

Should Clean Air be a Fundamental Right?



Photo: AIDMI.

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ABOUT THIS ISSUE

Disasters often invoke the imagery of cataclysmic events that lead to widespread death, destruction and human distress. However, there are few risks that creep up insidiously to cause massive loss of life and damage in the long run across a wide geography. Air pollution is one such risk. Rising levels of ambient air pollution in India has become a rallying point for policy makers, academics, healthcare professionals and civil society actors. According to research by the Indian State Level Disease Burden Initiative, close to 1.2 million people lost their lives due to air pollution in the previous year. This study further highlights that one out of every seven deaths in India was attributable to air pollution, and air pollution lowered Indian life expectancy by 1.7 years. All of this evidence points to the fact that air pollution is a major disaster risk in urban India.

This issue of Southasiadisasters.net is titled 'Should Clean Air be a Fundamental Right?' and highlights how India's deteriorating air quality has now assumed catastrophic proportions. This issue draws from the discussions and deliberations of a workshop called 'Tackling the Challenges of Air Pollution' held in Delhi in March 2019. Some of the key themes discussed in this issue include air quality and risk management; sources of air pollution in India and Asia; communication outreach campaigns for improving awareness on air pollution; the role of local governments in improving air quality among others. ■

- Kshitij Gupta

INTRODUCTION

Disaster Risk Reduction and Air Pollution



Mihir R. Bhatt interacting with the audience during the session.

According to the latest figures from the World Health Organization (WHO), ambient air pollution is a major cause of death and disease globally. The health effects range from increased hospital admissions and emergency room visits, to increased risk of premature death. An estimated 4.2 million premature deaths globally are linked to ambient air pollution, mainly from heart disease, stroke, chronic obstructive pulmonary disease, lung cancer, and acute respiratory infections in children.¹

A workshop titled "Challenges of Urban Air Pollution: Linking Research and Policy for Air Quality Improvement" was held in Delhi on March 6-7, 2019. Jointly organized by the University of Birmingham (UoB) and the Indian Institute of Technology (IIT) Delhi, this workshop brought together stakeholders from government, academia and civil society from all over the world to deliberate on the important theme of air pollution.

In this workshop, a session was held on the topic of Disaster Risk Reduction and Air Pollution. Mihir R. Bhatt, the Director of the All India Disaster Mitigation Institute (AIDMI) chaired this session. The panelists included G. Padmanabhan (former emergency analyst with UNDP), Mahesh Rajasekar (National Institute of Urban Affairs) and Prof. Francis Pope (University of Birmingham). Mr. Bhatt set the tone of the session by stating that air pollution fits the classic description of a slow onset disaster and it has multiple ramifications for cities, urban resilience and disaster risk reduction. Most importantly, air pollution is the inevitable concomitant of the development trajectory that economies have charted in the 21st century.

G. Padmanabhan spoke from his vast experience of policy making in the DRR realm in India and beyond. He commented that ambient air pollution has not been flagged as a hazard in the Sendai Framework for Disaster Risk Reduction (SDFRR),

¹ <https://www.who.int/airpollution/ambient/health-impacts/en/>

the global instrument guiding the actions of nations and communities on DRR. This is because of the 'siloe'd' working style of the international community to address challenges in Disaster Risk Reduction. Air pollution represents a classic 'tragedy of the commons' problem, however, given the multiple sources of air pollution and its widespread impacts on human health, equity and overall well-being, it must be considered a disaster. Mr. Padmanabhan opined that a strong economic case for mitigating the impacts of air pollution should also be made. He stated that while traditional disaster losses in India account for US\$ 10 billion per annum, losses from air pollution are as high as US \$ 150 billion per annum.

Mahesh Rajasekar took a more city-centric approach to tackling air pollution. He said that urban India seriously lacked the capacity to address the challenge of air pollution. While there are reactions from the government in the form of the odd-even rule in Delhi, in reality India's cities lack long-term enforcement capabilities to enforce emissions from vehicles and burning of fuel wood. While

everyone has been fixating on ambient air quality, the issue of indoor air pollution is of equal concern where little research and information is made available to the public at large, therefore this issue should also be raised. Similarly, there are behavioral aspects to air pollution such as nudging the people to adopt public transport instead of private vehicles. He also talked about the importance of modulating the Smart Cities Mission in India to include Clean Air as an overarching goal. He also discussed, the importance of ranking cities based on progressive indicators including air pollution which are currently being considered by the Ministry within their Climate Smart Cities initiatives.

Prof. Francis Pope spoke at length on how the seemingly insurmountable challenge of air pollution in India could be addressed by taking examples from other places across the world. He cited the example of the Great London Smog of the 1950s and the condition of Beijing some years back. Both the places have successfully addressed the threat of air pollution. He also insisted that any research on the theme of air pollution must

necessarily focus on actionable points.

After this stimulating discussion, Mihir R. Bhatt the chair of the session thanked all the panel members and presented the key points of the discussion:

- a) Climate change and air quality needs to be conceptualized together in India.
- b) Air pollution is indeed the next big disaster in India. The health data along with the impact on overall economy provide incontrovertible evidence of the same.
- c) It is imperative to embed air pollution mitigation measures in overall disaster risk reduction strategy.
- d) The benefits of tackling air pollution as a disaster should be made widely public to all concerned actors.

The session ended with an overwhelming response from the audience who indeed saw air pollution as the next big urban disaster in India. ■

- **Francis Pope**, University of Birmingham; **Mihir R. Bhatt**, AIDMI; **G. Padmanabhan**, Former UNDP; and **Mahesh Rajasekar**, National Institute of Urban Affairs

AIR QUALITY AND RISK

Managing Disaster Risk and Air Quality

According to the latest figures from the World Health Organization (WHO), ambient air pollution is a major cause of death and disease globally. The health effects range from increased hospital admissions and emergency room visits, to increased risk of premature death. An estimated 4.2 million premature deaths globally are linked to ambient air pollution, mainly from heart disease, stroke,

¹ <https://www.who.int/airpollution/ambient/health-impacts/en/>

chronic obstructive pulmonary disease, lung cancer, and acute respiratory infections in children.¹

On 6-7 March 2019, the University of Birmingham (UoB) and the Indian Institute of Technology (IIT) Delhi jointly organized a workshop titled, "Challenges of Urban Air Pollution: Linking Research and Policy for Air Quality Improvement". This workshop brought together stakeholders from government, academia and civil society from all

over the world to deliberate on the important theme of air pollution.

In this workshop, a session was held on the topic of Managing Disaster Risk and Air Quality. Mihir R. Bhatt, the Director of the All India Disaster Mitigation Institute (AIDMI) chaired this session. The panelists included G. Padmanabhan (former emergency analyst with UNDP), Prabodh Dhar Chakrabarti (former Executive Director NIDM) and Ray Kancharla (Save the Children). Mr. Bhatt



Panel members interacting with the audience.

opened this session by taking stock of the rich discussions that had taken place in this workshop during the course of the past two days. He reminded the audience that it has been unequivocally endorsed by all the delegates that air pollution is indeed a disaster risk. He then invited all the panelists to make their comments about the topic.

