

Making Indian Cities Resilient during and after Covid-19 Pandemic through Flexible Planning Approach

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1 ABSTRACT

In the advanced scientific world of information in the innovative medical knowledge age, the Covid-19 pandemic raised many questions of human existence at the dawn of the twenty first century. On top of it, countrywide lockdown to save humanity at the cost of a shrinking economy shattered the hope of survival of many. The paper is an attempt to find a flexible way forward for post Covid-19 city planning and management by analysing the impact of real time mobility data of Mumbai and Delhi. It also proposed the Integrated Spatial Hierarchical Emergency Functional System (ISHEFS) to integrate the horizontal and vertical functions of the city and various stakeholders/ government departments in a single platform for efficient and effective recovery from the future pandemic. It highlights the establishment of the ISHEF system at neighbourhood and city level and how it will provide for the collection and analysis of spatial and factual ground level information in order to establish a common ground to address the pandemic situation for effective governance and community empowerment.

The ISHEF System provides the flexibility to take decisions on the ground by understanding and analysing the existing situations. Hence, the paper discusses the flexibility of the ISHEF System which enables the field team to observe and analyse the real time challenges of transforming objectives and methodology to suit to the real time field situations and to be able to act in the shorter period of time as fast as possible to provide the solutions. The present hierarchical model will demonstrate successful city solutions for building a flexible, rapid, efficient and effective resilient city.

Keywords: Real Time Mobility Data, Resilient Cities, Hierarchy of city functions, Flexible Neighbourhood Planning, Post Covid-19 Cities

2 BACKGROUND

In late 2019, an unknown virus started spreading its dangerous impact in Wuhan, Hubei Province of China and in January 2020, through widespread news it started its threat to humanity and soon captured the minds of millions across the world, especially in cities. On 11th February 2020, the World Health Organisation (WHO) called this novel coronavirus 'Covid-19' and the very next day WHO published operational Planning Guidelines to support country-preparedness and response. In reality, it was too late to realise that was a pandemic, as within only a period of six to seven months more than 17 million population confirmed cases of Covid-19 (July, 2020) and 600,00 million people died (WHO Interactive Timeline). India was no exception. 50 percent of Covid-19 cases of India were reported from only four megacities (Mumbai, Delhi, Chennai and Ahmedabad), hence it is evident that cities were the epicentre of the pandemic COVID-19.

Non existence of medicine or vaccine left no option but to completely shut down cities and for the government authorities across the world to announce lockdown strategies. This unwanted model of complete lockdown, with supply of only essential goods and services; travel restrictions within and between cities and countries; social distancing, was adopted throughout the world as well as in India to minimise the impact of Covid-19. This model to save humankind from the Covid-19 disease has changed the dynamism of movement and functions of cities and as a result, many industries like tourism, aviation, hospitality, entertainments, sports, manufacturing, transports etc are experiencing tough time. The year 2020 experienced the deepest global recession in a decade with a global estimated GDP of -5.2 percent. India experience was even worse as -23.5 GFP from April to June and -7.5 GDP from July to September, 2020. Apart from health emergency, the Covid-19 pandemic put forth the greatest economic and social challenges for years to come.

The circumstances of unemployment, poverty, social distancing, slow economic recovery and physiological trauma put the question of survival and sustainability of our cities to urban planners, policy makers and managers. Moreover, innovation of communication and information technologies promoted 'work-from-home', online transaction and virtual meeting and completely changed the behaviour of urban communities,

leading to the adaptation of the virtual world and, gradually towards the transformation of urban structure. The paper is an attempt to understand the impact of the Covid-19 pandemic in two cities, Delhi and Mumbai, in order to evolve the Integrated Spatial Hierarchical Emergency Functional (ISHEF) System to make our cities resilient. By analysing the impact of Covid-19 on these two cities, the paper also discusses the steps taken by the government authorities in suggesting future strategies to cope with similar kinds of epidemics.

