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Limitations of institutional dimension in existing sustainability assessment tools: From the perspective of territory

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ABSTRACT

Cities face considerable fundamental sustainability challenges, and scholars have developed many sustainability assessment tools (SATs) to assess and address these problems. As an important pillar of the tools, the institutional dimension, though added to one of the main dimensions, needs to be stressed more in the existing studies, especially in the field of political geography. Territory, as one of the core concepts of political geography, is considered an essential practical perspective of institutional issues. This paper aims to clarify the limitations of the institutional dimension in SATs from the perspective of territory. Nineteen SAT tools are filtered and reviewed after refining the concept of institutional sustainability. Their categories and indicators are divided into four themes in order to clarify the intent of the institutional dimensions. After documentary analysis, we argue that the main shortcomings of the existing research are the need for more balanced integrality and spatial embeddedness of institutional indicators in the tools. The institutional dimension should be first considered before defining other dimensions through more detailed explanations than the existing one and should lay the roots in the specific institutional arrangements. This paper suggests that the preferential consideration for institutional dimension and the appropriate increase of its specific gravity can be considered in future SAT optimization and development. Some sociological approaches, like grounded theory, can be regarded as an introduction to form institutional indicators based on specific institutional arrangements. This study can provide an opportunity to improve the existing sustainability assessment tools or develop new tools to reflect more holistic understandings of institutional sustainability.

1. Introduction

Entering the third decade of the 21st century, the world faces many fundamental sustainability challenges in several domains. Energy supply, for example, is confronted with a rapid depletion of natural resources, air pollution, greenhouse gas emissions, nuclear risks, uncertainties related to its security of supply, and energy shortages (International Energy Agency, 2011). Water supply and sanitation systems have to tackle a broad range of problems related to water scarcity, insufficient access in low-income countries, and extreme events such as flooding, earthquakes, and micro-pollutants (Gleick, 2003). Meanwhile, the transportation sector is challenged by congestion, local air pollution, fossil fuel depletion and CO_2 emissions, and the risk of accidents (Geels, 2010). Similar challenges also occur in other sectors, such as agriculture, the food system and education. While most of these challenges are related to environmental and social issues, economic problems are pressing as well. In many parts of the world, existing infrastructure systems are confronted with huge financial needs in terms of infrastructure renewal and expansion, which seem even more daunting in times of financial crisis and public budget overruns (Gil and Beckman, 2009; United Nations Environment Programme, 2011). In addition, the COVID-19 pandemic is reshaping the world order of economy and politics (Ye et al., 2020). This event has slowed down economic growth, increased unemployment, and raised poverty and hunger (International Labour Organisation, 2020). The decline in the gross world product could lead to an additional 25 million unemployed people worldwide (International Labour Organisation, 2020). Hunger had also increased, with the number of people facing acute food insecurity doubling to about 265 million by the end of 2020 (United Nations, 2020). The need to deal with global climate change and other socio-environmental

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problems is urgent since these problems threaten global sustainable development.

Progressive technological innovation and periodic policy intervention are far from enough to cope with the current global climate and socio-environmental crisis. Human society needs to fundamentally change the existing socio-technology systems, including institutional and cultural concepts, resulting in a more sustainable production and consumption mode (Markard et al., 2012). In this case, sustainability assessment is an effective approach to clarify and address global sustainable development. Many scholars and institutions have developed various sustainability assessment tools (SATs) to evaluate the quality of the development process. As Hodson and Marvin (2010) point out, many cities aspire to manage the transition toward sustainability and develop a framework to better understand transition processes.

The institutional perspective plays an essential role in investigating sustainability characteristics and innovation to address sustainability goals (Paddison, 2002; Yang et al., 2016; Lu and Huang, 2021). If an institutional sector or an organisational field gains sufficient influence, it can transform society (Wei, 2020). Furthermore, many SATs included institutional indicators as a part of their assessment (Dawodu et al., 2020; Zhou et al., 2019). The environmental, economic, and social categories and indicators have been verified that the accumulated can be utilised to multi scales and spaces in common (Cheshmehzangi et al., 2020; Kaur and Garg, 2019; Moroke et al., 2019; Reyes Nieto et al., 2018). Oppositely, as one of the four main dimensions of sustainability, institutional scopes and indicators are inapplicable in this way from the perspective of political geography (Kahila-Tani et al., 2019; Malik et al., 2019). At the same time, its abuse, has not been sufficiently explained.

