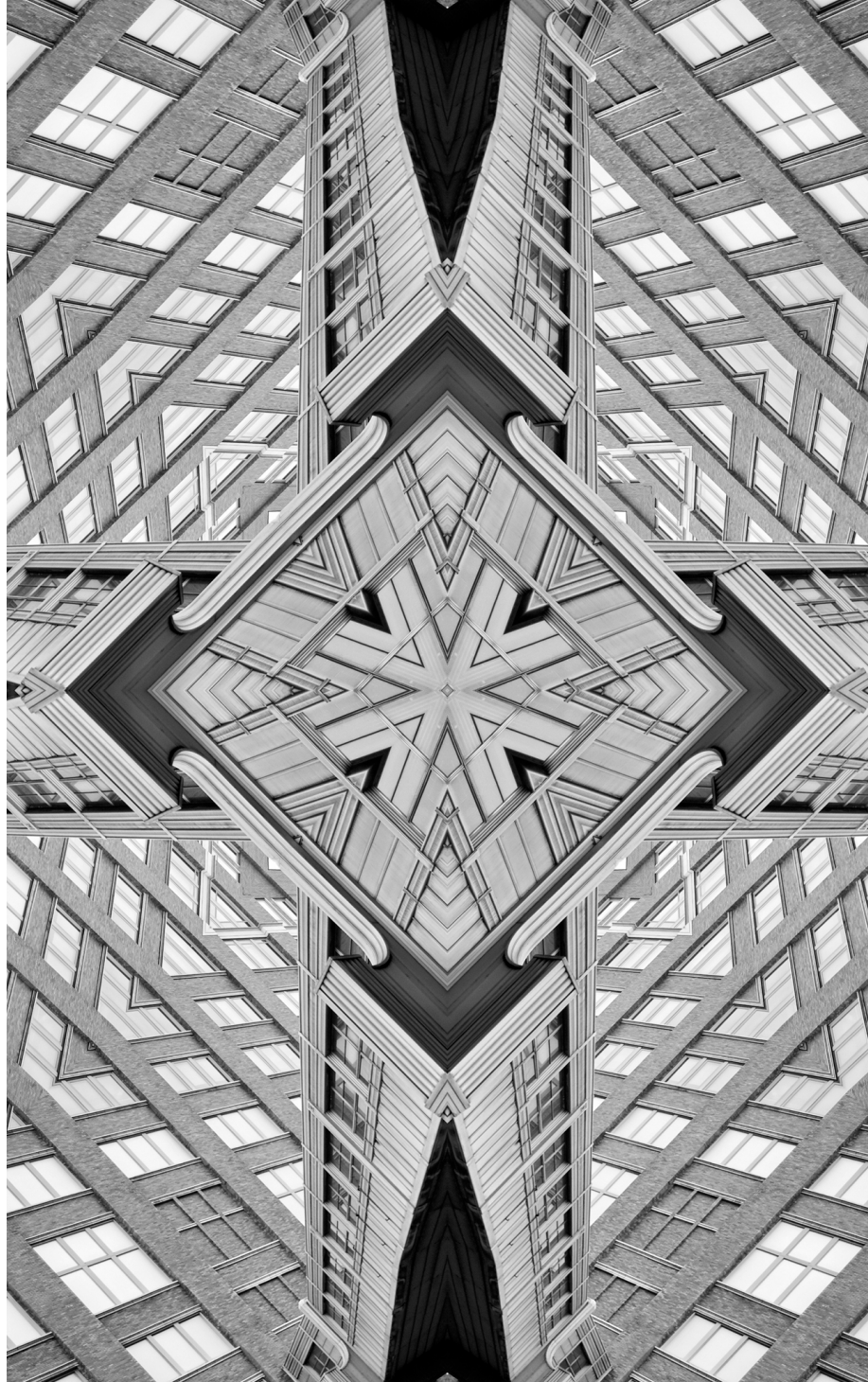


Issue

Brief

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The 'Green' in Delhi's Draft Master Plan: Weighed and Found Wanting

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Abstract

With increasing awareness of the role that a healthy and clean environment plays in the well-being of societies, governments are adopting environment-friendly approaches in the conduct of development activities. This brief examines the environment planning proposals contained in the draft Master Plan for Delhi (MPD) for the period 2021-41. Although the MPD proposes many new ideas to improve prevailing conditions as well as a framework to monitor progress, these fail to adequately address the wide range of issues that have hobbled development in the capital over the years. This brief outlines recommendations to address the gaps.

