

Review

Neighbourhood Sustainability Assessment Tools for Sustainable Cities and Communities, a Literature Review—New Trends for New Requirements

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Abstract: The aim of this documentary review was to determine the level of scientific production on environmental analysis tools and certifications for sustainable cities and communities, or “Neighbourhood Sustainability Assessment Tools”, worldwide between the years 2016 and 2023, considering as a precedent the appearance of the SDG 2030 and SDG 11. The analysis developed in this work was carried out based on WoS, Scopus and ScienceDirect. The eligibility of the results of 685 potential articles, in addition to complementary articles, was evaluated, leading to 27 selected reviews. Our analysis revealed the main and most recent results post implementation of sustainability measures, identifying limitations, success factors, trends and forecasts for the future selection, development or improvement of evaluation tools for the sustainability of human sites and describing strategies specific to local realities, which are valid from a global point of view but include the particularities of distinct communities in specific places.

Keywords: sustainable cities; communities; neighbourhood sustainability assessment tools; publications



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1. Introduction

Sustainable Development and Neighbourhood Sustainability Assessment Tools

Sustainable development (SD) has been introduced in various professional disciplines and fields of scientific research. Its presentation and definition were proposed by the Brundtland commission in 1987; it is defined as a search to “satisfy the needs and aspirations of the present without compromising the ability to satisfy those of the future” [1]. Since 1992, after the Rio Declaration on Environment and Development, most of the world’s countries adopted Agenda 21, which set out three main objectives: improve the standard of living of people in need; improve ecosystem management and protection; and achieve a prosperous future for all [2]. In 1995, the Sustainable Development Commission (CSD) defined four dimensions for SD: institutional, natural, economic and social [3–5]. In 2001, the definition of SD was reformulated by the European Commission (EC) through the Triple Bottom Line (TBL) concept, which sought environmentally friendly economic and social growth [6]. The Millennium Development Goals (MDGs) proposed by the United Nations (UN) in the years 2000–2015 promoted global development and poverty eradication [7].

The last version, proposed in 2007 by the CSD, reported the MDGs and Agenda 21 [8,9]. In 2015, the MDGs were changed to 17 new targets called the Sustainable Development Goals (SDGs) [10]. The 2030 Agenda requests local governments to implement the SDGs in their specific contexts, adapting and locating them in their own contexts, promoting the “operationalization of the SDGs” [11–14]. Table 1 enunciates the SDGs and the MDGs.

Table 1. Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs) own elaboration based on [7,11]. The authors have relied on tables and data that appear in those references to make Table 1.

MDG	Concept	SDG	Concept
1	Eradicate Extreme Poverty and Hunger	1	No Poverty
2	Achieve Universal Primary Education	2	Zero Hunger
3	Promote Gender Equality and Empower Women	3	Good Health and Well-Being
4	Reduce Child Mortality	4	Quality Education
5	Improve Maternal Health	5	Gender Equality
6	Combat HIV/AIDS, Malaria and Other Diseases	6	Clean Water and Sanitation
7	Ensure Environmental Sustainability	7	Affordable and Clean Energy
8	Global Partnership for Development	8	Decent Work and Economic Growth
		9	Industry, Innovation and Infrastructure
		10	Reduced Inequalities
		11	Sustainable Cities and Communities
		12	Responsible Consumption and Production
		13	Climate Action
		14	Life Below Water
		15	Life on Land
		16	Peace, Justice and Strong Institutions
		17	Partnerships for the Goals

The accelerated global urban development and high population density in certain specific areas have a strong impact on societies and their economies and generate a large consumption of resources, waste, pollution and infrastructure needs, which consequently degrade the environment and need to be addressed holistically from the point of view of sustainability using appropriate analysis tools [15]. The goal “sustainable cities and communities” (SDG 11) is one of the 17 SDGs defined in 2015 in order to “make cities and human settlements inclusive, safe, resilient and sustainable” [16]. Therefore, thinking about sustainable urbanisation appears on the list of priorities of many countries; in fact, the situation is becoming increasingly dramatic and urgently needs to be addressed. Today, the population of cities is close to 55% of the total population of a country. In cities, 85% of the gross domestic product (GDP) is generated and 75% of greenhouse gas (GHG) emissions are produced. For 2050, the world population is projected to reach 9500 million; so, it is unfeasible to continue to design and manage cities without integrating the sustainable development concept [16–18]. Territorial planning would facilitate the concrete implementation of the SDGs in political strategies and plans, institutional mechanisms, regulations and upward participation [19]. A selection of indicators and data collection/standardisation methods would allow for the evaluation and comparison of the level of sustainable development achieved in urban areas, and this, in turn, will facilitate its validation and improvement [20]. At the same time, an efficient implementation has to be locally relevant; that is, the selected indicators must address the sustainability needs of the place in order to promote the transition towards a certain sustainability level [21] and the well-being of people and society in general, as poor planning would negatively affect the environment [22,23]. The transformation path is a multi-scalar process, i.e., from the global to the local scale, encompassing the neighbourhood and even the products with

which the built environment is executed. This requires adequate governance and articulation between multiple actors, all aligned behind the concept of sustainable development, impacting technological innovation, infrastructures and social behaviour [24,25]. For this, it is required that the smaller portions of territories manage to define, manage and monitor compliance with their own sustainable agenda [26,27], since urban planning (cities and neighbourhoods), from a sustainable perspective, is more effective isolated applications (isolated buildings) [28,29]. The current challenge is to create a comprehensive practical and participatory framework, based on the specific characteristics of the territory, with the aim of resolving the tensions between the objectives of preservation and sustainable development in a balanced way [30,31], where locally selected performance indicators, in combination with citizen engagement, will provide real progress in sustainability [32]. National and local institutions must report on the progress in the implementation of the SDGs using “Voluntary Local Reviews”, according to Article 47 of the 2030 Agenda, facilitating those improvements related to other SDGs and laying the foundations for sustainable development from cities and neighbourhoods [33]. Figure 1 shows the interlinkages between SDG11 and other SDGs.

