

EVALUATING THE SUSTAINABLE INDICATORS OF CITIES OF INDIA: ESG FRAMEWORK REVIEW

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Abstract. A rising number of people agree that the actions conducted in India as part of the Smart Cities project should be utilized to create models for environmentally sustainable smart cities. The circumstances in developing nations differ from those in industrialized nations, which have historically worked toward sustainable cities and are currently working toward smart sustainable cities. The Smart cities standards as they stand now seem to place more of an emphasis on governance challenges, social and economic development and the use of contemporary information and communication technology (ICT). *Background:* Sustainable indicators are the measures that are used to gauge the effectiveness of environmental strategies. These activities are connected to certain goals and outlined in a sustainability plan. Reducing waste during production, for instance or the carbon footprint. Their execution serves as a gauge for whether things are moving in the proper way. *Methods:* This study emphasizes on 20 top smart cities of India using GIS Mapping techniques and geospatial data science. *Results:* These indicators are often used to assess if the city of India is accomplishing its goals. If there is a deviation, remedial action may be taken. Sustainability indicators, then, assess both the performance of the city's growth and its plan execution. *Conclusions:* But it's crucial to choose the appropriate parameters and make sure they're directly related to the suggested goals. If not, they will basically stop working.

Keywords: Sustainability indicators, GIS, Geospatial, Smart cities, ESG.

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1. Introduction

ESG full form Environmental social and governance was coined by United Nations (UN) in 2004. Indeed, UN was proposing to overlay ESG on Sustainable development goals (SDGs). There are 17 SDGs. Further this objective will define the ESG dimensions.

ESG Dimensions

Environmental aspect: Data is reported on climate change, greenhouse gas emissions, biodiversity loss, deforestation/reforestation, pollution mitigation, energy efficiency and water management.

Social aspect: Data is reported on employee safety and health, working conditions, diversity, equity and inclusion and conflicts and humanitarian crises (Shruti *et al.*, 2020) and is relevant in risk and return assessments directly through results in enhancing (or destroying) customer satisfaction and employee engagement.

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Governance aspect: Data is reported on corporate governance such as preventing bribery, corruption, Diversity of Board of Directors, executive compensation, cybersecurity and privacy practices and management structure.

This study will start the following process:

- Data collection;
- Data analysis;
- Data integrating;
- Data visualization;
- Data modeling.

2. Description of the Sustainable Indicators

In today's global business landscape, companies that prioritize Environmental, Social and Governance (ESG) initiatives have a competitive edge. ESG is no farseeing just a “nice to have” but a “must-have” for enterprises to certainly underwrite to group and the ecosystem while accomplishing healthier commercial marks. According to a study by MSCI, companies with high ESG ratings had an average return on equity of 10.1% per year, compared to 7.4% for companies with low ESG ratings. A survey by Nielsen found that 66% of consumers are willing to pay more for products and services that come from companies committed to positive social and environmental impact. (Source: Nielsen, “The Sustainability Imperative”).

This paper will not only go over the research questions but survey real world incidents in 2023 to help you interpret ESG and lead any group towards launching an real ESG platform or improving the current one.

By the end of this article, the reader will have the acquaintance and tools to establish an effective ESG program that positively contributes to group and the environment.

An understanding of the background for different methodologies to responsible deal and specifically, consideration of environmental, social and governance (ESG) factors.

An understanding of the underlying issues that constitute factors within each of the environmental, social and governance areas.

An understanding of the stronger sustainability framework and global proposals.

Pillar	Thomson Reuters	MSCI	Bloomberg
Environmental	Resource Use	Climate Change	Carbon Emissions
	Emissions	Natural resources	Climate change effects
	Innovation	Pollution & waste	Pollution
		Environmental opportunities	Waste disposal
			Renewable energy
			Resource depletion
Social	Workforce	Human capital	Supply chain
	Human Rights	Product liability	Discrimination
	Community	Stakeholder opposition	Political contributions
	Product Responsibility	Social opportunities	Diversity
			Human rights
			Community relations
Governance	Management	Corporate governance	Cumulative voting
	Shareholders	Corporate behaviour	Executive compensation
	CSR strategy		Shareholders' rights
			Takeover defence
			Staggered boards
			Independent directors
Key metrics and submetrics	186	34	>120

Source: Refinitiv, MSCI, Bloomberg, FTSE; OECD assessment.

Figure 1. Sustainable indicators for ESG from Global research organizations

3. Literature review

In this article, we study shall review 10 literature papers which is aligned with their keywords and content of the paper. The literature study is constructed to start with the origin of urban scaling law. The framework that defines how city-level characters scale with adaptations in city. This is the list of literatures considered for this research.

Table 1. Literature review of ten paper lists with Publisher name and year of publication

PAPER NUMBER	TITLE OF PAPER	PUBLISHER/ YEAR
1	ESG Investing: Practices, Progress and Challenges	OECD / 2020
2	The use of ESG scores in academic literature: a systematic literature review	Emerald/2022
3	The end of ESG	Wiley/2023
4	Evaluation and prediction of sustainability of urban areas: A case study for Kermanshah city, Iran	Elsevier /2017
5	Smart City Logistics on the Basis of Digital Tools for ESG Goals Achievement	MDPI/2023
6	Connecting the Sustainable Development Goals to firm-level sustainability and ESG factors: The need for double materiality	Sage pub/2023
7	Spatial scaling of land use/land cover and ecosystem services across urban hierarchical levels: patterns and relationships	Springer/2023
8	The Law of Population Concentration	Sage pub/2023
9	Shaping Sustainable Cities: A Long-Term GIS-Emanated Spatial Analysis of Settlement Growth and Planning in a Coastal Mediterranean European City	MDPI/2023
10	Evaluating the Environmental Sustainability of Smart Cities in India: The Design and Application of the Indian Smart City Environmental Sustainability Index	MDPI/2022

Paper Number: 01

Paper type: Journal

Name of Publisher: OECD Paris. The Organisation for Economic Co-operation and Development (OECD)

Year: 2020

Title: ESG Investing: Practices, Progress and Challenges

Authors: Riccardo Boffo and Robert Patalano.