This is not the first time that cities are experiencing emergency epidemic situations. There were many such instance when cities were the centres of epidemic, for example, yellow fever (1800) in Philadelphia, cholera outbreak in London (1854) and Naples (1884), Spanish flu (1918) in North America, Plague in Surat (1994), SARS (2002) in South East Asia, Bird flu in European cities (1959, 1991), China (1996), Hong Kong (1997) and in India (2020). These epidemics in the past have forced urban planners and policy makers to frame effective urban policies, better hygiene and social services, and improvement of health and medical infrastructure. These past epidemics acted as real-time test-bed laboratories for urban planners and actors to learn many lessons. These epidemics have also given us various examples of innovative solutions and resilience, like the use of city map or spatial analysis to identify the ground zero for London cholera and the construction of a sewerage system for better sanitation for London.

Expansion of city area, concept of urban renewal, land acquisition and social housing dominated during the end of the 19th century in Naples. Naples provides a good example of resilience by framing the urban policy preparation and adoption of the Code of Hygiene and Public Health and the establishment of a law for cleansing the city by Naples municipality. The concept of Garden City by Ebenezer Howard; geometric architectural design by Le Corbusier by giving more importance to light and air; the modern concept of 'Happy City' propagated by Charles Montgomery in his book, "Happy City: Transforming our lives through Urban Design" in 2013, are some of the examples of 20th and 21st centuries which depict the pandemic and epidemic influence of our city planning and the need to design and transform towards better and safe places for human civilisation to thrive the as well. However, the impact of COVID-19 has raised many questions to about effective, efficient and sustainable planning and design of our cities. Hence, in order to tackle future pandemics and to judge urban vulnerability to pandemics, there is a need to understand present behaviour of Covid-19. Its spatial pattern and its dynamics affected vulnerable populations and localities. Our preparedness for resilience efforts, our responses, resilient building strategies and adaptation measures etc are important to study and to prepare a resilient model for human survival.

Presently after two years of fear, distress, social distancing, uncertain future and shrinking economy, India is on the path of fast recovery with the announcement of vaccine and also herd immunity. A serological survey conducted by the Delhi government shows that about 95 percent of Delhi's population have already developed antibodies against the Covid-19 virus. But with the mutation of the Covid-19 virus in other parts of the world, it is difficult to predict the behaviour of Covid-19. Apart from paucity of funds faced by WHO to have equitable distribution of vaccines, the major question put before humanity is, how safe the vaccines of Covid-19 are. Hence, it has become even more important for the pharma companies and decision makers to earn credibility of the masses by by creating transparency and joining hands together through interdisciplinary institutions, governments and organisations at world level because the impact of Covid-19 has proven that we are now living in an interdependent world.

As a planner it is evident that to cope with situations like the Covid-19 pandemic there is a need to establish vertical and horizontal integration among various government departments to result in effective time bound decision and action. The more well-knit coordination and cooperation will be established among the various government departments, the more effective establishment of the resilience city will be achieved.

3 METHODOLOGY

The basic methodology adopted is quantitative collection of various observations and suggestions in meetings and discussion forums and self-observation of facts and situational analysis. In order to evolve a ISHEF system for post COVID-19 city resilience strategies, the impact of Covid-19 on two cities Delhi and Mumbai are observed and analysed. These two megacities have been chosen as case studies because of the fact that:

- Both cities experience rapid increase in Covid-19 cases in spite of Delhi being the national capital of India and Mumbai financial capital of India.

- Both cities are power houses of eminent personalities and dominated by high density to low density community locations.
- Both cities are also important tourist destinations and have a large commuting population.
- Both have adopted stringent method to curb the impact of the Covid-19 pandemic.

Due to the limited availability of data the study is based on various discussions and interviews of government officials and health workers and lessons learned during the period of high impact of Covid-19.

