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META-EVALUATION OF SUSTAINABILITY INDICATORS

From organizational to national level[1]

Tomás B. Ramos and Sandra Caeiro

Introduction

Although there are well-known indicator selection criteria and it has been significantly explored over the last two and half decades since Agenda 21 first called for sustainability indicators, sustainable development indicators (SDIs) have not yet fully matured and little effort has been put into their validation (Bockstaller and Girardin, 2003; Ramos et al., 2004; Meul et al., 2009; Ramos, Alves, Subtil and Melo, 2007), in particular into evaluating how, jointly, as a framework, they respond to sustainability questions, from the standpoint of a meta-evaluation and/or sensitivity analysis. It is important, therefore, to question the effectiveness of SDIs in an effort to continue advancing and facilitating sustainability (Wilson et al., 2007) and to illustrate to what degree the outcomes achieved correspond to the goals intended (Lyytimäki and Rosenström, 2007). In this way validation verifies whether the indicator possesses a degree of "accuracy" consistent with its intended application and a degree of "credibility" conducive to the potential users' confidence in it and the information derived from it, and hence their willingness to use it (Meul et al., 2009). In fact, validation means the achievement of overall objectives or the production of the intended effects, but as pointed out by Bockstaller and Girardin (2003), the use of any evaluation tools should be formalized in a real test and not simply limited to a descriptive work. The validation process for an indicator can be separated into two stages: (1) conceptual validation, which is based on data, information and a description of the indicator and (2) empirical validation, which is based upon the analysis of the behaviour of the indicator outputs (Mantese and Amaral, 2017), outcomes and impacts, for which different evaluation approaches could be used. A key component of effective evaluation is how information is presented, which will depend on the purpose of the evaluation, the target audience and their familiarity with the information. Simplification of the results is a key factor (Becker, 2004).

Meta-evaluation is not a new concept and in fact it was initiated by Scriven (1969). Meta-evaluation is an evaluation of an evaluation. It is a critical assessment of the strengths and weaknesses of an evaluation, and draws conclusions about its overall utility, accuracy, validity, feasibility and propriety. Meta-evaluation can serve a valuable function as a self-assessment quality-control tool during the implementation of an evaluation. It could use methods such as a checklist to help the evaluator to be sure that nothing important has been missed out (Patel, 2002).

Some work has been carried out to evaluate the performance of developed environmental and sustainability indicators and indices. For example, Jackson et al. (2000); Kurtz et al. (2001); Bockstaller and Girardin (2003) and Meul et al. (2009); Caeiro et al. (2012); Ramos et al. (2014); Mascarenhas et al. (2014) have discussed or explored methodologies to evaluate ecological/environmental indicators, where end-users play an important role in determining indicator applicability or effectiveness. Ramos et al. (2004; Ramos, Alves, Subtil and Melo, 2007) specifically focused this discussion with novel approaches and concepts on meta-level monitoring and meta-performance indicators, respectively. Cloquell-Ballester et al. (2006) have developed methodologies for the validation of indicators within the environmental impact assessment of project studies, where the core of the validation is to access the correct performance of new indicators in terms of concept, coherence, operationality and utility. Other studies have compared several national sustainable development index metrics, evaluating their consistency and meaningfulness (Böhringer and Jochem, 2007; Wilson et al., 2007). Others also discuss the constraints and need to standardize indicators that assess sustainability at the local level (Moreno Pires et al., 2014) or evaluate the use of indicators in the context of local governance (Moreno Pires and Fidélis, 2012, 2015).

Despite the proliferation of sustainability indicator approaches, frameworks cases and tools, mainly implemented at the country level, few of these initiatives include meta-evaluation procedures and, to even lesser extent, indicators to operate this kind of analysis. Even though national experience of SDI frameworks, e.g. that of Spain (Gallego, 2006), Germany (Walz, 2000), Finland (Rosenström and Kyllönen, 2007), considers the requirements of indicator selection, including public participation approaches to support SDI development, few of them include a meta-evaluation of the SDI systems themselves or their components, procedures and indicator outcomes and impacts, such as the Portuguese case (Ramos, Alves, Gervásio and Liberal, 2007) and APA, (2008). Lyytimäki and Rosenström (2007) analyze the effectiveness of different national conceptual frameworks for communicating SDIs in Finland and concluded that it is important to pay more attention to the indicators as a set than on an individual basis and that specifically tailored frameworks should be employed for specific uses. According to these authors, it is easy to list the characteristics of an ideal framework, but not so easy to find frameworks that actually contain these ideal characteristics. The same situation applies to stipulating and implementing the criteria for individual indicators. When a comprehensive list of ideal characteristics has been compiled, it is left for someone else to come up with actual work that meets all these criteria. In addition, a long list of indicators or extensive frameworks may be introduced that fail to meet the criteria. Monitoring and evaluating how indicators are used and learning from the information acquired are at least as important as the development work aimed at improving the ability of a framework to depict the reality objectively. This may be considered the key challenge for future research on SD frameworks and indicators (Lyytimäki and Rosenström, 2007), where still doubts exist.

