

The cost of urbanisation in Delhi

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What do the trees, water bodies, agricultural fields and forests mean for a city like Delhi? Can we ascribe a monetary value to their contribution? These are some of the questions that a team of Delhi-based scientists recently tried to answer and found that rapid and unplanned urbanisation in Delhi during the last two decades (1998-2018) has happened at the expense of many natural and semi-natural elements and it has resulted in a loss of about Rs. 560 million (US\$ 7.614 million).

The study showed that the biggest contributor to this loss was the decline in the city's forest cover, which declined from 12,206.97 hectares in 1998 to 5,780.88 hectares in 2018 – which is more than half.

To compute the monetary value of forests and other natural elements, the researchers used the concept of ecosystem services which includes quantitatively measuring the contribution of a natural element such as forests or river to the ecosystem.

There are four major ways in which natural elements are said to contribute – one is by provisioning, such as by providing food, raw material or other usable products; the second is by regulating processes in the ecosystem, like, carbon sequestration, water purification etc.; the third is by offering cultural benefits, such as, recreation and the fourth is by supporting the above three categories.

In 1997, a team of USA-based researchers published a study where they combined all the four categories of contribution for a natural element and ascribed a monetary value to it. They held that water bodies like rivers, lakes and ponds provide ecosystem services worth Rs. 627,000 per hectare per year (US\$ 8,498), grasslands contribute services worth Rs 17,000 per hectare per year (US\$ 232) and forests ecosystem services were worth Rs. 71,500 per hectare per year (US\$ 969).

In the present study that was released in September this year, the researchers used the same numbers to measure changes in ecosystem services in Delhi in the last decade. They identified different kinds of natural elements in Delhi's ecosystem, cropland, waterbody, built-up, plantation, scrub, forest and exposed area, and then measured the contribution of each of these seven categories.

What they found was that the total value of the ecosystem services provided by all the seven categories of natural elements was Rs. 2.29 billion (US\$ 30.97 million) in 1998 which declined to Rs. 1.72 billion (US\$ 23.35 million) in 2018. The value of ecosystem services from forests declined from Rs. 0.87 billion (US\$ 11.8 million) two decades ago to Rs. 0.41 billion (US\$ 5.6 million) in 2018. Similarly, for croplands, a decline from Rs. 370 million (US\$ 5.1 million) to Rs. 280 million (US\$ 3.9 million), in the same period, was observed.

"The lack of economic evidence remains the most potent cause for the observed degradation and loss of more than 75 percent natural ecosystems of the terrestrial landscapes around the globe," said study co-authors Sonali Sharma of the School of Environmental Sciences, Jawaharlal Nehru University in Delhi and Srikanta Sannigrahi of the School of Architecture, Planning and Environmental Policy at the University College Dublin, Ireland.



The study found that the area under forest cover in Delhi has reduced in the last 20 years. Photo by Pinakpani/Wikimedia Commons.

"The field of urban ecosystem services is still an open frontier in India. Our study is a starting point and more localised studies are required to make more precise measurements," they added.

Plantations bucked the trend

The only category to buck this trend was that of artificial plantations, which saw an increase in value of ecosystem services.

Owing to plantation drives and setting up of biodiversity parks (Yamuna Biodiversity Park, Sanjay Van, Aravalli Biodiversity Parks and Asola Bhatti Sanctuary) the value of ecosystem services from plantations increased from Rs. 100 million (US\$ 1.36 million) to Rs. 130 million (US\$ 1.79 million) from 1998 to 2018.

"Over the study period, the Yamuna biodiversity park aided in the highest net gain of ecosystem services – Rs. 96 million (US\$ 1.3 million) – through an increase in floodplain forest cover," said P.K. Joshi, the lead author of the study and professor at School of Environmental Sciences, Jawaharlal Nehru University, New Delhi.

The value of such plantations/green zones has been highlighted by other studies too. A recent, unrelated study last year by The Energy and Resources Institute (TERI) and the Central Zoo Authority (CZA), showed that the Delhi zoo provided ecosystem services worth Rs. 4.2 billion for the year 2019-20.

For the current study, the researchers also conducted a district-wise assessment of ecosystem services in Delhi. Most of the districts faced a decline in ecosystem services due to urbanisation during the study period. The highest contribution to ecosystem services comes from the south, and southwest, followed by the northwest, northeast, and east districts. However, for most of these districts, the value of ecosystem services is following a declining trend.

The rapid urbanisation of areas in India is here to stay as the study noted that, in the future, India is expected to add over 400 million new urban dwellers and stressed that as rapidly growing cities tend not to sustain their growth, it is necessary to study and highlight the importance of ecosystem services in sustaining human well-being by delivering both indirect and direct beneficial services.

It noted that an increase in urbanisation requires infrastructural support such as roads, houses, institutions which drive land-use transformations. In fact, over the past two decades, the built-up land use in Delhi has increased by 71 percent at an annual growth rate of 1,566.52 hectares, the study said.

The researchers also noted that residents of densely populated districts like northeast and west remain under-served by passively conveyed ecosystem services, such as air quality, recreation, cultural benefits.

Govind Singh, associate professor of environmental studies at O.P. Jindal Global University, who was not associated with the study, said though he personally doesn't believe in "putting a price value on nature and its bounty" he encourages such studies, "simply because this is the only language that policymakers and other stakeholders understand."

To be able to determine the patterns of change in land use in Delhi, the researchers used satellitederived images. In particular, they used images that have a spatial resolution of 30 metres. The researchers said they wish to continue such studies with higher spatial resolution satellite data sets.

The researchers recommended that policymakers in the national capital should look at establishing conservation zones, within and adjacent to the city and should engage with urban residents in order to develop a deeper understanding of ecosystem services and their role in achieving socioeconomic goals.

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