Inferences: It draws attention to the wide range of metrics, methodologies and approaches that, while valid, lead to inconsistent results. (Boffo et al, 2020) When combined with a variety of ESG investment strategies, they lead to an industry consensus on the performance of high-ESG portfolios, though this consensus may be subject to interpretation.

Research Gaps: The main conclusions of our study show that ESG ratings varies significantly depending on the provider selected. This can happen for a variety of reasons, including the use of different frameworks, measurements, key indicators and metrics, as well as the use of different data sources and qualitative judgments and subcategory

weighting. In addition, returns over the previous ten years have been inconsistent, raising doubts about how much ESG actually influences performance.

Investors find it challenging due to the lack of comparability between ESG criteria, ratings and investing strategies.

Paper Number: 02

Paper type: Journal

Name of Publisher: Emerald

Year: 2022

Title: The use of ESG scores in academic literature: a systematic literature review

Authors: Alexandre Clement and Elisabeth Robinot

Inferences: Scores for environmental, social and governance (ESG) are becoming more and more important in academic writing and the business sector. (Clement,2022) This is incompletely due to the statistic that the topics lectured by ESG scores are meant to report numerous noteworthy social and environmental glitches. Regarding the definition of ESG scores and their measurements, there is, nevertheless, limited agreement among academics. ESG scores have been utilized by several academics to indicate a variety of difficulties. This study aims to compile all definitions used by researchers who employed ESG scores in their work.

Research Gaps: Five distinct theme definitions of how academics have employed ESG scores in their study have been identified in the articles: sustainability, corporate social responsibility, disclosure, finance and the analysis of ESG scores. ESG scores can be used to express how well an environmental

Table 2. Thematic cataloguing of ESG score definitions from Clement, 2022 paper

Sustainability (50)	ESG equals sustainability (21)
	ESG is a proxy for sustainability (29)
CSR (95)	ESG equals corporate social responsibility (CSR) (26)
	ESG is a proxy for corporate social responsibility (CSR) (69)
Disclosure (35)	ESG equals performance disclosure (6)
	ESG is a proxy for performance disclosure (29)
Finance (153)	ESG equals ESG (139)
	ESG equals risk analysis (14)
ESG analysis (9)	Analysis of ESG scores (9)

Notes: Numbers in parentheses denote the number of articles classified in the observed themes

Paper Number: 03

Paper type: Journal

Name of Publisher: Wiley

Year: 2023

Title: The end of ESG

Authors: Alex Edmans

Inferences: ESG is both vital and unremarkable. Any academic or expert, not only those with “ESG” in their study, should take it genuinely because it is crucial to long-term value. (Edmans,2023) Therefore, ESG doesn't require a detailed name because that recommends that it has a detailed focus-taking long-term factors is investing, not ESG investing. Since it is comparable to other intangible assets that generate long-term

financial and social gains, such as managerial quality, corporate culture and innovative aptitude, it isn't particularly noteworthy.

But this title intends not to signal ESG's death, but ESG's evolution from a niche subfield into a mainstream practice. The chief chauffeur of this rise is the gratitude that ESG factors are serious to a company's long-term value.

Research Gaps: Investor engagement on ESG variables shouldn't be elevated above investor engagement on other value drivers. Corporations shouldn't be admired more for enlightening their ESG implementation than these other intangible assets.

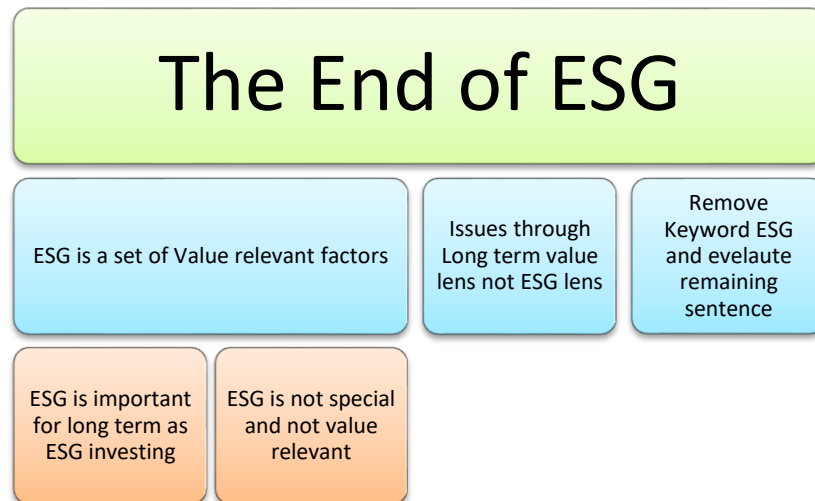


Figure 2. Edman’s study on End of ESG highlighting the constrain on ESG concept

Paper Number: 04

Paper type: Journal

Name of Publisher: Elsevier

Year: 2023

Title: Evaluation and prediction of sustainability of urban areas: A case study for Kermanshah city, Iran