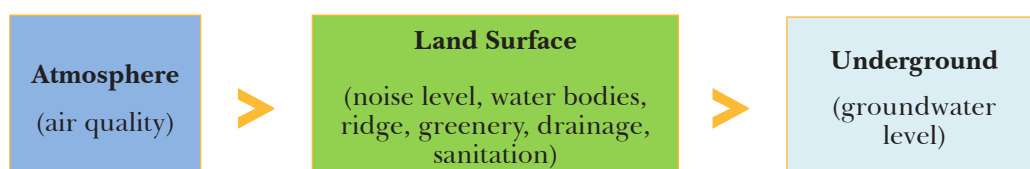
The international community has long reached a consensus that the sustainability of the environment is key to development. People can have longer life expectancies and become more productive, expenditure on healthcare is reduced, global warming is controlled, biodiversity is preserved, and future generations can be assured that they will have access to the same natural resources that their forebears had. Environmental conditions, however, remain unfavourable in most regions of the world. This is true for India, especially in its dense urban spaces. While the environmental challenges affect the entire population, the vulnerable and poor bear the brunt.

These conditions have arisen mainly due to flawed human practices, and the imperative is sound environmental planning. The aim is to maximise benefits and reduce the pressures on the environment.¹

Delhi is India's second most populous city and also has a large regional population. A high concentration of population and economic activities in the region, faulty working methods, and administrative inefficiencies have led to deterioration of the environment. The city does not fare well in several parameters, including air and water quality, drainage, sanitation, and noise levels.

This brief studies the case of India's capital, Delhi. The Delhi Development Authority (DDA) is presently finalising the city's draft master plan for the period 2021-41. It is therefore an ideal time to review the planning proposals provided in the draft plan. The brief aims to complement DDA's work on environment planning for the upcoming master plan. It reviews previous approaches and recent proposals, builds additional understanding of issues, and outlines specific ideas for improvement.

Considering Delhi's landscape, resources, and other characteristics, this analysis focuses on the following elements of the capital's ecosystem (see Figure 1):



Source: Author's own.

Environment Planning: A Historical Account

The DDA's first master plan (1961-81) earmarked locations for development of local, district, and regional parks. An inviolable 'green belt' of agricultural land was also proposed around urbanisable limits to prevent over-spilling of premature urban growth. The plan also recommended the shifting of noxious industries from residential to industrial areas, and provided a schedule for the same.²

At the time of the second plan period (1981-2001), Delhi was experiencing high population growth and its concomitant challenges. The two main natural features in the city—the Aravalli Ridge and river Yamuna—were impacted negatively. Parts of the ridge were encroached upon and the Yamuna was polluted.

To protect the environment, the second plan highlighted the need to conserve these features. Accordingly, the plan recommended the propagation of indigenous species of trees in the ridge and creation of adequate sanitation facilities for preventing untreated sewage and industrial waste from flowing into the river. Additionally, the plan provided for development of water bodies, which would act as lung spaces and improve the micro-climate.³ Despite the implementation of many of these recommendations, however, Delhi's environment continued to deteriorate.

The third master plan (2001-2021) was informed by unprecedented urbanisation and its resultant pressures on the environment. It suggested installation of decentralised sewage treatment plants and reuse of treated wastewater, restoration of traditional water bodies, and recharge of groundwater by harvesting rainwater. To improve Delhi's air, the plan recommended improvement of public transport facilities and conversion of thermal power plants to gas-based.⁴

Draft MPD-2041 Proposals for Environmental Sustainability

Prior to the formulation of the draft master plan, studies were conducted to understand the state of Delhi's environment. The problems pertain to the spatial distribution of green areas, area under surface water bodies, air and water quality, noise levels, drainage, sanitation, and local temperatures.