		ODS 1	ODS 2	ODS 3	ODS 4	ODS 5	ODS 6	ODS 7	ODS 8	ODS 9	ODS 10	ODS 12	ODS 13	ODS 14	ODS 15	ODS 16	ODS 17	
		Interlinkages between SDG 11 targets and others SDGs																
SDG 11 Sustainable Cities and Communities	11.1	X					X			X								
	11.2	X	X			X	X											
	11.3					X		X					X					
	11.4			X											X			
	11.5					X				X								
	11.6			X			X						X					
	11.7				X					X						X		
	11.a		X	X														
	11.b	X		X											X			
	11.c		X	X							X							

Figure 1. Interlinkages between SDG11 and other SDGs Own elaboration based on [33]. The authors have relied on tables and data that appear in those references to make Figure 1.

Nevertheless, the Sustainability Assessment (SA) is technically very complex and is carried out to support decision-makers and public policies, impacting social, environmental and economic aspects, transcending the dimensions that define it. In theory, this method would help those responsible for the formulation and implementation of public policies to make better decisions and define courses of action to make society more sustainable [34]. The Neighbourhood Sustainability Assessment Tools (NSAT) are certifications systems which would help to systematise the requested indicators and would provide a roadmap

for the communities, making it easier for non-technical users to differentiate who does it better via recognition by independent third parties who are more advanced in the transition towards sustainable cities and communities. This has generated the appearance of different systems globally in recent years; for simplicity, they will be referred to in this document as NSAT. These are tools that allow us to rate a neighbourhood based on how successful it is in approaching sustainability goals, being currently the latest generation of impact assessment tools geared towards global sustainability from a local perspective, coming from the USA in 1969 with the approval of the National Environmental Policy Act (NEPA), with the intention of developing evaluation systems for the pressure in the environment due to the intense human activity after the second world war. NSAT started to emerge almost two decades ago as a result of Agenda 21, first as a continuation of certification systems for buildings (spin-offs tools) and second as those which are embedded in neighbourhood-scale plans (plan-embedded tools) [35]. Through an evaluation of independent third parties based on a series of sustainability criteria applied from early stages to obtain better results at the end of the process, it also provides a platform and a common language for communication and collaboration [36]. The launch of the SDGs worldwide generated a change in the scope in which these tools are normally used to compare the level of success; the globalised view changed towards a local view, indicated by several previous studies until 2015 [36]. Table 2 shows NSAT before SDGs.

Table 2. Tools before SDGs, Own elaboration based on “Most well-known NSA tools” [35]. The authors have relied on tables and data that appear in those references to make Table 2.

Type	Tool's Name	Country/ Region
Spin-off tools	LEED—ND	US
	ECC	US
	BREEAM Communities	UK
	CASBEE—UD	Japan
	Qatar Sustainability Assessment System	Qatar
	Green Star	Australia
	Green Mark for Districts	Singapore
Plan-embedded tools	Green Neighbourhood Index	Malaysia
	Neighbourhood Sustainability Framework	NZ
	HQE2R	EU
	Ecocity	EU
	SCR	Australia
	EcoDistricts Performance and Assessment Toolkit	US
	Sustainable Project Appraisal Routine	UK
	One Planet Living	UK
	Cascadia Scorecard	US

These works already pointed out said some examples of NSAT were better than others from a planning perspective, and this may be due to the links between the system and its application contexts and particular needs [37]. The adaptation of the system is a key to a successful sustainable community and depends on national and locally requirements [38]. From 2016 to 2022, giving meaning to the requirements described above, but to a certain extent hindering the possibility of comparing performances between territories, this personalisation process was not yet implemented. Many critical reviews present new processes, structures and attributes in order to improve existing ones or create other systems. We find ourselves in a period of uncertainty, adaptation, empower and resilience [38]. This review aims to diagnose trends for the future of NSAT, selecting between systematic reviews and works that help us understand the new requirements necessary to increase the probability of success in its development and implementation for researchers, decision-makers and the communities they seek to represent, as well as their local interests, responding to global commitments.

2. Methods

The literature search and selection method is more accurately known as the protocol of preferred reporting items for systematic reviews and meta-analyses (PRISMA) [39]. The The bibliometric methodology used for data collection and analysis is summarised in Table 3 and Figure 2.

Table 3. Methodology.

Section	Description
Title	Identify the publication as a systematic review.
Abstract	Brief presentation
Introduction	Justification and objectives
Methods	Eligibility, sources, search strategy, selection process, data process
Results	Scoping review
Discussion	Interpretation, analysis
Conclusions	General interpretation of results and limitations

