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From the Editor's

Dear Readers,

In the April issue of our Newsletter, we received several popular articles from diverse fields. All the authors deserve great appreciation for sharing articles in huge numbers. Please continue sending articles to our Publication team and share published newsletter with your friends also.

I would like to thank the Editorial team including Print, Designer and Publication committee for their efforts throughout the edition.

Your suggestions are always welcome for improvement.

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## “World Earth Day” Webinar on “Global Warming and Climate Change: Sustainable Adaptation and Mitigation Strategies” April 22, 2023

**Prof. Tanu Jindal**, Group Additional Pro Vice Chancellor (R&D), Director, Amity Institute of Environmental Toxicology, Safety and Management and Vice President, NESA.

**Prof. Tanu Jindal**, welcomed all the esteemed speakers. Further she discussed about sustainable adaption and mitigation strategies.

She talked about the policies and strategies to integrate biodiversity conservation and restoration into the many uses of terrestrial, freshwater, and marine ecosystems, as well as expanding and improving protected areas which aims to halt the degradation of ecosystems and restore them as well as conserve the ecosystems for peaceful environment. Only with healthy ecosystems can we enhance people's livelihoods, counteract climate change, and stop the collapse of biodiversity.

Address by **Prof DK Bandyopadhyay**, Chief Advisor, Chairman, Amity Law School. He discussed about climate change adaptation and mitigation.

He stressed upon the topic like replacement of GHGs and Conventional Energy resources into Renewable Energy sources and also Energy Efficiency and forest reforestation. Adaptation is local but mitigation is global. So far, many countries are unfortunately unable to adopt mitigation measures.

He discussed global warming. Different policies should be implemented for the reduction of the greenhouse gases. The greenhouse gases emission should be mitigated as quickly as possible. India has started the programme Namami Gange for the conservation of water. The major problem of our nation and planet is climate change and global warming.

**1st Speaker: Dr. Rupa Kumar Kolli**, President, Indian



Meteorological Society. He talked about Climate Smart Societies and Role of Climate Services. He told that achieving a climate-smart society requires ambitious goals, comprehensive plans, and collective action from individuals, communities, and governments from local to global scales.

Greater focus required on enhancing national capacities to effectively incorporate global and regional inputs into their operational provision of tailored climate information products for local communities.

Despite the advances in climate sciences, there is a sub-optimal use of climate information in a real-world context. It is important to find ways to cope with climate variability and change through improved access to climate information and prediction/projection products. Climate adaptation and climate-related risk management require multi-disciplinary/international collaboration and cross-disciplinary/international exchange of information. GFCS is a major step forward in systematically providing climate information for decision-making at various levels of climate-sensitive sectors. Greater focus is required on enhancing national capacities to efficiently incorporate global and regional inputs into their operational provision of tailored climate information products for local communities.

**2nd Speaker: Dr. R Krishan**, Director, Indian Institute of Tropical Meteorology. He discussed key questions pertaining to the science of Climate Change. He discussed

possibilities for making reliable assessments of the impacts of climate change on the (a) Global and regional monsoon hydroclimate, (b) Regional weather and climate extremes, (c) Global and Indian Ocean Sea level, (d) Marine primary productivity and mechanisms controlling the ocean carbon cycle, and Future plans for the development of high-resolution climate change projections.

The climate of a planet depends on energy from the sun, planetary Albedo, speed of the planet's rotation, the mass of the planet, the radius of the planet, atmospheric composition, and ocean land topography. Long-term climate variations are known to arise due to orbital forcing.

Most of the incoming solar radiation is visible eg; UV radiation while outgoing radiation is infrared radiation. The thermal IR band is where the action is in view of both the magnitude of the energy exchanges and the enormous complexity of the atmospheric absorption spectra in this band.

**3rd Speaker: Dr. Jagvir Singh**, Scientist G, Ministry of Earth Sciences. He talked about several projects and schemes going on under Ministry of Earth Sciences (MoES) He also urged the students, academicians, and user communities about the various fields of Earth system science and climate change to come together and work.

The webinar was attended by Directors, Eminent scientist from Ministries, Faculty, Researchers and PhD scholars and Students.

## SMART CITY SOLUTION FOR OVERWHELMING OF URBANIZATION PROBLEMS-A REVIEW

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### Abstract:

Urbanization is a global phenomenon occurring all around the world it is the term that migration of large number of peoples from rural areas to urban areas to overcome their problems associated with their home town like droughts, floods, disastrous weather. And also for their comfortable life, better educational environment, better job opportunities. Rapid urbanization will bring many problems like housing shortage, water and air pollution, traffic problems, climate change etc. Urban infrastructure in many Indian cities has been upgraded. Modern airports, flyovers, bridges and expressways can be found in most cities in the country. However, the quality of urban services has not kept pace with the population explosion in most of our major urban centers. Overcrowding has led to a space crunch, which is aggravated due to lack of efficient and scientific utilization of urban spaces. The growing urban population exerts unbearably high pressure on the environment which contributes to deterioration in the quality of lives of most citizens. The next transformation in urban India would involve placing the concerns of citizens at the centre of any urbanization strategy something which smart cities aim to achieve in the next few decades. Smart city needs smart governance, smart business, smart approaches, and a smart city can effectively leverage technology infrastructure, public policy, citizen engagement, to create urban environment that fosters economic growth and productivity, innovation, social mobility, inclusiveness and sustainability. This paper argues that these elements emerge as important factors for the overwhelming the rapid urbanization concept in the context of smart cities for mobilizing collective learning and transforming urban infrastructure.