Prabodh Dhar Chakrabarti, former Executive Director of National Institute of Disaster Management (NIDM) was the first speaker to engage with the audience. He commented that although air pollution is not an explicitly accepted as a disaster in global and national frameworks, policies and plans of disaster management. mounting evidences of loss of lives, livelihoods and economy due to air pollution make it imperative that reduction of air pollution becomes part of overall risk management strategies, particularly of the cities. While preventing air pollution arising out of chemical and industrial disasters is already part of disaster risk management plans, more sustained research is necessary to establish the causality of disaster deaths and losses due to emissions from vehicles or particle materials in air. Several cities, such as Ahmadabad and Delhi have contingency plans for air pollution.

There is need to integrate such plans with overall city resilience plans in collaboration with all stakeholders.

Ray Kancharla from Save the Children was the next speaker. He spoke about the importance of engaging children in air pollution sensitization. He confessed that he has hitherto not focused on the theme of air pollution during his work with children but will do so from now on. He said that India has the highest number of children in the world. Given the devastating impacts of air pollution on these children, it is important to plan interventions that can mitigate these detrimental impacts. He exhorted the scientists who work on the theme of air pollution to transform the "research into practice" so that real progress could be achieved. It is important to include this into the school curriculum and enhance its integration into comprehensive school safety approach through enabling children and youth as agents of change in improving their "home-to-school" environment. By adopting these measures, and documenting the good practices on air pollution work with children, a body of verifiable and validated knowledge will be spawned that can help newer actors to scale up the work.

G. Padmanabhan, former emergency analyst with UNDP India opined that the scope of disasters has been expanding in India. He cited the example of heatwaves which were till recently not considered a disaster in India. Similarly, he opined that given the dismal data that we have on air pollution impact on human health and economy, it is time to officially recognize the need to develop data systems not just to monitor the levels but to mitigate this disaster risk. In terms of managing this disaster risk, he stated that more research on the sources of air pollution is needed. The monitoring systems on air pollution and impact of mitigation actions should be robust. It is also important to develop the capacities of local stakeholders, including elected members of local bodies.

Mihir R. Bhatt summed up the entire discussion by remarking that if we don't do anything substantial soon enough, then clean air may become merchandized. He said that just like eternal vigilance is the price of democracy, similarly eternal alertness to air pollution will be the price of the health of our future generations. ■

- G. Padmanabhan, Former UNDP;
Mihir R. Bhatt, AIDMI; Ray
Kancharla, Save the Children; and
Prabodh Dhar Chakrabarti, Former
Executive Director, NIDM

Promoting Clean Air Campaign in Indian Cities: Learning from AIR Plan and Future Plans

Air pollution is one of the highest-ranking environmental health challenges in the world, especially in developing countries like India. As per the World Health Organization's (WHO) 2014 urban air quality assessment, 13 of the top 20 most polluted cities for the worst fine particulate air pollution, are located in India.¹ In India, data collected by the Central Pollution Control Board (CPCB) in 2010 showed that 82% of 360 monitored sites across India exceed national air quality standards for particulate matter². High levels of pollution are taking a toll on public health in India. Air pollution contributes to shorter lives and sicker lives through increased rates of respiratory disease, chronic obstructive pulmonary disorder, and lung

cancer, disproportionately impacting on the most vulnerable. Thus, air pollution acts as a catalyst for rising healthcare costs, placing an ever-increasing stress on an already under-funded and ill-equipped health system.

In an effort to protect local communities from rising air pollution levels, the Indian Institute of Public Health Gandhinagar (IIPHG) and Natural Resources Defense Council (NRDC) partnered with the Ahmedabad Municipal Corporation (AMC) to launch two key tools in May 2017: an air quality index (AQI), and a city-level Air Information & Response (AIR) Plan³. The Ahmedabad AQI was developed by experts from the System for Air Quality and Weather Forecasting

and Research (SAFAR) program of the Indian Institute of Tropical Meteorology (IITM) in the Ministry of Earth Sciences. The SAFAR AQI provides regular information about air quality from 8 continuous monitoring stations across the city of Ahmedabad and produces a daily colour-coded AQI, which is accessible to citizens through 11 LED screens across the city and via a free SAFAR mobile phone application.

The Ahmedabad AIR Plan is a health-based program designed to protect residents from dangerous exposures to air pollution. With the AQI as the centre point, the Ahmedabad AIR Plan focuses on health risk communication with immediate and longer-term actions to increase preparedness,



Honourable Mayor of Ahmedabad Municipal Corporation Smt. Bijalben Patel launched Ahmedabad AIR plan and IEC materials in Gujarati and English. December 5-6, 2018, Ahmedabad.

information-sharing, and response coordination to reduce the health impacts of air pollution on vulnerable populations.

Furthermore, the AMC launched an innovative School Flag program in June 2017 focused on disseminating information on air quality and health to children in schools, who are especially vulnerable to the harmful effects of air pollution exposure. The "school flag program" in Ahmedabad aimed to protect children by increasing awareness on air pollution levels, related health impacts, and preventative steps. IIPHG and NRDC with AMC have also created pamphlets, hoardings, videos, and SMS campaigns to alert the public about air pollution-related health risks.

Nevertheless, based on discussions with the AMC and the Gujarat Pollution Control Board (GPCB), NRDC and IIPH-G worked to build a coalition of premier institution across Ahmedabad and Gandhinagar. The interdisciplinary expertise of the expert group was paramount to tackle the complex challenge of air pollution. Its inclusion of diverse voices (from public health, law, urban planning, disaster planning, clean energy, local and state government, and communications) helps to inform concrete measures that the city can take through strengthened interagency coordination and enhanced navigation of the policy landscape.

The Ahmedabad AIR Plan is the first of its kind in India, which was developed by the AMC with input from national and international experts and best practices from leading cities such as Beijing, Los Angeles, Mexico City, and New Delhi on their operation of effective AQI systems. The lessons learned from the development of the AIR Plan can serve as a template for other cities aiming to address the heavy burden of air pollution on public health. ■

- Priya Dutta, Shyam Pingle, Pankaj Yadav, Dileep Mavalankar, Indian Institute of Public Health, Gandhinagar; Vijay Limaye, Kim Knowlton, Anjali Jaiswal, Natural Resources Defense Council

1 World Health Organization, 2014. World Health Organization global health observatory data repository. 2015-05.

2 Central Pollution Control Board, "National Ambient Air Quality Status & Trends in India - 2010," 2012.

3 Limaye, Vijay, Kim Knowlton, Sayantan Sarkar, Partha Ganguly, Shyam Pingle, Priya Dutta et al. "Development of Ahmedabad's Air Information and Response (AIR) Plan to Protect Public Health." International journal of environmental research and public health 15, no. 7 (2018): 1460.

COMMUNICATING RISK OF AIR POLLUTION

Indian Cities on a Clean Air Mission

Only a simple thought in the 1970s - "We do not inherit the Earth from our ancestors; we borrow it from our children" has been personified today with Greta Thunberg, a passionate sixteen year old Swedish climate activist. Addressing the World Economic Forum in Davos she told the world leaders - "I don't want you to be hopeful, I want you to panic. I want you to feel the fear I feel every day and then I want you to act."

She inspired millions of students worldwide to step up and press for global action on climate change. The question arises though: Do we need the next generation to actually/ linguistically complain of our follies which we knew all along our lives?



Bollywood actor Hritik Roshan on the streets of Shimla.

A screenshot here from real-time air quality mapping website www.aqicn.org shows the current national position on air quality.

However, here are three cities of the country I believe which have made conscious efforts to clean the air of their cities.

