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THE IMPACT OF COVID-19 PANDEMIC ON CHEMICAL SCIENCE

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ABSTRACT

Chemistry plays a important role in understanding the whole lot from viral composition to pathogenesis, advancement of vaccines and therapies as well as in the development of materials and techniques used by researchers, virologists, and clinicians. This study aims at providing brief overview of the contribution of chemistry in understanding and controlling the spread of corona virus [26, 27, 4, 9]. COVID-19 pandemic has affected several fields of chemical science. Major effect or change were observed in Environmental pollution such as air quality, water quality, and greenhouse gases. It also affected chemical industry [1, 3, 13, 14, 15, 16]. It has been observed by number of studies that anthropogenic activities are considered as one of the key drivers of environmental pollution. Since people's social and industrial activities were blocked down for several months it was expected that pollution level of the environment got decreased. The Carbon release level has dropped drastically. This pandemic has increased interest in studying chemical science and attitude of research towards chemical science [2, 5, 6, 41, 35, 36].

Keywords: *Pandemic, COVID-19, virologist, vaccine, safety and equipment's etc.*

INTRODUCTION

The chemistry based research organisation and pharmaceutical companies are accompanying their efforts towards collecting more and more information about the corona virus. Chemical science is an important aspect at every step at battle against corona virus pandemic. This study aims at providing brief overview of the contribution of chemistry in understanding and controlling the spread of corona virus [7, 8, 10, 11, 12, 17, 18]. Chemistry based research institutions and pharmaceutical companies are refocusing their maximum efforts towards discovering more about the virus testing technologies and developing a vaccine. Chemistry played an important role at every step to understand virus and develop a vaccine. Technicians of chemical laboratory were provided the special skills needed to run tests, maintain equipment and manage laboratory supplies including chemicals for hand sanitizer and safety equipment that are providing direct to doctors, nurse on the frontline workers. There were thousands of teachers worked hard to give their experience to students and also inspiring, motivating and counselling during COVID-19 pandemic through online teaching. The whole chemical science community is contributing to fight against COVID-19[19, 20, 25, 29, 30].

The COVID-19 disease not only affected health and economy but also its impact on other aspects such as the environment [31, 32]. Environmental flow chart indicator that are potentially affected by COVID-19.

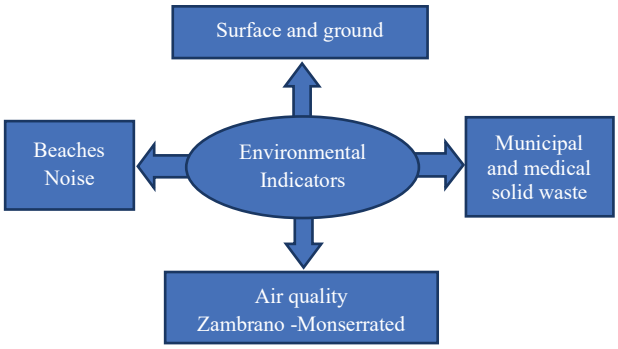

Figure 1: Environmental flow chart indicator that are potentially affected by COVID-19.

CORONA VIRUS PANDEMIC IMPACT ON THE ENVIRONMENT

On January 30 2020 first case of COVID-19 was reported in India. Soon after the case of COVID-19 started reporting from different parts of India due to international travel of Indians. In India First time total lockdown was extended for 21 days in the first phase. During this phase air quality status was improved in India. So many parameters of air quality as (particulate matter, air quality Index, tropospheric NO_2, O_3, absorbing aerosols index (AAI), CO, were analysed using ground and satellite observations. A pronounced decline in PM and AQI and also NO_2 concentration was observed in Delhi, Mumbai, Hyderabad, Kolkata and Chennai during lockdown

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period [33, 34, 28, 37, 38, 39, 40].

