# Assessment of urban development: A composite indicator analysis of the safe city index through the 'benefit of the doubt' model

*Evaluación de desarrollo urbano: un análisis de indicadores compuestos del índice de ciudad segura a través del modelo del 'beneficio de la duda'*

Nadine Burgoa*
Department of Management, Polytechnic University of Catalonia (UPC Barcelona Tech), Spain.
nadine.elma.burgoa@estudiantat.upc.edu

Andre Rosado
Department of Management, Polytechnic University of Catalonia (UPC Barcelona Tech), Spain.
andre.rosado@estudiantat.upc.edu

- Article received:
  10 January, 2023
- Article accepted:
  17 April, 2023
- Published online in articles in advance:
  21 August, 2023

* Corresponding Author
Nadine Burgoa

DOI:
https://doi.org/10.18845/te.v17i3.6849

**Abstract:** This study employs the 'benefit of the doubt' (BOD) weighting model to build a composite indicator to evaluate urban development in 60 cities located around the world for 2021. The results of the empirical application based on the data provided by The Economist (i.e., safe city index) reveal the informative power of the proposed composite indicator, relative to models using equal weight restrictions. Findings indicate that there are significant efficiency differences among the analyzed cities, and that cities follow different strategic pathways when it comes to design urban policies. This suggests that there is much scope for strategic and effective support policy in many cities. The results of the study highlight that an analysis based on the BOD approach may offer useful information to policy makers on what strategic actions may potentially optimize the allocation of local resources and, subsequently, enhance urban development.

**Keywords:** Urban development, data envelopment analysis, benefit of the doubt, safe city index

**Resumen:** Este estudio emplea el modelo del 'beneficio de la duda' (BOD) para construir un indicador compuesto que permita evaluar el nivel de eficiencia en desarrollo urbano de 60 ciudades ubicadas en todo el mundo para 2021. Los resultados de la aplicación empírica a partir de datos proporcionados por The Economist (índice de ciudades seguras) revelan el poder informativo del indicador compuesto propuesto, comparado con modelos que dan igual ponderación a las variables estudiadas. Los resultados muestran que existen diferencias significativas de eficiencia entre las ciudades analizadas, y que las ciudades siguen caminos estratégicos diferentes cuando se trata de diseñar políticas urbanas. Esto sugiere que hay mucho margen para una política de apoyo estratégica y eficaz en muchas ciudades. Los resultados del estudio destacan que un análisis basado en el enfoque BOD puede ofrecer información útil a los responsables políticos sobre qué acciones estratégicas pueden potencialmente optimizar la asignación de recursos locales y, en consecuencia, mejorar el nivel de desarrollo urbano.

**Palabras clave:** Desarrollo urbano, bienestar urbano, análisis envolvente de datos, beneficio de la duda, índice de ciudades seguras.

# 1. Introduction

This study analyzes the level of efficiency of 60 large urban centers located around the world, paying special attention to the multidimensional nature of the urban development construct, as well as the key role played by digitization and sustainability policies in shaping urban development.

The formation of cities is one of the most important observable consequences of the socioeconomic, demographic, and political evolution of societies (Tellier, 2009). In addition, urban development is a process strictly connected to the socioeconomic competition between cities, local and cultural circumstances, urban strengths and weaknesses, and political factors. This constant growth of cities requires the adoption of flexible policies, that is, adequate and effective responses to the different challenges faced by societies including, among other, housing, employment, infrastructure, public services, energy saving and, more recently, environmental and digitalization strategies (Kourtit et al., 2021; Acs et al., 2022).

For many large and small cities around the world, the lack of specific support policies that strengthen one or more of the components forming the urban development construct is a major concern today (González et al., 2011; Deilmann et al., 2016; Araya-Solano, 2019; Wang, 2019; Arias-Valle et al., 2021; Lafuente et al., 2022b).

This situation erodes urban prosperity and potentially creates negative externalities. Only within a safe urban environment can the necessary social, financial and regulatory situations develop and, therefore, contribute to the progress and advancement of cities (Glaeser et al., 2020). For example, urban development has evolved to include nowadays factors ranging from the physical to the digital and environmental issues. In addition, the Covid-19 pandemic has exposed a number of weaknesses in cities' existing healthcare system, prompting to re-think about a new approach to evolving risks and generate new urban development strategies.

Urban development policy cannot be exclusively based on speculative arguments. Instead, urban planning must be based on both evidence and relevant objectives for society. The development of urban centers not only supports individuals' progress, but also facilitates a series of socio-economic processes that imply the allocation of productive resources and, therefore, require special planning (Lafuente et al., 2022a). Therefore, cities constitute a geographical space that allows the efficient distribution of different resources to facilitate relationships between individuals and organizations (Duranton & Puga, 2004).

As a result of the natural evolutionary process of cities, the demographic and economic growth trends that characterize cities' development is expected to continue and the urban population to double within the next two decades (Lafuente et al., 2020; World Bank, 2022). This growth and transformation processes have led cities to become the economic, political and social nucleus of their countries (Kourtit et al., 2021).

Given that urban development—defined as the sum of various aspects that include individual security, healthcare, the quality of local infrastructures, the level of digitization and sustainability—is a key factor in the progress of urban centers, the present study will focus on urban development as a critical condition of success for sound urban consolidation.

By using the information available from the Safe Cities Index generated by the Intelligence Unit of The Economist for the year 2021 (URL: https://safecities.economist.com), the empirical application of this research uses the 'Benefit of the Doubt' model (Cherchye et al., 2007; Cherchye et al., 2008), rooted in the Data Envelopment Analysis (DEA) method (Charnes et al., 1978), to study the efficiency level of 60 large urban centers. The proposed analysis allows to generate an index number (i.e., the 'city development index', CDI) built upon endogenous (specific to each city) and non-arbitrary weights for the five outputs included in the model.

This way, the proposed model allows to identify priorities that can become policy objectives aimed at improving the level of development of the analyzed cities.

We briefly anticipate that the results of the study suggest that, compared to homogeneous interventions, models like ours—i.e., that consider the multidimensional structure of urban well-being—have the potential to equip social planners with better informed, tailor-made policy recommendations to improve cities' performance and, therefore, citizens' quality of life.

The rest of the paper is organized as follows. The data and methodology are described in Section 2, while Section 3 offers the empirical results. Finally, Section 4 presents the conclusions, implications, and future research lines.