The main aim of this chapter is to present a conceptual approach to design and assess the effectiveness of the sustainability indicators, which do not usually include an evaluation of themselves. A set of key-factor and meta-performance indicators is proposed that allow the implementation of the described tool. Additionally, some examples of its application worldwide are presented and briefly discussed.

The conceptual meta-performance evaluation framework

This framework assumes a definition of sustainability meta-performance evaluation that is supported by the concept presented in Ramos, Alves, Subtil and Melo (2007), as applied to public

sector environmental performance evaluation. The developed tool aims to assess the effectiveness of the sustainability assessment instruments themselves, where indicators are one of the most widely used and well-known tools. Meta-performance is understood here as part of performance management and assessment procedures. Sustainability meta-performance evaluation indicators could be the practical instruments for verifying the assessment, in showing how appropriate the SDIs are and allowing an evaluation of the overall performance of the assessment processes and results (see Figure 32.1). The sustainability indicator system itself, the entire structure of the indicators and the methodological features of the latter will be the target of the meta-performance evaluation process.

Based on Ramos and Caeiro (2010), an updated framework to conduct meta-performance evaluation of sustainability indicators was developed with the aim of identifying how to put the sustainability meta-evaluation challenges into practice (Figure 32.2). This framework was designed to be potentially applied to national, regional, local and organizational SDI initiatives, supporting indicator validation and allowing continuous assessment of these tools. Meta-evaluation may be seen as one process or component within an entire SDI system, but looking from above, mainly aimed at indicator revision and updating and system improvement. The development of sustainability indicators, when analyzed as a system where different processes occur, includes a series of actions and decisions with various data and information flows. Approaches to sustainability indicators should define various principal components, to assure a coherent development process. They may be divided into the following main categories: (1) planning and conceptualization (including all the design components and processes); (2) implementation: the whole process of data collection, processing and analysis; (3) operation and action: outcomes are presented through reporting and communication tools, leading to different kinds of reaction (e.g. policy measures; stakeholder participation); establishment of flow links with other SDIs, at the local, regional, national and international levels, and with strategic tools/instruments (policies, plans or programmes); (4) follow-up: updating and reviewing, mainly based on a meta-performance evaluation process.

This framework seeks to incorporate a systems analysis approach that integrates the main relationships among different components of the meta-performance evaluation of sustainability

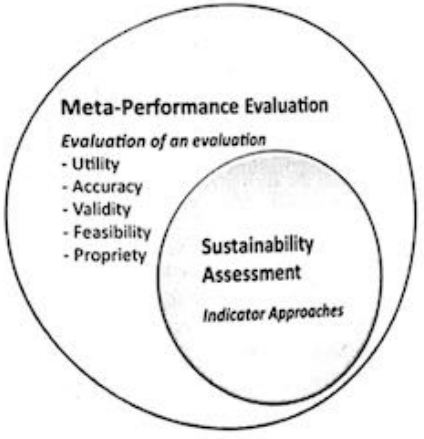

Figure 32.1 General meta-performance evaluation features of sustainability assessments

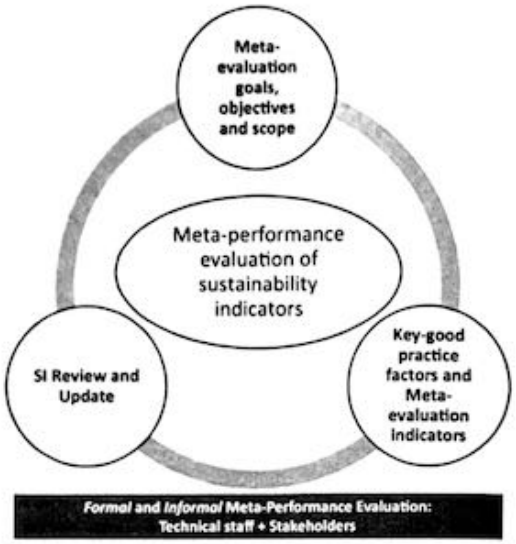

Figure 32.2 Conceptual framework for meta-performance evaluation of sustainability indicators