**Keywords:** Rapid urbanization, Smart city, Sustainability, Innovation, overwhelming.

### Introduction:

Now a days the problem of urbanization is increasing rapidly it estimates that 500- 600million of peoples will be urbanized by 2030 which is 60% of the whole world's population. The rapid urbanization will leads to a lot of different kinds of problems like urban densities, traffic congestions, energy inadequacy, unplanned development, lack of basic services, illegal constructions, creation of slums, crime and public safety issues, water soil & air pollution leading to environmental degradation, aging infrastructure and environmental impact on climate change coupled with poor natural resource management and governance. There have been many concepts for the overwhelming the urbanization challenge, but most

accepted definition is "smart city" which meets all the requirements of the present without compromising the ability of future generations to meet their own needs. smart cities make the urbanization more inclusive bringing together formal and informal sectors connecting urban cores with edges delivering services for all levels of peoples alike and integrating the wanderers and destitute into the municipality. Stylish municipality need to adopt green growth to improve the day to day lives of citizens which provides great opportunity to make continuous evolution which needs to house the many generations to come.

A smart city should adopt technologies like

- Elegant shipment
- Improved energy conservation
- Effective growth
- Intelligent smart city
- Eco friendly city
- Clean livable city

### Elegant shipment:

At present the transportation is inefficient for the running century. Smart city need to make the transportation more efficient by reducing its energy requirements making it sustainable by integrating technology and intelligence into the physical transportation infrastructure and also by improving capacity enhancing the travelers experience make the shipment system more efficient safe and secure.

### Improved energy conservation:

The use of replaceable resources like wind energy, thermal energy, power energy, solar energy and waste to energy are known longtime replaceable, but needs a little improvements to reduce our growing energy demands which replaces ones dependence on other sources to replaceable sources for generating reliable foundation charge power in electrical systems. It can be achieved by using battery storage to support renewable energy expansion, developing to support renewable energy expansion, developing geothermal potentiality, implementing advances in nuclear power, reducing polluting gas emissions which can boost manufacturing and economic growth.

### Improved growth:

Improved growth is a collection of land use and development principles which ensures the growth is fiscally environmental and socially responsible, by preventing natural resources, recognize the connections between development and quality of life by placing priority on infill redevelopment and densification strategies, the improved growth can be achieved by

- Uniform land use pattern where a mixture of homes, retail business, and recreational operations.
- Miniature development design where the people choose to live work, shop and play.
- Transportation by walking, cycling, and transit and driving





- Miscellaneous residence options where peoples of life stages and income levels can afford a home in the neighborhood of their choices
- Encourage growth in existing communities such as roads, schools, etc used efficiently and developments do not take up new lands
- Encourage community stakeholder's public in development decisions and citizens participation in community development and decision making.

The above can be very helpful to better understand problems of health hygiene and sanitation in a particular area and evolve cheap and innovative approaches to such problems, efficient natural resources utilization can be achieved only through greater community involvement finally the complex and crucial task of rejuvenation in smart city can be achieved.

**Intelligent city:**

Intelligent city is a concept beyond smart city. Integrating data and technology with urban planning impact the way cities look feel and function intelligent. Cities can be achieved by using sophisticated open technology platforms to deliver elevated quality services more consistently to the peoples and profession at lower cost, which can adopt to major risks like climate change, population growth and aging fundamentals. Technology has always shaped the city changing our relationships to time, space, nature and each other. Information communication technologies such as smart phones, tablets, iPods, are changing the way we

interact with the built habitat and our fellow citizens, besides the visible infrastructure needs , it is equally more important to invest in non-visible elements like cloud wifi and mobile connectivity.

**Eco-friendly city:**

Eco friendly city can be defined as new settlements adopting a sustainable approach for urban development that have implemented regulations to restore and consent as part of integrated environmental policy. An eco-friendly city must have clear goals, strong political backup, absolute expertise into it and putting efforts to bring the clean water efficiently into the city and moving out its polluted water by efficient means, which includes pipeline leakage rainwater harvesting reusing grey water and city must be equipped to deal with GHG emissions, encouraging investments on clean-tech companies which manufactures green products and provides all sort of environmental friendly services like urban waste recycling for instance every building has double glass window to save energy, most of the power is emission free, coming from solar, wind sources. This shows the role model of eco city.

**Livable city:**

Regional inequalities are many times attributed because of rapid urbanization urban poor and middle class peoples are lack of basic facilities is the common phenomenon in growing cities. The key ingredient of a successful economy includes not only strong growth and job opportunities but



also a highly livable environment which is very attractive; there is a strong need of overcoming threat such as “hollow urbanization” which is caused by large, dense, single use developments being segregated from other parts of the city. Cities ought to create places to entire people together and stay and these do not necessarily need to be complicated.

#### Conclusion:

Our world is undergoing change due to globalization, urbanization and technical improvements and it forcing us to think and change our way of living, urbanization is a global strategy that influencing all features of the world economy from production to consumption. New technologies to be designed to limit both economic and environmental impacts in global scale we need to adopt to the adaptive developments, this built environment lasts a long time, strong infrastructure and services will sustain cities, planning a smart city is not fulfill the replicating past practices but needs to adopt new and renewable practices for sustainable growth of smart city.