Authors: Somayeh Zinatizadeh, Aeizh Azmi, Seyed Masoud Monavari, Soheil Sobhanardakani

Inferences: Sustainable development strikes a balance between social conditions, environmental concerns and economic growth (Zinatizadeh et al, 2023). In this regard, sustainable urban development is a significant component of sustainable development and a significant issue. The improved full permutation polygon synthetic indicator (IFPPSI) and Shannon's entropy approaches were used in this study's integrated approach to evaluate and forecast urban sustainability in various areas of Kermanshah city, Iran. The largest city in Iran, Kermanshah, has six major urban regions and is plagued by numerous environmental, economic and social issues.

Research Gaps: Iran is rapidly urbanizing and dealing with issues such solid waste, air, water and noise pollution, high traffic densities, a lack of urban amenities and an inefficient distribution of facilities, marginalization and historic regions.

Table 3. Sustainable Indicator system to evolute urban areas sustainable development in Kermanshah city, IRAN (Social and welfare (1-23) Economic growth (24-31) Environmental protection (32-44)) by Zinatizadeh study

No.	Indicator		Values at different urban areas						Weight	Angle	
	Category	Title	1	2	3	4	5	6			
1	Social and welfare	Population density	56	88.8	99.3	103.04	103.6	66.9	0.002006	0.012604	
2		Literacy rate	85.9	77.7	75.6	8.034	84.7	83.1	0.000917	0.00576	
3		Family size	3.2	3.7	3.56	3.34	3.54	3.54	0.008309	0.052182	
4		Number of Fire station per 1000 people	1	2	1	1	1	1	0.011512	0.07227	
5		Number of gas station per 1000 people	7	4	1	7	7	8	0.031225	0.194938	
6		Number of toilets per 1000 people	89	35	37	56	27	35	0.023562	0.147504	
7		Number of public parking per 1000 people	3	4	15	11	2	0	0.115307	0.662757	
8		Number of hotel per 1000 people	1	3	9	2	2	1	0.109761	0.636265	
9		Number of not-level intersection per 1000 people	2	1	2	1	2	4	0.037687	0.234589	
10		Number of central post office per 1000 people	9	16	22	21	14	19	0.007423	0.046621	
11		Number of park per 1000 people	36	34	21	28	52	47	0.014057	0.088207	
12		Number of police centers per 1000 people	2	3	6	5	2	2	0.028361	0.177258	
13		Number of intelligent intersection per 1000 people	7	6	3	4	0	0	0.148629	0.803925	
14		Number of pedestrian bridge per 1000 people	11	3	5	3	4	7	0.031043	0.193813	
15		Number of Database Disaster Management per 1000 people	0	1	1	0	1	1	0.079185	0.477259	
16		Number of hospital per 1000 people	3	2	1	8	1	2	0.095756	0.566006	
17		Number of clinic per 1000 people	9	8	6	16	3	5	0.084947	0.508753	
18		Number of drugstore per 1000 people	14	15	14	45	15	7	0.024643	0.154218	
19		Number of university per 1000 people	4	2	7	4	0	11	0.0869	0.519282	
20		Number of sport centers per 1000 people	22	19	17	20	16	17	0.001686	0.010596	
21		Number of cultural centers per 1000 people	3	4	6	4	4	3	0.009692	0.06086	
22		Number of religious places per 1000 people	7	22	22	23	10	5	0.028122	0.175778	
23		Number of schools per 1000 people	54	47	57	104	40	34	0.01927	0.120781	
24	Economic growth	Unemployment rate	16.7	18.8	21.4	19.6	18.8	29.1	0.199759	0.950587	
25		Employed population to 15-year-old population and more	89.3	81.5	80.1	85.1	79.5	75.4	0.208196	0.965702	
26		Sponsorship rate	1.11	1.22	1.24	1.17	1.25	1.32	0.021259	0.133177	
27		Number of civil projects per 1000 people	4	7	3	3	4	1	0.017955	0.112573	
28		Number of shopping centers per 1000 people	14	11	6	18	7	9	0.093252	0.552967	
29		Number of markets per 1000 people	3	2	4	4	3	3	0.032902	0.205258	
30		Number banks per 1000 people	33	45	46	56	32	18	0.221543	0.984057	
31		Number of recreation and tourism centers per 1000 people	2	3	2	4	3	1	0.205136	0.960532	
32		Environmental protection	Percent of Accidents and breakdowns in water and sewage networks	16.9	11.7	18.1	17.8	15.6	20.4	0.021924	0.13732
33			Percent of wastewater treated	0	18	22	60	0	0	0.10955	0.635244
34			Percent of Population Water network coverage	100	100	100	100	100	100	0.000461	0.002898
35	Percent of Population network wastewater coverage		100	100	100	93	100	100	0.000921	0.005786	
36	Percent of source separation of solid waste		37.8	5.3	0	30.7	0	26.12	0.216273	0.977631	
37	Waste production per capita		0.75	0.73	0.68	0.64	0.73	0.61	0.0043	0.027014	
38	Percent of Semi-mechanized collection of household waste		100	80	94	94	90	82	0.004441	0.027898	
39	Number of industrial centers per 1000 people		2	3	0	0	3	4	0.191567	0.933355	
40	Number of database associated with environment per 1000 people		2	0	2	0	0	0	0.14267	0.781099	
41	Green space per capita		10.4	5.6	6.2	2.9	11.1	5.8	0.111328	0.643831	
42	Number of traffic jams per 1000 people		2	3	5	6	3	5	0.053538	0.330083	
43	Percent of travel at peak hours		15.08	9.9	18.5	17.8	21.3	17.2	0.045457	0.281745	
44	Percent of old area		6	11.6	27.1	27.1	10.5	17.6	0.09757	0.575364	