Accordingly, the draft plan describes the requirements for improving Delhi's environment (see Table 1). The sector-specific recommendations include enhancement of green cover and area under water bodies, improvement of surface water quality, promotion of non-polluting economic activities, green mobility, waste recycling, preparation of dust management and noise reduction plans, and generating public awareness.

The draft plan also proposes a monitoring framework for tracking environmental parameters and on-ground progress of implementation of master plan policies. The main features of the proposed framework are key performance indicators (KPI)-based evaluation,⁵ multi-agency supervision of work and coordination, data sharing and management, dedicated monitoring unit, and support for project implementation.

Draft MPD-2041 Proposals for Environmental Sustainability

**Table 1:
MPD-2041 Proposals for Addressing
Pollution and Climate Change**

| Proposals | Nature of Work |
|--|--|
| Improve green and blue assets | <ul style="list-style-type: none"> • Preserve and improve natural green and blue assets • Create new green-blue assets • Enhance green-blue features in built fabric • Manage green-blue infrastructure |
| Promote clean economic activities | <ul style="list-style-type: none"> • Concerned agencies to develop joint action plan for shifting of polluting industries or replacement with clean economic activities |
| Minimise vehicular pollution | <ul style="list-style-type: none"> • Adopt mixed use of land and transit-oriented-development (TOD) • Improve and encourage public transport • Create multi-modal hubs • Introduce congestion pricing • Encourage green mobility • Migrate to green fuels and shared modes |
| Address pollution of surface water bodies and ground water | <ul style="list-style-type: none"> • Check outfall of untreated wastewater • Remove existing pollutants • Monitor water quality in drains |
| Regulate dumping and disposal of solid waste | <ul style="list-style-type: none"> • Stop dumping of waste in environmental areas, such as river and other water bodies, Aravalli ridge, and forests. • Segregate waste at source • Develop system to manage waste at gatherings and festivals • Adopt waste reuse and recycling practices |
| Mitigate construction dust | <ul style="list-style-type: none"> • Dust management plan to be prepared and followed by construction agencies • Monitor construction sites |
| Other pollution mitigation measures | <ul style="list-style-type: none"> • Construct/coat pavements, roads, roofs with light coloured material to reduce heat • Plant trees at road sections • Prepare and implement a noise pollution action plan |
| Build understanding of pollution sources and action required | <ul style="list-style-type: none"> • Establish monitoring framework for tracking environmental parameters • Publish data through online platforms |
| Manage pollution at local level | <ul style="list-style-type: none"> • Improve citizen awareness, engage stakeholders as implementation partners |

Source: Delhi Development Authority.⁶

Delhi's Key Environmental Issues

Air and Noise Pollution

Air quality varies significantly during the year. Overall, however, the quality of Delhi's air is poor, with the season of monsoon being an exception. Pollution is at its peak during the winter months, as the lower atmosphere traps the air containing dust and emissions.

The most common sources of pollution are emissions from motor vehicles, construction activities, activities of power plants and industries, brick kilns, informal sector activities,^a garbage burning, and power generators.^b Other seasonal sources include farm stubble burning and regional dust storms. Accordingly, the draft MPD offers suggestions to address both regional and local aspects of pollution.

Although state governments have taken remedial steps^c at different periods of time, the problem of inferior air quality remains. This means that sufficient efforts to plan for, monitor, and control the sources of pollution are lacking. This could be due to deficiencies related to personnel, finance, and other resources.