Starting from this backdrop, this paper aims to investigate the limitations of the institutional dimension in existing SATs and determine the main shortcomings presented in these tools from the perspective of territory, which is an important part of political geography. The institutional categories, indicators, and their intents are summarised by reviewing the nineteen wide-used SATs. Based on the documental analysis, their limitations of institutional dimension – balanced integrality and spatial embeddedness – are highlighted in this study. This perspective of political geography was first introduced and applied to urban development and sustainable development. The outcomes provide an opportunity to improve the existing SATs from the perspective of inter-disciplinary political geography and develop new tools to reflect more holistic understandings of institutional sustainability.

This paper is organised into four parts after the introduction. At first, the key concepts and literature review about institutional sustainability and territory are comprehensively clarified. Next, the methodology used in this research is pointed out. The following section reviews the existing SATs and refines these tools' institutional categories and indicators. Then, the limitations of the institutional dimension in these tools are discussed after summarising and extracting their characteristics. Finally, we propose some directions for future sustainability research and practices.

2. The key concepts and literature review

To investigate the issues of SATs and their institutional dimensions, the concept of sustainability assessment (SA) needs to be clarified. Significantly, the definition of SA has changed over time (Hasna, 2010). Over the last three decades, this concept has emerged as a new development paradigm, combining social, economic, environmental, and institutional aspects of development. In 1995, the Commission on Sustainable Development acknowledged four dimensions: political-institutional; natural; economic; and social (Berardi, 2013; Littig and Griessler, 2005). The institutional dimension, added in 2011 (Villeneuve et al., 2017), can encourage the linkage between alternative dimensions and complement them (Devuyst et al., 2001; Spangenberg, 2002; O'Connor, 2006). These interactions constitute the linkages of the four dimensions (Fig. 1).

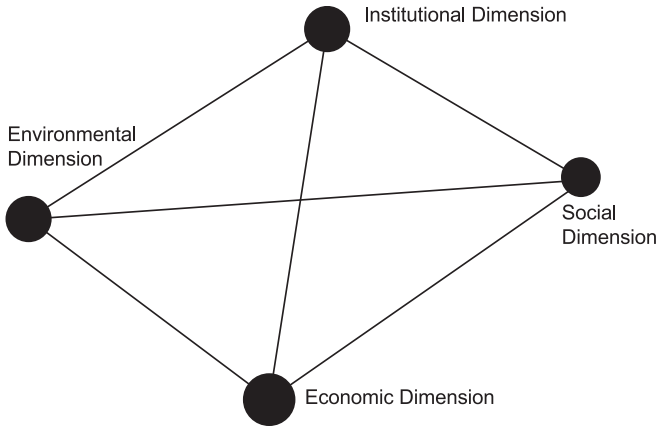

Fig. 1. The evolution of the dimensions of sustainability. Source: Author's edition based on Spangenberg (2002)

The literature on SA can be divided into two categories. The first category is the studies of the effectiveness of a single assessment tool. Szibbo (2016) examined the role of liveability and social sustainability in LEED-ND by assessing four North American neighbourhoods. Clark et al. (2013) examined LEED-ND's criteria for neighbourhood pattern and design in a case study of the Duboce Triangle neighbourhood in San Francisco. Stevens and Brown (2011) evaluated the moderate-to-vigorous physical activity among students in LEED-ND communities and provided a reference for walkable community design. The second is a comparison of the rating systems. Sharifi et al. (2021) identified two major success categories- structural and procedural – by identifying and categorising successes regarding the development and implementation of 40 tools. Cheshmehzangi et al. (2020) compared eight Asian Neighbourhood sustainability assessment tools (NSATs) to extract specific indicators for AS in the context of China. Braulio-Gonzalo et al. (2015) comprehensively reviewed the indicators of 13 tools. There is limited existing literature on the institutional aspect, even though abundant context can be found on this concept general introduction. Namely, within those SATs, institutional dimension is not lacked. The institution and institutional dimension, however, are broad and complex concepts with no precise definitions. The concepts are applied differently in various disciplines and theoretical traditions. For example, the institution is respectively defined as:

1. the rules of the game in a society, or more formally, the humanly devised constraints that shape human interaction (North, 1990: 356).
2. the working rules or rules-in-use set by individuals to organize repetitive activities, the outcomes of which affect those individuals and potentially others (Ostrom, 1990: 15).
3. formal or written laws or rules concerning what people and groups can and cannot do; informal habits, social norms or conventions which affect how people and groups behave, especially with each other; and more or less formal organizations of people or groups (Hodgson, 2006: 18).
4. durable rules which govern human interactions, and are also "humanly-devised" (Kingston and Caballero, 2009: 3).
5. integration of the policies, governing principles and structures, and regulations (Komeily and Srinivasan, 2015: 33).
6. a theme with indicators for evaluating the local government's planning capacity and resident participation (Hong et al., 2019: 8).

