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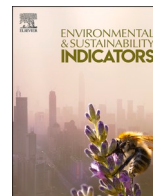
Are small municipalities prepared to use SIs? The case of Thailand

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A B S T R A C T

Sustainability indicators are among the tools used to help towns and cities inform and evaluate their sustainable development strategies. Research into sustainability indicators has mostly targeted large cities and developed countries. Little is known of the role of sustainability indicators in pursuing sustainability by smaller towns, notably in developing countries. Nevertheless, small towns are home to a majority of the population in most developing countries. Their governments, in the meantime, are typically highly constrained when it comes to available staff and resources, also when it comes to using sustainability indicators. This study into seven Thai municipalities investigates how the Thailand Sustainable Cities Indicators' (TSCI) is prioritized, used, and translated into local impact. While explicitly connecting to the TSCI, the investigation ends with some key considerations upon its use, coping strategies, and how improvement may be pursued. The results show that the TSCI is making an impact, albeit not necessarily as structured or clear as the UN might have envisioned. The study illustrates empirical evidence of problems and limitations small municipalities are facing and reveals the creative efforts of small municipalities in coping with such issues. Small municipalities are found to be limited in terms of instrumental uses, while a much more nuanced picture emerges when it comes to conceptual use. Furthermore, some general clues to improve how it might be used locally are also suggested.

1. Introduction

In 2003, the Thailand Environment Institute (TEI) developed the so-called 'Thailand Sustainable Cities Indicators' (TSCI). The TSCI targets the assessment of sustainable development of cities nationwide to promote healthy and sustainable cities, the spread of best practices and improve networking between municipalities. While not obligatory, the TSCI is relatively popular among Thai Municipalities with participating municipalities growing from 24 in 2004 to over 240 in 2016 (Thai urban and rural development foundation, 2016) making the TSCI the most used indicator-set supporting the local pursuit of sustainable development in Thailand.

This paper reports on an investigation into using the TSCI in seven Thai municipalities. A starting point for our investigation is that using the TSCI takes place in a challenging economic and institutional context. Thailand is home to mostly small-sized municipalities, with only 11 out of almost 2400 municipalities having over 100,000 inhabitants. Thai municipalities, therefore, have a relatively limited capacity for financial management, planning and service delivery, constraining policy development and implementation (Chuangchit, 2015). Furthermore,

Thailand was traditionally characterized by a highly centralized governance system granting limited local autonomy (Weist, 2001). It is only since the National Decentralization Act of 1999 that local governments are encouraged to become a self-governing dependency (Sudhipongpracha, 2014). Finally, Thailand is a developing country, which might further present challenges for local governing towards sustainable development, notably due to limited (financial) resources and the need to prioritize basic livelihood provision. Considering how the context in which – especially smaller – Thai municipalities have to operate our investigation means to identify how the TSCI is prioritized, used, and translated into impact in seven Thai municipalities. In doing so, our aim is to identify potential challenges and problems and, to see how these are dealt with locally. The core focus is not on evaluating progress towards sustainable development through the use of the TSCI, but instead, on how the TSCI has been used.

While our investigation is shaped by previous studies on the use of sustainability indicators (SIs) at a local level, it also departs from them. Research into SIs has tended to focus on promoting the efficient application of SIs, often emphasizing big cities or cities in developed countries (Cassar et al., 2013). They also show some key challenges in using

SIs to push forward sustainable development in local governance (Moldan and Dahl, 2007) (Verma and Raghubanshi, 2018). Nevertheless, limited attention has been paid to developing countries and even less to small towns and municipalities (Krank and Wallbaum, 2011). Although small towns in developing countries could learn important lessons from research on big cities in developed countries, their institutional, economic, and political contexts can be very different (Dall'O et al., 2017). Institutionally, small municipalities could face additional challenges to allocate finances, purchasing software to store and analyze data or attracting expertise to work with SIs (Krank et al., 2010). Limited economies of scale can also imply that smaller administrations rely on more ad hoc, informal, and more personal relationships in their governance process. While this might negatively affect the formal embedding of SIs in processes of policymaking and implementation, it might also create scope for novel and creative practices, like civic involvement, open and cross-sectoral communication, and tailor-made practices. Economically and politically, developing countries face challenges to meet basic standards of living that could erode prioritizing environmental and ecological ambitions (Ameen and Mourshed, 2019). The circumstances faced by small municipalities in developing countries urge to also study the use of SIs in such municipalities. Hence, while our investigation is specifically targeted at how the TSCI is prioritized, used, and translated into local impact in seven Thai municipalities, it is also a response to the relative lack of attention to the use of SIs in small municipalities in developing countries.

We begin in section two with a discussion of existing literature on using SIs on a local level to develop an analytical framework to be applied in our empirical work. Apart from operationalizing SIs and the role they can play in pushing forward sustainable development locally, we specifically target key factors that support or constrain the use and impact of SIs in a local setting. While these factors apply generally, we will also address how they can be interpreted and approached when applying them to small municipalities in developing countries. Section three presents our methodology, including a description of the TSCI, the administrative and governance system of Thailand, arguments for case selection, and means of data collection and analysis. In section four we present our results. Our conclusions and discussions will reflect on the use of the TSCI in the municipalities studied. There, we will discuss that despite some positive developments, the use of the TSCI needs further improvement if it is to truly support the pursuit of sustainable development. Key lessons are presented that could help enable the chances of success and that can inform further research on the use of SIs in small municipalities in developing countries.

2. The use of SIs in small municipalities

SIs were first promoted extensively following the 1992 United Nations conference in Rio de Janeiro, stating that "indicators of sustainable development need to be developed to provide solid bases of decision making at all levels and to contribute to self-regulating sustainability of integrated environmental and development systems" (United Nations, 1992) (section 40.4). An indicator refers to a policy-relevant variable that is specified and defined to be measurable over time and/or space (Astleithner et al., 2004) and captures a particular aspect of sustainability policy in an easily communicated form. Indicators also allow for monitoring and the subsequent 'steering' of policy, whether by internal management or external political pressure (Rydin et al., 2003). As such, SIs mean to collect and combine information about a range of variables to qualify the status and trends from a local to a global level regarding three main pillars of sustainable development: social welfare ('people'), economic development ('profit'), the state of the environment ('planet') (Dahl, 2012), (Holman, 2009). While clear in a more general sense, unpacking what SIs are and mean to achieve in detail is less evident. Unpacking is constrained by doubts about the exact meaning of sustainable development (Jordan et al., 2000) and thus, what should be measured. Also, and particularly relevant to our study, SIs can play

different roles in supporting local governance (Hezri and Hasan, 2004), (Gudmundsson and Sorensen, 2011), which has implications for which variables ought to be considered.