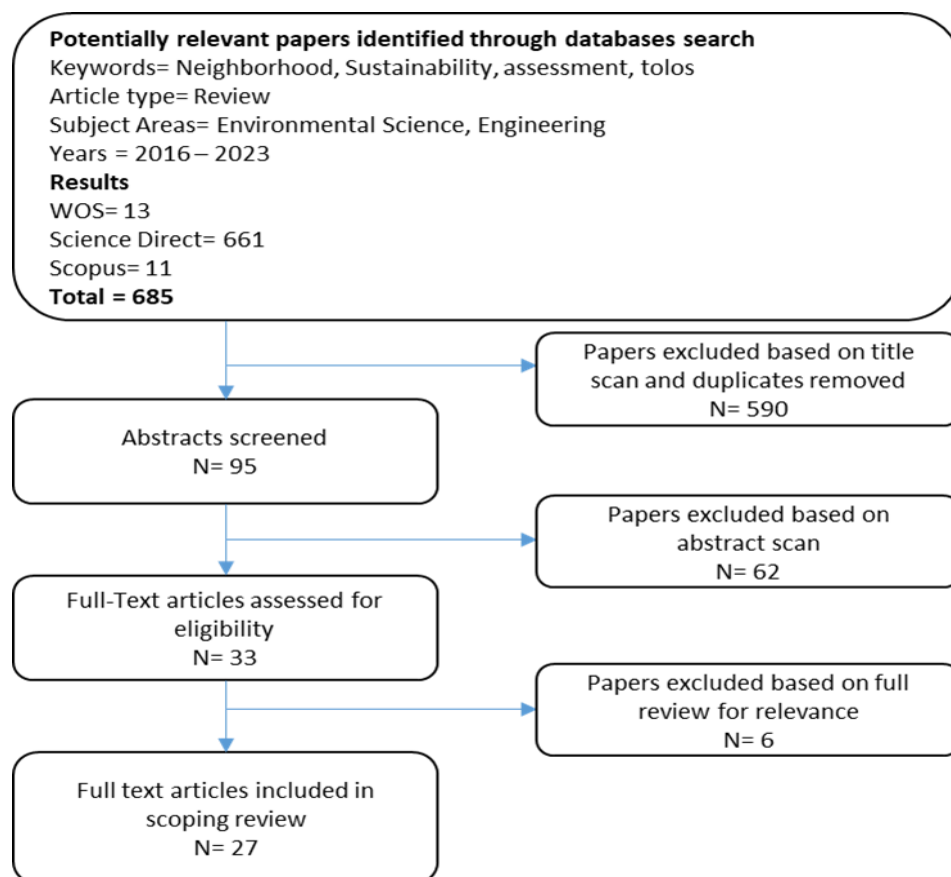


Figure 2. Selection process. The literature search and selection method is more accurately known as the protocol of preferred reporting items for systematic reviews and meta-analyses (PRISMA).

3. Results

3.1. Results of PRISMA Selection per Year

By searching for publications with the NSAT-related search string within the titles, abstracts and keywords of articles indexed in Scopus, Science Direct and WoS, 685 articles were obtained. Thereafter, with duplicates removed, the titles and abstracts of the obtained articles were manually verified to exclude unrelated papers; this led to a reduction from 685 to articles to 33 relevant articles. Afterwards, the comprehensive review of the contents of the 33 articles was executed, obtained 27 articles in scoping reviews. Table 4 shows the number off selected papers per year.

Table 4. Results per year.

Data Bases	2016	2017	2018	2019	2020	2021	2022	2023
Science Direct	1	1	1	-	1	2	2	-
WoS	1	-	-	1	1	-	1	-
Scopus	4	4	2	2	1	-	1	1
Selected per year	6	5	3	3	3	2	5	1
Total selected	27							

3.2. Brief Description of Reviews

Below, in Table 5, we present a brief overview of the contents those reviews that contribute to understanding the evolution of the discussion about NSAT from 2016 to 2023 from WoS (Ws), Scopus (Sc) and ScienceDirect (SD); then, some articles related complementary were cited post selection to enrich the information.

Table 5. Papers selected by year and database with a little resume (own elaboration).

#	Title	Year	Data Base	Resume
1	A critical review of selected tools for assessing community resilience [40]	2016	Ws	Compares the application of the concept of resilience through 36 assessment tools and five main dimensions, and considers the growing need to operationalise the concept, develop new systems and strengthen participation, anticipating the advance of climate change.
2	“The French eco-neighbourhood evaluation model: Contributions to sustainable city making and to the evolution of urban practices” [41]	2016	SD	Presentation of the French system shows differences between bottom-up national and local strategies, still based on agenda 21, but with 20 commitments that consider adaptation to climate change and the environmental emergency.
3	What is Neighborhood Context and Why does it Matter in Sustainability Assessment? [42]	2016	Sc	Analyses lack context-specificity and suffer from “one-size-fit-all” vision off the NSAT, looking for a “balance” in urban sustainability assessment from five different perspectives.
4	Neighborhood sustainability assessment tools and water system adaptation: A framework to analyse the adaptive capacity in the physical-social context [43]	2016	Sc	Presents the need for improvement in the NSAT to include adaptation to climate change based on impact scenarios mainly concerning temperature and precipitation, concluding that the tools have capabilities on the physical components, but with a weakness in terms of the social dimensions.
5	Sustainability assessment of urban areas through a multicriteria decision support system [44]	2016	Sc	Presents a new NSAT for the cities and neighbourhoods scale, using a simple decision support system to resume the complexity of urban planning.

Table 5. Cont.