In order to understand the socio-economic impact on the cities of Delhi and Mumbai, real time spatial and temporal data through 'Google Mobility Change data' (GMCD), are analysed to measure the Health Index of these two cities. GMCD are analysed to understand the trends in mobility over the time period of COVID-19 from 15th March, 2020 to 20th January, 2021. The percentage change of mobility with reference to the places like retail and recreation; market and pharmacy; parks; public transport; workplaces; residential areas are compared with the base line days. Base line days are the median value from the 5 weeks real time data registered during the normalcy days which are from 3rd January, 2020 to 6th February, 2020. Based on this base line, positive and negative data of Delhi and Mumbai are analysed to access the spread of infection and impact on socio-economic condition. Socio-economic conditions of the city are based on the mobility pattern. Thus, the real time mobility data pattern reflects the impact of the epidemic on the city. If the value is different from the base line data (positive or negative) then the impact of the epidemic is greater. This reflects that the Health Index of the city is poor, as real time data reflects difference from the normal travel behaviour of the local residents. With this assumption, the real time data of Mumbai and Delhi cities are analysed to determine the Health of the City.

4 THE IMPACT OF COVID-19 IN DELHI AND MUMBAI

4.1 Mumbai

Mumbai, the financial capital of India is a coastal city. With a population of 20.6 million persons in 2021 Mumbai, the capital of Maharashtra, is experiencing a decadal population growth rate of 11.94 percent, during 2011-2021. With a population of 30.1 million persons in 2021 Delhi, a land locked city and the national capital of India, registered a decadal population growth rate of 37.28 percent during 2011-2021 (www.MacroTrends.net; United Nation population projections data of Mumbai Metropolitan region and Delhi Urban Agglomeration). Both cities are connected with national and international airports and about 46.8 million (Mumbai) and 68 million (Delhi) national and international people commuted daily during 2019 (timesofindia.indiatimes.com; 10th January, 2020). This reflected how both the cities are well connected with the outside world. However, with the first covid-19 case reported from Delhi in 2nd March, 2020 and 11th March 2020 in Mumbai, both cities experienced decline in national and international travellers, followed by the announcement of the lockdown of 80 cities including Delhi and Mumbai on 22nd March, 2020. With the announcement of a nationwide lockdown from 25th March 2020 the connectivity with the outside world came to a complete halt. Even though in order to stop the spreading of the epidemic, the Delhi government ordered the disinfection of public places and closure of schools, colleges and cinema halls on 12th March, 2020. Similarly, the Maharashtra Government announced outbreak of an epidemic and invoked the provision of the Epidemic Diseases Act, 1897 on 13th March, 2020 and closed all public facilities in urban areas on 14th March, 2020.

The analysis of Google Mobility Change Data (GMCD), shows that with the announcement of the nationwide lockdown on 22nd March 2020, substantial reduction of all mobility results in places like retail and recreation; groceries and pharmacies; parks; transit stations; and workplaces. However, the real time data shows that people are spending more hours at home. During the first unlock period on 1st June 2020 the major decision of reopening retail stores, restaurants, the hospitality sector, hair salons and malls had only a minimal change in the travel behaviour. The real time data also shows that Delhi has manifested a sharp rise in mobility trends in various places, in contrast to Mumbai which experienced a only a gradual increase in mobility trends. Thus, Mumbai faced a stronger impact of the epidemic Covid-19 as compared to Delhi.

Both cities Delhi and Mumbai are reflecting an 80 percent and 90 percent sharp decline in the mobility respectively after the announcement of the country wide lockdown on 22nd March, 2021. The reduction of mobility was at its peak i.e. 90 to 92 percent from 18th April to 3rd May, 2020, of about half a month, in

Delhi. However, Mumbai experienced the highest decline of resident’s activities, i.e. 90 to 93 percent from 22nd March to 4th June 2020, of about two and half months. Subsequently, the mobility data shows the gradual reduction from the baseline data from 4th May and 5th June, 2020 in Delhi and Mumbai respectively. On 20th January, 2021 Delhi and Mumbai are reflecting 38 and 45 percent decline in travel trends respectively (Figure 1 and 2).

