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FLEXICITY

A Comparative Study of Air Quality and Mobility Before, During and After the COVID-19 Lockdowns in Bengaluru and Their Correlation with Hybrid Work Systems in the City

GREENPEACE INDIA SOCIETY

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Introduction

The uncontrolled and unsustainable growth in the transportation sector is leading to repeated climatic and health disasters. Additionally the rapid growth in vehicular population is also leading to persistent congestion in the city, causing time/efficiency wastage, along with stress build-up among citizens. The increased fossil fuel burning is worsening air pollution levels, adversely impacting public health. Bengaluru is a stark example of this situation where a larger share of hazardous air pollutants (48% of PM2.5 according to CPCB, TERI Study in 2010)[1] are emerging from vehicular emissions.[1]

As of May 2020, Bengaluru Urban has 85,63,863 registered motor vehicles for a human population of 1.2Cr(approx). The rising number of private motor vehicles has led to an unsustainable demand of road infrastructure, resulting in drastic increase in concrete/paved surfaces and severe depletion in the city's green spaces, further negatively impacting air quality.

1. https://cpcb.nic.in/displaypdf.php?id=QmFuZ2Fsb3JlLnBkZg==

The pandemic-induced lockdown provided a temporary respite to the citizens by reducing vehicular traffic, thereby significantly improving air quality, even dropping Air Quality Index (AQI) to well within National Ambient Air Quality limits.

In this report, Greenpeace India attempts to analyse the contribution of vehicular emissions to air pollution in Bengaluru Urban. For this purpose, a traffic analysis has been done by identifying five traffic congestion points in the city. Following which a comparative analysis of the data has been made from pre-lockdown period, to during lockdown and post-lockdown months with help from a Community Mobility Report.

2. https://www.google.com/covid19/mobility/

Methodology

For estimation of pollution due to vehicular exhaust in the city of Bengaluru (municipal boundaries), 5 roads were identified as the primary traffic congestion points using Google Traffic Trends. For this study, the average traffic status for six days, i.e., from Monday to Saturday, was recorded during two different time slots – 1100 hours (morning) and 1900 hours (evening).

Based on the vehicular density and length of traffic congestion, the status of traffic congestion is divided into four categories:

FAST	+
MODERATE	++
SLOW	+++
SEVERE	++++

With the help of Google Community Mobility Report, the mobility pattern and percentage was observed in pre-lockdown, during lockdown, and post-lockdown periods. The Community Mobility Reports show recorded traffic movement trends of regions, across different categories.

For each category in a region, the reports record changes based on two parameters:

1. Headline number: Compares mobility pattern of a particular date with the baseline date pattern (unless there are gaps) and reports a positive or negative percentage difference.

2. Trend graph: Recorded changes in mobility pattern (%) in the 6 weeks before the Google community mobility report publish date.

Changes via the Headline number method are taken into consideration for this data set.

What is Baseline?

A baseline day represents the normal(avg) value for that day of the week. It is the median value calculated over 5 weeks from 3 January 2020 to 6 February 2020.

A comparative analysis is done to assess the deviation in mobility pattern with changing number of Covid 19 cases and Air Quality Index during the study timeline.

Typical Traffic Study in Bengaluru city (Urban)

