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Contents

Contents

Photo: Jashvitha

For better cities, map and integrate all open spaces into urban planning

PK Das

January 26, 2024

Gardens, promenades, boardwalks, wetlands, salt pans, beaches, promenades, green connectors amid a city's concrete, are vital open spaces which make it more liveable. The most iconic open spaces combine a multitude of urban functions: ecological, social, public health, public safety, aesthetics and recreation. Networking open spaces into linear parks and making them more accessible to people is important. So is mapping and integrating them into urban plans. In Mumbai, the first such mapping and listing revealed 2,152 reserved open spaces – nearly three times that claimed by the civic body. Without thorough documentation and people's participation in protecting them, the city stands to lose these to construction or misuse.

The geography of any city and its development is rarely understood and used from the point of view of open spaces. They are taken for granted and it is assumed that they will be consumed as the city is expanded, that they will be covered with construction in the name of development. But it is the state of open spaces that reflects the state and quality of life in a city, the dignity of public community and collective life.

Though open spaces are considered as recreation grounds, play grounds, parks and gardens in urban development plans, this is a limited view. The entirety of open spaces in a city should include its invaluable natural assets which are not usually seen as open spaces such as hills, forests, natural plantations, mangroves, wetlands, rivers, ponds, lakes, and in coastal cities, the natural coastline, creeks and beaches. Equally importantly, these should be mapped in a comprehensive manner and this priceless information should be made accessible and available to people if we are to see any change in the existing matrix of urban planning.

The marking and provision of open spaces are a part and parcel of development plans in cities because regulations make such a provision a precondition of urban development. However, the current paradigm of planning sees open spaces as constraints on development – taken to mean real estate and construction – or a byproduct of the real estate activity or left-over spaces. Open spaces are a lot more. Only when people are aware of the necessity and co-existence of open spaces in their neighbourhoods, in a proportion stipulated in most planning regulations and necessary for healthy, dignified and sustainable living reflecting the larger ecological attributes, can they fully participate in their planning and collectively decide the nature of growth and development.

It is also assumed, wrongly, that open spaces are nothing but open-to-sky spaces for people's recreation and entertainment. This is but one function. Open spaces bring together a multitude of urban functions: ecological, social, public health, public safety, aesthetics besides recreation. The most iconic open spaces combine all or most of these functions. Planning requires public authorities to ensure that adequate, good quality and accessible spaces are available to all people as their right – and recognised as part of the fundamental Right of Life encompassed in Article 21 of the Constitution. But the need of the hour is to recognise natural areas as open spaces and integrate them so that the definition is expanded. This will help raise public consciousness about open spaces and initiate better city planning.

Open spaces and planning
Besides the recreational opportunities they provide, open spaces are significant from the standpoint of public health. Medical experts have advocated for decades that such spaces are essential for physical and mental well-being. After all, the origins of urban planning in Indian cities date back to the devastating epidemic outbreaks during the colonial regime and regulations which followed to ensure adequate open spaces for light and ventilation as preventive measures.

Open spaces are also important from a safety perspective. During emergencies such as fire outbreaks, earthquakes and other disasters, they serve as refuge areas for people.

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It follows, therefore, that there should be sufficient open spaces in every neighbourhood – not on podiums in gated complexes and private areas, but at the ground level of the mother earth which are networked across neighbourhoods, and are accessible to one and all.

The networking of open spaces in a neighbourhood and across a city is more important than acknowledged in planning. This gives us the powerful idea of linear parks – kilometres of green open spaces which are interlinked across a city – akin to a river flowing and connecting millions of people. This is important to address the segregation and fragmentation that happens in cities, and also to challenge the idea of centralisation with one large park for the entire city. Linear parks make open spaces more accessible and democratic to more people.

Open spaces are equally important for a city's ecology too. This function has been largely ignored but they offer a range of ecosystem services. Groundwater percolation is one of them. By absorbing rainwater into the ground, open spaces help reduce the surface runoff in our built environment and the intensity of urban flooding. Unfettered open spaces at the ground level, on mother earth as it were, can reduce the impact of the urban heat island effect and regulate the microclimate even in highly dense neighbourhoods.

Open spaces also support natural vegetation and, therefore, carbon sequestration which is now an important means of climate change mitigation. And open spaces help to improve the air quality by dispersing polluted air, and support biodiversity which is critical to maintaining the natural ecosystem in an urban environment. Open spaces are the best home to trees and urban forests without which cities remain an unbearable mass of concrete.

It is, therefore, imperative that open spaces are duly recognised in the planning process. Let us imagine a network of open spaces in a city being at the heart of urban planning and development. This is contrary to the prevailing notion about open spaces as wasted spaces to be used to maximise the construction and real-estate potential. We badly need this shift in planning.

Our Mumbai mapping

Networking various open spaces in a city into linear parks allows the development of an elaborate system of green connectors amidst the concrete. These can be avenues, gardens, promenades, boardwalks, cultural squares, wetlands, salt pans, beaches, promenades, and rock formations. Both the natural and built open spaces can radically enhance the character and quality of the city's landscape. Such a network will not only improve the environmental condition of the city but also provide opportunities to millions of people for walking, cycling and, importantly, social networking which help bring people together in an urban environment known for atomising and individualising people.

This is especially significant in a dense city like Mumbai where the availability of open spaces is well below the internationally recommended level. Mumbai's development

open spaces into recreation grounds (RG), playgrounds (PG), parks (P) and gardens (G) overlooking the many natural open spaces available in the coastal city. However, even within the limited definition, there is an important lapse: it shockingly lists far fewer open spaces than there are.

Mumbai's Development Plan 2014 listed 800 reserved open spaces across the four categories of RG, PG, G & P but in the comprehensive survey and mapping that some of us undertook in 2011, we found a total of 2,152 reserved open spaces in the above categories – nearly three times more. This was presented to the city as Mumbai's Open Spaces Map and a preliminary listing document which, I believe, was a necessary step towards a comprehensive plan.

Of the 2,152 reserved open spaces, nearly 600 spaces were encroached upon and, in many cases, built upon too. Comprehensive information of 752 spaces was not available with the Brihanmumbai Municipal Corporation (BMC) which is solely responsible for the city's open spaces. A check with a few of the 24 ward offices across Mumbai confirmed that there was neither a thorough documentation of open spaces within a ward nor consolidated information available to people. Moreover, natural spaces were not classified as such but simply marked as No Development Zones which means they could be released for development later. Our mapping suggested classified reservations in the NDZs.

Unfortunately, the DP 2034 did not improve on this. This abysmal situation warrants people's intervention where we have to join hands to prepare a complete inventory of open spaces in our neighbourhoods. This information can be made widely available so that any move by the BMC to change the classification or nature of an open space can be effectively and locally resisted. This would also help to democratise the process of planning, implementation, and monitoring. It is our collective responsibility to ensure that all open spaces are protected from abuse and misuse – and remain open to all.

However, this does not mean that the BMC is off the hook. It is the civic body's responsibility to prepare a comprehensive record of all the reserved open spaces irrespective of their ownership. If some are privately owned, the BMC must initiate the acquisition process with utmost priority in a time-bound manner. Under no circumstances should construction be permitted on these spaces; the relevant laws and Development Control Regulations must be amended to prevent such construction. It is the BMC's responsibility and duty to prepare a comprehensive map of open spaces and maintain all such spaces in collaboration with people. This map should be available to all.

Mapping, open data, and protection
The ward-wise Open Spaces Map and the detailed listing of open spaces in each of the 24 wards across Mumbai which we carried out was not an end in itself. The mapping and listing were to re-envision Mumbai's plan in an ecological way.

The mapping included all the RG, PG, parks, gardens, natural and ecological assets such as hills, forests, water bodies and so on, public places such as railway stations, markets, and public amenity buildings too. This was the first such map in Mumbai and

it showed a distinct geographic character of the city. The Open Spaces Map also marked out encroachments. Of the 2,152 open spaces tabulated, at least 1,552 were available while nearly 600 were encroached upon. The DP 2034 ought to have acknowledged this, incorporated a similar tabulation as part of the official document, and ensured that the open spaces are protected from all building activity irrespective of the purpose of the construction.

Despite the comprehensive Open Spaces Map and ward-wise tabulation made available for the first time, the BMC and its outsourced planners overlooked the city's open spaces network. The information could have been used to facilitate meaningful public participation and dialogues during the preparation of the DP 2034. This was not done. What will happen to the open spaces we had tabulated in every ward by 2034 is anyone's guess.

What lies ahead

The monitoring of the thousands of open spaces across Mumbai is necessary now especially as the new regulations allow for construction without even providing open spaces on the ground. In essence, the regulations allow builders to construct on every inch of a plot and provide 'open space' on the podium of a gated complex. This is scandalous.

This has been challenged by me and others in the Supreme Court on the basis that the podium-level open spaces cannot compensate for their absence on mother earth. They are an apology for open spaces and perform none of the vital ecological functions that natural open spaces do – they cannot absorb rain water to reduce the runoff and increase the groundwater level, they cannot support trees which are essential for carbon sequestration and micro-cooling of areas, and they cannot help in mitigating climate change impacts.

This assault on open spaces is at odds with what the Mumbai Climate Action Plan stated about open green spaces and trees: "The city will work towards green space access for all citizens, undertake conservation and extend biodiversity to protect the city from the impacts of climate change. Urban green cover helps minimise the mean rising temperature, reduce the effect of heat waves, and arrest urban flooding. This goal can be achieved by increasing the vegetation cover and permeable surface of the city surface area by 30-40 percent by the year 2030 and reducing the heat island effect…Ensuring an equitable distribution of open spaces, increasing the per capita open space to 6 square metres by 2040 and restoring, maintaining and enhancing the city's biodiversity and ecosystem will also be important".

The loss of open spaces on the ground level and consequent depletion in tree cover is likely to have devastating impact on flooding during intense rain events which studies have indicated a rise in the coming decades, depletion of groundwater table which could lead to soil changes, loss of natural ecology and biodiversity, rise in overall ambient temperature, and an exponential increase in building density in an already super-dense city. Without natural open spaces on the ground, Mumbai risks becoming a hotter city; studies show that open spaces with concrete paving were 1.5 to 3 degrees Celsius warmer than surfaces with trees. Urban forests and lush tree covers cannot be

replicated at podium level. Plants in pots at podium level placed around manicured green lawns are not a substitute for trees at the ground level in terms of environment and climate change threats.

People's participation can ensure that open spaces are protected. Within neighbourhoods, people can add to our documentation, fill gaps if any, organise exhibitions and dialogues at the open spaces, and evolve ways to maintain and protect them. Various citizens' forums, residents' associations, and other groups are welcome to use the Open Spaces Map and ward-wise listing we created.

Eventually, we can hope that such participatory activities will augment our list and people's movements will help evolve plans in each of the 24 wards in Mumbai so that the city's meagre open spaces, its ecology, can be preserved especially from the brutal construction onslaught.

Photo: Trisha Salvi

Mahalaxmi Racecourse: A public open expanse, threatened by a theme park

Trisha Salvi

January 26, 2024

One of Mumbai's largest and most recognisable open spaces, the Mahalaxmi Racecourse, attracts hundreds of joggers, walkers, sportspersons, and yoga enthusiasts among others. The theme park planned here will likely shrink the precious open space, replace the green with some concrete, and likely restrict access. It may damage trees nearly 100 years old which help mitigate the Urban Heat Island effect. The Brihanmumbai Municipal Corporation must acknowledge the value that this open space lends to a highly dense city like Mumbai and protect it. Any change should involve public consultations.

The gentle January sea breeze blowing across its 225 acres makes it the perfect time to be at Mumbai's Mahalaxmi Racecourse. There's unobstructed bright blue sky beyond its expanse, a skyline of rising towers around its eastern edges, a host of birds make a chorus of sounds above, ancient trees stand tall around its perimeter, the air smells clean and fresh as horse riders, walkers, joggers, football players and yoga practitioners take it all in. This is a rare space in Mumbai, by any standards.

Reclaimed from marshy land that was previously called the Mahalakshmi Flats, the Racecourse, housing the Royal Western India Turf Club (RWITC), occupies prime sea-facing real estate that is eyed by many. The land was leased from the Brihanmumbai Municipal Corporation (BMC) to the Mahalaxmi Racecourse in 1914; it finally expired in May 2013. The past ten years have seen renewals of the lease as well as attempts to make 'productive' use of the prime land.

The latest salvo from the BMC is the proposal to construct a theme park spread across 120 acres of the land leaving about 90 acres for the Turf Club and its activities. The theme park, now controversial and challenged in the Bombay high court, will mean that one of Mumbai's largest open spaces will no longer remain vacant, uncluttered, and accessible to all. In a city starved of open spaces, this is more significant than authorities care to acknowledge.

The Racecourse is seen as an elite space but only the Turf Club and its premises used as horse stables and offices are out of bounds for people without membership of the club. Large parts of the Racecourse attract a number of Mumbaikars from the crack of dawn to late evenings, providing a whiff of fresh air in the concrete jungle. The Turf Club has a social ecology of its own. The site was accorded Grade II-B heritage status which means it is largely protected and implies a precinct of local importance where construction is avoided.

At the heart of the controversy over the redevelopment of the Racecourse, into a theme park or whatever else, is not merely the control over this public open space but the purpose behind it. The BMC is the guardian of this open space; it has been functioning as a developer-broker.The people of Mumbai have the greatest stake over this expanse. Their say matters, or should matter, but the BMC's actions hardly reflect this.

Why the open space matters
The 225-acre land of the Mahalaxmi Racecourse is shaped like a boot (perhaps, a Christmas stocking) tucked between two arterial roads, the E Moses Road to its east and Lala Lajpat Rai Marg to its west. The almost-oval racecourse forms the lower part while the northern part, a trapezoid, comprises the stables and auxiliary amenities of the Turf Club. To the south of the racetrack are the functional buildings of the club, its grandstands, and a spattering of restaurants. The walking track and central area, roughly 90 acres in the centre, are publicly accessible and used areas.

A major chunk of land that the BMC proposes to use for the theme park is this open and spacious central portion of the track, half of which is currently used for the Amateur Riders Club and the polo field while the other half is leased for commercial

and private events. These spaces are usually open to the public – teenagers play football on the expansive field where polo tournaments are held, Mumbai's ubiquitous cricket matches can be seen, people do group activities like yoga, and a stage prepared for a globally recognised music festival. The Racecourse, for those who know and use, remains an important public open space within the timings set by the Turf Club, which leads many Mumbaikars to believe this is private club land; the BMC does little to correct the impression. The Turf Club faces a host of challenges including reduced footfall at races and higher taxes on betting. However, these are of no bearing on the public land and the civic body's plans for it.

The Racecourse land is one of the largest open spaces in the city, a relief from the concrete jungle, clearly seen in a satellite image. The few large open spaces in Mumbai are inequitably located. Most of them are in the south to the centre of the city – the old city, as it were – while its expanded suburban areas have few, if you discount the Aarey forest. This means Mumbaikars travel long distances to make use of the Racecourse space. A theme park would hardly offer the expanse that this open space does.

However, the theme park is not the first proposal for the space. There have been several, from the pragmatic to the inane, over the past century. In 1948, planners NV Modak and Albert Mayer, as part of the master plan for the city, wanted to relocate the Turf Club's activities and use the space for low to middle-income housing in between public parks. They stated: "In Bombay's lack of parks and playgrounds there is probably no sizeable city in the world to compare it to." In 2009, authorities planned a bridge over the Racecourse to alleviate the congestion of traffic headed towards south Mumbai. The theme park proposal was mooted first in 2013 and has been revived now.

While the contours of the theme park are not yet clear, what is certain is that it will dramatically change the way the space is now and how it is cherished by thousands. The park, which may be ticketed to cover costs, will mean construction cutting into the open space and possibly an end to the free access that people have, making this large open space a collective memory of the city. BMC Commissioner IS Chahal has assured the Turf Club members that a theme park will not necessarily mean an entertainment park with construction but there are proposals to erect a London Eye-like structure and construct an underground road 8feet below to reach the gardens of the new Coastal Road and so on. What is needed is an open public discussion of these proposals.