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Editorial board members of NESAs newsletter will be revised for the year 2023. All the interested applicants may send their curriculum vitae to Editor in Chief by **15th June, 2023.**

## MEDICAL GEOLOGY: FUTURE PERSPECTIVES

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### Introduction:

The field of medical geology is expanding quickly, and it has the potential to assist medical and public health organizations around the globe in addressing a variety of naturally occurring and environmental-related health problems. Health issues brought on by geologic material and processes are typically chronic in nature. Long-term, low-level exposures to trace elements like fluorine, arsenic, radon, mineral dust, and naturally occurring organic compounds in drinking water are among the culprits for these issues. It has been documented that the occurrence of some non-communicable diseases varies geographically around the globe. Examples include goitre, dental caries, multiple sclerosis, cardiovascular conditions, diabetes, and Parkinson's disease. Many biological, behavioural, genetic, and environmental risk factors contribute to the multifactorial aetiology of illnesses (Davies 2000). The aetiology and regional variation of some non-communicable diseases, for instance, may be significantly influenced by specific geological risk factors, which are generally stable. Hippocrates and Aristotle observed connections between environmental conditions and the distribution of many diseases thousands of years ago. Minerals were known to have therapeutic as well as possibly harmful effects in ancient China and India. However, the 20th century championed reductionist science, thus many find the term "medical geology" strange today. Medical geology is defined as the scientific field that investigates the effects of geologic materials and processes on ecosystem and human health. This definition covers both natural and artificial causes of potential health issues, and it also suggests that diseases of both wildlife and plants are included.

The most accurately descriptive term for this field of research, hydro, biogeo, chemo, epidemio, pathoecology will not be used for obvious reasons. On June 7-8, 2002, the International Society for Ecosystem Health (ISEH) hosted the Healthy Ecosystems/Healthy People conference in Washington, DC, where the working group Medical Geology: Earth Systems, Resource Use, and Human Health met. The working group decided to keep using the term "medical geology," acknowledging that the emphasis should be placed on the wide definition provided above.

### Exposure to trace elements: Deficiency and toxicity

The normal metabolism and physiological processes of both humans and animals depend on trace elements. About 22 of these substances are recognized as being "essential" for people and other animals. While "micronutrients" are needed in much smaller quantities (e.g., micrograms to milligrammes per kilogramme of diet), "macronutrients"

must be consumed in relatively substantial numbers (e.g., grammes per kilogramme of diet) (Adriano 2001). It has been determined that 16 components are necessary for good health. For example, membranes and bones need calcium, phosphorus, magnesium, and fluoride to perform structural tasks. Cellular water and electrolyte balance depends on the presence of sodium, potassium, and chloride. In addition to iron, the following elements are crucial for the function of enzymes: zinc, copper, selenium, manganese, and molybdenum.

The endocrine system's ability to function depends on chemical components as well. For instance, chromium serves as the main atom in the hormone-like glucose tolerance factor, and iodine is a crucial component of the thyroid hormone thyroxine. These are all important living processes, therefore many "nutritionally essential elements" in the body have their tissue levels maintained within specific ranges and are influenced by a number of physiological processes, most notably homeostatic regulation of enteric absorption, tissue storage, and/or excretion. Short-term dietary deficits or excesses of trace elements may be made worse by changes in certain physiological processes. For both humans and animals, food is an important source of trace elements. For both humans and animals, food is an important source of trace elements. The deliberate ingestion of dirt (geophagia) and water supplies are examples of alternative sources that could also contribute to the dietary intake of trace elements. Iodine, copper, zinc, selenium, molybdenum, manganese, iron, calcium, arsenic, and cadmium are documented trace element diseases as well as excesses. The juvenile cardiomyopathy known as "Keshan Disease" (Fordyce, 2005) and the iodine deficiency disorders such as goitre and myxedematous cretinism have been reported as endemic diseases associated with soil deficits in selenium and iodine, respectively.

In the following paragraphs, examples of adverse health effects due to trace element deficiencies and excesses are described. Chronic exposure to non-essential elements such as arsenic is also described.

### Iodine

For iodine, there is strong evidence linking geology materials to trace element deficiencies. Reduced IQ, miscarriages, birth defects, goitre (thyroid gland enlargement), cretinism (mental retardation with physical deformities), and iodine deficiency disorders (IDD) are some of the symptoms of IDD. People with goitre were fed seaweed to provide the necessary iodine in ancient China, Greece, Egypt, and among the Incas. People with goitre were fed seaweed to provide the necessary iodine in ancient China, Greece, Egypt, and among the Incas (Fordyce, 2005). There are still many places of the world where goitre is a serious illness. IDD could affect more than a billion individuals worldwide, most of whom reside in underdeveloped nations. Due to low levels of iodine in bedrock, the iodine content of drinking water is extremely low in all areas with a high risk of IDD.



### Selenium

Selenium is a crucial trace element with qualities that help regulate thyroid hormones, redox reactions, and antioxidant protective mechanisms. A severe physiological impairment and organ damage, such as a juvenile cardiomyopathy (Keshan disease) and muscle anomalies in adults (Kashin-Beck disease), have been linked to selenium shortage (caused by soils poor in selenium). Dietary selenium has been very effective in both the prevention and treatment of various disorders (Fuge, 2005).

