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ABSTRACTS

Emissions Reductions and Improved Air Quality: Insights from the IPCC Sixth Assessment Report

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Abstract:
Working Group III of the Intergovernmental Panel on Climate Change (IPCC) has shown in its Sixth Assessment Report how the role and shape of the global energy industry would change if the evolution of greenhouse gas emissions were to be consistent with the long-term temperature goal of the Paris Agreement. It has chosen how the availability of abatement technology and circular economy approaches could affect energy sector prospects. The report also notes synergies between GHG emission reductions and the achievement of the UN Sustainable Development Goals, including human health through air quality improvements. This talk will explain how IPCC works to reach its conclusions, the overall messages of the Sixth Assessment Report, its conclusions on the pathway towards net zero carbon neutrality, and synergies with air quality.

When the path to climate change mitigation needs reengineering think out of the box

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Abstract:
The paradigm change is needed and our societies must embrace sustainability and climate issues in a different way. A model in which the respect for the people, the planet and the profit is key for that transformation. When society and decision makers recognize the evolution with planetary boundaries and reduced consumption patterns a vision with regenerative adaptative perspective makes plenty of sense. Four economies working together; the Circular, the Knowledge, the Donought and the Feeling should have an impact. The mitigation of climate pollutants needs to switch from fighting the current fossil fuel centered development into an alternative model that is so convincing and attractive that people will change their way of life and behavior voluntarily. Dematerializing products by leasing/service systems should lead into options under the 3rd Horizon. Leaving behind the business-as-usual trend and promoting disruptive innovation in route. Electrify everything is a priority under high efficiency considerations. Long term view with short term actions in the right direction. Innovation and foresight together. It is not a fast or easy transition but the only way to survive with some enlighten of different technologies and practices at the macro and micro scale. The combination of low-cost renewables with initiatives to overcome the intermittency in power usage issues perhaps by using green hydrogen, green ammonia and improved batteries with new electrochemistry's. The same mitigation ideas work to reduce methane, particulate matter or hidrofluorocarbons in a different context with a wide scope of tools from regulatory to information to the citizen. People will lead the change after recognizing an attractive new way of life, breaking the actual lock-in economy and the business-as-usual scheme. Minimalistic and simpler lives. Good politics conversations together with innovative policies and new governance polity shall have a far-reaching effect all working together.

Methane emissions from offshore oil and gas production activities in Gabon and Angola: First results from the airborne METHANE-To-Go campaign 2022

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Abstract:
house gas. Due to its comparatively short lifetime of ~10 years, a significant reduction in anthropogenic CH4 emissions would help to reduce the atmospheric concentration within a decade with near term temperature benefits. However, the development of efficient mitigation strategies needs to be informed by identifying, locating and quantifying CH4 emissions from the different sectors.

A large part of CH4 emissions from the global oil and gas sector is expected to arise from offshore production, which currently however is understudied. Here we report on airborne measurements conducted using the DLR Falcon along the west coast of Central Africa in September 2022. The DLR Falcon was equipped with a suite of different in-situ instruments to measure CH4 and a series of other trace species, as well as meteorological variables. Measurements were taken off the coast of Gabon and Angola, where oil and gas production is spread over more than 800 kilometres across a wide variety of offshore installations. We will present and discuss our airborne results on regional and facility-scales, and compare them with available inventory estimates.

Our collected data, co-funded by the International Methane Emissions Observatory (IMEO), will help oil and gas companies and governments, to prioritize their methane emission mitigation actions and policies worldwide.

Methane emissions from industrial activities: A novel airborne concept applied to coal mines in Poland ,it is applicable for quantifying methane emissions from the oil & gas exploration and production in Oman?

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Abstract:
Methane (CH4) is one of the most powerful greenhouse gases. Due to its short lifetime (~10 years) compared to carbon dioxide (~100-1000 years), methane is in focus of current mitigation policies to reduce global warming.
A novel airborne concept to measure CH4 emissions from coal mines in Poland is presented with the focus on quantifying emissions from single point sources. During two recent field experiments in June/October 2022, a unique helicopter towed probe was equipped with a variety of meteorological, trace gas and particle instrumentation. Two different measurement techniques were applied for CH4 (Picarro: cavity ringdown spectroscopy / Licor: non-dispersive infrared spectroscopy, open path). To estimate the CH4 mass flux of single sources, the airborne CH4 and wind measurements are complemented by mobile ground-based CH4 measurements.
In autumn 2023, a similar setup is foreseen for an airborne field experiment in Oman focusing on CH4 emissions from the O&G exploration and production.
Our collected data, funded by the International Methane Emissions Observatory (IMEO), will help coal, oil and gas companies and governments, to prioritize their methane emission mitigation actions and policies.

Distribution of methane release rates accompanying the upstream sector of O&G in Romania and Poland detected with mobile, ground based, indirect measurements

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Abstract:

different remote techniques: inverted gaussian plume models, controlled tracer release method, stationary plume cross section (EPA OTM33A), installation tenting, mobile FTIR mass balance, UAV air-core collection and plume sampling, and TDLAS remote plume cross section. All these techniques were recently applied for verifying methane emissions from the O&G upstream installations and coal mine industry in Poland and Romania under projects funded by the UNEP (United Nations Environment Programme) and the International Methane Emissions Observatory (IMEO).

Our methane analysers (CRDS – cavity ring down spectroscopy, OA-ICOS – off axis integrated cavity output spectroscopy, OF-CEAS – optical feedback cavity enhanced absorption spectroscopy) were used for mobile applications on a car. Experiences of this setup will be discussed. Some modern SWIR (short wave infrared) and MIR (mid infrared) methane analysers available on the market will also be compared in the same context of methane "plume hunting".

The presentation will also focus on the validation of these techniques in assessment of methane emission estimations, their advantages, weaknesses and limitations. The log-normal distributions of methane release rates obtained with available experimental activities during the campaigns are compared. Additionally, fast screening technique based on simplified dispersion modeling will be presented. It was applied for verification of methane release rate distributions including the low efficiency sources, not detected by earlier mentioned techniques.

Climate Change, Air Quality, and Acid Rain indicators in the Environmental Performance Index

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Abstract:

The Environmental Performance Index (EPI) is a data-driven synthesis of sustainability in countries around the world. The EPI is conformed of 40 indicators across 11 issue categories translating the latest science and environmental data into policy insights. Three categories track atmospheric pollutants, but focus on three distinct policy objectives. The Air Quality indicators measure the effects of diverse air pollutants (PM2.5, Household Solid Fuels, O3, NOx, SO2, CO, VOCs) on human health. The Acid Rain indicators (SO2 trend, and NOx trend) measure how the concentrations of sulphur and nitrous oxides in the atmosphere contribute to acid rain that degrades natural ecosystems. Finally, the nine Climate Change indicators track countries' contributions to the accumulation of greenhouse gases in the atmosphere. Five indicators track emission trends of different gases (CO2, CH4, N2O, F-Gas, and black carbon), while the other four project total emissions to 2050, measure contributions to climate change from land cover change, or scale total emissions by countries population of GDP. The structure of the EPI reflects the different policy implications of atmospheric pollution in the health, environmental, and climate sectors. However, regardless of the policy implication, air pollutants tend to have common sources, and thus is not surprising that countries scores across these three issue categories in the EPI tend to be positively correlated with each other. In general, European countries with large investments in renewable energy tend to have the higher scores across the three categories, while the opposite is true for Asian and African countries that still rely heavily on coal power plants. Interestingly, several small nations (such as Barbados, Malta, and Djibouti) rank high in climate change mitigation, showing that there are multiple paths to climate sustainability that might work in contrasting contexts. As such, the EPI helps countries adopt policies from their more sustainable peers.

Nature for Climate: from Forests to Deserts

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Abstract:
10GT CO2e must be mitigated per year through nature-based solutions, achieving net zero, that's the 2030 breakthrough for the climate champion team. Nature comes at the heart of the work as a key element in facing climate change. One of the main causes of climate change is inappropriate ecosyste ms use and shifts in Nature's systems. On the other hand, a complete change in ecosystems is a result of actions taken to mitigate and adapt to climate change. For improved human health and well-being, adopting long-term adaptation and resilience tactics requires an understanding of this node. The talk will present global actions, initiatives, and the 2030 Nature's breakthroughs to highlight the UN-Climate Champions' role in boosting ambition and energizing credible climate action across cities, regions, companies, and investors through two campaigns, Race to Resilience and Race to Zero.

Highlights from UNEP Emissions Gap Report (EGR)

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Abstract:
The UNEP Emissions Gap Report (EGR) are annual science-based assessments of the gap between countries' pledges on greenhouse gas emissions reductions and the reductions required to deliver a global temperature increase of below 2°C by the end of this century.The EGR series tracks our progress in limiting global warming well below 2°C and pursuing 1.5°C in line with the Paris Agreement. Since 2010, it has provided an annual science-based assessment of the gap between estimated future global greenhouse gas (GHG) emissions if countries implement their climate mitigation pledges, and where they should be to avoid the worst impacts of climate change. Each year, the report also highlights key opportunities to bridge the emissions gap, tackling a specific issue of interest. With the aim to inform the climate negotiations among UN Member States, the EGR is launched every year ahead of the UN Climate Change Conference of the Parties (COP). The EGR is co-produced by UNEP, the UNEP Copenhagen Climate Centre (UNEP-CCC) and partners.In October 2022, the United Nations Environment Programme (UNEP) launched the 2022 edition of the Emissions Gap Report: The Closing Window - Climate crisis calls for rapid transformation of societies in a virtual press conference in the lead up to the 2022 United Nations Climate Change Conference (COP27).The report provides an update on global emissions pathways and progress towards achieving national mitigation pledges and the Paris Agreement goals, as well as the resulting "emissions gap." This presentation will raise the awareness about the EGR reports and highlight the key messages of the EGR 2022.

Environmental Issues in the GCC Countries 2020: Requirements of the Current Environmental Situation

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Abstract:

As part of GCC countries' follow-up to the current environmental situation in the world and the challenges and difficulties faced by common environment which requires everyone to increase attention and ensure coordination and cooperation to limit and minimize environmental damage, and to preserve environment components and resources and their sustainability for future generations, GCC countries have adopted environmental trends in line with current environmental situation with view to achieving comprehensive and sustainable development for current and future generations.

Recent advances in biochars applications for climate change mitigation and wastes sustainable management

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Abstract:

Huge amounts of biomasses are annually produced by several sectors including urban, agricultural, and industrial activities. Some of these wastes, especially livestock manure, emit large amounts of greenhouse gases (GHGs) that could result in the acceleration of global warming process and important threats to the environment. The sustainable management of these wastes has been pointed out as an urgent task in order to preserve the environment and also natural resources. Pyrolysis process has been identified as one of the most promising technologies for the conversion of biomasses into high added values products including biofuels (biogas and bio-oil) and solid residues named biochars. The intensive review of the most recent published papers has highlighted the important role that can be played by the biochars in the mitigation of climate change and resources preservation. Indeed, biochars can be valorized in several domains including agriculture, environment, and energy recovery. The choice of the ultimate use of biochars depend mainly on their physico-chemical properties that are governed by not only of the characteristics of the raw feedstock (composition and particle size), but also the pyrolysis experimental conditions (heating rate, final temperature, and residence time). Biochars application in agriculture as a low cost and eco-friendly biofertilizer significantly reduces GHG emissions, sequesters atmospheric carbon into soils, and improves soil fertility and plants production yields. Moreover, raw and especially modified biochars could be considered as promising and attractive materials for the efficient removal of various organics and inorganics from aqueous as well as gaseous effluents. In this context, efficient capture and storage of CO2, that is the main GHG responsible of global warming, can be ensured by functionalized biochars with basic functional groups, and having high specific surface area and large microporosity. Biomasses pre- or post-impregnation with alkaline solutions (i.e. potassium hydroxide) seem to be the most appropriate approach to synthetize such efficient biochars.

The Water-Food- Ecosystem Nexus in a Changing Climate: Toward a Holistic System of Thinking for Climate Change Mitigation

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Abstract:

Food security and water sustainability in arid and semiarid regions are threatened by rapid population growth, declining natural resources, and global climate change. Arid ecosystems are more vulnerable to climate change impacts, significantly decreasing water recourses and food security. In addition, countries in arid regions compensate for meat imports by raising domestic livestock with cultivated green fodder, which reduces land for other crops and depletes precious water resources. Thus, it is essential to understand the interconnection between the environmental components and the climate to develop better climate change mitigation strategic planning. This work aims to determine possible mitigation strategies through an in-depth assessment of Food-Water-Ecosystem-Climate nexus modeling for climate change mitigation. The restoration and revegetation of arid lands and taking advantage of ecosystem services such as grazing, improvement of soil properties, and carbon storage by these restored lands is a viable solution for countries in arid regions. In the best-case scenario, revegetated lands could support domestic livestock by up to 23% with a high productivity vegetation coverage of 70% and decreases water consumption for fodder cultivation by up to 90%. However, the probability of receiving optimum rainfall events, especially with climate change impacts to support the coverage and productivity of the best scenario is low. Therefore, strategic supplemental irrigation in specific months could support maximizing vegetation coverage and food security. Furthermore, locations covered with annual plants could play a significant role in enhancing the soil by providing approximately 50% higher soil moisture, phosphorous (P), organic matter (OM), and carbon dioxide (CO2) sequestration. Thus, annual plants could be considered a critical biological indicator to determine hot spot locations for restoration and grazing activities.

