Cities in Higher-HDI Countries Have More Urban Greenspace in South Asia

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2025-04-09

Overview: Motivation and Key Findings

Motivation

Why is Greenspace Important in Urban Areas?

- Improves air quality, cools cities, and supports biodiversity.
- Encourages physical activity, reduces stress, and fosters community.

Urban greenspace in South Asia is under pressure from rapid population growth and limited urban planning, especially in lower-HDI countries.

- Note: *HDI = Human Development Index, South Asian countries: India, Nepal, Bangladesh, Pakistan, Sri Lanka, Bhutan, Maldives, Afghanistan.*

Research Question and Key Findings

Research Question:

- How does urban greenspace vary across South Asian countries?
- Do more developed countries (higher HDI) have greener cities in South Asia?

Key Findings:

- Cities in higher-HDI countries have significantly more greenspace than those in lower-HDI contexts.

Dataset: Global Greenspace Indicator

Global Greenspace Indicator Dataset

Data Source:

- Harvard dataverse (2023), NDVI data from 1,000 cities worldwide (2010-2021). *(NDVI = Normalized Difference Vegetation Index)*

Scope for this Project:

- Cities in South Asia: India, Nepal, Bangladesh, Pakistan, Sri Lanka, Bhutan, Maldives, Afghanistan.

Key variables used:

- `annual_avg_2021`: NDVI score indicating level of urban greenspace in 2021.
- `Country`, `City`, `HDI_level`: Compare cities by HDI level.

Analysis of Dataset: Analysis 1 and 2

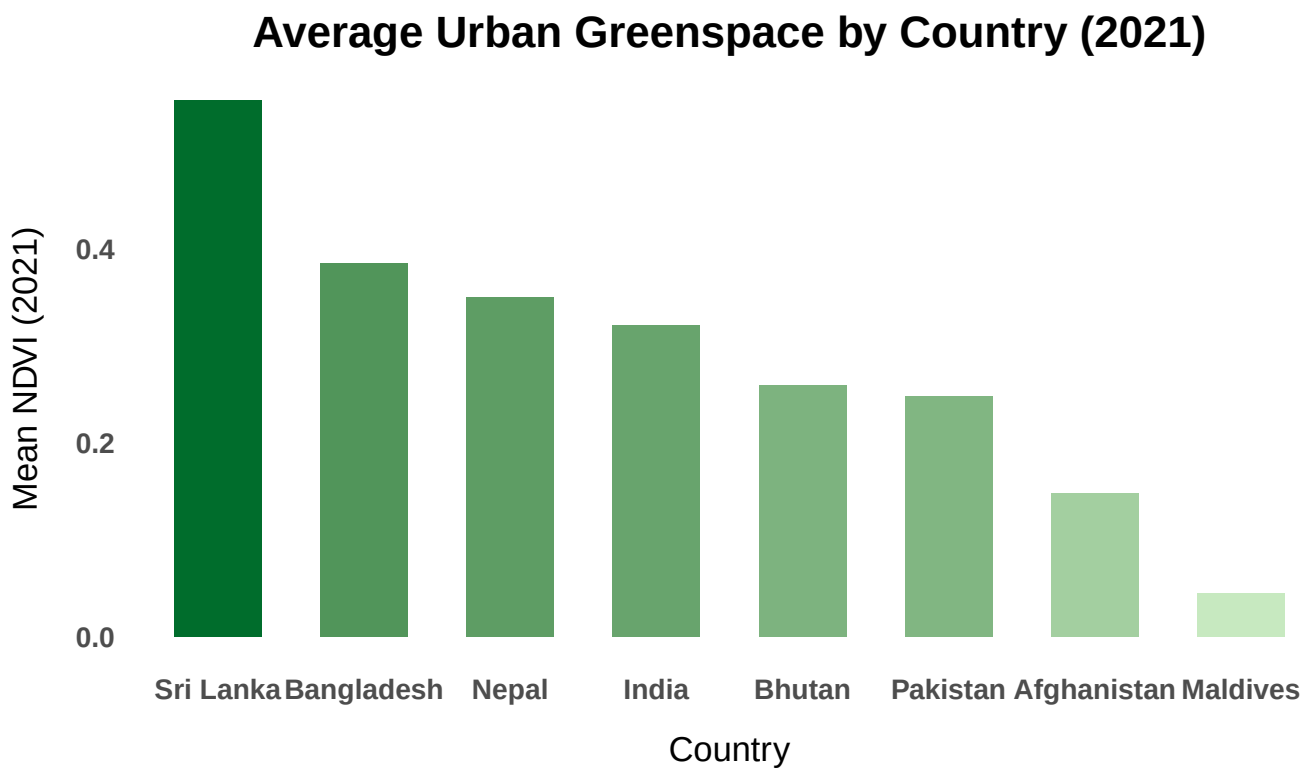
Analysis 1: Greenspace by Country

Research Question: How does urban greenspace vary across South Asian countries?