2.1. Roles of SIs

Providing information in support of governments and communities to pursue sustainable development can be done in different ways. To begin with, performance indicators specifically target how well a project, program, organization, or jurisdiction performs on a range of variables; e.g. CO_2 emissions, recycling, jobs generated (Bell and Morse, 2001), (Lehtonen et al., 2016). Performance indicators typically provide a more general overview but do not necessarily explain why performance does (not) occur (Holden, 2009). Other indicators mean to help evaluate policy implementation; i.e. assess if policies reach their goals, which impacts they generate, and possibly, how effective and efficient they are (Hezri, 2004), (Tanguay et al., 2010). While this can be important input for altering policies, relying on indicators may underestimate the complexities of how policies generate change (Hezri and Dovers, 2006). Rather, there is also scope to include other indicators, that for example target the capacity of communities or organizations to pursue sustainability (Holden, 2009), (Evans et al., 2005), (Moreno Pires et al., 2014). Central to such indicators is to support capacity building, participation, and engagement to promote community empowerment, education, and awareness (Holman, 2009), (Gahin et al., 2003). Implicit in each of these types of indicators is a different conceptualization of how SIs can provide input to the complex process of governing for sustainable development. That is: SIs can play a variety of roles that each present communities and governments with different challenges and requirements to use them.

While several categorizations exist to differentiate between these roles, we follow the often used categorization of Hezri (2004). Hezri identifies five different ways in which SIs are used: instrumental use (use for action), conceptual use (use for enlightenment), tactical use, symbolic use, and political use (We exclude the tactical, symbolic, and political uses, as these are all intended to justify what is already planned or decided and can be labeled as legitimizing uses) (Sébastien et al., 2014) (Rosenström, 2009). Alternatively, instrumental and conceptual uses directly refer to using indicators to pursue sustainability by helping us understand problems, envision policies and interventions, and learn about what does or does not work (Weiss et al., 2005) (see Table 1).

Instrumental uses dominated when SIs were first promoted during the 1990s. Instrumental use refers to the direct use of information as an input to formulate policies, support decision-making, and evaluate policies (Moreno Pires and Fidélis, 2015), (Lyytimäki et al., 2013). Indicators now mean to provide empirical evidence for policymaking through identifying trends, changes and by monitoring policy implementation. Typically, such uses require that indicators are

Table 1
The uses and purposes of indicators.

Use	Purpose
Instrumental	improve policy development and delivery by providing information to improve decision-making and thereby increasing the likelihood that desired policy outcomes could be achieved
Conceptual	gradually influence the awareness and consciousness of local people and groups by co-constructing visions and evaluating pathways towards desired societal change and by enhancing learning and an awareness of sustainability issues
Tactical	information gathering and information processes are used as a delaying strategy, or as a justification for non-action when confronted with emerging problems
Symbolic	giving ritualistic assurances that those who make the decisions hold appropriate attitudes towards decision-making
Political	justify predetermined positions and persuade various actors about the qualities of policy plans that are already well on their way toward implementation

policy-relevant, considered sensible and representative (Lyytimäki et al., 2011), (Bell et al., 2011). Typically, as Lehtonen et al. (2016) explain, relying on an instrumental use urges for relative strong institutionalized practices, such as assigning use and development of indicators to a specific organizational unit, creating accountability mechanisms and access to high-quality and uncontested data and related, stable funding (Holman, 2009). That is accepted as valid.

Relying on an instrumental use challenges small municipalities in developing countries due to a lack of resources and administrative capacities. In addition, critiques exist on the rationalist accounts of planning and policymaking an instrumental use of SIs resonates with, notably in assuming a causal link is between information, decision-making, and policy impact (Hezri and Hasan, 2004), (Krank et al., 2013). Direct causality between policies and impacts is itself often already difficult to identify and problems, envisaged policy objectives and solution strategies are furthermore viewed differently by different stakeholders (Holden, 2009), (Koop et al., 2017). Instead, how problems and their solutions are viewed tends to depend on processes of communication, negotiation, and sense-making (Dlouhá et al., 2013a). This is especially true when indicators are used in settings where various policy sectors, stakeholders, and laypeople, all with different backgrounds and understandings, come together (Lehtonen et al., 2016). Relying on SIs from the perspective of their instrumental use assumes that indicators provide valid information about the current status of the town or city, which, when combined with assumptions about causes and effects, can directly suggest which interventions are best to pursue (see Table 2). While this may be possible to a degree, indicators are also used in problem-framing processes where they are combined with alternative world views and values and are part of a wider process of social or collaborative learning (Bauler, 2012). In response, there is also a need to focus on what Hezri calls a conceptual use of SIs.

Table 2

Meanings, governance embedding, and envisioned impacts of instrumental and conceptual uses.

Types of use	Meaning	Governance embedding	Impacts
Instrumental use	Indicators provide information to improve decision-making and thereby increase the likelihood that desired policy outcomes could be achieved	· A process of institutionalizing in which the use and development of indicators is a task assigned to distinct units · Sensible, representative and, useful indicators · Coordinated use of indicators in the organization	· Changed policies · Changing Routines and procedures · Accountability for policy implementation
Conceptual use	Indicators influence the awareness and consciousness of local governments and local people and groups by co-constructing visions and evaluating pathways towards desired societal change and by enhancing learning and an awareness of sustainability issues	· Citizen-powered data that allow municipalities and local communities to interpret data · Indicators are part of departmental and societal interactions (direct interaction or through other media) · Indicators used in sustainability-oriented projects and initiatives as a platform for learning to take place · Platforms for sharing and (open) discussion that allows networks of actors to meet, discuss and reflect	· Accommodate (social) learning: - Growing the community of inquirers - Building up of social knowledge · Changing behavior · Public accountability · Connect local governments and communities (trust)

With the conceptual use of indicators, the idea is first that performance or policy implementation indicators *indirectly* affect decision-making; influence relies on learning or cognitive processing of both decision-makers and local people (Weiss et al., 2005). Indicators assist in changing the understanding of problem situations, which subsequently influences decision-making and societal awareness (Hezri, 2004), (Lyytimäki et al., 2013). This type of indirect influence is what Weiss et al. (2005) characterize as 'enlightenment'. It should not be conflated with having a 'less' impact than when considering an instrumental use. The impact is merely generated according to a different process, where learning and gradual changes in perception may still allow for indicators to exert serious influence (Rinne et al., 2012).

As the influence of SIs might seem difficult to document precisely when relying on a conceptual use (Moreno Pires and Fidélis, 2015), we may instead shift perspective to including and prioritizing different variables in an indicator set. Notably, variables related to community mobilization, behavioral changes, altered formal and informal practices within and outside of public administration, or even changes in public discourses as is visible in media or civic initiatives become relevant. These are well-measurable, can fit in well with more informal processes that resource-poor organizations such as small municipalities in developing countries may need to rely on, while they might also be very appropriate to help identify and shape how sustainability is and can be pursued. Hence, investigating how indicators create impact now requires an open view on the processes of learning and acting that these indicators fostered; i.e. relying on a conceptual use implies a style of working with its own set of requirements.