### Toxicity of essential and non-essential elements

#### Arsenic

Human carcinogens include arsenic and its compounds (IARC, 1987). A number of anthropogenic sources, such as mining, pesticides, medicines, glass, microelectronics, and most frequently natural sources, can expose people to arsenic. Arsenic exposure can happen through ingestion, inhalation, cutaneous contact, and, to some extent, parenteral exposure. Arsenic contamination of drinking water is a significant public health issue. Arsenic contamination of drinking water is a significant public health issue. In several nations across the world where a sizable amount of the drinking water is contaminated with high quantities of arsenic, both acute and chronic arsenic exposure through drinking water has been documented. Poor women and children in Bangladesh are the most negatively impacted. Adult females are typically the most malnourished and susceptible to disease in low-income rural households. Arsenicosis has an impact on sufferers' productivity as well because it frequently renders victims unable to work and a liability for their family. Since they were born, the underprivileged children have consumed filthy water. They might eventually get arsenicosis. The parents of a young woman who is affected may find it extremely difficult, if not impossible, to find her a husband without paying a sizable dowry. The arsenic issue will make the challenging social issue of dowry providing even more onerous.



**Figure 1: Squamous cell carcinoma on heel. The patient was from the village of Singergdanga (police station Gaighata), North 24-Paraganas District.**



**Figure 2: Hyperkeratosis on sole. The patient died of lung cancer. The patient was from the village of Chandpur North 24-Paraganas District.**

#### Fluoride

Over-exposure to trace elements in geologic materials is responsible for toxicity effects in humans and animals. One of the most studied trace elements in this regard is fluorine. The fluoride ion ( $F^-$ ) stimulates bone formation and also reduces dental caries at doses of at least 0.7 mg/L in drinking water. However, excess fluoride ( $>1$  mg/L) exposure can cause fluorosis of the enamel (mottling of the teeth) and bone (skeletal fluorosis) Teotia & Teotia 1994; Sunitha et al., 2020. Types of mottling are shown in Figure: 3.

### CONCLUSION

Future studies in the field of medical geology should focus on establishing a better understanding of the role of minerals in ecosystems and their interaction with biological organisms, for which it will be necessary to resort to the use of advanced technologies in the characterization of samples, providing valuable information not only in relation to environmental conditions but also in relation to the state of human health. However, it is necessary to consider essentiality and non-essentiality minerals with reference to human health, sources of exposure of toxic elements, and health effects induced by deficiency and excess of minerals. This will be essential in defining environmental and public health strategies. Therefore, to be most effective the Colombian geoscience community should be included as one of the key players or agencies involved in environmental health studies. Earth planet contributes to the pollution through volcanic eruptions, radiation, toxic elements, dust, etc., however, if the anthropogenic activities continue contributing to increase the levels of contamination, it would be very difficult to protect the humanity.

The objectives of Medical Geology are to identify harmful geologic agents, determine the conditions of exposure that promote deteriorating health conditions, and develop sound principles, strategies, programs and approaches

necessary to eliminate or minimize health risks. Interaction and communication is necessary between the geoscience, biomedical, and public health communities to protect human health from the damaging effects of physical, chemical and biological agents in the environment. We recommend that Medical geology be included in higher education curricula so that students will be aware of the connection between geology and health and encouraged to pursue a career in Medical Geology. The rapidly emerging scientific discipline of Medical Geology holds promise for increasing our environmental health knowledge base, and contributing to substantial tangible improvements in the well-being of the global community.

The goals of medical geology are to detect dangerous geologic agents, identify the environmental factors that contribute to deteriorating health conditions, and create the sound guidelines, plans, strategies, and methods required to completely remove or significantly reduce health hazards. To safeguard human health from the harmful impacts of physical, chemical, and biological agents in the environment, interaction and communication across the geosciences, biomedical, and public health groups are essential. We recommend that Medical geology be included in higher education curricula so that students will be aware of the connection between geology and health and encouraged to pursue a career in Medical Geology. Medical geology is a fast developing scientific field that has the potential to advance our understanding of environmental health and make a significant, positive impact on how well the entire world is doing. Promoting acceptance of the field of medical geology is a crucial task. By increasing awareness among funding organisations and decision-makers, this may make support for research easier to come by. The general public has to be made aware of the importance of this subject so that they can urge their

elected officials to support this vital cause. This field holds the promise of helping to solve severe public health issues. A partnership between the Society and the IUGS Medical Geology Initiative would certainly be advantageous to both Organisations given the ISEH's guiding principles and objectives. Together, these complementary groups can create Medical Geology, a robust, self-sustaining interdisciplinary scientific discipline.

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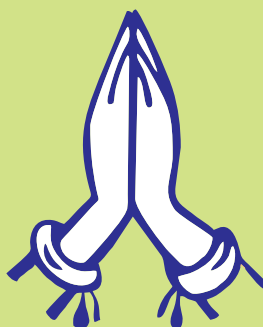
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## ACTIVITIES AND SPECIAL DAYS IN THE MONTH OF APRIL 2023

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### 1st April - Prevention of Blindness week



It is observed from 1st to 7th April to spread awareness against the causes of blindness and the ways to prevent them.

