F3

[33]

### **AIoT-BASED CLIMATE SMART TECHNOLOGIES FOR ENABLING SUSTAINABLE AND DATA-DRIVEN CROP PRODUCTION**

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#### **ABSTRACT**

Climate change has tremendously affected crop production in recent years. Some of its abrupt effects include plant disease incidences, insect pest outbreaks, and nutrition deficiencies among crops. Some of the intelligent ways to prevent these problems are to carefully monitor environmental conditions and to assist farm managers in decision-making using data and information. This presentation demonstrates the advantages of employing smart technologies to mitigate the effects of climate change. The presented technologies are based on the concept of artificial intelligence of things (AIoT) which integrates artificial intelligence (AI) and internet of things (IoT). This concept allows things or devices to perform complex functions such as data classification, time-series forecasting, and more. The smart technologies were tested in different locations that are considerably affected by sudden changes in environmental conditions. The collected data were analyzed to discover different methods on how end users can reach wiser decisions in protecting their crops. Finally, this presentation proves the importance of transforming data into sensible and concise information to meet the challenges of climate change.

Keywords: Integrated pest management, climate smart agriculture, artificial intelligence, internet of things, decision support system

F4

[34]

**NANOFERTILIZERS FOR SUSTAINABLE CROP PRODUCTION**

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**ABSTRACT**

Nanotechnology has immensely contributed to sustainable agriculture through enhancement of crop production and the restoration and improvement of soil quality. Through nanotechnology, the design of smart delivery systems was made possible for the release of nutrients in a slow and controlled manner to the targeted site targeting deficiency in plants. Nanofertilizers increase crop productivity by enhancing the availability of essential nutrients to the plant. Reduction in environmental damage is also attained using nanofertilizers through increased uptake efficiency of nutrients. Our team developed nanofertilizers which have shown increased uptake efficiency from 20 to 50 % of N, P and K macronutrients in sugarcane, rice, corn, vegetables, banana, coffee and cacao. Increased crop yield was also observed using the nanofertilizers. Our efficacy trials showed the potential of nanofertilizers to fill the gaps in soil quality management and assure long-term beneficial agriculture strategies to safeguard food security globally.

Keywords: nanofertilizers, crops, uptake efficiency, agriculture, sustainability

F5

[35]

**TOWARDS AN AUTOMATIC CROP PEST AND DISEASE MONITORING  
SYSTEM FOR EARLY DETECTION AND CONTROL**

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**ABSTRACT**

One of the consequences of climate change are outbreaks of pests that infests crops, leading to significant losses in crop yields. Traditionally, pesticides were used to prevent pest infestations. However, long-term frequent use of pesticides lead to increased pesticide resistance in many pest species, making it an unsustainable pest management practice. Biological control is a safe and sustainable approach that leverages the natural enemies of in order to manage pests in agroecosystems. Predicting the likelihood of success in biological control programs, however, relies on precise identification of parasitoids and estimation of their location-specific level of parasitism. In this talk, I will discuss our goals and on-going efforts in developing an automated crop pest and disease monitoring system that can aid in pest management. Our goal is to develop a tool that can analyze images of crop pest and parasitism levels. This allows us to determine the efficiency of a given parasitoid and help determine appropriate responses for augmentation and conservation of the biological control agent. It will also be used to compare and evaluate different biological control and treatment strategies to optimize for its efficiency in terms of eradicating the pests as well as cost-effectiveness. Moreover, it can give a regular update of the farm's state and the efficacy of the biological control agents, allowing us to make better and more informed decisions on pest management.

Keywords: crop pest monitoring, surveillance, biological control

G1

[36]

**OMICS APPROACHES FOR MONITORING ECOLOGICAL RESTORATION IN  
THE CHANGING ENVIRONMENT**

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**ABSTRACT**

Freshwater ecosystems face increasing pressures due to habitat degradation, biodiversity loss, increasing rates of extinction, and emerging challenges from anthropogenic stress, which is more relevant today with the amplified impacts of climate change. Ecological restoration may be used to restore biotic communities and ecological functions to a targeted pre-disturbance state, but may also inadvertently bring about conditions that can be unsustainable. The uncertainty of ecological response to often untested and unverified restoration treatments may be assessed within an effective monitoring and management framework. This warrants reliable, verifiable, and efficient biomonitoring and ecological assessment schemes for the management of freshwater resources and restoration of damaged ecosystems. Omics approaches are powerful molecular-based tools at the service of taxonomists and ecologists. In this presentation, I will introduce the basic workflow of omics-based approaches and present some examples of its applications for freshwater biomonitoring, with a specific focus on river ecosystems impacted by dam-fragmentation that have undergone or are currently undergoing restoration programs by sediment management and augmentation.