Its ecological functions
The various ecological ramifications are less discussed. Mumbai has been grappling with increasingly poor air quality with a 38 percent increase in PM2.5 levels .from 2019 to 2023 Bad air, as is well established by now, is directly related to and is the cause of a number of health problems. The correlation between air quality and urban land use, including the availability of open spaces, shows that they help to reduce the pollutants in the air and bring down the Air Quality Index.

The relatively low-lying location of the Racecourse allows space for the rainwater to collect every monsoon which perhaps motivated old-time planners to consider turning

it into a reservoir. Concretising vast stretches of the Racecourse, extensive piling and deep basement work required for a theme park would prevent water from percolating into the earth, adversely impacting aquifer recharge and the groundwater table.

The trees, some over 100 years old, are a majestic canopy, offering respite from heat. They are critical to mitigate the Urban Heat Island effect in which certain areas are hotter than their surroundings due to a combination of low tree cover, heavy concretisation, use of heat-trapping building materials, and traffic emissions. Those who use the Racecourse affirm this. While training for the marathon, Kushal Borlikar felt the area was cooler: "It was one of the advantages of practising here, especially during summer. Even a couple of degrees cooler makes a lot of difference."

This open space is critical in a city with 1.24 square metres per person which is projected to reduce to 0.87 square metres per person. The central government guidelines recommend 10 to 12 square metres. Delhi is way ahead of Mumbai; south Delhi offers nearly 43 square metres per person while northeast Delhi has the lowest at 3.22 square metres which is nearly three times Mumbai's average. This average, as per the BMC, includes traffic islands and rocks along the seashore too. Ironically, Mumbai's Development Plan 2034 promises 2 square metres per person.

The people of the racecourse
Over the decades, people have claimed and used the vast expanse independent of its function as a racecourse. Universities and colleges hold their track-and-field trials for state-level competition, bringing in hundreds of students for practice, some as far as from Virar nearly 75 kilometres away.

Aspirants to the police force and railway jobs like Nikhil Thakur train here too. "There is no space on the roads. We have grown up in this area and come here since we were children. There are many other groups for running, yoga and more who come too...If a theme park comes up here, the walking track will cease to exist," says Thakur.

Kushal Borlikar, training for the marathon, says: "Training on the road is no easy feat even early mornings. Here, there are no traffic signals, we do not have to watch out for cars or damaged roads, which allows for speed training. This place also offers the thrill sometimes of horses running on the track next to us." RPF jawan Rajendra Yadav was training for the city's annual half marathon and said "there is no alternative" to this space for training.

People living in railway quarters nearby come here for leisure or for sports practice. Teenage members of the Amateur Riders Club make videos of the space. "Everyone is welcome here, we want the place to remain this way and are looking for people to interview for our film," they say.

Quite a few people come here in the mornings and evenings to play cricket and football, or walk and exercise, while others come to watch the horses run. Football coach Suraj Jaiswal has been coming here for 20 years though football was only

permitted five-six years ago. He says, "We really don't need anything else here. If this place goes, it will not be economically feasible for my students or me."

Over the years, people have been involved in keeping this open space accessible to all. In 1986, when the club restricted access to people, Nivedita Shirodkar recalls standing in protest with a large group outside the Lala Lajpat Rai Marg gate. "Within a couple of days, the gates were opened to us," she says. Purusottam Singhi narrates the involvement of the Joggers and Walkers Society (JAWS) in the use of this space. **Both of them, former presidents of the society established in 1983, state that the absence of a clear public access to the walking/jogging track in the theme park proposal makes them wary; the walking community here would echo this.** Instead of restricting people's access, the authorities must take steps to make it more accessible.

The future

The boundaries of this open space have been blurring. The Arabian sea, Haji Ali Dargah and Mahalaxmi temple could be seen from its western gate till recently – views now blocked by the under-construction coastal road. The north-most part of the land was given to the Mumbai Metropolitan Region Development Authority for Line 3 of the under-construction metro. The avenue of magnificent trees to the south has been shrunk for road widening and a flyover. The construction of a cycling track, enclosed by tall fences, is underway. Tender notices have been issued for a promenade development on the Lala Lajpat Rai Marg side to the Mahalaxmi bridge.

With the edges of the open space thus threatened, a theme park means the land inside is threatened too. Irrespective of the fate of the Racecourse, will the Open Space Policy being drafted by the BMC apply here? A state government minister recently stated that the coastal road could be connected to the park by a tunnel. Have feasibility studies been done for this or any other proposal? The BMC Commissioner stated that the theme park will be eight feet lower than the race track, implying concretisation and shore piling. A prominent Mumbai architect has suggested, in his capacity as consultant to the BMC, that topiary gardens like at the Palace of Versailles should be on this land.

Do Mumbaikars really want this development? It is simple to find out, says Pankaj Joshi, Principal Director, Urban Centre Mumbai, suggesting surveys and crowd-sourced ideas. "Such an important decision should be taken in a democratic manner...Multiple proposals must be invited, published and city-wide consultation campaigns run for opening a dialogue with the public to democratise decision-making."

Robert Stephens, Founder of Urbs Indis and author of Bombay Imagined, points to proposals in 1865 and 1948. Former municipal commissioner Arthur Crawford imagined a 400-acre park to detoxify the Mahalakshmi Flats, Bombay's first landfill; J F Bulsara proposed an expansive campus of the Bombay University, and the Modak-Mayer outline building low and middle-income housing. "All three were incredibly forward-thinking dreams which understood that this land would have an impact across the city and all sections of society," says Stephens.

The ideal would be to simply leave the vast open space the way it is and undertake minimum upgrades in an ecologically-sensitive manner. The storm water drainage could be improved. Storing and harnessing rainwater can provide ample water for the racecourse reducing the current reliance on water tankers. Improving the public ground so that people can better access the space throughout the year may bring more Mumbaikars here. Subtle zoning and landscape design, well-designed and adequately-lit footpaths can elevate the open space into a frequently-used, luscious green ground.

As the future of this iconic open space of Mumbai hangs in balance, it is worthwhile to remember that open spaces were created to counter an old pandemic. Wrote J F Bulsara, in "Bombay, a City in the Making" in 1948: "...Our concern is not with a bigger Bombay but a better Bombay. A city is not great by its size, area or population, nor by its piles of buildings and sky-scrapers. We are not even laying down our objective of an ideal city as a great city, but as a good and beautiful city; a city that invites and enthuses the joy and fullness of life here and now, not one that demands the monotony of drudgery..." The imagination of open spaces, if anything, should have improved since.

Photo: Smruti

The green does not have to lose the battle to the grey in our cities

Shobha Surin

October 20, 2023

Large swathes of green cover are being cleared to make way for construction and infrastructure across cities in India. Trees are being cut, large canopies felled, old trees badly and unscientifically pruned. Urban plans and projects do not take trees into account at the planning stage, creating a false binary that trees are impediments to 'development'. Nowhere was this more evident than in Mumbai where the association of builders argued in courts to not provide even the mandated space on a plot for trees, and instead wanted to put plants in pots at the podium level, in a city with less than half a tree per person. But trees need to be at the ground level for their sound health as well as the sustainability of the city, especially in the times of Climate Change. What is a city without trees, except massive blobs of concrete?

If there was an environmental litmus test for people in cities, builders and real estate developers would fail it spectacularly – and nowhere more so than in Mumbai. Their association has been arguing in the National Green Tribunal (NGT) and fighting it out in the Bombay High Court to not provide the mandated open space, in construction projects, at the ground level to plant trees. That men with enormous clout to shape the built environment of Mumbai have to fight against trees – placing profits from land above trees – shows why our cities are being stripped off their green cover.

This story took shape about a year ago when the NGT passed an order, based on a Supreme Court judgment, holding that builders should provide recreational or open space at the ground levelwhich should be open to the sky and enable tree plantation. If a construction project failed to provide this space, then it should not be allowed to proceed, the tribunal directed, drawing the attention of the State Environment Impact Assessment Agency to this aspect when projects were evaluated for environmental clearance.

The emphasis was on open space and trees at the ground level – mother earth, as it was described in the case – and not merely on the podium or a raised height in the building. It should not have had to be spelt out but it did – trees need the ground and soil as much as the earth and air need the canopy. Yet, builders were fighting in courts to not provide the necessary and adequate space for trees, that too when Climate Change impact looms large. Future generations will scarcely believe this.

At least two critical aspects need attention. Firstly, trees are considered superfluous, not crucial or core, to the environment of the place and well-being of people. And secondly, trees are not taken into account at the planning stage of infrastructure or construction projects. Most major cities across India have lost their green cover in large proportions even as the pace of 'development' rapidly increased in the past few decades. For example, New Delhi lost more than 60,000 trees in seven years till 2022; importantly, these were felled with permission from the authorities. Mumbai lost 2,028 hectares of green cover between 2016 and 2021, according to the city's climate action plan, also with permission. Trees are clearly treated as highly dispensable or obstacles as the 'development' juggernaut rolls on.

This approach leads to court cases such as the one that the builders' association NAREDCO, or National Real Estate Development Council, mounted challenging the NGT order in the Bombay High Court. The HC ruled in its favour but underlined that it was neither examining the correctness of the order nor deciding the compliance of a proposal in the context of Mumbai's Development Control Rules 2034. This was a single case but the juggernaut does not stop there; the precedent has been set for builders to apply for – and obtain – environmental clearance without providing ground space for trees. The Bombay HC order has since been challenged in the Supreme Court.

Builders could, in principle, construct on nearly the entire plot leaving barely 1.5 metres at the ground level along its edges for trees and, instead, provide the green cover on the podium or raised levels of the building's elevations. Plants in pots at podium level placed around manicured green lawns, which are sometimes fake, are no substitutes

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for trees at the ground level. They do little for the neighbourhood, the city's environment and Climate Change threats.

Sanctioned by rules
The idea that trees or plants can be grown on podiums is, surprisingly, built into the rules in Mumbai. Regulation 27 of the Development Control Rules 2034 states that 40 percent of the open space on a plot, including trees and plants, can be at podium level while of the 60 percent on the ground – mother earth, as it were – half has to be for trees while the other half can be paved. This Regulation also allows 1.5 metres only along the periphery of the plot for trees. Either way, the shrinking space for trees in our built environment is written into rules and official plans.

Mumbai is not the only city, though. In different ways, laws in India's cities do not protect the existing tree cover as construction moves at a frenetic pace; in fact, trees are viewed as obstacles in the path of 'development'. Trees do not even make it to the standard Environment Impact Assessment reports of many projects. Only when the site is surveyed, the question of chopping down trees arises. This false binary between 'development' and 'environment' is designed to fail both the people of the city and its environment, especially in the era of Climate Change.

Trees are the life of a city. Local administrations such as the Tree Authority, which should protect the tree cover and ensure successful plantations, instead sanction tree-cutting. Around 2.3 million trees across India will face the axe for major infrastructure projects this year, announced Ashwini Kumar Choubey, minister of state Ministry of Environment, Forest and Climate Change, in Rajya Sabha in February this year. Tree-cutting is accompanied by talk of "compensatory plantation" but this hardly helps. Saplings – not fully grown trees with buzzing ecosystems – are planted at a location different from where trees are felled, and the majority of them die.

Why we need trees is a no-brainer

- Trees are the best gifts of nature to combat Climate Change. Trees and urban forests act as carbon sinks soaking up emissions, reducing air pollution, helping clean up the atmosphere.
- Trees cool streets and neighbourhoods in cities, providing shade under which many urban activities take place; shaded areas, it is now proved, are cooler from 2 degrees Celsius to even 25 degrees Celsius.
- Trees and gardens offer respite from the pressures of city living with recreational spaces and opportunities for community engagement. Trees have inspired art and reading clubs in their midst.
- Trees absorb rainwater, help in controlling urban floods, especially during intense or extreme weather events. Trees enrich the top soil, so essential for soil health, and enable groundwater to be recharged.
- Trees, even in cities, provide medicines and herbs; trees have entire ecosystems which nurture other life-cycles and biodiversity that cannot be easily replicated.
- Trees are necessary for the process of evapotranspiration – the process by which water is transferred from the land to the atmosphere by evaporation from the soil and other surfaces, and by transpiration from trees or plants.

For all these and more functions, trees of certain species and vintages are essential at the ground level, not on podiums or built-up spaces. Plants on podiums are ill-equipped to perform these functions. Yet, urban planning hardly acknowledges trees or incorporates tree-based, or nature-based, approaches. On the contrary, trees have routinely been seen as impediments as in the Aarey Forest The Mumbai-Ahmedabad high-speed or bullet train project will claim 1,828 trees in Vikhroli. It's the same story in other cities too. As the tree cover gets depleted, the relationship between people and nature in cities too gets eroded, fragmented.

Trees as urban essentials
Trees are indicators of a city's health. The greener a neighbourhood, the healthier the place and people there. The UN mandates at least 10 trees per person for a healthy environment. The per capita tree cover in Delhi in 2018 was barely 0.28 to 0.3 hectares – less than one tree per person – according to the last State of Forest report. Mumbai has one tree for every four people or less than half a tree per person in Mumbai, according to 2017 data released by Praja Foundation.

When a tree is cut, the CO_2 stored in it is released into the environment, adversely affecting air quality. Trees are powerhouses when it comes to regulating city microclimates – filtering air pollution, providing shade, and reducing the Urban Heat Island effect that makes cities far hotter than surrounding areas.

Trees can hugely reduce surface temperatures – by 2 degrees Celsius to 20-25 degrees Celsius. Asphalt roads, lack of open spaces, high density of buildings, and lack of trees or green cover is a recipe for Urban Heat Islands. Research shows the absence of trees can impact human health; planting more trees could decrease deaths directly linked to hot weather and heatwaves by a third.

Besides, tree roots stabilise the soil, tree canopies act as cushions during heavy downpour and reduce soil erosion, they buffer noise and filter stormwater. People in cities with a substantial tree cover possess better health immunity; trees boost oxygen levels and lessen blood pressure and anxiety; biochemicals released from trees contain even antibiotic, antifungal and anti-rheumatic properties. Trees ought to be seen and treated as essential elements in urbanisation.

Vanishing greens and calamities
Assam's capital Guwahati, which has lost one thousand hectares of tree cover from 2001 to 2020, sees an increased intensity of the floods every year. Other large cities have seen depletion of trees too. In Bhubaneswar, 870 old trees were chopped down last year for swanky high-rises. Between 2010 and 2021, as many as 21,000 trees were felled in Mumbai, roughly 2,000 trees every year or six a day, according to civic data.
Kolkata's tree cover saw a dramatic drop from 23.4 percent to 7.3 percent over 20 years till 2016 while its built-up area went up by a staggering 190 percent; Ahmedabad's tree cover fell from 46 percent to 24 percent over 20 years while the city's built-up area went up 132 percent, according to a study by an Indian Institute of Science team.

Prof. TV Ramachandran and his team at the Institute used satellite-borne sensors to gather data, compared images over decades, and modelled past and future growth of

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urbanisation in four Indian cities. Road networks, railway stations, and industries though "drivers of growth" were also "agents of change" for the ecology in each city, they stated.

The visuals of flooded roads and rail tracks during monsoon have become common but these events are rarely linked to the absence of trees. In July, Delhi witnessed one of its worst floods; flash floods in Himachal Pradesh triggered landslides; Sikkim continues to reel in the aftermath of flash floods on October 4. Forest land of 103.79 hectares was diverted in Delhi in the past 15 years for development projects, ironically, under the Forest Conservation Act 1980, shows government data.

Much was made of Mumbai bagging the Tree City of the World tag last year, but this is determined by certain boxes being ticked off irrespective of trees chopped, badly pruned, or saplings dying.

Tree equity and tree authorities
Along with the depletion of trees and green cover, another issue demands attention – tree equity. Studies point to unequal distribution of trees in cities, with a pronounced absence of or fewer parks and gardens in lower-income areas. In New York, this study showed that the green cover was denser and better-planned in wealthier areas. Studies by the European Environment Agency found that green spaces are less available in low-income neighbourhoods compared to others across Germany, the Netherlands, and Portugal.