Pollution also occurs when citizens and the administration do not have access to eco-friendly alternatives and operating procedures and guidelines to do their work. This has led to difficulties in preventing people from using diesel-run generator sets in commercial areas,⁷ deterring crop residue burning in farm lands of Punjab, Haryana and western Uttar Pradesh,⁸ as well as in shifting to electric vehicles.⁹

Emissions from the transportation sector are significant contributors to air pollution in Delhi.¹⁰ Since 2001, successive administrations have initiated various measures to minimise vehicular emissions, such as switching to Compressed Natural Gas (CNG) and better fuels, implementation of Odd-Even number plate scheme during periods of poor air quality, phasing out of old motor vehicles, and installation of emission monitoring systems.

a Namely, street food shops, automobile repair shops, manufacturing units engaged in dyeing of garments, metal works, and electroplating.

b Street sweeping and firecracker bursting also cause pollution.

c The National Capital Region (NCR) states of Haryana, Rajasthan, and Uttar Pradesh are required to comply with directions of NCR plan, National Green Tribunal (NGT), Environment Pollution (Prevention and Control) Authority (EPCA), as well as regulations and standards prescribed by Central Pollution Control Board (CPCB).

Delhi's Key Environmental Issues

Under the motor vehicle scrappage policy, the Government of India, in collaboration with private companies, plans to establish fitness check centres^d across the country from April 2022 onwards, with the aim of phasing out old polluting vehicles.^{11,12} The government has also decided to de-register all 15-year-old vehicles in the NCR.

Present efforts are to shift to 100 percent electric vehicles (EVs) by 2030. Some Indian and foreign automobile manufacturing companies^e are selling EVs and the infrastructure required for recharging these vehicles is also being developed. A sturdy e-car costs over a million Indian rupees,¹³ and low purchasing power and high upfront costs are important factors in the low uptake. Possible useful measures for achieving these include production of cheaper, better performing and safer electric vehicles, and installation of e-vehicle charging facilities at public places.

In August 2020, the Delhi government notified the Delhi Electric Vehicles Policy to accelerate the pace of EV adoption. The policy proposes offering financial incentives to buyers, waiver of road tax and registration fees, and establishment of a wide network of charging stations and swappable battery stations. The creation of a recycling ecosystem for batteries and EVs will be instrumental in addressing environmental concerns.¹⁴

Economic activities such as manufacturing and construction, contribute to air pollution as well. To control dust generated from construction and demolition activities, MPD-2041 has proposed regular monitoring of construction sites and implementation of dust management plans by construction agencies. Additionally, it has suggested shifting and replacement of existing polluting industries with clean economies, such as information technology, research and development, knowledge and innovation, clean manufacturing, and hospitality and tourism. More than these, however, the current air quality scenario calls for stricter interventions, such as levying penalties on polluting activities and shifting of polluting industries from non-conforming areas.

d In these centres, all vehicles have to undergo emission, braking, and safety equipment tests. While the existing pollution checking centres issue 'pollution under control certificate' based on pollutants released by the vehicle, comprehensive assessment of vehicles is not conducted.

e These include Tata Motors, Hyundai Motor, MG Motor.

Delhi's Key Environmental Issues

The forthcoming master plan should also address emissions from other sources, including for instance industries like pottery. Despite making claims of using clean fuel, many pottery units continue to rely on conventional sources of energy, which cause environmental pollution. This has led the Delhi Pollution Control Committee to issue legal notices to potters to replace their traditional kilns with gas furnace.¹⁵ While this measure is considered necessary for improving air quality, it is a cause of concern for potters as it will affect their livelihoods. They argue that earthen furnaces are more suitable for making a wide range of earthen items, and are cheaper to operate.¹⁶

Pollution caused by Indian railways is hardly mentioned in studies conducted to identify sources of air pollution in Delhi. Some rail corridors, such as the Delhi –Jaipur corridor, were expected to be electrified by December 2020.¹⁷ However, this has not been achieved till date. Every day, there is movement of about 30-40 passenger and goods trains on this corridor.¹⁸ The rail engines run on diesel and generate significant amounts of pollution.