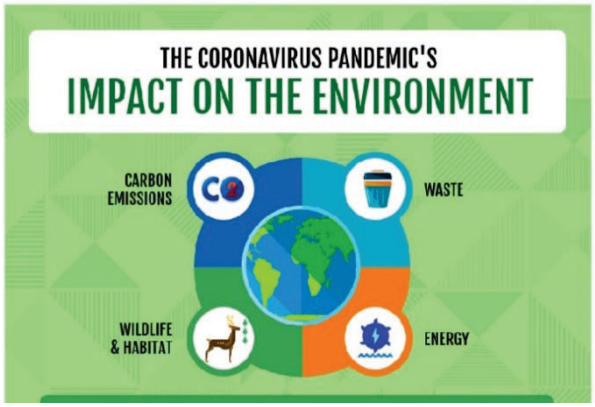

Figure 2: Impact on the environment during COVID-19 pandemic

During complete lockdown in India, roads were deserted without any vehicle except the emergency vehicles. winter crop harvesting (wheat) and planting of vegetables occurs in the month of April in India, so the Indian Government relaxed in lockdown so that movement of the farmers happened for agriculture work. During 15 April – 3May 2020 the Indian Government has further extended lockdown in some parts in a relaxed way, and allowed vehicular transport, domestic flights, and few trains farmers at many places also have started burning crop residue and as a result of all these long term movements of dusts all through the pre –monsoon season are also being observed, which affects the air quality of major cities located in the Indo – Gangetic Plains. Recently, Sharma et al. and Central Pollution Control Board deliberate the impact of lockdown on air quality for the phase 15 March to 14 April 2020 [21, 22, 23, 24].