### 2nd April - World Autism Awareness Day

On April 2, people around the world mark World Autism Awareness Day to educate and raise awareness about autism.



### 4 April- International Day of Mine Awareness



The International Day for Mine Awareness and Assistance in Mine Action is held annually on April 4 to raise public awareness of the danger that landmines pose to the security, well-being, and lives of civilian populations

and to encourage state governments to create mine-clearing initiatives.

### 7 April-World Health Day

Health is wealth, as we all know. As a result, April 7 is observed as World Health Day throughout the world. The World Health Organization oversees a number of initiatives and agreements. In 1950, it was honoured for the first time.



### 10 April - World Homeopathy Day (WHD)



Every year on April 10, World Homeopathy Day (WHD) is marked to honour Dr. Christian Friedrich Samuel Hahnemann, the system's founder and father. This day's major objective is to increase public awareness of the

benefits of homeopathy. Actually, the World Homeopathy Awareness Organization sponsors World Homeopathy Week every year from April 10 to April 16.

### 14 April-B.R. Ambedkar Remembrance Day

The day of remembrance for B.R. Ambedkar, also known as Ambedkar Jayanti or Bhim Jayanti, is commemorated on April 14 to honour his memory. Baba Saheb Bhimrao Ambedkar, an Indian politician and social rights advocate, was born on this day.



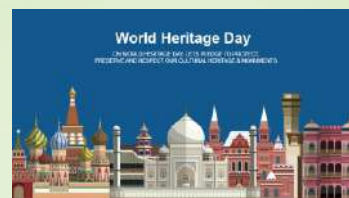
### 17 April - World Haemophilia Day



Hanuman Jayanti, or the birthday of Lord Hanuman, is a national holiday. On the day of the full moon during the Chaitra month, it is observed all across the nation.

### 18 April-World Heritage Day

Every year on April 18, this day is celebrated in order to honour the efforts of all pertinent organisations in the area and conserve human history. The General Assembly of UNESCO ratified the declaration of this day in 1983 after it was made by the International Council on Monuments and Sites (ICOMOS) in 1982.



### 19 April -World Liver Day



It is marked on April 19 in order to raise awareness of liver-related disorders. The liver is the body's second-largest organ. It is also the second most complicated organ in the body, right after the brain. It carries out a number of vital tasks related to immunity, metabolism, digestion, and the storage of nutrients inside the body.

### 22 April-World Earth Day

Every year on April 22, this day is commemorated to honour the beginning of the contemporary environmental movement in 1970. Since Earth is the only planet in the universe where life is conceivable, it is important to preserve this natural resource. In order to raise public awareness of the planet's importance, World Earth Day is observed.



### 24 April-National Panchayati Raj Day

Every year on April 24th, India celebrates National Panchayati Raj Day. The Constitution went

into effect on this day, April 24, 1993. The first National Panchayati Raj Day was observed in 2010.

### 25 April - World Malaria Day

Every year on April 25, World Malaria Day is observed to increase public awareness of malaria and the best ways to prevent, treat, and ultimately eradicate it.



### 28 April - World Day for Safety and Health at Work



The International Labour Organization (ILO) has been observing this day on April 28 every year since 2003. This day celebrates workplace safety and health and aims to keep up these efforts despite a number of changes, including those brought

on by technology, demographic shifts, and climate change, among others.

## SAVE OUR POLLINATORS

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Insect pollinators such as bees, butterflies, moths, beetles, flies and ants are all vanishing first around the planet due to excessive use of pesticides in agriculture and anthropogenic pollution. According to IUCN, 85% of flowering plants on our planet are dependent on these insect pollinators for their survival and maintaining the balance of our ecosystem. American

Beekeeper's Association reported that bee populations are showing an alarming decline due to a number of factors like environmental pollution, indiscriminate use and over applications of various agro-chemicals, industrial agricultural practices detrimental to nature, changes in the land use patterns; and parasitic diseases of bees as well as lack of adequate supply of nectar and pollens for different bee species due to lack of suitable of bee foraging plants. The yield loss due to lack of suitable pollinators for cross pollination is a serious threat to the future of global agriculture as well as for maintaining the balance of our natural ecosystems.

The worst decline is noticed in developed nations practising high precision industrial agriculture with native bee population crashes between 97-99% in the past two decades has been reported by the Beekeeper's Association of Canada. The major factor behind this rapid decline of

pollinator insects is specifically due to extensive application of toxic synthetic pesticides and synthetic fertilizers. The industrial level pesticide spraying in large farms in western countries is dependent on low wind speed and bright sunny mornings. Unfortunately, these are the days when insect pollinator's flock to their foraging ground in large numbers. As a consequence they are being killed in massive numbers impacting ecological balance. Pesticide laden irrigation water and rain water percolates through holes in the soil to reach the bee colonies to wipe them out completely as investigated by the US based Xereces Society that works actively towards pollinator conservation across the continent of North America.

This kind of bee population declines are not reported from developing nations like India where small plot farming is practised due to lack of large agronomic lands and related infrastructure to maintain such huge averages. Furthermore, there is tremendous crop biodiversity in the sense that rice, mustard, flax, various legumes, aromatic and medicinal herbs, forage crops, ornamentals and fruit orchards are all grown in adjacent areas. Thus pollinator insects have the grand opportunity to move or escape the negative chemical impact by moving into other plots or fields or Forage in an alternate crop.

