

## Less greenery for the Poor? Social inequity and urban nature distribution in tropical Asian megacities

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### ABSTRACT

Many studies on disparities in the distribution of green spaces have highlighted that highly deprived urban areas have fewer green spaces. These studies have mainly focused on access to urban parks and public open spaces that are usually for recreational purposes and exist as neighbourhood amenities. However, when other types of urban nature beyond designated parks are accounted for, claims of green space distributive injustice become even more complicated. In many developing Asian megacities, for example, the poor are forced to live on marginal lands which may contain remnant green spaces that could otherwise provide substantial ecological and biophysical functions. The loss of green spaces in underprivileged communities in these cities has accelerated over decades, yet little research has sought to quantify the distribution of different types of green spaces and their relationship with social disparities. Using the case studies of Mumbai and Jakarta, in our research, we questioned the common assumption that the poor have less access to green space by analysing green space distribution patterns; in doing so, we initiated a discussion on socio-ecological justice in sprawling developing Asian megacities.

We used three sets of geospatial data. First, we estimated vegetation cover from Landsat satellite images of Mumbai and Jakarta using the Normalised Difference Vegetation Index (NDVI), later converted to green vegetation fraction (Fg) with five values. Second, we identified types of urban greenery in the two cities based on geospatial databases, including City Land Use Map, Open Street Map, and satellite images, and further categorised these into managed and unmanaged spaces. Third, we extracted the wealth distribution of the two cities from property value maps produced by legal agencies. We consolidated the mutual relationships of green space distributional patterns, size of green patches, density of vegetation, types of green spaces, and social inequity and analysed them using linear regression models.

Our findings highlighted the following: 1) The green vegetation covers for Mumbai and Jakarta are 54.28% and 30.7% respectively of the total urban area. In both cities, more than half of the lowest land value districts are covered by green spaces, while the green cover in the highest land value districts are approximately 43.85% and 27.0% respectively. 2) The proportion of unmanaged greenery in the two cities is larger than that of managed greenery, approximately ten times larger for Mumbai and 1.5 times larger for Jakarta. Not surprisingly, healthy and dense vegetation predominantly constitutes the unmanaged greenery, including mangroves, woodlands, scrublands, green buffers, and urban forest. 3) The densely vegetated areas are two or three times larger in the poorest districts than in the richest districts of Mumbai and Jakarta. 4) The poorest districts in Mumbai have less managed greenery, 2.5% of total green space. In contrast, a substantial amount of managed greenery is co-located and co-exists in the poorest districts of Jakarta - The area of managed greenery is four times larger than unmanaged greenery in these districts, but the managed greenery is not accessible to everyone because these spaces require

entrance fees or are privately owned. 5) The co-relationship of the status of urban development and the land values in a district is not necessarily intuitive of the distribution. For example, in less developed districts of Mumbai, i.e., the fringe areas with lower land values, the presence of remnant greens is more significant than manicured greens, but in Jakarta, because of the low land values, the fringe areas are strategically located to expand exclusive greenery such as golf courses and recreational grounds.

The results suggest that unmanaged urban greenery is either perceived as less valuable and less desirable property, or it is surrounded by settlements that are relatively poorer in wealth, thus lowering its land value. The study concludes by discussing the practical consequences of these findings to policy, planning, and social justice. The political implications are straightforward: there is a need for a concerted effort to conserve green spaces in deprived urban neighbourhoods. This is challenging, however, as unmanaged green spaces in low-income neighbourhoods are often regarded as 'transitory' spaces awaiting development. Systematic approaches to conserving these significant patches are needed in long-term development plans to preserve remnant ecological functions in the city. The positive association between poverty and greenspace coverage may appear in other cities as well, because this pattern is a consequence of disadvantages in deprived areas: fewer job opportunities, farther from the main workplace. The paradoxical situation of more greenery, richer biodiversity, but poorer urban population requires further discussion by different stakeholder groups, including policy makers, researchers, and planners and designers, if we are to develop socio-ecologically sustainable cities.

Key words: Green space distribution, Social inequity, Socio-ecological justice. Asian developing mega cities