Method: Calculated the average NDVI(2021) for cities within each South Asian countries.

Analysis 1: Greenspace by Country (cont.)

Visualization:



Takeaway: Sri Lanka most green, Afghanistan and Maldives least.

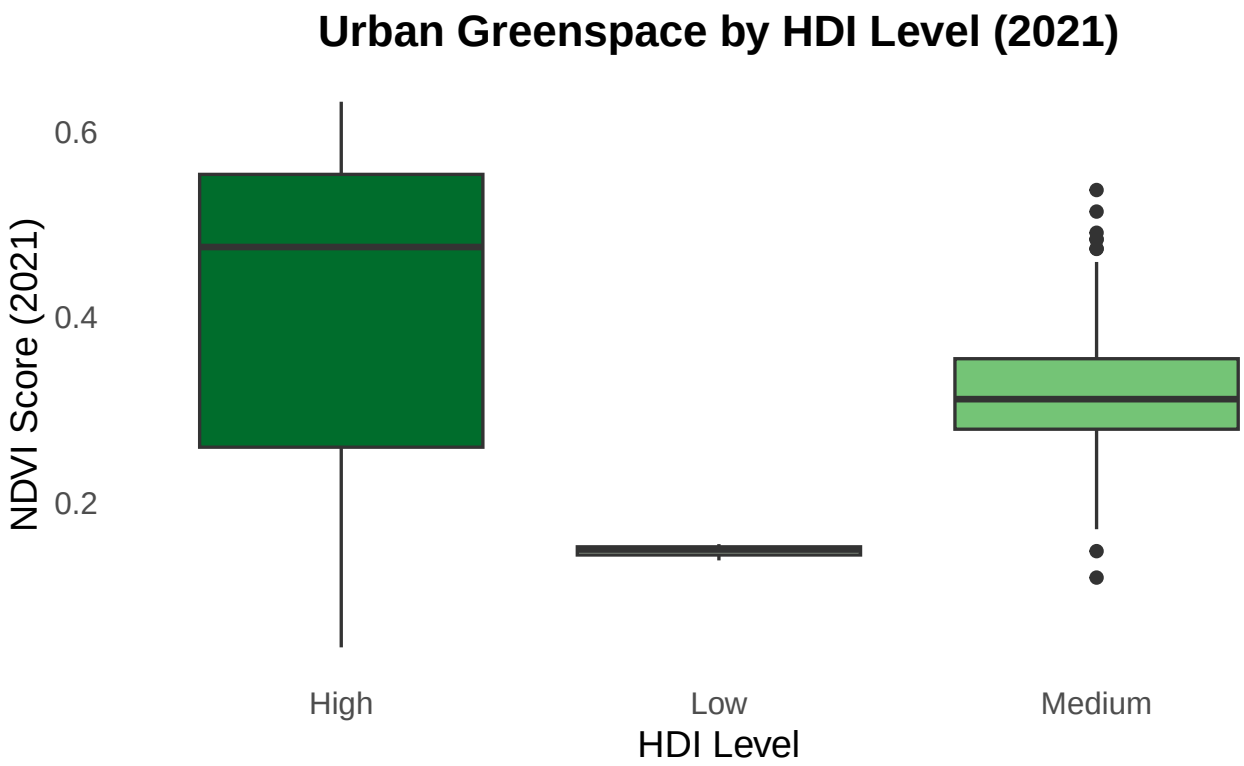
Analysis 2: Greenspace by HDI Level

Research Question: Do cities in more developed South Asian countries with higher HDI have more urban greenspace?

Method: Grouped cities by HDI level and compared average NDVI (2021) using a boxplot.

Analysis 2: Greenspace by HDI Level (cont.)

Visualization:



Takeaway: Higher-HDI countries are greener than lower-HDI.

Analysis 2: Statistical Test- ANOVA (cont.)

Purpose: Test whether the differences in urban greenspace across HDI levels are statistically significant.

Method: Used one-way ANOVA (Analysis of Variance) to compare NDVI scores (2021) across HDI categories.

Analysis 2: Statistical Test- ANOVA (cont.)

Result:

Df Sum Sq Mean Sq F value Pr(>F)
HDI_level 2 0.1017 0.05087 10.06 6.48e-05 *** Residuals 228 1.1526 0.00506
— Signif. codes: 0 ‘***’ ***0.001*** ‘**’ *0.01* ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Interpretation:

There is a statistically significant difference in greenspace between HDI groups. Cities in higher-HDI countries tend to have significantly greener urban environments.

Conclusion

- Urban greenspace varies widely across South Asia.
- Cities in higher-HDI countries are significantly greener.
- ANOVA confirms differences are statistically significant ($p < 0.001$).
- Development level plays a key role in urban environmental quality.

Thank you