The toxic chemicals land as droplets on the insect body and stick to them. Bees like other insects have the habit of cleaning their antennae; and through this process they intake toxic pesticides inside their system killing them. Often these chemicals impact their nervous system impacting their precise sense of orientation causing them to land at inappropriate sites causing deaths. Cross contamination with bees having pesticides with them with others in the hives or nest also causes an epidemic resulting in mass deaths of honey bees as well as native bees. While commercial honey bees are raised and can be replaced, native bees on which forest pollination is completely dependent are being wiped out in this process. In North America and EU over 40% annual productions in apiculture industries have been impacted due to mass deaths of bees (American Beekeepers Association). Unfortunately, reliable data on both honey bee and native





bee declines in India is not easily available or reported scientifically either by Zoological Survey of India or any entomological societies in the country to get a proper estimate of different bee populations, a research domain that needs urgent attention !

Establishing suitable pollinator (bee) gardens or habitats or sanctuaries at suitable sites could prove to be instrumental in both bee and other pollinator insect conservation from a long term, ecological perspective. Using suitable Pollinator Mixes comprising of native grasses, wildflowers as well as annual, biennial, perennial forage crops (forage grasses, legumes, different Brassica family members) can help in establishing Pollinator gardens or habitats or sanctuaries in

perimeters of forested areas, under used or unsuitable agronomic lands, unused and available rural locations, city and municipal parks and gardens, lawns, kitchen gardens, unused or hard to farm areas, in sites adjacent to natural or artificial water bodies like ponds, pools, ditches, swamps, bogs, streams, irrigation canals etc

Natural or artificial aquatic habitats like pools, ponds, ditches, swamps, bogs, lakes, canals etc could be targeted for ecological restoration by planting short or high grasses, salt tolerant aquatic plant species and grasses along with Pollinator mixes comprising of annual and perennial legumes, wildflowers and related pollinator friendly plant species adjacent to water bodies. Such mixes will not only

restore aquatic habitats; but, also attract small and medium sized land birds and a wide diversity of pollinator insects like honey bees, native bees, moths, butterflies, certain species of pollinator beetles and flies for nectar foraging, nesting and breeding purposes. If the water/bodies are well stocked with indigenous fish species, well protected grassy aquatic habitats will also attract a wide diversity of aquatic birds to nest, forage and breed in such unique environmentally restored ecosystems.



*Photo credit: Saikat Kumar Basu*





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## NOTIFICATION NO. 1

# APPLICATIONS ARE INVITED FOR NESA ANNUAL AWARDS – 2023

LAST DATE: **31<sup>st</sup> August, 2023**



This is to notify that applications are invited for the NESA Annual Awards 2023 from the Life Members of the Academy. The prescribed application forms for the following categories can be downloaded from our website: [www.nesa-india.org](http://www.nesa-india.org) • <http://nesa-india.org/award-form-submission/>

Separate applications should be submitted for independent awards. For detail guidelines the website of NESA may be approached by logging on.

The last date for all the categories of awards is **31<sup>st</sup> August, 2023**. The venue and the brochure will be shared soon.

The categories of Awards are given as under:

- (1) NESA FELLOWSHIP AWARD
- (2) NESA INTERNATIONAL SCIENTIST AWARD
- (3) NESA EMINENT SCIENTIST AWARD
- (4) NESA INDIGENOUS TECHNICAL KNOWLEDGE (ITK) AGRICULTURE AWARD
- (5) NESA SCIENTIST AWARD
- (6) NESA ENVIRONMENTALIST AWARD
- (7) NESA GREEN TECHNOLOGY INNOVATIVE AWARD
- (8) NESA DISTINGUISHED SCIENTIST AWARD
- (9) WOMEN EXCELLENCE AWARD
- (10) NESA YOUNG SCIENTIST AWARD
- (11) NESA JUNIOR SCIENTIST AWARD

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## SICK BUILDING SYNDROME (SBS): AN EMERGING PROBLEM FOR HUMAN HEALTH

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### Abstract

Sick Building Syndrome (SBS) is a terminology which is used to describe some ill situations in which building occupants experience acute health problems like head ache and discomfort feelings that appear to be linked to time spent in a building, but no specific illness or cause can be identified. The complaints may be confined to a particular room or zone, or may be widespread throughout the building. Synonymously the SBS are often termed as "Building Related Illness" (BRI) is used when symptoms of diagnosable illness are identified and can be attributed directly to airborne building contaminants. Many a times, diagnosing SBS becomes difficult because of the wide range of symptoms. These can also mimic other conditions, such as the common flu. The important point in SBS is that, the symptoms get improved after leaving the building in question and come back when return to the same location again. If someone notices recurring symptoms that seem to appear whenever the person is in a particular building, one may consider sick building syndrome as the cause.

### Introduction:

Sick building syndrome is a wide terminology used for describing a situation in which a building occupants feel different health related issues and discomfort. Although it is very tough to clearly mention about specific disease or health symptoms but still a group of symptoms appear which can easily be linked to time spent in that building.

### Indicators of SBS include:

Often such building dwellers complain of symptoms associated with acute health discomfort e.g., headache; eye, nose, or throat irritation; dry cough; dry or itchy skin; dizziness and nausea; difficulty in concentrating; fatigue; and sensitivity to odors. The actual cause of the symptoms is not known. Most of the complainants report relief soon after leaving the building.