Spatial Temporal Analysis of Surface Industrial Heat island of Sohar Complex Industrial Area

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Abstract:
More than $15 billion USD had been invested in Suhar city directly or indirectly during the past two decades. The Sohar industrial zone and the Sohar ports drew the bulk of these expenditures. The city of Suhar is emblematic of Oman's rapid urbanization during the past four decades. In the early 1970s, the city was made up of a few scattered fisherman's communities, but by 2020, the population had risen to almost 232,849. These population increases have both positive and negative consequences for the environment of Suhar. It indirectly increases the city's economy, improves the quality of life in the city, and creates new jobs. The environmental toll was high as a result of these expansions, which led to greater factory construction and more pollution from factories. The primary purpose of this research was to examine the Industrial heat island (IHI) phenomena in Suhar using remote sensing imagery from Landsat and Modis. The primary goals of these research projects are (1) identifying the spatial and temporal surface of IHI between 2012 and 2020, and (2) examining the interaction between IHI and other urban characteristics such vegetation, urban area, and pollution. Our study was able to offer a robust assessment of the spatial and temporal variance of IHI impacts because the industrial park was separated from other human-made places. When the intensity of the IHI was evaluated in relation to a number of natural and man-made benchmarks, new evidence for the presence of the IHI effect across space and seasons was discovered. Time series analysis revealed that the IHI impacts expressed themselves in the form of more pronounced disparities in land surface temperatures between the industrial parks and their surrounding backgrounds throughout the warm seasons.

Oman's Black Carbon Emission Trends and Reduction Policy

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Abstract:

The Black carbon (BC) emission inventory in the Sultanate of Oman was performed based on fuel consumption and emission factor in a top-down scheme. BC emissions in Oman have increased 453 times between 2000 to 2015, with an annual growth rate of 11.29 from 0.46 Gg in 2000 to 2.56 Gg in 2015. The projection of BC based on the Business as Usual Scenario is estimated to reach 11.67 Gg by 2030. In 2015 Black carbon key sources came from the transportation sector, with a 97.9 percent share of the national total. The rest of the Black carbon emission is related to the combustion of oil products in the energy sector. For the transportation sector, heavy trucks powered with diesel contributed up to 87% of the total national emission of Black Carbon in 2015, followed by Cars with 6.9 % of the total national emission of Black Carbon. Reducing emissions from heavy truck diesel in the transportation sector is one of the most promising near-term strategies for lowering CO2eq emissions, with additional positive effects on direct radiative forcing, public health, and air quality. Now commercially available technological solutions can dramatically cut the amount of BC emitted by diesel-powered vehicles. Compared to older diesel engines, BC emissions can be removed with soot-free diesel engines that comply with European emission standards such as Euro VI for heavy-duty diesel vehicles adopted in 2009, Euro 5Bb for light-duty diesel vehicles enforced in 2011, or US 2010 criteria. Adopting framework criteria for soot-free diesel engines is, therefore, a feasible alternative in Oman and will decrease Black Carbon emissions. The rate at which black carbon emissions decrease in Oman due to the deployment of soot-free diesel engines depends on the degree to which conventional diesel engines are phased out.

The economic impact of California's Cap and Trade program:an interrupted time series analysis with a matching approach

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Abstract:
In 2012, California presented their CaT Program to meet its goal of reducing GHG emissions to 1990 levels by 2020 and ultimately, achieving an 80% reduction from 1990 levels by 2050. Although these programs are found to have significant environmental impacts, there has not been many studies that analyze their economic effects, especially focusing on California. To contributeto the carbon pricing literature, I investigate this question using a matching framework for 40 U.S. states within an interrupted time series analysis approach (ITSA) for the period 1990-2019. Results show that in the presence of the abovementioned emissions trading system, California'sper capita personal income level significantly increases immediately after the intervention in $741.504 dollars. My estimations suggest too that there exists a positive difference in trends with respect to control states in $608.916 dollars. Analogously, results indicat e that Californian nominal and real GDP indices (2012=100) pre–post trend is significantly higher than control states in 2.624 and 2.386, respectively. Additionally, it is obs erved t ha t t he renewa ble elect ric g enera t ion index (2012=100) t ren d significantly outperforms control states in 6.214. Finally, when addressing robustness checks, results are found to not change systematically, supporting my prior estimations. I believe this paper will significantly contribute to the green transition and to the carbon pricing policies debate.

Advantages of Harnessing Fourth Industrial Technologies for Climate Change Alleviation in the Asia-Pacific Region

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Abstract:

Nowadays climate change impacts are getting more intense and all nations around the world are eagerly ramping up joint efforts to ensure the planet's sustainability. Climate change has begun showing its impacts on the environment, and the change is real. Many initiatives are being undertaken with the hope to accomplish the target of net-zero emissions as soon as possible. However, over the past two years the ongoing COVID-19 pandemic has heavily impacted global socio-economic conditions and aggravated the challenges being faced by countries. To address these social, economic and environmental issues and build back better, the development of advanced tools such as the fourth industrial revolution (4IR) technologies would be crucial, especially in the AsiaPacific region. This paper discusses the opportunities, challenges, innovations and strategies to enhance climate change mitigation with 4IR technologies from sectoral perspectives and provides policy recommendations based on the analysis.

An Integrated Approach to Enhance the Desalination Process: Coupling Solar Cell Desalination with Microbial Desalination Cell

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Abstract:

Water scarcity is a major issue in the world, with an increase in population growth rate there is an increased stress on fresh water demand. The worldwide goal is to follow sustainable methods and environmentally friendly techniques to provide solutions for such problems. Desalination has become a major way to obtain fresh water from unconventional water resources such as seawater and brackish water especially for the GCC region. Generally, current desalination methods are expensive and energy intensive, and with the world turning its attention to green technologies and sustainable methods, it's important to look for better and more sustainable methods of water desalination. In the case of GCC countries, solar desalination is very affective because of the climate state in this region which is sunny all year round, especially in the summer time in which the maximum ambient temperature reaches over 50 ⍰. Oman is situated geographically in a location that is exposed to high temperatures and high solar energy almost all year round. Solar radiation being an infinite source of energy, makes it sustainable to make use of it in our industries to provide fresh water for instance. The solar coupled by microbial desalination cell (MDC) is an emerging technology for electricity generation through active microorganisms. In MDC, electro-active bacteria perform oxidation of soluble organics from wastewater, this oxidation process generates protons and electrons (e-) that are transmitted to the anode chamber. The electric potential gradient generated by exoelectrogenic bacteria drives cations and anions in the saline solution to migrate through cation exchange membranes (CEM) and anion exchange membranes (AEM) into the cathode chamber and anode chamber, respectively. Although MDC and Solar desalination have been researched separately and have been proven successful in terms of the removal of salt in water and energy production, there hasn't been enough research done on the coupling of MDC with Solar Desalination Cell. It's recommended to couple microbial desalination with solar desalination to provide potable water especially in countries like Sultanate of Oman which are exposed to high solar radiation that could make it more efficient than other places in the world.

Comparison of the observed trends and Projections of precipitation of Global Climate Models over Sultante of Oman

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Abstract:

Climate change represents a threat to the available water resources. To achieve better environmental planning and monitoring, it is necessary to take into consideration the influence of climate change projections. The most important factor that affects the environmental system's response to the manmade climate change is the variation of the amount and intensity of precipitation, especially in Sultanate of Oman, which is known for the frequent flash floods over the years. This study compares the historical observed precipitation trends in Oman – especially Sohar region – with the future climate changes projections using climate change knowledge portal (CCKP) for the years (2000-2022) then using it to predict the precipitation amounts for the years (2022-2050). The data was translated to maps by the software QGIS. The aim of this research to evaluate whether the climate change scenarios can be utilized to predict the amount of precipitation or not. In the current effects on climate change on the local precipitation amounts, this study provides an insight into the upcoming precipitation patterns. Moreover, the results will help the decision makers in the country to make informed wise decisions regarding mitigating and managing the current water resources to minimize the effects of climate changes.

Climate Change Risk Perceptions, Vulnerability, and Adaptation in High Altitude Farming Regions of Hindu Kush Himalaya- a regional perspective

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Abstract:

The Hindu Kush Himalayas (HKH) is the primary source of livelihood for more than 200 million people living in the mountains. Rapid climatic changes and extreme events have adversely affected the region's mountain ecosystems, agriculture, and food security. Traditional adaptation strategies to tackle the effects of rapidly unfolding climatic events are no longer effective. Despite a great level of vulnerability in the HKH, there is the least understanding of the impacts of climate change. This study explored local climate change risk perceptions, vulnerability, and adaptive responses in the three HKH countries, Pakistan, Nepal, and Bhutan. For this purpose, 379 farm households from low, medium, and high elevations in the study districts of Rasuwa in Nepal, Gilgit in Pakistan and the Central District in Bhutan were surveyed. A semi-structured digital survey was used for data collection. The study revealed that farmers in the study areas strongly agreed that the climate was changing in the region with high summer temperatures and increasing frequency and intensity of weather-related extreme events. Increasing poverty and limited institutional services make farmers more vulnerable to climate risks. Farmers reported reduced agricultural productivity and decreased revenue caused by climate change. Crop yields at high altitudes were slightly higher, but only because of multiple cropping triggered by weather patterns. Lack of information, resources, and institutional support significantly hamper the farmers' adaptive capacity. A small fraction of the farmers adopted improved crop varieties and land management. The study recommends improving outreach and institutional services, especially climate-specific farm advisory services in HKH countries.

Modeling of Seawater Intrusion into Salalah Coastal Plain Aquifer, Sultanate of Oman

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Abstract:

Salalah Coastal Aquifer is the vital natural water resource for agriculture, domestic and commercial use for the city. A lack of balance between the recharge and abstraction rates caused seawater intrusion in the wells in the vicinity of the coastal side of Salalah Plain. In this MODFLOW and MT3DMS were implemented for Salalah Coastal Plain aquifer covering about 640 km2 representing around 83% of the total area of the plain. The groundwater modeling was carried out using MODFLOW. The model was calibrated and validated at steady state and transient state using data from 2000 to 2019. It was used to define the aquifer properties such as hydraulic conductivity, specific yield, and vertical anisotropy. MODFLOW results were mapped to MT3DMS in order to simulate solute transport at transient state. The longitudinal dispersivity and porosity of the aquifer were calibrated and validated. Across the three aquifer layers, the hydraulic conductivity was found between 10 m/day to 100 m/day, vertical anisotropy was found to be 4 and the specific yield was found between 0.01 to 0.1. The predictive modeling indicated an average of 1.5 m drop in hydraulic head across the whole study area by 2040, while seawater intrusion effect was expected to increase at the coastal side with potential extension to the central area of the Salalah plain. The study concluded that the generated model can be used as a prediction tool to study the aquifer behaviour under different climate change scenarios, as a part of the integrated water resources management for Salalah city.

Multistakeholder Engagement Via Co-creation for Capitalising and Innovating Nature Based Solutions

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Abstract:
The presentation aims to provide participants with an overview about the innovation and critical approach to co-creation of Nature Based Solution. The foreseen impact is to reach the integration and mainstreaming of co-creation embedded into strategic planning and programming into urban and territorial context and agendas. Consequently, the objective is to help facilitate locally adapted implementation of Nature-based solutions as well as tackling global societal challenges, such as, climate mitigation and adaptation, and human/ecological well-being.
Research demonstrates that by adoption of an inclusive multistakeholder approach and integrating a framework for co-creation will facilitate the process of applying to NBS under diverse social, cultural, economic, environmental, and climate conditions. An important aspect has to do with the reduced risks of natural hazards induced by more frequent, more amplified extreme (hydrometeorological) weather events. What types of NBS get implemented, by whom, how monitoring is arranged, and impacts evaluated, are related to carefully devised co-governance processes.