# 2. Data, variable definition and method

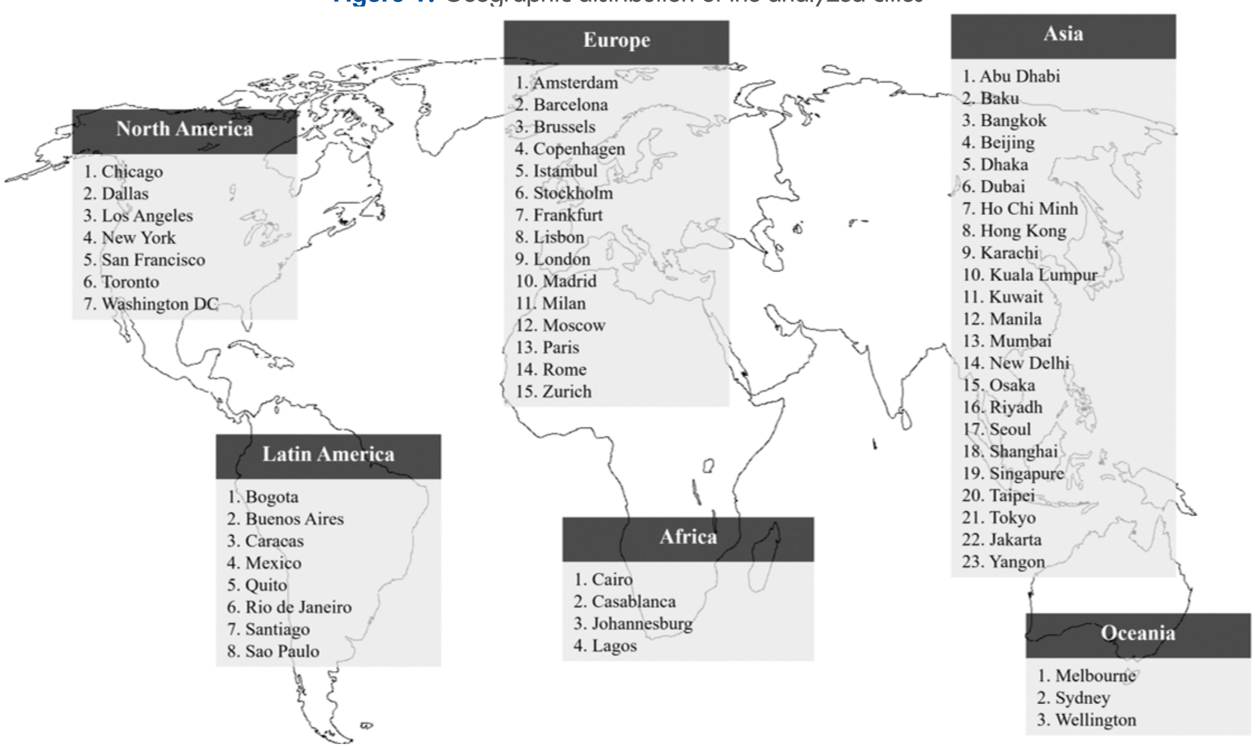
## 2.1 Data

To analyze the efficiency level of large urban centers, this study uses information obtained from the dataset on the Safe Cities Index (ICS) generated by the Intelligence Unit of The Economist (URL: https://safecities.economist.com) (The Economist, 2022).

The Safe Cities Index is the result of extensive research and in-depth interviews with a panel of experts in different fields: Hans Jayatissa (Chief Technology Officer at KMD); Esteban Léon (head of the City Resilience Global Program of UN-Habitat); and Nicola Tollin (professor of urban resilience at the University of Southern Denmark) (The Economist, 2022).

The final sample includes information for a total of 60 large urban centers for the year 2021. The analyzed cities are located in North America (seven cities: 11.67%), Latin America (eight cities: 13.33%), Europe (15 cities: 25.00%), Africa (four cities: 6.67%), Asia (23 cities: 38.33%), and Oceania (three cities: 5.00%). This final data includes cities with marked differences in terms of size, geographic location, environmental and weather conditions, and income levels (Figure 1).

**Figure 1:** Geographic distribution of the analyzed cities



Keep in mind that, in its evaluation of large urban centers worldwide, The Economist Intelligence Unit regularly revises and updates the safe city index. Thus, significant changes were observed in the different editions of the index since 2015. The modifications in the safe city index include updating the different sub-indicators with the aim of reflecting more broadly emerging problems in urban safety over the years, and improve the scoring methodology and data sources seeking to better capture the different dimensions of urban safety (e.g., in the latest edition published in 2021, a new dimension or pillar called 'Environmental Safety' that refers to the importance of sustainable development was added to the safe city index). As the safe city index has evolved over time, the different editions of the index do not show internal consistency, in terms of the composition of the sub-indicators of the index. This lack of internal consistency makes it impossible to analyze cities' efficiency from a longitudinal perspective.

## 2.2 Variable definition

The Safe City Index includes 76 variables that are grouped into five indicators (y): (1) digital security (y1), (2) health security (y2), (3) infrastructure security (y3), (4) personal security (y4), and 5) environmental security (y5) (The Economist, 2022).

The Safe Cities Index includes both quantitative and qualitative indicators. Concretely, 31 out of the 76 variables (40.79%) are based on quantitative data (e.g., the number of secure internet servers, and life expectancy at birth). On the other hand, 45 of the 76 variables (59.21%) are qualitative assessments based on a methodology decided and established by The Economist's Intelligence Unit (e.g., privacy policies and prevalence of petty crime) (The Economist, 2022).

To generate comparable data points as well as construct aggregate scores for each city, The Economist's Intelligence Unit follows a min-max approach was followed to normalize the quantitative indicators on a scale of 0 to 100. Qualitative indicators were normalized in a similar way, but for these indicators the scale ranges from 0 to 4 (The Economist, 2022).

Descriptive statistics for the five indicators of the Safe City Index are presented in Table 1, while Table A1 in the Appendix shows the full list of variables included in the index.

Following the description in The Economist (2022), the indicators included in the 'Digital security' output (y1) account for different digital capabilities and threats of cities, for example: the quality and dependence on digital infrastructures, existing technologies and teams dedicated to cybersecurity, the number of secure internet servers and the risk of online attacks, among others. 'Health security' (y2) refers to the quality level of cities' health services, where the Covid-19 pandemic highlighted the need to consider a more holistic approach to health security and its closer integration into urban resilience planning. The variables included in this indicator are related, among others, to the access and quality of healthcare services, the level of preparedness against pandemics, citizens' life expectancy, infant mortality, and lifestyle-related diseases. 'Infrastructure security' (y3) addresses the city's infrastructure, measuring its availability and its vulnerability to natural and man-made disasters. This indicator considers the quality of local infrastructures, the application of transport safety, the death toll resulting from traffic accidents, natural disasters and the percentage of the homeless population as a result of the combined effect of migration to urban areas and increased birth rates.

'Personal security' (y4) considers individual safety (i.e., theft, violence, economic vulnerabilities, or other man-made threats). This indicator includes factors related to police interventions, the use of data-driven crime prevention plans, the country's general political stability, women's safety, economic security, the prevalence of violent crime and drug abuse, perceived safety among citizens, corruption, and the effectiveness of the criminal justice system. Finally, 'Environmental security' (y5) considers the implementation of sustainability and green policies. This indicator includes variables linked to, among others, policy proposals aimed at improving the health of the natural and physical environment, the city's sustainability master plan, the incentives for the production of renewable energy, urban forest cover, the cities' water consumption, and waste management policies.