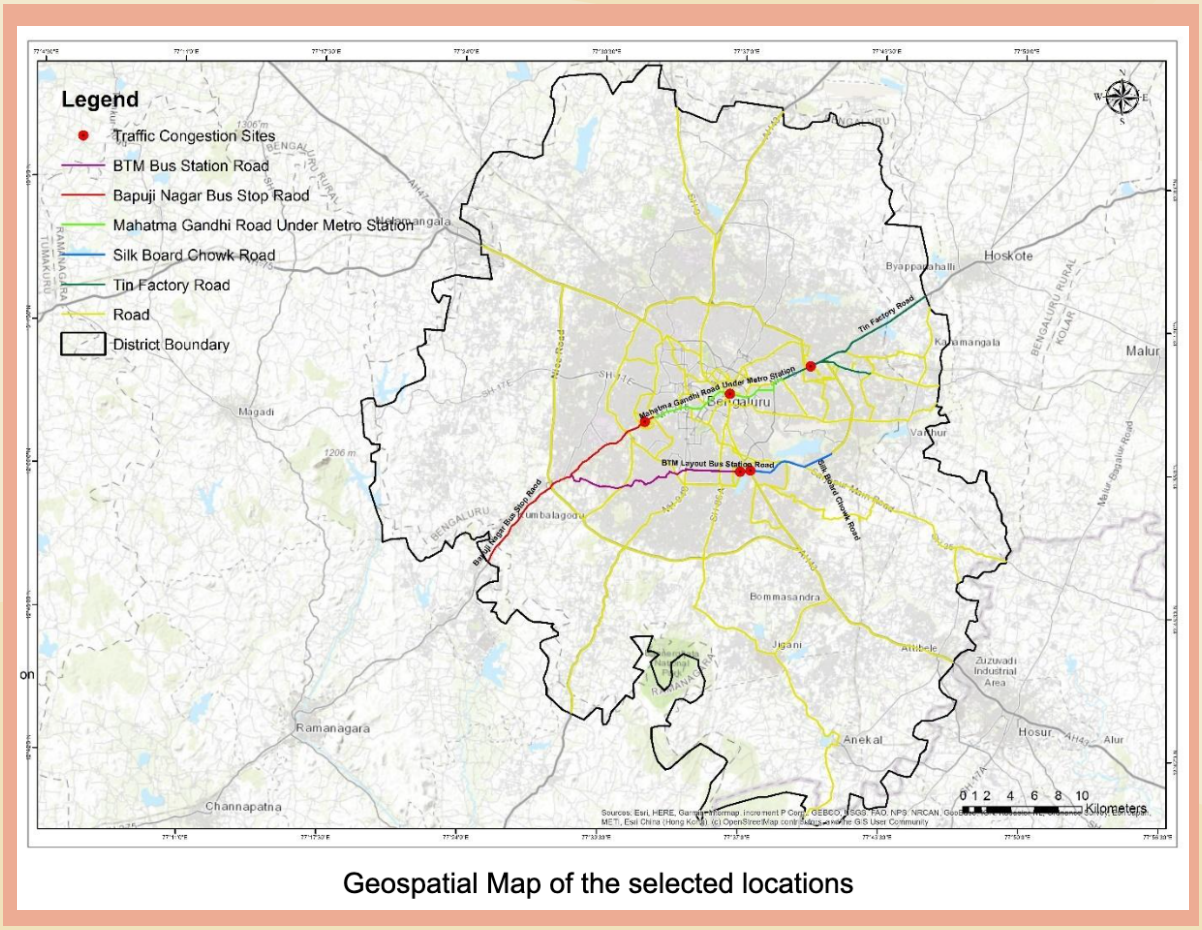
A traffic study was done for the city of Bengaluru with the help of live/typical traffic updates given by Google Traffic. For this study, the average traffic status for six days, i.e., from Monday to Saturday, was recorded during 1100 hours (morning) and 1900 hours (evening).

Five Roads were identified as the primary traffic congestion points within the municipal boundary of Bengaluru Urban. The roads and their detailed traffic analytics are as follows:

S.no	Road	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday	
		11am	7pm	11am	7pm	11am	7pm	11am	7pm	11am	7pm	11am	7pm
1.	MG Road	+++	++++	++++	++++	+++	++++	+++	+++	++++	++++	+++	+++
2.	Silk Board	+++	+++	+++	+++	++++	++++	+++	++++	++++	++++	++++	+++
3.	BTM Layout	++++	++++	++++	++++	++++	+++	+++	++++	+++	++++	++	++++
4.	Bapuji Nagar	++++	+++	++++	+++	++++	++++	++++	++++	+++	++++	+++	++++
5.	Tin Factory	++++	++++	++++	++++	++++	++++	++++	++++	++++	++++	++++	++++

A table showing the 5 selected roads and their severity of traffic over 6 days from 11AM to 7PM

