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Air Pollutants and Health Effects at Different Locations in Dhaka City

Brundaban Naik, K.L.Mohanta

Department of Health Science

Siksha 'O' Anusandhan (Deemed to be University), Bhubaneswar, Odisha

kamalmohanta@soa.ac.in

Abstract: Air pollution is a significant environmental concern. Over several decades air pollution in Dhaka city have risen significantly. Regarding the healthy environment, the air pollutant investigation in Dhaka and other metropolitan areas is of great importance. Air pollution and their potential health impacts in Dhaka Cities are the subject of current study. Numerous pollutants have been found to be harmful in this field of research, including volatile organic compounds (VOC, s), nitrogen oxide (NOx), relative humidity (RH), carbon monoxide (CO), , sulfure (SO2), hydrogen Sulfide (H2S) (CO2) (O2), particulate matter (PM10), suspended particulate matter (PM2.5), and lead (Pb). The VOC and CO, RH, NOx, H2S, CO2, PM10, PM2.5, SPM and Pb (p<0.01; 0.01 < p 0.05, 0.05 < p 0.1) were related statistically well. The relation with CO2 , CO, SO2 , NOx, H2S, SPM, PM10, PM2.5 and Pb has always been positive in each case. Between June 2018 to July 2019 at many places in Dhaka, these ozone pollution increased considerably. According to medical and health professionals, environmental pollutants are responsible for safety problems such as eye inflammation, diarrhea, kidney disruption to central nervous tract, cancer of the brain, respiratory diseases, diarrhy, asthma to anemia. In order to protect inhabitants against various diseases, daily monitoring of air quality criteria and essential guidance can be given for the creation of a healthy environment in urban residents of Dhaka

Keywords: Air, Dhaka, Health, Pollutants, Volatile

1. INTRODUCTION:

Pollutants are introduced into the air from their numerous origins. Acts have been developed all over the world to monitor and avoid such pollutants from hitting dangerous levels for humans. For eg, the European Commission has adopted guidelines for monitoring and rising air pollutant atmospheric concentrations. Various known approaches are used to track the levels of SO2-NOx, particulate matter (PM), plumes and ozone (O3). About 200 pollution pollutants are commonly found within a metropolitan environment. Some of these substances are particularly destructive and make it impossible to preserve a healthy and secure environment. The rates of pollution in the environment are dependent on increasing pollutant concentration. The rates in the soil with these toxins often differ in time and place around the world [1].

Ambient chemistry depends strongly on living species in the biosphere. The makeup of the earth's environment has evolved over time over human activities. Some of these improvements affect human health, crops and ecosystems. As a large part of the population, human beings have unpleasantly impacted the urban atmosphere through an growing amount of environmental toxins, such as particulates (PM) and dangerous pollution pollutants (HAPs). Smoke, smog & acid rain are present in cities and developing areas, in particular. The air pollution. The real adverse effects of people's health and the environment can be seen as, for

example, PM10 increases morbidity and mortality levels of coronary and respiratory disorders. The use to carbon monoxide will result in nausea, vomiting, dizziness, lack to consciousness and even death. Asthma and chronic respiratory illnesses improve, decrease pulmonary capacity and worsen coronary disease. Nitrogen oxides and sulfur dioxides also affect the immune systems.

Air emissions are classified on the basis of different human activities. Such emissions can be categorized as vehicle, manufacturing, household fuel and electricity. The road traffic is considered to add substantially to air emissions due to improper driving, older cars and servicing of two-stroke motor vehicles. Dhaka and the trading center of the town of Lagosisa, which has a wide number of factories. Their diesel-powered generators emit fumes and gasses of various magnitudes which add substantially to air pollution. With unplanned expansion in several major cities, including Dhaka, the development in residential and industrial sites is indiscussionably and haphazardly contributing to increased environmental threats. Trace gasses are found in the atmosphere at small concentrations, and may have significant impacts even at this point on a number of natural systems and health problems. To understand their atmospheric concentrations, lifetimes and environmental consequences, the interactions between gasses is important. A variety of other elements, including volatile Organical Compounds, react with ozone (O3), nitrogen oxides (NOx), carbon monoxide (CO) and sulfur dioxide (SO2), resulting in a change in atmosphere. In the past decade, the United States Environmental Protection Authority (US-EPA), the European Union (EC) as well as the World Health organization (WHO) have been striving for the implementation of an Atmospheric Quality Index (AQI), based on the common standards of international organisations. For instance, Khanna created an AQI focused on the loss of well-being due to ozone exposure, while Murena proposed a system for measuring air quality at each sampling site and the whole metropolitan environment. In fact, a new Air Pollution Index (API) system focussing on relative danger and that everyday mortality associated with short-term exposure to individual pollutants has been launched. A series of air quality evaluation thresholds in the medium size region and a range of bio-meteorological metrics that take account of adverse environmental impacts are compared, while in South Portugal epiphytic lichens are introduced as air quality controls [2].