**Table 1:** Safe City Index. Output set for the analyzed cities (2021).

| | City | Digital security (y1) | Health security (y2) | Infrastructure security (y3) | Personal security (y4) | Environmental security(y5) | Safe City Index 2021 |
|---|---|---|---|---|---|---|---|
| 1 | Abu Dhabi | 66.80 | 76.50 | 77.30 | 67.00 | 46.70 | 66.90 |
| 2 | Amsterdam | 79.30 | 72.50 | 83.50 | 80.50 | 80.90 | 79.30 |
| 3 | Baku | 48.90 | 47.30 | 58.60 | 47.30 | 46.70 | 49.80 |
| 4 | Bangkok | 52.70 | 73.10 | 65.70 | 46.40 | 62.90 | 60.20 |
| 5 | Barcelona | 72.90 | 78.10 | 83.70 | 75.80 | 78.40 | 77.80 |
| 6 | Beijing | 52.20 | 73.60 | 76.50 | 59.50 | 57.00 | 63.80 |
| 7 | Bogota | 51.60 | 59.00 | 57.00 | 50.90 | 85.50 | 60.80 |
| 8 | Brussels | 68.50 | 67.80 | 82.30 | 79.20 | 70.40 | 73.60 |
| 9 | Buenos Aires | 60.00 | 67.40 | 62.60 | 55.90 | 78.80 | 64.90 |
| 10 | Cairo | 43.60 | 45.60 | 47.20 | 48.10 | 33.80 | 43.70 |
| 11 | Caracas | 37.40 | 39.00 | 38.00 | 46.10 | 41.90 | 40.50 |
| 12 | Casablanca | 53.70 | 51.40 | 52.20 | 48.50 | 35.10 | 48.20 |
| 13 | Chicago | 76.70 | 74.80 | 84.50 | 64.90 | 74.00 | 75.00 |
| 14 | Copenhagen | 82.20 | 70.00 | 89.00 | 86.40 | 84.50 | 82.40 |
| 15 | Dhaka | 39.00 | 50.90 | 49.60 | 46.60 | 58.20 | 48.90 |
| 16 | Dallas | 76.50 | 74.60 | 82.90 | 61.40 | 77.20 | 74.50 |
| 17 | Dubai | 66.80 | 75.50 | 76.00 | 67.00 | 37.70 | 64.60 |
| 18 | Istanbul | 58.70 | 71.90 | 72.10 | 48.80 | 62.80 | 62.90 |
| 19 | Stockholm | 72.60 | 66.50 | 87.30 | 79.70 | 83.70 | 78.00 |
| 20 | Frankfurt | 76.70 | 72.30 | 84.10 | 80.30 | 74.90 | 77.70 |
| 21 | Ho Chi Minh | 46.20 | 63.90 | 59.50 | 56.50 | 66.40 | 58.50 |
| 22 | Hong Kong | 70.10 | 84.00 | 93.40 | 70.40 | 74.80 | 78.60 |
| 23 | Johannesburg | 53.10 | 61.00 | 49.80 | 51.70 | 65.60 | 56.20 |
| 24 | Karachi | 38.50 | 48.40 | 43.00 | 33.30 | 35.40 | 39.70 |
| 25 | Kuala Lumpur | 59.10 | 64.00 | 69.00 | 60.10 | 81.00 | 66.60 |
| 26 | Kuwait | 43.60 | 69.70 | 53.40 | 58.00 | 22.00 | 49.40 |
| 27 | Lagos | 46.40 | 43.70 | 32.40 | 33.70 | 68.80 | 45.00 |
| 28 | Lisbon | 64.30 | 57.50 | 77.40 | 76.90 | 74.30 | 70.10 |
| 29 | London | 76.60 | 78.80 | 82.70 | 74.40 | 73.70 | 77.20 |
| 30 | Los Angeles | 82.00 | 74.80 | 82.90 | 66.60 | 76.30 | 76.50 |
| 31 | Madrid | 72.90 | 67.00 | 84.00 | 76.60 | 73.10 | 74.70 |
| 32 | Manila | 47.40 | 49.90 | 52.90 | 46.40 | 65.90 | 52.50 |
| 33 | Melbourne | 78.30 | 81.90 | 84.00 | 73.00 | 76.10 | 78.60 |
| 34 | Mexico | 57.20 | 57.40 | 62.10 | 52.50 | 72.10 | 60.30 |
| 35 | Milan | 65.10 | 61.30 | 76.60 | 68.70 | 84.90 | 71.30 |
| 36 | Moscow | 59.40 | 68.60 | 74.20 | 49.90 | 60.50 | 62.50 |
| 37 | Mumbai | 45.40 | 60.80 | 57.30 | 48.20 | 60.10 | 54.40 |
| 38 | New York | 81.60 | 75.20 | 84.40 | 66.90 | 80.90 | 77.80 |
| 39 | New Delhi | 47.50 | 63.60 | 59.80 | 52.80 | 56.80 | 56.10 |
| 40 | Osaka | 64.80 | 81.80 | 86.60 | 73.20 | 77.00 | 76.70 |

**Table 1:** Safe City Index. Output set for the analyzed cities (2021) (Continued).

| | City | Digital security (y1) | Health security (y2) | Infrastructure security (y3) | Personal security (y4) | Environmental security(y5) | Safe City Index 2021 |
|---|---|---|---|---|---|---|---|
| 41 | Paris | 69.40 | 68.60 | 82.60 | 79.00 | 71.70 | 74.30 |
| 42 | Quito | 45.70 | 58.30 | 59.10 | 50.90 | 80.10 | 58.80 |
| 43 | Rio de Janeiro | 53.80 | 50.70 | 62.90 | 58.40 | 83.30 | 61.80 |
| 44 | Riyadh | 53.10 | 68.60 | 55.20 | 51.80 | 46.70 | 55.10 |
| 45 | Roma | 60.10 | 65.20 | 74.50 | 69.40 | 78.00 | 69.40 |
| 46 | San Francisco | 82.00 | 77.30 | 83.60 | 64.90 | 78.30 | 77.20 |
| 47 | Santiago | 64.20 | 66.50 | 70.80 | 70.70 | 54.30 | 65.30 |
| 48 | Sao Paulo | 53.80 | 57.70 | 66.50 | 53.90 | 76.70 | 61.70 |
| 49 | Seoul | 62.10 | 81.10 | 83.00 | 69.90 | 72.90 | 73.80 |
| 50 | Shanghai | 57.20 | 73.60 | 80.30 | 59.00 | 69.30 | 67.90 |
| 51 | Singapore | 82.80 | 84.10 | 92.10 | 74.50 | 69.90 | 80.70 |
| 52 | Sidney | 83.20 | 77.70 | 84.50 | 76.30 | 79.00 | 80.10 |
| 53 | Taipei | 63.20 | 73.50 | 82.40 | 70.90 | 80.30 | 74.00 |
| 54 | Tokyo | 71.00 | 87.70 | 87.70 | 73.30 | 80.60 | 80.00 |
| 55 | Toronto | 75.00 | 80.00 | 88.60 | 77.20 | 90.30 | 82.20 |
| 56 | Washington DC | 72.10 | 74.00 | 86.50 | 66.80 | 87.60 | 77.40 |
| 57 | Wellington | 77.30 | 63.40 | 84.20 | 78.30 | 91.70 | 79.00 |
| 58 | Jakarta | 38.00 | 58.90 | 63.70 | 47.60 | 73.80 | 56.40 |
| 59 | Yangon | 28.10 | 44.60 | 40.50 | 39.20 | 45.30 | 39.50 |
| 60 | Zurich | 74.80 | 66.60 | 84.20 | 73.40 | 82.30 | 76.30 |

## 2.3 Method

A key point of our paper is to provide a composite indicator (CI) analysis that is suitable for tailor-made policy recommendations. Thus, we aggregate the five pillars of the safe city index into a CI to assess the relative efficiency of the 60 cities included in the analysis.

Because the weight assigned to variables is decisive to generate meaningful policy actions, we employ the 'Benefit of the Doubt' (BOD) weighting approach (Cherchye et al., 2007, 2008) to compute endogenous (city-specific) weights for the five pillars of the safe city index that permit us to identify priorities that may become targets for policies aimed at promoting urban development.

The BOD approach is rooted in the non-parametric Data Envelopment Analysis (DEA) model (Charnes et al., 1978; Cooper et al., 2011; Grifell-Tatjé & Lovell, 2015; Ray, 2004).

DEA is a benchmarking method that employs linear programming to evaluate the relative efficiency of a set of units, in our case cities, by estimating their distance to the efficiency frontier. DEA models a technology with multiple inputs and outputs without imposing any assumption on the distribution function (Grifell-Tatjé & Lovell, 2015). A free function is ideal in models like ours where the core of the analysis is the identification of the specific weights assigned to each output. The primary technological assumption of DEA models is that cities (*i*) employ a set of inputs (**x**) to produce a set of outputs (**y**), and that these sets form the technology (T): $T=\{(\boldsymbol{x},\boldsymbol{y}):\boldsymbol{x}\ can\ produce\ \boldsymbol{y}\}$.