Influence of urban canopy ratio and morphology on CO2 concentration and thermal comfort in new proposed residential urban canopy complex

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Abstract:

Urban canopy in residential complex affects air quality and thermal comfort for residents doing social activities in outdoor spaces between building. This study aims to investigate the effect of new proposed residential urban canopy complex on thermal comfort and air quality. CO2 concentration was evaluated and improved based on ENVI-Met 5.0.0 simulation model using different design scenarios for urban morphology and urban canopy ratio (H/W) optimization. Thermal comfort values, by Physiological Equivalent Temperature (PET) and CO2 concentration (ppm) were compared. The results concluded that the average CO2 concentration were 393.54 ppm, 394.55 ppm, and 394.91 ppm for the urban canyon ratio equal 1.825 and 1.25, and 1.0 in the developed strategies D1, D2, and D3 respectively, compared with 408.89 ppm in the existing case. The optimization model of the canyon ratio (H/W) equal 1.5 which achieved significant reduction of CO2 in the courtyard with better air quality for users. Also, depending on the semi-enclosed courtyard with an aspect ratio of 1.5 in the optimization model led to provide self-shading by the surrounding buildings, so reduction the solar radiation and discomfort hours. The study provided information for architects and planners to use the new proposed theories for residential urban canopy complex with optimum dimension in new cities and complex with low heat stress and air quality.

Cooperative On-line International Learning (COIL) to Educate Health Professionals About Climate Change

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Abstract:

Background/ Issue: The 2015 Paris Agreement amplified that climate change will impact all areas of human health and called for awareness and training related to climate change. To address this important public health issue a prepared health professional workforce is needed globally. Additionally, the workforce should have a global perspective of the impacts of climate change on human health. Description: Four educational institutions from Finland (nursing), India (public health), Nigeria (medicine) and the U.S. (nursing) collaborated to develop and deliver an on-line asynchronous, interdisciplinary course to address climate change and health from a global perspective. The on-line platform allowed experts from each country to collaborate and teach in their area of specialty and highlight the unique climate change health issues of each region. The course culminated with a live zoom session with student led group presentations that included students from each country. Lessons Learned: This session will share how we addressed intellectual property issues, the technical support needed, administrative concerns, tuition, and worked with the resources that were available from each of the four educational institutions to successfully deliver a course in which students could engage in an on-line environment with students and climate change faculty experts on four different continents. Implications/recommendations: This innovative course is a prototype for engaging in important global public health education such as climate change. It presents an opportunity for greater understanding and learning of global impacts and international faculty collaboration.

Crossing multi-source climate data to estimate the effects of climate change on evapotranspiration data: application to the French Central Region

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Abstract:
Climatic factors are the subject of considerable research, both methodologically and instrumentally. Under the effect of climate change, the approach to climate parameters with precision remains one of the main objectives of the scientific community. This in the perspective of assessing climate change and its repercussions on humans and the environment. However, many regions of the world suffer from a severe lack of reliable instruments that can make up for this deficit. Alternatively, the use of empirical methods becomes the only way to assess certain parameters that can act as climate indicators. Several scientific studies have addressed the issue of evapotranspiration, the result of which has led to the development of methods allowing its assessment either directly at the level of climatic stations or by empirical methods. All these methods make a point approach and in no case allow the spatial variation of this parameter. We therefore propose in this paper, the use of three sources of information (network of weather stations of Météo France, World Databases and Moodis satellite images) to evaluate spatial ETP using the Turc method. This first step will reflect the degree of relevance of the indirect (satellite) methods and their generalization to sites without stations. The spatial variation representation of this parameter using GIS accounts for the heterogeneity of the behavior of this parameter. This heterogeneity is due to the influence of site morphological factors and will make it possible to appreciate the role of certain topographic and hydrological parameters. A phase of predicting the evolution over the medium and long term of evapotranspiration under the effect of climate change by the application of the IPCC or GIEC scenarios gives a realistic overview as to the contribution of aquatic systems to the scale of the region.

The Impact of Different Courtyard Ratios in University Buildings on CO2 Concentration and Air Quality in Hot Arid Climate

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Abstract:

The courtyard affects the success and learning of the students due to the importance of courtyards in educational buildings and their role in improving climate. The purpose of this study is to investigate the impact of different courtyard ratios on CO2 concentration in the two Faculties of Agriculture and Education, New Sohag University, Egypt in order to choose the ratio that can be applied in future educational building in hot arid climate. To attain the aim, the research adopts the applied approaches including physical measurements. CO2 concentration, and air speed were measured for courtyards and overlooking spaces. The results showed the level of CO2 concentration increased in the "courtyards with an H/W ratio of (0.7) compared to the courtyard with a ratio of (1.2) during the hot period. As result, the level of CO2 concentration increased in the spaces overlooking it. Finally, it is recommended to use courtyard with a ratio 1.2 in designing educational buildings in hot arid climate.

Climate Change Impacts on Irrigation Water Requirements and Implications for the Agriculture Sector in Oman

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Abstract:
To understand the climate change impact to water resources in Oman, it is crucial to quantify how climatic variables are connected to crop evapotranspiration and, by extension, to irrigation water requirements. A few studies to date focused on projected changes in temperature and precipitation in the region, let alone the effects of these variables on irrigation water requirements of important crops. In this study, the Food and Agricultural Organization (FAO) crop evapotranspiration approach is used to quantify the changes in crop water requirements associated with projected changes in climatic variables under the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5) scenarios for four periods in the 21st century in Oman. More specifically, first quantified the contemporary water requirements of major crops in three agroclimatic zones in the country. Then for each of these zones, the future water requirements is calculated in the three periods of interest and two AR5 scenarios, assuming no changes in irrigation management practices. Finally, the differences between current and future water requirements by crop is computed as well as for the entire agricultural sector and interpreted these results from the cultural and economical perspectives. The findings point to major increases in irrigation water requirements for Oman in all regions but the magnitude of these increases are controlled by both IPCC scenario used and the time horizon in the century. These findings are important to evaluate water resource situation – specifically groundwater – in Oman and can help determine available alternatives and measures and help understand the future water resources limitations across the country.

Threats of Pollution and climate change to the Arabian Oryx Sanctuary , Oman

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Abstract:
The Arabian oryx sanctuary, also known as Al-Wusta Wildlife Reserve (WWR) is the first wildlife reserve in Oman. It was established in 1980 for the reintroduction and breeding of the Arabian oryx (Oryx leucoryx) and recently other wildlife, including Sand gazelle (Gazella marica), Arabian gazelle (Gazella arabica) and Nubian ibex (Capra nubiana). WWR is an area within the central desert and coastal hills of the biogeographically regions of Oman. The reserve contains varieties of geological life and landscapes of unique scientific and aesthetic value. It is the first site in the region to be recognized by the United Nations Educational, Scientific and Cultural Organization (UNESCO). Seasonal fogs and dews support this unique desert ecosystem whose diverse flora includes several endemic plants. Peninsula are conservation programs of endangered animals such as the houbara bustard (Chlamydotis macqueenii), waders (storks and herons), Nubian ibex (Capra nubiana), Arabian wolves (Canis lupus arabs), Honey badger (Mellivora capensis), Caracal (Caracal caracal) and the largest wild population of the Arabian gazelle (Gazella arabica). Human and animals face new challenges for survival because of climate change. More frequent and intense drought, cyclones, heat waves, air pollution, rising sea levels, melting glaciers and warming oceans can directly harm animals and human, destroy the places they live. Furthermore, human settlement in natural habitat of wildlife lead to extinction of some endangered species. Industrialization in Duqm (Oman) has economic benefits but adverse effects on the environment as well. Every year, at WWR, high mortalities and injuries occur in animals because of pollution and cyclones. In this article, we will discuss threats of pollution and climate change to the WWR and their possible solutions

Climate modeling soil moisture quality prediction Using the Internet of Things (IoT) and LPWAN Sensors in Oman

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Abstract:

There are some changes in soil moisture because of climatic changes. Soil moisture is a primary climatic variable that occurs because of its high spatial fluctuations affected by the amount of precipitation and temperature of unsaturated soils. the environmental problem has a significant negative impact on the lives of living organisms Measuring soil is expensive on a scale of tens of kilometers. It has become a serious problem for environmentalists around the world. Lack of moisture in the soil destroys enough crops to feed 81 million people a day. LPWAN is an extensive sensor. It is specially designed to provide a cheap and reliable communication method. In this work, we have developed a two-part intelligent system for analyzing and monitoring soil moisture. The first part is a network of LoRa sensors to measure moisture stored in farmland to validate changes in soil moisture due to changes in soil temperature and precipitation. The second section is a center for processing data received and transmitted by devices' sensors to take timely action. The Microsoft Azure Cloud serves as a cloud computing platform. Big data stores provide a reliable global system at a low cost, as sensors and IoT systems are minimal. The system is fully integrated, starting with monitoring humidity, then processing it, and finally giving the final decisions to act. And verify that the differences in soil moisture are correct.

The impacts of the summer season on the hotel occupancy rate in the Sultanate of Oman

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Abstract:

This paper studies the impacts of hot temperatures on hotel occupancy rates during summer season in the northern region of Oman versus the higher occupancy rate in the winter. Tourism is a promising economic sector; this paper will discuss the measures and interventions of the concerned governmental bodies selecting alternative locations with moderate weather, promotional packages and summer activities to overcome the shortage of tourists' number during the summer season.

The Sultanate of Oman is located on the Eastern- South of the Arabian Peninsula meaning that Oman is within one of the hottest geographical locations on the earth. The degree varies between 18 and 26 degrees for a much cooler winter. While summer temperature is hot and humid in coastal areas, with temperatures around 37/38 °C on average, but it can get close to as high as 50 °C except for the moderate climate in Dhofar Governorate due to the monsoon. This indicates that winter, specifically between October to April, is a pleasant time to visit Oman, especially the northern side, for tourists who find the Middle East, including Oman, the best option to travel.

Rainfall vulnerability and its impacts on water resources in Oman

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Abstract:
Sultanate of Oman is characterized by restricted resources of freshwater, in combination with extremely high summer temperatures and high evaporation rates. During the last five decades the country witnessed spectacular socio-economic developments which intensify the anthropic pressure on the limited water resources that call for a quantitative assessment of the possible impact of climate change. In the face of ever-increasing uncertainty and fluctuations in the global water cycle, investigation of precipitation variability is considered to be an effective means for enhancing water management capabilities.
In this study, a normalized rainfall index was used. The normalized rainfall anomaly (Asy) for a given station is computed with Asy = (Rsy – Rs) /σs where Rsy is the rainfall total for the station s during a year (or a season), and Rs and σs are the long-term mean and standard deviation of the annual (or seasonal) rainfall total for that station, respectively. The area-averaged normalized rainfall anomaly (Ary) is defined as Ary = (1 / Ns) Σ Asy Where Ns is the number of country-wide (or regional) stations operating in a year y. Data analysis was used to investigate large-scale atmospheric properties during winter & summer rainfall.
The main rainfall systems in Oman are depending to the major climatic oscillations of the North Atlantic Oscillation, Indian Oscillation Dipole and El-Nino Pacific Oscillation. The future projection of the frequency of those climatic Oscillations was very useful to determinate the rainfall trend in Oman (reduction of the 25% in the northern and 42% in the southern. Future work will focus on the Oman Convergence Zone (OCZ) that produce rainfall across the interior desert region of Oman. This investigation requires sophisticated atmospheric model that are able to reproduce the boundary layer condition with high accuracy.

The International Methane Emissions Observatory: Using Data to Drive Methane Reductions

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Abstract:
Methane emissions are a major climate problem, but not enough information is known today on the magnitude and location of methane emissions. To address this data problem, the UN Environment Programme launched the International Methane Emissions Observatory (IMEO) to provide free, reliable, and actionable data to stakeholders who can act to reduce methane emissions at the speed and scale needed to reach the Paris Agreement. IMEO collects, integrates and reconciles methane data from different sources, including scientific measurement studies, satellites, rigorous industry reporting, and national inventories, to create a public dataset of empirically verified methane emissions.

IMEO Head Manfredi Caltagirone will speak to IMEO's data-driven, action-focused approach to addressing methane emissions by connecting empirically-verified data with actions on science, transparency, and policy. As a core implementing partner of the Global Methane Pledge, IMEO supports countries and companies to use its data to achieve and track progress towards methane commitments.

Estimating Methane Emissions from Oil and Gas Industry in The Sultanate of Oman Using A Bottom-Up (BU) Inventory

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Abstract:
In the Saltant of Oman, methane emissions from the oil and gas sector are the highest contributor to the total GHG emissions. Curbing these emissions is considered an effective way to reduce the rate of warming over the near term. Therefore, assessing CH4 per source category of oil and natural gas value chain is essential for developing an efficient abatement policy. In light of these facts, this study's objective was to address the lack of knowledge in estimating methane emissions from the oil and gas value chain from 2017 to 2020. Methane emissions from the Sultanate's oil and natural gas industry were estimated using a bottom-up (BU) approach based on Tier 1 of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories and the IPCC 2019 Refinement. The results showed the highest estimated amount, 847.6 Gg in 2019, and the lowest was 759.96 Gg in 2017. The methane emissions per operational sector were the same for the study period. The upstream sector is the primary source of emissions, as it is responsible for more than 81% of the methane emissions from the oil and natural gas value chain. In this sector, the fugitive emissions from natural gas production are the critical source of emissions; they represent more than 60 % of oil and natural gas methane emissions.