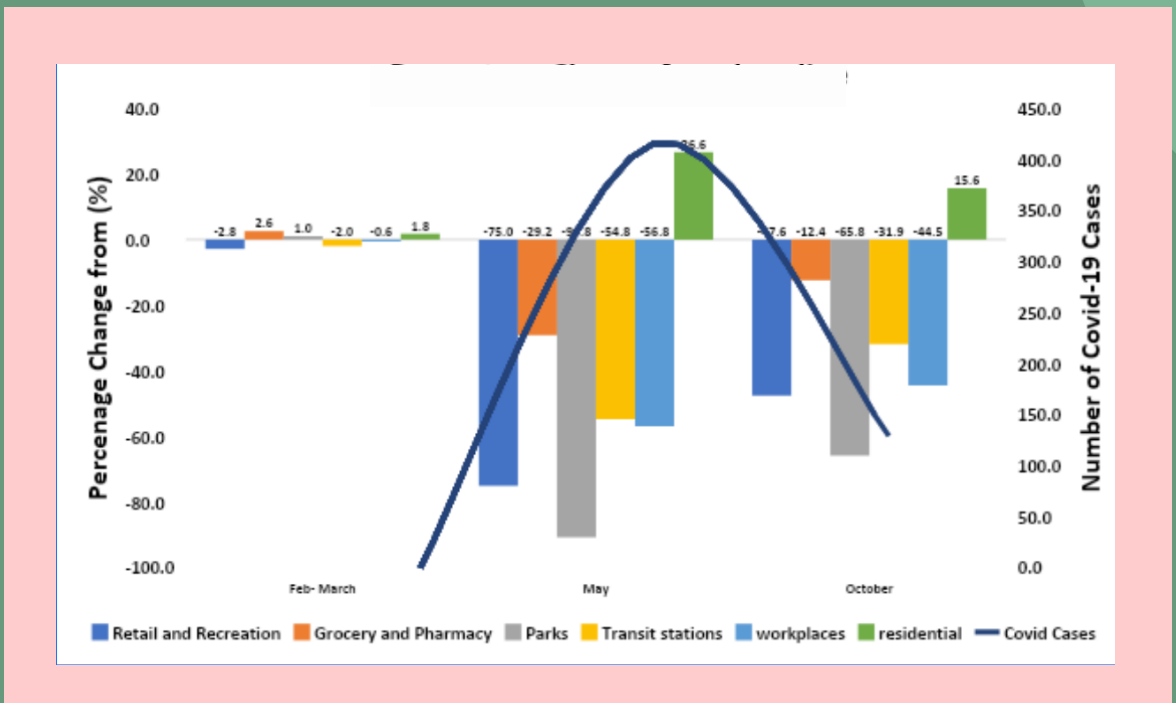
The image below shows a geospatial view of the 5 selected locations and their main traffic congestion points.



Geospatial Map of the selected locations

Based on the above findings, the pre-lockdown, during lockdown and post lockdown analysis of traffic density and its impact on air quality was studied for the selected five locations. Community mobility report (by Google) for the city of Bengaluru Urban was considered for the months of February - March, i.e., the 15th of February 2020 to the 15th of March (pre-lockdown), May, i.e., the 1st of May 2020 to the 31st of May 2020 (during lockdown) and October, i.e., the 1st of October 2020 to the 31st of October 2020 (post-lockdown).

The following graph was plotted showing the observations in mobility patterns across various categories representing mobility motives:



% change in mobility patterns of different sectors in Bengaluru across the study duration

From the graph, the following observations can be deduced:

- During the pre-lockdown period, high traffic movement was observed, which was close to the average mobility pattern of the city. Conditions like frequent traffic jams during rush hours were very common. A minor decline in the use of transit stations was seen in retail, recreation and workplaces. This could be attributed to pandemic-related inactivity in the country. However, no significant changes in mobility patterns were observed.

- During the lockdown period, a drastic and steep fall in mobility pattern was observed from the baseline. This trend was due to the sharp increase in Covid-19 cases. On average, a 60% decline in mobility pattern was observed from the baseline. The remaining 40% is attributed to movement of frontline workers and essential service providers. In the residential category, there was a rise in mobility by 29% presumably because of the intra-urban activities of citizens to procure essential goods, medicines or trips to the hospital.

- Again, in the post-lockdown period, i.e, the month of October, 35% of the activities resumed after the lockdown lull. The activities resuming is attributed to the decline in Covid-19 cases and occurrence of popular festivals like Dasara and Deepavali. The change in the residential category still stood at 15% from the baseline presumably due to festive travels.

Months (2020)	AQI
February - March	95
May	61
October	63

A table showing the change in AQI in Bengaluru during pre-lockdown, lockdown and post-lockdown periods

Since the major pollutants in Bengaluru city is Particulate Matter, i.e., PM10 and PM2.5, it was assumed that AQI for the study timeline is predominantly due to PM10. During the study, we found that there are some small-scale industries distributed in patches throughout the municipal boundary, but no significant cluster of industries was identified. Therefore, it can be inferred that the major contributor to air pollution in the city is vehicular exhaust. The increase in the number of vehicles with time has contributed to increase in emissions.