The BOD weighting is a special case of the input-oriented DEA model with one constant input (Cherchye et al., 2007; Liu et al., 2011; Alonso & Leiva, 2019; Araya-Solano, 2019; Lafuente et al., 2022a; Lafuente et al., 2022b). The BOD method exploits the observed data to generate the weight of the outputs so that, for any given city, a relatively good performing indicator points to the relevance of this policy dimension for the focal city. In words, output dimensions assigned with lower weights would reveal their weak relevance relative to the rest of cities in the data. Thus, the optimal weighting configuration can be empirically generated for each city by identifying the relative strengths and weaknesses of the output set (y). Without information about the exact weights of the five outputs (y), the BOD model assigns to each city the best possible weight configuration, relative to the rest of cities in the sample.

The following linear program computes, for each city (*i*), the BOD model used to generate the endogenous set of optimal weights for the five outputs (Cherchye et al., 2007; 2008):

$$
\begin{aligned}
& CDI^{BOD} = \max \sum_{j=1}^{5} w_{ij}\, y_{ij} \\
& \text{subject to} \sum_{j=1}^{5} w_{ij}\, y_{ij} \le 1 \quad i=1,\ldots,N \wedge N=60 \\
& \qquad w_{ij} \ge 0 \quad j=1,\ldots,5 \\
& \qquad L_j \le \frac{w_{ij}\, y_{ij}}{\sum_{j=15}^{5} w_{ij}\, y_{ij}} \le U_j \qquad L_j = \left(\frac{1}{5}\right) \times 0.25 \wedge U_j = \left(\frac{1}{5}\right) \times 1.25
\end{aligned} \tag{1}
$$

Equation (1) computes for each city a vector of endogenous weights for the five SCI pillars ($w_j = w_1,\ldots,w_5$) that maximizes the proposed city development index ($CDI^{BOD}$). The $CDI^{BOD}$ values are bounded ($CDI^{BOD} \le 1$), where $CDI^{BOD} = 1$ for efficient cities (on the production frontier) while for inefficient cities $CDI^{BOD} < 1$ ($1 - CDI^{BOD}$ is the estimated relative inefficiency). By computing non-negative ($w_{ij} \ge 0$) endogenous weights to the SCI pillars the BOD approach assumes that cities have their own policy priorities and, consequently, optimal policy should be city specific.

We thus add to the $CDI^{BOD}$ model in equation (1) a 'pie share' restriction (Cherchye et al., 2007): $L_j \le \frac{w_{ij}\, y_{ij}}{\sum_{j=1}^{5} w_{ij}\, y_{ij}} \le U_j$ This restriction is especially attractive because pie shares ($w_{ij}\, y_{ij}$) reveal the contribution of each output to the $CDI^{BOD}$, while allowing for weight heterogeneity within and between cities. Similar to Cherchye et al. (2008), Lafuente et al. (2022a) and Acs et al. (2022), $L_j$ and $U_j$ are the lower (1/5 × 0.25) and upper (1/5 × 1.25) bound of 'pie shares'. That is, cities can freely choose their output weights conditional on the two weight constraints in equation (1) (i.e., non-negativity and bounded 'pie shares'). The 'pie share' constraint in equation (1) allows for a more realistic modeling of cities' efficiency and contributes to our objective: to identify city-specific policies that permit us to know what aspects of the $CDI^{BOD}$ should be prioritized in order to produce significant improvements in key city performance dimensions.

# 3. Results

## 3.1 Baseline results

This section presents the results of the BOD model. Summary statistics of the proposed BOD model ($CDI^{BOD}$) are presented in Table 2, while figures 2 and 3 show the visual representation of the efficiency frontier and the frequency distribution of the efficiency scores, respectively. Also, Table A2 in the Appendix shows the full list of scores and endogenous weights for the analyzed cities.

Overall, the findings show a mean competitive efficiency level of 81.64%, which means that, on average, the analyzed cities can expand their outputs by 18.36% to become efficient and reach the efficiency frontier. Also, the model identifies three efficient cities, that is, Copenhagen, Singapore and Toronto; whereas the worst performing cities, in terms of the $CDI^{BOD}$, are Caracas, Yangon and Karachi.

At the continent level, we observe that cities from Oceania present the highest efficiency level (mean inefficiency: 2.67%), while African cities report the poorest efficiency results (mean inefficiency: 39.41%). From Figure 3 it can be noted that efficiency scores for cities located in North America and Oceania present the lowest dispersion. On contrary, the efficiency scores of Asian cities show the highest dispersion.

**Table 2:** BOD model ($CDI^{BOD}$: equation (1)): Summary results.

| Continent | Average | Standard deviation | Q1 | Median | Q3 | Minimum | Maximum | Obs. |
|---|---|---|---|---|---|---|---|---|
| North America | 0.9542 | 0.0244 | 0.9290 | 0.9544 | 0.9624 | 0.9283 | 1.0000 | 7 |
| Europe | 0.9064 | 0.0648 | 0.8647 | 0.9143 | 0.9527 | 0.7803 | 1.0000 | 15 |
| Oceania | 0.9733 | 0.0108 | 0.9672 | 0.9695 | 0.9775 | 0.9649 | 0.9855 | 3 |
| Asia | 0.7622 | 0.1501 | 0.6560 | 0.7480 | 0.8812 | 0.4926 | 1.0000 | 23 |
| Latin America | 0.7291 | 0.0964 | 0.7313 | 0.7457 | 0.7793 | 0.5042 | 0.8155 | 8 |
| Africa | 0.6059 | 0.0716 | 0.5542 | 0.5843 | 0.6360 | 0.5504 | 0.7045 | 4 |
| **Total** | **0.8164** | **0.1469** | **0.7180** | **0.8420** | **0.9510** | **0.4926** | **1.0000** | **60** |

At the city level, from Figure 2 and Table A2 in the Appendix it can be seen that the top performing cities (third quartile) are report an average inefficiency level of 4.90%, and they are located in Europe (Copenhagen, Amsterdam, Stockholm, Barcelona, Frankfurt), Oceania (Sidney, Melbourne, Wellington), USA (New York, San Francisco, Washington DC), Asia (Singapore, Tokyo, and Jong Kong), and Canada (Toronto). The second group of cities shows a mid-level efficiency scores (mean inefficiency level: 15.79%). Cities in this group are mostly located in Europe (10 cities), Asia (10 cities), Latin America (7 cities) and North America (3 cities).

Finally, the third group includes poor performing cities. This group of 15 cities reports an average inefficiency level of 28.20%. Cities in this group are mostly located in Asia (Dhaka, Jakarta, New Delhi, Karachi, Kuwait, Manila, Mumbai, Riyadh, and Yangon) and Africa (Cairo, Casablanca, Johannesburg, Lagos). Also, one European city (Baku) and one Latin American city (Caracas) are included in this group.