For one, such a style of working means indicator systems needs to explicitly address the local politicized nature of sustainability recognizing the different cultures and value systems. In doing so, SIs also pin to the actions they are fit to produce and are meant to assist in building and bolstering civic communities that can engage in long-term thinking (Holden, 2009). Hence, indicators systems must be streamlined with local governance procedures and processes, while their uses also mean to engage communities. For nationally-derived indicators such as the TSCI to 'make sense' in diverse contexts and be workable for small municipalities, they need to be interpreted and applied in ways reflecting the local public interest of cities and citizens (Moreno Pires et al., 2017). While local governments themselves should be involved in translating national indicators into data that is locally relevant, citizen-powered data may also be useful where indicators not only provide data but also boost citizen empowerment and institutional relationships between governments and local communities (Moreno Pires et al., 2017), (Lyytimäki et al., 2014) (see Table 2).[1] Especially in resource-poor contexts, these may be crucial impacts of indicator use to help pursue sustainability.

A conceptual use relies on learning processes as the cornerstone of how governments and communities pursue sustainable development, where indicator sets are an assessment and information tool enabling learning (Salvaris, 2000). The definition of learning can be related to 'social learning', implying that a change in understanding goes beyond the individual and spreads to communities through social interactions, either through direct interaction, e.g., conversation, or through other

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[1] This is also is motivated by the Community Indicators Movement, where community indicator projects have been defined as "tool[s] which give regular people the ability to know, based upon information that tries to be objective, whether the things that matter most to them are getting better or worse" (Moreno Pires et al., 2017).

media, e.g., mass media, telephone, or Web applications (Reed et al., 2010). The process of learning is related to 'situational learning'[2], which is the process of influencing individuals, institutions, and communities of practice to explore actual sustainability-oriented projects and initiatives (Rinne et al., 2013). It is a collective process of innovation, communication, and common understanding that thrives on a community of inquirers to continuously test new knowledge and help reduce uncertainty (Holden, 2008). Platforms such as conferences, seminars, workshops, competitions, and campaigns, which involve both policy actors and local stakeholder groups, can help accelerate actions, develop trust and increase local capacity to act collectively (Scott and Bell, 2013). Furthermore, for indicators to result in actual learning, sustainability-oriented projects and initiatives are needed for key stakeholders to meet, discuss and reflect (Dlouhá et al., 2013b). In other words, it is essential to have 'networks' of actors in which discussions take place and where there is an open atmosphere that allows for local learning (see Table 2).

2.2. Requirements unpacked

Past studies on the use of SIs show various factors that shape how SIs are used locally, both regarding instrumental and conceptual uses (see Table 2). Here we discuss some of the prime factors, also considering how we might interpret such factors in the context of small municipalities in developing counties. Combined, it is to result in an analytical

Table 3
Key factors influencing the use of SIs in local units.

Factor	What to look for in practice?
Access to data and resources	- Financial and human resources - Data storage and management systems - Datasets for measuring sustainability - Software and hardware - Procedures for data collection and analysis - Public involvement and collaboration - Creative (informal) data sharing and collection practices
Accountability mechanisms	- Long-term accountability mechanisms (and use of SIs in them) - Interest in monitoring long-term progress - Long-term policy and initiatives (and influence of SIs for them) - Public accountability - Informal processes of accountability (and role of SIs in them)
Cross-sectoral working	- Disseminate data within/between departments/across different institutions - Open and transparent data sharing systems - Informal practices (ad hoc or structural)
Disseminating and communication platforms	- Sharing and learning platforms - The inclusion of community action to implement policies, share and collect data - Role of media
Acceptance and understanding	- Indicators that are relevant to policy - An ability to interpret and analyze data - Indicators that are understandable and match the user's ideology/interests/prior information - An authentic dialogue between governmental levels, policy sectors, and stakeholders - Indicators are not used or misinterpreted

framework as presented in Table 3.

The first key factor is *access to data and resources* (Rydin, 2007), (Holden, 2006). As Hezri (2004) notes, such access cannot be taken for granted. Rather, he describes the limitation of budgetary and human resource capacity, effective technology transfer, and data storage systems as 'technical' issues. Access to stable funding can play a major role in supporting local capacity in terms of having an effective database and hiring experts who can manage and use the dataset. Having 'good' indicators that are presented at the right time with up-to-date data is additionally important (Mickwitz and Melanen, 2009). Municipalities often struggle to manage data collection as it is expensive and at risk of producing biased and incomplete indicator sets for measuring sustainability (Bauler, 2012). As a result, indicators may be defective and have little chance of being used (Rosenström and Phil, 2006). Municipalities may also perceive SIs as monitoring instruments with technical specificities that should be dealt with, or are better dealt with, by experts (Rinne et al., 2012). Therefore, when faced with a lack of technical experts, municipalities may no longer be interested in internalizing routines and procedures for data collection and analysis. While this is true of any jurisdiction, developing countries and small municipalities may struggle even more. When aiming for a conceptual use, access to data and resources also should consider public involvement. This requires that local communities have easy access and are involved in the processes of interpreting indicators (Moreno Pires et al., 2017). Local communities can also be actively involved in data collection and sharing [Moreno Pires et al., 2017]. There are several ideas of self-organized tools for data collecting and sharing platforms, i.e. via surveys, federal sources (that is available in easy-to-use charts, graphs, and maps), street monitoring by mobile phone carrying citizens, data sharing via public computing outlets (kiosks, digital dashboards), real-time analytics labs, intelligent operations centers, and city dashboards, with dynamic multimedia visualization formats (Moreno Pires et al., 2017).

A second key factor is the embedding of *accountability mechanisms* (Gudmundsson, 2003) in local governance to help use in policy (re) formulation. Accountability mechanisms are designed to ensure that information is taken into account in the relevant policy processes (Gudmundsson, 2003). Accountability may be constrained as municipalities tend to be uninterested in monitoring progress (Cassar et al., 2013), mainly due to prioritizing short-term policy and initiatives over long-term information-gathering efforts that are more 'research-oriented' (Hezri, 2004). This may be aggravated in developing countries, fuelled by urgent challenges regarding local livelihoods. While seemingly linked mostly to an instrumental use, *public* accountability also fits well with a conceptual use and allows civic processes of pursuing sustainability (Dlouhá et al., 2013b). Public accountability resonates with the process of social learning, which includes building shared understandings, collaboration, and community-building, increasing the competency of individual actors and instigating behavioral change (Dlouhá et al., 2013b). Social learning, then, becomes a context in which accountably occurs due to ongoing feedback between policy and society. A pre-condition for such public accountability is to provide platforms for social interactions (see below) (Moreno Pires et al., 2017). A key consideration is how to maintain and bring continuity to these platforms, projects, and initiatives or to (also) rely on informal strategies where developments and data are embedded in conversations with community members, politicians, and other stakeholders.