Enhancing methane production by inserting granular activated carbon coated with nano zero-valent iron in anaerobic digester as a sustainable biotechnology

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Abstract:

Anaerobic digestion (AD) is among the most popular technologies that have provided dual benefits of waste treatment and alternative energy generation. AD has the capacity to capture the methane gas that would usually be released into the atmosphere as a potent greenhouse gas. AD captures methane and provides a source of renewable energy that has the potential for no net increase of atmospheric CO2. The use of conductive additives in the AD matrix has improved biodegradation and biogas production performance. Hence, thermophilic AD (TAD) was operated under three different conditions such as (i) addition of GAC/nZVI materials in the matrix of TAD, which was operated for co-digestion of cow manure with food wastes (ground rice and bread); (ii) addition of GAC/nZVI materials in the matrix of TAD, which was operated for mono-digestion of cow manure; and (iii) the control TAD without the addition of GAC/nZVI) materials in the TAD matrix, which was operated for co-digestion. The results were compared with the control TAD without conductive additives. Biogas production increased by 11 folds upon using GAC/nZVI addition compared to the control TAD. Moreover, the addition of GAC/nZVI increased the methane in biogas by 20.7 folds compared to control one. A cumulative biogas and methane generation of 16.660 L and 1.111 L were achieved, respectively. With GAC/nZVI, the maximum COD removal of 78.29% and 85.21% were noticed for co-digestion and mono digestion, respectively. Such improvement of TAD performance was due to easy bacterial communication and electron exchange through the conductive particles. The technology may contribute to the development of clean energy because the captured methane can be used as an energy source to produce heat or generate electricity. Therefore, the potential of recycling sewage sludge with life-stock and food waste in the AD process will enhance nutrient management for agriculture and create an avenue of renewable energy for the circular economy with low carbon emission.

The Application of Energy Simulation Modeling to Decarbonize buildings

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Abstract:
To limit global warming by 2 °C by 2050, carbon dioxide emissions in buildings would need to be reduced by 77%, according to projections. Energy consumption in buildings is one of the main sources of greenhouse gas emissions. Decarbonizing the energy demand of buildings involves two approaches: first, a reduction in energy demand, and second, a reduction in the carbon content of energy by shifting to clean renewable energy sources. Some countries that account for a large share of global CO2 emissions, such as China, Russia, Japan, Germany, Korea, Canada, and the United Kingdom, have already started energy efficiency initiatives. Nevertheless, same effort is not performed by Arab countries. Of the 163 member countries of UN, listed in the 2022 Sustainable Development Report, only four countries score more than 69 points (Algeria, Tunisia, Jordan, and Oman), and Sudan ranks last with 49.6 points. Arab countries need to do more to link existing climate targets with realistic, enforceable measures. This research proposes a framework that promotes the use of energy simulation models to ensure the optimization of retrofit initiatives to reduce energy consumption in buildings. The objective is to present numerical forecasts of energy demand after renovation. Extensive field measurements have been conducted and used as input data for the building energy simulation program. The proposed building renovation project has resulted in a 38% reduction in energy consumption, in addition to 41% of the total energy consumption met by solar energy production.

Developing the novel design of a microbial electrochemical system for desalination, sewage treatment, energy and resource recovery

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Abstract:
In bio-electrochemical technology, electroactive bacteria degrade organics metabolically and produce electrons. The metabolic electrons are extracted from bacteria to the anode electrode and diverted to the cathode, where it is used to generate value-added products. In recent years, bio-generated electricity has been used to desalinate seawater in a technology called microbial desalination cell (MDC). It is an eco-friendly and sustainable desalination technology that is not using any external power (i.e., heat or electricity). MDC technology attracted attention due to its capacity to remove salts from seawater, organics from wastewater with the concurrent recovery of electrical energy and value-added chemicals. The presentation will cover the technical overview of MDC, it's prospects for sustainable desalination, waste treatment and resource recovery (H_2O_2, H_2, NaOH, HCl, humic and fulvic acid). Instead of having environmental and economic benefits, the real application of MDC is limited due to several engineering challenges. Therefore, the study will focus on the recent development of MDC design suitable to mitigate the technical challenges. The novel MDC designs can alleviate the pH imbalance and ion transport barriers and increase 55% power and 40% desalination efficiency compared to the conventional MDC. In future, more investigations need to analyze the techno-economic feasibility of bio-electrochemical technology through mathematical modelling. The figure below represents the technical overview of MDC technology.

Novel designed microbial desalination and chemical recovery cell for chemical resource and green power recovery

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Abstract:

Microbial desalination cell (MDC) is a sustainable environmental friendly technology for water desalination using organic contaminants in wastewater as energy source to drive the desalination process. Microbial desalination and chemical recovery cell (MDCRC) is a modified MDC that provides desalinated water, bioelectricity, and concurrently produces value-added products. This study presents a novel design of MDCRC for enhanced desalination and acid-base production. This research focused on the novel quadruple design of MDCRC and its performance of desalination, voltage generation and acid-base recovery. Three different circuit connections; i.e., individual (IQMDCRC), parallel (PQMDCRC), and series (SQMDCRC) were used to study the desalination rate, organics removal, and recovery of acid-base. The recovery and desalination rate were investigated at different salt concentrations in absence and presence of power supply. The novel design showed promising improvement compared to the control design in terms of recovery and desalination. Due to the single and enlarged central salt chamber, the internal resistance was reduced significantly, which increased the desalination rate and recovery. The two directional anode and cathodic reactions in MDCRC benefited the bio-electrochemical outcomes. The voltage generation and desalination rate were doubled compared to the control design, which gave evidence of two-directional ionic movements in MDCRC despite having the same volume and position of salt chambers in both systems. The configurations showed the lowest internal resistance over the control desalination cycle along with a significant power recovery, significant desalination rate and desalination ratio of 99% were noticed. The optimization of the novel quadruple design of MDC can be advantageous towards target based bio-electrochemical outcomes towards real application. Such a low carbon emitting and ecofriendly technology is very important to reduce the climate change effects and achieve the goals of circular economy.

UAE's National Net Zero by 2050 Pathway

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Abstract:

UAE is the first country in the Middle East and North Africa to launch a Net Zero by 2050 Strategic Initiative to meet the Paris Agreement target of keeping global warming below 2°C. The strategic national drive has leveraged the development of "The National Net Zero by 2050 Pathway" for the UAE to be the core of the defined decarbonization roadmap of Long-Term Low-Carbon Development Strategy.

The identified 'diversified' net zero pathway ensures accelerating the shift toward a green economy, while ensuring a balance between climatic and socio-economic impacts.

Gas generated from landfills in Oman

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Abstract:

Due to decomposition of organic solid waste in landfills, methane, carbon dioxide and other gases are generated. Of these gases, the methane gas (CH4) was generated in large amounts. There are ten MSW operational landfills in Sultanate of Oman that are receiving MSW waste and other solid waste. These landfills are distributed around all the governorates of Oman. In this study, the amount and composition of gases generated from six landfills in Oman were studied. Landfills gas was monitored through 150 mm HDPE perforated pipes inside landfill cell. From the average percentage of landfill gases, the six landfill were in anaerobic phase. However, the quantities of landfill gases varied between landfills. The highest amount of methane gas was recorded in Barka LF and it is about 49.5 % of all gas generated in that landfill. The result also shows that the percentage of methane gas in all gasses generated, increased withe time. On the other hand, oxygen gas percentage declined with time. The e results also show that the methane increases with the increase in leachate quantities. Some mitigations measures were recommended to reduce the leachate quantity and to reduce the percentage of landfill gases.

Microbial electrosynthesis as novel biotechnology for CO2 sequestration and renewable resource recovery for zero carbon emission

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Abstract:
Climate change and Global warming, mainly due to the increased greenhouse gases (GHGs) emissions (e.g., CO2, CH4, and N2O) are the most threatening global concerns for scientists nowadays. CO2 is known to be the culprit of this emergent environmental problem as it represents the majority of GHG emissions (63% CO2, 24% CH4 and 3% N2O). To solve this issue, the world introduced several GHG control strategies, including carbon capture and utilization strategy (CCU), which implicates chemical, physical and biological processes of CO2 capture. Despite the significant advancements in the chemical and physical processes like absorption, adsorption, photo and electrochemical processes, these technologies typically demand high energy inputs, electrode materials have a short life cycle with leaching toxicities, and increased requirements for electrode materials. Unlike physical and chemical CO2 capturing methods, biological processes such as microbial electrosynthesis (MES) integrated from microbial electrochemical systems have been proposed as a cost-effective and environmentally friendly biotechnology for waste treatment and energy-resource recovery. MES sequestrates CO2 gas on the cathode electrode and synthesis diverse organic compounds using microorganisms as biocatalysts. However, the chemical synthesis using CO2 reduction on the MES cathode requires specific attention to improve energy consumption efficiency for value-added chemical production. Reactor design, membrane and electrode materials and microbial catalysts are the main factors affecting the MES functions. Particularly, the cathode materials significantly impact the microbes' ability to perform electricity-driven CO2 reduction. This study will explore the recent advances made in reactor configuration and develop a novel electrode material for MES application. The implementation of such novel biotechnology is significantly important for CO2 sequestration and waste minimization to achieve a lower effect on climate change and circular economy.

Reducing GHG Emissions and Optimizing Renewable Energy in a Full-Scale (A2/O) Treatment Plant by Novel Process that Eliminates Side streams Effects on Mainstream Sewage Treatment

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Abstract:
Wastewater treatment plant, in addition to its wastewater treatment operation, it produces several air pollutants and greenhouse gas emissions (GHG). The balance between the three integrated sustainability requirements, including effluent quality, energy efficiency and low GHG emissions, should be achieved in modern wastewater treatment plants. This research aims to reduce carbon footprint, reduce energy consumption, and improve renewable energy production through a novel operational process. In this study, the novel process was developed by designing an extended nutrient moving bed biofilm reactor (EN-MBBR) system to separately treat all sidestream lines (supernatant gravity thickener, underflow mechanical thickener, and centrate) from full-scale (A2/O) treatment plant without returning them to the treatment plant head, but rather integrating treated sidestreams with treated mainstream. The GHG emissions and energy production/consumption were modelled using GPS-X before and after applying the novel process. The model sensitive fractions and mass balance were calibrated to obtain results with R values of more than 0.8 and NMSE values close to zero for all parameters. The results showed that the novel process contributed to increasing the biogas production from 8577 to 8676 m3/day, increasing the renewable energy in the plant by about 214 KWh, reducing the energy consumption by about 412 KWh, and reducing the carbon footprint by 12%. This novel process provided sustainable ways for managing the entire plant in general and reducing the cost of energy consumed.

Production of bio diesel from fresh water algae

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Abstract:

Biodiesel Is An Alternative Fuel Similar To Conventional Or 'Fossil' Diesel. Biodiesel Can Be Produced From Straight Vegetable Oil, Animal Oil/Fats, Tallow and Waste Cooking Oil. The Process Used To Convert These Oils To Biodiesel Is Called Trans esterification. The possibility of economically deriving fuel from cultivating algae biomass is an attractive addition to the range of measures to relieve the current reliance on fossil fuels. Algae biofuels avoid some of the previous drawbacks associated with crop-based biofuels as the algae do not compete with food crops. Biodiesel is prepared from algae collected from Ain-Razat. Soxlet method is used for the extraction of oil from dried algae. 1.92 gm of algae was obtained from 50gm of dried algae. The %Yield for oil extraction was only 3.84%. The prepared biodiesel sample is tested for its properties like viscosity, refractive index, flash point and fire point. The measured physical properties of biodiesel match with the physical properties of commercial petroleum diesel. Biodiesel is a much cleaner burning fuel than standard diesel fuel. Because it is not a fossil fuel, and therefore its combustion does not result in added atmospheric carbon dioxide originating from beneath earth's surface. By reviewing the status of this technology we suggest that the large uncertainties make it currently unsuitable as a priority for many developing countries. The potential of modern biotechnology, especially genetic modification (GM) to produce new algal strains that are easier to harvest and yield more oil has to be developed.