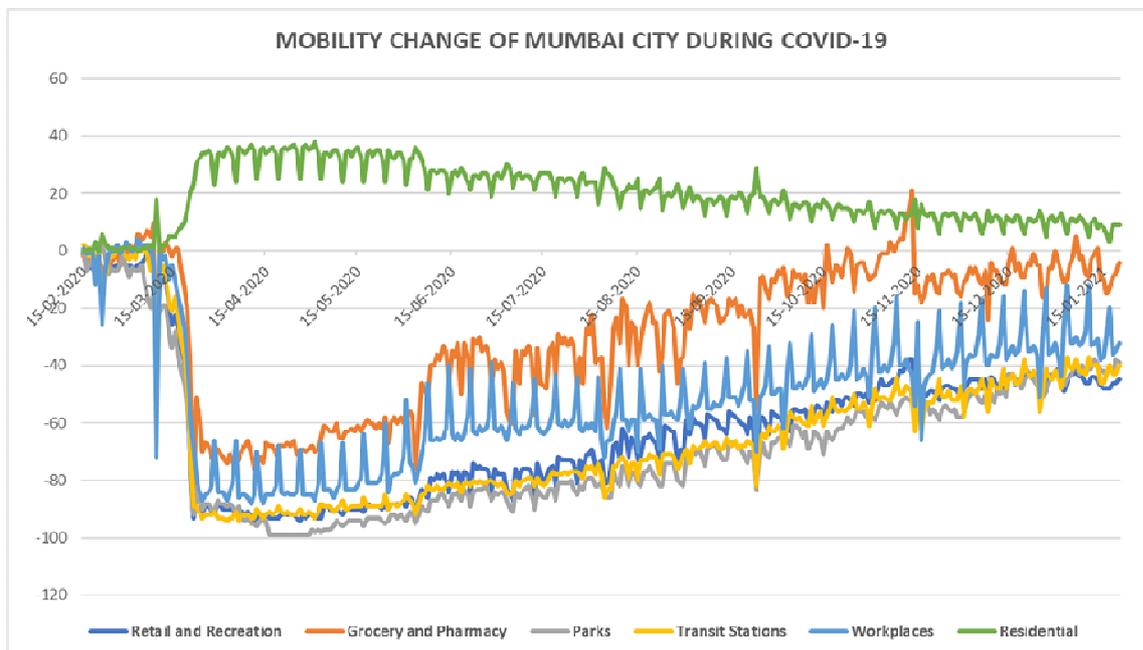


Fig 1: Real time Mobility change data of Mumbai from 15th March, 2020 to 20th January, 2021 (Source: COVID-19 Community Mobility Report, 2021 January 22.)

The analysis of real time mobility data in correlation with the increased number of Covid-19 cases in the city depicts that while Delhi and Mumbai have witnessed highest Covid-19 cases the reduction of mobility within the city is at its peak. As Mumbai has a longer peak curve than Delhi, it reflects that Mumbai suffered a stronger impact of Covid-19 and taken more time to control the epidemic. Thus, Delhi’s strategies to tackle Covid-19 are more effective and resilient as compared to Mumbai. One of the Delhi government’s social strategy is to provide free food, by setting up over 500 hunger relief camps for people who have been left stranded due to nationwide lockdown.