Air contamination is also caused by road traffic. For instance, South-East France and the town of Dhaka are one of the most air pollution-affected regions. Dhaka City has significantly expanded its population. The harmful air emissions have been alarmingly high, frequently affecting air and water in this City. Dhaka ranks today among the largest cities in the world in terms of low urban air quality. A significant reduction in air quality in Bangladesh could save up to 3,500 lives and prevent 230 million cases of breathing diseases each year. This is statistically equivalent to savings of about $500 million per year due to reduced health costs and increased efficiency. At various locations in Dhaka's mega city, air quality criteria and their health implications for people were explored to have a safe life. Because of its large numbers of cars and one of the world's greatest population densities, Dhaka has also been viewed as highly polluted. The idea is that air emissions can be consistently minimized by tracking air quality parameters to reduce health impacts.

2. METHODOLOGY

Design:

Dhaka, with a density of 23,234 per square kilometer, is Bangladesh's densest populated area. It's simply regarded as a super city in comparison to the size in other cities all around the country. The population of this town itself is estimated at about 8.5 million. Seven places in Dhaka have measured multiple air quality parameters. The area of Dhaka city is 23 °

42'37.44"N altitudes and 90 ° 24'26.78"E longitude. It consists of West Rasulpur, Dhaka Cantonment, Savar Brick Fields, Birulia at Savar, Savar's South DEPZ, Savar's East DEPZ, Savar's North DEPZ, and Savar's West D EPZ. The video. 1 displays an area of research on a Bangladesh map and locations to determine parameters of air quality [3].

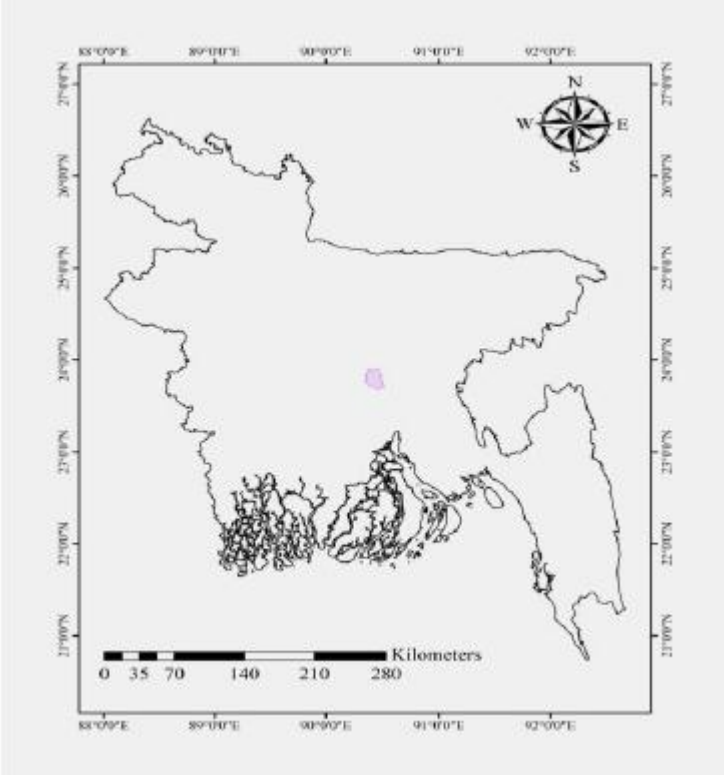

Fig.1 Study Area for the Air Quality

Sample*:*

An initiation conference was held in Dhaka at the Bangladesh Bureau of the BCSIR, which lasted three days. The meeting took place in cooperation with officials of government, citizens, visitors, healthcare employees, scientists and many others who have been living here for a long time. The conference concentrated on air pollution and its possible safety implications in Dhaka. At this meeting participants received their unique views on the nature of the air in Dhaka and its own health consequences. The meeting identified critical emission areas at several locations in Dhaka [4].