Paper Number: 05

Paper type: Journal/ Conference

Name of Publisher: Mdpi

Year: 2023

Title: Smart City Logistics on the Basis of Digital Tools for ESG Goals Achievement

Authors: Sergey Evgenievich Barykin, Anna Viktorovna Strimovskaya, Sergey Mikhailovich Sergeev, Larisa Nikolaevna Borisoglebskaya, Natalia Dedyukhina, Igor Sklyarov, Julia Sklyarova and Lilya Saychenko

Inferences: Modern logistics system development necessitates cutting-edge approaches to meet both ambitious commercial goals and sustainable development objectives. The difficulty of integrating digital technologies in social life, particularly in smart cities, merits special consideration in this regard. (Barykin et al, 2023) The inadequacies in the design, control and efficiency assessment of digital tools in the logistics of smart cities are brought to light by the diverse application of Industry 4.0 philosophy and digital shadow penetration to all domains of socioeconomic systems. Another difficulty is the requirement to consider environmental, social and governance (ESG) considerations when harmonic digital tools are introduced into metropolitan areas.

All these concerns necessitate a sophisticated methodological strategy for comprehending the function of IT in the contemporary economy through an ESG lens.

Research Gaps: The essay includes a survey of recent literature on the subject as well as a conceptual framework for the digitalization of city logistics within the context of ESG perspectives and limitations. The researchers' mathematical model allows for a multidimensional design of digital solution applications inside the logistics performance of smart cities. Other variables besides the crucial ones mentioned above can be scaled toward and developed further using the specified discrete stochastic model. The distribution of the limited budgeting of administrative branches within municipal logistics is considered by the mathematical formalization of the suggested model, showing the research's usefulness in relation to the ESG principles.

Table 4. Matrix analysis of ESG dimensions with advanced technologies with its description

<i>Advanced Technologies</i>	<i>Description</i>	<i>ESG Dimension</i>
Autonomous Robots	Evolving utility, increasing autonomy, flexibility, and interaction with humans and other robots	Environmental
Simulation	Improve plant operations, creating a virtual model of the factory, including machines, products, and humans, also called digital twins	Social
Horizontal and Vertical Systems Integration	IT system integration in the entire supply chain, creating data-integration networks and internal cross-function integration	Governance
Industrial IoT	Devices with embedded computing communicating and interacting in real time	Social
Cybersecurity	Securing reliable communication and information flows	Governance
Cloud Logistics	Data-driven services and data sharing across different sites deployed in the cloud	Governance

Paper Number: 06

Paper type: Journal

Name of Publisher: Sage pub

Year: 2023

Title: Connecting the Sustainable Development Goals to firm-level sustainability and ESG factors: The need for double materiality








Authors: Javier Delgado-Ceballos, Natalia Ortiz-De-Mandojana, Raquel Antolín-López and Ivan Montiel

Inferences: In this paper, we relate the United Nations' Sustainable Development Goals (SDGs)-a comprehensive set of societal goals and targets aimed at addressing grand challenges and achieving global sustainability by 2030-to firm-level sustainability and Environmental, Social and Governance (ESG) factors. (Delgado-ceballos et al, 2023) We emphasize the necessity of linking the SDGs to the concept of double materiality-stakeholder materiality and financial materiality-in this way.

Research Gaps: Our assessment assists firms in navigating the complex sustainability landscape and understanding how their sustainability initiatives can help tackle the ESG big problems outlined in the SDGs. The five scholarships that are a part

of the special issue "Our house is on fire! The contribution of business to achieving the SDGs and outlining a course for the future. We also highlight the argument over whether ESG ratings are helpful for gauging a company's impact on society and the environment. The main problem is that corporations' contributions to tackling all sustainability concerns at the society level are underrepresented by ESG indicators. For instance, a business could use more water while also raising revenues to increase its ESG rating on "Water use to revenues USD".

Table 5. SDG 17 goal indicators equivalences between societal-level SDGs and firm-level ESG factors