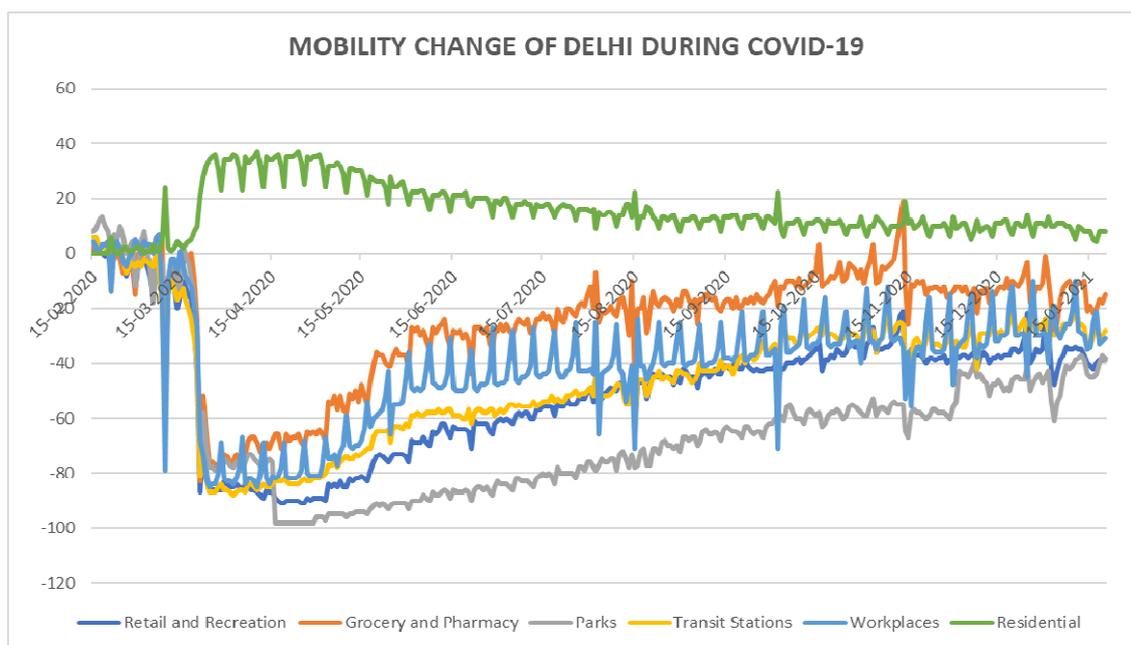


Fig 2: Real time Mobility change data of Delhi from 15th March, 2020 to 20th January, 2021 (Source: COVID-19 Community Mobility Report, 2021 January 22).

As regards land-use both the cities are witnessing that the mobility trends in workplaces, parks and transit stations are decreasing towards normalcy at a slow pace as compared to grocery and pharmacy and residential areas. This reflects that more and more of the urban community are selecting to 'work from home' options. Moreover, many companies are permanently adopting the policy to work-from-home.

The analysis of interviews of different people in Mumbai and Delhi reflect that 82 and 65 percent respondent respectively will prefer the Work-from-Home culture permanently. The 75 to 80 percent of the planner community of Delhi and Mumbai respectively believe that the demand of location specific office spaces and travel demand will be reduced and thus the pattern of mobility will change in future.

4.2 Lesson learned

- The present alarming situations could be the warning from which to draw lessons for the next global emergency. This raises many questions of the modern urban community system over the traditional rural community system.
- Unsafe drinking water, crowded housing, lack of health professionals, poor infrastructure and chronic diseases play a major role in making the indigenous community more vulnerable to Covid-19.
- Location of first cases was reported from major urban centres and rural communities which are more self-sufficient than other and support traditional way of life.
- Isolation means lack of recreational, education and employment opportunities. Isolation also has an impact on an individual's holistic mental health and wellness like psychological, emotional abuse and jealousy.
- The countrywide lockdown model, in fact the biggest lockdown in the world, had brought our country to suffer the consequences of deep uncertainty and economic crises.
- The current extreme situation forced the planner and urban expert to think about all spatial planning theories of sustainable urban development or to recognise the need to evolve a new innovative solution model of sustainability.
- Digital infrastructures and technologies for virtual connectives and analysis of real time data need strengthening.
- In order to control the spread of epidemic, there is a need to have a single platform to coordinate the decisions taken by different agencies or government bodies.