IMPACT ON CO_2 EMISSION

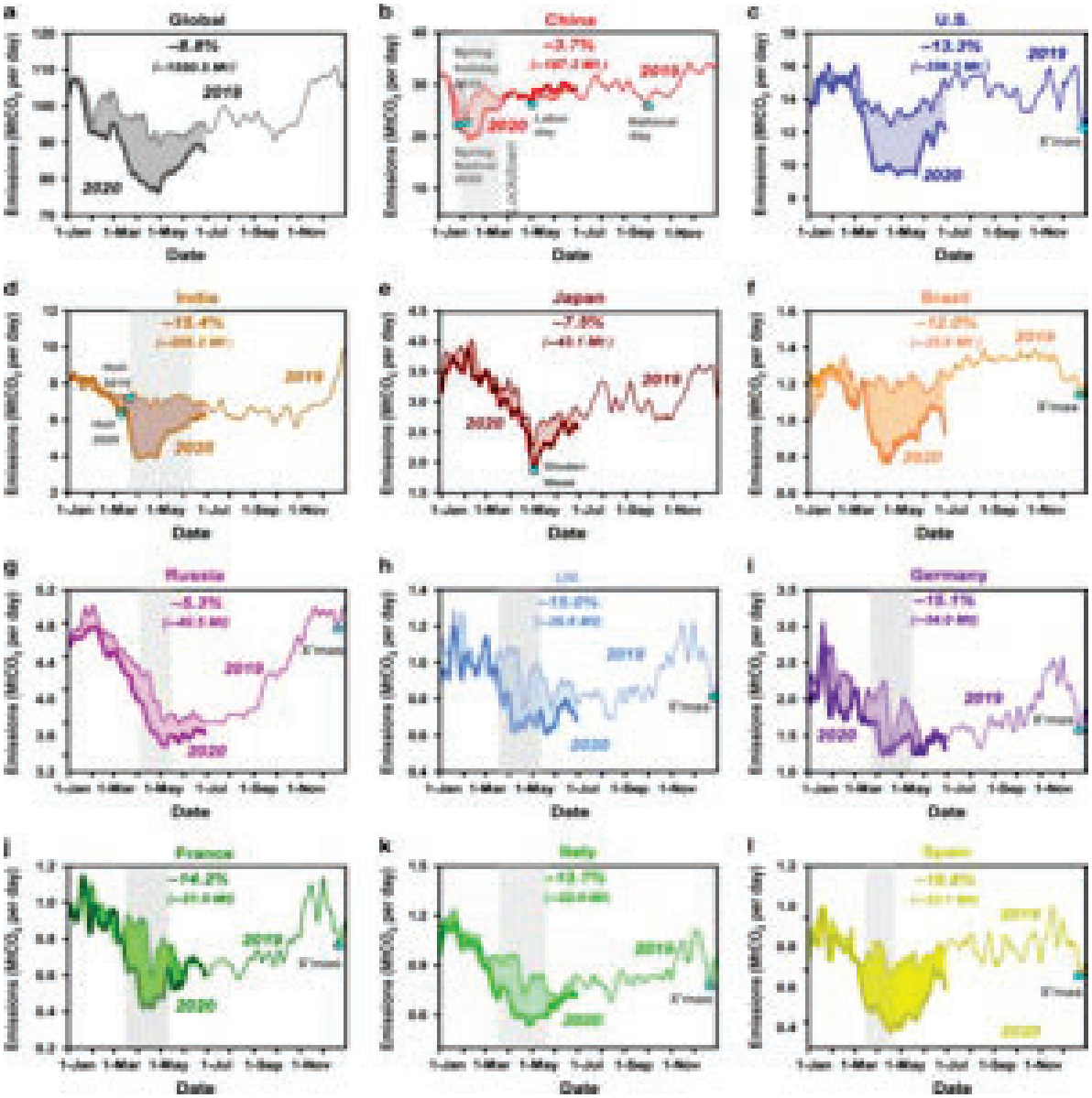

Figure 3: The COVID-19 pandemic on daily CO_2 emissions globally and in nations [17]

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Lockdown with greater decrease in march[U.S -14% EU-27 and UK-8.5 India-16.9%,Russia-4.9%, Brazil-10.8%, Japan-4.7%) than in February(U.S -1.7% EU-27 and UK-6.2%, India-6.4%, Russia-1.0%, Brazil-1.4%,Japan-2.2%). In these countries emission decreases were the largest in April (U.S-25.4% EU-27 and UK-26.3%, India-44.2%, Russia-10.9%, Brazil-31.5%, Japan-10.5%) Since May 2020 lockdown restrictions in many of these countries began to ease and emission deficits became smaller but remained significant (US-26.4% in May and -14.8% in June EU -27 and UK - 21.6% in May and 6.9% in June, India-27.6%in May and 15.0% in June, Russia 8.4% in May and 5.1%in June, Brazil 26.0% in May and 12.6%in June,Japan-17.2%in May and 7.6% in June).The decrease is primarily due to ground transportation sector(-18.6%) and domestic(-35.8%) and international aviation(-52.4%).

According to a report released on 2nd March by the international energy agency 2020 total jump down in global CO_2 emissions of 6% which is the largest annual decline since world war and keeping almost 2 billion tons of planet warming gases out of the sky. The overall curve of emissions in 2020 was closely near the severity of the pandemic. The universal lowest point came in April when worldwide CO_2 emission were approximately 14% lower than they were in April 2019 just at the point at which most countries were retreating into their first and strictest wave of lockdown [22].

A study in May 2020 Le Quere published their estimates from the universal carbon project) in the leading journal Nature climate change found that the daily universal carbon emissions during the lockdown fell by 17% and could lead to an annual carbon emissions decline up to 7% [23]. This decrease is primarily due to the lessening of transportation and industrial activities. However, it has been noticed that this decrease is more due to the restricted industrial activities. Nevertheless, communal shifts caused by the COVID-19 lockdowns – like prevalent telecommuting, implementation of remote work policies, and the bring into play of virtual conference technology – may have a more continual impact on the short-term reduction of transportation tradition. In a study published in September 2020, scientists estimated that such behavioural changes developed during captivity may reduce 15% of all transportation CO_2 emissions

Despite this, Energy and climate expert Constantine Samaras stated that "a pandemic is the achievable way to decrease emissions" and that "scientific, behavioural, and structural alter is the best and only way to reduce emissions". Tsinghua University's Zhu Liu further says that "only when we would trim down our emissions even additional than this for longer period, we would be gifted to perceive the drop in atmospheric gaseous concentrations ". The world's requirement for fossil fuels has lessened by approximately 10% amid COVID-19 measures and reportedly many energy economists believe it may not recover from the crisis.