### Symptoms of Sick Building Syndrome:

Building dwellers may complain with the following health relates issues.

- Itchy, irritated, dry or watery eyes
- Nasal congestion
- Throat soreness or tightness
- Dry, itchy skin or unexplained rashes
- Headache, lethargy, or difficulty concentrating

Some building related factors, such as high building temperature, interior poor ventilation, high humidity, and sealed windows, along with introducing conventional paints, coatings, and furnishings into the space, can contribute to SBS. Complainants may require prolonged recovery times after leaving the building. It is important to note that complaints may result from other causes. These may include an illness contracted outside the building, acute sensitivity (e.g., allergies), job related stress or dissatisfaction, and other psycho-social factors. Nevertheless, studies show that symptoms may be caused or exacerbated by indoor air quality problems.

### Causes of Sick Building Syndrome

There are many reasons behind sick building syndrome to get developed (**Fig. 1**). Following are identified as main contributing factors to sick building syndrome:

#### a. Inadequate ventilation:

Inadequate ventilation which may also occur if heating, ventilating and air conditioning (HVAC) systems do not effectively perform and don't distribute air to people in the building is thought to be an important factor in SBS.

#### b. Chemical contaminants from indoor sources:

Most of the indoor air pollutant comes from different sources that are placed inside the building itself. For example, wall paints, furniture and door paints, adhesives, carpeting, pesticides, manufactured wood products, upholstery copy machines and cleaning agents may emit volatile organic compounds (VOCs), including formaldehyde. Tobacco smoke contributes high levels of VOCs, other toxic compounds, and respirable particulate matter. Research shows that some VOCs can cause chronic and sometimes acute health effects at high concentrations and some are known carcinogens. Low to moderate levels of multiple VOCs may also produce acute reactions. Incomplete combustion products and byproducts such as carbon monoxide, nitrogen dioxide, as well as respirable particles, can come from unvented kerosene and gas space heaters, woodstoves, fireplaces and gas stoves etc.

#### c. Chemical contaminants from outdoor sources:

The outdoor air that enters a building can be a source of indoor air pollution. For example, pollutants from motor vehicle exhausts; plumbing vents and building exhausts (e.g., bathrooms and kitchens) can enter the building through poorly located air intake vents, windows, and other openings. In addition, combustion products can enter a building from a nearby garage.

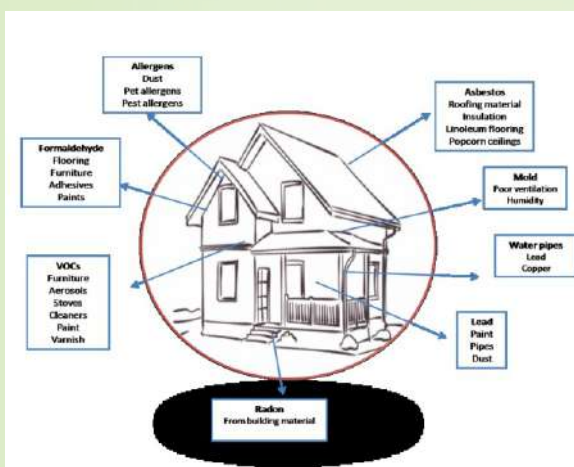
#### d. Biological contaminants:

Bacteria, molds, pollen, and viruses are types of biological contaminants. These contaminants may breed in stagnant water that has accumulated in ducts, humidifiers and drain pans, or where water has collected on ceiling tiles, carpeting, or insulation. Sometimes air borne bacteria,

spores can also contaminate indoor air conditions. Insects or bird droppings can be a source of biological contaminants. Physical symptoms related to biological contamination include cough, chest tightness, fever, chills, muscle aches, and allergic responses such as mucous membrane irritation and upper respiratory congestion. One indoor bacterium, *Legionella*, can cause both Legionnaire's Disease and Pontiac Fever. Basically this bacterium spreads from Air conditions. These elements may act in combination, and may supplement other complaints such as inadequate temperature, humidity, or lighting. Even after a building investigation, however, the specific causes of the complaints may remain unknown.

**e. Special considerations:**

SBS and BRI are associated with acute or immediate health problems. Radon and asbestos cause long term diseases which occur years after exposure and are therefore not considered to be among the causes of sick buildings. But yet, Radon exposure is often being simultaneously recognized as related illness. This is not to say that the latter are not serious health risks; both should be included in any comprehensive evaluation of a building's IAQ.



**Fig. 1: Causes of Sick Building Syndrome (SBS).**

**Investigation on SBS:**

Once one building identified with these all health issues by the building dwellers, an indoor air quality investigation procedure is best characterized as a cycle of information gathering, hypothesis formation, and hypothesis testing. The investigation generally begins with a walk through inspection of the problem area to gather detailed information about the four basic factors that influence indoor air quality:

- The occupants' health issues
- The HVAC system
- Possible pollutant pathways
- Possible contaminant sources

The initial walkthrough includes overall documentation of information which are easily obtainable about the history

of the building and of the complaints; identifying known HVAC zones and complaint areas; notifying occupants of the upcoming investigation. The walkthrough itself entails visual inspection of critical building areas and consultation with occupants and staffs of the building.