Similar studies for Indian cities are hard to come by but anecdotal evidence in many cities shows this trend. The posh Lutyens in Delhi boasts of 125 species of trees, more than in other areas. Most of Mumbai's open spaces and large gardens are in the south of the city while the Sanjay Gandhi National Park and Aarey are at its northern edges; these are averaged across the city's population. When parsed, they show that over four of every ten Mumbaikars do not have a garden or park within a kilometre of their home, according to official data itself. The World Health Organizationrecommends that every person should have access to at least two hectares of green space, not more than 300 metres away from their home.

Equitable distribution of trees in a city is important but, first, trees have to be preserved or planted at the ground level.

Tree authorities, formed by municipal corporations and councils, have drawn flak for their shoddy functioning or sanctioning tree-felling and indiscriminate pruning. In July, the Maharashtra (Urban Areas) Protection and Preservation of Trees Act 1975 was amended to empower local bodies to permit tree-felling, including heritage ones, without referring to the State Tree Authority. At the national level, the recent amendment to the Forest Conservation Act, 1980, invited widespread criticism.

Trees in our cities need more of the exemplary Karnataka Preservation of Trees Act (KPTA) which seeks public permission before the government decides to fell trees. This is on paper but it is a start. For cities to be environmentally healthy and sustainable, trees should be the first bulwark – and an essential component of city-making.

Photo: Jashvitha

Walking through a green Mumbai, meeting special and rare trees

Jashvitha Dhagey

October 20, 2023

Oasis in a concrete city, areas like the Five Gardens in Dadar Parsi Colony are a veritable treasure trove for naturalists and tree lovers. Here, besides the ubiquitous Banyan and Peepal, less-seen species in Mumbai such as Almond, Copper Pod, Trumpet, Putranjeva and Hatiamiuki. They stand their ground, providing shade and character to the Colony, and showing that trees have their place too in a bustling metropolis. The ecosystems and biodiversity they nurture within themselves are a revelation on a walkthrough. Tree enthusiasts also commend the Rani Bagh Botanical Garden, another popular spot of green that people are fighting to preserve.

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In Mumbai's Dadar, a kilometre's walk from one of the busiest suburban railway stations is the Dadar Parsi Colony. Wide roads with spacious footpaths are lined with trees, both native and exotic – Banyan, Almond, Copper pod, Trumpet, and Hatiamiuki to name a few. Mumbai's noise, pollution and heat fade out here. Even in Mumbai's infamous October heat, the drop in temperature is perceptible and bird calls are crystal clear.

Among Dadar Parsi Colony's long-time residents is children's author Katie Bagli, who has recorded the 60 types spread across 25 acres in a book called *Trees of Dadar Parsi Colony*. The colony was an effort of the Bombay City Improvement Trust in the early 20th century to provide Parsis with a tree-lined precinct and civic amenities. "Besides the Five Gardens, this area has 14 smaller gardens and trees lining each avenue," says Bagli. She is also a trustee of the Save Rani Bagh Botanical Garden Foundation, another conserved spot of green near the zoo.

Illustration: Shivani Dave

Trees clockwise from top right: Chrysophyllum, Kasod, Bottlebrush, Shirish, Indian Rubber, Gulmohar, Rain, Putranjeva, Wild Bhendi, Copper Pod/Rusty Shield Bearer, Wild Almond, Trumpet, Umbrella, Tiwar, Guest.

Scattered among its concrete and glass facades, Mumbai is home to a few green pockets such as the Sanjay Gandhi National Park, Aarey forest, mangrove forests and wetlands along its coastline, swathes of green concentrated in a few pincodes. Dadar Parsi Colony is one where trees and buildings appear in harmony rather than conflict – an exception or an oasis in the city where trees are being overrun by construction.

Plants of the Parsi Colony
The quiet and shaded environs of the Dadar Parsi Colony do not seem to be a part of the frenetic and noisy Mumbai, thanks to its widespread canopy of common and exotic trees. The greens form the nucleus around which the colony stands, forming a natural barrier between it and the city beyond, absorbing and filtering the city's noise and fumes. If this could be planned and executed back in the 1900s, why couldn't more areas of Mumbai be built this way?

Bagli, a naturalist and tree lover, identifies shapes, sizes, colours and contours of their leaves, flowers and trunks. And she is delighted to walk around with me. Five Gardens is an amalgam of one central circular garden and four around it, all separated by tree-lined roads with residential buildings. We begin walking in Garden A and she shows me the Wild Bhendi tree and its fruit with fluorescent yellow flesh underneath brown skin. We move to the Rusty Shield Bearer to see its rust-coloured pods.

Around us are indigenous and easy-to-spot species like the Banyan, Peepal, Indian Rubber, and Indian Almond among others. There are exotic ones like the umbrella tree and the Copper Pod whose flowers form a bright yellow carpet on the ground, attracting pollinator birds like bulbuls and parakeets to them. We then spot the Trumpet Tree, a cousin of the world-famous Cherry Blossom.

"They look gorgeous when they are in bloom on the Vikhroli stretch of the Eastern Express Highway," Bagli says. I remember that visual relief. We come to the road that runs between Gardens A and B which hosts two of the six Hatiamiuki trees; the other four are scattered around the colony. "Their gnarled trunk signifies that they are at least a hundred years old," says Bagli. We cross the road to see the Putranjeva, whose little round seeds are made into necklaces only for boys. "People build myths around trees. No one's going to harm their sons, so the tree lives on." The patriarchal belief may have protected this tree.

Spotting a Rain Tree at the centre of Garden B, Bagli bursts into child-like giggles and explains that its leaves droop in the evening which leads to insect droppings that feel like "rain". Nearby, an Indian Almond tree stands with its leaves turning red, preparing to shed, its neatly-tiered branches a distinguishing characteristic, and its soft and fibrous fruit enjoyed by birds.

The riches within
A little ahead, the Tiwar tree stands out. According to Bagli, this is not only because of its tiny pink flowers with striking red stamens but also because of its cylindrical shaped fruits with edges at acute angles. I also learn that the leaves of the Indian Rubber tree have a red sheath before they fully open, and this tree is usually mistaken for the Banyan because of its hanging roots. A butterfly nestles among the Bottlebrush shrubs before flying away. In how many areas of Mumbai can one do this?

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Bagli points to moss-covered stones around the Peepal, explaining that while the wind and water erode rocks, the moss secretes a substance which breaks them down into soil over time. The wonders of nature do not cease. Then, there's the Star Apple tree whose copper undersides shine like gold in sunlight; the fruits of the Guest Trees are fondly called 'jewel boxes' or 'pearl capsules' with their white seeds resembling pearls.

Trees, even in the harsh and polluted atmosphere of the city, hold entire worlds within themselves; their ecosystems nurturing life processes of insects, bats and birds, their flowers and fruits serving as food source, their soil binding organisms underground, their fallen leaves and flowers decomposing into soil, and their shade cooling busy city people. Sustain trees and they sustain you, your city and your world.

Further along the Gardens, the Wild Almond or Jungli Badam is a busy tree with the dull white and small shell-like protrusions on its bark; Bagli points out that these are moth cocoons. We pick up a fallen fruit with a woody exterior only to see white ants engrossed in decomposing it; Bagli carefully replaces it so that the ants are not disturbed.

Under the shade of the Shirish tree, people rest oblivious that its rattling pods are called 'woman's tongue'. Students choreograph dances under the Rain tree, a man sleeps in the shade of Wild Bhendi and two women sit a short distance away glued to their phone screens, a man eats his lunch under the Banyan, fruit vendors use the shade of trees for their businesses, and lovers of all ages find space on benches under the trees here. The trees also provide refuge to rare birds like hornbills, cattle egrets and night herrings, who Bagli informs, prey on the snakes in the nearby Sewri salt pans.
Take away the trees and Dadar Parsi Colony will simply not be the same. It stands out as an example, even today, of how trees – natural ecology – can nourish and support neighbourhoods. It also exemplifies the planning principle rarely followed – cities can be built along tree-lined avenues and neighbourhoods around gardens.

Green beyond the colony
The Five Gardens is a green oasis now intruded by vehicles and the occasional high-rises. The buildings encircling the gardens were planned as three-floor structures with balconies facing the neighbourhood or inner streets and gardens; each plot also had a garden of its own. Bagli recounts when she used to taste the nectar of Oleander flowers in her grandmother's garden here.

The redevelopment bug has crept in here too. "The newly redeveloped buildings don't have gardens or common open spaces," Bagli says, adding that the concrete allows no trees and their ecosystems to grow. These buildings have concrete walkways devoid of trees, manicured terraces rather than trees in their compounds. With resignation, she adds, "We cannot stop change but we can save what's left of the trees."

Urbanisation is not the only woe for the trees. They are subjected to fairy lights wrapped around their trunks which disturbs the bats and birds. Besides, Climate Change has made the flowering patterns of these trees erratic; the Amaltas trees which used to flower in spring-summer are seen flowering in October too.

Legend has it that Mumbai's coconut palms were introduced to the old Mahim island by Raja Bhimdev in the 13th century and Mazgaon island, in south Mumbai, was famous for its mango orchards. The mangoes were apparently sent to the Mughal rulers, and are mentioned as the 'mangoes of Mazagong' in the poem Lalla Rookh by Thoma Moore, written as far back as 1817.

Many of Mumbai's localities were named after the trees and flowers found in local groves long before the islands were engineered into a city. Worli is named after its Banyan grove, Parel derives its name from Trumpet flowers called *Padel* by the native Kolis. Chinchpokli, which was earlier called Chinchpooghly, means a dell of tamarinds (*chinch* is tamarind in Marathi and Konkani). The Bhendi tree lent its name to Bhendi Bazaar while the jackfruit known as *Fanas* gave the name Fanaswadi to an area in Kalbadevi. Umarkhadi gets its name from being the *khadi* or creek where *umber* or fig grew.

According to a study by Bombay Natural History Society (BNHS), Mumbai has 318 species of trees, of which 50 percent are exotic, but this is a somewhat older chronicle of the city's flora. The Sanjay Gandhi National Park, Aarey forest, Veermata Jijabai Bhosale Vanaspati Udyan, Hanging Garden, Mumbai Port Trust Garden and of course, its mangroves are the other green spots. The word 'Vanaspati', meaning 'botanical' was added to the garden's name in December 2022, to emphasise its importance as a heritage botanical garden, thanks to the sustained effort of the Save Rani Bagh Botanical Garden Foundation of which Bagli is a trustee. It managed to save the garden from being turned into a "world class zoo" and hold it as a green heritage.

Hutokshi Rustomfram and Shubhada Nikharge, trustees of the Foundation, supervise the renovation of the Bagh. "Given Mumbai's high population density and poor air quality, the Rani Bagh garden sprawling 60 acres is literally a life-saving green lung, and footfalls prove that Mumbai's citizens love and value this space," Rustomfram says. With an average of 8,000 visitors a day, going up to nearly 30,000 on holidays, the Rani Bagh could well be one of the most visited botanical gardens worldwide, she adds. It has "the largest agglomeration of 4,131 trees across 256 species, and holds 80 percent of all tree species found in Mumbai," Nikharge says.

The century-old Sundari, or the Looking Glass Mangrove of Maharashtra, is found here. It is native to the Sundarbans. The Krishna Fig or Krishna's Buttercup is a one of a kind tree that is said to be found only in Rani Bagh. The Mumbai Sugran, which is endemic to the island of Mumbai, and is not found in the Sanjay Gandhi National Park is found here and is known as the Rani Bagh Sugran. It is the only surviving member of its species.

Up north, in the Aarey forest, the Waghoba Habitat Foundation has been conducting foraging walks led by the tribals or adivasis of Aarey. Sanjiv Valsan, founder of the Waghoba Habitat Foundation, believes that the Uddhav Thackeray- government's decision to declare nearly 800 acres as forest saved the trees here. The walks have generated curiosity amongst people and rekindled a sense of pride among the adivasis of their culture. "In a time of climate anxiety, the walks provide an alternative way of being with trees, the way that the adivasis have done from time immemorial," he says.

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The forest has at least 86 species of trees, found a study by activists in 2019, including the Babul, Palash, Bartondi, Apta, and Karvat to name a few. Among the trees recognised by the International Union for Conservation of Nature (IUCN) are trees like the Teak, Indian Beech and Golden Shower to Red Silk Cotton, and exotic species such as the Rat Poison and Jujube trees. The Aarey forest is also a part of Mithi River's floodplain.

Mangroves and more
Mumbai is also endowed with mangrove forests along its coast. Mangroves act as barriers against floods, storm surges, tidal waves and also tsunamis while also protecting the coast from erosion. Warming seas have meant that the Arabian Sea, which rarely ever sees cyclones, saw Cyclones Nisarga in 2020, Tauktae in 2021 and Biparjoy in 2023. Mumbai lost 9,000 acres of mangrove cover between 1991 and 2001 but has since stabilised after citizens' movements and judicial interventions.

Mumbai's Trans Harbour Link, the Coastal Road Project, the Mumbai-Ahmedabad Bullet Train Project and even the Navi Mumbai Airport are some of the infrastructure projects that threaten the mangrove cover even today.

The lingering smog and heat in Mumbai underscore the need for trees which act as barriers against pollutants, 'removing' them from the air, and physically collecting particulate matter on their leaves and barks. They dim out the high decibel noise of city life, as we experienced in Dadar Parsi Colony and Rani Bagh Botanical Garden. Mumbai needs more areas like these. The Dadar Parsi Colony is a testament to the planners of yesteryears. Its tree-lined avenues serve as an example of what Mumbai can be if its development is planned around trees and natural areas.

Drain the rain: Why urban India floods, how to build sponge cities

Maitreyee Rele

June 30, 2023

Urban floods have become an inseparable part of city life every monsoon. Lives are lost, livelihoods are disrupted, and property and infrastructure worth thousands of crores are damaged or destroyed. With the increasing challenges that Climate Change has brought and the rapid pace with which India is urbanising, the incidences of flooding are set to worsen. How frequent have floods been in some cities, why doesn't the rainwater drain off, what measures have been adopted by international cities built on water or below sea level, how does the concept of 'sponge city' unfold on the ground are some of the questions addressed in this visual essay.

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The Intergovernmental Panel on Climate Change (IPCC) in its sixth assessment report has warned of more intense storms and flooding as the planet warms. This is not the first warning bell. Even as dire predictions about rain and submergence turn into reality, cities across India have hardly taken concrete steps to address flooding. Instead, trees are razed for infrastructure projects and high-rises, water bodies are built over or lie neglected. How are city planners still designing urban spaces without understanding the consequences?

Most cities in India have the same story — expanding built areas, rapid depletion of vegetation, and more flood-prone areas. Though 'resilience' has become a buzzword, the efforts to make cities flood-resilient are half-hearted at best. For the past few years, there have been talks to make Kochi, Mumbai, and Chennai sponge cities – cities, which absorb rainwater through a number of green methods, to reduce the flood risk. China started turning its cities into sponge cities – with promising results. Indonesia's capital Jakarta is on its way to adopt the concept and Auckland, New Zealand's largest metropolitan city, has set an example of being the "world's spongiest city". The path to making cities flood resilient is green.

In the past 122 years, New Delhi experienced six major floods in 1924, 1947, 1976, 1978, 1988 and 1995, but just the past decade has seen five major floods – in 2013, 2018, 2019, 2021, and 2022. Bengaluru, despite its natural topography of rivers, valleys and lakes struggled through severe flooding in the last few years. After the 1974 inundation in Patna, the city witnessed disastrous floods in 2019 and 2021. In Guwahati, Chennai, Bhubaneswar, Kochi, Bhopal, Ahmedabad, and Surat — flooding has become more common.

Why are our cities flooding? There are different parameters for urban flooding, and for every city, the primary parameter might vary. These range from Climate Change to an increase in impervious surfaces in cities, encroachments on water bodies, increase in population and a spike in informal housing, poor land-use planning, geography and soil conditions, improperly-designed infrastructure, and inadequate drainage system. Why are our cities not draining themselves out? The answer is in how cities are constructed – more and more construction which disregards all else. **The neglect and insensitivity have resulted in our cities turning into massive machine-infrastructures built upon land that has been tamed instead of being a part of the land.**

To add to it, the drainage systems are poor. The stormwater system is disproportionate to the density of built spaces in newly-developed areas, the increase in untreated garbage and lack of desilting clogs drains, a lack of understanding of topography and hydrology while making urban development plans, rampant deforestation and encroachment of blue and green spaces. A city which is able to regulate and discharge rainwater would be a step closer to being sustainable.