Motor vehicles too, act as sources of noise pollution. Due to inadequate surveillance by traffic police, regulations and road signs are violated, resulting in disorder. A solution to control this problem is the installation of technology-based traffic management systems, which will also help in monitoring of road conditions and in tracking and penalising violators. Awareness generation among motorists about the negative effects of noise pollution is an equally important requirement.

Water Quality

Water bodies, wetlands, ridge, trees, green areas, and green buildings help in reducing the negative effects caused by air pollution. MPD-2041 calls for preservation and further development of such blue and green assets.

Some suggested measures are protection of boundaries of the assets by creating green buffers or walls, afforestation, treatment of wastewater before disposal in water bodies, processing and recycling of garbage, regulating public access in eco-sensitive areas, re-establishing lost connections with water systems and aquifers, conversion of under-utilised sites and wastelands into biodiversity areas, and generating public awareness about the benefits of natural resources.

Delhi's Key Environmental Issues

Protecting surface water bodies and groundwater from untreated wastewater, industrial effluents, and garbage is also an urgent requirement. In the case of river Yamuna, it is observed that the water is highly polluted. However, the draft MPD falls short of proper proposals for the protection of Yamuna. It fails to provide a proper plan to deal with issues such as disposal of garbage along the course of the river and the immersion of offerings by devotees on religious occasions. Nor does the plan address the release of untreated industrial effluents and wastewater in the river. Given how the Yamuna is a crucial source of raw water for the water supply agency, it is imperative to improve its state.

Attention should also be given to the wetland that is lake Najafgarh,^f whose quality fails to meet standards in prescribed acidity (pH) and dissolved oxygen (DO) that are necessary to support wildlife.¹⁹ This is due to the entry of untreated sewage in the lake from Gurugram and surrounding villages of Delhi.

The Delhi government aims to address these issues by creating adequate treatment facilities. The upgrade of existing sewage treatment plants (STPs) and setting up new plants in a decentralised manner are planned. The government aims to build 56 STPs in the next three years.²⁰

Groundwater Level

Maintaining a certain threshold of groundwater level is an important environmental requirement. This allows the retention of water in lakes and water bodies, and protects land surface from subsidence. According to the water supply agency, Delhi has over a thousand water bodies. However, many of these have dried.²¹

A study of the groundwater situation in Delhi reveals that depth of the water level in the city varies from a minimum of 0.80m to a maximum of 65m below ground level and there is an increasing trend in maximum depth.²²

^f The lake is considered to be the only rich wetland in the city that attracts a large number of birds, and has potential to raise groundwater level in west Delhi areas such as Dwarka which experience severe water shortages.

Delhi's Key Environmental Issues

Illegal extraction of groundwater poses a challenge to the attempts of reviving and rejuvenating water bodies and recharging groundwater through rainwater harvesting (RWH). People who do not have access to required quantities of water, or overuse water, resort to such unfair practices. To address the problems, it is important to provide adequate water supply and penalise violators. The draft MPD-2041 suggests that groundwater should be recharged using treated wastewater as well as rainwater by developing aquifer recharge ponds and lakes in Yamuna floodplain and biodiversity parks.

Aravalli Ridge

The Aravalli ridge, an extension of the Aravalli mountain range, is often described as the “lungs of Delhi”. It is rich in flora and fauna, and is home to several water bodies and historical monuments. In order to preserve the ecosystem, and ensure environmental and health benefits, the ridge has been declared as a protected area. Yet, unauthorised construction has taken place in some locations due to lack of monitoring by the authorities. The draft MPD-2041 calls for enhancing biodiversity for conserving and preserving the ecosystem of the ridge.²³

There is growing concern among environmentalists over the possibility of the Aravallis being opened up for construction activity in the adjoining state of Haryana, which would lead to shrinkage of this ecologically sensitive area.²⁴ It would do Delhi's policymakers well to draw lessons from the regional plan for Goa.²⁵ The plan has identified and marked two eco-sensitive zones, which are mapped to protect the endangered and fragile ecosystem. While Zone I does not allow for any development, Zone II permits minor interventions that pass certain ecological requirements.

