UNEP · International Resource Panel · **Delhi, India** *Case Study*

TOWARD ZERO-POLLUTION CITIES
Making Mega Cities Resource Efficient, Inclusive, and Low Polluting

Overview

Delhi, India is typical of many megacities in Asia and Africa, with large populations, swift economic growth that spurs in-migration, and an already stressed built environment with significant underserved populations lacking access to basic infrastructure and services. Such megacities are often unable to keep up with the rapid pace of growth, which in turn leads to further deprivation and inequality as well as significant pressures on the built and natural environment resulting in air pollution, water quality degradation, and ground water depletion. Such pressures adversely affect well-being of people and the environment, thereby impacting almost all the SDGs. This case study demonstrates the value in applying a systems approach that quantifies linkages between natural resources, infrastructure and food supply systems and multiple SDG co-benefits. The study identifies the potential benefits of a bundle of strategies that can promote more inclusive development, while reducing air pollution emissions, greenhouse gas emissions and human health risks in developing world cities.

Envisioning a Systems-Based Strategy Bundle in Delhi, India

To address the overwhelming pace of urbanization in developing mega cities, a foundational shift toward a more compact urban fabric (form) to reduce motorized travel is essential. This, along with transformations to better manage agricultural and municipal solid waste, provide clean cooking fuels, access to renewable electricity, promoting building efficiency and the use of low-polluting construction materials, will be significant in reducing air pollution and an important complement to end of pipe pollution control. No single strategy is sufficient by itself - a combination of all these strategies, together, is essential to move toward zero-polluting mega-cities. Specific strategies and their rationale are shown below

Strategic Land Use Intensification

❖ High density nodes around transit with surrounding medium density promotes transit and reduce personal motorized travel (e.g. polluting cars).

❖ Efficient transit combined with walkable/ bikeable streets reduce vehicle emissions and congestion.

Resource Efficiency for All

❖ Multi-storey resource-efficient buildings use 36% less construction materials.

❖ Energy efficiency in all buildings and culturally sensitive behavioural nudges aimed at high consumers reduces demand for polluting electricity.

Resource Substitution

❖ Creating a market for low polluting construction materials such as stabilized earth blocks, green bricks and green cement, avoids PM2.5 emissions from brick and cement factories.

❖ Clean cooking fuels can save lives from air pollution exposures in poor households using dirty fuels.

Renewable Electricity and Electric Mobility

❖ Electricity grid transformation with more renewable energy reduce GHG and PM2.5 emissions.

❖ Careful integration of new electric mobility technologies such as electric cars and e-rickshaws can benefit the environment and urban livability.

Waste Management

❖ Business innovations to develop markets for crop residues and municipal solid waste prevents their burning, a substantial source of PM2.5.

❖ Reuse of industrial wastes like fly ash and steel slag in construction materials further reduces PM2.5.

Anticipated Co-Benefits

The above strategies, if implemented well and in concert, even with current technology and policy projections, yield multiple co-benefits as illustrated in the case study on Delhi, India:

❖ A reduction of GHG and PM2.5 emissions of 22 percent to 25 percent.

❖ Cooking fuel substitution alone avoids 2,500 premature deaths annually.

❖ Improving access to electricity, sanitation and good housing for 7 million underserved in Delhi, requires less than 10% added electricity and construction material use annually.

These systems strategies combined with air pollution control and robust monitoring provide a road map for developing resource-efficient, inclusive and low-polluting megacities.