A third factor is the *role of cross-sectoral working* (Eckerberg and Mineur, 2003), between sectors, departments, and employees within administrations. Working within distinct departments with their policy priorities can undermine the willingness to disseminate data within and between departments, making sector coordination inside municipalities cumbersome (Krank et al., 2010). The coordination and exchange of information across different institutions are also relevant here (Cassar et al., 2013). Existing routines and cultures of evaluation may also play a role (Rinne et al., 2012). Using SIs is more impactful if the information is openly shared, discussed, and used to reflect on each other's sectoral

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[2] Situated learning is a learning theory developed in the late 1980s, which assumes that knowledge should be presented in an authentic context involving its application. Learning should be viewed as a social process within certain conditions, which include activity, context and culture (Rinne et al., 2013). Situated Learning defines learning as a situated activity within the process of "learning while doing." (Sierhuis and Clancey, 1997).

policies, choices, and ambitions. In addition, such sharing can boost learning processes and a wider process of awareness-raising upon the status, development, and process towards sustainable development. While transparent data systems and regular meetings encourage communicating and sharing of information in support of cross-sectoral working, cultural tendencies to 'stick to your own priorities' can undermine coherent processes of monitoring and evaluation. Small municipalities may derive some benefits from using more informal practices to communicate, but this can also risk a reliance on ad hoc processes of cross-sectoral working that do not allow for structural routines and communication.

A fourth factor is the availability and use of *disseminating and communication platforms* (Sébastien et al., 2014), (Rinne et al., 2012). Societal communication supports good governance and encourages public discourse and participation, the mutual understanding of issues, and general democratization of planning and policy processes (Hezri, 2004). Notably, if we view SIs from a conceptual use perspective, an infrastructure of communication including conferences, seminars, workshops, competitions and campaigns, urban labs, hackathons, community mapping initiatives, citizen forums, and other online platforms can all be important tools. Communication means to boost public awareness about sustainability and support processes of learning and open up opportunities for local citizens to perceive information, share ideas and discuss. While learning platforms can be important for any jurisdiction, they may be even more helpful in developing countries. Limited government resources can be an argument to encourage communities to become more self-organizing, including reliance on local citizens for the implementation of policies and projects (Salvaris, 2000). Communication infrastructures can encourage public participation, create mutual understanding and increase the willingness of local community actions at the same time. Hence, they may be crucial tools to empower citizens and raise community involvement in developing and monitoring a development process for the city. While doing so, communication infrastructure might strengthen institutional relationships and build trust between local governments and communities; foster dialogue between governmental levels, policy sectors, and stakeholders; and usher in new local institutional arrangements and communication.

Finally, *acceptance and understanding* of SIs is also a key factor that will influence the likelihood that they are used (Astleithner and Hamedinger, 2003). Bell and Morse (2001), while staying relatively close to an instrumental perspective, suggest that indicators have little chance of being used if they are not relevant to policy. This is especially a risk when the data collected involves highly specific data in large quantities that need to be analyzed and interpreted before anything meaningful can be said about the outcomes and effectiveness of programs (Bell and Morse, 2001). This requires expertise, which is not necessarily readily available. Apart from government administrators, politicians and key stakeholders should be able to use and work with the indicators. However, they may have very different backgrounds, from engineers to farmers, and may have limited prior knowledge of issues (Sébastien et al., 2014). They are less likely to use indicators if the information does not match their ideology and interests or match their prior information (Mickwitz and Melanen, 2009). Analyzing, interpreting, and translating what the indicators tell us into meaningful information is therefore crucial. It requires expertise which, especially in small municipalities and developing countries, can be precisely what is missing (see Table 3).

3. Methodology

3.1. About the TSCI

Sustainable development has been included in the Thai National Economic and Social Development Plans since 1992. Currently, the UN Sustainable Development Goals (SDGs) are integrated into the 20-Year National Strategy (i.e. Thailand's main development framework) and its overarching Sufficient Economy Philosophy. The National Committee for Sustainable Development is leading in implementation, for example, based on interdepartmental, inter-agency, and public-private collaboration. Sustainable development has long remained mostly a national affair but since 1999 voluntary attempts to promote local-level initiatives do exist such as Local Agenda 21 initiatives, the Low-Carbon Municipality program, and the Thailand Sustainable City Indicators (TSCI). Since 2017 specific committees exist to boost the local implementation of SDGs and promote building the capacity of local communities.

The TSCI is operated by three collaborating institutions: the Department of Environmental Quality Promotion (DEQP), the National Municipal League of Thailand (NMLT), and the Thailand Environment Institute (TEI). The TSCI means to assist municipalities in pursuing sustainable development by 1) integrating sustainable development knowledge into local policy processes, 2) supporting coordinated actions between different departments, 3) increasing skills of local municipal staff through information-based decision-making, 4) evaluating and benchmarking municipal performance, 5) developing data collection and storing systems for supporting local development plans, and 6) creating a network of sharing and mutual learning between various local stakeholders (Department of Local Administration, 2005). The TSCI provides 34 indicators that focus on four different themes, each of which relates to the people, planet, and profit dimensions of sustainable development: liveability, well-being, environmental sustainability, and good governance (see Appendix 1). Between 2004 and 2020, the number of participants in the TSCI program has also been increasing (see Appendix 2).

3.2. Thailand's local administration

Thailand for a long time remained a highly centralized country (Chardchawarn, 2010), with a partial transfer of power, responsibilities, and budgets to local authorities starting in 1999 (ThaiLaws.com and Determining, 2017), (Krueathep, 2014). As a consequence, Local Administrative Organizations (LAO) need to cope with over 150 tasks ranging from public infrastructure investments to order and security and the conservation and management of natural resources and the environment. Most of the LAOs are small; of the 7850 LAOs, over 3000 have fewer than 5000 inhabitants, and only 11 out of 2400 official municipalities have over 100,000 inhabitants. As a result, most LAOs are considered too small to effectively function due to a lack of financial resources (World Bank Group and "Centra, 2012), human resources and access to technical capacity to take responsibility for important issues (Chardchawarn, 2010). While LOAs are assigned to do the tasks, the implementation of SD and TSCI are originated from the Ministry of Natural Resources and Environment and to apply them requires cooperative structure and cross-sectoral working. In addition, there are no less than five types of LAOs in 76s provinces, next to two specific urban administrations (see Fig. 1). The result is a fragmented set or administrative structures with distinct historic development paths and thus, differing administrative cultures and capacities.

