Sustainable and Resilient Infrastructure
Need of the Hour

Moving towards a holistic approach of building risk-informed infrastructure that considers a wide range of repercussions will reinforce the country's infrastructure and facilitate the population depending on it, says **Anand Sharma, Founder & Partner, Design Forum International.**

Public health and its risk of it turning into a catastrophe had shaped contemporary city planning since the early 19th century when sanitation and overcrowding appeared to be directly linked to the spread of infectious diseases. The COVID-19 pandemic and its alarming impact on the cities globally, have further reshaped the architecture and planning of future cities. The ongoing epidemic had headlined the need for devising an infrastructure that has the capacity to facilitate a smooth transition, connectivity and utility services. This time frame that hosts numerous risk factors and uncertainties poses questions on the bearing capacity of the region's infrastructure to withstand the burden of the next disaster. Despite the accelerated economic and infrastructural development the country has witnessed in the last decade, the biggest threat that looms large on our built environment right now is the drastic climate change and the induced disasters and the required resilient architecture to mitigate this threat remains underdeveloped.

Holistic and sustainable Design Approach

As a solution to make places and services more accessible while being safe, there is an urgent need to imagine a holistic growth in our cities with keen attention towards devising a sustainable infrastructure, more so now than it has ever been. The intent here is to devise on the ideology of an inclusive building approach that offers solutions for all the prevalent urban challenges. These sustainable cities must be able to surmount the significant concerns while being sensitive to the impact it has on the ecosystem. Incorporating environment-friendly architecture that communicates well with its surroundings can take us forward on this path. Adding breathable open spaces to the built environment rewarded with natural landscapes will not only elevate local air quality but also improve well-being and biodiversity and reduce the heat-island effect. As cities continue to expand, maintaining urban gardens and farms can become a way of compensating for the resultant habitat loss. Strategic landscaping, green roofs, sky gardens, rooftop farming, and solar walls can be some of the suggestive ways to resort to a holistic and inclusive design approach. Ways and means to ensure optimal use of resources and minimizing energy loss can also take us a step ahead.

Adaptability- the Future of City Planning

As we witness global cities rethinking their approach to devising better-equipped city planning modes with adaptability and mobility as major concerns for future developments, the future makers of India have also been on the path of exploring and implementing risk-informed infrastructure. To gauge and mitigate the effects that development has on health and devise to improve India's urban infrastructure to help prepare cities to respond more rapidly and efficiently to the unprecedented disasters of the future has become the need of the hour.

The city planners have to be capable of interpreting the prevalent changes in the society while creating, and adaptability can be the mitigation that design and planning can support. Creating temporary-use scenarios, such as a review of public and private spaces to make them adaptable and flexible for gradual use, can be one of the possible efforts towards equipping the contemporary cities to cope better with future disasters.

Strategic and Resilient Development

In this era of increasing and potentially overlapping risks, countries and cities have no choice but to invest more in strategic, resilient development than solely reactive recovery efforts. We may require re-imagining our towns as a closely looped, self-sufficient system with prioritised public open spaces and a remodelled work and living architecture. The ongoing pandemic has given us this opportunity to retrospect and reassess our preferences in regards to the progress of our cities and reorient urban planning towards the aspects of resilience along with functionality and sustainability.

Architects and urban planners are now reassessing the relationship between urban design and public health without giving up the idea of the city as a social hub. Open public spaces and community spaces that weave together the fabric of a city have also gone through a major transition in terms of their utilisation. Parking areas, stadiums, hotels, public buildings, inner streets have been remodelled during the pandemic to assist in medical care. Some of these spaces have also been transformed temporarily into isolation wards for practicing social distancing.

Disaster Mitigation- a Prospective Standard for Public Buildings

The future of a city's design must be such that it can adapt and cope with natural and man-made disasters with equal vigour. For this, the towns must accept design paths that incorporate robust and resilient plans that direct a more equipped disaster management programme. Designing a resilient built space demands careful thinking and an extensive analysis on the building's capability to respond in different scenarios of disaster management. Other aspects that determine the resilience of the building also come from its rootedness in its local context and how approachable, accessible and flexible it is incase of a calamity. This further promotes creating smart and adaptive infrastructure at the local level that can help recover from aftershocks and stresses.

One commendable example of local planning based on the adaptive capacity of a neighbourhood prevailed in the ongoing crisis- the gated societies initiated to set up small Covid-19 care facilities run by Sainik Farm's Resident Welfare Associations (RWA), in tandem with NGOs while utilising their own resources. This turned out to be an admirable initiative that considerably reduced the strain

on the already overworked medical community as it helped in assisting the cases with early or mild symptoms that did not require severe medical aid. Adapting large public buildings into covid care centres has also been a rescue measure in this direction.

These initiatives have also signalled towards adapting Disaster Preparedness as a Standard feature for all large scale community buildings making them capable of facilitating pluggability of medical infrastructure, sterile environment, flexibly convertible spaces and a disaster mitigation committee that works towards repurposing the respective built volumes into health care facilities that can be activated in times of crisis like the ongoing pandemic.

The Global Coalition for Disaster-Resilient Infrastructure led by India is another good example of developed and developing countries in the region building synergies to reach the goal of disaster-resilient infrastructure. Moving towards a holistic approach of building risk-informed infrastructure that considers a wide range of repercussions will reinforce the country's infrastructure and facilitate the population depending on it.

Conclusively, in addition to the lessons learned from this continuing epidemic, the building industry now seeks conscious solutions to equip the community with more disaster-resilient built volumes that are capable of adaptability and rapid mitigation. Although devising resilient infrastructure is a complex and vast ensample that requires a well researched and thoroughly integrated approach towards analysing the various dimensions of disaster management, the lesson to learn here is fairly elemental - inventing pandemic ready buildings that are sustainable and resilient suggest the only way through. CBT

Bendable concrete and other cement mixes could reduce global emissions

One of the big contributors to climate change is right beneath your feet, and transforming it could be a powerful solution for keeping greenhouse gases out of the atmosphere. The production of cement, the binding element in concrete, accounted for 7% of total global carbon dioxide emissions in 2018. Concrete is one of the most-used resources on Earth, with an estimated 26 billion tons produced annually worldwide. Given the scale of the industry and its greenhouse gas emissions, technologies that can reinvent concrete could have profound impacts on climate change.

Rethinking concrete

Concrete is made up of aggregate materials – primarily rocks and sand – along with cement and water. Because about 80% of concrete's carbon footprint comes from cement, researchers have been working to find substitute materials. Industrial by-products such as iron slag and coal fly ash are now frequently used to reduce the amount of cement needed. The resulting concrete can have significantly lower emissions because of that change. Alternative binders, such as limestone calcined clay, can also reduce cement use.

Apart from developing blended cements, researchers and companies are focusing on ways to use captured CO2 as an ingredient in the concrete itself, locking it away and preventing it from entering the atmosphere. Carbonation curing, also known as CO2 curing, can also be used after concrete has been cast.

These processes turn CO2 from a gas to a mineral, creating solid carbonates that may also improve the strength of concrete. That means structures may need less cement, reducing the amount of related emissions.

The CO2-based bendable concrete can be used for general buildings, water and energy infrastructure, as well as transportation infrastructure. Bendable concrete was used in the 61-story Kitahama tower in Osaka, Japan, and roadway bridge slabs in Ypsilanti, Michigan. CBT