Instrument*:*

The data were collected based on the initiation meeting on the effects of contaminants on people's health in Dhaka. The data was obtained from many points in Dhaka city. Data gathered, from medical practitioners, have been reported from general public opinions. There were 18-20 people in each group. The interviewees were between the ages of 40-50 and ranged from college to middle school. All acknowledged that the environmental risks have significantly improved for more than a decade, as air quality in the urban area has declined [5].

Data collection:

Toxic gases:

A PID (NDIR), NDIR, and electrically sensing instrument (Direct Sense Advanced Environmental Instrumentation, Grae Wolf Sensing) is used to test volatile organic

compounds (VOC), carbon dioxide (CO2) , carbon monoxide (CO), oxygen (O2), relative humidity, sulfur dioxide (SO2), nitrogen oxide (NOx) and hydrogen sulfide (H2S).

Air Particles:

In accordence with ISO 12103-1 and with the gravimets followed by sampling of the filter, Casella Micro Dust Pro CEL-712 has measured the PM2.5, PM10 and SPM in real-time testing. A small volume air sampler with a minimum resolution of 0.001 mg gathered the air dust particles of previously weighted PM 2.5, PM 10 and microbial repair filter [6].

Data Analysis:

Air sampling for monitoring of Lead (Pb):

The Pb analysis was carried out on air samples according to a dust sampling package, which included filtering paper, sample head, flow meter, air sampling pump, and other tools. First air samples were obtained from the Mixed Cellulose Esters (MCE) filters using a Casella APEX air samples pump (diameter: 25 mm, pores measurements-0.8 microns). MCE membrane filters are easily soluble and one of the most often used in atomic absorption test filters. Sampling with a specifically know flow rate of 3.5 L / min to 8 h was carried out for the total sample size from 1 to 1500 L.

Laboratory analysis:

In the filter holder, the filter paper was put in a clean beaker. Added HNO3 concentrated 3 mL and H2O2 concentrated 1 mL 30 per cent and sealed in a watch bottle. On a hot plate, the sample was heated to 140oC until a volume of approximately 0.5 ml was decreased. The beaker was cooled and 5% HNO3 cleaned off the beaker's glass and walls. Quantitatively transmitted to a 10 mL volumetric flask and diluted to thickness with ultra-clean water. The sample was then put into a Graphite Furnace Atomic Absorption Spectrophotometer for the analysis of lead (Pb).

Statistical analysis:

For data validation using R Program, version 3.2.2 (R Statistical Computing Foundation, Vienna, Austria), substantial association rates of air pollutants were analyzed. Dhaka City has analysed coefficient patterns for increasing air pollutants using R version 3.2.2. [7].

3. RESULTS AND DISCUSSION

Volatile Organic Carbon (VOC):

In all the months of August 2018, statistically positive correlations were formed between VOC and carbon monoxide (CO), oxide of nitrogen (NOx), relative humidity (RH), particulates (PM10), particulate matter (PM2.5), hydrogen sulfide (H2S) and lead (Pb), at various locations in Dhaka ($p<0.01$; $0.01 < p0.05$; $0.05 < p0.1$). This VOC also has a favorable relation with the CO2 (CO2, NOx, H2S, PM10, 2.5 PB, and pb ($p<0.01$; $0.01 < p0.05$; $0,05 < p0.1$), during December 2018. This VOC was shown to be a good one of the PBOCs. [7].

Carbon dioxide (CO2):

Carbon dioxide (CO2). The moisture content in different places in Dhaka City was strongly connected throughout August 2018. The relation of CO2, SO1, NOx, H2S, Highscore, Ch4, Nitrogen dioxide & Pb was optimistic in november 2016 ($p<0.01$; $0.01 < p=0.05$; $0.05 < p<0.1$). This gasses were also correlated substantially with RH, PM2,5 and Pb in july 2018 ($0.01 < p0,05$; $0.05 < p0,1$). In Savar Mud Fields, kolkata Canton, West Rasulpur or western DEPZ, between 2019 and 2020 CO2 increased substantially ($0.01 > 0.05 < p\ 0.1$)..