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[3] The Provincial Administrative Organizations (PAOs) constitute the higher tier of local government. The urban population within each province is demarcated into the city (Nakorn), town (Mueng), or sub-district (Tambon) municipalities depending on population size, density, level of revenue, and administrative capacity for municipal development, creating three types of LAOs officially called municipalities. The rural population is assigned to a Tambon (Sub-district) Administrative Organizations (TAOs) which despite having a legal status is not a formal municipality. (World Bank Group and "Centra, 2012).
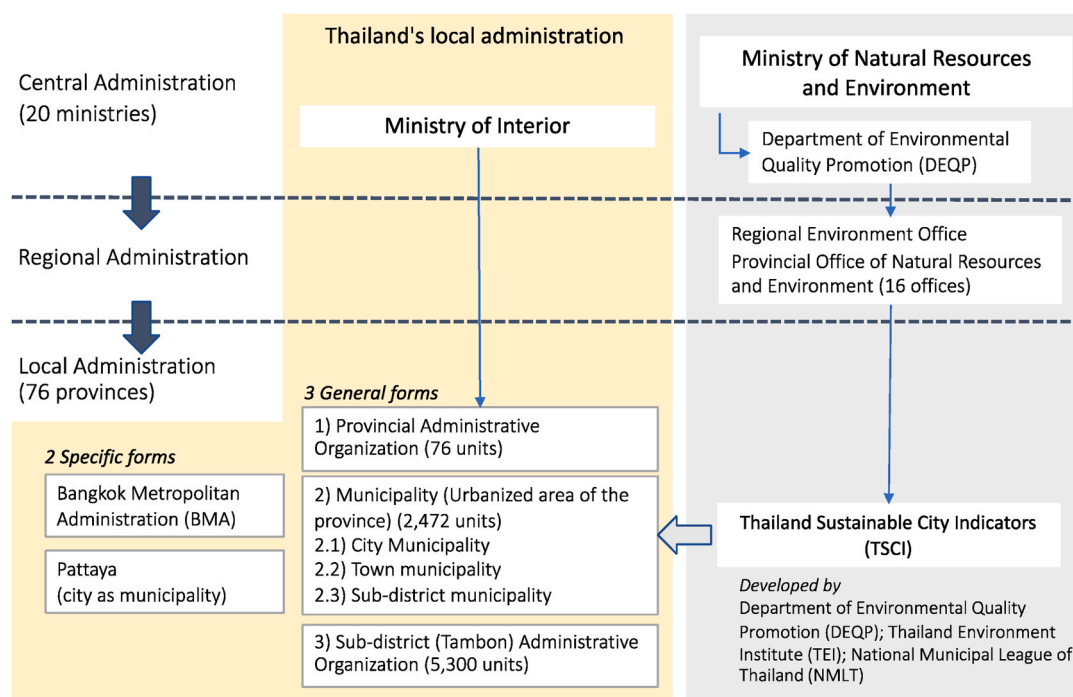
Fig. 1. Thailand's local administration structure.[3]

3.3. Seven municipality cases

We conducted an in-depth study of a small sample of municipalities to understand how SIs are being used, and to identify key challenges and how municipalities cope with them. We aimed for a range of population sizes to assess the use of indicators in more varied institutional settings, including one larger municipality (see Table 4). We chose municipalities that (a) have been part of the TSCI since the start, (b) show evidence of real engagement with the TSCI as evidenced by having won the award of Sustainable and Liveable City at least twice and (c) that explicitly invested in sustainable development, illustrated by development projects on sustainable development and invested capital.

Data collection was based on a combination of document analysis and 20 semi-structured interviews with 15 representatives from the municipalities and 5 interviews with representatives of the TEI, DEQP, and NMLT (see Fig. 2). Among the key documents analyzed were national evaluations of municipal use of the TSCI, local policies and annual reports in each of the 7 municipalities, and media features reporting on the TSCI. The analysis was based firstly on an overall study of how the TSCI was used to gain a clear impression of key factors identified in these reports upon its use. Secondly, we also specifically targeted all key factors influencing the use of SIs as expressed in Fig. 2.

The interviews lasted 30–60 min and were recorded in both voice and visual files. The interviewees included the key people responsible for producing and applying the TSCI (DEQP, NMLT, and TEI). Respondents in the municipalities were selected based on their active participation in indicator development senior representatives and administrators; i.e. mayors and directors or staff (see Appendix 4). The main questions are included in Fig. 2. Interviews were conducted in a semi-structured fashion and focused on building an in-depth picture of uses and influences reflecting different experiences and perceptions of indicators, their actual use, and the difficulties and constraints found when using the TSCI. Interviews lasted 30–60 min and were transcribed and analyzed manually by using Atlas.ti to locate and code variables and annotate findings (see Appendix 3).

4. Results

The seven municipalities use the TSCI in both an instrumental and a conceptual sense, albeit to varying degrees. In an instrumental sense, the TSCI provides information to support decision-making and policy improvement, which all seven municipalities report. One respondent illustrated their use of indicators as: '*At the time when we were evaluated by the committee, they gave us suggestions on what needs to be improved and they pointed out our weaknesses. The suggestions would be taken into account and were seen as information for our leader.*' More generally, as another respondent explained, '*The indicators help display our performance in numbers. We then learn our successes and failures. (…) Having to collect the data every year, we also learn to monitor changing trends.*' As these quotes are also illustrative, indicators influence policymaking mostly on a more general level, something we found in all municipalities. There is limited evidence of indicators explicitly influencing agenda setting, changing policy objectives, or requiring the use of different instruments. One such example is indicator data showing a clear increase in the amount of

Table 4
Seven cases of Thai municipalities.

|	Categories by size	Populations (2019)	No. of development projects (2020)	Funding for development projects (Baht)
Khonkaen (KK)	City Municipality (thesaban nakhon)	114,459	272	445.5M
Chiangrai (CR)	City Municipality (thesaban nakhon)	77,292	154	121M
Mahasarakham (MK)	Town Municipality (thesaban mueang)	51,276	245	134M
Srisaket (SK)	Town Municipality (thesaban mueang)	41,508	128	121.5M
Roi Et (RE)	Town Municipality (thesaban mueang)	36,225	219	288 M
Panusnikom (PN)	Town Municipality (thesaban mueang)	10,075	97	71M
Renunakhon (RN)	Subdistrict Municipality (thesaban tambon)	4753	104	21M
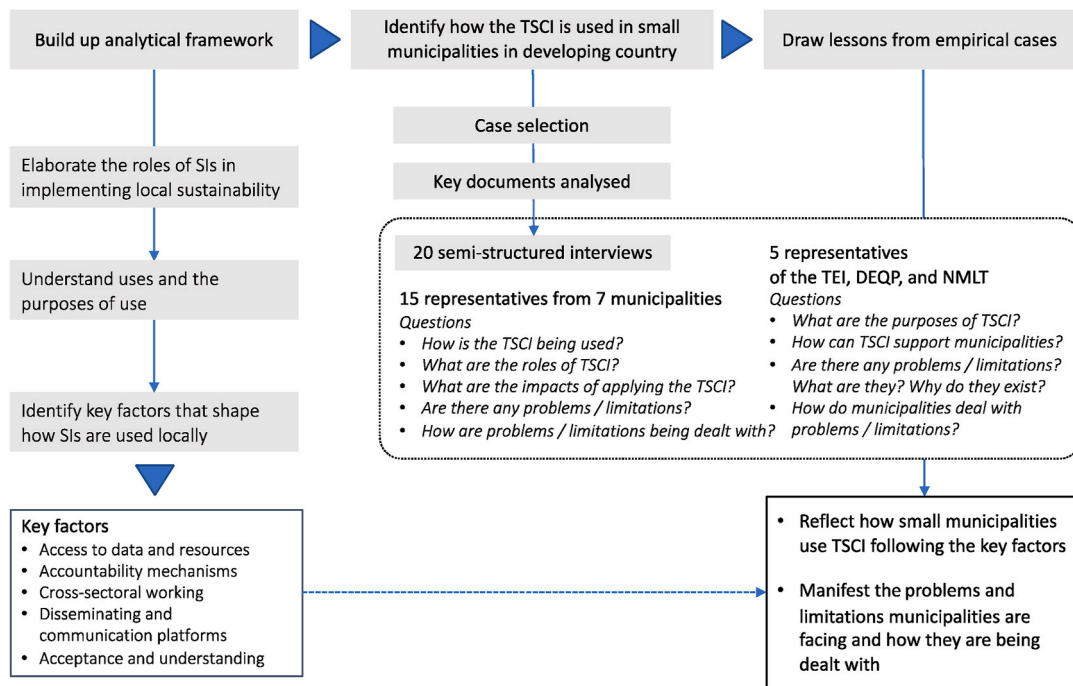
Fig. 2. Methodological framework.