DELHI - Yes, the immensely polluted Delhi! It is no wonder that among the sloganeering, tangible efforts have just been ignored. One such phenomenal concept introduced in the national capital is the WAYU (Wind Augmentation and Air Purifying Units) machine. Launched in September 2018, these machines developed by IIT-Mumbai and National Environmental Engineering Institute soak in the lethal PM 2.5 and PM10 from the air. The machine filterable particles have diameters in microns (10^{-6} meters). These can easily enter the human lungs and increase the risk of chronic respiratory diseases and in certain cases, even cancer. Capable of

purifying air in an area of 500 sqm this machine consumes only half a unit of electricity for 10 hours of operation at the maintenance cost of Rs. 1500/- per month.

SONEPAT, HARYANA - Kriya Labs, a start-up incubated at IIT-Delhi has evolved a mechanism to convert crop residue into a profitable trade. The residue is intensely purified and converted into tableware like plates, spoons and bowls. These products are eco-friendly and even cheaper than its plastic counterparts. The start-up compensates these farmers with Rs. 4000-Rs. 5000 per acre (which includes transportation charges) whereas the actual cost of stubble collection to the farmers is Rs. 2000-Rs. 2500.

The organisation plans to campaign ahead to decentralise operations and involve more entrepreneurs in. Such innovations must be supported by us to restore the air quality of our cities.

SHIMLA and DALHOUSIE - The Mall Roads of these two hill stations specifically have their own poetic charm. As a rule, apart from Mail Vans, Ambulance, fire services department vehicle and waste-collection vehicle of Municipal Corporation - no other official/personal/commercial vehicles are permitted. Visiting dignitaries also abide by the rule and walk the stretch as requested.

Towns and cities suffering from poor air quality must designate one such stretch in their vicinity. This would not only help in restoring pollution levels to some extent but also promote social relations in society.

More than these measures, participatory citizenship is the need of the hour. Information today is at our fingertips. All we are missing is the will to initiate.

Let us not go back to our smoke-emitting cars and trucks but pledge to raise the demand for e-vehicles, prefer a cycle over a taxi or at least carpool our way to work daily. Let us contribute in our own novel ways to save the planet or prepare ourselves to pay an obligatory 'carbon-tax' in the future.

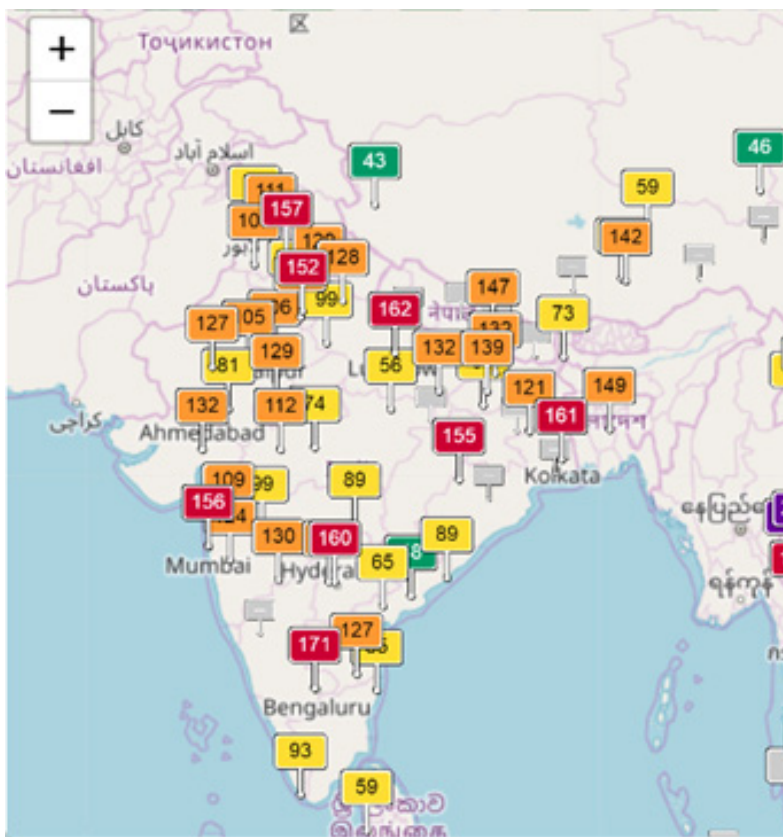
You know the odds, what would you go for? ■

- Arindam Upmanyu,

SLS'15, Pandit Deendayal Petroleum University, Gandhinagar, Gujarat, India

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Transportation and Air Pollution



Photo credit: Sandesh Bhandare.

India is battling with what could soon turn into a national public health emergency – the air pollution crisis. Cities across the country show the air quality index from poor to severe, putting citizens at the risk of serious health impacts, physical and mental. The National Clean Air Program (NCAP) which has been launched by the government in January 2019 to reduce pollution levels recognizes transportation (due to vehicular emissions) as one of the major sources of air pollution. Vehicular pollution is unique from other kinds of pollution because its impact is linked directly with exposure, and not to the ambient air quality. Roads are the main corridors of exposure and whoever are on these corridors for longer periods, are the ones most likely to be impacted. Autorickshaw drivers, traffic police, hawkers, etc. are high exposure victims. Senior citizens and children are also more susceptible due to deteriorating, and immature immune systems respectively.

The NCAP has prescribed ambitious action plans to address the transportation pollution like adoption of BS-VI (Bharat Stage) norms to regulate and reduce the output of air pollutants from motor vehicles, stringent implementation

of the National Biofuel policy for producing cleaner fuels, launching e-mobility related schemes to provide an impetus to making e-vehicles more feasible, amongst others.

Despite that, the Avoid-Shift-Improve (ASI), a much talked about approach in the discourse of sustainable urban transportation is underapplied by the NCAP. Although there are considerable measures which fall under 'Improve' category, there is either only a passing mention, or a clear gap in stating action points under the Avoid and Shift categories.

'Avoid' refers to avoid the need to travel and if undertaken, to reduce the length of the trip. Policies that will disincentivize private vehicle trips on the road need to be adopted. Higher parking charges, environment cess on polluting vehicles (especially diesel) and integrated land use and transport planning are all elements of the 'avoid' strategies. Mixed land use planning that allows people to access work, recreation and education by shorter walk/cycle trips (non-polluting) is desirable. Recently policies such as Transit Oriented Development (TOD) which encourage dense development centred around

mass transit stations (such as within 500 metres of a Metro Station) so that more people will use these non-polluting modes are emerging.

'Shift' refers to moving from private motor vehicles (cars) to alternative modes like non-motorised transport like cycling and walking and Public Transport, which although generates emissions, the higher occupancy levels mean that the per passenger-km emissions are lower compared to cars.

'Improve' component aims to optimize fuel efficiency and vehicle technology to minimize tailpipe emissions. Yet, owing to the sheer increase in number and usage of cars and two-wheelers, these gains will be nullified quickly.

Instead, developing a robust, affordable and efficient public transport would go a long way in curbing pollution and improving air quality. Rendering cycling and walking safe and enjoyable by providing clean, properly demarcated footpaths and cycling tracks, many citizens would shift to these modes, contributing largely to reducing air pollution. Currently, the policies seem to emphasise on more and more infrastructural investments for wider roads and flyovers catering to the needs of private vehicles, which in turn lead to more congestion and more emissions.