Carbon monoxide (CO):

In August 2018, it was found that carbon monoxide (CO) had a favorable PM 2.5 partnership (p<0.01;0.01 < p 0.05; 0.05 · p 0.1), SO, NOx, H2S, SPM and PM10. In addition to SO2 , NOx, H2S, SPM, PM10, PM2,5 but rather Pb (P<0,01) this gas must have been highly associated during December 2018. CO in April 2019 was correlated favorable with the p<0.01; 0.01 < p0.05; 0.05 < p0.1) correlated with SO2 , NOx, Gases, nor PM2.5. During July 2018 and july, air pollution in various lahore areas along with Savar Brick Fields, Birulia, North DEPZ, Dhaka township, South DEPZ, East DEPZ, West DEPZ risen exponentially.. The capacity to transportably minimize this ambient toxic gas, which is close to the health practitioner experience, is drastically reduced.

Oxygen (O2):

In August 2018, important relationships between O2, SO2 and NOx were found (p<0.01). However, in December 2019 and April 2019, the relationship was not associated. This O2 was found to have increased from 2018 to 2019 (p<0.01; 0.01 < p 0.05; 0.05 < p 0.1) in West rasulpur, Birulia and South DEPZ. This gas's high flow causes death.

Relative Humidity (RH):

RH was marginally associated with NOx, H2S and PM10 gasses (0.05 < 0.1) in August 2018. The H2S, SPM and PM2.5 (p<0.01; 0.01 < p = 0.05) have been also associated during December 2018. This was positively associated with PM2.5 gases (0.01 < p uppercase 0.05) in April 2019. From 2018-2019, the RH increased substantially in the areas of Süd-DEPZ (p < 0.01; 0.05 < p 0.1), north and south-DEPZ and west-DPZ. The effect is an increased variation of asthma , allergies including chronic fatigue. The relatively low moisture can dry and inflame the airway mucosa and increase glucose risk and cause agitated sinuses, according the patient and government professionals.

Sulfur Dioxide (SO2):

This gas was correlated with NOx, H2S, SPM, PM10 & PM2.5 in August 2018. This gas was positive. The correlation was also high in December 2019 (p<0.01; 0.01 < p0.05; 0.05 < p 0.1). It was found that the relationship between SO2 and H2S and PM2,5 (p<0,01) was really relevant in April 2019. These gas actually increased significantly from 2018 to 2019 (P<0.01; 0.01 < p=0.05; 0,05 < p0.1). This poisonous gas often risen dramatically.

Nitrogen Oxide (NOx):

Nitric oxide (NOx) was positive for H2S, PM10 and Pb through August 2018 (p<0.01; 0.01 < p0.05). Pb (p<0.01) were also positive. The gas has also a ways by providing for H2S, SPM, PM10, PM2.5 and Pb in December 2018 (p<0.01; 0.05 < p=0.1). NOx was also found related positively to H2S and PM2.5 in April 2019 (0.01 < 0.05). In all Dhaka study locations between 2019 and 2020, this toxic gas also significantly increased (0.01 < p = 0.05). The healthcare provider claims that a lung disease may grow as a result of high rises in this atmospheric gas, which really is close to public opinion.

Hydrogen Sulfide (H2S):

The significant positive relationship of PM10, PM2.5 & Pb (p<0.01; 0.01 < p0.05) for hydrogen sulfide (H2S) in August 2018 was found. This propane also was detected of SPM, Ch4, PM2.5 and Pb on the first day of november 2016 (p < 0.0001; 0.01 < p at the current 0.05). The association between Fine particulate matter and H2S alone was significant in july 2018 (p<0.01). The DHAKA areas in Savar Brick Fields, West Rasulpur, Birulia, DEPZ North and DEPZ South have increased significantly since 2018-2019 (p<0.01; 0.01 < p 0.05; 0.05 > p0.1). The gas produces bad odour in these communities, as well as nausea, breathing difficulties and serious infection.