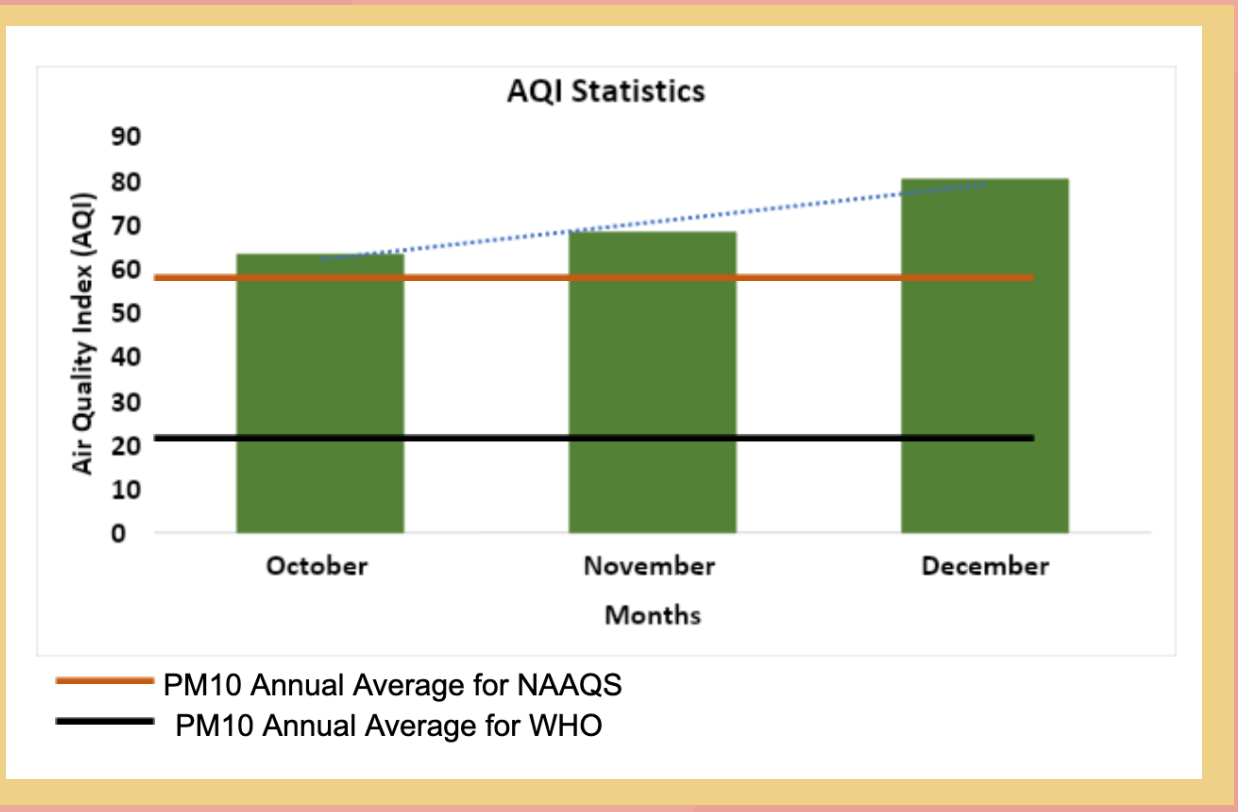
PM10

major pollutants in Bengaluru

PM2.5

major pollutants in Bengaluru

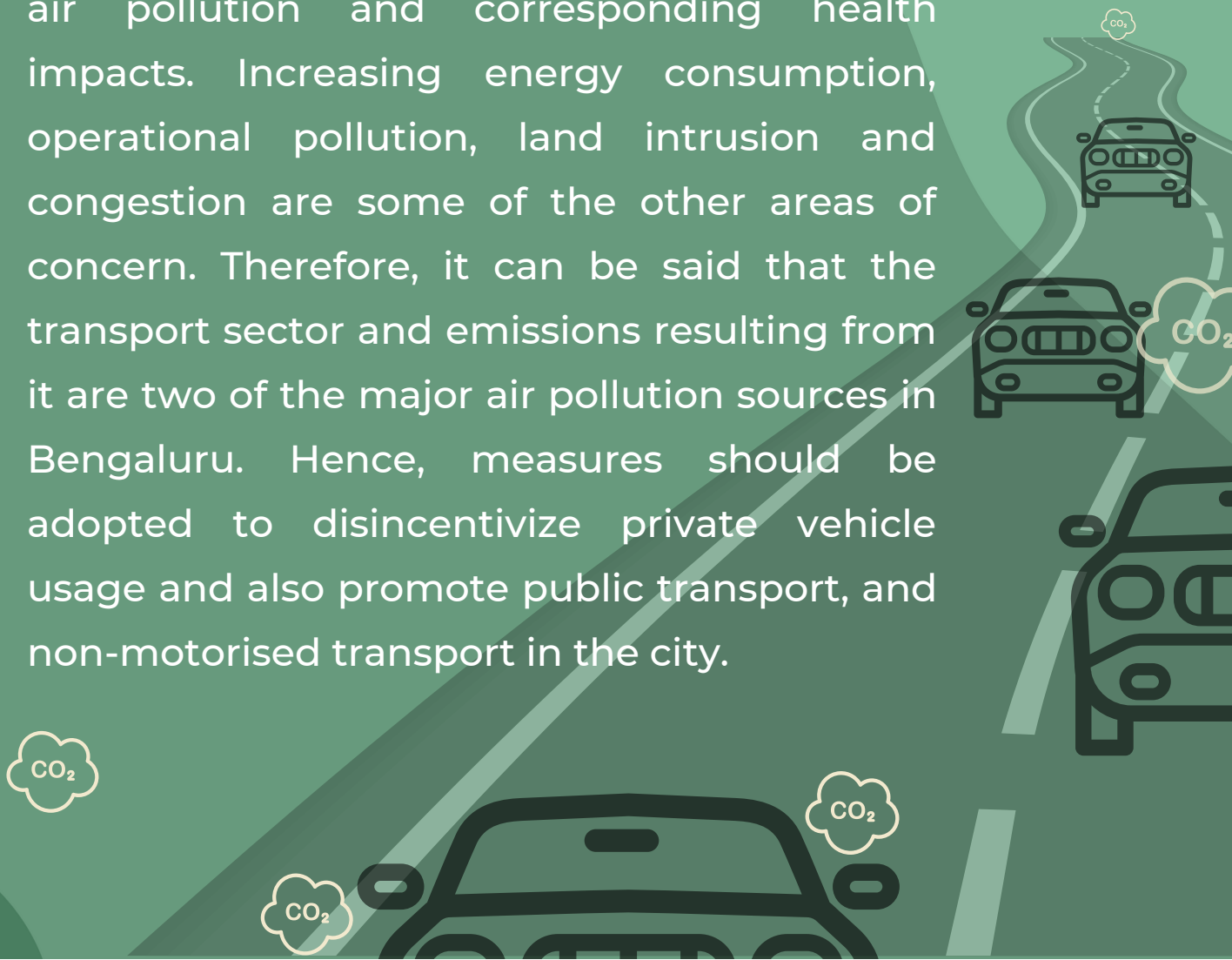
The AQI also seems to have a correlation with the number of vehicles on the roads, that witnessed a steep decline due to the lockdown restrictions. A significant decline in AQI from 95 in pre-lockdown to 61 during lockdown (nearly touching the National Annual Air Quality Standards for PM 10- 60 µg/m3) can be observed. Continuing the trend, the partial relaxation of lockdown restrictions in October lead to the AQI rising again. The AQI trend for October, November and December are as follows:



It can be observed in the above graph that when the lockdown restrictions were progressively eased, the AQI too showed corresponding rise, even reaching pre-lockdown levels.

Conclusion

The transport sector is the second-largest consumer of energy in India. The growth of transport not only increases pressure on the limited non-renewable energy resources and increases foreign exchange outgo, but also significantly contributes to environmental pollution. Increasing car dependence in India, especially in urban areas, is most visible at the local level – with vehicular emissions causing air pollution and corresponding health impacts. Increasing energy consumption, operational pollution, land intrusion and congestion are some of the other areas of concern. Therefore, it can be said that the transport sector and emissions resulting from it are two of the major air pollution sources in Bengaluru. Hence, measures should be adopted to disincentivize private vehicle usage and also promote public transport, and non-motorised transport in the city.



The Effect of Remote Work

The studied five traffic congestion points accommodate more than five hundred IT and BPO companies employing lakhs of people. The fall in mobility during the lockdown period, read along with the better air quality, during the same time, indicates an important role played by the companies and their employees.