**Figure 2:** BOD results: Efficiency frontier

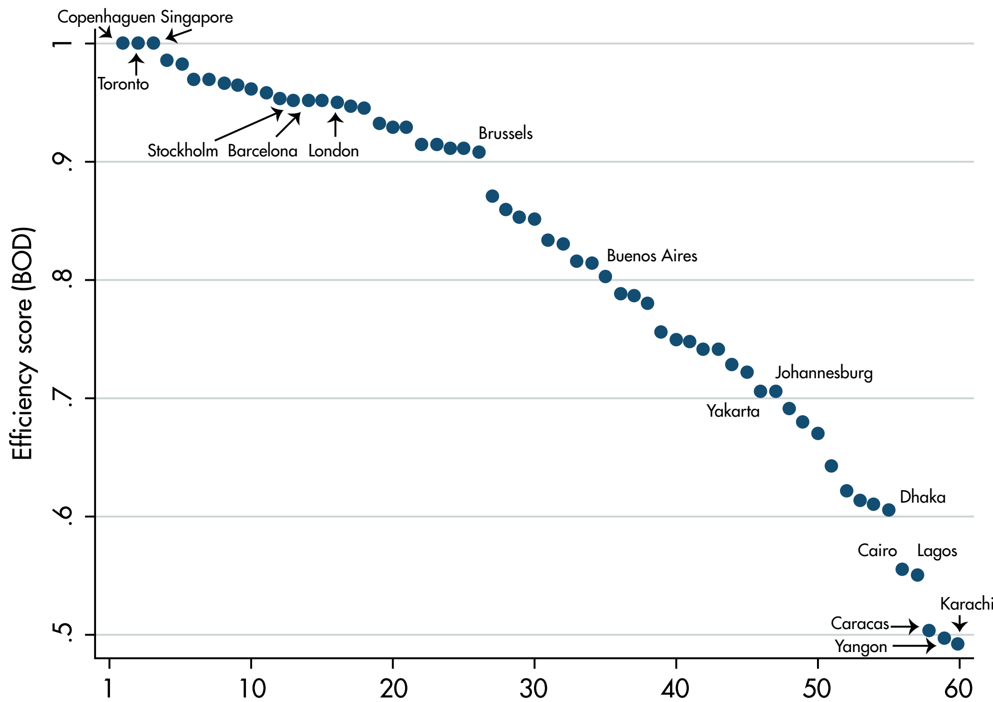
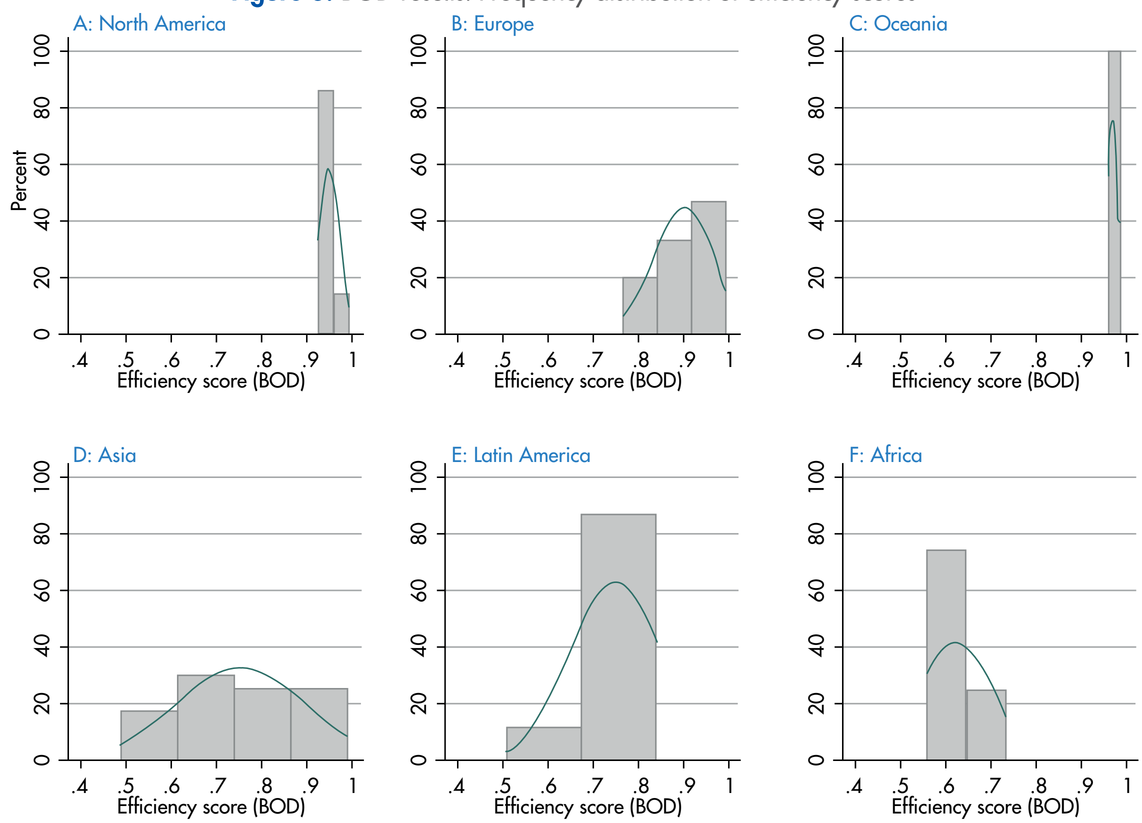



**Figure 3:** BOD results: Frequency distribution of efficiency scores



### 3.2 Cities' strategic priorities

This section focuses on the identification of the outputs (pillars) prioritized by the studied cities by analyzing the results of the weights computed via the BOD model. Results at continent level are presented in Table 3.

Results show that North American cities prioritize three sub-indicators: digital security, health security, and infrastructure security. New York and San Francisco are notable examples of cities prioritizing these pillars. On contrary, the environmental safety and personal safety sub-indicators are the least important sub-indicators among these cities, being Los Angeles and Chicago cases showing this strategic pattern (Table A2 in the Appendix).

Like North American cities, the cities from Oceania prioritize the sub-indicators related to digital security and infrastructure security, whereas environmental safety is the least important sub-indicator. However, keep in mind that Sydney and Melbourne prioritize actions plan that affect the health security while Wellington dedicates more resources to environmental policies (environmental security).

In the case of European cities we observe that the strategic priorities are linked to health security, infrastructure security and personal security. Five cities follow this prioritization strategy (Table A2 in the Appendix): Barcelona, Frankfurt, Madrid, Paris and Brussels. It should be mentioned that, similar to the case of Asian and Latin American cities, digital security is not yet a high priority among European cities; however, Copenhagen and Amsterdam move away from this approach and they give greater importance to policies related to these two pillars.

**Table 3:** BOD model ($CDI^{BOD}$: equation (1)): Cities' strategic priorities (by continent).

| | Endogenous weights for the $CDI^{BOD}$ indicators | | | | | |
|---|---|---|---|---|---|---|
| | $CDI^{BOD}$ | Digital security (y1) | Health security (y2) | Infrastructure security (y3) | Personal security (y4) | Environmental security(y5) |
| North America | 0.9542 | 24.28% | 24.27% | 25.00% | 5.95% | 20.49% |
| Europe | 0.9064 | 16.90% | 20.51% | 23.29% | 20.30% | 19.00% |
| Oceania | 0.9733 | 25.00% | 18.34% | 21.20% | 17.13% | 18.31% |
| Asia | 0.7622 | 15.19% | 24.86% | 23.29% | 19.63% | 17.04% |
| Latin America | 0.7291 | 19.47% | 24.04% | 17.38% | 16.65% | 22.47% |
| Africa | 0.6059 | 25.00% | 25.00% | 12.51% | 22.51% | 14.98% |
| **Total** | **0.8164** | **18.39%** | **23.28%** | **21.88%** | **17.87%** | **18.58%** |

Regarding Asian cities, it was found that they mostly prioritize the health security and infrastructure security sub-indicators. Although Asian cities on average do not prioritize policies that affect digital security, we observed that various cities are implementing digital-oriented plans (i.e., Singapore, Tokyo and Hong Kong), while Shanghai is an example of a city that prioritizes environmental policies (Table A2 in the Appendix).

Among Latin American cities the most relevant sub-indicators are health security and environmental security. Buenos Aires, Sao Paulo and Mexico City are cases of cities following this strategic path. Finally, African cities prioritize the sub-indicators related to digital security, health security and personal security (e.g., Cairo and Casablanca), while the least important sub-indicator for these cities is infrastructure safety (e.g., Johannesburg and Lagos).

# 4. Concluding remarks, implications and future research lines

## 4.1 Concluding remarks and policy implications

At territorial level, social planners are increasingly turning their attention to the design of urban policies that contribute to enhance cities' welfare. In this sense, digitalization and environmental policies are gaining weight in the policy agenda.