Particulate Matter and lead (Pb):

The concentration of suspended Material (SPM) was strongly linked with the PM2.5; the PM10 had the positive PM2.5 and Pb correlation ($p<0.01$; $0.01 = p=0.05$; $0.05 < p=0.1$). SPM now has critical relationship with PM10, PM2.5 and Pb. The PM10 and PM2.5 and Pb ($p<0.01$; $0.01 < p$ 0.05) were also strongly related. Pollutants and Pb have both greatly increased from 2018 to 2019 in different Dhaka locations. Public health and practitioners record a results indicate that high of PM and Pb in the atmosphere caused by bronchitis, chronic cough, respiratory infections, asthma, anemia, and skin cancer.

Air pollution poses a significant environmental danger to health worldwide. Deferent air contaminants including, VOC, PM2.5 H2S, O2, CO, Pb PM10,NOx,, SPM, CO2, , SO2, and are significantly associated. All of these in atmosphere are positively correlated with each other. Most of these air quality parameters at various locations in Dhaka have been substantially increased. In the same way, the increasing population growth and unplanned construction led air pollution to grow for several years in developed and emerging countries. More than two million deaths a year were recorded annually by the World Health Organization in developing countries with various respiratory disorders. About 70–80% of megacities are estimated due to pollution from cars caused by a growing number of aging cars and insufficient road safety, weak road networks and low fuel efficiency [8].

Growth in Dhaka has increased in recent decades. In these areas air pollutant parameters have been escalated due to unplanned urbanization. Similarly, 20 environmental hot spots were focused on in 20 European cities . As a result of rising traffic, ozone pollution exceeded environmental concentrations. In comparison, in 92 percent of AIQAs reported to be 33 percent NOx and 21 percent PM10, motorized road travel in the UK was considered one of the main single emission sources. In Dhaka as well as in the mega towns of Los Angeles , New York and Mexico City, NOx and PM10 have also risen considerably. NOx and PM 10 are both substantially expanding. Road transport in New South Wales (NSW) Australia is the main producer of NOx emissions, accounting for over 71% of total pollution.

Many developing countries in the Asian subcontinent, such as Singapore, Japan and Hong Kong, face problems of air pollution at street level due to a rise in motorized transport. The accelerated urbanization in developing countries means that mega-cities face serious problems due to rising concentrations in ozone PM and NO2. The amounts of atmospheric PM and NO2 are usually in excess of WHO norms in Bangkok, New Delhi, Mumbai [9].

Chan but instead Yao suggested that even in the Chinese large cities of Shanghai and Pearl River Delta levels in the atmosphere of PM10 and SO2 are 4-6 times higher than in any developed world. A recent study has shown that the average yearly dose of PM10 is three times greater in Asian cities than the WHO recommends. At different locations in Dhaka compared to other cities around the world, air pollution has increased considerably.

Air pollution pose a significant public safety concern. Specific environmental risks are discussed by the pollution contaminants, such as SO2, VOC, CO, CO2 and NOx, PM10, PM 2.5, SPM, H2S, and Pb. Yelda and Mustafa note that ambient and human health adverse effects can include airborne sulfur dioxide (SO2), particulate matter (PM) and nitrogen oexides (NOx). The contamination of the environment is the product of people's lives. Such emissions have a harmful impact on the health of terrestrial natural systems. A number of African cities are now recognized as having unacceptable pollutant levels which harm air quality. It had been observed to reside in areas where pollution met air quality requirements up to 1980. 1.3 billion people. According to the World Health Organization, nearly 98 per cent of cities with a population of over 100,000 in low and middle income countries do not satisfy the required air quality requirements. Dhaka is also included in towns that affect people negatively. Nevertheless, this proportion falls to 56 percent in high-income economies [10].

Its structure, reaction properties, reaction, time of decay and diffusion patterns varied across air contaminants, such as carbon monoxide (CO), SO2- and NOx- (VOC) compounds, ozone(O3), heavy metals, to particulates (PM 2,5 and PM10). Their structure was strongly distinguished between the two types of substances. These air pollutants have patients with severe effects on humans and damage various processes and internal organs. A similar result was also reported by talking to a doctor and public understanding of this study in Dhaka [11].