Each scholar or policymaker derives their definition according to discipline-specific criteria or study perspective, making it difficult to achieve a generalised definition. A common understanding is that it normatively evolves in society to regulate and standardise stakeholders' conduct (Smajgl and Larson, 2006). Additionally, it is treated as formal

rules such as policies and laws, and informal constraints such as conventions and norms (Cleaver, 2002; Kisoza, 2007). Aina et al. (2019) stated that formal rules, especially policies from the central government, remain more important in the context of top-down governance. They can provide needed support for collective actions in urban sustainable development (Liu and Ravenscroft, 2017; Markantoni, 2016). In those processes, the institutional dimension in this research is defined as the ability of institutions, under particular conditions, to guide actors to address sustainability goals.

The existing studies about the institutional dimension can be divided into identified five broad views. Firstly, in the earliest studies, Honadle and Van Sant (1985) defined it as a continuation of the benefit flows to the users or clients, with or without the programmes or organizations that stimulated them in the first place. This conceptualisation assumes that the institutional dimension needs to be assessed after the project has ended, presenting practical problems in predicting it during the project period (Brown, 1998). It is widely accepted and developed in subsequent studies. Another school of thought defines it in terms of the institution's longevity. The longer an organisation survives as an identifiable unit, the more institutionally sustainable it is (Brinkerhoff and Goldsmith, 1992). However, this conceptualisation has several flaws, such as unclear working periods, the uncertainty associated with the end of a project period, feeble insights into actual capacity, etc. (Brown, 1998). In the context of development management, it has also been defined as the ability of an organisation to meet recurrent costs after donor funding is exhausted (Brown, 1998; Kayaga et al., 2013). The financial self-sufficiency definition may not necessarily apply to some developmental activities that require high capital costs, such as in the case of water source development to supply low-income communities in a water-scarce area. Some desirable developmental activities will never be financially viable, as their capacity for full-cost recovery is minimal or non-existent. Brinkerhoff and Goldsmith (1992) and Hill (2008) emphasised its dynamic and temporal character. They conceived it as a process by which key sustainability features have been institutionalised within a management regime. The institution was defined by Kayaga et al. (2013) as mechanisms (i.e., explicit or formal systems of rules) or orientations (i.e., implicit or informal systems of rules) that structure the choices of actions of individual or collective actors in society. The regulative mechanisms and structures reinforce system dynamics to produce and maintain desired outcomes that satisfy collective goals. With the definition developing, there is a clear emphasis on the content of institutional dimension and the interaction with other elements. Lin (2021) divided it into the sustainability of the natural environment as the built-in institutions of society, like the emissions of CO_2, and man-made institutions like the market and government. It does not mean that other dimensions are incorporated into the institutional element. Quite the reverse, other dimensions like the environment, are intensely interactive with the institution.

According to the analytical framework of political geography proposed by Painter and Jeffrey (2009), the territory is the key research objective of institutional sustainability. However, as a practical tool involving strategies, current research fails to examine it from the territory perspective. Territory, as the core concept of political geography, is defined as a regulated-bounded space (Cox, 2008; Liu et al., 2015; Sack, 1986). The understanding of the territory as a regulated-bounded space began from the concept of sovereignty and inter-state relations established in the Westphalian system (Taylor, 1999; Osiander, 2001). Paasi (1996) believes that it is the product of society and history and calls the construction of territory at different spatial scales "the institutionalisation of regions". More narrowly, as boundaries divide space into exclusive places, institutional features of different places are difficult to share (Gallaher et al., 2009). Based on this key characteristic, this paper re-examines and analyses the institutional dimension in the existing SATs in the following sections.

3. Methodology

According to the research aim and objectives, a qualitative research methodology is deemed appropriate for this research. The procedures taken for data collection and analysis can be conducted in four steps (Fig. 2). These procedures are aligned with the guidelines of Preferred Reporting Items for Systematic reviews and Meta-Analyses (Moher et al., 2009).