By identifying cities' strategic priorities through a 'benefit of the doubt' (BOD) model, this study has produced evidence that helps to better grasp the potentially optimal design of policies aimed at improving the level of welfare of large urban centers around the world.

Overall, the results of this study show that the strategic priorities that promote urban well-being are heterogeneous among the analyzed cities.

The results reveal clear differences in the performance of the analyzed cities. Large urban centers located in North America, Europe and Oceania show higher levels of efficiency. On contrary, cities located in Africa report the poorest efficiency results. Additionally, the findings suggest that cities follow different strategic paths when it comes to prioritize welfare-enhancing policies. Whereas cities in North America and Oceania pay more attention to digital security, health policies are more relevant for Asian and African cities and Latin American cities prioritize environmental policies.

The findings of this study have relevant policy implications. The main policy recommendation that can be drawn from the results is clear: an informed, tailor-made policy that takes into account the multidimensional nature of the urban well-being construct is more appropriate, relative to homogeneous actions based on policy isomorphism.

In this sense, the proposed 'benefit of the doubt' (BOD) model has the potential to reduce social planners' ambiguity and discretionary decision making by allowing to identify specific components of urban well-being that must be prioritized if improvements in cities' standards of living is the desired objective. Logically, the results produced by a composite indicator analysis would turn unfruitful if the information on policy priorities does not reach policy makers in charge of developing and implementing interventions. In this sense, a greater connection between academics and policy makers is highly recommended for the generation of better informed and potentially effective support actions to materialize (Cherchye et al., 2008; Lafuente et al., 2022b).

The new realities and concerns of the 21st century have led many policy makers to address these challenges from a holistic perspective and turn their attention towards the design of policies linked to the environment the society's digitalization. Among others, Copenhagen, Toronto, Amsterdam, Wellington, and Washington DC are notable examples of cities actively adopting digital and environmental policies.

In summary, in light of the relatively poor attention paid to digital and environmental plans, the introduction of public policies based on more informed models offer valuable guidance to cities' policy makers on how to use their (scarce) resources to maximize urban well-being and, consequently, promote a more organized and sustainable development of their urban centers.

## 4.2 Future research lines

Like any study, the results of this research are open to verification. First, the lack of consistency in the construction of the ICS by the Intelligence Unit of The Economist in its different editions is an important limitation that limits any comparative analysis using longitudinal data. It would be desirable that future studies access information to carry out longitudinal studies that allow to analyze the evolution of cities' efficiency using total factor productivity models based on the multidimensional definition of urban well-being used in this work.

Second, future research should consider the possibility to take into account budgetary information in order to scrutinize whether investments that cities make in certain areas (for example, environmental policy) are conducive to enhanced social welfare. Also, because support policies unquestionably have different costs, analyses including economic figures would help quantifying specific interventions, and offer a clearer picture of policy-related decision making, thus contributing to understand the cost-benefit of support actions designed to generate greater social outcomes. Third, in a related manner, future work would benefit from the comparison between models that compute strictly endogenous weights and models that use a 'budget allocation' approach in which experts (ideally, policy makers) are asked to prioritize the different variables included in the studied composite indicator (e.g., Karagiannis & Karagiannis, 2020; Lafuente et al., 2022a). This way, the role of experts (e.g., policy makers and other stakeholders) and their prioritization strategies can be put to the test which, in turn, increases the flow of information and knowledge transfer between scholars designing tools to evaluate territories' performance and policy makers leading the development and implementation of specific interventions.

Finally, future research should consider the possibility to gather information for a greater number of indicators in order to integrate more comprehensively into potential analyses the economic, social and environmental components of urban development.

## Acknowledgement

This study is based on Nadine Burgoa's master thesis (Master in Construction Building Management) presented at the Barcelona School of Building Construction (EPSEB), Polytechnic University of Catalonia (UPC Barcelona Tech).

## References

Acs, Z. J., Lafuente, E., & Szerb, L. (2022). A note on the configuration of the digital ecosystem in Latin America. *TEC Empresarial, 16*(1), 1-19. https://doi.org/10.18845/te.v16i1.5926

Araya-Solano, M. (2019). Efficiency assessment of Costa Rica's counties: A non-parametric analysis of the county competitiveness index. *TEC Empresarial, 13*(3), 78-92. http://dx.doi.org/10.18845/te.v13i3.4599

Alonso, S., & Leiva, J.C. (2019). Business competitiveness in Costa Rica: a multidimensional approach. *TEC Empresarial, 13*(3), 28-41. https://doi.org/10.18845/te.v13i3.4597

Arias-Valle, M. B. ., Berbegal-Mirabent, J. ., & Marimon-Viadiu, F. (2021). How do socially responsible universities perform? the case of Spanish universities. *TEC Empresarial, 15*(3), 64-82. https://doi.org/10.18845/te.v15i3.5816

Charnes, A., Cooper, W.W., & Rhodes, E. (1978). Measuring the efficiency of decision making units. *European Journal of Operational Research, 2*(6), 429-444. https://doi.org/10.1016/0377-2217(78)90138-8

Cherchye, L., Moesen, W., Rogge, N., & Van Puyenbroeck, T. (2007). An introduction to 'benefit of the doubt' composite indicators. *Social Indicators Research, 82*(1), 111-145. https://doi.org/10.1007/s11205-006-9029-7

Cherchye, L., Moesen, W., Rogge, N., Van Puyenbroeck, T., Saisana, M., Saltelli, A., Liska, R., & Tarantola, S. (2008). Creating composite indicators with DEA and robustness analysis: the case of the Technology Achievement Index. *Journal of the Operational Research Society, 59*(2), 239-251. https://doi.org/10.1057/palgrave.jors.2602445

Cooper, W.W., Seiford, L.M., & Zhu, J. (2011). *Handbook on data envelopment analysis* (2nd edition). Springer, New York.

Deilmann, C., Lehmann, I., Reißmann, D., & Hennersdorf, J. (2016). Data envelopment analysis of cities–Investigation of the ecological and economic efficiency of cities using a benchmarking concept from production management. *Ecological Indicators, 67*, 798-806. https://doi.org/10.1016/j.ecolind.2016.03.039

Duranton, G., & Puga, D. (2004). Micro-foundations of urban agglomeration economies. In Henderson, J.V. and Thisse, J.-F., *Handbook of Regional and Urban Economics*, Vol. 4 (pp. 2063-2117). Elsevier. https://doi.org/10.1016/S1574-0080(04)80005-1

Glaeser, E., Kourtit, K., & Nijkamp, P. (Eds.) (2020). Urban empires. London: Routledge.

González, E., Cárcaba, A., & Ventura, J. (2011). The importance of the geographic level of analysis in the assessment of the quality of life: The case of Spain. *Social Indicators Research, 102*(2), 209-228. https://doi.org/10.1007/s11205-010-9674-8

Grifell-Tatjé, E., & Lovell, C.A.K. (2015). *Productivity Accounting: The Economics of Business Performance*. Cambridge University Press.