#	Title	Year	Data Base	Resume
6	Attaining SDG11: can sustainability assessment tools be used for improved transformation of neighbourhoods in historic city centers? [45]	2016	Sc	By analyzing the existing conditions, this study aims to present the strengths and weaknesses in order to respond with a plan at the neighbourhood level using LEED ND.
7	Comparative assessment of sustainability strategies applied to urban neighbourhoods in Brazil, Germany and Sweden [46]	2017	Sc	Discusses strategies and solutions for urban sustainability at the neighbourhood scale, with a literature review coupled to information collected in technical site visits and interviews.
8	Assessment of sustainable neighbourhoods: From standards to cultural practices [47]	2017	Sc	Provides a cultural characterisation of NSAT and discusses factors such as contextual adaptation, planning and design ideology and green construction market.
9	A conceptual re-visualization of the adoption and utilization of the Pillars of Sustainability in the development of Neighbourhood Sustainability Assessment Tools [48]	2017	Sc	Develops a relational model called the Sustainability Pathway Model which categories and investigates the successes and shortcomings of already developed NSAT, in order to implement optimal solution
10	Neighborhood sustainability in urban renewal: An assessment framework [49]	2017	Sc	Proposes a framework for assessing neighbourhood sustainability to support urban renewal decision making, with two components: sustainability and building condition and a decision-making matrix for urban renewal strategies.
11	Towards life cycle sustainability assessment of cities. A review of background knowledge [50]	2017	SD	Analyses whether existing life cycle assessment (LCA) methods can be used in the evaluation from a construction product to a city or an urban region, concluding that current sustainability evaluation tools omit, holistically, various environmental impacts, and comparing the results between cities indices.
12	Toward a holistic sustainable and happy neighbourhood development assessment tool: A critical review of relevant literature [51]	2018	SD	Describes the need of a new NSAT including happy neighbourhoods, integrates five domains: social impact, cultural impact, economic impact, ecological impact and impact on happiness.
13	Comparative sustainability assessment using three rating systems in the Myanmar context [52]	2018	Sc	It looked at the development of three neighbourhoods in three cities, used and compared three scoring systems, and determined that there is no perfect NSAT for performance in developing countries.

Table 5. Cont.

#	Title	Year	Data Base	Resume
14	The comparative analysis of neighborhood sustainability assessment tool [53]	2018	Sc	Conducted a qualitative and quantitative analysis of NSAT in developed Asian countries, concluded that NSAT strongly emphasises resource and energy categories but neglects economic development, governance and participation.
15	Urban sustainability assessment tools: A review [54]	2019	Sc	A review to understand the similarities, differences, gaps and problems of NSAT in multiple contexts, concluding that certain aspects have more importance and others less or no consideration, and each criterion is evaluated independently of whether it may be influenced by other criteria.
16	Developing a neighbourhood sustainability assessment model: An approach to sustainable urban development [55]	2019	Sc	Provides a new integrated NSAT based on a measure that can determine a degree of sustainability, comparing holistic models and common concepts.
17	A review of renewable energy assessment methods in green building and green neighborhood rating systems [56]	2019	Ws	Provides a comprehensive review of renewable energy assessment methods adopted in sustainable buildings and also NSAT, summarising indications and improvements on existing methods.
18	Neighborhood sustainability assessment in developed and developing countries [57]	2020	Ws	The review classifies NSAT and their approaches for developed and developing countries, presenting different priorities depending the location and context. The performance is focused on developing countries and social development.
19	Reviewing neighborhood sustainability assessment tools through critical heritage studies [58]	2020	Sc	Comparing LEED ND and BREEAM C, the article explains how immaterial practices do not exist for NSAT and suggests a change to emphasise that the meaning of immaterial heritage transcends time and space but also identity, memory and experiences.
20	Chapter 11—Urban sustainability assessment tools: toward integrating smart city indicators [59]	2020	SD	Results shows a deficiency between smart city and NSAT; in particular, smartness indicators related to the economy, governance and quality of life dimensions, making recommendations for future research.
21	Neighbourhood sustainability assessment tools: A review of success factors [60]	2021	SD	Identifies and categorises cases for the implementation of NSAT through a systematic review, finding two main categories of success, structural and procedural.

Table 5. Cont.

#	Title	Year	Data Base	Resume
22	Limitations in assessment methodologies of neighborhood sustainability assessment tools: A literature review [61]	2021	SD	The purpose was to provide advice for better NSAT, aimed at sustainable development. Nine major categories of methodological limitations were identified. In addition, it provides recommendations for developers.
23	Neighborhood sustainability assessment tools: Research trends and forecast for the built environment [62]	2022	SD	Shows unnoticed gaps in NSAT frameworks and identifies trends such as communities' concerns, resilience, climate justice and technology, as well as the low contribution of undeveloped countries.
24	Comparative Review of Neighborhood Sustainability Assessment Tools [63]	2022	Sc	Compares two Italian NSAT, "GBC Quartieri" and "ITACA Scala Urbana", identifies differences and analogies among the different tools, confirms that the protocols originating from building dedicate a little space to social aspects—contrasting with the concept of inclusion—instead of the newly developed neighbourhood protocols.
25	Towards worldwide application of neighbourhood sustainability assessments: A systematic review on realized case studies [64]	2022	Ws	Aims to examine NSAT. and verify that they are aligned with the sustainability goals. Examines the weaknesses and strengths behind the use at the district level, testified as achieving carbon neutrality target; however, the lack of data consistency and the significance given to the contextual features hindered the replication of the previous experiences and nudged the development of custom-fitted NSA tools.
26	Urban green rating systems: Insights for balancing sustainable principles and heritage conservation for neighbourhood and cities renovation planning [65]	2022	SD	After examining the NSAT, it was verified that their use would facilitate achieving environmental goals and carbon neutrality; however, the rigidity, the inconsistency in data and the non-recognition of contexts led to the creation of personalised systems of a national and local nature.
27	Global South research priorities for neighbourhood sustainability assessment tools [66]	2023	Sc	Presents a systematic review of NSATs in cities of the Global South. The results revealed five themes for research with one dominant theme. Identifies priority themes and tools for each region.