It may be worthy to note that while the air pollution crisis is caused by many factors, the huge increase in the number of vehicles is a significant contributor. Hence, while improving public transport and non-polluting modes such as walking and cycling, curbing the use of cars and two-wheelers through various means becomes inevitable. ■

– **Sharmila Deo**, Parisar, Pune, Maharashtra, India

Smart Communication Makes Cities Safer

Two interrelated trends have become conspicuous in the 21st century. The first is urbanization at an unprecedented pace, and the second, the increasing number of natural and man-made disasters and the people getting affected by them. Cities face the risk of *natural* disasters such as floods, fires, earthquakes, tsunamis, heat waves, etc. and man-made disasters such as terrorist attacks, pollution, security, groundwater contamination, structure failures, traffic congestion, and disasters resulting from climate change.

Smart Cities Mission mandates future proofing our cities and minimising vulnerability against disasters. We do it in three different ways: a) Urban planning & development, and design interventions for safer communities, b) creation of resilient urban infrastructure networks using cutting edge, international best practices. (e.g. storm water drainage, waste water re-use, use of technologies for energy efficiency, solar rooftop), and to integrate the above two we have: c) smart



solutions using technology for effective monitoring and management of city functions.

Smart Cities Mission has harnessed the advances in technology to improve our options to address vulnerability against disasters. Our Integrated Command and Control Centres (ICCCs) bring these smart solutions at one place in the cities to ensure effective coordination, planning and decision-making. They capture the ethos of the Mission-making our cities more liveable and safer than ever before! As a result, our Smart Cities now have much greater availability of risks related data, hardware to capture it, and a whole ecosystem of making sense of this data and communicating with citizens in so many different ways.

So far we have 16 ICCCs already operational with work under progress in 44 others and 16 are under tendering.

Communication, the cornerstone of citizens' protection against disasters, is a key ingredient taken into account through every stage of risk assessment in the Mission cities. The communication between citizens and governing agencies is planned as both preventive and dispersive in nature. Preventive communication such as early warning systems in-cases of floods and earthquakes; weather forecasting systems to predict storms, heat waves, cold-waves, drought, rainfall; etc. save

Smart Cities: Clean Air and Pollution

Smart Cities Mission has a strong focus on environmental sustainability, clean air and reducing pollution. As a result, the Mission promotes the use of clean technologies, renewable materials and clean energy sources. The cities have implemented multiple projects on solar rooftop, energy efficient green buildings, green transport and wind energy projects along with other initiatives to keep their air clean and reduce pollution + health hazards.

Jaipur, Visakhapatnam, Pune and Surat have implemented solar projects producing about 5 MW of solar energy and resulting in reduction of carbon emissions by about 13,500 tons per annum. Ahmedabad Smart City has set up wind power projects of 8.4 MW capacity resulting in reduction of about 8300 tons CO₂ per annum. Currently, 15 e-vehicle projects worth Rs. 123 crores have been initiated by the smart cities across India. Public Bike Sharing (PBS) projects, construction of dedicated cycle track projects have been implemented to encourage the citizens to opt for cycles as mode of transport instead of using motorized vehicles. The smart cities have successfully redesigned 84.2 km of streets with enhanced pedestrian facilities, cycle tracks and are in the process of re-designing another 352.4 km of streets. Under Smart Cities Mission additional green open spaces are being created/redeveloped, Indore has redeveloped 26,072 sq.m as green open spaces under Kahn-Saraswati Riverfront development project. The smart cities have also introduced various waste-to-energy (WTE) programmes for solid waste management. These are just to name a few.

All these initiatives contribute to keeping the air clean and reducing pollution at a fundamental level, but in the long run they contribute to sustainability and resilience of cities against climate change related extreme events and disaster situations.



lives. Dispersive communication through PA systems, variable message boards, mobile apps, etc. including preventive and safety measures, aid-drops, information on hospitals—ensures readiness in-case of any eventuality.

ICCCs ensure effective communication among the different departments of the city and ensure real-time monitoring (*monitoring of traffic congestion, security threat, public disturbances, water logging, fires, etc.*) and disbursement of information on remedial measures to mitigate the same. ICCCs aim at preventive approaches based on forecasts, historic data, predictive analysis, etc. rather than reactive approach where possible.

Smart cities have invested on improved surveillance, video analytics solution, predictive analysis to detect security issues, and emergency response systems to gain additional efficiencies and improve collaboration across agencies from a centralized command centre.

The 16 operational ICCCs are in the following cities: Ahmedabad, Allahabad, Atal Nagar (Naya Raipur), Bhopal, Bhubaneswar, Kakinada, Jabalpur, Nagpur, Pune, Raipur, Surat, Ujjain, Vadodara, Visakhapatnam, and Varanasi.

Most Smart Cities such as Ahmedabad, Bhubaneswar, Surat, have features that address disaster risk management. Coastal cities such as Bhubaneswar, Visakhapatnam, and Surat have identified city specific strategies to address the disaster risks.

All of them have features that help improve communication within the governing agencies as well as between citizens and governing agencies. For example, Visakhapatnam ICCC has 50 Public Address Systems and 10 Variable Messaging Display Boards, which disseminate information during emergency or peaceful situations. There are emergency-boxes and citizen mobile apps for SOS and panic button to enable citizens to report emergencies. 50 environmental sensors continuously track temperature, humidity and pollutants and help publish AQI level and pollution warning with the pollutant details.

In Prayagraj (Allahabad) pedestrian traffic (around 3.64 crore people) from railway station to the bathing site was monitored using 1050 cameras on the Holy day of Mauni Amavasya on 4th February 2019, as a result no major incident was reported. Emergency calls received

regarding lost and found incidents were transmitted to police/other stakeholders with relevant data in less than 5 minutes. The Kumbh Mela helpline number 1920 played a major role in receiving and resolving more than 1.75 lakh queries of pilgrims and visitors. It was for the first time, that technology was deployed at a large scale for effective management of the Kumbh.

This is only the beginning—when complete, this network of 100 cities will be more than the sum of its parts. The Mission is setting a new paradigm for rest of the country to follow—as to how communication in future would take place within the cities in the times of disasters as well as in peace. Smart cities are built with the gospel of "Citizen at the core". As we move forward, I have firm belief that all our cities will be able to provide more liveable and safer conditions to all sections of the society including the vulnerable, homeless, elderly, children and people with disabilities. ■

– **Kunal Kumar (IAS)**, Mission Director (Smart Cities), and Joint Secretary, Ministry of Housing and Urban Affairs, Government of India

Clean Air Challenges in Nepal

Over the past decade, Nepal has steadily and progressively moved towards democracy. After the prolonged insurgency period and restoration of democracy in the nation, the proliferation of infrastructure activities like the construction of roads, bridges and industry has started on a large scale. While these new developments have bolstered Nepal's economy and have put it on a trajectory of prosperity, little attention has been paid to the country's environmental issues. Worsening ambient air quality is one such problem that requires immediate attention in Nepal.



Photo courtesy: <https://thehimalayantimes.com/kathmandu/unabating-air-pollution-city-endangers-public-health/>

The emission released from the industrial units, dust from the congested road system, open burning of the solid waste along with the congested traffic system and swift increase in the number of vehicles have largely expanded both indoor and outdoor pollution in Nepal. In 2018, World Economic Forum ranked Nepal's air quality 176th out of 180 countries (EPI, 2018) and in Asia; Kathmandu is ranked one of the most polluted cities¹.