Map 1: India floods
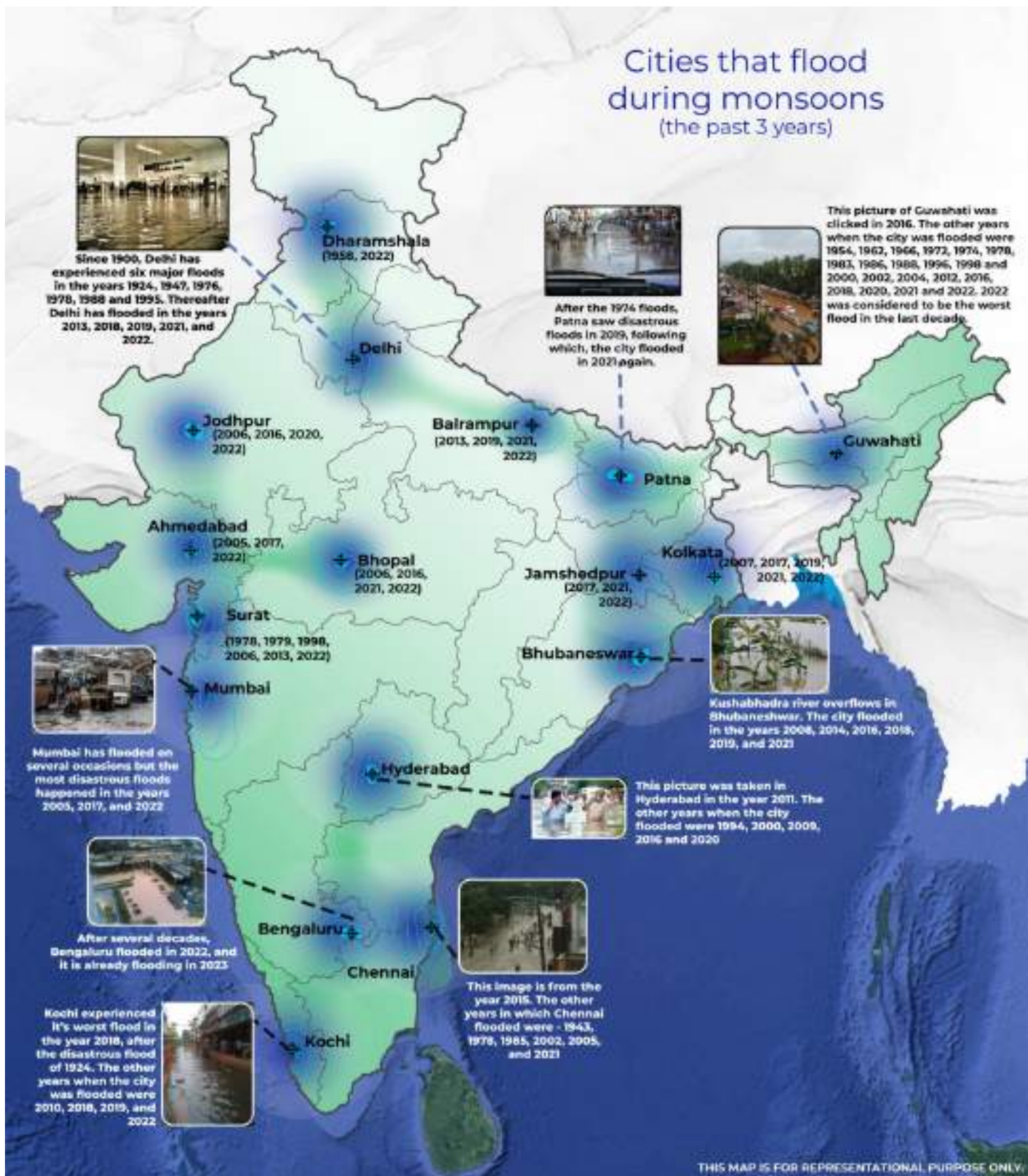
This map is an illustration of how cities, large and small, across India have seen frequent floods and waterlogging in the last decade. Other cities and towns faced floods too. In 2022, the annual rainfall measured across India amounted to 1,257 millimetres; ten years earlier, the total was 1,054 millimetres. In the past few years, there have been cases of flash floods in cities that do not flood regularly.

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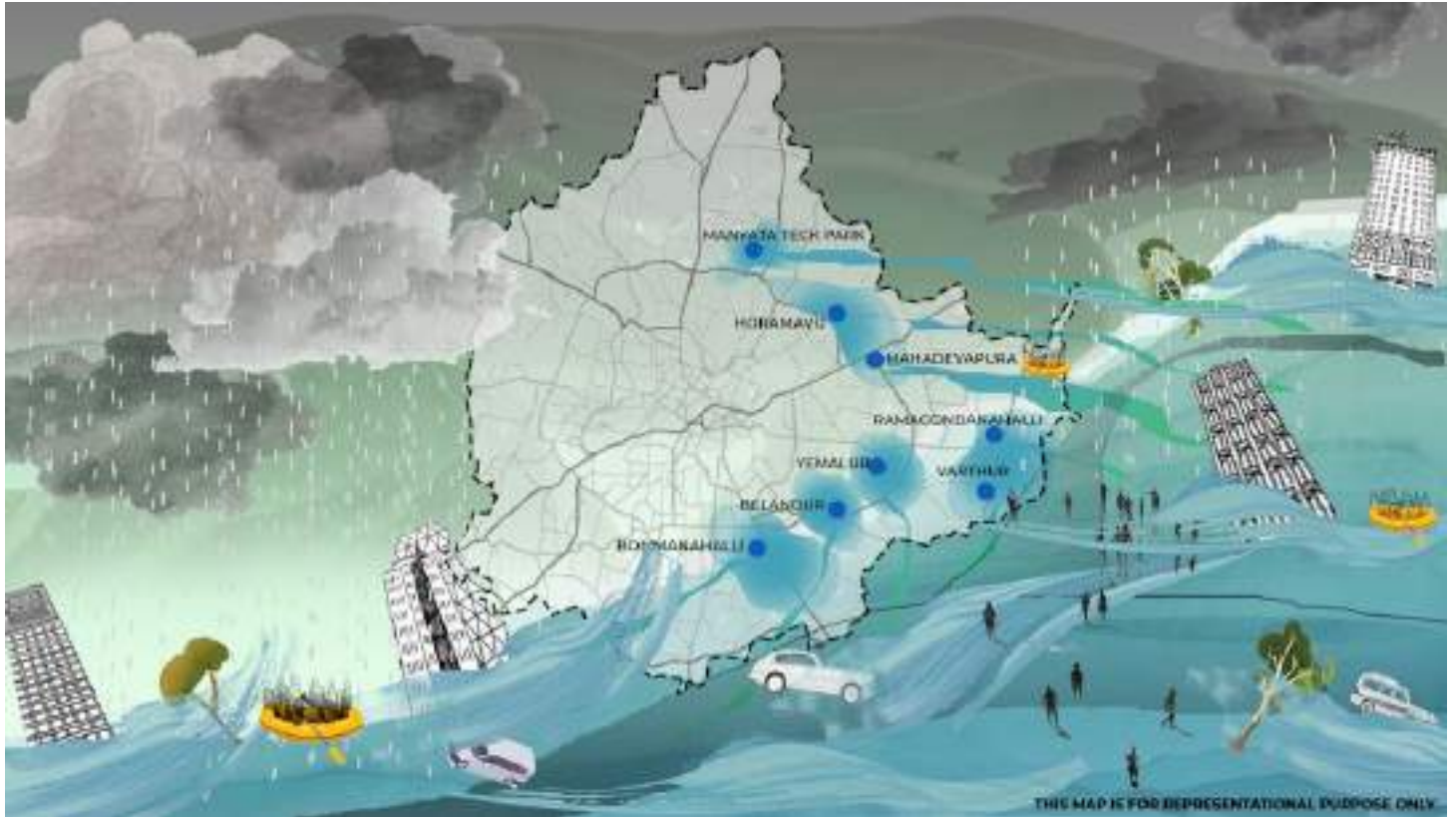
Map 2: Bengaluru

Bengaluru, which is situated in the rain shadow region of the Western Ghats, is part of an ancient wetland system. Bengaluru is located on a ridge which allows water to flow around it in three different directions. Across the city, its once-interconnected lakes linked by canals or *kaluves* have turned into individual basins as their connection was snapped by parcelling of land and construction. In a heavy downpour, a lake that has excess water cannot transfer it to the next lake through the kaluves. This has happened due to the encroachment of lakes and stormwater drains for construction and real estate, polluting the water bodies with debris and untreated discharge, rendering them lifeless. Construction and concretisation does not allow water to percolate into the ground which has increased waterlogging in the city.

A study by Indian Institute of Science (IISc) found that there had been a 79 per cent reduction in water bodies and the number of lakes in Bengaluru in only 44 years between 1973 and 2017 while urban areas of Greater Bengaluru increased by a staggering 1,028 percent.

In 2020, the Bruhat Bengaluru Mahanagara Palike (BBMP) identified 211 flood-prone areas across the city, 58 severely vulnerable to flooding and 153 moderately vulnerable. **Bengaluru, with its interconnected lakes and kaluves could be a natural sponge city, if only it took immediate measures to conserve what is left of its natural areas and repair its ecology.**

Map 3: Rotterdam

When it pours in Rotterdam, the city is barely affected because it was planned in ways that water would drain out. Instead of fighting the water, the Dutch have shown how to live with it, with minimum fatalities and disruptions. Rotterdam, the second largest city in the Netherlands whichlies at the confluence of the rivers Rhine, Meuse and Scheldt, has 90 per cent of its area below sea level. The city was built by landfilling. Its name literally means, 'the dam on the river Rotte' but a spate of disasters including the flood of 1953, which took 1,800 lives, changed its direction. The government initiated the Delta Works (known as Deltawerken in Dutch) programme to avoid a once-in-a-100-year flood.

Later, in 1999, the city completed building a system of floodgates, called Maeslantkering, near the mouth of the North Sea to protect the city from storm surges and flooding. It is tested from time to time. From trying to fight off water by building levees and dikes, the city of Rotterdam has embraced its reality — of a city built on water that's bound to flood. Its planning and design weaves in its topography. Rotterdam has built several water retention ponds across the city which help to collect rainwater and prevent waterlogging. These ponds have acted as floodplains. The new rowing course just outside Rotterdam, where the World Rowing Championships were held, is a part of the Eendragtspolder which is 22 acres of reclaimed fields and canals doubling as retention ponds. At 20 feet below sea level, it is among the lowest points in the Netherlands but, with bike paths and water sports, is a popular recreational space.

Besides, 0.33 square kilometres of the city's 18.5 square kilometres of flat roof space was covered with green and the city is developing a 'green-blue grid'. The idea is not just have green areas but also create reservoirs and tanks to retain excess runoff.

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Dakpark, once a railway switching station and a neighbourhood infamous for drug dealers, is now a dyke with a shopping centre and roof park which slopes down.

In a bid to stay ahead of Climate Change, Rotterdam has opened the world's largest floating office building alongside a floating farm, and a solar-powered Floating Pavilion in 2010 on its harbour. The city also has an app with a GPS which tells residents exactly how far below sea level they are. Dutch children are also required to earn diplomas to certify that they can swim with their clothes and shoes on. All the measures show how a city built by landfilling can flood-proof itself with appropriate and sensitive urban design.

Map 4: Auckland

The term "sponge cities" is used to describe urban areas with abundant natural areas such as trees, lakes and parks or other good design intended to absorb rain and prevent flooding. (United Nations Framework Convention on Climate Change)

The concept envisions urban areas with regenerated green spaces and water courses which can hold the rainwater or allow it a free flow while also effectively utilising it to mitigate flooding. Sponge cities have abundant natural areas such as trees, lakes and parks intended to absorb rain and prevent flooding; cities as diverse as Shanghai, New York and Cardiff are embracing their "sponginess" through inner-city gardens, improved river drainage and plant-edged sidewalks, according to this report.

Auckland, in New Zealand, turned out to be the most spongy city in a survey conducted by the architecture-design firm, Arup, when compared to seven other cities in the world.

New Zealand is prone to flooding when it rains. Auckland re-engineered pavements using gravel instead of tiles and cement to allow water to filter into soil, replaced empty lawns with native plants, and along the shore, planted trees to block the runoff. The city has engaged people to make Auckland more sustainable.

How can cities turn into sponge cities? First, integrating green infrastructure such as permeable surfaces, green roofs, and urban wetlands to help absorb and retain rainwater, and reducing the surface runoff which is a key feature of the concept. This keeps the water from getting polluted as it travels to larger natural drains and allows water to seep into the ground where it has a tendency to collect itself.

Auckland has incorporated these nature-based solutions into urban planning, by emphasising such green infrastructure projects. The city, like sponge cities of China, has also incorporated water-sensitive design practices by implementing sustainable drainage systems (SuDS). They employ techniques like rain gardens, bioswales, and retention ponds, hence allowing cities to manage their stormwater runoff at its source. This ensures minimising strain on drainage systems.

Urban designer Yu Konjian first articulated the sponge city idea in 2012 after flooding wreaked havoc on dozens of cities in China. Shenzhen and Harbin are examples of China's Sponge City Programme. Under the watchful eye of Kongjian and his firm which has carried out over 1,000 projects across 200 cities, the Bangkok Benjakitti Forest Park was spongi-fied and deemed a success; the sponge city model is improving day by day as the evidence base grows.

Auckland has the highest sponge rating of 35 per cent followed by Nairobi and New York. Shanghai and London have also taken steps to turn into sponge cities. In the United States of America, the two cities that are making headway in sustainable urban planning are Pittsburgh and Los Angeles. Cities are making permeable pavements, developing rain gardens, making vegetated swales which are essentially ditches filled with grass and plants that gather stormwater and help it seep into the ground. Los Angeles has its own story too.

'This summer heat is cooking our bodies alive, sweat runs off our feet'

Palani Kumar

June 2, 2023

The unbearable heat across cities this summer has been the harshest for outdoor workers who have no option but to toil through the high temperatures, without mitigating measures such as cool shelters and drinking water booths which should be provided by governments and employers. Of the many types of informal workers – street hawkers, door-to-door vendors, construction workers, drivers, gig workers and others – who keep Chennai rolling, head loaders and cart pullers who have to carry 80 kilograms in one load in the city's famous wholesale market Parry's Corner remain off the radar. Question of Cities met a few of the thousands of men who facilitate the commercial hub but find themselves – literally – on life's edge to get through the super-hot days.

On Acharappan Street in Parry's Corner, Chennai's old wholesale bazaar, Muthu and Krishnamoorthy are loading handcarts with sacks of rice and flour. This is hard physical labour on any day; it is utterly draining when the sun is blazing overhead and daytime temperatures are in the range of 40 degrees Celsius. But the two men, who have carried heavy sacks and loaded carts all morning this day in mid-May, do not have a choice. They must do this work for hours to keep their home fires burning.

This year, the heat in April-May has been particularly difficult for outdoor workers like Muthu and Krishnamoorthy – and me. I travelled the length and breadth of Tamil Nadu and spent summer days in Chennai documenting the lives and work of people who do not usually find space in the mainstream media. I am used to the heat, or so I thought. But after I trudged the streets in Parry's Corner speaking to the head loaders for the better part of the day and taking their photographs, I found it difficult to get up the next morning.

All outdoor workers have it hard, a few harder. Loaders or men who carry headloads or cartloads, without whom the wholesale commercial hub of Parry's Corner would not function, are among them. Each street here specialises in selling or trading certain products, the 20-25 streets are the city's prized shopping destination – stationery and books on Bunder Street, flowers and garlands on Badrian Street, textiles and garments on Godown Street, household appliances and cutlery on Evening Bazar Road, dry fruits on Naicken Street, motors-pumps-pipes and insulation or packing materials on Mooker Nalla Muthu Street, hardware and sanitary ware on Thambu Chetty Street and so on.