Keywords: biomonitoring, ecological restoration, omics approaches, metagenomics, metaproteomics

G2

[37]

**AIR QUALITY MONITORING IN MANILA USING AN AFFORDABLE  
RASPBERRY PI AND ARDUINO BASED SENSORS: IMPACTS OF COVID-19**

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**ABSTRACT**

The unsustainable rapid growth of urbanization in Manila is becoming a problem as the number of vehicles continue to increase. The top contributor to poor air quality in the city is vehicular emissions. Air pollution is the fifth leading risk factor for mortality worldwide with the Philippines ranking number 10 in terms of the highest mortality burden attributable to air pollution. For a better assessment of the air quality at a certain location, a higher spatial and temporal resolution of air quality monitoring is needed. This is not possible with traditional reference monitors because they are expensive and difficult to maintain. To address this gap, we developed an affordable air quality monitoring system that can measure the criteria pollutants like PM<sub>2.5</sub>, Ozone, NO<sub>2</sub>, CO<sub>2</sub>, CO, SO<sub>2</sub> named EARTH-AQMS and it has been monitoring the air quality in front of De La Salle University since 2018. The EARTH-AQMS was able to provide measurements of two criteria pollutants, PM<sub>2.5</sub> and Ozone for a period of two years and still ongoing. PM<sub>2.5</sub> concentrations showed two peaks within the day (morning and evening rush hours). During the week, Tuesdays gave the highest PM<sub>2.5</sub> concentration and the trend was decreasing going towards the weekend. PM<sub>2.5</sub> is inversely correlated with wind speed. The impact of COVID-19 was also seen on the measured concentrations of Ozone and PM<sub>2.5</sub>, as both decreased during the period. The EARTH AQMS can provide policy makers immediate information if their policies in connection with air quality improvement is working or not. Furthermore, this can be deployed to many areas and can provide higher spatial and temporal resolution

Keywords: air quality, low-cost sensors, PM<sub>2.5</sub>, Ozone, COVID-19



G3

[38]

**OPEN GEOSPATIAL DATA AND COMPUTING TOOLS FOR CLIMATE RISK  
ASSESSMENT**

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**ABSTRACT**

In the past decades, the limited availability of climate data was a big challenge in climate risk assessment studies. Recent advancements in data collection, earth observation, and computing technologies have paved the way to the explosion of open- source geospatial climatic data covering the entire globe. This paper will present different sources of open-source geospatial climatic data, and open-source computing tools for handling and processing these data for climate risk assessment to contribute to a future-proof society.

Keywords: CRU-data, WorldClim, TerraClimate, QGIS, R

G4

[39]

**UNDERSTANDING THE ROLE OF ENVIRONMENTAL FACTORS IN DENGUE  
DISEASE DYNAMICS THROUGH AN EXPLAINABLE ARTIFICIAL  
INTELLIGENCE APPROACH: A CASE STUDY IN METROPOLITAN MANILA,  
PHILIPPINES**

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**ABSTRACT**

Climate change plays an important part in dengue disease dynamics. With this, many studies use machine learning approaches to understand the role of climate in dengue disease distribution and epidemiology. One of the disadvantages of machine learning algorithms is that it is considered as a black box model which there is no knowledge of their internal workings within the model. However, a new approach called explainable artificial intelligence (EAI) or also known as interpretable or explainable machine learning is gaining popularity. In this presentation, we would like to discuss the application of EAI in dengue disease distribution in Metropolitan Manila using climate variables such as surface temperature, relative humidity, and precipitation.

Keywords: dengue, explainable artificial intelligence, interpretable machine learning

G5

[40]

**MOBILITY OVER AIR QUALITY INDEX (MAQI): LESSONS FOR EVIDENCE-BASED CLIMATE ACTION AND POLICY**

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The COVID-19 pandemic led to community lockdowns and quarantines resulting to decreased mobility and improved air quality worldwide. As countries begin to recover from the pandemic, mobility is back on the rise and air quality has begun to deteriorate again. In this presentation, we discuss the development and current progress of Mobility Over Air Quality Index (MAQI) which combines mobility indicators from Google with Tropospheric NO<sub>2</sub> to generate an index of mobility against air quality. MAQI is a normalized ratio of Google Mobility against NO<sub>2</sub>. COVID-19 Community Mobility Reports were downloaded for a 1-year period from Google. To align the spatial coverage, polygons were defined as GeoJSON on the Sentinel EO Playground and Statistical Info Service (FIS) API's to extract nitrogen dioxide (NO<sub>2</sub>) time-series from the Sentinel-5 Precursor mission. MAQI brings a better understanding of the air quality trends – a high value indicates more movement relative to emissions while a low value indicates more emissions relative to movement. Temporal MAQI visualizes this change and highlights areas where mobility has recovered without sacrificing air quality. We discuss the current state of the project, ongoing integration with the ESA EO Dashboard, and how open data, geospatial tools and approaches such as MAQI provide directions for evidence-based climate action and policy and opportunities for big data analytics in climate change. MAQI was the global winner of the Technology Award of the 2021 EO Dashboard Hackathon Challenge sponsored by NASA, ESA, and JAXA.

Keywords: mobility, NO<sub>2</sub>, air quality, maqi, sentinel



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