Utilizing Renewable Energy Sources to Reduce Carbon Dioxide Air Pollution in a Heath Clinic in Oman Through Modelling Process

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Abstract:

The primary source of energy must switch from using fossil fuels to clean renewable energy to create an eco-friendly atmosphere. Utilizing renewable energy can reduce air pollution and helps ensure that there is a sustainable energy source to meet future energy needs. This study's main goal is to look at various hybrid renewable system combinations that could be used to generate electricity for a health clinic in Dhofar, Oman, and present key metrics that have the biggest effects on the sustainability of the environment and energy. HOMER software was used to conduct a techno-economic assessment based on the data gathered from the meteorological organization and the factors influencing the environment in Oman. The Grid-connected hybrid arrangement, which consisted of photovoltaic (PV) and battery technology, was shown to offer the best outcome in terms of the lowest air pollution compared to the other hybrid energy systems considered. Additionally, the findings indicated that this hybrid renewable energy system can significantly reduce the annual CO2 emissions, increase production of sustainable energy production, and a financial basis for investors to invest in the renewable energy sector. A study of the net present cost (NPC) and Levelized cost of energy (LCOE) revealed that the Grid, PV, and battery technology have the lowest NPC and LCOE of $351,311.90 and $393,764.30, and $0.4551 and $0.5109 respectively.

Improving Microbial Desalination Cell Performance by cathode modification using BiOCl/gCN aselectro-catalyst to achieve a low-carbon emitting technology

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Abstract:

The cathodic limitation is the main bottleneck for scale-up of bio-electrochemical systems (BES) due to the induced overpotentials. The internal resistance of a microbial desalination cell (MDC) is higher than that of any other BES due to the surface and electrochemical constraints of the cathode. As a result, modification of the cathode surface by semiconductor material appears to be a new-generation remedy for such limitations. Hence this study investigated an earth-abundant, nontoxic, anti-corrosive electro-catalyst Bismuth oxychloride (BiOCl) hybridized with a very promising graphitic-C3N4 (gCN), a graphene-like electronic structured catalyst coated on stainless steel mesh (SSM) cathode for MDC. The aim is to see the effective integration of this catalyst in the cathode modification of MDC for improving performance. A chemical process was used to synthesize the heterojunction of BiOCl/gCN following the yielding of gCN by the thermal exfoliation process. Different final catalysts of BiOCl/gCN were prepared by changing their ratio. The hybridization and functional groups were confirmed by morphological characterization using FTIR, XRD. The spectra showed evidence of a successful combination with distinct properties of BiOCl and gCN.The electrochemical characterization was performed using cyclic voltammetry. The best-performing loading rate was investigated using cyclic voltammetry before preparing the final electrode on SSM for application. Cyclic voltammetry showed distinct oxidation and reduction peaks with an interesting sequence of output current for different combinations. The two best results were 50 and 20 mg/cm2 loading rate for 50:50 and 100:0 of BiOCl:gCN respectively. These optimum loading rate and combinations were used to fabricate the final cathode and used in a pre-acclimated three-chambered MDC for real application. Compared to the control of uncoated SSM, the newly fabricated BiOCl/gCN/SSM cathode showed superior performance in terms of desalination and current generation. The polarization also showed a reduction in the internal resistance of the MDC. The result showed a successful application of BiOCl/gCN as a semiconductor catalyst for the first time in cathode modification for bio-electrochemical desalination in MDC. The development of such innovative and novel biotechnology will achieve the low-carbon emission that will significantly reduce the climate change effect.

The reality of achieving carbon neutrality in school system in the Sultanate of Oman from the point of view school administration and teachers

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Abstract:
The study aims to investigating the reality of carbon neutrality practices in school education at Sultanate of Oman School from the point of view of school administration and teachers, To achieve the objectives, two data collection tools will be used, namely: questionnaires and focus interviews. The study will be applied to a sample of school principals and teachers in public schools in the governorates of Al Dakhiliyah and South Al Batinah in the Sultanate of Oman, The results are expected to reveal the reality of applying carbon neutrality in school education from the point of view of the respondents. In light of these results, the study will recommend a number of recommendations that we hope will be implemented in educational policies in the Sultanate of Oman.

Comparison between Conventional Activated Sludge (CAS) and Membrane Bioreactor (MBR) Process for Characterization of MBR Fouling for Municipal Wastewater Treatment

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Abstract:

The purpose of this study was to investigate the pollution removal efficiency of two different wastewater treatment processes, one using CAS that was implemented at Sultan Qabous University (SQU) Sewage Treatment Plant (STP) and the other using MBR that was implemented at Al-Ansab STP. Both of the STP's were located in Muscat, Oman, a representative location in the arid region with average temperature 38- 45 C. as CAS is a well-established technology for sewage treatment since many decades, these studies focus the mechanisms of membrane fouling in MBR process and the way to control it. The analyses of two sewage treatment processes had been performed during five months' operation of the system from. The samples from the both systems had been analyzed to find out the physical, chemical and biological efficiencies of the pollution removal. Subsequently, the achieved efficiencies were compared with Environment Agency and Climate Affairs (MECA) standards.

The study also aimed to investigate the various causes of membrane fouling in the MBR system used in Al-Ansab STP. To have a better understanding on the mechanisms of membrane fouling, scanning electron microscopy (SEM) and elemental analysis of the fouled membrane surface had been done. To identify the types of microbes on bio-fouling layer, Maldi Biotyper identification had also been performed.Why, MBR process is a good Choice for municipal wastewater treatment to remove carbonaceous organics, as well as, nitrogenous compounds biologically.

Modeling and Monitoring of Air Quality in Gulf Co-operation Council (GCC) Capitals Using Satellite Technology and GIS Based analysis

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Abstract:

The issue of air quality including air pollution problems is one of the most serious problems facing countries in the world. Indeed, many countries put this serious issue among their priorities to ensure a decent life for their residents since big industrialization, in the 18th century, made the problem more critical and complex. For its detrimental effects on the natural environment and human life, air pollution caused several health problems related to heart and the respiratory system. The Gulf Cooperation Council (GCC) countries are one of the most active economic regions in the world. They witness a clear economic boom in the recent period that has had an impact on air quality like major cities and capitals. The population of the Gulf Cooperation Council countries is about 53.1 million, of whom about 25.8 million are citizens and 27.3 million are foreigners. Oil extraction is one of the most important economic pillars of this region, along with other economic booms in the fields of agriculture, tourism and industry. The current study seeks to model, monitor and observe air quality in Gulf Cooperation Council (GCC) Capitals based on Landsat-8 OLI and TIRS images, HYSPLIT dispersion model, and GIS techniques. Major land covers were mapped from Landsat-8 images. Air quality map and AOT (Aerosol Optical Thickness) were derived by calculating aerosol path radiance based on exoatmospheric solar constant and atmospheric transmittance. Relying on satellite observations of atmospheric gases from Landsat-8 OLI, results indicate significant changes in the levels of atmospheric pollutants. The study showed that concentrations of PM10 are high in Kuwait and Doha, as the value of the air quality index increased to 95. The value of the air quality index ranged between 56 in Muscat city as the lowest value and 97 in Kuwait City as the highest value, while this value reached about (76-77-95-77) in Riyadh, Abu Dhabi, Doha and Manama. Key Words: 4Air pollution– Satellite Technology - PM10- Kuwait- Abu Dhabi – Gulf Co-operation- Economic boom- Modeling - Air Quality- Monitoring- GIS analysis.

Regional characteristics of long-term PM2.5 over Middle East under SSP Scenarios Based on CMIP6 Models

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Abstract:

Regional characteristics of long-term PM2.5 over Middle East under SSP Scenarios Based on CMIP6 Models Baiju Dayanandan1*, Ajay P2, Ahmed Al Harrasi3 Issa Al Amri4, Pritam Das Mahapatra5, Abhilash S6, Asma Sulaiman Nasser Al Abri1, Safa Nasser Al-salmi 1 1Department of Mathematical and Physical Sciences, College of Arts and Science, University of Nizwa, Oman 2Space Physics Laboratory, Vikram Sarabhai Space Centre, Thiruvananthapuram, Kerala, India 3Natural and Medical Sciences Research Centre, University of Nizwa, Oman 4Department of Biological Sciences and Chemistry, College of Arts and Science, University of Nizwa, Oman 5Department of Atmospheric sciences, Cochin University of Science and technology, Kerala, India 6 Advanced Centre for Atmospheric Radar Research (ACARR), Cochin University of Science and technology, Kerala, India *Corresponding Author: Baiju Dayanandan (baiju@unizwa.edu.om) Abstract The most significant uncertainty in climate change remains due to aerosols. The Middle East region is one of the dustiest in the world because of its proximity to the Sahara Desert which leads high amount of dust deposition on surface level and main contributor to PM2.5 concentration. Asthma, bronchitis, respiratory illnesses, infections, and lung cancer are just a few of the many health effects of dust deposition and high surface PM2.5. In addition to having terrible effects on health, dust aerosols also harm the environment, agriculture, transportation, and infrastructure. We compare the dust aerosols simulated by 18 different models that are a part of the sixth phase Coupled Model Intercomparison Project (CMIP6) and analysed using different reanalysis data. Over the Middle East, highly concentrated aerosol seasons are observed to be MAM (March-April-May) and JJA (June-July-August), which different scientific studies have already reported; that leads to high PM2.5 surface concentration during this season. Most models and multi-model means compared to accurately depict the seasonal climatological spatial distribution of dust aerosols as well as PM2.5 over the Middle East and show distinguished inter-model diversity with very high positive bias (overestimation) or very high negative bias (underestimation). In order to examine model performance, Taylor's diagram is also analysed using spatial correlation and ratio of variance, which explains different model performance over the study region. A significant understanding of the AQI values in the mid-future using future SSP (shared socioeconomic pathways) scenarios that implement significant air-quality controls (SSP1-2.6, SSP5-8.5) and medium air-quality controls (SSP2-4.5) analysed by using CMIP6 model simulations to predict the annual PM2.5 levels in the Middle East. These model-observation comparison results must be considered when analysing aerosols (PM2.5) anticipated future climatic impacts and the possible benefits of different mitigation strategies, particularly regarding the Middle east's uncertain regional and decadal climate change and provides significant information about regional impact of PM2.5 mitigations. Keywords: CMIP6; SSP scenarios; PM2.5; air quality index, Dust aerosols.

Does ENSO affect PM2.5 concentrations in Indonesia?

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Abstract:
The presence of a short-lived climate pollutant, PM2.5, can influence the condition of air quality in specific regions. In the atmosphere, the PM2.5 concentration pattern might be affected by climate phenomena, such as El Niño Southern Oscillation (ENSO). In this study, we examined the effects of El Niño and La Niña in two stages; moderate and strong, on PM2.5 concentrations in Indonesia by using an hourly reanalysis dataset from CAMS global emission inventories during the period 2004 - 2020. We analyzed the anomaly of PM2.5 concentrations by calculating the difference between each El Nino/La Nina episode and the Normal condition. The result shows that El Niño tends to increase PM2.5 concentration in forest fire prone areas of Indonesia, i.e., southern part of Sumatra, southern part of Papua, and most of Kalimantan. It indicates that during the El Nino episodes, the prolonged droughts associated with suppressed rainfall enhance the risk of forest fires occurring in those areas, resulting in elevated PM2.5 concentrations emitted from burned materials. There is, however, no distinct pattern shown between La Nina and PM2.5 during the study period. This might be the result of coupled ENSO and Indian Ocean Dipole (IOD) that may affect the risk of forest fire, particularly in Sumatra and Kalimantan.

Air Pollution Monitoring System Based on LPWAN Technologies and Cloud Computing in Industrial Areas in Oman

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Abstract:
Air pollution is one of the major problems that threaten human life. In addition to being one of the leading causes of many diseases, it is responsible for 9% of all deaths globally. Although there are global efforts to reduce air pollution represented in pollution control systems, the problem still exists. This article discusses the possibility of using LPWAN and cloud computing technologies to monitor air pollution in the industrial area of Sohar in Oman. LPWAN technology was specifically designed to provide a simple, reliable, and low-cost communication method for sensors spread over a wide area, covering the needs of applications that are not demanding data transfer speed. LPWANs may use licensed or unlicensed frequencies and include proprietary or open standard options. The problem in Oman is that there is no reliable central air pollution monitoring system and a data processing center to take action quickly. In this work, we have developed an intelligent system which consists of two parts for air analysis and monitoring. The first part of the system is a network of LoRa sensors to measure the gases emitted by factories. The second section is a center for processing the data sent by the sensors to take action in a timely manner. The Microsoft Azure Cloud system is used as the cloud platform. The developed system is also characterized by very low cost, as IoT sensors and systems are a meagre cost. The system is also fully automated, starting from monitoring the air, then treating it, and finally giving final decisions to take action.