Firstly, a literature review identifies the present research progress and gaps by consulting the scientific literature - published in bibliometric databases (Scopus and Google scholar) – about SATs and its institutional issues. The initial literature search was done on September 2021, using a broad-based search string that includes different variants of terms related to SA, and titles of SATs that have been frequently used in previous studies (Ameen et al., 2015; Ali-Toudert et al., 2020; Sharifi et al., 2021). Using the string for the initial search in titles, abstracts, and keywords of articles indexed in Scopus and Google scholar returned 248 articles. Titles and abstracts of these articles were manually checked by the authors to exclude irrelevant papers that were not focused on SA. At the end of this screening process, 145 articles were selected to identify the present research progress and gaps. SATs are collected from grey literature, including government reports, websites, minutes of the meeting, policies and procedures, diaries and logbooks, newspapers, and magazines (Costley and Fulton, 2018; Mills and Birks, 2014). These are tools including, but not limited to, the Global Sustainability Assessment System (GSAS), Leadership in Energy and Environmental Design for Neighbourhood Development (LEED-ND), Sustainable Building Tool in Portugal ($SBTool^{PT}$), Pearl Community Rating System (PCRS), and Green Building Index (GBI) Assessment Criteria for Township. The complete search with existing widely-known SATs string is available in Table 1. Secondly, each co-author reviewed a group of SATs to extract the necessary data. Upon completion of this step, the lead author went through the collected data to categorise and code them based on commonalities. The selected tools were subjected to document analysis and comparison in terms of general characteristics, contents, and criteria. Thirdly, the categories in the filtered tools were divided into those four themes and clarified their utilised scales based on the bibliometric databases. The institutional categories were then selected for further analysis. Fourthly, the institutional indicators in these categories were determined based on their intentions, the limitations of the institutional dimension in the tools were identified, and then in the final step they were discussed from the perspective of territory.

4. Institutional dimension in existing sustainability assessment tools

Many scholars and institutions have developed many SATs to address the abovementioned problems. The sustainability assessment can be undertaken at various scales, from the city to the neighbourhood or building level (Woods et al., 2016). Each tool focuses on different indicators and different perspectives of sustainable requirements, but all of them share the common objective of evaluating sustainability and proposing actions to make sustainable societies (Lucchi and Buda, 2022; Reyes Nieto et al., 2015). Many SATs with multiple dimensions have been developed based on Spangenberg (2002) classification: environmental; economic; social; and institutional dimensions before being applied to multiple scales (see Table 2). Examples include the Comprehensive Assessment System for Built Environment Efficiency (CASBEE) from Japan, Leadership in Energy and Environmental Design (LEED) from the US, Building Research Establishment Environmental Assessment Method (BREEAM) from the UK, Building and Construction Authority (BCA) Green Mark from Singapore, and the Sustainable Building Tool ($SBTool^{PT}$) from Portugal.

As seen in that Table 1 and argued by Dawodu et al. (2020), there is no dearth of institutional indicators in the existing SATs. They not only integrated into the categories which mainly focus on the content of the

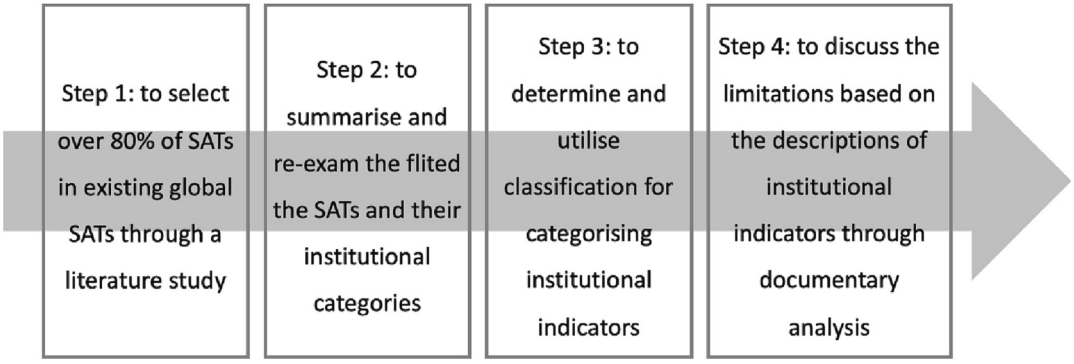

Fig. 2. Research design – source: authors' edition.

other three dimensions (e.g., minimum building energy performance in the *LEED for Building*), but exist in the independent institutional categories (e.g., governance, process quality, and management). We never went deeply into the details of embedded institutional indicators in this paper since the common limitations could be more obviously reflected in those in the independent categories. Furthermore, the descriptions for the indicators in the independent are multiple and comprehensive, involving multi-stakeholder participation in the whole project process, design procedure and review, construction plan, post-stage management, etc. (see Table 3). These indicators and their descriptions are hugely in accord with the content advocated by Spangenberg (2002) conceptual framework.

Although descriptions for the indicators are different, the tools cover the institutional arrangement in different project stages. For example, the PCRS focuses on the goals and strategies of the project and construction process, while the GSAS highlights the construction process and post-stage management. The professionalism of these indicators has been widely discussed by numerous scholars (Dawodu et al., 2017; Kaur and Garg, 2019; Sharifi et al., 2021). Commonly, they all put forward the importance of multi-stakeholder participation in the whole project process. Furthermore, the scope and content of the institutional dimension are generally optimised with the research and practice development of SATs.