(Left to right) Raju, Krishnamoorthy and Muthu catch their breath in between work calls.

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The frenzied retail commerce on each street is silently facilitated by thousands of men like Muthu and Krishnamoorthy. Hailing from Villupuram, the 48-year-old Muthu who has been at this work for 25 years, says, "Compared to last year, the heat is unbearable, especially from 11am to about 3pm. If we don't work, we won't get our daily wages. We are annadangachis, daily wage workers, who have to work when called for. Those who work in air-conditioned rooms don't feel the heat. We also don't feel the heat because we're used to it," says Muthu.

On good days, which are rare, he earns Rs 1,000 but his average take-home is between Rs 100 and Rs 500 a day. "Only if I tire myself out here every day, can I educate my children." When his health fails, he returns home for two-three days, then comes back to Parry's Corner. The busy time around here is the first half of the month, in the run-up to festivals, and in summer when shopping peaks.

Muthu (left) and Krishnamoorthy are at their task as the sun scorches Chennai.

Krishnamoorthy, also from Villupuram, has been around Parry's Corner for nearly 35 years. "If we are bothered by veyil (summer heat), we can't live. We aren't Tata- Birla's grandchildren to chill at home with air conditioners. If we stay at home, we can only afford one meal. So we work...These heat waves literally burn our legs as we carry and drag goods that are meant to be carried by bulls and oxen. Each sippam, a bundle, weighs around 50 kilograms. We load 30-35 bundles and drag it using an iron hook with our bare hands. For one stretch, we drag around 1,500 kilograms," he says. The

footfalls in the bazaar have fallen as retail shopping only picks up in the evening but head loaders work through the day, ferrying goods from wholesale stores to the lorries nearby.

G. Ramesh and S. Vetri struggle to drag the loaded cart out of the market.

No water, no slippers

Most men hope to make between Rs 12,000 and Rs 15,000 a month but there are no guarantees. As the 29-year-old R. Raji, from Vyasarpadi in Kannayapuram, says, "We earn according to the work we do every day. Some days we walk home with empty pockets; on other days, we get paid." They save a large chunk from their meagre earnings for their families, usually for children's education, which they take with them when they return to their villages in the second half of the month.

However, they do not stay home for more than two-three days because "a prolonged holiday makes us unwilling to return to this work…We are expected to carry and drag loads like bulls do. The only difference between bulls and us is that we are born humans," lament Muthu and Krishnamoorthy.

Many head loaders are forced to count their paise even to keep themselves hydrated. Coconut water, usually recommended to beat the heat, costs Rs 50 apiece which is expensive for them. They make do with water available in the bazaar, mostly due to largesse of their owners or shopkeepers. Says G Ramesh, from Thindivanam who has carried head loads for 25 years, "From the Rs 500-600 I earn every day, I keep a hundred for my food and send the rest home. How much water can I buy?"

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G. Ramesh suffers from severe
body pain and fatigue –
symptoms of heat stress.

He is weighed under an 80
kilograms cotton bale at
Parry's Corner.

Ramesh believes that this summer has brought unbearably high heat compared to the past. "This summer heat is cooking our bodies alive. The heat begins to rise around 7am and it is extremely hot till past 3pm. It is exhausting. If we pull a load, we can't get to the next one without relaxing for a few minutes. When we put our feet down, we can see sweat running off our feet. I suffer from severe body pain as well as physical fatigue. But I work," he explains, drenched in sweat.

Ramesh, like many head loaders here, does not use footwear. They can, at best, afford chappals or slippers but these are hazardous. They find that chappals make them slip. Says Muthu, "It's extremely dangerous to wear slippers while pulling and dragging huge bundles. Many have met with accidents, a few have even died in such accidents. Our feet get scorched and blistered which causes awful pain, our legs burn and itch. At night, this burning sensation spreads across our entire body, hits our heads. If we lie down, we can't get up. If there are any casualties, the owners don't help us. We work here as long as we can; when we can't, we have to simply leave."

Their nights are hardly better than their days. Without their own houses or rooms to return to, they make do with sleeping slots in shops or lorry sheds. The bazaar is where they work – and rest.

S. Vetri and G. Ramesh lift the heavy load on a street bracing themselves for the harsh heat.

Scarce public facilities

The loaders and cart pullers complain of heat-related skin problems and diseases. M. Parthiban, 32, has skin eruptions but he cannot afford medical attention. "The cost of living has peaked after GST was introduced but our wages remain the same. We are paid Rs 700 for a hundred bundles, but if there are five of us then we get Rs 100 each."

The common complaint here is lack of facilities. Drinking water facilities and public toilets – two critical amenities for outdoor workers, especially in summer, mandated even in the city's Heat Action Plan (HAP) – are scarce here. Most men rely on the goodness of shopkeepers, where they deliver their loads, to get the much-needed glass of water. A few get, others don't. "If we have to relieve ourselves, we squat near dustbins. Even if we choke while eating, it's hard to find a glass of water," says Parthiban. The nearest common toilet is almost two kilometres away at the bus stand.

The harsh sun glistens off
S. Vetri's back as he lifts
the sack into the truck.

Thirty-eight-year-old S. Vetri from Vyasarpadi is among the newer men on the job. He finds the heat highly oppressive, but somehow gets through the day. "This work is very torturous but I don't want to rely on anyone. My wife died a few years ago from cancer; we didn't have kids." Men from Ariyalur, Salem, Thindivanam, Pondicherry, Marakanam, Kadaloor, Vilupuram and Virudhachalam and many other places come here to work, most of them spending nights in an allotted part of their workplaces and starting work by sunrise to beat the heat. Yet, the heat makes them slower. As S. Krishnan, 30, says, "I would be done by 12 noon if I started pulling the loaded cart around 11am but now it gets done by 2pm. No matter how much water I drink, I feel dehydrated. I don't use the bathroom till evening by when urine becomes concentrated dark yellow."

S. Krishnan, 30, says heat slows down the work.

This is where public amenities like cool shelters, drinking water, and public toilets matter. It is the responsibility of governments or civic bodies to provide these, according to the HAP.

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Islands of heat

Areas that are densely built and highly congested at most hours of the day tend to be hotter than others – the Urban Heat Island effect. Studies showed that commercial hubs in north Chennai, where Parry's Corner is located, are among the areas in the city where "the temperature differences between fringes and central parts of heat packets were in the range of 3 to 4.5 degrees Celsius". This study cited high discomfort in May and June.

(Left to right) Ramesh, Pandiyan, Parthiban, and Vetri take a break.

Chennai, a coastal city, sees high daytime temperatures which have been on the rise but the heat index – feels-like temperature – is higher due to the high humidity. So, 38 degrees Celsius can feel like 45 degrees Celsius to people and extended exposure to such levels can turn hazardous.

"We can't afford even a tender coconut to beat the heat. We earn only Rs 7 or 8 per bundle so how can we spend that money on a tender coconut that costs ₹50. Our owners provide us with buttermilk and curd rice – that's all we have. Only if someone buys for us can we drink and eat other things," says Vetri.

This raises questions about the associations and sanghams that workers like Muthu, Krishnamoorthy and Vetri are part of, which can negotiate with traders or the government on their behalf.

It's a sore point with many of the men. S. Shankar, 46 years old and working in Parry's Corner for the past 25-30 years, says that around 2,000 men must be at work at any given time in these streets. "There are many sangams and associations here for us, but I don't find them doing anything worthy for our welfare," he shrugs. The Sumai Thookum Tholilalar Sangam office bearers did not respond to the phone calls.

The workers have lunch after hours of toiling outside in the hot sun.

Even the provision of basic facilities of cool shelters and drinking water on each street can make a huge difference to the thousands of outdoor workers, especially those who do hard labour, in Parry's Corner. It has office spaces, of course, but these are out of bounds for the head loaders. "The office spaces are used only by owners-traders, we annakavadigal belong to the streets. They are the entrepreneurs, we are after all only daily wage labourers," bemoans Parthiban.

It is these men on the streets who most need respite from the harsh sun and high heat. "During summer, it's a nightmare to pull carts. When we walk barefoot on tar roads, we literally feel our feet burning," bemoans Krishnamoorthy.

Photo: Jashvitha

Heat index, or the temperature it feels like, will change the way India measures heat

Shobha Surin

June 2, 2023

Mere air temperature or land surface temperature, conveyed as minimum and maximum temperature twice a day, is no longer enough to combat heat during the harsh summer. The heat index, which layers temperature with other factors such as relative humidity, is a more accurate description of how hot it feels. Often called "feels like temperature," it is usually several degrees higher than the air temperature. A 38 degrees Celsius reading can feel like 44-45 degrees Celsius in some places. The India Meteorological Department started communicating the heat index on an experimental basis this March and hopes to give India its own index, called the heat hazard score, next year. What is it? Why does India need one? Read on.

Telangana received some hot news this May 29. The India Meteorological Department (IMD) placed the state in the "caution zone", flagging off that the daytime temperatures there ranged between 35 and 45 degrees Celsius. It was India's first-ever heat index – a concept that is gaining ground around the world to determine what the temperature "feels like" to people and has been adopted in India this summer on an experimental basis.

The heat index is widely considered a more incisive and near-accurate measurement than mere air temperature or land surface temperature of the heat that human beings and animals battle against. It takes into account the air temperature that's routinely measured but layers it with metrics such as relative humidity to arrive at a number that is a more correct, real-feel, measurement of exactly how hot it feels.

The heat index figure is usually several degrees higher than the air or land surface temperature. In fact, the term "feels like temperature" or apparent temperature are often used to describe the heat index. Our electronic devices already have weather apps which tell us this. Earlier this week, Mumbai's temperature on phones read thus: "33 degrees Celsius, feels like 44 degrees Celsius".

Climatologists advocate that merely communicating temperature to people can be misleading because when combined with factors such as relative humidity, wind direction and speed, green cover, built density and so on, the real temperature they are combating tends to be far higher than that simple metric. The "feels like temperature" leads to heat-induced stress, or heat stress, on the body which could prove hazardous to people's health – or life.

As many as 14 people died and more than 200 had to be hospitalised on April 16 this year when the Maharashtra government held its Maharashtra Bhushan award ceremony in an open ground in Navi Mumbai and had lakhs of people gathered there for over six hours. The air temperature that day read 38 degrees Celsius but, evidently, the heat index was far higher. Estimates are that it would have been in the mid-40 degrees Celsius range. People apparently took ill from the heat stress and 14 among them died of heat stroke. Those who recovered in the hospital told the local media about the dehydration and exhaustion they had felt waiting for hours in the scorching sun of the afternoon. Parts of Kerala recorded temperatures above 40 degrees Celsius in April too but the heat index had touched or breached the 50 degrees Celsius mark.

In May, the state experienced similar rising temperatures disrupting people's normal routines and prompting the authorities to chalk out immediate damage control plans. Other parts of India such as Bihar, Jharkhand, Odisha, Uttar Pradesh and Rajasthan have registered temperatures in the upper 30 to lower 40 degrees Celsius range; the heat index, if measured, would have been way higher.

Measure the heat hazard
Climate Change has made heat waves – prolonged high temperatures – more common now, even areas that did not experience high heat are now reporting heat waves. However, this simple metric of air temperature or land surface temperature has

increasingly proved insufficient or inaccurate to deal with the impact of high heat on people. As is commonly said, 40 degrees Celsius in the plains is not the same as in coastal areas, it does not mean the same in tropics and deserts.

"Heat stress is mostly caused by temperature but other weather-related factors such as humidity, radiation and wind are also important...Our bodies gain heat from the air around us, the sun, from our own internal processes such as digestion and exercise. In response, our bodies must lose some heat. Some of this we lose directly to the air around us and some through breathing. But most heat is lost through sweating...Meteorological factors affect all this. For example, being deprived of shade exposes the body to heat from direct sunlight, while higher humidity means that the rate of evaporation from our skin will decrease. It's this humidity that meant the recent heatwave in south-east Asia was so dangerous, as it's already an extremely humid part of the world," explained climate scientists Alan Thomas Kennedy-Asser, Dan Mitchell, and Eunice Lo.

The heat index, launched on an experimental basis in March, takes into account the air temperature as well as relative humidity. When communicated as such, people know not only what the day's maximum and minimum temperatures are but also what "the temperature actually feels like". IMD Director General Mrutyunjay Mohapatra told the media at the launch that "we are utilising the temperature and humidity data at 2:30 pm for the heat index, and the forecasts as the maximum temperature occurs at that time".

The IMD began using the formula devised by the United States' National Oceanic and Atmospheric Administration (NOAA) to calculate the heat index but clarified that the metric is yet to be validated for Indian conditions. Mohapatra informed that the IMD is "coming up with our own system now, a multi-parameter product called 'heat hazard score'. We hope that it will be better than the others" as it factors in temperature, relative humidity, wind patterns and exposure time.

The heat index for Indian conditions, or the heat hazard score, which the IMD hopes to have in place by next year, will alert people – and governments – to take precautionary measures in time. Evolving a heat index for India and communicating it to people has not come a day too soon; it is crucial for people to know what the temperature "feels like". The four categories of excess heat measured in the index are communicated as zones – caution zone, extreme caution zone, danger zone, and extreme danger zone – which progressively alert people to possible heat stress, heat cramps, heat exhaustion, and heat stroke. The excess heat factor methodology has been adopted as the standard metric in Australia.

Why India needs a heat index
Typically, the IMD and independent meteorologists put information in the public domain about minimum and maximum temperatures for different cities or regions. This enabled the declaration of a heat wave. The IMD uses two parameters to classify abnormally hot temperature as a heat wave: The maximum temperature recorded at its local meteorological station and departure from the normal in that station.

When the maximum temperature reaches 40 degrees Celsius in the plains and 30 degrees Celsius in the hills, it considers and warns that there could be a heat wave. It is declared as such if the maximum temperature crosses 45 degrees Celsius and is at least 4.5 degrees above normal for two days. A severe heatwave is declared when the temperature is above 40-45 degrees Celsius and more than 6.5 degrees above normal for that station over two days. Lately, the IMD has begun issuing heat wave alerts in colours ranging from yellow to amber to red, making it easier for people to comprehend the severity of the situation.

However, it is still one metric of the temperatures recorded and does not factor in other parameters which determine what is the level of hazard people face. A maximum temperature of 38 degrees Celsius in humid cities like Mumbai and Chennai feels harsher and more unbearable than in the plains. This underscores the need for a composite heat index, or heat hazard score, which allows people to know the actual heat level around them. This has become critical given that Indians suffered through 200 heat wave days last year with some of the hottest months since 1901. India (and Pakistan) is among the world's hotspot regions for heat waves in the world.

"A relative humidity of 90 per cent has the effect of 45 degrees Celsius. With higher relative humidity, we perspire as a result the body's temperature increases without getting a chance to dissipate the temperature. So, in coastal areas, a lower temperature creates more discomfort and fatalities than in areas where relative humidity is less," says Kamal Lochan Mishra, former executive director, Odisha State Disaster Management Authority (OSDMA). In the state capital Bhubaneswar, a coastal city, 35 degrees Celsius feels more like 45 degrees Celsius whereas Nabarangpur, which is 520 kilometres from Bhubaneswar, would feel like 35 degrees Celsius when the temperature records as such.

Heat is a silent killer, often ignored, in tropical countries like India. With increasing frequency and intensity of heat waves, triggered by Climate Change among other factors, it has become imperative to go beyond the minimum-maximum reading that has been traditionally done in the country. Heat index, or heat hazard scores, will enable planning measures to combat extreme heat and equip people with the information they need to take decisions about their lives; it could help decide everything from working during afternoon hours to staggering school and office timings, and so on.

The more granular, the better
Heat waves are recorded in places but the heat stress and its impact are borne by people. The more finely calibrated, nuanced, and layered India's heat index can be, the more accurately heat stress can be predicted and tackled. Experts in the domain are calling for making the heat index or heat hazard score as granular as possible, at city and district levels. Just as flooding during heavy rain is a local issue with some areas in a city experiencing higher water levels than others – as a result of local factors such as built environment and green cover – heat too is localised.