Deployment of Low Cost PM2.5 Sensors to Investigate the Spatial Distribution of Fine PM in Muscat, Oman

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Abstract:
With the increased need of quantifying the tempo-spatial variability of ambient PM2.5 and identifying the pollutant's hotspots, low-cost particulate matter (PM) sensors exist as promising technologies for enhancing existing air quality monitoring networks. However, the performance of these new sensors has not been thoroughly evaluated. In this study, 10 low-cost PM sensors (Plantower PMS 3003) were evaluated under variable ambient conidiations over a period of ~ 3 months in Muscat, Oman. Two collocation tests were conducted before and after the field deployment of the PMS 3003 units. Measurements of the collocation tests were used to assess degradation of the sensors over the study period. The ten sensors were synchronized using "best reference" approach which use the average of one-hour PM2.5 of all sensors as the best estimate of the true value. With such approach, a different synchronized slope and intercept was applied for every hour of data from every monitor. Strong correlation exhibited between the 10 sensors in the collocation tests (0.86 R2 ≤ 1.00), with high precision of 10 and 9%, respectively. The PMS 3003 units were deployed in 10 locations across Muscat to understand the spatial gradient of PM2.5 concentrations. The synchronized 1- hour averaged PM2.5 concentration was 12.69 ± 1.42 µg m-3 (range: 9.90 – 14.20 µg m-3). Inverse associations were shown between the measured PM2.5 concentrations and temperature (R= -0.29) and wind speed (R= -0.23). Where, positive correlations were displayed between 1-hour averaged PM2.5 concentration and RH (R= 0.47) and wind direction (R= 0.10). These findings suggest that Plantower PMS 3003 can provide reasonable estimate of PM2.5 concentration under variable ambient conditions.

Air quality index and PM2.5 predictions from 2017 to 2021 in Baghdad city, Iraq using artificial neural network models

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Abstract:
Due to its considerable effects on the global environment and human health, global particulate matter pollution is regarded as one of the most lethal forms of air pollution. The air quality index (AQI) and particulate matter with a diameter of ≤ 2.5 μm (PM2.5) are significant components of air pollution that have been associated with adverse effects on human health, including early mortality after extended exposure. To evaluate AQI and PM2.5, a number of experimental experiments were conducted. Few studies consider the application of statistical and artificial analysis. In the present study, statistics and artificial neural networks (ANN) were used to estimate AQI and PM2.5 for Baghdad city, Iraq, from 2017 to 2021. AQI and PM2.5 (input dependent variables) were computed as a function of the year's month and hours of day (output independent variables). One hundred ANNs were constructed using the Intelligent Problem Solver tool in the STATISTIC 7 software. Retained are only high-performance networks. There are three types of ANNs constructed. Linear, Multi-Layer Perceptrons (MLP), and Radial Basis Function (RBF). With a high correlation coefficient and low absolute error, RBF was determined to be the optimal ANN for data representation. Analysis of variable sensitivity revealed that the month of the year was the most sensitive variable, while daytime hours had the least impact.

Analysis of a Synoptic Severe Dust Storm Event in the Middle East and its Impacts on PM10 and PM2.5 Levels in Oman

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Abstract:

This study examines the atmospheric dynamics related to severe dust storm event (SDS) and transport, dust-plume characteristics in the Middle East, and impacts on PM10 levels in Oman from May 10 to May 22, 2010. Daily atmospheric ERA5 model of wind speed and pressure of the surface and upper level of resolution of 0.25o x 0.25o coupled with daily Aqua MODIS satellite AOD (aerosol optical depth) of resolution 4 km x 4 km are used to trace the dust storm and to analyze PM10 and PM2.5 level over Oman during SDS event. AOD data are used to trace the dust storm and to compare it with the PM10 level from observation stations. The results suggest that the dust storm was initiated by strong northerly Shamal winds (~20 ms-1) associated with the intrusion of the high-pressure ridge on the Northern part of the Arabian Peninsula. The trough upper troposphere initiated unstable weather over Iraq and further strengthened surface winds causing massive dust emissions and increasing the particulate matter (PM10) concentrations up to 1800 µg m-3 at Oman stations. In addition, this study was also carried out to examine the dust storm event using the Hybrid Single-Particle Lagrangian Integrated Trajectory Model (HYSPLIT) dust storm model. The results of the HYSPLIT model analysis revealed that several PM10 particle source areas contributed to the increase in unhealthy air quality conditions in the Middle Eastern. This study suggests that this ERA5 is a useful tool to analyze the important mereological processes of the formation dust storms that are often occurred in the Middle East.

Long term Seasonal variation of aerosol optical properties over Middle East using MERRA-2

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Abstract:
Aerosols and dust in the atmosphere have become a regional air quality issue. The current study quantified long-term seasonal spatio-temporal variations of aerosols, dust, and optical properties over the Middle East (ME) from 2000 to 2020 using the NASA MERRA2 air quality model. Satellite measurements were used to compare the optical properties of simulated aerosols. The summer (June, July, and August ((JJA)) simulated seasonal mean AOD values were highest and minimum during winter (December, January, and February (DJF)) over the eastern ME region, which included Kuwait, Dammam KSA, Bahrain, Qatar, the United Arab Emirates, Oman, and eastern Yemen. During summer, maximum values were in the range of 0.5- 0.8, and minimum values were in the range of 0.1-0.3 during winter season. AOD values were between 0.4 and 0.6 during Autumn ((March, April, and May (MAM)), which is greater than in winter but lower than in summer. The seasonal cycle was completed by AOD values in the Autumn (September, October, and November (SON)) that ranged from 0.1 to 0.3. AOD values in the western ME region (along the Red Sea), which includes Sana'a, Jazan, Jeddah, Makkah, Madina, and Tabuk, were, on average, lower than AOD values in the eastern ME region, and AOD values shown significant seasonal changes.

Real-Time Air pollution Notification System Based on Raspberry Pi Microcontroller and IOT Sensors for Sohar port

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Abstract:

The Air Pollution is an environmental problem not just in Oman but all over the world. Air Pollution means the Pollution of internal or external environment by any physical, chemical, or biological factor that leads to the modification of the natural characteristics of the atmosphere. Many factors cause air pollution, such as smoke from vehicles and factories, and other factors. Air Pollution affects human health in different ways, and high level of air Pollution may also lead to an increase in heart disease, respiratory problems, coughing, and irritation of the mole, throat, and nose. The purpose of this design is to generate a sample which will detect the air pollution particulate matter in Oman. This design aims to create a prototype that will detect air pollution and particulate matter is Sohar Port. The hardware will send an email notification file to the offices of pre-registered email addresses when the sensors find a high reading on either particulate matter or carbon monoxide. The component of the device includes a dust sensor that will measure particles in the area, a carbon monoxide sensor to measure detected gases, a microcontroller, and a Raspberry Pi for sending data via email. The benefit of this research is to try to find a way to measure the amount of air pollution in Sohar port and alert the concerned authorities as soon as possible to take the necessary measures.

Towards Air Quality Improvement Via Various Renewable Energy Approaches

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Abstract:
According to 2021 statistics, the global CO 2 emission due to the use of anthropogenic fossil fuels reached 37.9 gigatonnes. Approximately 84% of the global energy consumption requirements are met from fossil fuels, including natural gas, coal, and oil. Carbon dioxide is one of the main greenhouse gasses that cause climate change, wildfires, and respiratory diseases from air pollution. Moreover, one of the major goals of the Paris Agreement was to decrease the global temperature below 2 degrees Celsius to realize a climate-neutral world by 2050. This can be achieved with renewables and different climate-friendly energy resources.
One source of renewable energy is wind energy as it can be constantly replenished. Wind power is generated by a wind turbine to produce electricity without using fossil fuels that pollute the air. In addition, 329 million metric tons of CO 2 can be avoided by wind energy which significantly prevents air pollution. products such as hydrogen and synthetic fuels in a climate-friendly approach can be created using wind energy. The studies nowadays aimed to develop methods such as pumped-storage hydropower and batteries to store the excess wind power for future use. Wave and tidal energy are also other promising source of renewable energy. As the water in the oceans is in continuous motion, kinetic energy can be harvested and used to generate electricity. Waves, produced by the winds, make the water oscillate in approximately circular orbits extending to a depth of 1/2 of the wavelength of the wave. The energy extracted from wave power projects is either from the deep motion of waves (10 meters) or the waves on the surface. Overtopping (with a low-head hydraulic turbine), oscillating water column (with air turbine), and overtopping (with a low-head hydraulic turbine) are the prime wave energy converters. Wave energy is considered carbon neutral as it produces almost no carbon dioxide emissions. However, further research is required to explore the challenges and environmental impact of such technology. Tidal energy is produced by the gravitational pull of the moon and sun on the oceans which generate extremely long wavelength waves that relatively produce very strong currents. The captured kinetic energy by tide movement is forced through a turbine to produce electricity. Studies estimate that both wave and tidal energy have the lowest carbon footprints. Tidal energy emits less than 22 grams of CO 2 , and wave energy emits similarly low levels of CO 2 . Moreover, there is no evidence to date that the installation of both tidal and wave energy stations has negative impacts on the flora and fauna. As a result of neutral carbon emissions and being free of direct air pollution renewable energy sources (wind, tidal, and wave energy) has undertaken a global adoption to mitigate climate change. Despite the above facts, the high initial cost of installation, the present market scenario, political pressures, and lack of power storage are the main challenges of renewable energy which required to be solved for wider adoption worldwide.

Anthropogenic Emissions of Aerosol over an urban Environment of Northern Pakistan: Implication to Air Quality and Climatic Impacts

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Abstract:
Anthropogenic aerosol plays a crucial role in degrading visibility, affecting air quality, change the hydrological cycle, and perturbed the energy balance of the Earth's atmospheric system. This study investigates the increase in anthropogenic emission of aerosol and their impacts on air quality and climate over an urban of Peshawar, Northern Pakistan using satellite, model and ground based observations. The results revealed that particulate matter (PM2.5) was in the range from 51.8 to 742.8 µg/m3 (Avg: 149.9 µg/m3) during the year 2021. The high values of PM2.5 depicted poor air quality in the region. The morphology of PM2.5 revealed irregular, rounded and spherical types of particles that originating from geogenic, anthropogenic, and biogenic sources. Furthermore, aerosol optical properties such as Aerosol Index (AI), Absorbing Aerosol Optical Depth (AAOD), Black Carbon AOD (BCAOD) and Dust AOD (DAOD) were analyzed. The averaged values of AI, AAOD, BCAOD and DAOD were found to be 1.01±0.49, 0.01±0.009, 0.02±0.006 and 0.18±0.09, respectively during the year 2021. The results revealed that vehicular and industrial emission, biomass burning and re-suspended dust are major sources of anthropogenic emission in the study region. The averaged radiative forcing at the top of the atmosphere and at the earth's surface were -8.03±2.47 W/m2 and -19.82±6.39 W/m2, respectively, which produced an average atmospheric forcing of 11.79±4.04 W/m2. This means that the anthropogenic emissions cool the top of atmosphere and earth's surface but produced heating effects within the atmosphere.

Modeling the Nexus between Air Pollution and Growth: A VECM and Causality Analysis for Oman

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Abstract:
The article examines the effect of air pollution on growth of Oman during the period 1990–2021. Cointegration and vector error correction model (VECM) approach are used to identify the shortand long-run dynamics of the air pollution-growth nexus. Moreover, Granger causality is used to test the direction of causality between variables. This paper will examine the Environmental Kuznets Curve (EKC) hypothesis using the World Bank data (WDI, 2021) on environmental quality. Two different pollution parameters are used to assess air quality. These are carbon dioxide emissions metric ton per capita (CO2), and nitrogen dioxide (NO2). Data on per capita real GDP (RGdpit) were collected from Penn World Table version 10.0. In order to analyse the effect air pollution on economic growth of Oman the following models are adopted: Model 1: RGdpit = α0 + α1 CO2 + α2 NO2 +ε Where Economic growth denoted as RGdpit is a dependent variable. Independent variables includes carbon dioxide emissions metric ton per capita (CO2), and (NO2) "emitted from fossil consumption in kilotons". Model 2: Air Pollution it = α0 + α1 RGdpit + α2RGdpit 2 + α3 EGit + α4 URPit +εit Where Air Pollution it (denoted by CO2 and NO2) is a dependent variable. Independent variables includes Economic growth denoted by RGdpit , Energy use (kg of oil equivalent per capita) denoted by (EGit), and Percentage of urban population (% of total population denoted by URPit). The term εit is the error term bounded with the classical statistical properties.