Additionally, some similarities among those indicators are the negative points or limitations that they present. The need to consider the information of the specific region being evaluated is of vital importance in the assessment processes, since sustainability challenges are different from place to place. Most of the methodologies currently do not emphasize the local aspects, and they propose assessments systems in a general way, failing to take into account the aspects of the locality, adaptability and applicability (Kyrkou and Karthaus, 2011; Reyes Nieto et al., 2018). Additionally, an excellent indicator system for monitoring sustainability must reflect the specific institutional context in which it was generated and not only its technical process (Krank et al., 2013), while this does not occur in most of the existing sustainability assessment tools. By the above documentary analysis, we, therefore, award that the institutional indicators with spatial characteristics should be re-examined from the perspective of territory, which plays an essential role in political geography.

5. Discussing limitations: Balanced integrality and spatial embeddedness

As mentioned before, the institutional aspect plays an essential role in sustainable urban transitions. Nevertheless, their role in the sustainable development process is unclear, despite many institutional indicators developed in existing assessment tools. Additionally, although existing research on SATs does not lack coverage of the institutional dimension, there is no consistent and explicit mention of the institutional indicators and criteria for a special context in the literature. In other words, although these tools are widely adopted for assessing sustainability in a variety of contexts as well as covering holistic institutional factors, there are two major limitations in the present SATs from the perspective of territory: balanced integrality; and spatial embeddedness.

One limitation is the balanced integrality of institutional indicators. Although the institution was added to SA as a dimension as early as 2002, the focus is still on the environmental, social, and economic categories with a lack of attention and importance given to institutional aspects in the present tools. Most of the current practices related to sustainability have primarily analysed the generation and optimisation of energy, waste and water management, and public transportation (Kaur and Garg, 2019). Most of the assessment frameworks have focused on testing the technicalities of sustainability rather than addressing it in a holistic way. This has caused several SATs critics to suggest that they are being overly environmentally focused with little consideration for other dimensions of sustainability (Reyes Nieto et al., 2018; Dawodu et al., 2020). However, this does not mean that an institutional indicator is missing in SATs. Apart from essential institutional objectives, institutional components are allocated to social, economic, and environmental dimensions (Spangenberg, 2002). There are many institutionally mixed indicators in existing tools as this dimension should be linked with others, e.g., eco-institutional, socio-institutional, and econo-institutional (Sharifi and Murayama, 2012; Komeily and Srinivasan, 2015; Dawodu et al., 2020). As seen in Table 1, the institution is still less regarded as a single category or an objective in SATs. Furthermore, as one of the leading factors, institution plays a fundamental role during the process of urban development. For instance, power and politics have a very relevant impact on the decision-making process by enabling or constraining the stakeholders involved in the process (Cashmore and Richardson, 2013). The institution is widely acknowledged to shape and drive such a dynamic process. One example is that many national policies in China drive its urban development from resource-oriented high-speed to human-based high-quality development, as mentioned above. This type of institutional guidance sets a direction and goal for sustainable development, especially in centralised developing countries. Only contributions for other dimensions mentioned in the policies and regulations are implemented. In this light, the feature of territory, the power container to achieve social control, emerged in the institutional dimension (Taylor, 1994). As such, the institutional dimension should be firstly considered before defining other dimensions with more detailed explanations than the existing one.

The other limitation is the spatial embeddedness of existing SATs in terms of the institution. Currently, most of the assessment tools do not emphasize the local aspects. They propose assessment systems in a general way, failing to take into account the aspects of locality, adaptability and applicability (Kyrkou and Karthaus, 2011; Reyes Nieto et al., 2018). Indeed Moore (2008: 217) has argued that scalar practices "deserves greater attention: what people do with scale categories, how they utilize them to construct space and social relations for specific political

Table 1
Descriptions of the selected SATs.