Execution of remote work models by a majority of these corporations can undeniably lead to reduction in the number of private vehicles (mostly cars) on the roads, especially during peak hours, consequently avoiding their share of emissions. This observation is crucial because it posits us a possible solution to mitigate emissions in urban areas. Remote work inadvertently leads to fewer fossil fuel driven private vehicles on the road, thereby reducing emissions. On the chance of considering the emission from such vehicles owned by corporate employees as Scope 1 emission of the company itself, such companies should be held accountable. They should deploy major cut downs on their emissions to reduce their carbon footprint.

Unlike how remote work setups unfolded during the lockdown, companies should offer flexible work options like remote work, telecommuting, hybrid and working from bases close to home for employees. The provision of such choices should be seen as adding to employees' wellbeing and better work-life balance rather than a contingency measure. Subsequently, excess office spaces and parking spaces could be put to creative and more sustainable uses by the organizations.

In order to understand and further explore the correlation between corporate work setup, mobility and air quality, Greenpeace India has initiated the Project Let's Flex It as part of its Sustainable Mobility Campaign, DetoxCity. The project aims to recognize corporate flexible work policies and capture their positive impacts on the environment. Through the project, Greenpeace India intends to publish a working leaderboard that ranks Bengaluru-based corporations and their work policies based on flexibility, positive environmental impact and innovation. This is to encourage corporations and startups to emulate flexible work practices.

Recommendations

- The private corporations should maintain a flexible remote work policy or apply staggered work shifts, where possible. Continuing to minimize physical interaction in various workplaces could also save employees from long commutes, help lessen vehicles on the streets, and improve air quality.
- Promote the creation of clean, affordable, safe and efficient public transport for all (including rail, buses and bike-sharing systems), ensuring wide territorial coverage and guaranteeing people's right to access the city.
- Acknowledging and financing the new mobility patterns of people with a focus on improved policies to expand non-motorized transport infrastructure.
- Re-assessing and investing in both future sustainable mobility infrastructure as well as those that commenced prior to the pandemic.
- Develop strategic policy frameworks that are aligned to promote a sustainable recovery of our economy.
- Strengthening transport policy measures which include a collection of data on new mobility patterns and investments in non-motorized transport infrastructure.

- No cars - implement equitable city access with a focus on walking, cycling (active mobility) and public transportation. Public policies must invert the ratio between car space vs space dedicated to people and nature, creating more green spaces while reducing the space for cars.
- Promote car-free proximity open spaces in all neighbourhoods, especially those that lack safe pedestrian spaces due to their density, either by dedicating complete pedestrian routes or pedestrian priority areas without car traffic.
- Link public transport strategies with electric mobility—prioritize buses, feeders, three-wheelers, delivery fleet etc.
- Adopt and implement a strategy for the deployment of electric vehicles, charging stations and subsidy or incentive policy.
- Rationalize taxation systems for private and public transport, making private transport costlier than public transport.
- Promote low-emission zones to ban polluting vehicles from entering city centers or targeted zones.
- Ensure other modes of transport, as well as policies, are well integrated with the metro system. Plan and ensure last-mile connectivity with adequate feeder systems.

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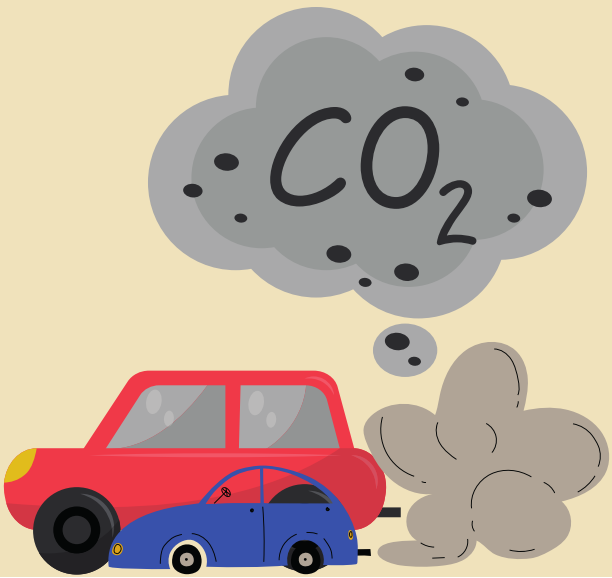

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Greenpeace India is an independent campaigning organization that uses non-violent creative action to pave the way towards a greener, more peaceful world, and to confront the systems that threaten our environment.

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