After the initial walkthrough gets done, the investigator should develop some possible explanations for the complaint. At this point, the investigator may have sufficient information to formulate a hypothesis, test the hypothesis, and see if the problem is solved. If it is, steps should be taken to ensure that it does not recur.

However, if insufficient information is obtained from the walk through to construct a hypothesis, or if initial tests fail to reveal the problem, the investigator should move on to collect additional information to allow formulation of additional hypotheses. The process of formulating hypotheses, testing them, and evaluating them continues until the problem is solved. Although air sampling for contaminants might seem to be the logical response to occupant complaints, it seldom provides information about possible causes. While certain basic measurements, e.g., temperature, relative humidity, CO<sub>2</sub>, and air movement, can provide a useful "snapshot" of current building conditions, sampling for specific pollutant concentrations is often not required to solve the problem and can even be misleading. Contaminant concentration levels rarely exceed existing standards and guidelines even when occupants continue to report health complaints. Air sampling should not be undertaken until considerable information on the factors listed above has been collected, and any sampling strategy should be based on a comprehensive understanding of how the building operates and the nature of the complaints.

**Solutions to Sick Building Syndrome:**

Solutions to sick building syndrome usually include combinations of different approaches. The following practices may be followed:

- Pollutant source removal or modification is an effective approach to resolve an IAQ problem when sources are known and control is feasible. Examples include routine maintenance of HVAC systems, e.g., periodic cleaning or replacement of filters; replacement of water-stained ceiling tile and carpeting; institution of smoking restrictions; venting contaminant source emissions to the outdoors; storage and use of paints, adhesives, solvents, and pesticides in well ventilated areas, and use of these pollutant sources during periods of non-occupancy; and allowing time for building materials in new or remodeled areas to off-gas pollutants before occupancy. Several of these options may be exercised at one time.
- Increasing ventilation rates and air distribution often



can be a cost effective means of reducing indoor pollutant levels.

- Air cleaning can be a useful adjunct to source control and ventilation but has certain limitations.
- Particle control devices such as the typical furnace filter are inexpensive but do not effectively capture small particles; high performance air filters capture the smaller, respirable particles but are relatively expensive to install and operate. Mechanical filters do not remove gaseous pollutants. Some specific gaseous pollutants may be removed by adsorbent beds, but these devices can be expensive and require frequent replacement of the adsorbent material. In sum, air cleaners can be useful, but have limited application.
- Use an air purifier: Air filters; UV filters, Ozone generators etc. are available in the market today.
- Indoor plants: A good solution to curb down indoor air pollutants: Through studies conducted by NASA, scientists have identified 50 houseplants that remove many of the pollutants and gases mentioned above. NASA, with assistance from the Associated Landscape Contractors of America, conducted a two-year study directed by Dr. B.C. Wolverton, an environmental engineer from Picayune, Washington, and a research scientist for NASA for over 20 years. Dr. Wolverton's study of the interaction between plants and air found that houseplants, when placed in sealed chambers in the presence of specific chemicals, removed those chemicals from the chambers. He concluded that plants can clean pollutants in homes, offices, factories and retail outlets.

Later, Wolverton expanded the study and assigned plants a rating from one to 10, based on a plant's ability to remove chemical vapors or indoor air toxins, ease of growth and maintenance, resistance to insect infestation, and the rate at which water evaporates from the leaves. He summarized much of his research in his book, [–“How to Grow Fresh Air 50 Houseplants that Purify Your Home or Office.”](#)

- Examples of top ten indoor plants for removing formaldehyde, benzene, and carbon monoxide from the air (Fig. 2):
  - Areca Palm (*Chrysalidocarpus lutescens*)
  - Lady Palm (*Rhapis excels*)
  - Bamboo palm (*Chamaedorea seifrizii*)
  - Rubber plant (*Ficus robusta*)
  - Dracaena “Janet Criag” (*Dracaena deremensis*)
  - Philodendron (*Philodendron* sp.)
  - Dwarf Date Palm (*Phoenix roebelenii*)
  - Ficus Alii (*Ficus macleilandii* “Alii”)
  - Boston fern (*Nephrolepis exaltata*)
  - Peace lily (*Spathiphyllum* “Mauna Loa”)



Fig. 2: Plants that purify indoor air.

### Who is affected?

Almost any worker can be affected by Sick Building Syndrome. Cases have occurred with many different types of building including hospitals and even in the home. Most reports, however, concern those employed in large office buildings. For this reason, Sick Building Syndrome is largely associated with office work. However, not everyone is equally at risk. Workers most commonly reporting the symptoms tend to be those who have little control over their working environment and are employed in routine jobs such as general clerical work and work using display screen equipment. Women seem more at risk than men, though this partly reflects the fact that more women are employed in these areas.

### Awareness:

Education and communication are important elements in both remedial and preventive indoor air quality management programs. When building occupants, management, and maintenance personnel fully communicate and understand the causes and consequences of IAQ problems, they can work more effectively together to prevent problems from occurring, or to solve them if they do.

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**14<sup>th</sup> – 16<sup>th</sup> December 2023**

**Venue: CSIR – National Botanical Research Institute, Lucknow**



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**SUBMIT ABSTRACT**  
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Abstract submission Deadline:	31.10.2023
Intimation of acceptance of abstract:	07.11.2023

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