Tool name	Developer	Origin	Release year	Last version
BCA Green Mark for Districts	Building and Construction Authority (BCA)	Singapore	2009	2013
BREEAM Communities	Building Research Establishment (BRE)	United Kingdom	2009	2012
BREEAM ES Urbanismo	El Instituto Tecnológico de Galicia (ITG)	Spain	2011	2020
CASBEE	JSBC&MLIT	Japan	2001	2015
DGNB New Urban Districts	German Sustainable Building Council (DGNB)	German	2011	2020
EarthCraft	The Greater Atlanta Home Builders Association and Southface Energy Institute	United States	2005	2015
EcoDistricts Toolkit	Portland Sustainability Institute (POSI)	United States	2010	2012
Green Star - Communities	Green Building Council Australia	Australia	2012	2016
Green Star - Buildings	Green Building Council Australia	Australia	2014	2017
LEED for Building	The United States Green Building Council (USGBC)	United States	2007	2019
LEED for Neighbourhood Development	The United States Green Building Council (USGBC)	United States	2007	2018
LEED for Cities and Communities	The United States Green Building Council (USGBC)	United States	2007	2021
Pearl Community Rating System (PCRS)	Abu Dhabi Urban Planning Council	Abu Dhabi	2010	2010
Global Sustainability Assessment System (GSAS)	Gulf Organisation for Research and Development (GORD)	Qatar	2007	2019
Sustainable Building Tool in Portugal ($SBTool^{PT}$)	Unversity of Minho and iiSBE-Portugal	Portugal	2013	2017
Sustainable Project Appraisal Routine (SPeAR)	ARUP	United Kingdom	2000	2017
Green Building Index (GBI) Assessment Criteria for Township	Pertubuhan Arkitek Malaysia (PAM) and the Association of Consulting Engineers Malaysia (ACEM)	Malaysia	2011	2017
Indian Green Building Council (IGBC) Green Townships	Confederation of Indian Industry (CII)	India	2010	2010
Green Rating for Integrated Habitat Assessments (GRIHA)	The Energy and Resources Institute (TERI)	India	2015	2017

aims". However, existing SATs pay scarce attention to the interactive and dynamic change with the stability factors such as the institution. According to Krank et al. (2013), a sound indicator system for assessing sustainability must reflect the specific institutional context in which it was generated and not only its technical process. Moreover, the spatial embeddedness of the institutional dimension is more sensitive than that of other dimensions. For example, system resources such as intellectual capital market and legitimacy have different spatial fluidity (Binz and Truffer, 2017), leading to different development paths in those cities and regions. The sites with different institutional elements are crucial in the

Table 2
The classification of categories and applied scales of the SATs.

Tool	Category	Applied Scale			
		C	D	N	B
BCA green mark for districts	Energy efficiency Water management Material and waste management Environmental planning Buildings and green transport Community and innovation		○		
BREEAM communities	Resource and energy Land use and ecology Social and economic wellbeing - Local economy Social and economic wellbeing - Social wellbeing Social and economic wellbeing - Environmental conditions Transport and movement Innovation Governance	○	○	○	
BREEAM ES urbanismo	Resource and energy Land use and ecology Social and economic wellbeing - Local economy Social and economic wellbeing - Social wellbeing Social and economic wellbeing - Environmental conditions Transport and movement Innovation Governance	○	○	○	○
CASBEE	Environmental aspect Environmental load Social aspect Economic aspect	○	○	○	○
DGNB new urban districts	Environmental quality Economic quality Sociocultural and functional quality Site quality (Building level only) Technical quality Process quality		○		○
EarthCraft	Construction waste management Durability and moisture management Indoor air quality High performance building envelope Energy efficient systems Water efficiency Resource efficiency Site planning Education and operations Innovation		○	○	○
EcoDistricts toolkit	Energy Water Habitat + Ecosystem function Materials management Equitable development Health + Well being Community identity Access + Mobility		○	○	
Green Star - communities	Environment Economic prosperity Liveability Innovation Governance		○	○	
Green Star - buildings	Indoor environment quality (IEQ) Energy Water				○

(continued on next page)

Table 2 (*continued*)

Tool	Category	Applied Scale			
		C	D	N	B
LEED for building	Land use and ecology Emissions Materials Transport Innovation Management Water efficiency (WE) Energy and atmosphere (EA) Indoor environment quality (EQ) Materials and resources (MR) Location and transportation (LT) Sustainable sites (SS) Innovation (IN) Regional priority (RP)				○
LEED for neighbourhood development	Green infrastructure and building (GIB) Green infrastructure and building (GIB) - WE Green infrastructure and building (GIB) - EA Green infrastructure and building (GIB) - SS Smart location and linkage (SLL) Smart location and linkage (SLL) - LT Neighbourhood pattern and design (NPD) Neighbourhood pattern and design (NPD) - LT Innovation (IN) Regional priority (RP)			○	
LEED for cities and communities	Ecology and natural systems (EN) Water (WE) Energy and greenhouse gas emissions (EN) Materials and resources (MR) Transportation and land use (TR) Quality of life (QL) Innovation (IN) Regional priority (RP) Integrative process (IP)	○	○		
Pearl community rating system (PCRS)	Natural systems Precious water Resourceful energy Stewarding materials Livable communities Innovative practice Integrated development process	○	○		
Global sustainability assessment system (GSAS) for districts	Site Energy Water Waste management Indoor & outdoor environment Materials Cultural & economic value - economy Urban connectivity Cultural & economic value - cultural Management & operations		○	○	
Sustainable building tool in Portugal ($SBTool^{PT}$)	Environment Economy Society Extra		○	○	○
Sustainable project appraisal routine (SPeAR)	Environmental Economic Social		○	○	○