In the same city, areas with abundant green cover and lower density of buildings are likely to show a lower reading on the heat index than areas that have no greens but

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closely-spaced tall buildings. The latter classified as the Urban Heat Island effect underscores the need for a granular heat index.

Dr Rajashree Kotharkar, professor at Department of Architecture and Planning, Visvesvaraya National Institute of Technology in Nagpur, who has researched heat in India and advises on a model Heat Action Plan, says each place would have a particular index. "It is good that the IMD is releasing the daily heat index. But additionally, all cities will have to conduct studies to find out local thresholds which is a basic requirement for Heat Action Plans. Currently, we have the same threshold throughout the country – 45 degrees Celsius for plains, 37 degrees for coastal, and 30 degrees Celsius for hill areas. Trying to find a threshold for each district (or city) will take time" she said to **Question of Cities**.

While it may be fanciful to expect area-wise heat indices for cities or districts at this stage, it should be the way forward for the IMD. For now, even if cities and districts are able to receive localised heat index readings, on a dynamic basis through the day as far as possible, it would help to mitigate the heat stress that people face and help avert heat-related illness and fatalities during a heat wave. In Navi Mumbai, for example, a heat wave had not been declared that fateful day in April but clearly the heat index was high enough for hundreds of people to take ill.

Ideally, it would be sensible to also communicate the Wet Bulb Temperature (also called Wet Bulb Globe Temperature) in addition to the heat index or heat hazard score. The Wet Bulb Temperature is a measure of the heat stress that people feel in direct sunlight; it considers the ambient temperature, factors in relative humidity and wind speed as the heat index does, and additionally calculates the sun angle and cloud cover or solar radiation.

With millions of Indians in direct sunlight through the day, this would be an important metric to have. A staggering 75 per cent of India's labour force is employed in outdoor or heat-exposed work, according a report by McKinsey Global Institute.
The incidence of outdoor work and the number of hours spent working outdoors are projected to increase in the coming years. Official data showed at least 8,500 heat-related illnesses from March to May this year.

The cumulative heatwave-related mortality in India is over 24,000 deaths since 1992. This is only the recorded figure and likely to be an under-estimate given that heat-related death data is not always recorded and the full impact of a heat wave is often not known until weeks or months later. A recent report averred that heat waves are among the deadliest natural hazards with thousands of people dying from heat-related causes each year and many more suffering severe health and livelihood consequences, and that heat waves across India and Bangladesh were 30 times more likely.

While the focus has been on drawing up and implementing Heat Action Plans – which are sorely needed to combat the increasing incidence of heat waves – developing a reliable heat index and effectively communicating it to people through all media would go a long way in prevent heat stress and heat-related illnesses because the future is hotter than ever.

Mumbai needs an Ecological Plan beyond the quick fixes for air pollution

Smruti Koppikar

February 24, 2023

Mumbai's air quality has been deteriorating since November last year but hardly anyone thought it would soon get the dubious tag of the second-most polluted city in the world. Even the Arabian Sea, the city's natural cleanser, could not help clear the heavily polluted air. Mumbaikars have been battling ailments related to bad air but the authorities are yet to see air pollution as a public health hazard, let alone an emergency. They are a long distance away from making the link between air pollution and the city's natural ecology, but that is the way forward. Air pollution is not a minor seasonal problem, it is likely to escalate into a larger threat to people and the economy unless addressed in a comprehensive ecological framework.

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For the fortunate Mumbaikars whose apartments overlook the coast, the Bandra Worli sea link became the marker of how bad the city's air was – its iconic outline barely visible on the heavily polluted days. Those who could see vast stretches of the city from their balconies and windows often found that the haze made the skyline nearly invisible. For millions whose view of the city was mostly from the ground level, there were other markers such as increased incidences of respiratory ailments, incessant coughing, frequent visits to the neighbourhood doctor, and the grim realisation that the masks which were bought to keep the Covid-19 virus at bay had to be used to filter the ganda hawa, or bad air as it has been colloquially called.

From November through February, Mumbai has had the worst air quality in many years. The city had long compared itself favourably with New Delhi which had earned the dubious reputation as one of the top three polluted cities around the world. The Arabian Sea helped sweep Mumbai's pollutants away and cleansed its air in ways that natural ecology silently does. This advantage has steadily diminished – Climate Change has influenced changes in wind patterns and speed, as studies have shown – at a time when pollutants in Mumbai's atmosphere have steadily increased.

This February may well rank as the worst polluted in many decades with Air Quality Index (AQI) readings falling from 'poor' (201 to 300) to 'very poor' (301 to 400) and bordering the lower end of 'severe' (401 to 500) on several days. Nine out of the month's 17 days recorded very poor quality air, making it hazardous for the city's nearly 20 million. What is worse is that there were no days with 'good' (0 to 50) or 'satisfactory' (51 to 100) AQI readings for at least three weeks of the month.

These readings came on the heels of AQI numbers in January which saw the index touch 'very poor' on two days and 'poor' for nearly 13 days. The consistency of high and hazardous AQI readings stood out in stark contrast to the last two years in which there were only two days each in February with bad air quality. Clearly, air pollution was no longer an issue that Mumbaikars – mainly its authorities in the Brihanmumbai Municipal Corporation (BMC) and the state government – could relegate to the back burner.

Road and construction dust, and vehicular emissions are the main sources of air pollution in Mumbai contributing more than 70 per cent of the Particulate Matter (PM) in the air, according to National Environmental Engineering Institute (NEERI)-led study in 2021; airport operations, garbage dumps, industrial emissions make up the rest. The dust is literally everywhere. The top three sources contributed only 28 per cent in 2010. It is clear that massive construction and demolition activities, including infrastructure projects and thoughtless expansion of road or private transport burning more fossil fuels, have come at a huge price.

Public health emergency
The alarm was visible in the rash of online petitions that Mumbaikars circulated and signed demanding that the authorities take immediate steps to keep the pollutants under control. The petitions urged the authorities to implement what was in their

domain such as capping construction and road dust. There was a nine percent year-on-year rise of home registrations last year; in addition, there is large-scale commercial and infrastructure construction across Mumbai. This 'build-more syndrome' is worsened by the BMC's recent move to construct car parks under the city's gardens and green spaces in which the tree cover would be further endangered.
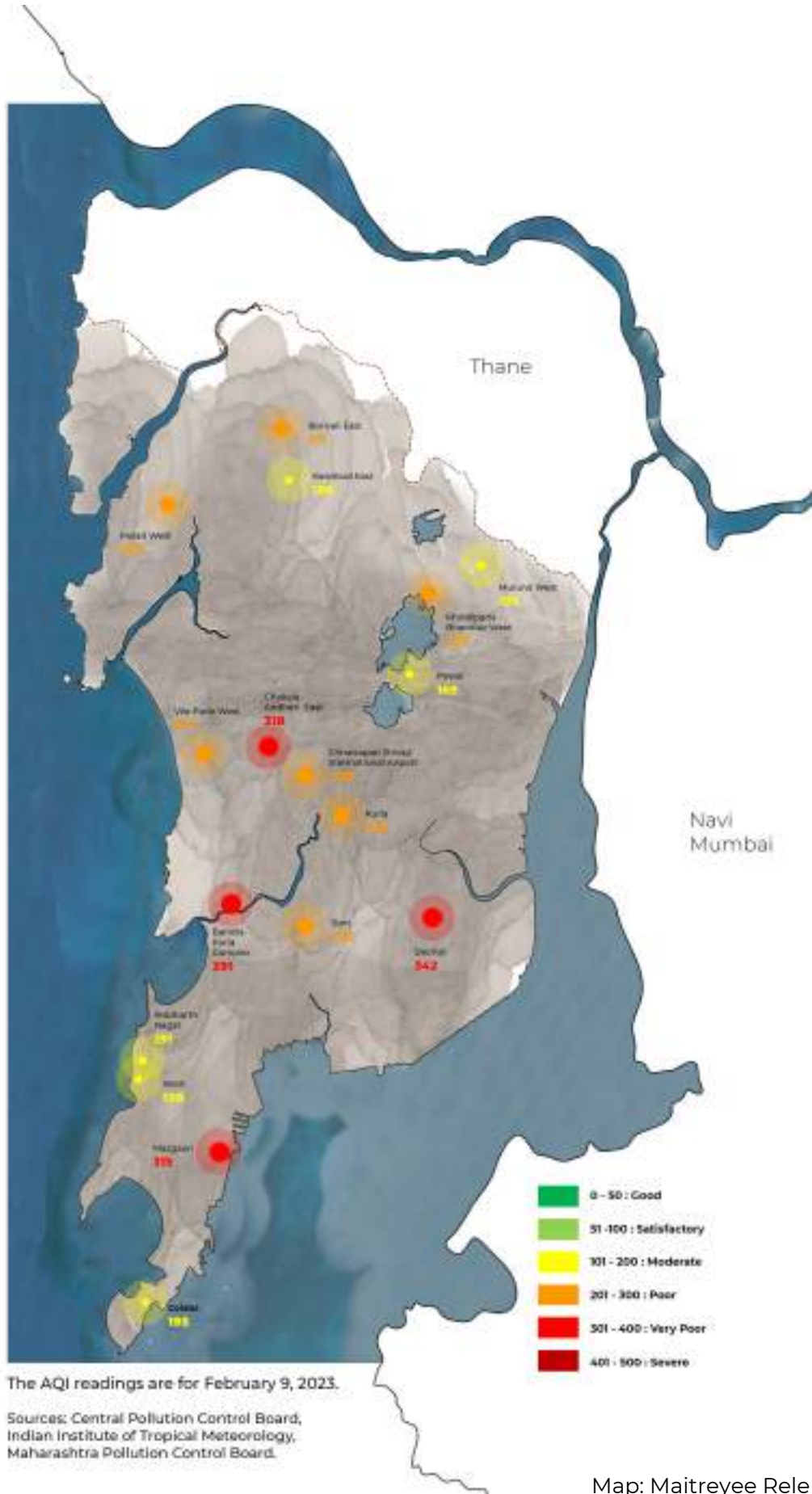
The BMC's annual budget 2023-24 laid out some relief measures and chief minister Eknath Shinde's suggested that Mumbai be fitted with air purifier towers. While these may provide localised and temporary respite, they do not point to a comprehensive and long-term solution.

The government and the BMC are not responding to air pollution as a public health issue. Consistently high levels of pollution may well qualify as a public health emergency on the lines that the Covid-19 pandemic was; instead, the approach is to throw a few pennies and programmes at a complex issue. There is evidence of deaths related to or caused by air pollution; in 2020, the year of the lockdown when air quality was not as bad, a study by the Greenpeace Southeast Asia had calculated nearly 25,000 deaths in Mumbai linked to air pollution. The fatalities in Delhi were twice as much but that is hardly a consolation.

The World Health Organization (WHO) estimates that there are more than seven million premature deaths every year associated with exposure to air pollution, that nine out of every 10 people around the world living in cities are breathing less than optimal air, and has urged governments to treat air pollution as a public health issue. Consistent poor air quality, its studies show, affects the respiratory system, and makes people more susceptible to other ailments, including cancer, neurological disorders, cardiovascular diseases, as the toxic particles move in the bloodstream.

If motor vehicles or airplanes had defects which caused a tiny fraction of these fatalities, there would have been a worldwide furore and the vehicles called back, compensation offered, and so on. But deaths due to or linked to air pollution barely cause a kerfuffle in governments – or even among people. The authorities see air pollution as a minor seasonal problem – nothing more.

In large cities such as Mumbai, the health impact of air pollution is not evenly felt. Those who can afford air purifiers at home and in offices, or frequent trips away from the city, are better placed to counter it. Millions who take public transport every day, work outdoors for long hours such as police personnel and delivery executives, labour on construction sites or garbage dumps directly inhaling the bad air can least afford mitigation measures – or the treatment when they take ill. If tagged a public health issue, or public health emergency during its worst period, the authorities have to assume responsibility for medical care.

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The AQI readings are for February 9, 2023.

Sources: Central Pollution Control Board,
Indian Institute of Tropical Meteorology,
Maharashtra Pollution Control Board.

	0 – 50 : Good
	51 -100 : Satisfactory
	101 - 200 : Moderate
	201 - 300 : Poor
	301 - 400 : Very Poor
	401 - 500 : Severe

Map: Maitreyee Rele

The map shows the 'very poor' air quality in Chakala-Andheri East, Mazgaon,
Bandra Kurla Complex and Deonar in Mumbai.

Band-aid on a bleeding wound

In the BMC's seven-step plan to combat air pollution, called the Air Pollution Mitigation Action Plan (APMAP), Rs 25 crore or just about half per cent of its annual budget of Rs 52,619 crore for 2023-24 has been set aside. BMC administrator Iqbal Singh Chahal announced that "better practices" will be adopted for construction and demolition of buildings, specific measures to reduce dust on roads, creation of urban greenery, encouragement of clean transportation and sustainable waste management practices, and so on.

At this stage, when 'poor' to 'very poor' AQI days abound, the BMC is still planning to set up dedicated air quality monitoring units at the ward level, install 14 air purifier towers each of which can purify air within a one-kilometre radius, and mount air purifying filters at five locations which record high amounts of carbon emissions due to heavy vehicular movement such as the Dahisar and Mulund toll nakas, Kalanagar, and Haji Ali.

More data will help localise the issue because not all areas of Mumbai are equally polluted. On a given day, when the average AQI for the city hovers in the 200s, there are areas relatively cleaner with an AQI of 80-100 and areas far more polluted with AQI of 300+ such as Andheri East and Bandra-Kurla Complex.

It must be noted that these are still plans on paper; action is still some distance away. Besides, the experience of the cities which fitted air purifying towers or filters is that they offer limited respite and cannot constitute long-term resolution of the problem. Even if all the relief measures announced are implemented, it would be a classic case of band-aid on a deep bleeding wound, considering how widespread and deep-rooted the problem is.

What is appalling is that the BMC has not seen it fit to inform Mumbaikars on a regular basis of the pollution levels in areas across the city, and the steps it will take as part of the emergency response mechanism. Like Delhi's Graded Response Action Plan (GRAP), a set of measures mapped to the AQI categories such as ban on construction during bad days, it was possible for Mumbai and Mumbai Metropolitan Region to adopt their own. In fact, the Maharashtra Pollution Control Board (MPCB) had drafted a plan two years ago. Why was the GRAP not implemented, why did the BMC ignore warnings of high pollution this year?

The missing link – ecology

Caught in the minutiae of measuring air quality and installing filters, just as the authorities are missing the link between air pollution and public health, they are ignoring – wilfully or otherwise – the important link between air pollution and ecology. Mumbai's rivers and waterbodies, forest and tree cover, all dimensions of its natural areas hold the key to understanding the issue and showing the way forward towards a comprehensive and long-term response plan.

Air pollution is a layered issue. Air filters and other technological fixes, though necessary as immediate responses, work at a superficial level. Such measures, often politically convenient and symbolically significant, become ends in themselves because

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they allow the authorities to show that "something has been done". This also lulls citizens into believing that action has been taken, allowing the authorities to escape the more difficult, comprehensive and long-term measures that are required.

The present situation calls for a holistic response. In focusing on near-term fixes, the authorities not only avoid their responsibility to evolve a holistic plan but also display their ignorance about the larger ecological framework within which air pollution occurs. The quality of air is invariably and inextricably linked to, or a result of, the quality of ecology in a city. The more green and open areas, the greater the number of trees across a city, and the more complex its biodiversity, the better its air quality will be.

Trees sequester carbon and help to decarbonise the city's air – they can influence air quality locally, but also over a large area, by changing the deposition and dispersal rates of pollutants in the air. By absorbing toxic pollutants which give high readings of PM 2.5 and PM 10, they help to naturally 'filter' the air.

How does Mumbai fare? The city lost more than 2,028 hectares of tree cover – or one and half times the size of Aarey forest – in only five years between 2016 and 2021, according to the Mumbai Climate Action Plan. In Aarey itself, nearly 2,140 trees were felled virtually overnight for the car shed of Mumbai Metro 3. Claims made by authorities of transplanting trees must be taken at face value given that the Bombay High Court's fact-finding team found in 2019 that more than 60 per cent of the transplanted ones had died.