waste collected, which in three of the medium-sized and large municipalities resulted in plans to invest in a waste disposal system (i.e. Roi Et has started to build a waste treatment facility). Similar data encouraged small municipalities (Srisaket, Panusnikom, and Renunakhon) to start campaigns to encourage local communities to manage their waste, such as an initiative for 'returning and recycling egg waste', a training course on how to manage home food waste disposal. The initiative was intended to engage local participation and has less to do with policymaking. Therefore, despite intentions and some degree of instrumental use, it is mainly the conceptual use that currently prevails.

Conceptual use occurs firstly when decision-makers and other municipal staff discuss municipal performance in pursuing sustainable development, also in comparison with other municipalities. For Khonkaen and Chiangrai the TSCI is a formal task assigned to specific staff and features in departmental meetings, while in all other municipalities, actual use and discussions depend on the leadership of the mayor and occur ad hoc on prioritized items. Notably, in the latter case, the TSCI has only a more general role as illustrated by one respondent:, '*if we win [an* award *following evaluation], it could mean that we have done it right. In contrast, if we lose, we then learn our failures and weaknesses.*' As all respondents reported to some degree, the TSCI did become a general vehicle for learning for and awareness of sustainable development. Secondly, all municipalities indicate that conceptual use comes forward by engaging local communities in processes of awareness-raising, implying that learning goes beyond what occurs within governments and municipal departments. Although true for all municipalities, mostly the smaller ones work closely with local communities. As one of our respondents reported, '*the municipality stays close to locals. What we do is not only to promote and tell a story but also to play as a team. We started with a key person and learned step by step through informal meetings and external workshops. We give local citizens the ideas and they tell us what they want to do.*' All municipalities also use media – radio broadcasts and online platforms such as websites and social networks – to engage wider local communities.

Finally, conceptual use is evident in the instigation of learning processes across municipalities and other national stakeholders. The DEQP and the TEI provide several platforms in the form of workshops, meetings, websites, and other media to enhance learning and shared

understanding among municipality staff, policymakers, and local communities. The platforms distribute knowledge and experience to support long-term learning processes and to generate cooperation. Recently, the platforms focused on environmental issues, which most municipalities have difficulties dealing with. By taking part in workshops, municipal staff and community leaders from all 7 municipalities are educated in natural resources protection, dealing with the diversity of natural components in urban ecosystems and environmental problems. The participants collectively report they better see how their municipality performs and f how to improve performance. Meanwhile, 2 out of 7 municipalities also report that local communities gained a greater awareness of both the urgency of environmental problems and how to respond to them. An example is the engagement of local people in waste reduction, which was directly based on the lessons gained from the educational activities and on an increased awareness of municipal waste streams.

4.1. How small municipalities use the TSCI

Despite the positive impacts of using the TSCI, all municipalities do struggle with its use. The most explicit challenges relate to the instrumental use of the TSCI, with limited *access to data and resources* being the first main challenge. Without exception, municipalities struggle to create and manage expensive data collection and storage systems, both of which are necessary for efficient and correct policy evaluation and monitoring. Due to limited budgetary and human resource capacity, municipalities struggle to acquire data management systems and hire technicians or specialists to collect data and manage the system. As population size determines national funding to municipalities (Sudhipongpracha, 2014) the small municipalities struggled most severely, resulting in incomplete datasets and undermining opportunities to support decision-making and evaluation. For example, the 'sewage treatment' indicator requires knowledge on the volume of sewage in an urban area, but also of the origin points where sewage is generated and the locations and capacity of treatment plants available in nearby areas. While volumes may be estimated based on numbers of inhabitants, detailed data on origins of sewage, transport and treatment is often not easy to map. Small municipalities cannot afford good datasets and

effective data storage systems, while they are unlikely to prioritize efforts to ensure complete datasets when simply investing in sewage treatment-in itself is hardly possible.

To use the TSCI, information is collected and reported by the Division of Technical Services and Planning of each municipality. Support is offered by TEI through training courses for municipalities on data collection. Nevertheless, scarce resources compel the three smallest municipalities to be creative in collecting data. They are usually able to manually collect some basic information, such as the number of green areas and trees, the volume of collected waste, and the number of students with basic education. Public involvement and collaboration come as a solution, although on an ad-hoc basis. Three of the seven municipalities partly rely on the local community to collect the data: the number of local trees and green areas was measured and documented by local people. Some basic software in the form of Microsoft Excel sheets is available for municipalities, produced by academic institutions and other initiatives that help to support data collecting, which 2 municipalities also use. While collaboration with local communities and academic institutions may prompt learning, their relative ad hoc application remains limited in boosting the ability to interpret data and better understand the causes of sustainability issues and how policies influence them.

Khonkaen and Mahasarakham, which are among the largest in our sample, were actively trying to develop more structured databases on specific areas (transport, buildings). Unfortunately, the information is often not systematically kept and there is a lack of continuity, which is needed to allow for trend analysis and understanding the impact of policies. This means that data is only mentioned in an annual report and is used on an ad hoc basis. Truly internalizing the use of indicators on a routine and structured basis within the policy cycle, thus, is not commonplace. Instead, municipalities select the indicators they deem relevant for inclusion in the local plan rather than integrating a complete set of TSCI indicators into their policy cycles. Summarizing, access to data and resources is a challenge in all cases studied and notably affects an instrumental use of the TSCI. Nevertheless, partly inspired by the creative involvement of local communities, we do note that in all municipalities the TSCI does at least allow for the instigation of a learning process (see Table 4).