Table 2 (*continued*)

Tool	Category	Applied Scale			
		C	D	N	B
Green building index (GBI) assessment criteria for township	Climate, energy, water (CEW) Environment & ecology (EEC) Buildings & resources (BDR) Business & innovation (BSI) Transportation & connectivity (TRC) Community planning & development (CPD)		○	○	
Indian green building council (IGBC) green townships	Site selection & planning Infrastructure resource management Land use planning Transportation planning Innovation in design & technology	○	○	○	
Green rating for integrated habitat assessments (GRIHA)	Site parameters - microclimatic impact Energy Water Human health & comfort Maintenance & housekeeping Site parameters - accessibility to basic services Social aspects Bonus points		○	○	

certification process because sustainability challenges are different from place to place (Kyrkou and Karthaus, 2011; Reyes Nieto et al., 2015). These different governance contexts affect the dispersion of power, which can either support or impede the progress of local sustainability, promoting either power-sharing or power concentration (Ehnerta et al., 2018). The regulated-bounded space (e.g., countries) exerts influence or control sustainability by controlling their geographic space (Painter, 2010; Sack, 1986). In terms of the methods for constructing the SATs, the prior studies mainly selected indicators and categories by picking up and summarising from the existing ones (Lucchi and Buda, 2022; Moroke et al., 2019; Reyes Nieto et al., 2018). Unlike the other dimensions, which may commonly appear in different scales and spaces, the institutional dimension should lay the roots in the specific territory. As such, SATs should consider the local political contexts.

Based on the above limitations, we suggested the leading and guiding position of the institutional dimension in the SATs should be addressed. The implementation approaches are multiple. More indicators, for instance, can be established in the independent institutional categories. The governance and management indicators can be covered in the whole project process, like the multi-stakeholder participation. Also, although embedded in the environmental, economic, and social indicators, some institutional descriptions are incidental rather than preconcerted. We thereby suggest that the preferential consideration for institutional dimension and the appropriate increase of its specific gravity can be considered in future optimisation and development of the SATs. Additionally, instead of emphasizing the comprehensiveness of institutional content by collecting its indicators from existing SATs, we argue that compatibility is more important due to its spatial embeddedness. Some sociological approaches, like the grounded theory, can be considered and introduced to form institutional indicators based on specific institutional arrangements (such as regimes, polities, policies, and regulations).

6. Conclusions

Sustainability assessment is an effective approach to clarify and address sustainable urban transitions. Scholars and institutions have developed many sustainability assessment tools to evaluate and quantify

Table 3
the indicators of institutional dimension and their intents in the SATs.

Tool	Category of institutional dimension	Indicator	Intent
BREEAM communities/ BREEAM ES urbanismo	Governance	Consultation plan	To ensure the needs, ideas and knowledge of the community are used to improve the quality and acceptability of the development throughout the design and construction process.
		Consultation and engagement	
		Design review	To ensure that the master plan's design supports a vibrant, healthy, functional and inclusive development.
		Community management of facilities	To support communities in active involvement in developing, managing and/or owning selected facilities.
		Comprehensive project brief	To ensure that the quality of the building is as high as possible employing an optimised, transparent planning process and defining the relevant general conditions early on (during "Phase 0" or the pre-planning phase).
		Sustainability aspects in the tender phase	To integrate sustainability aspects early on, right from the tender phase, to ensure that all decisions take an integrated holistic approach.
DGNB new urban districts	Process quality	Documentation for sustainable management	To ideally operate the building as soon as it is complete, and to ensure that the building's planned performance is attained in reality, with as little deviation as possible from the plans. To achieve this, all the relevant information must be provided to the owner, tenant and facility manager in a clear and organised format.
		Urban planning and design procedure	To improve the design quality of our built environment.
		Construction site/ construction process	To minimise negative impacts on the local environment during the construction phase.
		Quality assurance of the construction	To ensure that the requirements concerning sustainability aspects from the planning stage are appropriately implemented through informative quality assurance processes during the construction phase and, based on this, provide documentation that these requirements have been fulfilled.
		Systematic commissioning	To promptly hand over the completed building and ensure its systematic operation where all features/attributes work as initially designed.
		User communication	To actively inform the building's users with regaaboutding's sustainability to them to contribute to the building's sustainability and, in particular, motivate them to act in a way that ultimately contributes to their well-being.
		FM-compliant planning	To adequately take into account the requirements of facility management (FM) for later building operation, as early as in the planning phase.
Green Star - communities	Governance	Accredited professional Design review Engagement Adaptation and resilience Corporate responsibility Sustainability awareness Community participation and governance Environmental management	To encourage and recognise developers and projects that demonstrate leadership within the sector, by establishing and maintaining strong governance practices. The category promotes engagement, transparency, as well as community and industry capacity building. It also seeks to ensure that community projects are resilient to a changing climate.
Green Star - buildings	Management	Accredited professional Commissioning and tuning Adaptation and resilience Building information Commitment to performance Metering and monitoring	To encourage and reward the adoption of practices and processes that support best practice sustainability outcomes throughout the different phases of a project's design, construction and ongoing operation.

