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TESIS DOCTORAL

Presentada para optar al título de Doctor por:

Jane Doe
Your prior studies

Madrid, 2025


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Bajo la dirección de:
Dr. Your supervisor name
Your cosupervisor name

Madrid, 2025

Table of contents

1 Introduction

Urban areas are rapidly expanding, creating pressures on local ecosystems (Knuth 1984). Understanding the interaction between economic growth and ecological sustainability is crucial for long-term urban planning. This paper proposes a model to assess these trade-offs.

2 Theoretical Framework

We develop a conceptual framework that links urban economic activity with environmental indicators such as air quality, green space, and biodiversity. The model assumes that economic growth can be achieved without compromising key ecological functions, up to certain thresholds.

3 Methods

3.1 Data Sources

We used simulated data representing urban population growth, economic output, and ecological metrics over a 20-year period.

3.2 Model Description

The model integrates economic indicators with ecological constraints. Key equations include:

$$E_t = E_{t-1} + \alpha \cdot G_t - \beta \cdot U_t$$

where E_t is the ecological index at time t, G_t is economic growth, and U_t represents urbanization pressures.

4 Results

Our simulation shows that moderate economic growth can be sustained without significant ecological degradation, provided that urban planning policies enforce green space and pollution controls. Figures 1 and 2 illustrate the projected trends.

5 Discussion

The results indicate that careful policy design can balance economic and ecological objectives. Comparing our findings with previous studies, we see consistent evidence that integrated urban planning mitigates environmental risks.

6 Conclusion

This study highlights the importance of combining economic and ecological modeling to inform urban sustainability policies. Future research should include real-world case studies and sensitivity analyses.

7 Test

7.1 Section

This is a simple placeholder for the manuscript's main document (Knuth 1984).

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# This is code
a <- 1 + 2
print(a)
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[1] 3
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14		Belgique ..		11,662.348	11.780.399	12.071.408	14.633,325	12.694.923	286.615
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16		Danemark.		11686.786	3.037.166	1.381.142]	3.909.8801	2.939.797	115.318
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22				53.295.770	56.780.074	53.227.662	60.667,0281	53.665.7771	37.145
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27	f			23.144.494	17.648.4301	19.350.5301	14.849.680	10.562.730	421
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31	20	Pohs,.....		5,981.282	6.547.080	7.078.997	7.739.3451	7.586.484	94.017
32	21			1.098.213]	324.481	82.372	129.6311	166.7611	311570
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36	25			4,288.8731	4.667.276	4.798.4371	5,580.3461	5.213.878]	
37									
38				2.513:3261	1665.863	2.951.342	4.174.6921	3.236.097	3.299
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40									

Figure 7.1: test image

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This is new content.

```
rep(9, 10) - seq(1, 10)
```

```
 [1]  8  7  6  5  4  3  2  1  0 -1
```

Acknowledgements

We thank the Example Research Council for funding support and colleagues for valuable feedback.

References

Knuth, Donald E. 1984. “Literate Programming.” *Comput. J.* 27 (2): 97–111. https://doi.org/10.1093/comjnl/27.2.97.

Appendix A

This is my appendix A.