indicators. As with any planning or management process, SDI systems should be flexible and dynamic, and should have a follow-up procedure for reviewing and monitoring, and improving the robustness and overall quality of the sustainability assessment results produced by the indicators. The procedure for the meta-performance evaluation of sustainability indicators starts with a definition of the main objectives and the scope of this process, which will depend on various fundamentals that characterize the SDI system and its indicators. On the basis of current and well-established principles and guidelines for environmental and sustainability indicator development, key good-practice factors should be selected in order to develop a tool that can be operationalized through the construction of a checklist and the corresponding meta-performance evaluation indicators. These factors will cover two main levels of evaluation: Level 1 – Performance of the SDI system, including the main processes, and the respective actors and methodological approaches; Level 2 – performance of individual and aggregate indicators, including their inputs, outputs and outcomes/impacts. Meta-performance evaluation indicators will allow the following: (1) an evaluation of overall assessment activities, to measure how well the indicator initiative is going; (2) the appropriacy of the sustainability indicators, including the methodological aspects and outcomes produced and (3) an evaluation of the sustainability measures and actions originated by the indicator operation and analysis.

The key good-practice factors of meta-evaluation include various aspects, e.g. the type of SDI management framework, the existence of some sort of collaborative/participative process, the target audience, the coverage of the subject, the structure of the indicator organization (e.g. sustainability dimensions/themes and/or causal chain frameworks, such as the STRESS model [Rapport and Friend, 1979] from which the OECD [1993] pressure-state-response [PSR] framework was developed), the number of indicators, the relationship with sustainability indicators developed at different levels (national, regional, local and organizational), the regularity of the reporting, the sustainability indices, and the indicator report format/platform (the medium

used to communicate the report information). In this way, for the assessment of the progress towards sustainability, participatory sustainability assessment frameworks should be used. Most of the works listed earlier, also used participation processes to validate indicators (Jackson et al., 2000; Walz, 2000; Kurtz et al., 2001; Bockstaller and Girardin, 2003; Gallego, 2006; Cloquell-Ballester et al., 2006; Rosenström and Kyllönen, 2007; Meul et al., 2009; Mascarenhas et al., 2014, Ramos et al., 2014).

Exploring Ramos et al. (2014) approach, the meta-evaluation performance can be *formal* and *informal*, designed on the assumption that we should integrate two dimensions of meta-evaluation, that are complementary and synergistic. *Formal*, which is mainly led by the experts/technical staff and reflect mandatory or official procedures, and the *informal*, mainly represented by voluntary, ad hoc, non-regular or private initiatives (facts and figures, views, ideas, desires, needs and/or perceptions), conducted by different types of stakeholders. Informal stakeholders participation can include lays, general citizens, public and private organizations, non-governmental organizations, universities, media and research institutions. The stakeholder's contributions for the meta-evaluation evaluation process can be integrated using different techniques and tools, namely (Ramos et al., 2014): (1) computer systems for collaborative data uploads – raw treated and analyzed data – and mailing lists for data exchange; (2) participative workshops, focus groups brainstorming meetings; (3) social networks, wikis; (4) Participatory Rural Appraisal (PRA) tools for lay and traditional knowledge data input and gathering; (5) interviews and questionnaires surveys or self-assessment checklists. The informal contributions to the meta-evaluation process could be put into practice through the implementation of a sort of collaborative Sustainability Assessment Forum, as explored in Ramos and Caeiro (2010). The results of the comparison between formal and informal evaluation will be used for cross-validation of the sustainability meta-evaluation outcomes.

This framework was designed to improve the quality of indicators, by facilitating their development and evaluation, and produce better sustainability assessments. As stressed by Kurtz et al. (2001), this kind of approach can be used to target gaps in knowledge and formulate future research directions. When the meta-performance is conducted a more effective reviewing process is implemented, with readjustments and improvements to the SDIs through an adaptive scheme.

The proposed meta-performance evaluation framework will not directly measure the full real outcome or value of a certain SDI system in assessing sustainability, given the complexity and uncertainty of sustainability issues. Nevertheless, it will help the user to ascertain if the indicator initiative is well developed, implemented and managed, and will give important signals about the credibility and accuracy of the SDI set.