Spatial Management of Quarries and Crushers: Al Obeid Village, South Al Batinah Governorate, a case study

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Abstract:

During the past fifty years, a huge urban expansion occurred in the Sultanate, particularly in the capital, Muscat, and the main centers of the governorates. This expansion increased the demand on building materials (gravel and sand). Therefore, the government encouraged private sectors to invest in the mining and quarrying sector. These quarries are concentrated near urban areas within the mountainous regions and valleys. Despite the economic benefits and their role in driving the urban growth process for quarrying, there are environmental impacts that must be controlled in order to preserve and sustain environmental resources and human well-being. Therefore, this study aims to enhance the spatial management of quarries using geographic techniques to monitor and evaluate the environmental impacts of quarrying and crusher activities: by applying to the village of Al Obeid in the South Al Batinah Governorate. local. The study noted that all crushers are active and have their own quarries. However, some of them do not follow the environmental regulations and standards as per the environmental laws of the Sultanate of Oman. It is also noted that there is a lack of coordination between the concerned government agencies, especially with regard to the issuance of environmental permits and monitoring. Therefore, the study came out with the need to improve administrative coordination for monitoring quarries and crushers and obligating them with technical specifications, standards and systems through the establishment of an integrated spatial system of Geographical Information Systems (GIS) and Remote Sensing (RS).

The Mathematical Modeling of air pollutants emitted from a fixed source

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Abstract:

A mathematical modeling for the simulation of transport and diffusion of the pollutants released from a fixed source on or above ground level in the atmosphere is studied. The investigation of transport of these pollutants by wind in the atmosphere is important because it causes health hazards to the environment [1-5]. The presence of moderate to strong wind speed can transfer particles of pollutants into the atmosphere, some of which can cause problems for humans, plants, and animals [1-2]. The study of mathematical modeling of air pollution is also relevant to some industrial applications, e.g. diffusion of fumes emitted by factories chimneys into the surroundings [3-5]. Mathematically, the diffusion of pollutants in the atmosphere from a fixed point source is governed the atmospheric diffusion equation. This equation is a partial differential equation, which, in general, depends on the three space coordinates, the time, and other parameters of this physical system. It is found that the concentration of the pollutants at any point in the atmosphere depends on the wind speed, the strength of the source, the distance from the source, the diffusion force between the particles of pollutants and the gravitational force. An analytical expression of the concentration of pollutants at every point of space was obtained in a closed form. The solutions of some special cases with regard to the values of the diffusion parameters and the time dependence of the source were examined. A general point introduced by this model was that the dependence of the source on the time affects the way the pollutants emitted from a fixed source is distributed in the atmosphere. Another general result obtained was that in all the special cases considered here the asymptotic behavior of the solutions for large times approaches the steady state solution obtained previously by Sharan et al. (1996).

The suitability of utilizing slag in subbase and base course of flexible pavements

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Abstract:

Various byproducts are produced in the process of smelting or refining metals that are a form of solid waste. However, the utilization of these byproducts in the pavement construction field is limited. Their increasing amounts lead to harmful effects on the environment, especially in the Middle East where the disposal in open dumps or water bodies is common. Moreover, the increasing pressure of climate change is making taking steps towards reducing pollution and recycling mandatory. The amounts of natural aggregate are decreasing due to the rapid urbanization since aggregates are the base of road construction. Hence, the field of recycled asphalt pavements (RAP) is being recently explored. The purpose of this study is to investigate the feasibility of incorporating slag into the subbase and base courses of the flexible pavement. Slag was used to replace the fine sand and silt material (passing sieve no. 40) in the material that is used as the subbase and base materials. The performance of the material was assessed using soaked and unsoaked California bearing ratio (CBR) tests. This method does not only reduce the amounts of slag that is left not utilized, but it also shows that waste materials can be effectively recycled and reused in various construction applications. In addition, this study provides a way to reduce the overall cost of the material and helps reduce the gas emissions and air pollution that such byproducts cause.

Ambient Air Pollution and its Influence on Human Health and Welfare: An Overview

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Abstract:

Human health is closely related to his environment. The influence of exposure to air pollutants on human health and well-being has been an interesting subject and gained much volume of research over the last 50 years. In general, polluted air is considered one of the major factors leading to many diseases such as cardiovascular and respiratory disease and lung cancer for the people. Besides, air pollution adversely affects the animals and deteriorates the plant environment. The overarching objective of this review is to explore the previous researches regarding the causes and sources of air pollution, how to control it and its detrimental effects on human health. The definition of air pollution and its sources were introduced extensively. Major air pollutants and their noxious effects were detailed. Detrimental impacts of air pollution on human health and well-being were also presented.

State's Legal Liability for Air Pollution Comparative Study

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Abstract:

All States are trying to protect their environment in general especially air. They are establishing numerous legislations to punishment any defendant or legal person who has been polluting the air. But States may often violate their obligation to enact such legislation by refraining from playing their role in this regard, or enact legal legislation that is not sufficiently effective in practical realization, or that leaves laws without genuine control over their implementation. Here, the question arises as to the basis for a State's legal liability in breach of its primary task of maintaining clean and its legal responsibility for air polluting? Are individuals entitled to sue the State, and what legal means is available to them? And who judge are they applying for? What does the limits of this right against the State's obligation to control its legislations? Does It go beyond their right to compensation when there is real harm to their physical integrity?

An Overview of Municipal Waste Management and Recycling in the Gulf Cooperation Council Countries (GCC): Focusing on Bahrain

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Abstract:

Municipal waste management (MSW) is becoming a global complex field, which requires facing challenging policies. Countries strive to make balance between promoting recycling technologies and protecting people's public health and environment, aiming to achieve socio-economic sustainability. The Gulf Cooperation Council countries (GCC) are among the world's highest waste generation, which approximately generate 1.5 to 2.3 kg daily per capita. Despite having land scarcity, landfilling is the dominating waste disposal method. There are some governmental and non-governmental efforts to increase MSW recycling technologies in the GCC, however, recycling rates are still low. In a time of rapid economic, urbanization and population growth, promoting national policies and effective governmental regulations in the GCC becomes a must to decrease the adverse risks of the growing municipal waste. Approximately, 52 resources have been reviewed to build this research, including published studies and formal relevant websites. The research aims to provide an overview of MSW management in the GCC, including latest regulations, recycling technologies, and future plans, focusing on the Kingdom of Bahrain by conducting a "practice benchmarking" to evaluate its situation in the region. In addition, analyzing Bahrain's current recycling policies by conducting interviews with licensed recycling companies of the private sector. The research reveals that recycling rates in the GCC ranges between 1% to 15%. Effective MSW management and higher rates of recycling can be achieved by making laws that specifically address MSW and raising public awareness. Legislations in the GCC are addressing environment and public cleaning in general, with only two countries recently issued laws that regulate MSW. It also reveals that promoting recycling in Bahrain could yield various socio-economic and environmental benefits if it grants more governmental support.

Impact of Environmental Pollution on Historical Buildings: An Overview

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Abstract:
Technological improvements in environmental assessment and monitoring have raised public and organizational understanding of the social and health consequences of air pollution in tourist-attractive public places. Monuments are commemorated remains of bygone depictions in any civilized state's social and cultural tradition. India, as one of the world's oldest and most active civilizations, has various ancient pieces of evidence in the form of both built museums and living monuments such as temples and palaces. Prolonged exposure to particulate and gaseous contaminants has caused significant damage to relics and monumental constructions in cities around the world. The purpose of this research is to provide an outline of scientific efforts relating to the analysis of the consequences of air pollution and other meteorological changes on historical monuments in India in the context of the global scenario. It has been discovered that seasonal changes in the climatic condition, as well as increased human activity in the vicinity of museums, have plausible effects on the immediate changes in indoor air quality. The variability in air quality is strongly influenced by vehicle exhaust and industrial pollution, whereas interior air quality is primarily influenced by inadequate ventilation and an absence of appropriate control measures. The study proposes a few technological and administrative alternatives to enhance the atmosphere for both indoor museums and outdoor monuments, as well as methods for creating air quality standards for museum environments.

Analysis of Climatic Parameters and Dust Accumulation on PV Power Production

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Abstract:
Clean energy sources are important because fossil fuels are running out, they are negatively affecting the environment, and they contribute to global warming. Non-conventional energy, comes from sources that can be replenished by nature and have low operating costs. Photovoltaic power plants may minimise greenhouse emissions and diversify energy sources. The performance of a solar photovoltaic system is affected by factors like the ambient temperature, the amount of sunlight, the surface temperature of the solar photovoltaic module, dust, shadows, etc. Dust is a major challenge to photovoltaic (PV) power generation because it blocks sunlight from reaching the surface of PV modules. Dust refers to aerosol particles in the atmosphere, which can be caused by either natural or human-made sources of air pollution. Dust deposition on PV panels lowers power generation and increases surface temperature, which can limit panel life. In this work effect of various proportions of dust particles on solar panels are analysed by using a thermal camera and Convolutional neural network (CNN) combined with these infrared images is used to detect the panels having faults due to soiling. Thermal image analysis helps to PV module inspection by facilitating a more precise and cost-effective identification of PV defects. Further a solar system analyser equipment is used to study the performance of solar panels.

The Efficiency of Thumrait Engineering Landfill Operation in Conserving the Ambient Air Quality: A case in Dhofar Governorate, Sultanate of Oman

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Abstract:

Thumrait Engineering Landfill (TEL) is in Wilayat Thumrait, Dhofar Governorate, Sultanate of Oman. The landfill started its operation phase in 2017 as solid waste ultimate disposal hub for the entire governorate of Dhofar. The operations were implemented in the refuse cells of the engineering landfill to manage the MSW in terms of on-site sorting, storage, including its ultimate disposal. The objective of this study is to investigate the ambient air quality (AAQ) in both measuring sites of the engineering landfill for a period of three (3) consecutive years 2020 up to 2022. The monitoring investigation took place in the main TEL site and in the adjacent residential area of Hakbeet Village (HV). The study focuses on the solutions to the problems related to municipal solid waste management (MSWM) at TEL as some pollutant concentrations are contributing to some negative environmental effects at TEL and HV. Personal observation with site visits along the study area was conducted to measure some pollutant concentrations inside and adjacent the landfill. Interviews, meetings with field level staff and officers of the study areas including focus group discussions all supported the rationalization of the results of the investigation. This study found that the CH4 levels in TEL site (19 mg/m3, 14 mg/m3, for 2 monitoring occasions in 2021) and in HV mosque (1 mg/m3 for 2 monitoring occasions in 2021) exceeded the allowable permissible standard AAQ mandated by the Environment Agency of Oman (EA) at range of CH4 in residential areas (0.20 mg/m3). In similar investigation, Volatile Organic Compounds (VOCs) emission has found in 2020 inside TEL emitted (0.27 mg/m3) and exceeded the Omani AAQ limits (0.20 mg/m3). The case justified that once the emissions fall beyond the compliance limits, the decision action must be taken by the landfill operators to rectify it. The study recommends methane gas collection and transfer techniques to prevent emission that harms the AAQ at TEL adjacent areas. Since these gases can possibly be sources of electricity, there is a need to build a gas storage plant designed to generate electricity.

Impact of afforestation on thermal reduction and air quality in Bahrain

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Abstract:
Research on thermal reduction techniques and improving the air quality in urban cities has a long tradition. A common technique is to increase the afforestation and green areas that provide shades and act as a barrier that hinders the pollutant from spreading through the air. However, lands in the GCC region, which has recently been encountering increased temperatures and more frequent sandstorms, are poor in nature for tree growth. Furthermore, the high population density and the limited land availability in Bahrain impose more constrains to afforestation. This paper provides a case study to the afforestation experiences in Bahrain after the announced target to double the afforestation area in the country. Satellite imaging techniques are used to measure the temperature and air monitoring stations to measure the air quality throughout the country. The impact of the afforestation on reducing the thermal stress and improving the air quality is analysed based on the geographic location, type of tree, and the time from plantation. This case study provide evidence that afforestation can be successful, even in regions with desert-nature, to improve the air quality and outdoor weather conditions.

Impact of the Cov2 on the environment found the right solution

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Abstract:

The sources of air pollution and the ways to deal with it are known, but in recent years a new pollution has been added to it, the source of which is the coronavirus, which requires scientific intervention to address this. Familiarity with the dynamics of viruses (speed-mass-quantity), as well as knowledge of the resistance of mask fabrics to impact and penetration loads) Breasting strength), and visualization of the shape of the precise micro channel inside the fabric, with the best selection of fiber type and mask manufacturing technology, has become a necessity. All these questions will find the answer with the technical textiles against Corona disease. Key words: Number of virus attack mask fabric -Virus density -CoV2, kinetic energy- Kinetic Energy -Electrostatic energy- Stereology Methods-Pore Size-Fabric resistance to penetration Anti CoV2 Face Mask-Spun bonded nonwoven fabric-Thermally bonded nonwoven fabric (lofty stricture)-Spun laced nonwoven fabric, Normalization process-Kendall coefficient of concordance.