5 BUILDING URBAN RESILIENCE

For a planner it is evident that to cope with a situation like the Covid-19 pandemic there is a need of vertical and horizontal integration of various government departments to result into effective and time bound decision and action taking. The more coordination and cooperation will be established among the various government departments, the more effective the resultant establishment of resilience city will be achieved.

The establishment of an Integrated Spatial Hierarchical Emergency Functional (ISHEF) System during the epidemic within the city will ensure the systematic spatial and hierarchical arrangement of essential goods and services. The emergency functions of the city are:

- Health and medical services;
- Food distribution system;
- Hygienic water distribution network system;
- Efficient sanitary network system;
- Transportation and communication system;
- Network of Real time data design centres;
- Emergency Governance system; and
- Network of trained local volunteers system.

All these emergency functions of the city should be in hierarchical arrangement spatially in such a way that an identified epidemic city/ locality/ neighbourhood should act like a self-sufficient cluster on the one hand and also hierarchically connected to the supply of goods and services on the other hand, so that the epidemically impacted community should not feel isolated mentally on the one hand, and restricted in its movement physically on the other hand, to control the further spread of the epidemic.

To identify the interested citizen keen to work/ help in epidemic situation it is necessary to establish a core citizen group (CCG) network which may be called ‘Swasth fielder’ (SF). The Swasth Fielder will be chosen from different areas of the city and from different communities who are willing to help and have some basic education and off course have interest in taking active part in the Epidemic Emergency support group (EESG) and Government. These CCG will work with City level EESG and respective government official in more effective ways to analyse content and solve epidemic related problems. Under the National Disaster Authority, it is suggested to establish a Neighbourhood Disaster Resilience Technology Centre (NDRTC) at neighbourhood level and a City Disaster Resilience Technology Centre (CDRTC) at City level of all cities. This NDRTC will have a real-time data analysis centre and a Geographic Information System (GIS) Web 2.0 technology lab which will:- (a) Provide access to GIS and real time data design system; (b) Provide and communicate data and information to higher order or city level EESG or lower order or neighbourhood level SF; (c) Store and analyse real time data for future predictions and overall management of supplies of essential goods and services and also simulate emergency alert situations ; (d) Educate/ communicate and also provide transparency between local community and government. and (e) adopt efficient and coordinated decision making and participatory planning processes. For the higher level NDRTC is connected with City Disaster Resilience Technology Centre (CDTC).

The Swasth Fielder will feed/ communicate the most vulnerable community related data to NDRTC at neighbourhood level. These Swasth Fielders should be identified and also be provided training to collect data especially from the urban poor and slum areas for inclusive public participation. Thus, this is the practical solution to the digital divide and to reduce the gap between planning professionals and local public. Town and Country Planning Organisation will help establish real-time-data base Centres and GIS Web 2.0 technologies lab and also to impart training to urban planner and city managers for the same purpose. The School of Planning and Architecture (SPA) should take a lead role to identify Swasth Fielder and also to impart training to these SF and other ground level officials. The National Disaster Authority (NDA) should establish coordination among administrative systems of various government departments and also to impart training to various level of government officers/ officials. The Disaster Management Agency will establish a single platform for the Epidemic Emergency Support Group (EESG) and the Core Citizen Group and also provide the coordination support to TCPO, SPA, NDA, health professionals, NGOs, various government departments and other professionals (like, software engineers, data scientist, regional analysts etc). (Figure 3)