Societal-level SDG indicators			Firm-level ESG metrics	
SDG	SDG target	SDG indicator	ESG variable	
	Target 6.4 Substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.	6.4.1 Change in water-use efficiency over time.	Water use to revenues <ul style="list-style-type: none"> Total water withdrawal in cubic meters divided by net sales or revenue in millions of USD. 	E factors
	Target 7.1 Ensure universal access to affordable, reliable, and modern energy services.	7.1.2 Proportion of population with primary reliance on clean fuels and technology.	Renewable energy use ratio <ul style="list-style-type: none"> Total energy purchased from primary renewable energy sources divided by real energy use. 	
	Target 13.2 Integrate climate change measures into national policies, strategies, and planning.	13.2.1 Number of countries that have communicated the establishment or operationalization of an integrated policy/strategy/plan, which increases their ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions.	CO ₂ equivalent emissions to revenues <ul style="list-style-type: none"> Total CO₂ and CO₂ equivalent emissions in tons divided by net sales or revenue. 	
	Targets 3.9 Substantially reduce the number of deaths and illnesses from hazardous chemicals, air, water, and soil pollution, and contamination.	3.9.2 Mortality rate attributed to unsafe water, unsafe sanitation, and lack of hygiene.	Health-safety policy <ul style="list-style-type: none"> Whether the company has a policy to improve employee health and safety within the company and its supply chain. 	S factors
	Target 8.8 Protect labor rights and promote safe and secure working environments for all workers, including migrant workers, in particular women migrants, and those in precarious employment.	8.8.1 Frequency rates of fatal and non-fatal occupational injuries by sex and migrant status.	Total accidents <ul style="list-style-type: none"> Number of injuries and fatalities reported by employees and contractors while working for the company. 	
	Target 5.5. Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic, and public life.	5.5.2 Proportion of women in managerial positions.	Board gender diversity <ul style="list-style-type: none"> Percentage of females on the board. Executive management gender diversity <ul style="list-style-type: none"> Percentage of female executives. 	G factors
	Target 16a. Strengthen relevant national institutions, including through international cooperation, for building capacity at all levels, in particular in developing countries, to prevent violence and combat terrorism and crime.	16.a.1 Existence of independent national human rights institutions in compliance with the Paris Principles.	Human-rights policy <ul style="list-style-type: none"> Whether the company has a policy to ensure the avoidance of child, forced, or compulsory labor, or to guarantee the freedom of association universally applied independent of local laws. 	

Source: United Nations and Refinitiv Eikon. The use of SDG icons is permitted under the UN Department of Global Communications (UN, 2019).

Paper Number: 07

Paper type: Journal

Name of Publisher: Sage pub

Year: 2023

Title: Spatial scaling of land use/land cover and ecosystem services across urban hierarchical levels: patterns and relationship

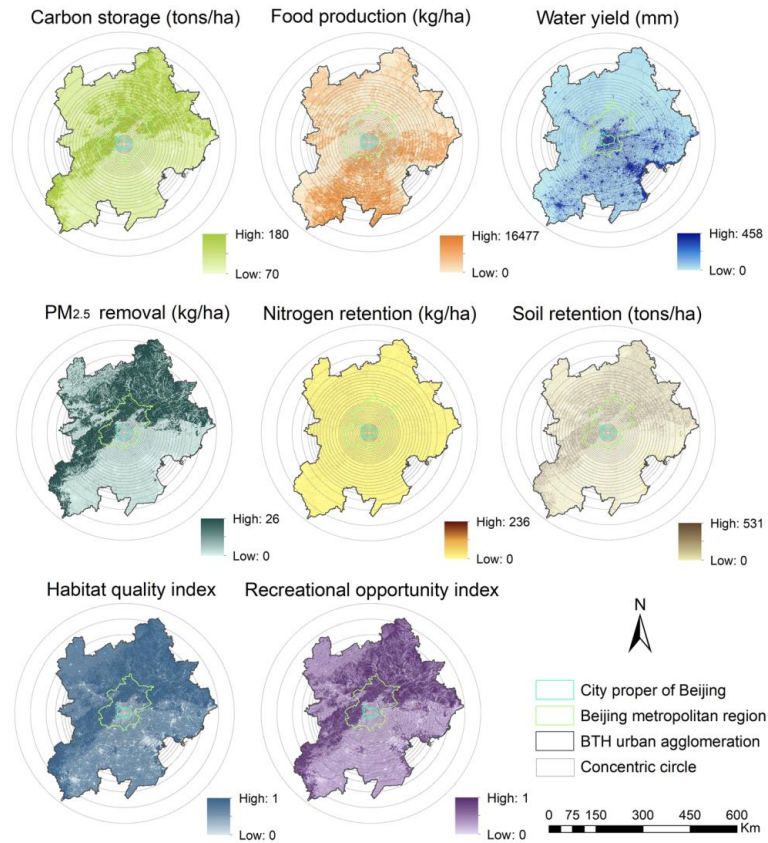
Authors: Xiao Sun, Qun Ma, Guangji Fang

Inferences: This study aimed to (1) identify the scaling relations of LULC and ESs across different urban hierarchical levels, (2) explore the potential mechanisms of these two types of spatial scaling and (3) look at how the scaling relations of ESs relate to LULC and the policy implications by mapping the spatial patterns of LULC and ESs in the three largest urban agglomerations of China. (Sun et al, 2023) We measured ES indicators grounded on LULC using the Cohesive Evaluation of Ecosystem Services and Tradeoffs (InVEST) model and other biophysical models. The scaling relations of LULC and ESs were then measured using scalograms in relation to be altering spatial extent.

The responses to altering spatial extent were most predictable in developed land and farmland. In contrast to other ESs, services were the predicted.

Research Gaps: Across urban hierarchical levels, LULC and ES scaling interactions vary. The spatial scaling of ESs and LULC patterns were tightly connected. Decision-makers can develop multi-scale landscape conservation plans by incorporating the scaling relations of ESs into land use planning.