The impact of pandemic on CO_2 emission is not noteworthy and not even higher than the natural unpredictability figure.'' This means that the short–term impact of the COVID- 19 confinements cannot be notable from natural variability", according to WHO. The Earth's atmosphere has a heavy concentration of GHGs in emission due to the pandemic would not curb global warming and resultant climatic change. Rather, the GHGs emission would continue to rise in 2020 as well. Last year the global average of CO_2 crossed the threshold of 410 ppm. Different sources of CO_2 were affected in different ways throughout the year. Aviation was down by a staggering 70% during the April low. Overall emissions from the transportation sector chop down by 45% in 2020, the equivalent of taking 100 million private vehicles off the road. Private and public transportation accounted for 50%of the year's total drop in CO_2 emissions Demand for oil fell by 8.6% in 2020. Demand for coal was down by 4%. China the world's largest releaser of greenhouse gases and the first country hit by pandemic went into lockdown in February resulting in its CO_2 output falling by12% compared to the same month one year prior. India with its 1.4 billion people saw its emission fall by dizzying 40% in APRIL the largest decline of any major economy.

IMPACT ON PETROCHEMICALS BASED POLYMERS

Due to the downfall in crude oil prices, the bazaar for petrochemical is likely to be most affected. The universal chemical industry is classified into four main regions including North America, Europe, Asia-Pacific and respite of the world. Asia-Pacific is predictable to be extremely affected by COVID-19 due to the effect of the pandemic in China, Japan and India. China is a main country in terms of the

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chemical industry. As per the CEFIC Chem. Data International, in 2018, chemical sales in China reached around 1.32 trillion dollars. According to the International Council of Chemical Association (ICCA), China is the 8th. largest chemical importing nation.

Chemical science played a vital role in preventative and protective way as

Role of soap and detergents in killing viruses – soaps and detergents are tremendously helpful in killing viruses. Both soap and detergents chemically contain surfactants chiefly sodium salts of long chain fatty acid as sodium stearate $C_{17}H_{35}COONa$ known as amphily. Amphiphile contains long chain hydrophobic tail water repelling group and COO- Na+ called the hydrophilic the water loving group.

Normal cleaning mechanism of soap and detergent is as follows - when soap and detergent is dissolved in water the detergent molecules are arranged jointly forming minute bubbles called micelles where the hydrophilic head groups are arranged outward facing the water while hydrophobic group trap the normal dirt released from our skin or garments. Now, these amphiphiles are structurally comparable to the lipid molecule of the organic membranes so the surfactant molecule fight with the lipids in the virus membrane and substitute them easily because the virus is a self assembled structure where the weakest link is in the lipid bilayer. The attached surfactant molecule bonds to water at one end and bonds to lipid at another end resulting in push pull interactions which breaks the virus membrane. And in this way, soap breaks the fatty membrane and thus the virus structurally is removed and gets destroyed. Alike to dirt, the virus gets washed off with water from the skin. Due to this reason it is suggested to wash the hand with soap water for minimum 20 sec.

Mechanism of hand sanitizers; Hand sanitizers are also very useful to get rid of virus. According to WHO, hand sanitizer principally contains four components

a. alcohol, it can be either ethyl alcohol or isopropanol
b. water
c. glycerol and
d. hydrogen peroxide.

Ethyl alcohol and iso-propanol are selected due to their good water solubility and non toxicity. Alcohol are mainly accountable for destroying the virus because the lipid layer of the virus membrane cannot stay alive in the presence of alcohol which dissolves the lipid molecules in it and the virus membrane melts and virus get inactivated. Moreover, alcohol cause denaturation's of viral protein leading to the loss of their biological actions. Thus alcohol plays an significant role in destroying the virus by melting the lipid membrane and denaturing the protein of the virus. Water plays a vital role in destroying viruses. Water also acts as a catalyst for denaturing the proteins of the cell membrane which successfully diffuses the entire cell and so the virus gets destroyed.