Similarly with mangroves, which besides preventing erosion and absorbing storm surges, capture massive amounts of carbon emissions from the atmosphere. Spread across Mahim, Bandra, Versova, Vikhroli, Airoli, Vasai, Malad and Manori, and Sewri, Mumbai's mangroves have served as its ecological sentinels. Between 1991 and 2001, the city lost a large swathe of its mangroves. However, thanks to the sustained campaigns by citizens' groups and some judicial intervention, the mangrove cover stabilised at around 36 square kilometres in the past few years. The threat is not over – mangrove patches are at risk from infrastructure projects such as the Coastal Road and the Mumbai-Ahmedabad bullet train.

Cutting through the smog
The air purifier towers and filters apart, there are steps that authorities can take to make Mumbai's less polluted and hazardous.

Ecological plan: Mumbai needs a comprehensive, far-reaching, and inclusive plan to address air pollution in a meaningful way. The need of the hour is an Ecological Plan, on the lines of the city's Development Plan 2034, which can map all its natural areas, chart ecological goals, and decide steps to conserve these areas in ten-year and 20-year periods.

The Ecological Plan must have clear no-go areas where all 'development' which threatens ecological balance and diversity is proscribed, set down air and water pollution parameters which cannot be breached (construction activities must not be allowed between November and February when the air quality is 'very poor'), lay down

a roadmap to increase the tree cover. Officials at ward levels must be made accountable for the natural areas in their wards. The Ecological Plan would be more comprehensive than the city's Climate Action Plan; it must inform the Development Plan.

Immediate response: In the near-term, urgent steps are required such as following Central Pollution Control Board guidelines to mitigate construction dust including sprinkling water, covering sheets on construction material and debris, washing truck tyres and so on; movement of commercial transport can be regulated in the day time to cut down vehicular emissions, and so on.

Monitoring and measuring air quality must be taken to the next level of informing Mumbaikars in a continuous manner on the lines of COVID-19 dashboard. The authorities must also think of Low Emission Zone policies which have yielded good results in international cities.

Multiple agencies: The buck should stop at the BMC, but given Mumbai's fragmented system of governance institutions, other authorities such as the MPCB, Mumbai Metropolitan Region Development Authority, Mumbai Metro and others are responsible for various actions to keep the pollution levels down. What is needed is a clearer chain of command where irrespective of the agency working on the ground, the BMC must have the mandate to enforce all norms to combat air pollution.

Economy and public health: Continuing high pollution levels, accompanied by other incidences such as high summer heat and urban flooding, can eventually reflect on the city's economy. Their economic impact must be borne in mind, but for now the BMC's focus must be on public health; it must involve its own and the government's health departments in tackling the impact of air pollution on people.

The bad air days will pass, the problem will persist unless holistically addressed.

Photo: Government of Odisha/ Creative

How Bhubaneswar's master plan was overtaken by unsustainable development

PK Das

January 27, 2023

German-Jewish architect Otto Koenigsberger adopted a linear approach in building Odisha's capital Bhubaneswar in which the neighbourhood unit would be "an attempt to transplant into the city one of the healthiest features of country and small-town life." This, he argued, would enable people to understand their civic responsibilities much better than a large amorphous city. However, in its expansion, Bhubaneswar has spread far beyond the plan and in ways that the planner would not have imagined. Urbanisation has encroached on agricultural land and forests around the city putting it on the path of unsustainable growth and left behind the less-privileged people for whom life is a struggle. Bhubaneswar should have – and can do – better.

Among the many fond memories of growing up in Bhubaneswar, then one of India's planned new towns after independence along with Chandigarh and Gandhinagar, is one of spending long evenings with the family as the cool southern breeze gently swept across the forecourt garden of our bungalow. My sisters and I spent time outdoors climbing trees or running and cycling with friends. There was a sense of the open, a vastness, beyond the home.

Bhubaneswar had become the capital city of Orissa (now Odisha) with a population of barely 25,000. Moving to Mumbai, then Bombay, to join the Sir JJ College of Architecture in 1972 was overwhelming given the city's size, complexity and congestion even then. Besides igniting the spark for human rights and justice movements, the wide chasm between the two cities brought home to me the learning not always given in classrooms: Spaces matter, how they are built matter too because they impact people and ecology.

The story of Bhubaneswar tells us that planning a city is best not done from a top-down perspective and must include participation of people, that master plans which do not integrate what already exists – such as the old temple town – are overrun by time, and planning which does not take into account local ecology is not sustainable in the long run.

Bhubaneswar was imagined more than a decade before independence though it became one of the post-independence new towns. Orissa was carved into a separate province on April 1, 1936, from the administrative units of Bihar, Bengal and Madras; a new Bhubaneswar was to be its capital. However, the city's planning started only after April 13, 1948, when the then Prime Minister Jawaharlal Nehru laid the foundation stone with his words: "...Bhubaneswar would not be a city of big buildings for officers and rich men without relation to common masses. It would accord with our idea of reducing differences between the rich and the poor".

Nehru's noble vision did not fully materialise in the master plan prepared by German-Jewish architect Otto Koenigsberger, who was forced to leave Germany under Adolf Hitler and secured Indian citizenship in British India. He also drew up the master plan for Gandhinagar. With Le Corbusier and his team of largely international architects planning Chandigarh, the imagination of India's modern new cities – and the realisation of Nehru's vision through architecture – was in the hands of foreigners.

The master plan
Bhubaneswar's master plan, contrary to Nehru's words, was based on hierarchical grids with differing sizes of houses and amenities for various classes of government officials apparent in the layout of neighbourhoods. Such spatial segregation, seen also in Chandigarh's master plan, has been ingrained in the popular psyche through policies. Unlike his keen interest in building Chandigarh, Nehru paid scant attention to Bhubaneswar – a reflection of the political importance of a Chandigarh after the Partition but also a sign of north Indian dominance. This was carried forward by many including Prime Minister Narendra Modi when he chose Varanasi as his national political constituency; the temple town added to his Hindutva icon image too.
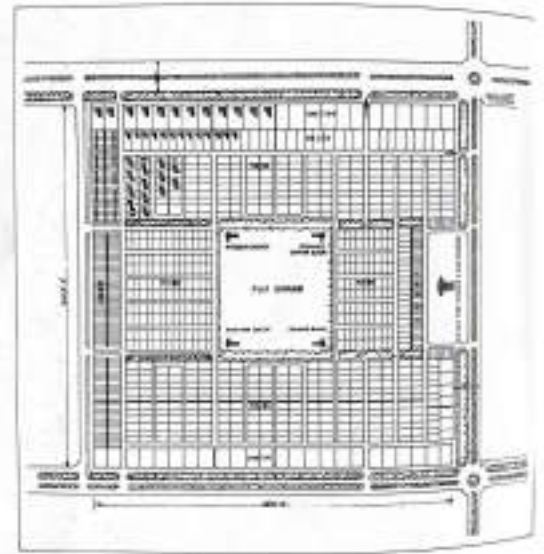
From Ravi Kalia's book *Bhubaneswar: From a Temple Town to a Capital City*

For Bhubaneswar, Nehru's apparent disinterest and paucity of funds were a blessing in disguise. It meant relative independence for Orissa's decision makers, including social leaders, to establish an independent Odia identity along with the state. Planning and building the city, including defining the architecture of buildings, became more participatory – though limited to government officials – than in Chandigarh.

Koenigsberger, invited by the Orissa administration in 1948, was present when Nehru laid the foundation stone. However, he was presented with the site for the new city, away from the old temple town. The siting had begun before his appointment and years before India was independent. The selection process was long and contenders many – Cuttack, the then capital of Orissa; Chowduar, an adjoining industrial town; the temple town of Puri; Angul, Khurda and Barang besides the temple town Bhubaneswar. Eventually, the selected site was between the old temple town and Cuttack, away from temple town culture and Cuttack's parochialism.

Koenigsberger's neighbourhood unit idea
The basis of city planning, in Koenigsberger's imagination, was the neighbourhood unit like a sector. He had worked with this concept earlier in Jamshedpur. A neighbourhood unit was an average 150 acres square with 1.2 kilometres on each side. Houses were organised in clusters around the open spaces in each unit to allow the cool southern breeze to waft across them.

Koenigsberger believed that the unit would be "an attempt to transplant into the city one of the healthiest features of country and small-town life." Each unit was self-contained with amenities like schools, dispensaries, shopping, and entertainment centres, all of which could be accessed on foot. Such units, he thought, would enable people to "understand their civic responsibilities much better than a large amorphous city." Multiple neighbourhood units, connected by a public transport system, would form the city.

If Bhubaneswar was to expand, units could be added. This linear approach, he argued, would make for easy growth and an efficient transport system. He also proposed area planning in which different zones would have industry, recreation, shopping, housing, and transportation. Life in Bhubaneswar's neighbourhood unit meant social relationships were forged across the usual caste-religion boundaries, people developed a sense of community, and an attachment to their neighbourhoods. This deeply influenced me. It evolves well into neighbourhood-based urban planning in large cities enabling people's participation and deepening democratic processes.

People and nature
The first six units were the oldest in Bhubaneswar. My father, an anthropologist heading the Tribal Welfare Department of the state government, was allotted a bungalow in Unit-III. The Capital Complex – comprising the Secretariat, Assembly Hall, Accountant Generals (AG) office among other institutional offices – was in Unit-V. Koenigsberger's plan had envisioned many units, but the first phase was limited to six. Subsequently, 12 or 13 larger units were added. The city later expanded far beyond these units, almost upto Cuttack, making them twin cities. On the opposite side, vast areas have developed too.

Koenigsberger's master plan imagined all houses in the units to be single-storied which would be favourable to the Indian way of life and climate. Every house had its forecourt garden and a rear yard. Our bungalow too had a large garden in the front and a walled courtyard at the back useful for household work. Away from the house, in the farthest two corners, a toilet and a bath were separately located. There was a large guava tree in the centre of the courtyard which helped keep the house cool. My sister and I would climb it for the fruit. The front had a seasonal vegetable garden with maize, brinjal, okra, and cabbage.

All the bungalows had front and rear courtyards – though their sizes varied – with abundant vegetables, fruits, and flowers. We developed a symbiotic relationship with farming, and learnt how local ecology shaped lives and buildings. In Germany, Koenigsberger had been deeply influenced by his teacher Bruno Taut, an architect with a deep commitment to social architecture and an early member of the Garden City Movement. Undoubtedly, these reflected in Koenigsberger's master plan.

Koenigsberger's city of privilege
Koenigsberger proposed that Bhubaneswar would be a linear city; from a planner's perspective, achieving "unity" in planning was more possible in a linear pattern than in a radial plan. In fact, he opposed radial planning because he believed "it will never result in useful towns which are pleasant to live in". His linear city plan for Bhubaneswar relied on one main traffic artery to which individual neighbourhood units would be attached.

Besides the arterial road, he proposed seven types of roads – pedestrian walkways within units, parkways in recreational areas, bicycle paths across various units and areas, minor streets connecting houses, major motorable housing streets connecting the minor streets, main roads between neighbourhood units and workplaces. Walking

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was to be the predominant mode of mobility within units. Koenigsberger planned shopping squares "not shops along the various streets, accessible from the main roads but at the same time clearly separated from them, so that fast traffic can move undisturbed, and people can buy their provisions at leisure without danger of being run over".

Bhubaneswar city and its functional areas.
Please note: The map is a basic overlay of the sketched historical map on the present day Google Earth aerial imagery and hence is not entirely accurate.

His brief was to prepare a master plan to accommodate the new bureaucracy and the emotional needs of Odias. Bhubaneswar was, therefore, a largely administrative town. "Koenigsberger viewed the new city of Bhubaneswar as an autonomous body, having its own law and jurisdiction, political independence, right of self-determination, and an organised sense of communal relationship along secular lines," writes Ravi Kalia in his well-regarded book Bhubaneswar: From a Temple Town to a Capital City.

Koenigsberger had proposed that the government publish his plan calling for public participation, but it was not put into the public domain. "The planning of the new capital of Orissa requires popular collaboration...It is therefore, suggested that the

Master Plan be published with an appeal for constructive criticism and practical collaboration...No substantial improvement can be possible unless mass public opinion, is roused in favour of responsive clean civil administration and civic consciousness among all the people," he observed. It is not clear who he imagined as the public; the plan was circulated only amongst government officials.

This is emblematic of planners and architects across India who, individually and collectively, have failed to influence social change despite their discipline being a democratic tool of social change. Planning and design have become a narrow, timid service to the "client" alone. Even in public projects, administrators and politicians decide; people's voices are rarely considered necessary. This is most glaring as free-market forces assume control of public resources in a development paradigm which disregards natural ecology.
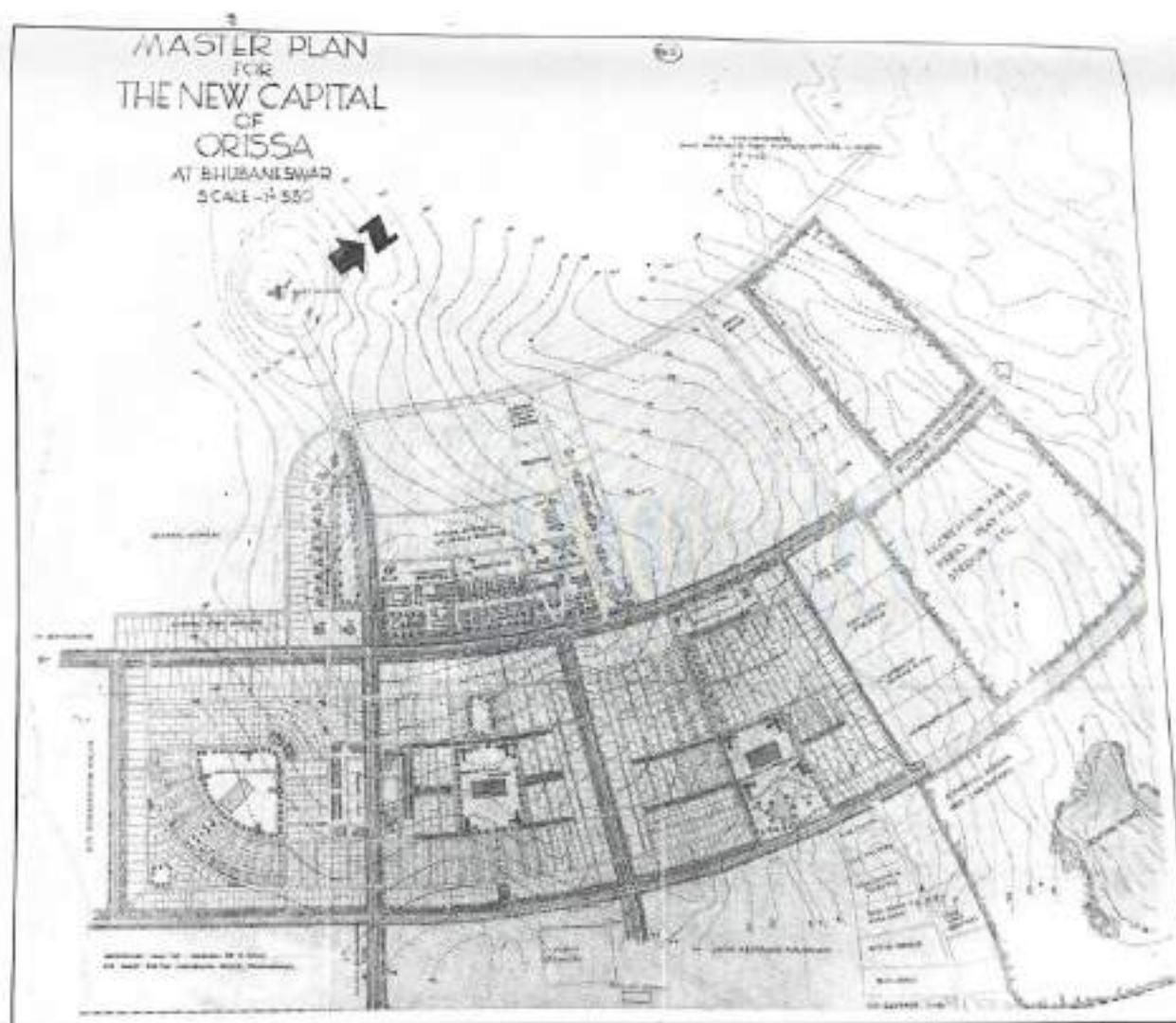
Otto Koenigsberger's master plan for Bhubaneswar.
From Ravi Kalia's book *Bhubaneswar: From a Temple Town to a Capital City*

The plan and the city

Koenigsberger and the state government had conflicting visions for Bhubaneswar. The 1948 plan, credited to him, underwent several iterations with many officials influencing changes. Soon after he accepted the Bhubaneswar offer, he moved to New Delhi to assume a role in the union Health Ministry and his involvement in Bhubaneswar tapered. Julius Vaz, chief architect of the government who was actively collaborating with Koenigsberger on the master plan despite their differences, then played a larger role and designed prominent buildings including in the Capital complex.