Figure 3. Spatial distributions of ESG indicators in 2018 for Beijing-Tianjin-Hebei (BTH) urban agglomeration. The radii list of concentric circles in Table by Sun author



Country (Staat)	A.K.	Sp.K.
Netherlands (Niederlande)	5.3	91
Great Britain (Großbritannien)	39.4	87
Belgium (Belgien)	5.8	82
Switzerland (Schweiz)	2.6	75
Germany (Deutsches Reich)	47.8	74
United States (Vereinigte Staaten)	53.0	57
Italy (Italien)	15.9	47
France (Frankreich)	17.4	44
Spain (Spanien)	8.6	43
Austria-Hungary (Österreich-Ungarn)	16.8	32
European part of Russia (Europäisches Rußland)	24.2	19
British India (Britisch-Indien)	36.0	11

Notes: This table shows the absolute concentration measure (A.K.) and specific concentration measure (Sp.K.) for different countries. The table is based on the second table in Auerbach (1913). The German country names are in parentheses.

Paper Number: 08

Paper type: Journal

Name of Publisher: Sage pub

Year: 2023

Title: The Law of Population Concentration

Authors: Felix Auerbach

Inferences: This German paper has been translated to English by Antonio. The author discusses about rank size distribution for cities for Germany. The equation $p_n = k/n$ where k is the constant, p is the city population and n are the rank of the city. (Auebach,2023) Mathematician Alfred proposed inverse proportional $n = kp - 1$ means $\log n = \log k - \log p$. Later this relationship was known as Zipf's law for cities. Philologist George Zipf discussed the applications of power laws – their applications to city size distributions. There are numerous possible distributions for the people residing in a given area. In some areas, people live in small farming villages or on their own farms. Larger towns, cities and even global cities may exist in other locations. There are very few global cities in the globe, none in many nations, a lot more major cities and a lot more medium-sized cities than there are global cities. There are hundreds of thousands of towns, small towns and villages. For instance, in Germany, there is only one global city if one considers administrative borders and two global cities if one considers the extent of their topography; the number of great cities is around 50, while the number of minor cities is approximately

If people are spread out throughout numerous nearby communities, a nation can have a high population density yet a low specific concentration. A country has a minor population but the people is focused on a few bigger cities, the association between population density-mass and detailed strength is reversed and withdraw.

Research Gaps: As the number of people is inversely proportional to the square of the minimum wealth in the group, there is a significantly greater correlation between rank number and personal wealth in this instance. That is, rather than just being twice as common, there are four times as many half-millionaires as millionaires. Where these legal variances arise from is now the theoretical topic. The link will often be weaker the simpler the circumstances. This is due to the fact that a single driving force wears out more quickly than two or more. In essence, the construction of summits is only a matter of whether the energy that created mountains did not extend past a particular point. Situations are more complicated.

Paper Number: 09

Paper type: Journal

Name of Publisher: MDPI

Year: 2023

Title: Shaping Sustainable Cities: A Long-Term GIS-Emanated Spatial Analysis of Settlement Growth and Planning in a Coastal Mediterranean European City.

Authors: Ioannis Vardopoulos, Sophia Ioannides, Marios Georgiou, Irene Voukkali, Luca Salvati and Yannis E. Doukas

Inferences: European cities have seen fast (and often conflicting) transitions in areas such as the environment, the economy, society, climate change and access to cheap

housing, with implications for their future development (Vardopoulos et al, 2023) Understanding new urban growth patterns is essential to addressing these difficulties, which can be solved by analyzing the existing state of European metropolises. Between 1993 and 2021, Pafos, Cyprus, saw urban growth, which was the topic of our study. Such dynamics were investigated using photointerpretation (kernel density estimate) and the ArcGIS spatial analyzer tool. The experiential conclusions of this investigation are mostly insightful, principally in terms of urban sprawl and its allegations for future land managing in the study area and could aid in the expansion of detailed guidelines to influence cities toward ecological and environmentally responsive development.

Research Gaps: Significant environmental issues are caused by the intensity of growth, the lack of necessary infrastructure and a disregard for landscape sensitivity.

The disintegration of land proprietorship has been and remains a substantial obstacle to the planning and implementation of unified and rational developments. Concentrating development in specific areas fosters compact urban growth and facilitates the provision of services and amenities. Land reuse downtown should be actively encouraged. The research project discussed in this article involved a collaborative approach, with each author making distinct contributions that encompassed diverse perspectives, insights, feedback and guidance. These contributions may not be easily quantifiable or neatly categorized, yet they collectively enriched the study.

Table 6. Sustainable Indicators of urban spread and their details by Vardopoulos paper

Indicator	Description
Average population density	The average number of inhabitants in a km ² of land, urban area
Population-to-density allocation	The share of population living in areas where population density is below a certain threshold (e.g., 1500 inhabitants/km ²)
Land-to-density allocation	The share of urban footprint of areas where population density lies below a certain threshold (e.g., 1500 inhabitants/km ²)
Variation of population density	The degree to which population density varies across the city
Fragmentation	The number fragments of urban fabric per km ² of built-up area
Polycentricity	The number of high-density peaks in an urban area
Decentralization	The percentage of population residing outside the high-density peaks of an urban area

Paper Number: 10

Paper type: Journal

Name of Publisher: MDPI

Year: 2022

Title: Evaluating the Environmental Sustainability of Smart Cities in India: The Design and Application of the Indian Smart City Environmental Sustainability Index.

Authors: Shruti Singh, Prabhat Kumar Singh and Anurag Ohri.