During COVID19 Pandemic Raised Demand of Waste Water treatment:

As per recommendation of WHO, hygiene is extremely significant concern to prevent the spread of virus. The access of large amount of fresh and safe water is one biggest challenge to India particularly, rural India where facilities of medicine sanitizers may not be available' The risk of COVID-19 virus has reinstated the demand of waste water management. Water can be purified by using certain chemicals such as chlorine, U.V ray, ozonisation, ion exchangers, In this sector, chemists were on high demand to test water and to construct water purification system.

CONCLUSION

On reviewing diverse information, it has been observed that indisputably COVID-19 has brought a scared devasting curse for human being but it has also been as a blessing for natural environment providing it a recovery time as rivers of India like Ganga, Yamuna and Kavery have become such crystal clean and clear that even marine life became visible. We have also learnt that the environmental degradation caused by humans is not totally irreversible. In a episode of 1-2 month, revival of nature is being witnessed by one and all. This is a signal for humans to understand and react. Government and policy makers must take some essential steps. The covid19 pandemic also affected chemical researchers working and personal lives. Its biggest impact in pharmaceutical sector is to develop different types of medicines and vaccine as a immune buster. Lockdown also increase interest in research in chemical and biochemical science. First time people feel the importance of oxygen.

REFERENCES

[1]. Chauhan A, Singh RP (2017) Poor air quality and dense haze/smog during 2016 in the Indo-Gangetic plains associated with the crop residue burning and Diwali festival. In2017 IEEE International Geoscience and Remote Sensing Symposium (IGARSS), 6048-6051.

[2]. Chauhan A, Singh RP (2020) Decline in PM2. 5 concentrations over major cities around the world associated with COVID-19. Environmental Research 109634.

[3]. Krotkov NA, Lamsal LN, Marchenko SV, Celarier EA, Bucsela EJ, Swartz WH, Joiner J, OMI Core team (2019) OMI/Aura NO2 Cloud-Screened Total and Tropospheric Column L3 Global Gridded 0.25° x 0.25 ° V3, NASA Goddard Space Flight Center, Goddard Earth Sciences Data and Information Services Center (GES DISC), Accessed:29/04/2020,10.5067/Aura/OMI/DATA3007.

[4]. Muhammad S, Long X, Salman M (2020) COVID-19 pandemic and environmental pollution: a blessing in disguise? Sci Total Environ 138820

[5]. [5] Prasad AK, Singh RP, Kafatos M (2006) Influence of coal based thermal power plants on aerosoloptical properties in the Indo-Gangetic basin. Geophys Res Lett 33 (5).

[6]. [6] Raibhandari B, Phuyal N, Shrestha B, Thapa M (2020) Air medical evacuation of Nepalese citizen during epidemic of COVID-19 from Wuhan to Nepal. J Nepal Med Assoc 58(222). 10.31729/jnma.4857

[7]. Sarkar S, Singh RP, Chauhan A. Crop residue burning in Northern India: increasing threat to Greater India. J Geophysics Res-Atmos. 2018;123(13):6920–6934. doi: 10.1029/2018JD028428.

[8]. Chaudhary, A Chaudhary S and Sharma, Y.K study of plants in relation to ambient air quality in Lucknow city, Uttar Pradesh. Res. Environ. Life Sci,1,17.20(20080.

[9]. Transportation Research Board and national Research Council. The ongoing challenge of Managing Carbon Monoxide Pollution in Fairbanks, Alaska; Interim Report http//doi.org/10.17226/10378 (The National Academics Press, Washingaton Dc,2002.

[10]. National Air Quality Index- Report of the Expert Committee. Control of Urban Pollution Series (CUPS/82/2014-15) Central Pollution Control Board, Ministry of Environment, Forest and climate change, Government of India.https//app.cpcbccr.com/ccr_docs/FINAL-REPORT_ AQI_ (2014).

[11]. Kota, Sri Harsha, Hao Guo, Lauri Myllyvirta, Jianlin Hu, Shovan Kumar Sahu, Rajyalakshmi Garaga, Qi Ying et al. "Year-long simulation of gaseous and particulate air pollutants in India." Atmospheric Environment 180 (2018): 244-255.