Greenery

While Delhi has done well in maintaining and increasing the green cover, there is scope for improvement. Lack of coverage of vegetation in various parts of Delhi results in the generation of dust from passing motor vehicles or during stormy weather conditions. It is necessary to address the barren state of these areas.

Delhi's Key Environmental Issues

Delhi's weather is hot and dry for most of the year, thereby requiring proper arrangements for watering plants. However, the use of motor vehicle tankers to water the plants along roads results in over-consumption of water. The case of Abu Dhabi provides an alternative to this practice. In the city, a network of rubber pipes with holes has been laid to supply the required quantity of water according to a timetable in many of the city's green areas.²⁶

Improvement is also needed in the city's green building footprint, as this has a direct relationship with the health and well-being of people residing in those buildings. In Indian cities, most buildings and group housing areas are built without any regard for the need to preserve the natural environment in surrounding areas. They also do not invest in solar rooftop installations, rainwater harvesting, and proper ventilation systems. This leads to wastage of precious natural resources and entry of dust and emissions in the building, which has adverse impacts on human health. Following green standards during construction of buildings ensures that the indoor air quality remains satisfactory. In such buildings, the mechanical ventilation systems ensure a continuous supply of fresh air inside the buildings.²⁷

With respect to rainwater harvesting in Delhi, it is noted that provision of RWH structures in existing and new properties measuring 100 sq m and above is a mandatory requirement for obtaining a house completion and occupancy certificate. However, a large number of buildings do not install the structures. Further, it is learnt that after installation of the apparatus, owners are less inclined towards investing in maintaining the system.²⁸

Another practice among plot owners is the violation of building by-laws. While laws require some land to be left vacant on the front and back side of the house for better circulation of air and sunlight, the owners extend the built-up area after obtaining the house completion and occupancy certificate. The concretisation leads to reduced greenery.

Delhi's Key Environmental Issues

The draft MPD-2041 proposes mandatory green rating^g for new developments. Some other practices that can help in mitigating CO₂ emissions from buildings are people-friendly policies, adherence to existing building by-laws, supportive programmes, and annual inspection and audit.²⁹

Drainage and Sanitation

Delhi has fared poorly in managing waterlogging and flooding for many years. Though waterlogging is attributed to excessive amounts of rain, the problem actually occurs due to a deficient drainage system. Therefore, some aspects which require attention are identification and improvement of waterlogged areas, drain maintenance and network continuity, and drain size.

Although the administration is aware of the locations of many waterlogged areas, action is rarely taken to improve those drainage systems, and the result is seen in the inundation of roads, underpasses, and, recently, the international airport.³⁰

There are also issues with the storm water drainage network, as well as its size. The purpose of the network is to transport storm water to where it can be harvested, or sent to surface water bodies such as the Yamuna. However, in several areas, storm water drains have not been constructed. The size of existing drains is too small to handle the large quantities of water received during the monsoon season. The Delhi-Jaipur national highway, as well as several underpasses along the highway, are examples of flood-prone areas where the drains are extremely small. Indian city governments can learn from the experience and design of storm water management systems in Singapore, where drains for transporting storm water are wide and deep, and are properly maintained throughout the year.³¹

^g The green building rating system is an evaluation tool that measures environmental performance of a building through its life cycle. It comprises of a set of criteria covering various parameters related to design, construction, and operation of a building. These pertain to energy systems, wastewater treatment facilities, water reuse and recycling, waste disposal facilities, ventilation systems, etc. For example, a green building can help in reducing energy consumption from mechanical heating/cooling and thus mitigate pollution.