The first six neighbourhood units developed in accordance with the master plan were expanded to 12-13 additional units. These had a larger footprint each than what Koenigsberger had proposed as a model unit size. His ideals of a neighbourhood unit were compromised as engineers from the Public Works Department (PWD) determined the expansion. Interestingly, M.P. Kini, a senior draughtsman under Vaz had said, "We had too much government influence. There was no Le Corbusier-like person in Bhubaneswar".

The Bhubaneswar plan, therefore, had many voices but within the government; none from the public. But cities grow beyond a plan. This is true of Bhubaneswar too. The city expanded in all directions engulfing its peripheral villages and agricultural lands, led by more government agencies such as Bhubaneswar Development Authority (BDA) and Orissa Housing Board besides the PWD. This radial expansion shelved Koenigsberger's linear city planning idea. The new areas are not even referred to as units but identified by their names – Sahidnagar, New Town, Nuapally and so on.

Even his ideas of open spaces, market location and the provision of other social amenities were not followed. Land use and building activity in these areas has meant high-cost and unaffordable mega housing complexes, corporate-run hospitals and schools, even universities, but very little public open spaces and accessible amenities for the less privileged who are a substantial section of the city's population.

Learning from Bhubaneswar

The city's planning narrative – a master plan by a well-known planner, implemented by politicians, bureaucrats and engineers, and little to nothing of people's participation – is now familiar across India. Even when people's participation is sought, it is perfunctory. However, this is possible if the concept of neighbourhood unit – the basic brick in Koenigsberger's master plan – was embraced and people allowed to shape spaces within their neighbourhoods. The concept of Koenigsberger neighbourhood unit expanded to neighbourhood-based city planning is possible – even necessary today.

Bhubaneswar today ranks as the best Smart City in India. It is a well laid-out city with excellent roads and street art. It has grown from a bureaucrats' town to a city for professionals in the infotech and education sectors, among others. Its urban economy now has apartment complexes which have taken over large tracts of the city's surrounding agricultural land. Bhubaneswar is also an important sporting hub; World Cup hockey tournaments have been hosted here twice.

Among the many questions that Bhubaneswar and its expansion raises is how villages

are subsumed into it, mainly by urban land sharks who convert agricultural land into real estate opportunity. New speculative housing stock is created – but not for the poor and working people – the natural terrain is ignored, and piecemeal land filling is done which upsets the natural drainage of the region. Many hills and forests have been cleared or reduced in size too in the city's expansion. It is an unsustainable development model – sadly, the planned city of Bhubaneswar which was meant to be the newly-independent India's urbanism model has fallen prey to market forces that care little about public interest and sustainable ecology.

The city has expanded to 161 square kilometres and has more than 10 lakhs people. It is increasingly car-oriented, shows familiar traffic congestion issues and hardly any efficient public transport network. Roads are without pavements, safe cycling is an uphill task. Peak summer temperatures rise to over 50 degrees Celsius and Urban Heat Island effect is perceptible. Tree cover is diminishing, and frequent cyclones batter the city. The state government receives international recognition for its cyclone response measures preventing loss of lives, but sadly, it has no long-term measures to deal with Climate Change events.

Rampant construction activity and destruction of forests and coastal mangroves continue unabated. Two significant forests on either side of the city, Nandankanan and Khandagiri have been reduced in size. Khandagiri hill, once dreaded for its wildlife, has been split wide open by a freeway cutting across its centre. Across the hill, once impossible to reach, is Kalinga Nagar with large real estate projects. An important natural culvert in the city is being systematically encroached, including by government-approved entertainment parks and buildings, and could cause flooding during torrential rains. Such devastating climate events, besides loss of life and property, demand radically different vision for cities that is nature-led and not determined by free-market-growth.

Even within Koenigsberger's plan, the implementation leaves much to desire but it is now imperative that city planning is both ecologically sustainable and socially sound. Every time I go to Bhubaneswar expecting the cool southern breeze, I am disappointed.

Right to Environment: It's time to foreground it and for people to claim it

Shobha Surin

December 2, 2022

People's Right to Life in India assumes, and indirectly devolves into, the Right to Environment based on judicial interpretations and orders. As pollution of air and water deepens across India, urban space becomes more congested or privatised, and Climate Change impact is most deeply felt by the vulnerable in our cities, it is time to revisit the Right to Environment. It has manifested in various environmental laws but the laws are of little use if they are ruthlessly violated or poorly implemented for what passes as 'development.' The price of urbanisation has been the rapid loss of forests and water bodies, poor air and water quality, and lack of open space leading to poor quality of nature and people's lives. It is crucial to recognise the centrality of the Right to Environment in people's lives and take lessons from those who have invoked it in various struggles and courtroom battles.

In 1983, the Rural Litigation and Entitlement Kendra, a non-governmental organisation with its headquarters in Uttarakhand, wrote to the Supreme Court complaining about the quarrying being carried out in the Mussoorie region of the Himalayas. Landslides had devastated the area and killed locals when the hillsides were blasted. Five years later, the Supreme Court held that all the mines in the area, barring three, should be shut down. Mining in the valley had violated the Forest Conservation Act; economic development could not come at the cost of environmental degradation, it held.

This litigation led to the passing of the Environment Protection Act, 1986. It was the first case where the apex court had applied the concept of sustainable development. The landmark judgment upheld the environmental rights in India, citing that the Constitution of India guarantees the right to wholesome environment as a Fundamental Right under Article 21, the Right to Life, which also encompasses the less-discussed Right to Environment.

The Right to Environment, now universally accepted as part of human rights, are interpreted through rights to health, food, clean water and air. Its international roots, in the material sense, lie in the famous Stockholm Conference of 1972 during which the United Nations recognised that addressing certain environmental problems called for international cooperation. The Stockholm Declaration on the Human Environment stated: "The right to a healthy environment is crucial as cities are facing the effects of air and water pollution. As more and more people are suffering from diseases owing to pollution, it becomes important to effectively implement the right."

India responded with an amendment to the Constitution in 1976 in which Articles 48A and 51 A (g) were written explicitly for environmental protection. Article 48A comes under the Directive Principles and instructs the State to protect the environment. Article 51A (g) states that "It shall be the duty of every citizen of India to protect and improve the natural environment including forests, lakes, rivers and wildlife and to have compassion for living creatures."

Fifty years later, in July this year, the UN General Assembly passed a resolution recognising the right to a clean, healthy, and sustainable environment as a human right (Resolution 76/300). This follows similar resolutions adopted by the UN Human Rights Council and the Parliamentary Assembly of the Council of Europe last year, and has been deemed a "catalyst for accelerated action to achieve the Sustainable Development Goals" by the UN Special Rapporteur on human rights and the environment.

The recently concluded COP27 too stressed "the right to a clean, healthy and sustainable environment and livelihoods".

Inalienable but has to be claimed
The debate about the need for the Right to Environment has been settled; it is difficult to deny or erase the right now. Whether directly stated or indirectly inferred (as in India), it is now accepted as an inalienable part of human rights. A healthy environment is necessary for the overall growth of human beings.

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As cities are built and expanded on the profit-motive, the natural ecological balance is disturbed and the relationship between people and nature slowly weakens. The impact is all around – poor air quality, polluted water, congested spaces all of which affect people's quality of life and are even responsible for deaths. Failure to secure environmental rights has meant that people in the land-locked northern India breathe highly toxic air every winter and millions struggle to get clean drinking water or adequate space in cities across India. Polluted cities and increasing deepening of Climate Change impact strike at the very root of our Right to Environment.

The latest Lancet Commission on pollution and health report blamed pollution for nine million deaths globally. It noted that India – where bad air kills more than a million people every year – was among the worst affected leading to an estimated 1.6 million deaths in 2019. The overall pollution-related deaths, at 2.4 million, were also the highest in India; this includes water, lead and occupation-related pollution, the report pointed out. A majority of these deaths were caused by Particulate Matter 2.5 (PM2.5) pollution, it added.

Activism to claim the right, crushed by violence
Like all rights, it does not mechanically or inevitably manifest in people's lives; it has to be fought for and claimed, often through long-lasting protests or extreme action which more often than not brings on the might of the State on the protesters. The right has been invoked and tested through the bevy of laws on the environment enacted over decades, on the basis of which environmental activists and civil society have repeatedly approached courts.

This claiming of environmental rights, explicitly or otherwise, lies at the heart of many battles that the civil society has fought in the past few decades, often knocking on the doors of the Supreme Court to stall projects that could damage the environment, disturb ecological balance, and compromise lives.

Ideally, the State should enforce the right; when it does not, people are pushed to fight the State and claim the right in protests that have often turned violent – violent against nature as in Mumbai's Aarey forest where more than 2,000 old trees were hacked in 24 hours in 2019 to make space for a metro car shed or in places like Thootukudi where 13 protesters were killed and more than 100 injured in 2018 in police firing as they raised voices against the pollution and excessive emissions from the Sterlite Copper plant.

As many as 200 environmental activists were killed in 2021, according to the non-profit Global Witness which tracks such attacks; Latin American nations ranked at the top of the list. According to the UN, three people a week around the world are killed in their fight to protect environmental rights, with many more being harassed, intimidated, and criminalised for their essential work (UN Environment, 2020). Though Mexico, Brazil and Colombia were the deadliest places for environmental activists, according to the Global Witness report, India was among the handful of nations where violence against environmentalists had increased most markedly in recent years. As elected governments side with big business against the interests of nature and people, the battles turned intense and are likely to escalate.

"The most important is Article 21, the Right to Life, and that includes a clean and healthy environment. When the executive fails, the court has to step in," says Vivek Chattopadhyaya, principal program manager of the air pollution control programme, Centre for Science and Environment, New Delhi. Article 21 is the responsibility of both the central and state governments, but if the government does not do its duty, people have the right to sue the government. And the right to protest.

Poor implementation of law

The Right to Environment is reflected in a host of laws enacted from time to time — The Forest (Conservation) Act, 1980, the Wildlife Protection Act, 1972, the National Green Tribunal Act, 2010, the Air (Prevention and Control of Pollution) Act, 1981, and the Water (Prevention and Control of Pollution) Act, 1974. They make it incumbent on the State to protect the environment but people have had to drag the State or corporations to court instead. Even on occasion that the judicial orders have been in favour of nature and people, their implementation on ground has remained tardy.

In 1996, while hearing a petition filed by Vellore Citizens Welfare Forum, the Supreme Court passed an important judgment. Citizens had filed a petition against the untreated effluents released by tanneries which polluted the Palar River, the main source of water in the area. Deciding in favour of the petitioners, the court observed that the tanneries were a health hazard to the people. This judgment sought to ensure a healthy environment and stressed on sustainable development; however, it did not fully reflect on the ground.

"It doesn't matter what the court has said and not said. You just have to look around to see its impact. If the Right to Environment had been strictly enforced, then the country would look different – whether the pollution control is doing its job, whether the Environment Ministry is relevant, and whether the courts are able to play the role of a positive force," says Chennai-based environmental activist and writer Nityanand Jayaraman.

It has been a chequered journey, a mixed bag, with the numerous progressive judgments on the Right to Environment since the 1990s; they are important but they did not always check environmental damage.

Special ecological tribunal

The National Green Tribunal (NGT) was established under an Act in 2010 to dispose of environmental protection cases, conserve forests and other natural resources matters. It was also meant to enforce legal rights relating to the environment, and giving relief and compensation for damage to person or property, according to its establishing law. With the NGT structure, India became the first developing nation and the third country in the world, after Australia and New Zealand, to have a specialised ecological tribunal.

The NGT has passed numerous orders in these years that have upheld the ecological integrity of an area, but has come under criticism for its relative powerlessness to have them implemented. "The NGTs are technical forums. It passes orders but it does not look at it from the governance perspective. Though it is a judicial body, the NGT does

not have the teeth like the SC or high courts," says Soumya Dutta, trustee of MAUSAM (Movement for Understanding of Sustainability and Mutuality).

The NGT order of January 13, 2015, on the Yamuna River was significant but the restoration project has missed numerous deadlines. The river continues to be in a pathetic polluted condition. After the petition by Manoj Misra, convener of Yamuna Jiye Abhiyaan, the NGT bench presided over by chairperson Justice (retired) Swatanter Kumar issued 28 directions for the implementation of the 'Maily Se Nirmal Yamuna' rejuvenation project by March 2017. The bench levied a fine of Rs 5,000 on anyone spotted throwing waste in the Yamuna, and a fine of Rs 50,000 for dumping of construction debris.

"The directions were significant but nothing came out of it. The problem with the NGT is it has no power of contempt," says Misra, adding that the provision to jail offenders has not been used. Adds Chattopadhyaya, "The tribunal should be further strengthened – give it more powers, equip it with expert members."

The NGT was severely criticised for its inconsistent judgment in the petition against Sri Sri Ravi Shankar's Art of Living Foundation which had organised a three-day cultural event in March 2016 on the Yamuna floodplain. Before the festival, Misra petitioned the NGT to stop the event as it would damage the floodplain. The Tribunal had failed to stop the event despite the environmental consequences. Later, it held the Art of Living Foundation responsible for the damage and imposed an environmental compensation fine. Irrespective of whether the amount was paid, in full or not, the pollute-and-pay one's way through would hardly help in ecological conservation or upholding people's Right to Environment.

Striking a balance
Four and half years later, the Thoothukudi case presents a piquant issue that must be playing out in many locations around the country: the hard choice between jobs at polluting industries and clean environment to live in. Many, including those who were injured in police firing, want the plant to reopen as they grapple with the loss of jobs and livelihood.

Caught between exercising their Right to Livelihood and Right to Environment, locals seem to have chosen the former given that families suffered without jobs. But they should have never had to make this choice. It is not a choice at all – a clean environment without livelihood holds little meaning, jobs without a clean environment adversely affects their lives.

This points to the limitation of having the right and the laws with which the right can be exercised. "Not law, but culture, can play an important role in ensuring a clean and healthy environment. In order to have a healthy environment we need to have a culture which values the environment," says Jayaraman.

Three years after India passed the Air (Prevention and Control of Pollution) Act 1981, the Bhopal gas leak happened. "The Act did not protect the people of Bhopal. The

regulatory collapse prevailing in the 1980s is no different now. There is no change in regulatory discipline," says Leo Saldanha, coordinator of Environment Support Group, a Bengaluru-based NGO which works on environmental and social justice initiatives.

Saldanha shared the example of the London Smog of 1952 which killed more than 4,000 people and many suffered respiratory ailments. This prompted Britain to pass the Clean Air Act in 1956; air pollution is taken seriously and countermeasures are still being put in place. "What is the purpose of having such jurisprudence that doesn't deliver in real terms? We need a structural change as India's nightmares will be worse than other countries," says Saldanha.

In 2019, the Government of India launched the National Clean Air Programme but Indian cities regularly occupy the top ten or more spots in the list of all cities in the world. Stringent environmental laws alone will not improve air and water quality, or make open space available to people.

People have to be aware of rights – specifically the Right to Environment and what it means in our lives – and fight the good fight. The rights exist, the legal routes to establishing and claiming those are there too. When the State appears to have abdicated its role as protector of the natural environment, people have to step up to see it as a trans-disciplinary issue and take action. Otherwise, the Right to Environment as part of Right to Life will be redundant. As Dutta puts it, "If Delhi's residents lose nine years of their life on an average due to pollution, where is their Right to Life?"