The country has listed vehicular emission as one of the major factors for deteriorating air quality of the nation particularly in the valley. Looking into the statistics, in Nepal vehicles have dramatically increased in the last 15 years particularly in the towns. In Kathmandu, capital city of Nepal, numbers of registered vehicles were 24,003 which reached to 779,822 in 2015/16 (Saud and Paudel, 2018). This increment in vehicle quantity by nearly 32 times poses a substantial threat to Nepal's air. Along with this, the use of sub-

standard or adulterated fuel, narrow and poorly maintained streets, poor traffic management, old vehicles and poorly maintained vehicles have even escalated the problem in recent years.

The sources of air pollution in Nepal are diverse. Nepal is bestowed with the wide range of geographical gifts in the form of mountains, hills, valleys to plain land. These pristine beauties of nature have promoted the tourism in country but at the same time they have also made it challenging to understand the dynamics of air pollution in country. The level of pollution in a valley like Kathmandu could be different than the pollution in upper Himalayas and hills. Realizing such a problem, Government of Nepal has established some air quality monitoring stations, air quality standards and guidelines.

But these stations are not sufficient because they are limited only to a

few places of the country and only centered in the city areas of Nepal. Similarly, Nepal also lacks sophisticated tools for monitoring various component of air pollution. The Constitution of Nepal 2015 has also given priority to the issue of pollution as the peoples' primary right mentioning that clean and healthy environment should be guaranteed to the people. These promising developments come in the wake of growing awareness on air quality among the citizens of Nepal.

In the year 2016, government of Nepal also initiated steps to develop the National Pollution Control Strategy and Action Plan but due to the restructuring process of Nepal, the government could not endorse it from the parliament. However, there are a number of challenges that need to be addressed to tackle the problem of air pollution. The first one is the enforcement of existing laws, policies and strategies on air

¹ <https://thehimalayantimes.com/nepal/>

pollution. The second challenge is the limited resources in the country for monitoring the air quality in Nepal and malpractice in politics. Thirdly, the awareness level of people at the grassroots levels about air pollution and its adverse impacts remains low in Nepal. In a poor country like Nepal, communities are often too tied up with the challenges of food, water and livelihood security to devote proper attention to a long-term problem like air pollution. Thus, it is important to carry out massive awareness building programmes to educate at-risk communities about the ill effects of air pollution and also about suitable precautions and preventive measures.

Fourthly, research and study on air pollution has hitherto only focused on health aspect and that too in a narrow manner. No longitudinal study has been done to find out the short and long term effects, seasonal patterns, geographical variations and other issues of air quality affecting human health. Likewise, the impact of air pollution environmental health and ecological vitality has been neglected. For instance, air pollution may have an

adverse impact on fertility on some animals which may lead to a considerable dwindling of their numbers. Current studies are too generalized and focus mostly on human health.

Likewise, there is gap in coordination and collaboration among the agencies for tackling the problem of air pollution in the country. There are a multiple number of organizations in country that are working rigorously for generating the database which will be useful for tackling down the problem of air pollution. This is a great initiative but without centralized government ownership and proper data management, it may prove ineffective.

Till date we don't have any systematic data management system. Similarly, it is necessary to share knowledge and proper documentation with other stakeholders which would create an opportunity to tackle issue in effective manner in coming years. In addition, lack of the political commitment is another major challenge to combat the threat of air pollution in Nepal. The newly

formed federal structure of the government has created the immense opportunities to address the issue of air pollution in the country. However, this institutional advantage has been squandered by weak governments that change quickly.

Beside the above mentioned challenges, Nepal is not left behind from the transboundary pollution issues. Nepal is also a victim of transboundary pollution as lies in between India and China, two of the highest emission emitters in Asia. The pollution generated in these countries crosses over to Nepal from all directions. Such long distance air pollution problem would ultimately prove detrimental to the glaciers, mountains and cultural heritage of Nepal (Bonasoni et al., 2012). Therefore, the solutions of the air pollution can be achieved only when the government of Nepal considers it as a priority issue and takes the leading role in addressing the situation such as legislation, awareness building and diplomacy.

■ - **Ayush Adhikari**, Consultant; and
Anu Adhikari, Senior Programme Officer (Climate Change, Gender and Social Inclusion), IUCN Nepal



Photo courtesy: <http://kathmandupost.ekantipur.com/news/2018-01-25/nepals-air-quality-is-worst-in-the-world-epi-report.html>.

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Clean Air as Disaster Risk Reduction Challenge in Nepal



Photo courtesy: <https://www.onlinekhabar.com/2019/04/755401>

On June 30th, 2018 Indian Actress Juhi Chawla tweets "While waiting for our cars, in Kathmandu ...so much dust, so much traffic, so much diesel and petrol fumes in the air, that we had to cover our faces, every day here locals walk around with surgical masks." Although people had mixed reaction to this tweet, but it summarizes air quality of the capital city of Nepal.

'Kathmandu has ranked 5th in Pollution Index 2017 mid-year as published by the Numbeo.com recently.' The suspension of particles smaller than 2.5 pm was 64.3 $\mu\text{g}/\text{m}^3$ on March 27, 2019 immediately after a rainy day in Kathmandu. The air quality index was 151 for Nepal, 14th in the rank on the same day. What does it mean to a public; air quality index tells us how polluted the air quality is and the areas having index value less than 50 are good, 51-100 moderate, 101-150 unhealthy for sensitive groups and 151-200 unhealthy, 201-300 very unhealthy and 301-400 is hazardous. PM 2.5 air quality defines the existence of

mixture of solids and liquid droplets floating in the air that can enter our lungs being smaller than 10 micrometers in diameter.¹ People have health consequences along with others if the air is polluted. According to a major study released Thursday, Oct 19, 2017 in The Lancet medical journal 'contaminated air is killing more people than any war or violence in the world and also killing more people than HIV and AIDS'. The poor-quality air affects the vulnerable people such as elderly, children first and people with weaker health and in the long term it affects all.

Air pollution in the city areas in Nepal has been a problem throughout the year and for short time periods in the rural areas specially during the winter and dry season in Nepal. The major pollutants in the urban areas have been vehicle emission and dust particles coming out from the street, brick factories and it has some geographical reasons as well. Kathmandu, the capital valley of the

country, is most polluted among all the other cities not only because of more carbon emission but also the due to its shape like a bowl, as it takes lot of time to circulate the air in the valley and the pollution remains in the area for long time. In the city areas burning of plastic is common due to improper management of garbage. Forest fire, burning of crop residue mostly wheat is a major problem associated in the rural areas especially the mid-hills of Nepal. Lumber and fossil fuel burning is widely used for cooking that causes indoor pollution, which has a major health consequence specially among women and children below the age of five. Nepal census report 2011 says that 74.4% of people use fire wood and cow dung for cooking, which generates a lot of indoor pollution. A WHO report says that Chronic Obstructive Pulmonary Disease (COPD) are higher among the population who are exposed to pollution and the prevalence of COPD were around 2% more among the people living in Kathmandu (Multisectoral Action Plan for the Prevention and Control of Non-Communicable Diseases (2014-2020) Government of Nepal, WHO). The same report says that if no action is taken the country will not be able to cope with the problem of non-communicable diseases over next three decades. Nepal is in thirst of accelerating economic development and bringing rapid changes in the lives of people but the policy makers and development planners have to think twice how our development efforts could be irreversible and one of ways of doing that is tackling air pollution, invest on renewable energy sources and emitting less and less to the atmosphere. ■

- Kiran Ojha, Country Director,
Lutheran World Relief (LWR), Nepal

1 <https://www.health.ny.gov/> (accessed on March 28, 2019)

Clean Janakpur, Green Janakpur

Sustainable waste management and keeping the city of Janakpur clean and sanitary has been a target for not just the government but the people of Janakpur itself. Solid waste management still is a big issue in this city despite possessing pretty good solid/liquid waste collection equipment/tools. Being a tourist and holy destination for a large amount of pilgrims, keeping Janakpur clean is undoubtedly a top priority.