[12]. NAQI (National Air Quality Index Central pollution control Board (CPCB) 2020.www.app.cpcbeer.com/AQI, India

[13]. WHO Director-Generals opening remarks at the media briefing on COVID19, World Health Organition(WHO) press release, (March2020).

[14]. Corona Virus disease2019(COVID-19)-symptoms and causes, Mayo Clinic. Retrieved,April (2020)

[15]. Marriam Webster Dictonary, pandemic,https;//www.merriam-webster.com/dictionary/ pandemic March 2020

[16]. Cleaning and disinfection of environmental surface in the context of COVID-19,16 May 2020, COVID 19 infection prevention and control/WASH, http;//www.who.int//publications//i/item//cleaning and disinfection-of- environmental-surface-in the-context-of-COVID19.

[17]. Liu, Zhu, Philippe Ciais, Zhu Deng, Ruixue Lei, Steven J. Davis, Sha Feng, Bo Zheng et al. "Near-real-time monitoring of global CO_2 emissions reveals the effects of the COVID-19 pandemic." Nature communications 11, no. 1 (2020): 1-12.

[18]. Van Geffen, J. et al. S5P TROPOMI NO_2 slant column retrieval: method, stability, uncertainties and comparisons with OMI. Atmos. Meas. Tech. 13, 1315–1335 (2020).

[19]. Gopinath, G. The Great Lockdown: Worst Economic Downturn Since the Great

Depression, https://blogs.imf.org/2020/04/14/the-great-lockdown-worsteconomic-downturn-since-the-great-depression/ (2020).

[20]. Evans, S. & Gabbatiss, J. Coronavirus: Tracking how the world's 'green recovery' plans aim to cut emissions, https://www.carbonbrief.org/coronavirus-trackinghow-the-worlds-green-recovery-plans-aim-to-cut-emissions (2020).

[21]. Kuzemko, C. et al. Covid-19 and the politics of sustainable energy transitions. Energy Res. Soc. Sci. 68, 101685 (2020).

[22]. Tong, D. et al. Committed emissions from existing energy infrastructure jeopardize 1.5 °C climate target. Nature 572, 373–377 (2019).

[23]. Liu, Z., Zheng, B. & Zhang, Q. New dynamics of energy use and CO_2 emissions in China. Preprint at, https://arxiv.org/abs/1811.09475 (2018).

[24]. Friedlingstein, P. et al. Global carbon budget 2019. Earth Syst. Sci. Data 11, 1783–1838 (2019).

[25]. Korsbakken, J. I., Andrew, R. & Peters, G. Guest post: Why China's CO2 emissions grew less than feared in 2019, https://www.carbonbrief.org/guestpost-why-chinas-co2-emissions-grew-less-than-feared-in-2019 (2020).

[26]. Kumar, S., Singh, K., Joshi, A., Gairola, N., Gautam, A.S., Patni, B., Panwar, M.S., 2020. A review of studies on coronavirus (covid-19) and its transmission, Journal of Science and Technological Research 2, 1–4.

[27]. Impact Assessment of Covid-19 Outbreak on Higher Education in India, Devendra Singh, Alok Sagar Gautam Babita Patni and Anil Kumar Nautiyal, International Journal of Management, 11 (09), 429-434.

[28]. Alok Sagar Gautam, Sanjeev Kumar, Sneha Gautam, Aryan Anand, Ranjit Kumar, Abhishek Joshi, Kuldeep Bauddh, Karan Singh, Pandemic induced lockdown as a boon to the Environment: trends in air pollution concentration across India, Asia-Pacific Journal of Atmospheric Sciences, https://doi.org/10.1007/s13143-021-00232-7.

[29]. Nepolian, J.V., Siingh, D., Singh, R.P., Alok Sagar Gautam, Sneha Gautam. Analysis of Positive and Negative Atmospheric Air Ions During New Particle Formation (NPF) Events over Urban City of India. Aerosol Science Engineering (2021). https://doi.org/10.1007/s41810-021-00115-4.