Karagiannis, R., & Karagiannis, G. (2020). Constructing composite indicators with Shannon entropy: The case of Human Development Index. *Socio-Economic Planning Sciences, 70*, 100701. https://doi.org/10.1016/j.seps.2019.03.007

Kourtit, K., Nijkamp, P., & Suzuki, S. (2021). Comparative urban performance assessment of safe cities through data envelopment analysis. *Regional Science Policy & Practice, 13*(3), 591-602. https://doi.org/10.1111/rsp3.12276

Lafuente, E., Acs, Z.J., Sanders, M., & Szerb, L. (2020). The global technology frontier: productivity growth and the relevance of Kirznerian and Schumpeterian entrepreneurship. *Small Business Economics, 55*, 153-178. https://doi.org/10.1007/s11187-019-00140-1

Lafuente, E., Acs, Z.J., & Szerb, L. (2022a). A composite indicator analysis for optimizing entrepreneurial ecosystems. *Research Policy, 51*(9), 104379. https://doi.org/10.1016/j.respol.2021.104379

Lafuente, E., Araya, M., & Leiva, J.C. (2022b). Assessment of local competitiveness: A composite indicator analysis of Costa Rican counties using the 'Benefit of the Doubt' model. *Socio-Economic Planning Sciences, 81*(June), 100864. https://doi.org/10.1016/j.seps.2020.100864

Liu, W.B., Zhang, D.Q., Meng, W., Li, X.X., & Xu, F. (2011). A study of DEA models without explicit inputs. *Omega, 39*, 472-480. https://doi.org/10.1016/j.omega.2010.10.005

Ray, S.C. (2004). *Data Envelopment analysis: Theory and Techniques for Economics and Operations Research*. Cambridge University Press: New York.

Tellier, L.N. (2009). *Urban world history*. Quebec: Presses de l'Université de Québec.

The Economist (2022). *Safe Cities Index 2021: New expectations demand a new coherence*. The Economist Intelligence Unit. Available at: https://safecities.economist.com

Wang, D.D. (2019). Performance assessment of major global cities by DEA and Malmquist index analysis. *Computers, Environment and Urban Systems, 77*(September), 101365. https://doi.org/10.1016/j.compenvurbsys.2019.101365

World Bank (2022). *Urban Development*. Retrieved from: https://www.worldbank.org/en/topic/urbandevelopment/overview

# Appendix

**Table A1:** Safe city Index: List of variables (source: The Economist, 2021, p.11).

| Ref. | Variables | Scale |
|---|---|---|
| | 1. DIGITAL SECURITY | |
| 1.1.1 | Privacy policy | Scale: 0-4 |
| 1.1.2 | Citizen awareness of digital threats | Scale: 0-4 |
| 1.1.3 | Secure smart cities | Scale: 0-2 |
| 1.1.4 | Cybersecurity preparedness | Scale: 0-4 |
| 1.1.5 | Public-private partnerships | Scale: 0-2 |
| 1.2.1 | Percentage with internet access | % |
| 1.2.2 | Secure internet servers | # per million |
| 1.2.3 | Risk of attacks | Scale: 0-4 |
| 1.2.4 | IT infrastructure risk | Scale: 0-4 |
| 1.2.5 | Percentage of computers infected from online attacks | Scale: 0-5 |
| | 2. HEALTH SECURITY | |
| 2.1.1 | Universal healthcare coverage | Scale: 0-2 |
| 2.1.2 | a) Availability of public healthcare | Scale: 0-4 |
| 2.1.2 | b) Availability of private healthcare | Scale: 0-4 |
| 2.1.2 | c) Availability of OTC drugs | Scale: 0-4 |
| 2.1.3 | a) Quality of private healthcare provision | Scale: 0-4 |
| 2.1.3 | b) Quality of public healthcare provision | Scale: 0-4 |
| 2.1.4 | a) No. of beds per 1,000 | # |
| 2.1.4 | b) No. of doctors per 1,000 | # |
| 2.1.5 | Access to safe and quality food | Scale: 0-100 |
| 2.1.6 | Policy on substance abuse / drug use | Scale: 0-1 |
| 2.1.7 | Pandemic preparedness | Scale: 0-100 |
| 2.1.8 | Mental health | Scale: 0-1 |
| 2.2.1 | Emergency services in the city | Scale: 0-2 |
| 2.2.2 | Life expectancy (years) | Years |
| 2.2.3 | Infant mortality | # per 1.000 |
| 2.2.4 | Cancer mortality | Standardized by age |
| 2.2.5 | Lifestyle related disease burden | Mortality rate |
| 2.2.6 | Mental health burden | DALYs, per 100.000 |
| 2.2.7 | Covid-19 mortality | DALYs, per 100.000 |
| | 3. INFRASTRUCTURE SECURITY | |
| 3.1.1 | Enforcement of transport safety | Scale: 0-10 |
| 3.1.2 | Pedestrian friendliness | % |
| 3.1.3 | Disaster management / business continuity plan | Scale: 0-4 |
| 3.1.4 | Water infrastructure | Scale: 0-4 |
| 3.1.5 | Hazard monitoring | Scale: 0-2 |
| 3.2.1 | Road traffic deaths | # per million inhabitants |

**Table A1:** Safe city Index: List of variables (source: The Economist, 2021, p.11) (Continued).

| | | |
|---|---|---|
| 3.2.2 | Deaths from climate-related disasters | Based on classification |
| 3.2.3 | a) Transport infrastructure: Air transport facilities | Scale: 0-4 |
| 3.2.3 | b) Transport infrastructure: Road network | Scale: 0-4 |
| 3.2.3 | c) Transport infrastructure: Rail network | Scale: 0-4 |
| 3.2.4 | Power network | Scale: 0-4 |
| 3.2.5 | Institutional capacity and access to resources | Scale: 0-2 |
| 3.2.6 | Catastrophe insurance | Scale: 0-2 |
| 3.2.7 | Disaster-risk informed development | Scale: 0-2 |
| 3.2.8 | a) Percentage living in slums | % |
| 3.2.8 | b) Percentage of homeless population | % |
| | 4. PERSONAL SECURITY | |
| 4.1.1 | Use of data-driven techniques for crime | Scale: 0-2 |
| 4.1.2 | Gun regulation and enforcement | Scale: 0-10 |
| 4.1.3 | a) Threat of terrorism | Scale: 0-4 |
| 4.1.3 | b) Threat of military conflict | Scale: 0-4 |
| 4.1.3 | c) Threat of civil unrest | Scale: 0-4 |
| 4.1.4 | a) Police personnel per capita | # per 100.000 |
| 4.1.4 | b) Prosecution personnel per capita | # per 100.000 |
| 4.1.4 | c) Professional judges or Magistrate personnel per capita | # per 100.000 |
| 4.1.5 | Expenditure on social security | % |
| 4.1.6 | a) Laws on domestic violence | Qualitative |
| 4.1.6 | b) Laws on sexual harassment | Scale: 0-4 |
| 4.2.1 | a) Prevalence of petty crime | Scale: 0-4 |
| 4.2.1 | b) Prevalence of violent crime | Scale: 0-4 |
| 4.2.2 | Organized crime | Scale: 0-4 |
| 4.2.3 | Severity of terrorist attacks | Scale: 0-10 |
| 4.2.4 | Deaths from substance use disorders | Standardized by age |
| 4.2.5 | Level of corruption | Scale: 0-4 |
| 4.2.6 | Enforceability of contracts | Scale: 0-4 |
| 4.2.7 | a) Income inequality levels | Gini coefficient |
| 4.2.7 | b) Share of population in vulnerable employment | % |
| 4.2.8 | a) Female homicide rates | # per 100.000 |
| 4.2.8 | b) Prevalence of domestic violence | % |
| | 5. ENVIRONMENTAL SECURITY | |
| 5.1.1 | Sustainability masterplan | Scale: 0-2 |
| 5.1.2 | Incentives for renewable energy | Scale: 0-1 |
| 5.1.3 | Green economy initiatives | Scale: 0-2 |
| 5.1.4 | Waste management | Scale: 0-2 |
| 5.2.1 | Sustainable energy | % |
| 5.2.2 | Rate of water stress | Scale: 0-4 |
| 5.2.3 | Air quality levels | µg / m3 |
| 5.2.4 | Urban forest cover | % city area |
| 5.2.5 | Waste generation | Kg / capita / year |