Key good-practice factors and indicators for meta-performance evaluation

To put the proposed framework into practice, the core meta-evaluation components – the key good-practice factors and meta-performance evaluation indicators – were developed (see Table 32.1). A great amount of work already published presents the ideal criteria to select and develop environmental and sustainability indicators, in particular the Bellagio Principles (Hardi and Zand, 1997), and various other pieces of work (e.g. Mascarenhas et al., 2015; Morenos Pires et al., 2014; Mascarenhas et al., 2012; Bell and Morse, 2008; Niemeijer and Groot, 2008; Ramos, Alves, Subtil and Melo, 2007; Cloquell-Ballester et al., 2006; Spangenberg, 2002; HMSO, 1996; Ott, 1978). In the development of the proposed framework it was assumed that various guidelines and criteria for the selection and development of sustainability indicators could be adapted

Table 32.1 Key good-practice factors and meta-performance evaluation indicators for sustainability assessment. Summary of rationale and recommendations for each factor available at Ramos and Caeiro (2010)

Key good-practice factors	*Meta-performance evaluation indicators (checklist examples): name and measurement units/scale (in brackets)*
Level 1 – Performance of the SDI System: planning and conceptualization processes, actors and methodological approaches	
Objective, scope and scale effects (scale integration and spatial extent)	• Main dimensions covered by the SDI system: environmental economic, social and institutional (yes, no, not clear, for each SD dimension) • Themes related to particular territorial features – national, regional, local or organizational, depending on the main SDI scale (%; no.) • Indicators for comparison/integration among different spatial scales (type and no.)
Target audience and type of language	• Identification of the central indicator audience (yes, no, not clear)
Management model and institutional cooperation	• Identification of the management model (yes, no, not clear) • Institutions involvement and cooperation (type and number of institutions and their roles)
Technical and educational skills of the staff	• Staff profile: type and diversity of staff (total number of personnel; no. per type of background or expertise; number of personnel by function and time spent) • Training personnel for particular indicator tasks (number of persons allocated to SDI development who follow training initiatives)
Indicator organization and structuring	• Use of a conceptual framework – by sustainable development dimension or theme, DPSIR, PSR or others – for SDI organization and structuring (yes, no, not clear) • SDI size (total no. and no. by type) • Indicator subsets (type of indicator subsets for particular purposes, e.g. headline indicators; common sectoral, regional or local indicators)
Regularity issues, revision and updating procedures	• Revision of the entire SDI system processes, including a review of the general methodological approach and related procedures as well as a reselection of the indicators (yes, no, not clear; no. of revisions planned versus accomplished) • Regular SDI updating and reporting (yes, no, not clear; no. reports and updates planned versus accomplished)
Governance and public participation process	• Participative/collaborative processes undertaken in each stage of the SDI development, from the design to the operation and revision stages (yes, no, not clear; total no. and type of stakeholders involved in each participative phase) • Stakeholders' feedback to SDI development (no. $year^{-1}$ of messages received by email/letter or through personal contacts) • Institutional cooperation with other public institutions for SDI development and implementation (yes, no, not clear; no. of formal and informal protocols)
Relationships with SD policies, strategies or plans	• SDS goals and objectives covered by the sustainability indicators (yes, no, not clear; no.; %)
Intra-territorial (or sectoral or organizational) asymmetries	• Use of particular methodological procedures to measure territorial, organizational or sectoral asymmetries (yes, no, not clear)
Communication and promotion/dissemination	• Reporting and communication to stakeholders (no. reports, workshops, internet sites, email list)
Cost-benefit analysis	• Implementation of public sector projects as outcome of SDI results (no.; $year^{-1}$) • SDI planning/conceptualization and maintenance investments and expenses (10^3 € $indicator^{-1}$ $year^{-1}$)
Decision-makers' and stakeholders' responses	• Linkage between sustainability indicators and output and outcome indicators for policies, plans and programmes (yes, no, not clear) • Decisions, actions/recommendations and measures to reverse or prevent negative trends and to maintain or increase positive trends (no.; % by type of sector) • Identification of unexpected sustainability effects through the SDI measurements (no.; %) • Willingness of potential end-users to effectively use the SDI systems (% of positive answers from potential end-users submitted to an interview survey)
Level 2: Performance of individual and aggregate indicators at the implementation and operation/action stage	
Conceptual coherence and relevance to sustainability assessment	• Indicators that are not supported in published scientific or technical work (no.; %)
Relevance to the conceptual category, theme and/or sub-theme	• Stakeholders that use the indicator in their sectoral activity assessment (no.; %) • Direct relationships between the indicator title and its category (yes, no, not clear; no.; %)
Sensitivity and sustainability targets/thresholds	• Indicator targets reached (no.)
Methodological approaches for data collection and analysis	• Indicators without clear methods of data analysis and/or collection (no; %) • Periodicity of new data collection for indicators (no.; %); • Chemical use in indicator data-collection activities (loads of monitoring reagents reaching environment: $indicator^{-1}$ $year^{-1}$) • Use of environmentally preferable products and equipment in indicator measurement (no. of environmentally preferable products: $indicator^{-1}$ $year^{-1}$)
Quality control	• Identification of quality control objectives for each indicator (yes, no, not clear) • Identification of the means and methods to audit indicator quality (yes, no, not clear) • Analytical measurements and related detection levels (no. of indicator measurements under analytical detection level $year^{-1}$)
Spatial and temporal scales	• Indicators within socio-economic and/or homogeneous spatial/biogeographical units (no.; %)