There is no explicit use of *long-term accountability mechanisms* in any of the seven municipalities. As the TSCI is not obligatory, municipalities regard it as optional. This has clear impacts, as one respondent aptly explained: '*The indicators we use are not integrated into our routines. Therefore, we feel that using indicators is additional, extra work.*' Municipalities tend to focus simply on developing and implementing short-term policies and initiatives that they can manage and which produce quick results. One respondent stated: '*Although we want to do a long-term project, for example, waste recycling or a water treatment system, we have to put lots of effort into contributing the cost of designing and construction. These projects require large amounts of money that we cannot afford.*' Thus, time and resources go into practical projects, rather than long-term attempts to bring about and map change. However, making indicators a coherent part of the policy cycle requires a commitment to long-term change and monitoring, which is difficult and not necessarily a priority in municipalities: '*It is difficult to focus on long-term issues that cannot be made explicit for people to see and tell the difference. Citizens expect to see that things have been developed and that their problems have been taken care of. If we cannot show this, we are in trouble.*' Although some tools and software are being developed to support data collection, municipalities will need to deal with monitoring and analysis themselves, which is a crucial aspect of accountability.

In the meantime, the four-year political cycle may disrupt the continuity of implementing a long-term sustainability strategy, as was indicated by 2 respondents. Elected mayors are expected to show tangible outcomes within three to four years, which may be incompatible with implementing long-term strategies on urban sustainability. Hence, '*The weakness of local governing is its discontinuity. The elected*

council has a limited time of four years and implementing a long-term sustainable plan cannot provide the outcome that citizens want to see. Thus, the mayor often focuses on solving problems that citizens face in daily life.' For these two municipalities, the willingness to apply the TSCI and implement sustainability strategies was constrained by the relatively long-term focus they associate with both. Finally, using the TSCI means that municipalities are involved in evaluation at least once a year, which in turn has allowed them to take accountability for their actions. However, expressed by all municipalities is that accountability may not lead to actions as evaluations typically reflect more general levels of performance rather than detailed information on policies and actions. Hence, as one of our respondents reported, '*Using the TSCI and having a good result may help confirm our policy strategy, but it cannot directly tell us how effectively a plan has been implemented.*'

Public accountability is in some municipalities possible due to online platforms that are open for social interactions. Khonkaen, Chiangrai, and Roi-et (which are among large and medium-sized) created a mobile application and website where city information and development projects are uploaded. In addition, local communities can monitor and present feedback and suggestions via conversational platforms. These online forums are typically linked to sustainability issues and not the actual use of TSCI, but at least allow municipalities to take accountability for their policies. The other 4 municipalities rely on informal interaction, which takes place during community meetings and social events. As one respondent expressed, "*Our mayor is often invited to community events and he would take an opportunity and talk about environmental concerns and some other stuff. He always promotes our campaign and contest to persuade social movements.*" The mayor himself further explained how he accepts feedback and gets ideas from meeting with community members. Such informal talks occur fairly randomly, implying public accountability is not a structural phenomenon (see Table 5).

The use of the TSCI also requires *cross-sectoral working*, which means that municipalities should coordinate actions both within municipal departments and between the municipality and other related institutions. The information needed to support the TSCI comes from several departments and institutions. 'Waste management and air pollution control' is an example of an indicator that requires coordinated efforts since the effects of pollution can spill over into surrounding areas. The indicator involves a wide range of data from individual activities, including the number of industries, emission levels, and transport. Coordination does occur to a degree in all of our studied cases, but mainly within municipalities. There is still limited sharing of information between institutions. Municipalities have no structures or mechanisms for coordination actions across adjacent municipalities and among other related institutions: '*Although we believe that action from affected municipalities and related institutions is desirable, we are not able to create coordinative actions to effectively deal with this kind of problem.*' In terms of internal working, all municipalities share a similar approach. The implementation of the TSCI is discussed in council meetings, which include governors and staff from internal departments. The purpose of the meetings is to disseminate information and discuss, based on the TSCI results and how the municipality is performing in terms of sustainable development. This cross-sectoral work depends on communication and personal factors.

The coordinative actions are mostly informal in the three small and medium municipalities, with mayors and community leaders playing a major role in sharing and coordinating. They involve municipal staff from various departments and local people, as reported by one respondent: '*We are so small. We have limited resources and incomes. Therefore, many projects will have to be managed under a limited budget and be done through collaboration between governors and people in the community.*' While this operates in many ways as a constraint on data collection, accountability, and analysis, it can allow a fairly open process of sharing and learning and could support coordination and cross-departmental and collaborative working. Nevertheless, this fairly informal process

Table 5
The use of SIs in Thai municipalities.

Factor	What is found from the cases study	Revealed in sample municipalities
Access to data and resources	- Incomplete datasets	7
	- Information is not systematically kept and lacks the continuity	7
		7
		2
	- Data collection is limited to annual reporting and used on an ad hoc basis, while merely relevant indicators are included in the local plan.	3
		3
	- The basic software is produced by academic institutions and other initiatives.	
	- Data collecting by local people.	
	- Public involvement and collaboration stimulated.	
Accountability mechanisms	- Focus on short-term activities.	7
	- Reduced willingness due to four-year political cycle	2
		7
	- Accountability may not lead to actions.	7
		3
	- TSCI has implicitly given municipalities the opportunity to take accountability for their actions.	4
	- Use of mobile application and Webboards	
	- Stay close to locals with direct interaction.	
Cross-sectoral working	- Internal coordination	7
	- Cross-sectoral working depends on personal factors.	7
		7
	- Mayors & community leaders play a key role in sharing and coordinating.	3
	- The coordinative actions tend to be informal.	
Disseminating and communication platforms	- Sharing and learning platforms are underway.	2
		5
	- Disseminating based on informal ad hoc basis	7
		7
	- The poor link between TSCI and information disseminated Community inclusion in sharing and collecting data.	
Acceptance and understanding	- Information communicated to local communities has been simplified.	2
		2
		5
	- Dissemination and communication rely on the ability and willingness of individual staff and community leaders.	
	- No clear problems reported	

of learning is done on an ad hoc basis (see Table 5).

As noted above, *disseminating and communication platforms* are used or being developed in large and medium-sized municipalities, while small ones rely on mere informal settings. All municipalities use communication tools such as radio broadcasts, billboards, and online social networks as used by all municipalities; e.g. *'The best way to communicate is to keep explaining whenever you can. Here we have morning radio broadcasts where information can be communicated every morning. People can help spread it around.'* Also, all municipalities indicate they communicate directly with local communities through casual talks and informal meetings. A talk starts with a discussion with community leaders and eventually moves to local people, producing a kind of snowball effect. One of our respondents explained, *'We are accountable to our citizens. We gain citizen trust by keeping in touch and working step by step. We start with one community and when they begin to understand, we*

then move to another community. What we do is to engage people to keep the area clean and to reduce waste.'* Information is that is discussed is not always directly and comprehensively based on the TSCI, but does aim to increase the focus on (sustainability) issues and promote participation. Including communities worked well during the stage of sharing and collecting data, but does not extend to implementing policies or evaluation.