Aasaman Nepal, in support of UNESCO, has taken steps to fulfil this priority with the objective of making Janakpur cleaner/greener by sensitizing school stakeholders on climate change adaptation and mitigation, promoting school gardens and establishing a proper waste management system for solid wastes in 5 schools as role models. With these objectives, the project has been able to make a significant

impact. Commitment from school stakeholder (Shree Rajshree Janak Lower-Secondary School) to portray their school and community as a model has been achieved which will in turn create a benchmark for the rest. The messages conveyed by the campaign has spread massively. The surroundings of school have been cleaned with the initiation of school stakeholders and regular plantation on school grounds has increased as well. Kishornagar (one of the clusters of Janakpur) has started to make compost manure in their cluster and some local leaders have committed to make their tole(s) clean and green. This goes without saying that, connecting and empowering local level to district level stakeholders has brought incredible changes in Janakpur for the better. The idea was, a student learnt in school, then shared it to their parents and supported to make

their own house cleaner and the school took responsibility to keep those ideas in their local curriculum to it make more effective.

The project has made a long term impact on people as they are sensitized about the essence of keeping and maintaining the cleanliness of the city. IEC materials were prepared and disseminated in both Maithili and English for the purpose of sensitizing people in the previous project. Tea mats, stickers and booklets with key messages about waste management were developed and distributed among targeted communities, schools and district level stakeholders. The ADB project has been able to create a sustainable impact by sensitizing the people of Janakpur, involving the municipality and prioritizing public-private partnership.



वातावरणीय आ विद्यालयके सफाई करु ।



गाछ-वृक्ष रोपि हरिअर बनाउ ।



हरिअर जनकपुर (Green Janakpur)

कुडाककर्ट, बहारन आ गन्दगी निश्चित ठाम धरु । अप्पन घरक गन्दगीक, व्यवस्थापन अपने करु ।



अप्पन जनकपुर, सफा जनकपुर आ सुन्दर जनकपुर ।



सर-सफाई अभियानमे सभ केओ जुटु ।



Rituals such as the 'Ganga Aarati' has made a positive impact on Janakpur's cleanliness status. With people cleaning the holy sites and initiating steps to clean out the rivers and ponds, it has helped the project reach a little closer to its goal. However, there are existing factors that have interrupted making "Clean Janakpur, Green Janakpur" possible. Saving historical Janakpur has also captained on the program. They had distributed fruit plants like mangoes in both the city and rural community. ASN had supported to plant different types of crops/trees in government office and their surroundings in coordination with government organization and CSO.

Goals and objectives associated with this project are only achievable if the efforts are holistic and are made from the bottom-up. Keeping the city clean should start from home. Involving local and district level stakeholders, youths, children, women and focusing on not just one site but gradually tackling every site is important for creating a protected and safer environment for all. Creating a strong network of governmental, non-governmental agencies such as municipalities and the inclusion of stakeholders can help sustain the impacts of the project for a long term. Positive campaigning and developing a provision for strict punishment

enforced by the administrative government is needed to make the project enduring and impactful.

Despite of moving in the positive direction, Janakpur and the district of Dhanusha still face problems caused by improper management of solid waste. Efforts made by both governmental and non-governmental agencies can be long lasting if a more comprehensive and integrated approach is exercised. 'Clean Janakpur, Green Janakpur' is a program to bring people together for the betterment of the city, with proper measures and steps, getting closer to the goal seems more practical than it has ever been. ■

- Santosh Kumar Mahato,
Technical Advisor, Aasaman Nepal

AIR POLLUTION IN VIETNAM

Clean Air Challenges in Cities of Vietnam

Vietnam has joined list of the top 10 most polluted countries in the world. Hanoi tops the list of the most polluted cities in Southeast Asia. Ho Chi Minh City ranks fourth. According to WHO data, each year, 60,000 deaths in Vietnam are linked to air pollution: heart disease, stroke, lung cancer, chronic obstructive pulmonary disease and pneumonia. Air pollution now is not only the serious concerns of the authorities, but is affecting daily lives of the citizens.

Sources of air pollution are attributed to: transportation, industrial production, construction, agricultural production and handicrafts, and improper waste management, according to the 2013 Report on Air Pollution by the Ministry of Natural Resources and Environment. Lack of awareness of the citizens, rapid urbanization rate, improper governing law and infrastructure system, and economic pressures can be seen as challenges

for the authorities and citizens in Vietnam to build their cities clean and liveable.

According to data from Ministry of Transportation, Vietnam currently has 1.9 million cars and 40 million motorcycles; Ho Chi Minh City alone, 600,000 cars and 7.3 million motorbikes – the highest number of motorbikes in the world. With the rocketing usage of personal transportation, this increases significantly the amount of toxic gases emission and fuel consumption. Vietnam Vehicle Registration Agency (VVRA) formulated a plan in 2011 to control emissions by proposing emission test fees in which vehicle owners have to pay a certain fee based on the age of their vehicles. However, this plan faced widespread criticism from the public since the vehicle owners claimed this only add up to the various fees they paid to the authorities already. The expansion of population size with new arrivals of

migrants from the countryside without proper resettlement plans and due to overcapacity of infrastructure only makes the problems worse. The migration is mostly caused by climate change and disasters events such as flood, sea rise level, and salt intrusion; pushing them to move out to the city to find better alternative ways of livelihoods.

A Japanese ODA-funded (Overseas Development Assistance) Ho Chi Minh City Metro Project has been hung for more than 3 years; started in 2012, expected to finish and operate in 2017, but is still under construction now and is promised to finish in 2020. Funding shortages, cost overruns, site clearance complications lead to the delays of the project. On the other side, in the North, Hanoi bus rapid transit (BRT) started operating in 2016 with the high hope that the system would take some of 5 million motorized two-wheelers off the road and



Photo courtesy: Viet Nam News.

reduce congestion and pollution of the city. However, it failed to achieve that ambitious goal, the Hanoians find it inconvenient, ineffective, even, exacerbate the congestion with its exclusive lanes taking up almost half of the roads. Building physical infrastructure is not enough, persuading and raising awareness of people to use it is also equally important.

If economists and experts have warned Vietnam on the environmental degradation while prioritising the economic benefits, it has become essentially true. Hanoi is expected to reach 1.4 million tonnes of carbon dioxide and 4,000 tonnes of sulphur dioxide in 2020, more than three times higher in 2005. Replacing fossil fuels with clean fuel is not an easy option for Vietnam in the current situation given economic and financial resources constraints. More production facilities continue to operate with obsolete exhaust

treatment system, easily bypass check of authorities and loose governing laws, increasing industrial emissions. The production of cement, metallurgy, and thermal power station only to add up the amount of toxic gases discharged with no concrete plans to develop and be replaced with clean alternative energy. Dust and fine dust concentrations are recorded to exceed permissible standards and 1.5-2.5 times higher in industrial production and nearby areas compared to normal resident areas.