(*continued on next page*)

Table 3 (*continued*)

Tool	Category of institutional dimension	Indicator	Intent
		Responsible construction practices	
		Operational waste	
LEED for building/ neighbourhood development/ cities and communities	Regional priority (RP)		To provide an incentive for the achievement of credits that address geographically specific environmental, social equity, and public health priorities.
	Integrative process (IP)		To support high-performance, cost-effective, equitable project outcomes through an early analysis of the interrelationships among systems.
Pearl community rating system (PCRS)	Integrated development process	Integrated development strategy	To ensure new development adopts an Integrated Development Process (IDP) as a way of attaining greater synergy between project systems resulting in high-performance communities.
		Sustainable building guidelines	To ensure that the design and construction of buildings will contribute to the overall community's sustainability objectives and targets.
		Community-dedicated infrastructure basic commissioning	To ensure that the infrastructure systems perform as designed, thereby protecting occupant health and providing ongoing efficiency.
		Life cycle costing	To enable effective long-term decisions about infrastructure design and construction to maximize efficiency over the whole life of the development.
		Guest worker accommodation	To promote fair labour practices in construction.
		Construction environmental management	To reduce the environmental impacts associated with construction practices.
		Sustainability awareness	To promote the efficient ongoing operation of the community by enabling site residents, workers and visitors to appreciate, understand and therefore contribute to responsible resource use in the community.
Global sustainability assessment system (GSAS)	Management & operations	Construction plan Management plan Wastewater management plan Organic waste management plan Solid waste management plan	To define the building's management and operations plan.
Green rating for integrated habitat assessments (GRIHA	Bonus points		To promote the adoption and implementation of innovative strategies in improving the sustainability of the project.

the level of its process, which is a useful way for creating and monitoring sustainable development. Four dimensions have been widely categorised into the main dimensions of the tools in the existing studies. Among them, the institutional dimension reflects the understanding of different stakeholders in sustainability. This research has analysed the limitations of the institutional dimension. By reviewing nineteen existing SATs from the perspective of territory, the main shortcomings of these are the lack of balanced integrality and the spatial embeddedness of institutional indicators. We argue that the institutional dimension should be firstly considered before defining other dimensions with more detailed explanations than the existing ones, as well as should lay the roots in the specific institutional arrangements. Hence, we suggest that the preferential consideration for institutional dimension and the appropriate increase of its specific gravity can be considered in future optimisation and development of the SATs. Some sociological approaches like the grounded theory can be considered and introduced to form the institutional indicators based on the specific institutional arrangements.

This paper attempts to apply the perspective from political geography to urban sustainability and sustainable development research. Based on the perspective of territory, we summarised two common limitations by reviewing and analysing the existing SATs. Addressing these shortcomings can improve the understanding of the institutional dimension of sustainability, and other indicators would lose their functionality and effectiveness if the institutional dimension was not present. This study can help improve the existing tools or the development of new tools to reflect more holistic understandings of institutional sustainability.

Although re-examining the existing SATs from the perspective of territory can enrich the application scenarios of geopolitics, the consideration of the analytical framework of political geography needs to be comprehensive. Therefore, it is important that future research directions apply more geographical concepts to the verification and improvement of SATs and make a more detailed analysis of specific institutional indicators.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. Ali Cheshmehzangi would like to thank the Ministry of Education, Culture, Sports, Science, and Technology (MEXT), Japan, and Hiroshima University, Japan. He also acknowledges the National Natural Science Foundation of China (NSFC) for funding project 71950410760.

Data availability

No data was used for the research described in the article.

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