Only the larger and medium-sized municipalities with sufficient resources and staff assign information dissemination as part of their working process, through regular meetings, reports, and documents. Khonkaen and Chiangrai have invested in developing databases and communication infrastructure, to manage and share city data, while Chiangrai is working on it. These mostly contain reports and document archives, while a city dashboard with an open database is still under development.

In two small municipalities, in particular, *acceptance and understanding* are found to be problematic, which may undermine both the instrumental and conceptual uses of the TSCI. Although local policymakers understand and accept the use of the TSCI, they tend to understand it in a more general sense as referring to the degree to which the municipality is working successfully towards sustainable development. In both municipalities, the TSCI was considered insufficiently tangible to directly relate distinct policies to. The information communicated to local communities is often simplified and modified due to fears that local community actors will not fully understand the data provided by the indicators. Rather than discussing details about waste production, collection, and disposal, for example, citizens are merely informed about how they might reduce waste. This reduces the full citizen engagement in the wider issue of waste management to what individual households can do, as illustrated by this quote: *'If you make it too complicated or use technical words, people won't understand. You need to keep it simple and suitable to local contexts.'* Disseminating information and communication between municipalities and local communities relies on the ability and willingness of individual staff and community leaders.

5. Conclusions and discussion

Since 2017 the TSCI is an integral part of the obligatory national local performance assessment by Thailand's national Department of Local Administration for those municipalities using it, illustrating the growing status of the TSCI. Also, the growing number of municipalities using the TSCI show its relevance and acceptance among local governments. Its actual role in implementing SD and raising local awareness is more cumbersome to identify. Nevertheless, our results do show that the TSCI is making an impact, albeit not necessarily as structured or clear as the UN might have envisioned when promoting sustainability indicators after 1992. To some degree, this is no surprise. With even large cities in developing countries facing problems to collect and analyze data, connect them to actual policy cycles and use them as a structural input to learning processes, it is only logical such problems also occur in our sample. What deviates are the more detailed manifestations of the challenges faced in our sample and the coping strategies employed.

Limited human and financial resources affect even basic needs such as owning or managing databases or collecting data. Hence, in our sample municipalities apply SIs opportunistically, resulting in their ad hoc use. Furthermore, the indicators do not always provide information that is directly useful and accessible, while expertise to interpret, analyses, and translate indicators into policy-relevant information is limited. Limited resources and professional expertise also undermine opportunities to monitor trends and use SIs in formulating policy options. Simultaneously, challenges to local quality of life compel municipalities to focus on short-term activities. We especially found modest evidence of municipalities creating clear accountability mechanisms or more widely, aiming for instrumental uses. Nevertheless, when it comes to cross-sectoral working and disseminating and communicating platforms, a more nuanced picture emerges. We identified several structural

attempts at using the TSCI in creating cross-sectoral working and the use of the media or the creation of interactive databases. We also encountered many informal practices used in especially smaller municipalities. Their downside is evident: an ad hoc use and a reliance on personal styles of coordination and collaborative working among municipal actors and local communities. Their upside is also evident: the TSCI, even if loosely connected to what is disseminated and discussed, is part of an open and informal process of awareness-raising, learning, and thus pursuing and making sense of sustainable development in these localities. Close working with local communities might even give the municipalities in our sample an advantage over larger cities in truly engaging people. The creative use of citizens to help in data collection is a fine example and also an encouraging coping strategy in the face of limited resources for data collection.

Overall, the TSCI in our sample of municipalities is only partly able to deliver on its objectives (section 3) and thus, the municipalities are only partly prepared for using the TSCI. Being (un)prepared is not so much an issue of commitment to the idea of using SIs, but mostly is a matter of having the resources and capacities to use the TSCI comprehensively. Data collection and storing systems are not commonplace, municipal performance is mostly measured more generally as a benchmark (i.e. not directly policy-relevant) and the integration of knowledge into local policy processes and coordinated actions between different departments occur often more ad hoc and does not necessarily result in information-based decision-making. To some degree, these objectives might also be an ideal to merely pursue; i.e. it is hard to be fully prepared. Nevertheless, there is no doubt that skills of local municipal staff are increased, sharing between various local stakeholders occurs and mostly, the TSCI might serve a more overarching objective 'generate learning and awareness in local administration and communities their aim to govern'. Especially, we learn that it is the conceptual use that stands out in our sample and that should not be overlooked as valuable.

6. Reflections and recommendations

Using SIs within municipalities is associated with several key factors, amply discussed in the international academic literature. Clearly, our study only addressed a limited sample of small municipalities in a single country, rendering generalizations problematic if not unjustified. Nevertheless, our study does provide empirical evidence of problems and limitations small municipalities are facing and reveals the creative coping strategies employed. While explicitly connecting to the TSCI, we here end with some key considerations upon its use, coping strategies, and how improvement may be pursued.

The most explicit effort is related to the conceptual use of TSCI. Small municipalities rely on an informal and close relationship between governors, municipal staff, and local communities. The close relationship resulted in clear public involvement and collaboration, creative data sharing and collection practices, public accountability and informal processes of accountability, the inclusion of community action, and authentic dialogue between governmental levels, policy sectors, and stakeholders. Although these partly occurred ad hoc, they also provide us with some general clues to further update both the TSCI and especially how it might be used locally to generate impact. Community mobilization and engagement and a cross-sectoral sharing and ownership of a sustainable development agenda might be the most potent impacts the TSCI can and does generate.

In more detail, improving the TSCI starts with support in terms of budgetary and human resource capacity, technology transfer, and data storage systems. Without these fundamental requirements, small municipalities cannot apply the indicators efficiently, nor use them to their full potential. A possible recommendation is to promote collaboration between local municipalities in the region, allow for increased economies of scale to collectively purchase software, hire experts, and improve dissemination platforms. Secondly, more impact can be generated if the TSCI is more formally integrated with the development

and evaluation of local policies; i.e. more pressure to use them. The national government has begun to apply more pressure by encouraging municipalities to include at least some of the TSCI indicators in their local plans. Meanwhile, creating a network of communities, municipalities and other institutions would help to share experiences, provide support and share problems. From 2020 onwards, the national Department of Environmental Quality Promotion has begun to promote at least one city from each province for the best practices award to spark mutual learning and increase the number of participating municipalities. Thirdly, more guidance and resources for a community initiative in collecting data and translating information into practical solutions that might increase performance are sensible. This may help to respond to limited resources and boost community engagement.

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.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.indic.2021.100162.

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