Waiting for policy or institutional change, it might take 5 years, 10 years, or even longer for positive change. To save our lives, we need to save ourselves first with small actions. ■

- Do Ngoc Thao, Vietnam

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Endorsing EcoDRR for Emerging Disaster Risks in Growing Urban Sprawls of India

The urban population of India grew at the rate of 17.6% from 2001 to 2011 and increased by 32.8% in 2017 and is forecasted to be 33.9% and 47.8% by 2020 and 2050, respectively. Growing Urban sprawls in India have extraordinarily large ecological, carbon and water 'footprints' and more complex, powerful, and often unforeseen effects on ecosystems. Haphazard and un-planned urbanization, lack of long term vision and comprehensive plan with poor urban governance have been key underlying factors accelerating the risk against disasters in these urban areas. This has been evident through increased regularity and concentration of urban disasters witnessed by India in the last few decades. The increase is not just in terms of the number of events but increasing intensity as well as complexities that has provoked and enhanced the requirement of pre-disaster preparedness and mitigation efforts as a mandate for all Indian cities.

High density urban regions are at a greater risk from potential disasters and thus, making Indian cities more vulnerable against climate-meteorological associated disasters with a toll rising to approximately 900 cities characterized by their high population density. Rapid urbanization in cities has co-occurred with a reduction in size, fragmentation and degradation of green areas. Rise in population and urban sprawl are important factors increasing vulnerability and exposure of residents. Exponential rise in demography and increased immigration due to employment availability has led to high residential demand. This is due to poor and un-planned construction in

formerly open green spaces, illegal settlement along water and drainage courses, agriculture land conversions and increase in hard surfaces throughout the city. This has further increased issues like ground water depletion, heat island effect due to less surface area available for infiltration and discharge, air pollution due to reduced green coverage, etc.

Smart city documents fleetingly mention the word disaster twice but nothing beyond that reflects the understanding and seriousness about the issue. An ecological approach for smart development of upcoming smart cities under AMRUT (Atal Mission for Rejuvenation and Urban Transformation) should seriously aim at restoring natural environment of the city to a healthy state while, renouncing upon direct services, tangible and intangible benefits received from these green assets as far as possible.

In the last few decades there has been increased acceptance and endorsement of the ecosystem approach as a predominant agenda to address the environmental management agenda. The evolution of a framework for ecosystem based approaches from scholastic academic discussions to applied natural resources conservation, restoration and management in urban landscapes and its contribution in framing effective policies is still in the making.

Ecosystem Services (ES) concept has been widely accepted for nature and biodiversity conservation of natural landscapes and getting prominence in human dominated landscape through increasing research in

qualitative and quantitative urban ecosystem assessment aimed to improve quality of life of urban population. Although, integration of ES in urban planning for implementation and operationalization still faces many challenges, the concept has helped to understand the associated synergies between ecosystem management and development to support decision-making.

To create smart cities, our study focused on understanding age old practices of conservation while, having an eye of Aichi Targets, 2020 by having right combination of EcoDRR, civil engineering approaches with a focus on urban ecosystems. This will help restoring the actual role and function as these urban green and blue spaces that provide vital provisioning, regulatory, cultural, and supporting ecosystem services. This also needs to be comprised of investments to maintain development in a risk-sensitive manner not risk friendly manner. Significant progress requires enhanced capacities for EcoDRR and approaches that are well integrated in city development and management plans. At the time when situations of extreme events arises that are arising well in Chennai, Delhi, Mumbai, Hyderabad, Srinagar, Trivandrum etc., a secure, aware and empowered urban society can offset with resilience and will be able to cope up with the situations in a better way.

The valuation of ecosystem services approach is suggested to support urban decision-making and strategic planning, to reduce costs by conserving energy and improving well-being of local people. Unless,

city administrators and planners understand the need to integrate nature's values into decision-making it will not be reflected in significant positive impacts on the environment and quality of life of urban dwellers in the growing urban sprawls of India. Following the Sendai Framework for Disaster Risk Reduction 2015-2030 and Urban SDG 11; smart city planners need to understand and value the ecological benefits of conserving the existing

ecosystems in these cities. Awareness generation for protection, restoration, and conservation of urban water bodies should develop sense of belongingness for cultural, regulating and supporting ecosystem values. Support of corporates can help city planners to include efficient and cost-effective technologies to reduce the ecological footprint of urban dwellers. Constructed wetlands, healthy wetland buffers and regular cleaning of water

bodies, waste water reuse and recycling in urban areas have a lot of scope for corporate community partnerships. Developing ecologically smart cities in the country is an effective way that governments plan for and urban dwellers dream of! The approach has the potential to increase the aesthetic value and resilience of urban sprawls in India. ■

- **Dr. Shalini Dhyani**, South Asia Regional Chair, IUCN CEM and Scientist CSIR-NEERI, Nagpur, Maharashtra, India

NATIONAL DISASTER MANAGEMENT PLAN

How Indian Cities can be Resilient?

Rapid urban growth, projected to reach 6.4 billion by 2050, presents challenges, including increased disaster vulnerability and exposure, as well as opportunities especially to local governments, as they have the closest engagement to citizens and their communities and responsible for many basic social services.¹ Making sustainable and resilient cities – amidst a changing climate, rapidly depleting resources, and unplanned urbanisation – is one of the core focuses for cities in the post-2015 development agenda. With the population of close to 1.3 billion, India remains one of the most risk-prone countries in Asia.²

Mitigating this urban disaster risk requires a mainstreaming of disaster planning. To do that, the nodal agency – the Urban Local Body, whether municipal corporation, or nagar panchayat (town council) – is key. However, most of India's urban local bodies are inadequately prepared to address this challenge holistically.

While India's National Disaster Management Authority (NDMA) has proactively tried to raise awareness and issue guidelines on the drafting of City Disaster Management Plans (CDMPs), many urban local bodies haven't taken up these measures.

Apart from the lack of CDMPs in many Indian cities, there are other governance challenges as well that further exacerbate their disaster risk profile. For instance, meaningful delegation of executive powers to elected members of urban local bodies remains a distant dream. Similarly, the dearth of financial resources with city governments also makes effective disaster management planning a challenge. The Chennai floods in 2015 and Srinagar floods in 2014 are grim reminders of the need to factor in extreme events that are predicted to increase with climate change while Delhi's smog highlights the perils of pollution.

Investment in disaster management is also modest. Currently, only the National Disaster Response Fund and the State Disaster Response Funds – solely assigned for providing relief to victims of various disasters – are functional. All hazards are dealt with individually by distinct departments at different levels of governance, and there is a lack of a multi-hazard approach. Development Sector agencies (e.g., those working on poverty reduction, housing, water and sanitation, etc.) are still not integrating a risk reduction agenda

sufficiently in their planning practices. India's flagship schemes such as the SMART Cities Mission or AMRUT would do well to embed a disaster risk reduction agenda in a systemic way to make its urban citizens disaster resilient.

An internal review meeting was held on April 5, 2019 at AIDMI to understand the key indicators, which makes the city resilient in the Indian context. The following key indicators were discussed and brainstormed in the meeting.