Study: After a two-stage screening process, 24 environmental indicators (including 11 from the current guidelines) have been finalized to ensure the environmental sustainability of such large-scale development planning. These indicators can be used to track different aspects of smart cities' environmental sustainability. (Singh et al, 2022) As a result, a provisional framework was created in the current study using these indicators to produce a Smart City Environmental Sustainability Index (SCESI) on a scale of 0 to 100, increasing and the city's environmental sustainability was divided into five categories: Based on declining SCESI, you can be excellent, good, fair, poor or critically low. Five Indian cities that are now undergoing SCM development (Delhi, Patna,

Allahabad, Varanasi and Bhubaneswar) have been studied using this paradigm. While three of them (Delhi, Allahabad and Bhubaneswar) are major cities.

Research Gaps: In the context of developing nations like India, the present study work concentrated on a methodology for assessing Environmentally Sustainable Smart Cities (ESSC). The indicators have been decided upon based on monitoring metrics that are now available via SCM and other concurrent Government programs, keeping in mind experiences documented in the literature on sustainable and smart cities around the world. Although the indicators, their relative weights and the significance of various environmental domains may differ, the strategy may be helpful for other developing nations as well. Additionally, other sustainability factors like the social and economic ones might also need to be properly studied for cities under Smart City Mission.

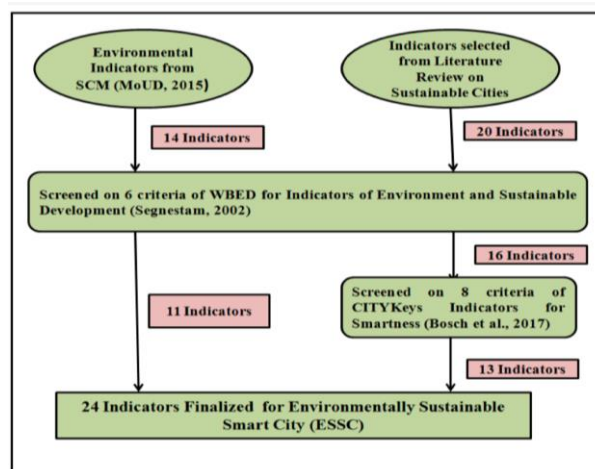


Figure 4. Flow Process of ESG indicators selection for Environmentally Sustainable Smart Cities (ESSC) by Shruti paper

4. Methodology on ESG framework

With the study of seamless ten literature studies on ESG – Environmental, social and governance, the following List of Sustainable indicators inclined with ESG is prepared as framework for cities growth in India.

Table 7. ESG Methodology with its aligned indicators for data availability for cities of India

ESG	Sustainable indicators
Environmental	Carbon Emissions
	Climate change effects
	Pollution (PM 2.5,10 levels)
	Waste disposal
	Renewable energy
	Natural Resource depletion
	Biodiversity
Social (Economy)	Life expectancy (Health)
	Discrimination - Gender inequality

	Education
	Employment rates
	Human rights
	Crime (Security and Safety)
	GDP
Governance	Cumulative voting
	Ethics
	Risk Management
	Corruption
	Cyber security

ESG (Environmental, Social, and Governance) is increasingly important for India's sustainable growth. Here's a breakdown of the key areas of focus:

Environmental:

- Renewable Energy: India is heavily investing in solar, wind, and hydropower to reduce reliance on fossil fuels and combat climate change.
- Green Infrastructure: Building sustainable and climate-resilient infrastructure is a priority, including energy-efficient buildings and transportation systems.
- Circular Economy: Promoting recycling, resource efficiency, and waste management to minimize environmental impact.

Social:

- Inclusive Growth: Ensuring that the benefits of economic growth reach all segments of society, with a focus on job creation and social welfare.
- Green Jobs: Developing a skilled workforce for the green economy through training and upskilling initiatives.
- Social Safety Nets: Strengthening healthcare, education, and poverty alleviation programs to support vulnerable populations.

Governance:

- Transparency and Accountability: Promoting ethical business practices, strong corporate governance, and transparent reporting.
- ESG Integration: Encouraging companies to integrate ESG factors into their core strategies and decision-making processes.

Why is ESG important for India growth? What are the overall ESG principles?

Climate Change: India is highly vulnerable to the impacts of climate change, making sustainable practices essential for resilience.

Social Challenges: Addressing poverty, inequality, and access to basic needs requires a focus on social responsibility.

Economic Growth: ESG can drive innovation, attract investment, and enhance competitiveness, contributing to sustainable economic development.

Overall:

India is making significant strides in integrating ESG principles into its policies and economic structure. While challenges remain, the country is committed to a sustainable and inclusive growth trajectory.