3.3. List of NSAT Found in the Literature until 2023

NSAT are the latest generation of impact assessment tools, emerging around the world in the first two decades of the 21st century and supporting multi-scale urban planning as a synergistic approach; in fact, experts point out that the trend of individual buildings is insufficient to achieve sustainability objectives [67,68]. These objectives require an integration of the building and its context, measuring other impacts such as accessibility, generated traffic, citizen validation and, in general, broader and more precise environmental evaluations, something recognised by researchers [35]. The tools used for construction do not provide a sufficiently deep look at the context and do not fully consider the cumulative impacts that occur in the urban environment, where individual solutions are affected by the general system and vice versa. In addition, the NSA tools better approximate the social interactions of the context, seeking to provide tangible and sensitive results [69]. There is also an acceptance that cities are not just a conglomerate of people, but the foundation for sustainable development at a global level, where the results of evaluation and planning based on NSA tools can increase citizen awareness about the strengths and weaknesses of their territory, improve decision-making in development plans, or perhaps simply facilitate the choice of where to live and work. The neighbourhood scale evaluation provides a perspective in its widest sense [70]. Table 6 shows the NSAT found until 2023.

Table 6. NSA tools found until 2023. The verbatim transcription of the original articles has been respected, own elaboration based on [38]. The authors have relied on tables and data that appear in those references to make Table 6.

N°	NSA Tools	Developer (s)	Country	Year	Latest Version
1	Sustainability Self-Determination Evaluation Eanking	Shi et al. [71].	China	2022	
2	Urban Forest Certification System	Kadam et al. [72].	USA	2021	
3	Holistic Green Urban Meter	Yakoub et al. [73].	Egypt	2021	
4	Eco-cultural design Assessment Framework	Qtaishat et al. [74].	France	2020	
5	Sello Comuna energética	Energy Sustainability Agency	Chile	2020	
6	SNM (Successful Neighbourhood Model) Comprehensive Assessment Method for	Moroke et al. [75].	South Africa	2019	
7	Sustainable Urban Development (CAMSUD)	Ali-Toudert et al. [76].	Germany	2019	
8	RESSICOM	Diaz-Sarachaga et al. [77].	Spain	2018	
9	Assessment Standard for Green Eco-districts (ASGE)	Ministry of Housing and Urban-Rural Development of the People's Republic of China	China	2018	
10	WELL Community Standard™	International WELL Building Institute (IWBI)	US	2017	

Table 6. Cont.

N°	NSA Tools	Developer (s)	Country	Year	Latest Version
11	LEED Cities and Communities	US Green Building Council (USGBC)	US	2017	2019
12	Green Star Sustainable Precincts (South Africa) Building Environmental Assessment Method (BEAM)/Plus	Green Building Council South Africa	South Africa	2017	
13	Neighbourhood Assessment Tool French	Hong Kong Green Building Council	Hong Kong (China)	2016	
14	Eco-Neighbourhood Evaluation Model	Paris City Council	France	2015	
15	Conavi CEV Mexican Code Green Rating for	National Housing Commission	Mexico	2015	
16	Integrated Habitat Assessment (GRIHA LD)	GRIHA Council and The Energy and Resour	India	2015	
17	Circles of Sustainability	UN Global Compact Cities Programme	Australia	2014	
18	Living Community Challenge	International Living Future Institute	US	2014	2017
19	EcoDistricts	EcoDistricts	US	2012	
20	EcoQuartier	Ministères Transition écologique Cohésion des Territoires	France	2012	2020
21	Green Star Communities	Green Building Council Australia (GBCA)	Australia	2012	2016
22	DGNB for Districts	German Sustainable Building Council	Germany	2012	
23	STAR Communities	STAR Communities (now merged with the USGBC)	US	2012	2016
24	AQUA Bairro e loteamento label	Fundação Vanzolini	Brazil	2011	
25	GBI Township	Greenbuildingindex Sdn Bhd (GSB)	Malaysia	2011	
26	2030 Districts	Architecture 2030	US	2010	
27	EEWH Assessment System for Eco-community	Architecture and Building Research Institute	Taiwan	2010	
28	Pearl Community Rating System	Abu Dhabi Urban Planning Council	UAE	2010	
29	Sustainable Sites Initiative (SITES)	American Society of Landscape Architects	US	2009	2015
30	LEED-ND	US Green Building Council (USGBC)	US	2009	2018
31	BCA Green Mark for districts	Building and Construction Authority (BCA)	Singapore	2009	2017
32	SCAM	Ministry of Environment Building Research Establishment	Chile	2009	
33	BREEAM Communities	(BRE Global)	UK	2008	2016
34	GreenTRIP	TransForm	US	2008	
35	IGBC Green Townships	Indian Green Building Council	India	2008	

Table 6. Cont.

N°	NSA Tools	Developer (s)	Country	Year	Latest Version
52	Green Township Index	Siew (2018)	Malaysia	2008	
36	CASBEE-UD	The Institute for Building Environment and Energy Conservation (IBEC)	Japan	2007	2014
37	Global Sustainability Assessment System (GSAS)	Gulf Organization for Research and Development	Qatar	2007	
38	Sustainable Building Tool (SBTool)	International Initiative for a Sustainable Built Environment (iiSBE)	Canada	2007	2020
39	Sustainable Community Rating (SCR)	VicUrban, the Victorian Government's land development agency	Australia	2007	
40	EnviroDevelopment	Urban Development Institute of Australia (UDIA)	Australia	2006	
41	VicUrban Sustainability Charter (Master Planned Community Assessment Tool)	Government of Victoria	Australia	2006	
42	SEEDA checklist	National Audit Office	UK	2006	
43	Wulvern Indicators of Neighbourhood Sustainability	Wulvern	UK	2006	
44	Neighbourhood Sustainability Framework	Beacon Pathway	NZ	2005	2014
45	EarthCraft Communities	Greater Atlanta Home Builders Association	US	2005	2014
46	Enterprise Green Communities	Enterprise Community Partners	US	2004	2020
47	One Planet Communities	BioRegional Development Group	UK	2004	
48	Cascadia Scorecard	Sightline Institute	USA	2004	2006
49	Ecocity	EU research project	EU	2002	
50	HQE2R	Scientific and Technical Center for Building (CSTB)	France	2001	
51	SPeAR (Sustainable Project Appraisal Routine)	ARUP	UK	2000	2017