1. Tools and content in terms of making cities resilient. Review the existing tools and revise, update and expand. In Addition to several other aspects, structures of education, faith and economic activities come up again and again.
2. Key strategies to make the cities resilient. Carry out study and identify the list of best strategies in the Indian context. Jobs, work for men and women in urban context came up again. As you know India is suffering lowest job creation rate in past 45 years.
3. Key Sectors/Areas. What are the key sectors/areas to be made resilient? Road? Shelter? Land use plans? This includes digital and geospatial technology use. ■

- **AIDMI Team**

1 <https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html>

2 <https://www.downtoearth.org.in/news/urbanisation/why-asian-cities-should-be-made-smart-cities--46328>

A DRR Definition of "Global Catastrophe"

Key message: A clear definition of global catastrophe could help fast and crucial decision-making by disaster risk managers and governments in extreme scenarios, where distinct strategies will be needed (e.g. if WFP is unable to source any food supplies globally).

There are two distinct group of disaster and catastrophe professionals who need to define and consider "Global Catastrophic Risks" (GCR).

- (a) DRR-humanitarian-resilience practitioners, for example WFP.
- (b) existential-risk researchers, who focus on human extinction risks and scenarios, for example CSER Cambridge.

Examples of GCR include the global flu pandemic of 1918-20, which killed 3-6% of the world's population, including as many as 18 million in

India, or a volcanic winter like the one caused by Tambora (1815) which caused simultaneous multiple bread basket failure (MBBF) in 5+ continents in 1816., and *three consecutive years of monsoon failure* in India and China.

There are a number of problems with defining GCR according to number of people at risk (e.g. thousands vs millions vs billions) including that if planners and DRRs are successful, casualty rates get reduced massively. So perhaps for the DRR profession as a whole, the key issues for defining global catastrophe are those which could determine whether humanitarian practice across the world is disrupted:

A. Is it truly global?

Are 4+ continents affected abruptly?
 Are the usual food donating nations now in food deficit too?

B. Magnitude and impact:

Are 5-10% of global food supplies at risk? *Are prices of two of global food, petroleum and fertiliser more than quadrupled?*

This is a schematic from ALLFED.info which looks at catastrophes according to percentage of planetary food production loss (see below image).

C. Supply:

Are WFP and others still able to source food from wealthy countries? Are transport and distribution systems functioning on and between most continents?

I believe this is the key question for DRR, as it's what makes a qualitative change to the role of DRR professionals and organisations.

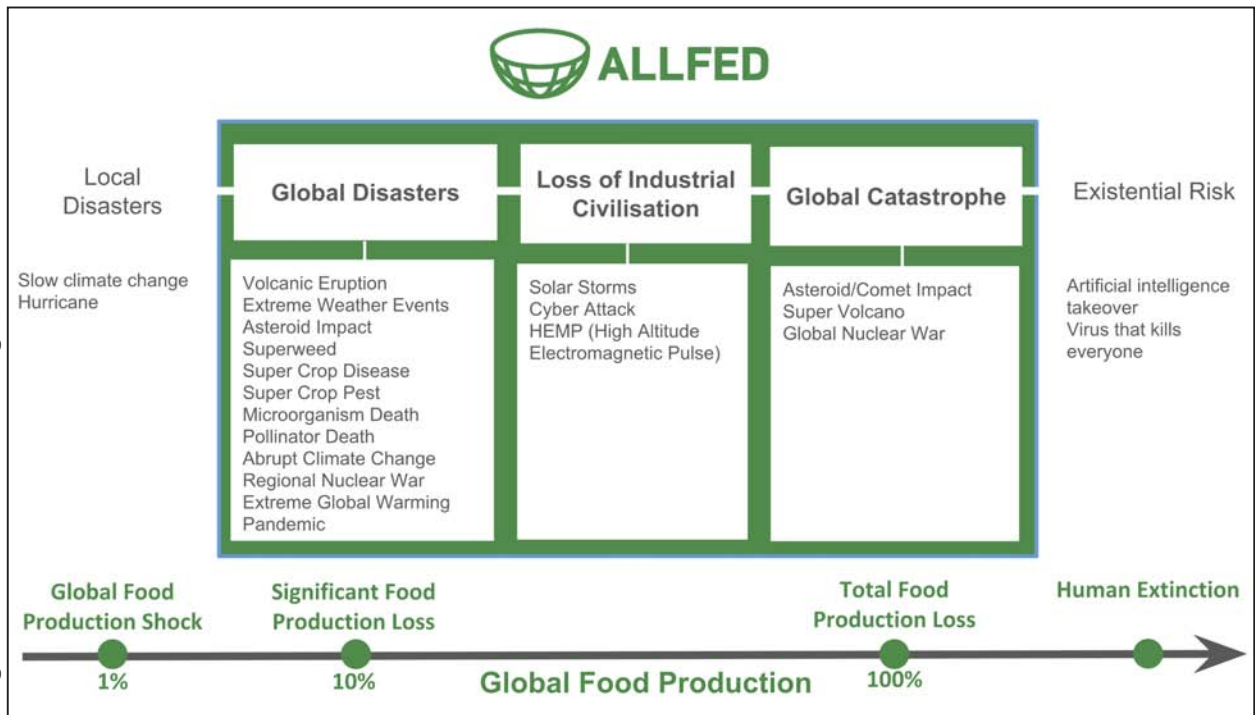


Image credit: Prof David Denkenberger, ALLFED

Hypothetical GCR example:

DRR person working in West Africa:

- a full GCR happens so WFP are unlikely to deliver any food to Dakar ports during 2-18 months after the GCR
- awareness that a GCR is underway becomes useful for planning or activating alternative nutrition strategies ASAP e.g. rationing, ALLFED.info strategies
- all local production becomes crucial increase planting of cassava and other "bachelor" crops

D. Operational and financial:

Are all of these still functioning: shipping, currencies, reinsurers and futures markets? If they are, it could probably be called a major or even international disaster, but not, strictly speaking, a systemic global catastrophe, which disrupts normal food supplies and humanitarian work across the world.

E. Is it a systemic shock?

Are human and natural and economic systems¹ as a whole affected, or is it an isolated problem, without cascading consequences that ricochet around the world?

Using Criteria A-E

- taken together, World War 1 and the 1918-20 flu pandemic were a global catastrophe
- taken together, the famines in 1940s Bengal, China, Netherlands, Greece were part of a global catastrophe, namely World War 2
- the Indian Ocean tsunami would be a regional shock, a humanitarian emergency, and a major disaster in multiple nations, but not strictly a GCR, on any of the above 5 criteria, despite its abrupt and horrific nature
- the Tambora eruption and consequent famines on 4 continents during 1815-18, and deaths caused by the global

spread of cholera was a global catastrophe and would be if repeated now.

The above is a discussion of definitions from the world of X-risk, and then thoughts of my own.

So, dear readers, what in your opinion would be a useful definition of catastrophe, global catastrophe and GCR for the DRR profession? Should the word cataclysm be reserved for scenarios which could extinguish a culture, or threaten mass extinction?

Please respond to ray@ALLFED.info or in LinkedIn group www.AlliesEarth.net or in a letter to the editors. ■

- Ray Taylor, Oxford, UK

Further reading on global catastrophic risk:

1. www.ALLFED.info/papers
2. www.foodsystemshock.com
3. www.GCRX.info
4. globalprioritiesproject.org/2016/04/global-catastrophic-risks-2016

¹ Classifying global catastrophic risks, Shahar Avin, Martin J.Rees et al www.sciencedirect.com/science/article/pii/S0016328717301957

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