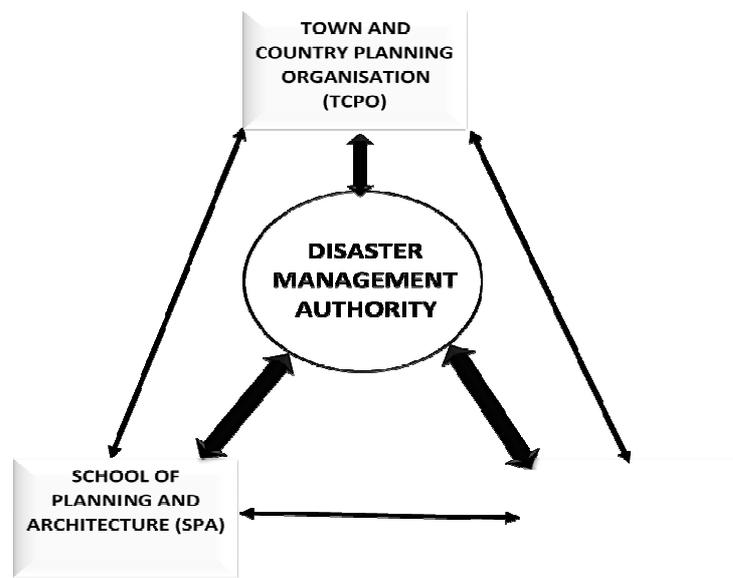


Figure 3: Implementation of ISHEF System (Source: Author, August, 2022).

The pathways for Urban Resilience are developed through the ISHEF System. At the time of epidemic the proposed ISHEF System should create a single platform for information storage and dissemination. The ISHEF System will ensure the following steps at the time of epidemic situations:

- Prepare real-time-base maps for responsive implementation of recovery plan.
- Identify locations with the most needed.
- Quantify the number of people who need assistance.
- Strengthen the food system of the city and define the city capacity to provide food.
- Identify the stakeholder and measure its adaptive capacity
- Establish effective partnership with organisation
- Provide reliable source of information.
- Strengthen networks with neighbourhood leaders (SF).
- Single platform to meet the challenges to integrate all information collected/ deiminated by the SF.
- Provide solution to emergency requirement of space and capable of giving answers to urgent decision-making questions like
 - How to approach the city spaces?
 - How much public or private spaces are required to redesigning the city?
 - epidemic effected area and with which shortened roots?

6 CONCLUSION

Overall, by understanding the impact of the Covid-19 pandemic in Mumbai and Delhi and some of the major lessons learned, the paper tries to frame the concept of Integrated Spatial Hierarchically Emergency Functional (ISHEF) System to increase the resilient capacity of cities. No doubt various models of sustainable urban development and resilient cities are available, however the current situation of the Covid-19 pandemic has raised many more questions for the success of a resilient system. At present, the proposed ISHEF System is the first insight to access, collect, analyse and transfer spatial information providing innovative, sustainable, participatory solutions for effective governance and community empowerment at the time of a Covid-19 like pandemic in the future. By analysing the Google Mobility Change real time data, the paper tries to understand the impact of Covid-19 on the cities of Mumbai and Delhi. The paper suggests possible ways of establishing a ISHEF System for the management of future pandemic situations through a community based local Neighbourhood Disaster Resilience Technology Centre (NDRTC) at neighbourhood level and a City Disaster Resilience Technology Centre (CDRTC) at city level. The establishment of NDRTC will give the local urban community a free hand to communicate its problems at the time of an epidemic to higher or decision-making authorities. The paper is an attempt to understand the impact of the Covid-19 pandemic on two cities (Delhi and Mumbai) in order to evolve the Integrated Spatial Hierarchical Emergency Functional (ISHEF) System to make our cities resilient. By analysing the impact of Covid-19 on these two cities, the paper also discussed the steps taken by the Government Authorities by suggesting future strategies to cope with a similar kind of epidemic in future.

Note: For real time data of Google Community Mobility Report <https://www.google.com/covid19/mobility/> ; covid19india.org; Ministry of Health and Family Welfare <https://www.mohfw.gov.in/>; and WHO Coronavirus disease (COVID-19) Dashboard <https://covid19.who.int/> , were used.

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