4. Discussion

The list in Table 6 shows the evolution of the proposed systems from a regional to an urban scale, and later to a local and community scale, in some cases seeking to highlight specific elements of the city, and, in other cases, seeking to emphasise culture or identity. No single city can contribute to overall sustainability if its own component parts are found not to be unsustainable [78]. NSAT can help local governments and communities understand the real situation of their own cities and neighbourhoods. Each tool basis its evaluation on several parameters, whose rates are generally obtained by comparing real performances with referenced ones (benchmarks). In recent years, the focus when developing assessment frameworks and tools is moving from the urban scale to individual neighbourhoods [79,80], recognising the importance of neighbourhoods as the frontlines in the battle for sustainability. This is the scale where land development takes place and facilities are proposed, debated and constructed.

This can be achieved through strategic planning that broadly considers the characteristics of the territory where the selected evaluation system is intended to be implemented [81]. Today, the neighbourhood scale is the most appropriate for new planning that considers cutting-edge ideas. These would be considered the optimal scale from which to observe social indicators and the interactions of the people [82], hence the importance of recognising the significance of pre-existences in the territory and the meaning of relationships between residents, their representatives in local governments, local dynamics, priorities and the availability of data that facilitates the replication of the framework developed [83,84]. Another important fact is that, comparatively, the progress in the number of cases recognised by the NSAT is very slow compared to the cases of certified buildings [54]. However, in most countries, the basic requirements for certification systems are voluntary, that is, not regulated, nor are there tax incentives with which to promote their implementation [85]. Thus, there is uncertainty regarding the applicability of existing NSAT. In previous reviews and literature comparisons up to 2023, different authors explain the great difference in the progress of the system via different causes and sub-causes; among these and environmental bias, non-adaptive global calculation methods, lack of context data, additive and non-integrative logic, etc. [42]. Thanks to the reviews and diagnoses, we can add certainty to this field of study and the implementation processes in certain territories. Below, we will review some outstanding publications and their recommendations in detail.

4.1. Neighborhood Sustainability Assessment in Developed and Developing Countries (2020)

The review entitled “Neighborhood sustainability assessment in developed and developing” (2020) [57] classifies NSAT and presents different priorities depending on the location and context, The performance is focussed on developing countries. The paper stressed the following set of recommendations that, though broad, clearly describe the fundamental steps of an effective process in moving towards more sustainable neighbourhood urban development. Table 7 shows the recommended steps.

Table 7. Process steps recommended. Own elaboration based on [57]. The authors have relied on tables and data that appear in those references to make Table 7.

Process Steps Recommended	
1.	Looking for the big picture;
2.	Understanding the sustainability phenomena clearly;
3.	Understanding the drivers of urban sustainability, and determining key factors and indicators;
4.	Collecting and accessing to the relevant data;
5.	Adopting tools and models and modeling the data;
6.	Defining quality targets for sustainable urban development;
7.	Facilitating the creation of relevant knowledge in the area of sustainable urban development;
8.	Formulating the urbanisation policy from a sustainable development perspective;
9.	Changing behaviours and including stakeholder and community views;
10.	Forming collective efforts to develop sustainable urban neighbourhoods;
11.	Planning dynamically for sustainable urban development;
12.	Translating the sustainability agenda into a number of strategic initiatives for implementation;
13.	Enhancing the control and monitoring mechanisms;
14.	Enabling an iterative policy and plan making process.

4.2. Chapter 11—Urban Sustainability Assessment Tools: Toward Integrating Smart City Indicators (2020)

In the review entitled “Chapter 11—Urban sustainability assessment tools: toward integrating smart city indicators” (2020) [59], after examining the NSATs, inconsistencies in the data and the non-recognition of the dimensions of smart city indicators were verified. The performance of the selected NSAT with respect to the coverage of smart city indicators related to the five main themes of intelligence was quite deficient; only in the environmental dimension were there relevant coincidences in BREEAM and LEED; CASBEE almost did not obtain coverage; and LEED CCE was the one that obtained the best performances. Table 8 shows NSAT performance compared to the dimensions of smart cities.

Table 8. NSAT performance. Own elaboration based on [59]. The authors have relied on tables and data that appear in those references to make Table 8.

	BREEAM	LEED ND	LEED CCE	LEED CCPD	CASBEE UD	CASBEE CJ	CASBEE CW
Correspondence	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Economy	4.54	9.1	9.09	9.09	0	4.5	9.1
Governance	5.88	0	17.65	11.8	0	0	0
Environment	44.9	49	79.59	81.6	12	2	22
QOL	15.63	13	15.63	18.8	13	3.1	3.1
Mobility	17.95	21	43.59	46.2	10	5.1	7.7

4.3. Success Factors for NSA Tools 2021

Continuing with the summary of recent reviews, the second most relevant paper in 2021 was “Neighbourhood sustainability assessment tools: a review of success factors”, which, based on evidence, analysed 40 NSA tools and identified success factors in their implementation [60]. Successful experiences and strengths were organised into two classes related to structure and procedures, showing that they have great potential to facilitate sustainable urban development and are worth noting with respect to the structural successes of LEED-ND, CASBEE-UD and BREEAM communities. Promoting sustainable design is the foundation of a successful procedure. Table 9 shows structural success factors in relevance order, and Table 10 presents the procedural factors, both with respect to the success NSAT.