Delhi's Key Environmental Issues

Perennially waterlogged areas are located in various places in the city – along railway lines, in slums and unauthorised colonies, peri-urban areas, and *nallahs* (open drains). These are depressions where rainwater remains collected, as the soil has lost absorption capacity. The continuous inflow of sewage from neighbouring informal areas further aggravates the problem as the sewer network has not been laid. Disposal of garbage in such depressions is also a common practice. Due to these reasons, the water has turned green, and conditions are ideal for breeding of mosquitoes that cause diseases.³²

Similarly, the local governments in Delhi need to do more for garbage planning, management and disposal. Inefficiencies are observed in municipal waste segregation, collection, transportation, recycling, and disposal. The sites of immediate concern are the waste dumping grounds, informal settlements, and peri-urban areas.

“Delhi’s green building footprint needs to be improved, as it has a direct relationship with the health and well-being of people residing in those buildings.”

Conclusions And Recommendations

The draft master plan for Delhi offers planning proposals for improving environmental conditions in Delhi by the year 2041. Upon finalisation, these proposals will be translated into development projects for implementation by the concerned agencies. To achieve the goal of making Delhi an environmentally sustainable city, it is necessary to ensure that the proposals are doable, they address emerging challenges, and that the agencies are equipped to implement these effectively.

A perusal of proposals reveals introduction of new ideas, such as enhancement of green-blue features in built fabric, promotion of clean economic activities, creation of multi-modal hubs, preparation of dust management and noise reduction plans, and establishment of an environment monitoring framework. Previously, such measures were lacking, and if successfully applied, these would be instrumental in improving the quality of the environment.

This brief makes the following recommendations to improve the environmental components of Delhi's new master plan:

1. Mapping is an important aspect of a master plan, and thus many of the proposals need to be mapped. It will be helpful if the precise locations of proposed activities and planning strategies are shown on a map, such as urban farming, biodiversity parks, eco-parks, green buffers, green mobility corridors, ecologically sensitive areas, afforestation areas, areas prone to flooding, and heat islands. If proposals are not mapped, their implementation on the ground will occur in a haphazard manner. Decisions on selection of locations and planning strategies cannot be left entirely with the implementing agencies. The mapping expertise and planning techniques of trained planners can be useful in this regard.
2. Provision of eco-friendly alternatives for diesel-run generator sets in residential, commercial, industrial, and agricultural areas, and crop residue burning in farm lands.

Conclusions And Recommendations

3. The production of cheaper, well designed, and safe e-vehicles. Adequate charging facilities at public places/fuel pumps should be provided, and the government should develop and support innovative financing models to facilitate EV adoption by cost-sensitive consumers.
4. Setting up adequate numbers of CNG stations and providing sufficient CNG supply.
5. Motorised tankers used for watering green areas and other vehicles involved in delivery of public services, such as gas cylinders and goods, should be allowed to operate only after these meet prescribed emission norms.
6. Non-electric Indian railway corridors should be upgraded and electrified. Level railway crossings should be better managed. The circular rail network in Delhi constructed in 1975, popularly known as ring railway, remains unutilised. This should be revived and integrated with the metro system to reduce the current pressure on roads.
7. Installation of intelligent traffic management systems and improved enforcement of rules of the road such as maintaining proper distance between vehicles and use of low-beam headlight after dark.
8. The provision and implementation of specific rules and regulations that will require communities, shop owners, and industrial establishments to maintain cleanliness in and around water bodies, and in public places.
9. The revival of barren public lands such as by covering them with vegetation to reduce generation of dust particles.
10. The promotion of educational and recreational activities, such as trekking, hiking, cycling, along the Aravalli ridge.
11. Frequent monitoring of new constructions to ensure compliance with green building norms.

Conclusions And Recommendations

12. Reducing the incidence of waterlogging. For one, depressions along railway lines, and in informal or peri-urban areas should be filled with solid and demolition waste, and drainage facilities should be provided. Greater efforts should be made to keep storm water drains clear of garbage and silt. The size of drains should be increased to accommodate higher volumes of rainwater. All roads should have proper drainage facilities.
13. Preparation of a decentralised waste management plan that will address the various aspects of waste, including for instance the unsafe disposal of medical waste.
14. The improvement of water supply to consumers, and guarding against illegal extraction of groundwater.

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