**Table A2:** BOD results ($CDI^{BOD}$) for the analyzed cities.

| | City | Efficiency | Endogenous weights ($CDI^{BOD}$) | | | | |
|---|---|---|---|---|---|---|---|
| | | $CDI^{BOD}$ | Digital security (y1) | Health security (y2) | Infrastructure security (y3) | Personal security (y4) | Environmental security(y5) |
| 1 | Copenhagen | 1.00000 | 19.99% | 5.00% | 25.00% | 25.00% | 25.00% |
| 2 | Singapore | 1.00000 | 25.00% | 25.00% | 24.97% | 19.98% | 5.04% |
| 3 | Toronto | 1.00000 | 20.02% | 24.96% | 24.98% | 5.02% | 25.00% |
| 4 | Sidney | 0.98548 | 25.00% | 25.00% | 18.19% | 17.04% | 14.76% |
| 5 | Tokyo | 0.98211 | 20.53% | 25.00% | 25.00% | 14.03% | 15.43% |
| 6 | Amsterdam | 0.97029 | 25.00% | 25.00% | 5.00% | 23.56% | 21.42% |
| 7 | Melbourne | 0.96953 | 25.00% | 25.00% | 20.44% | 14.38% | 15.15% |
| 8 | Hong Kong | 0.96703 | 21.45% | 25.00% | 25.00% | 13.83% | 14.69% |
| 9 | Wellington | 0.96491 | 25.00% | 5.00% | 24.98% | 19.98% | 25.00% |
| 10 | New York | 0.96236 | 25.00% | 25.00% | 25.00% | 5.00% | 20.00% |
| 11 | San Francisco | 0.95926 | 24.97% | 25.00% | 25.00% | 5.01% | 20.01% |
| 12 | Washington DC | 0.95435 | 25.00% | 20.01% | 25.00% | 5.00% | 24.98% |
| 13 | Stockholm | 0.95294 | 9.98% | 15.00% | 25.00% | 25.00% | 25.00% |
| 14 | Barcelona | 0.95286 | 16.91% | 25.00% | 25.00% | 19.73% | 13.33% |
| 15 | Frankfurt | 0.95244 | 14.33% | 24.96% | 24.45% | 25.00% | 11.24% |
| 16 | London | 0.95056 | 24.98% | 25.00% | 19.75% | 15.34% | 14.89% |
| 17 | Osaka | 0.94721 | 9.03% | 24.96% | 24.96% | 25.00% | 16.01% |
| 18 | Los Angeles | 0.94600 | 24.98% | 25.00% | 25.00% | 8.31% | 16.71% |
| 19 | Zurich | 0.93274 | 25.00% | 14.14% | 25.00% | 10.86% | 24.97% |
| 20 | Chicago | 0.92895 | 25.00% | 24.95% | 25.00% | 8.31% | 16.72% |
| 21 | Dallas | 0.92834 | 24.96% | 24.98% | 25.00% | 5.00% | 20.03% |
| 22 | Madrid | 0.91429 | 14.29% | 24.35% | 25.00% | 25.00% | 11.36% |
| 23 | Paris | 0.91394 | 14.12% | 24.45% | 25.00% | 24.97% | 11.45% |
| 24 | Seoul | 0.91189 | 8.51% | 24.99% | 25.00% | 25.00% | 16.47% |
| 25 | Taipei | 0.91126 | 5.00% | 25.00% | 24.97% | 25.00% | 20.02% |
| 26 | Brussels | 0.90713 | 14.27% | 24.30% | 25.00% | 24.97% | 11.41% |
| 27 | Milan | 0.87005 | 8.45% | 16.55% | 25.00% | 25.00% | 24.97% |
| 28 | Lisbon | 0.85925 | 11.15% | 13.85% | 25.00% | 24.97% | 25.00% |
| 29 | Roma | 0.85278 | 5.01% | 20.04% | 25.00% | 25.00% | 24.98% |
| 30 | Abu Dhabi | 0.85114 | 21.13% | 25.00% | 25.00% | 23.87% | 5.00% |
| 31 | Shanghai | 0.83292 | 5.02% | 25.00% | 25.00% | 19.99% | 24.98% |
| 32 | Dubai | 0.83090 | 22.76% | 25.00% | 24.98% | 22.27% | 5.00% |
| 33 | Santiago | 0.81553 | 25.00% | 25.00% | 17.27% | 24.96% | 7.72% |
| 34 | Kuala Lumpur | 0.81334 | 24.98% | 25.00% | 20.01% | 5.02% | 24.98% |
| 35 | Buenos Aires | 0.80362 | 25.00% | 24.99% | 9.89% | 15.10% | 25.00% |
| 36 | Beijing | 0.78756 | 8.09% | 25.00% | 24.97% | 25.00% | 16.87% |

**Table A2:** BOD results (*CDI*$^{BOD}$) for the analyzed cities (Continued).

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 37 | Istanbul | 0.78649 | 25.00% | 24.96% | 25.00% | 5.03% | 19.97% |
| 38 | Moscow | 0.78028 | 24.98% | 24.98% | 25.00% | 5.00% | 20.02% |
| 39 | Sao Paulo | 0.75503 | 20.02% | 25.00% | 25.00% | 5.00% | 25.00% |
| 40 | Rio de Janeiro | 0.74973 | 7.75% | 17.24% | 25.00% | 25.00% | 25.00% |
| 41 | Bangkok | 0.74803 | 25.00% | 25.00% | 25.00% | 5.02% | 19.99% |
| 42 | Mexico | 0.74173 | 25.00% | 25.00% | 20.01% | 5.03% | 24.98% |
| 43 | Bogota | 0.74071 | 25.00% | 25.00% | 11.92% | 13.05% | 25.00% |
| 44 | Ho Chi Minh | 0.72804 | 5.01% | 25.00% | 20.02% | 24.98% | 24.98% |
| 45 | Quito | 0.72198 | 5.00% | 25.00% | 24.97% | 20.03% | 24.97% |
| 46 | Jakarta | 0.70610 | 5.00% | 25.00% | 24.98% | 20.02% | 24.97% |
| 47 | Johannesburg | 0.70447 | 25.00% | 25.00% | 5.02% | 20.02% | 24.94% |
| 48 | New Delhi | 0.69108 | 7.70% | 25.00% | 25.00% | 25.00% | 17.26% |
| 49 | Riyadh | 0.68002 | 25.00% | 25.00% | 22.65% | 22.32% | 5.01% |
| 50 | Mumbai | 0.66932 | 5.02% | 25.00% | 25.00% | 20.02% | 24.97% |
| 51 | Manila | 0.64276 | 25.00% | 25.00% | 8.07% | 16.90% | 25.00% |
| 52 | Kuwait | 0.62140 | 19.99% | 25.00% | 25.00% | 25.00% | 5.00% |
| 53 | Casablanca | 0.61313 | 24.98% | 25.00% | 20.02% | 25.00% | 5.00% |
| 54 | Baku | 0.61133 | 25.00% | 21.57% | 25.00% | 13.30% | 15.11% |
| 55 | Dhaka | 0.60665 | 5.01% | 25.00% | 20.02% | 24.95% | 25.00% |
| 56 | Lagos | 0.55540 | 24.96% | 25.00% | 5.01% | 20.01% | 25.00% |
| 57 | Cairo | 0.55044 | 25.00% | 25.00% | 19.98% | 25.00% | 5.00% |
| 58 | Caracas | 0.50417 | 22.95% | 25.00% | 5.00% | 25.00% | 22.05% |
| 59 | Yangon | 0.49749 | 5.02% | 25.00% | 20.01% | 24.96% | 25.00% |
| 60 | Karachi | 0.49260 | 25.00% | 24.98% | 25.00% | 9.88% | 15.11% |