Table 9. Structural successes. Own elaboration based on the bibliographic references consulted. The verbatim transcription of the original articles has been respected, based on [60]. The authors have relied on tables and data that appear in those references to make Table 9.

Number	Issue	Count
1	Tool improvement over time	12
2	Providing measurable indicators for assessment	7
3	Local tool ensures context-specificity	5
4	Adequate coverage of sustainability dimensions	4
5	Design standards of NSA tools can provide co-benefits	4
6	Upscaling building-based activities	3
7	Providing methods for dealing with interactions between different indicators	2
8	User friendliness	1

For successful procedures, the literature suggests the following.

Table 10. Procedural successes. Own elaboration based on the bibliographic references consulted. The verbatim transcription of the original articles has been respected, based on [60]. The authors have relied on tables and data that appear in those references to make Table 10.

Number	Issue	Count
1	Promoting sustainable design	53
2	Improving performance	13

Table 10. *Cont.*

Number	Issue	Count
3	Highlighting priority development locations and areas that need further improvement	9
4	Facilitating stakeholder engagement and improving transparency	9
5	Informing decision making	6
6	Relative success in terms of adoption	6
7	Expediting planning and decision-making processes	3

4.4. Limitations of NSA Tools 2021

The paper entitled “Limitations in assessment methodologies of neighborhood sustainability assessment tools: A literature review” (2021) [61] classifies the different methodological limitations found in the literature indexed up to that moment, showing that the above research findings could be classified in a hierarchical way. In this investigation, we will pay special attention to the first three, but we will list all nine of the limitations found. Table 11 shows the methodological limitations released in the papers.

Table 11. Methodological limitations. Own elaboration based on the bibliographic references consulted. The verbatim transcription of the original articles has been respected, based on [61]. The authors have relied on tables and data that appear in those references to make Table 9.

Limitation Category	Mentions
Limited coverage of sustainability dimensions	42
Top-down and non-transparent approaches	41
Limited consideration of context-specific issues	30
Rigidity and prescriptiveness of design measures	22
Lack of measures to ensure that basic sustainability requirements are met	19
Lack of agreement between different assessment methodologies provided by different tools	16
Limitations due to the lack of correlation between the quantitative indicators	5
Complexity of the assessment tool	5
Limited consideration of boundary linkages	2

The table shows highlight that the main methodological limitations are as follows:

1. Limited coverage of sustainability dimensions: The four pillars defined by the CSD in 1995 and the Sustainability Assessment and Measurement Principles (STAMP) are not sufficiently represented. In refs. [85,86], 42 publications until 2022 indicate an imbalance between the environmental aspect and the other three fundamental aspects, namely, social, economic and institutional [87]. At the same time, other studies point to qualitative elements that have been ignored, such as aesthetics, belonging, place, happiness and cultural values, among others [88,89]. In addition, the economic development dimension has been largely neglected in NSA tools, leaving aside the strengthening of local economies and its benefits, in addition to the limited consideration of local institutions and governance as articulators of the four dimensions [90,91].
2. Top-down and non-transparent approaches: According to the STAMP, participation and transparency are mandatory in order to ensure the legitimacy of the results and processes and are key to the success of the implementation of the NSA tools. Forty-one studies were found in different places that indicate that this integration and communication towards the communities is not happening in the best way, criticising the developers of the NSA tools [92,93]. It is not clear to the communities and local governments how the indicators that they will be measured and recognised with have been created and ranked. This greatly weakens the validation processes of the interest groups in the local areas and the follow-ups after their implementation [94,95]. Consequently, the fulfilment of expectations and the commitment of the interested

parties are strongly weakened. This generates a lack of understanding on the part of potential beneficiaries and impairs compliance with requirements such as transparency and the high standard requested by authorities who want to be recognised for their management in the territory. In the long term, this discredits the NSA tools, and the development of citizen self-awareness through simple tools that reflect the needs of the specific place is key [96,97].

3. Limited consideration of context-specific issues: With 30 publications mentioned in the revised document, NSA tools today work with standardised assessment criteria and indicators without considering context-specific differences [98,99]. Some important indicators/criteria are not observed for certain contexts, resulting in the under-evaluation of measures, which is not suitable for guiding sustainable neighbourhood development in different countries. In the review, there are only a few exceptions based on consulting local residents in the neighbourhood development process (HQE2R and Ecocity). On the other hand, the state of affairs of underdeveloped, developing and developed countries provide different socioeconomic realities as bases [100,101].

4.5. Trends and Forecast for NSA Tools 2022

The second paper found was “Neighbourhood sustainability assessment tools: Research trends and forecast for the built environment”. This is a review that allows for the determination of gaps and trends for NSA tools, revealing that journal articles are predominantly qualitative [62], limiting research results and highlighting the need to undertake experimental research and produce concrete results, as well as providing better methods of analysis with respect to performance, producing recommendations that NSA tools can adopt, as described below in Table 12.

Table 12. Topics and trends. Own elaboration based on the bibliographic references consulted. The verbatim transcription of the original articles has been respected, based on [62]. The authors have relied on tables and data that appear in those references to make Table 12.