Investigating the role of atmospheric circulation and temperature inversion in persistent smog events over South Asian mega cities

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Abstract:
The winter fog/haze events in northeastern Pakistan and surrounding regions of India are often mixed with pollutants to form smog, and consequently damage human health and hampers daily life in the form of fatalities through road accidents, road blockages, and flights delays. The persistent anti-cyclonic conditions can further trigger the temperature inversion and prolong the smog event from days to weeks. The present study provides characteristics and lasting mechanisms of two persistent winter fog events (2016-2017) in Northeast Pakistan and Northwestern parts of India. We used the European Center for Medium-Range Weather Forecast (ECMF) ERA-5 reanalysis data and National Oceanic and Atmospheric Administration (NOAA) HYSPLIT Model simulated with GDAS meteorological data. The results showed the presence of strong low-level anti-cyclonic circulations with a wind speed of less than 1.5 m/s from November to January over Eastern Punjab for two foggy winter seasons. The deep inversion during the fog events was observed that prevented the natural ventilation of air in the upper atmosphere and ultimately the smoke and heavy pollutant accumulated in the lower atmosphere. Furthermore, high relative humidity greater than 83% near the ground indicates a high condensation rate for water vapors to form fog near the ground. The analysis of the NOAA HYSPLIT trajectory model at different vertical heights revealed that smoke from stubble crop burning in the first week of November 2017 in Punjab and Haryana mixed with fog under favorable stable conditions that lead to intense smog over Lahore. This study will help to understand and to develop a forecasting mechanism for fog events by characterizing the meteorological conditions of the study area and to minimize the adverse impacts of smog on public health.

Phytomining of Pure Nickel From special Plants for environmental impact in Oman

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Abstract:

Phytomining is Bioharvesting of metals from high biomass crops grown in soil substrates particularly those associated with sub-economic mineralization. It is a recent more advanced technology of phytoremediation to produce low volume, sulphide-free 'bio-ore', which can either be safely disposed of or, if the target metal is of sufficient economic value, smelted, and recovered. This technology has potential application in the mineral industry to return an economic profit by commercial production of metals via cropping. Numerous sites across the globe are enriched with metals that could potentially be phytomined. In recent years major scientific progress has been made in understanding the potential for application of this herbage-based technique in the mining industry to develop a good relationship between the industry and community. Phytomining has considerable environmental advantages over traditional forms of mining. In general, nickel is extracted through open-pit mining, to access nickel embedded inside laterite rocks. To get the nickel, the rocks need to be crushed, which can release radioactive elements, naturally occurring asbestos-like substances, and metallic dust. Open-pit mining also produces waste materials in the form of a toxic semi-liquid waste known as tailings. If not properly managed, arsenic and mercury-laden tailings can leak into surrounding environment. More broadly, traditional mining as a whole is a considerable carbon emitter, releasing at least 10% of greenhouse emissions in 2017. As well as offering a more environmentally friendly way to mine nickel, these plants could help to rehabilitate land that has already been mined. But that undiscerning revegetation process is flawed and Most of these plants are common weeds that are highly undesirable for rehabilitation. Nickel hyper-accumulators could do it better by improving soil health by removing the nickel and bringing back the major nutrients needed by normal plants. Eventually, normal crop plants can be cultivated on these soils after phytomining has finished. But that undiscerning revegetation process is flawed and Most of these plants are common weeds that are highly undesirable for rehabilitation. Nickel hyper-accumulators could do it better by improving soil health by removing the nickel and bringing back the major nutrients needed by normal plants. Eventually, normal crop plants can be cultivated on these soils after phytomining has finished,. It could also give an economic benefit for the mining company because the nickel residue that has been accumulated in their shoots could be harvested. Currently, only soil that consists of at least 1% nickel can be mined in the traditional way. But a hyper-accumulator can achieve high levels of nickel accumulation in a soil that consists of just 0.1% [nickel].t could also give an economic benefit for the mining company because the nickel residue that has been accumulated in their shoots could be harvested. Currently, only soil that consists of at least 1% nickel can be mined in the traditional way. But a hyper-accumulator can achieve high levels of nickel accumulation in a soil that consists of just 0.1% of nickel.

Effects of Indoor Air Pollution on Health and Olfactory System by Using Internet-Of-Things (IoT) and Smart Sensors

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Abstract:

Air pollution is one of the major environmental and social problem. Day by day air pollution is increasing from different sources including increasing of vehicles, urbanization, more energy consumption and lack of government policies in both developed and developing countries. Various cities of different countries have no access of fresh air due to ventilation system in buildings and fresh oxygen in surroundings. Air pollution from vehicles, industries, burning of solid waste, power plants, oil refineries, agriculture areas and factories are creating massive air pollution and which area causing health problems in all age groups. Many peoples are getting health problems due to high toxic air and air pollution. Exposure to high level of toxic air pollution creates different health issues including heart disease, lung cancer, respiratory system and olfactory system. In this research smart sensors and internet-of-thing were used to monitor olfactory systems after breathing toxic air pollution in indoor areas. It was observed that high concentration of different gases in air were major cause of health problem and on olfactory system. Major part of body structures that serve the sense of smelling were damaged in children's and old peoples. Three main parts of olfactory including mucous membranes, olfactory glands and olfactory neurons were damaged due to high exposure of air pollution in lungs and respiratory system. In this regard smart solutions for examining the health effects with innovations of hi-tech technology, latest smart water sensors and Internet-of-Things (IoT) smart sensors were used in research. In this paper IoT and sensors used with different age groups and collected from different locations of dedicated areas. IoT based and smart sensors for respiratory monitoring system are the cost effective method to get more accuracy in environmental research areas. This system was used in different samples which were collected from different locations of certain areas for research. These sample results can be used for further research and data can be used for future with past data for monitoring of health issues and olfactory system.

Influence of Some Gaseous and Particles Emissions from Municipal Solid Waste Dumps on Ambient Air Pollution in Selected Baghdad Regions

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Abstract:

The Air pollutants emitted from Municipal solid waste without treatment or investment are One of the most common problems that affect ambient air quality, which leads to environmental and health effects, both on the man, animal, or land. The research aims to study the environmental impact of solid waste dumps in air pollution in Baghdad city/ Al-Karkh district, and to know the extent of their effect on the neighboring areas to avoid the negative impact of landfill emissions and their impact on the ambient air. Nine sites of waste dumps were selected for measuring gaseous emissions in two seasons (winter and summer), which included (CH4, NO2, SO2, CO, CO2) and particulate matter (TSP, PM2.5, PM10). The measuring sites were represented by four typical baler's dumps and five ordinary transfer stations. All measuring sites are located inside and outside of study stations.

The field study of the waste dumps on Al-Karkh side was summarized by presenting the results of air pollutants measured in the selected sites inside and outside the waste dumps and comparing them with Global and Iraqi determinants to determine their compliance with or exceeding the permissible limits. Study results indicated that the concentrations of gases (NO2, SO2, and CO2) and suspended particles (TSP, PM2.5, PM10) in the ambient air for most sites little exceeded the national and global permissible limits and recorded low pollution. As for methane and carbon monoxide (CH4, CO), they did not exceed the National or Global limits, so we conclude that the landfills on the Karkh side do not have polluted by CH4 and CO.

The gases and particle matter concentrations average in the air for the winter and summer seasons, are compared among the study sites. We recognized that the dumps (Typical balers) are less environmental pollution or have a minimal impact on the surrounding areas. They were conforming to all environmental conditions. But the ordinary transfer stations that are open locations help to spread the pollutants, and carry them to the surrounding areas, causing environmental damages which the neighboring areas suffer from it, especially the unpleasant odor. Sometimes, these stations recorded lower concentrations than the typical balers due to the ordinary open transfer station design, which helps the wind factor to dispersing of the air pollutants concentrations.

Environmental and Health Risk Assessment and characterization Resulting from Air Pollution in Al-DORA District in Baghdad

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Abstract:
on settlements, agricultural land, petroleum fields and other economics. Iraqi has narrow coastline at Basra on the Arabian Gulf, about 58 Km. It's very vulnerable to an SLR. Based on satellite data of Landsat 5 TM, Landsat 8 OLI, and TOPEX/Poseidon, Jason1, Jason2 and Jason3 from 1993-2018, created scenarios (less than or equal to 1, 2 and 3 meters) for assessing SLR in Iraqi coastal region using GIS application. The results show that most of Iraq southern parts in Ras Al-Bisha, and some of agriculture areas on Shat Al-Arab, were prone to inundation by seawater, according to the first scenario (SLR below or equal to 1m). The results also show that all regions on Shatt Al-Arab and most of the areas around Faw city and local villages were prone to inundation by sea water, if SLR was below or equal to 3m. The results of classification of land cover for the study area show that dry and the salt lands represented the dominant form of Faw, with minimal vegetation growth during the study period. Data from TOPEX/Poseidon, Jason1, Jason2 and Jason3, show that SLR in the Arabian Gulf increased 4.3 ± 0.4 mm/year during the period 1993-2022. In Arabian Gulf, acidification affect of the marine environment. That's leads to biological effects, such as coral bleaching, especially after discovered true coral reefs at the mouth of the Shatt al-Arab in Iraqi coastal water in 2012.

Influence of enzyme on biogas generation using conductive material assisted thermophilic anaerobic digester

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Abstract:

The conventional sources of energy e.g., oil, gas and coal are reducing at higher rates which efforts human to find green and renewable alternatives. Recently, anaerobic digestion attracted the researcher's attention as it provides a unique set of benefits in organic waste management and alternative energy source. However, the performance of the digesters is often deteriorated due to the accumulation of ammonium nitrogen and organic acids released from the biodegradation of organics. High concentrations of these compounds hinder the growth of methane-producing microorganisms. Hence, an integrated anaerobic digester with Conductive material such as Carbon Brush Additives has been utilized to improve the process stability and performance of livestock sludge and manure digesters and allow recovery of additional value-added products. The current study used four different thermophilic anaerobic digesters (TADs) as Carbon electrode-assisted TAD (R1), enzyme assisted TAD (R2), co-effect of electrode and enzyme assisted TAD (R3) and a conventional TAD as a control (R4) for bioenergy recovery and waste removal using a batch feedstock of cow manure with food waste. The study revealed that using ENZ with CB (R3) is more efficient in terms of biogas production, total solids removal and COD depletion. In which the accumulated biogas reached up 4800 mL in less than 10 days process compared to other reactors. Whereas the total solid removal and COD depletion were 59.29% and 65% in less than 10 days, respectively. The study is a step forward to enhancing resource recovery from organic waste by thermal treatment.

Contribution of atmospheric processes to the degradation of air quality: case study (Sohar Industrial Area, Oman)

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Abstract:
The impact of the air pollution generated by any industrial activities may be further aggravated if the location of the industrial area is exposed to certain atmospheric characteristics. Under such conditions, the likelihood of accumulation of local air pollution is high. This paper uses two approaches (statistical and numerical simulation) to investigate the contribution of atmospheric processes towards degradation of air quality. A case study of the two approaches was conducted over Sohar Industrial Area in the Sultanate of Oman. Measured wind data were used to account for specific atmospheric characteristics such as stagnation, ventilation, and recirculation using the statistical approach. In the second approach, numerical weather prediction model was used to simulate mesoscale circulation phenomena such as sea breeze and its contribution to the processes affecting the air quality. The study demonstrates that the atmospheric processes appear to contribute substantially to the degradation of air quality in the Sohar Industrial Area. The statistical analysis shows that the atmospheric dilution potential of Sohar Industrial Area is prone to stagnation and recirculation, rather than ventilation. Moreover, model simulation shows that there is a seasonal variation in the contribution of atmospheric processes to the degradation of the air quality at Sohar Industrial Area.

Does climate change explain the rising incidence of early onset colorectal cancer?

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Abstract:
Despite the noticeable decline in Colorectal cancer (CRC) incidence among those above 50 years old, there is a global alarming increase in early onset colorectal cancer, EOCRC (<50 years old). Genetic predisposition explains only10% of the EOCRC while the remaining 90% is thought to be due accumulative environmental exposures that are not yet fully understood Colorectal cancer is a prominent example of . Knowing that environmentally mediated disease, deciphering the impact of external environmental exposures on the CRC risk and outcome is necessary. Prior studies showed that climate change causes disturbances of the body biology process such as hormones production, DNA damage, immune suppression and gene regulations in humans and animals. There are growing concerns that such biological disturbances are inducing carcinogenesis pathways and speeding up the conversion of colorectal pre-neoplastic lesions to neoplastic lesions. The knowledge in this issue is evolving with some proposed direct and indirect associations. Therefore, this review focuses on evaluating available work and evidences for the inter-relationship between the increased incidence of EOCRC and the climate change. Furthermore, we highlight the existing knowledge gaps and the need for multidisciplinary collaboration to understand the association and plan the needed cancer preventive measures.

THANK YOU