[30]. Sneha Gautam, Alok Sagar Gautam, Karan Singh, E.J. James, Brema J., Investigations on the relationship among lightning, aerosol concentration, and meteorological parameters with specific reference to the wet and hot humid tropical zone of the southern parts of India, Environmental Technology & Innovation, Volume 22,2021,101414,ISSN 2352-1864, https://doi.org/10.1016/j.eti.2021.10141

[31]. Sandeep Negi and Harish Chandra Josh Monojit Ray, Amit Ghati, Harshvardhan Pant "Comparison of water quality between upper and delta course of the river Ganga during winter 2021" Volume 3, Issue 2, p16-22, Journal of Science and Technological Researches, https://doi.org/10.51514/JSTR.3.2.2021.16-22.

[32]. Balram Ambade, Tapan Kumar Sankar, A.S. Panicker, Alok Sagar Gautam, Sneha Gautam, Characterization, seasonal variation, source apportionment and health risk assessment of black carbon over an urban region of East India, Urban Climate, Volume 38, 2021, 100896, ISSN 2212-0955, https://doi.org/10.1016/j.uclim.2021.100896.

[33]. Gautam, S., Samuel, C., Gautam, A.S. Strong link between coronavirus count and bad air: a case study of India. Environ Dev Sustain (2021). https://doi.org/10.1007/s10668-021-01366-4

[34]. Alok Sagar Gautam , Nishit Pathak , Taufiq Ahamad , Poonam Semwal , A. A.Bourai , A. S. Rana & O. P. Nautiyal (2021): Pandemic in India: Special reference to Covid-19 and its technological aspect, Journal of Statistics and Management Systems, https://doi.org/10.1080/09720510.2021.1879469

[35]. Balram Ambade, Tapan Kumar Sankar, Amit Kumar, Alok Sagar Gautam, Sneha Gautam COVID-19 lockdowns reduce the Black carbon and polycyclic aromatic hydrocarbons of the Asian atmosphere: source apportionment and health hazard evaluation, Environment,

Development and Sustainability, https://doi.org/10.1007/s10668-020-01167-1.

[36]. Alok Sagar Gautam, Dilwaliya, N.K., Srivastava, A. et al. Temporary reduction in air pollution due to anthropogenic activity switch-off during COVID-19 lockdown in northern parts of India. Environ Dev Sustain (2020). https://doi.org/10.1007/s10668-020-00994-6 (Impact Factor -2.6).

[37]. Srivastava, S., Kumar, A., Bauddh, K., Gautam, A. S., & Kumar, S. (2020). 21-Day Lockdown in India Dramatically Reduced Air Pollution Indices in Lucknow and New Delhi, India. Bulletin of Environmental Contamination and Toxicology, 0123456789. https://doi.org/10.1007/s00128-020-02895-w.

[38]. Deepak Shrotriya, Pramod Kumar Verma, and Rajeev Kumar Agarwal "Affection on Viruses Due to Resonance Frequency" Volume 3, Issue 1, p13-18, Journal of Science and Technological Researches, https://doi.org/10.51514/JSTR.2.4.2020.13-18.

[39]. Aarti Malhosia, Nitu Singh, Sadhna M. Singh and Ravindra Kumar Elements Influencing the Human Immune System During Any Pandemic" Volume 3, Issue 1, p09-13, Journal of Science and Technological Researches, 2021, https://doi.org/10.51514/JSTR.3.1.2021.9-13

[40]. Gautam, A.S., Joshi, A., Kumar, S., Singh, K., 2020. Short-term Impact of Weather Parameters on COVID-19 Cases in 25 States and Union Territories of India, International Journal on Emerging Technologies (Scopus Index), 11, 1–7.

[41]. Gautam Alok Sagar, Abhishek Joshi, Sanjeev Kumar, Mahesh Shinde, Karan Singh, Annpurna Nautiyal, variation of atmospheric parameters and dependent nature of covid-19 pandemic in india during the lockdown period. Journal of Critical Reviews (Scopus Index). 2020, 7(19), 2445-2453. DOI: 10.31838/jcr.07.19.297.