Topics and Trends	Distribution in Literature
Climate Change Mitigation	30%
Resilience	21%
Smart Location and Linkages	15%
Smart Growth	11%
Climate Change Adaptation	10%
Smartness	7%
Sustainability Incentives	4%
SDG Discussion	2%

4.6. Towards a Worldwide Application of NSA Tools 2022

The first paper found was “Towards worldwide application of neighbourhood sustainability assessments: A systematic review on realized case studies”. This study aims to examine all neighbourhood sustainability assessments performed in line with sustainability goals. For this, a review is carried out through case studies of neighbourhoods that used NSA tools or rejected their applicability to develop custom tools [64], verifying the practicality of NSA tools for achieving carbon neutrality goals. However, not being able to replicate the theory with which the tools were generated in different contexts pushes the creation of personalised systems that respond to specific needs. This bibliographical review produces a list of recommendations from different authors to improve the tools and classifies the publications by the concluding remarks, as described below in Table 13.

Table 13. Concluding remarks. Own elaboration based on the bibliographic references consulted. The verbatim transcription of the original articles has been respected, based on [64]. The authors have relied on tables and data that appear in those references to make Table 13.

Concluding Remarks	Remarks
To consider the specific local features of each project's context	11
To develop a new NSA tool	9
To improve existing NSA tools by adding new indicators	9
To include stakeholders and community views	7
To better understand and define the intentions, indicators and concepts	6
To formulate new urbanisation policies and guidelines	6
To confirm or refute the applicability of NSA tools by leveraging case studies	4
To adapt technical tools to simulate indicators	3
To have some kind of master-plan evaluation	3

5. Conclusions

This work allows us to establish several conclusions of different kinds. First, there is an evolution in terms of maturity from the first reviews found in articles from 2016 to those found from 2023. At the beginning, there were previous reviews that had already indicated observations such as the global view of the system not fitting the realities. Local concepts such as resilience, considering climate change and its direct impacts from early stages and bringing a global tool to the local level are very complicated among developed countries, but between systems from developed to developing countries, it is even more complicated. A relevant concept that we must bring back is the “NSAT for happiness” indicator proposed in 2018; although it is not mature enough at present, it is key to connect with the origin of the systems that aim to generate “well-being for people and communities”, as defined in SDG 11, and to “make cities and human settlements inclusive, safe, resilient and sustainable”. Proof of this is that more and more strategies and systems emerge from the academic world, governments and NGOs, who are seeking to join the solution but do not feel represented by global systems, except for some cases such as LEED CC or BREEAM C, which have managed to introduce flexibilities. Even so, the mandatory elements do not connect in all locations, and the management system does not function. As it is natural in all countries, massive customisation is required. It is not a problem of the scientific basis, which supports the metrics and dimensions to obtain the results; rather, the problem relates to the descent through procedures, processes and strategies that are not connecting with the local realities of communities that respond to regional and national frameworks. From the legal, cultural, economic, environmental and heritage point of view (among others), the concept that there is “only one size” has generated the appearance of other systems that come from an ascending and decentralised relationship, such as the French eco-neighbourhood, which already addressed, from its origins, two urgent topics: climate change and identity. Another important point is the lag with respect to other strategies that facilitate sustainable urban development, such as the inclusion of technologies for smart cities. In theory, they help us measure environmental performance and other characteristics through intelligent and real-time monitoring, which should be a premise from which to implement in the NSATs, but there is a disconnection in the management of the information, the proposed dimensions and the reportability structure. Clearly, the three main limitations to overcome would be the limited coverage of sustainability caused by overvaluing the environmental dimension; the need for an ascending and decentralised relationship with the communities; and the rigidity of the key processes and indicators. From the point of view of success factors, the three main structural factors would be continuous improvement of the system, measurable indicators and ensuring connection within the context of the NSAT; while the three main procedures would be to promote sustainable design, to improve performance and to prioritise areas that need improvement. Considering the location of each project, in terms of developing and/or improving NSAT with new indicators and including stakeholders, Table 6 shows that as customised NSATs continue to appear around the world, their articulation and

standardisation is necessary in order to recover the comparison that exists with older systems, probably through specialised INDEX-type rankings. The paper aims to finally provide prospects and guidelines with respect to what could be improved in terms of existing certifications and perhaps considered as a basis for new NSAT developments. Some strong ideas are constantly repeated in the reviews, as follows:

- Include the four dimensions of sustainability in a balanced way;
- Include bottom-up approaches from the bases of the territory, improving the information channels to the interested parties to achieve more commitment in the implementation from the communities and local governments;
- Expand the limited consideration of context-specific issues and provide measurable indicators for their assessment;
- Promote sustainable design;
- Improve existing design, adding new indicators or creating new NSA tools with concepts and indicators such as:
 - Climate change mitigation;
 - Climate change adaptation;
 - Resilience;
 - Smart growth.

Today, the challenge is to create or improve methods that integrate what was previously urgently requested, giving rise to what we could call a third generation, beyond the “Spin Off” and the “Plan-embedded”, namely, a “Quick wins” and “LEAN” proposal NSAT, which allows us to respond in a timely manner to the current “climate emergency” and the crisis regarding resources, since we must not forget the projection of inhabitants in cities towards 2050. This third generation approaches new metrics in a more transparent, participatory and practical way, which allows for balance between conservation and development. Inevitably, future new indicators and evaluation systems will need to be appropriated and recognised by local stakeholders and their governments, so that they might participate in making sense of the metrics and managing compliance together. For successful implementation, commitment and recognition of incentives for people and their communities are essential.

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