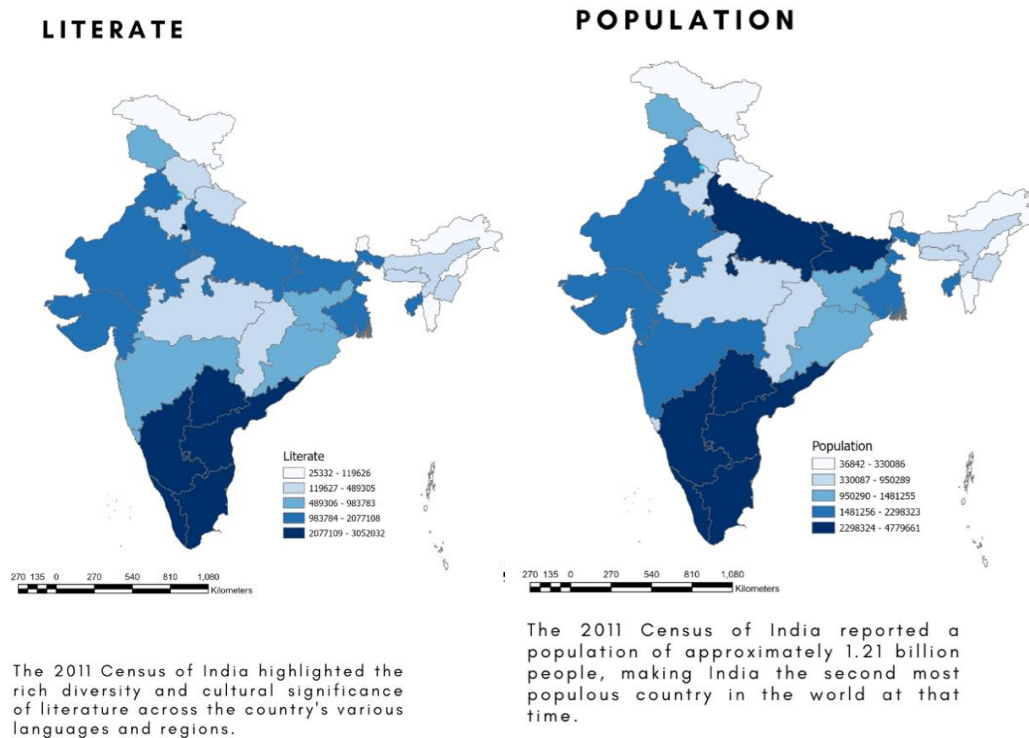


Figure 5. India census data mapping on ArcGIS software for year 2011 with Population and Literacy data values

5. Discussion and Recommendation

This paper elaborates ten literatures on ESG and sustainable indicators for cities. Environmental, Social and Governance (ESG) factors are gaining significant importance in India's urban landscape. As cities grapple with rapid urbanization, environmental degradation and social challenges, the adoption of ESG principles is becoming crucial for sustainable development. Environmental ESG Growth in Indian Cities have Several factors are driving the growth of environmental ESG in Indian cities:

1. **Government Initiatives:** The Indian government has launched several initiatives to promote sustainable urban development, including the Smart Cities Mission and the National Clean Air Programmed. These initiatives encourage cities to adopt green technologies, improve air and water quality and promote sustainable transportation.

2. **Investor Interest:** Investors are increasingly recognizing the importance of ESG factors in their investment decisions. This has led to increased investment in green infrastructure projects, renewable energy and sustainable urban development initiatives in Indian cities.

3. **Corporate Social Responsibility:** Many Indian corporations are incorporating ESG principles into their business strategies. This includes initiatives to reduce carbon emissions, conserve water and promote sustainable practices in their operations and supply chains.

4. **Citizen Awareness:** Growing awareness among citizens about environmental issues and the impact of climate change is driving demand for sustainable solutions. This has led to increased pressure on city governments and businesses to adopt environmentally friendly practices.

Key Areas of Environmental ESG Focus in Indian Cities:

1. **Air Quality:** Improving air quality through measures such as promoting public transportation, reducing vehicular emissions and adopting cleaner technologies.
2. **Water Management:** Ensuring sustainable water management practices, including water conservation, wastewater treatment and rainwater harvesting.
3. **Waste Management:** Implementing efficient waste management systems, including waste reduction, recycling and composting.
4. **Green Infrastructure:** Creating green spaces, parks and urban forests to improve air quality, mitigate urban heat islands, and enhance biodiversity.
5. **Renewable Energy:** Promoting the adoption of renewable energy sources, such as solar and wind power, to reduce reliance on fossil fuels.
6. **Sustainable Transportation:** Encouraging the use of public transportation, non-motorized transport and electric vehicles to reduce traffic congestion and air pollution.

Challenges and Opportunities

While there has been significant progress in environmental ESG in Indian cities, several challenges remain:

1. **Limited Financial Resources:** Many cities face financial constraints, limiting their ability to invest in sustainable infrastructure and projects.
2. **Institutional Capacity:** Weak institutional capacity and lack of technical expertise can hinder the implementation of ESG initiatives.
3. **Data and Monitoring:** Reliable data and effective monitoring systems are essential for tracking progress and making informed decisions, but these are often lacking.
4. Despite these challenges, the growing focus on environmental ESG presents significant opportunities for Indian cities:
5. **Attracting Investment:** ESG-focused investments can help finance sustainable infrastructure projects and create green jobs.
6. **Improving Quality of Life:** By addressing environmental issues, cities can improve the health and well-being of their citizens.
7. **Building Resilience:** Implementing climate-resilient infrastructure and practices can help cities adapt to the impacts of climate change.

6. Conclusion

Environmental ESG is a critical component of sustainable urban development in India. By embracing ESG principles, Indian cities can create a cleaner, healthier and more resilient future for their citizens. (Gupta et al, 2001) India being the largest populated country in the world is making substantial developments in amalgamating ESG principles into its strategies and economic configuration. (Gupta,2022) While challenges remain, the country is committed to a sustainable and inclusive growth trajectory. This paper had a limitation with data collection for Indian cities for year 2011 from census data for further analysis on ESG philosophies. (Sao et al, 2023) (Kunnath et al, 2024) The objective of this paper to understand ESG theory from ten literature reviews and they implement to cities of India to create GIS maps and geospatial evidence in the research.

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