Usually, urban people are exposed to contaminants in the soil by their everyday practices. In urban areas, human activities typically cause air emissions to increase. During this case the risk of cancer or any other serious health consequences may be raised for individuals exposed to prolonged levels and durations of toxic environmental pollutants. These health risks may also include immune disruptions and neurological, hormonal, behavioral, respiratory and many other conditions of health. Not only humans, but also poisonous compounds, such as plumage (Pb), accumulated by plants and animals and ultimately magnified in soil or surface water via the food chain. Like humans, if animals are exposed over time to significant quantities of environmental contaminants, they may also have health problems. Similarly, it is unlikely that air emissions levels will be significantly short-term. However, higher rates and/or long-term that use air pollution will lead to more serious negative effects and circumstances on population health. It induces coughing & swelling mainly, and could lead to serious diseases like heart disease and cancer. The consequences of air pollution can be more harmful to just the lungs and heart conditions. Air pollution has encountered a variety of health issues in the town of Dhaka, given their serious repercussions. The message is that urban people are worried about air pollution and also the influence that would have on the environment. [11].

4. CAUSES OF AIR POLLUTION IN DHAKA CITY

The addition to soil of poisonous compounds that are detrimental to the atmosphere and humans is chemical pollution. That happens when chemicals toxic to humans are found in the air, including foreign gases, odours, powders, or smoke. Dhaka has been found to have different sources of air pollution.

Population density:

With an annual population of more than 8 million, Dhaka has become one of the largest state cities. The city of Dhaka was an acute air pollution epidemic. Population and emissions in various areas are closely related. A European city of 1 million is, for obvious reasons, six times more vulnerable to emissions of nitrogen dioxide than a city of 1 million people in India. A wide variety of surface concentrations of nitrogen dioxide occurred in urban areas for limited areas of around 1 million people. Europe ranks over 1.3 per billion, although India ranks over 1 million towns have ranked just over 0.2 per billion in population [12].

Unplanned industrialization and urbanization:

An growing situation in the city of Dhaka is the unplanned urbanization and industrialization. This town spreads into its suburbs but without damage to the city being noted. In Dhaka the air pollution is also one of the major factors. High levels of smoke, particulates, sulfur dioxide , carbon monoxide and organic compounds are released into the atmosphere at the rising pace of rapid industrialization in Dhaka, City. The atmosphere in Dhaka is becoming highly toxic. Throughout the city of Dhaka, soil profile concentrations were found. In its recent pollution monitoring report, Bangladesh has been the fourth of the 91 countries of the worst urbanisation. About 90% including its residents in these municipalities are subjected to toxic air pollution. Unforeseen industrialization and construction can be considered as causes of increased air pollution in Dhaka [11].

Traffic pressure:

Most motor cars are closing highways and leading to bad air quality. Beyond the vast number of vehicles, a persistent Colliding between public transportation and motocyclists like rickshaws also leads to a long-term stoppage, which affects the environment and health as well as considerable economic damage due to loss of time. Those Dhaka groups had quite a bad traffic-pressure system. The daily average NOx, HC, CO, PM and SOx emissions are calculated by the daily fuel usage. of traffic. Estimates are 42, 39, 314, 14 and 42 tons of total average NOx, HC, CO, PM and SOx emissions [12].

Climate changes:

Climate-related ambient heating in many areas has the potential to raise ozone levels in soil that may pose problems for possible ozone application. Climate change can contribute to releases of pollution into the air. Atmospheric ozone warms the air, while the actual components of particulate matter (PM) will either warm the air or refrigerate. For example, black carbon, a particles in the air contaminant in oxidation, will warm Earth by cooling the climate of the globe with particulate surfactants. For many decades , air quality in Dhaka has increased because the atmosphere has changed [13].

5. CONCLUSION

Air pollutants rise in Bangladesh's Mega City of Dhaka. This is a terrible threat to a sustainable human life in this city. When poisonous air pollution has increased, people have suffered from many diseases. Air contaminants in Dhaka are growing dramatically as air contaminants, including Cig, CO2, Nitrogen , Oxygen, Sulfur (SO2), H2C (Hydrogen Sulphide), Oxide (NOx), Suspendable particulate matter (PMM10), mercury vapors (PMM) and Volatile Organic Carbon (Cig), H2C (CO) (PM2.5). With rising levels beyond each pollutant 's usual limits, a number of health issues have arisen among the residents of the area. This has since contributed to a rise in death rates. Research into parameters of air quality and their effect on human health is therefore of utmost importance. The analysis of air quality parameters on a regular basis and the discovery of their effect on a healthy environment are required to provide normative recommendations for improving urbanization in relation to sustainable living.

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