(*Continued*)

Table 32.1 (Continued)

Key good-practice factors	*Meta-performance evaluation indicators (checklist examples): name and measurement units/scale (in brackets)*
Logistical requirements and information management	• Identification of logistics requirements for each indicator (yes, no, not clear) • Identification of information management procedures for each indicator (yes, no, not clear)
Costs	• Average cost of sustainability indicators (10^3 € indicator^{-1} year^{-1})
Understanding and social utility	• Indicators easily understandable by the end-users (no.; % of positive answers from potential end-users submitted to a survey)

to suit meta-evaluation needs. This framework takes into account certain evaluation guidelines that were developed with similar purposes but different scopes or targets in mind, in particular the work of Jackson et al. (2000) and Kurtz et al. (2001) on evaluation guidelines for ecological indicators. The research work of Meul et al. (2009); Niemeijer and Groot (2008); Ramos et al. (2008); Ramos, Alves, Subtil and Melo (2007); Ramos (2009); Cloquell-Ballester et al. (2006); and Bockstaller and Girardin (2003) was also considered for the key good-practice factors developed.

These key good-practice factors could be viewed as the basis for a checklist, providing aspects that an SDI initiative should be able to cover, though they must be adapted to each particular indicator system. A universal and standardized list of criteria for meta-evaluation is not desirable, since it is not realistic to expect a wide consensus on this subject, and also because each specific case requires a customized meta-evaluation tool. Additionally, it will be very difficult to include all the factors desired, so an SDI system could define a prioritizing scheme for key-factor accomplishment, on the basis of the defined objectives and scope of the meta-evaluation. This would result in various stages of performance that could be achieved in different periods of time. It should also be stressed that to conduct or supervise the meta-evaluation process a different institution than the one in charge of the SDI system should be involved, thus assuring independent external verification. This can be considered a fundamental step towards guaranteeing the reporting quality, robustness and credibility of the meta-evaluation.

Despite the efforts to obtain a manageable but balanced core set of factors and indicators, the total number is still high. Though a problem, this is mitigated by the fact that different factors and related indicators can be implemented in gradual stages, with a view to accomplishing partial meta-evaluation goals. A user's guide can be produced to explain the methodology in greater detail.

To avoid a too complex and resource-demanding process, the list of factors could be scored according to a qualitative assessment, based on expert knowledge, of how well the SDI system or indicator meets the requirements. An ordinal scale based on five categories can be defined to classify each meta-performance evaluation factor, in a range from 1 to 3: poor – 1; medium – 2, good – 3. The aggregated and final result value can be computed using an arithmetic or heuristic algorithm. As an alternative or complement to the scoring method, a summary analysis taking in each specific key factor could be also conducted to produce a qualitative integration of the main meta-evaluation outcomes.

Overview of application examples

The presented approach for meta-evaluation of SI has already been used or adapted in different thematic contexts and scales, demonstrating its relevance and practical utility. The framework application was found by searching in the Google Scholar research papers that cited the "meta-performance evaluation of sustainability indicators" conceptual framework (published in Ramos and Caeiro, 2010). Some of these international cases and related key factors/indicators used are analyzed below (see also Table 32.2).

Table 32.2 Meta-evaluation indicators or good-practices factors used by the application examples, based on meta-performance evaluation indicators suggested by Ramos and Caeiro, 2010

Meta-evaluation good-practices factors	*Scale*	*Author*
• Degree of reporting of environmental performance indicators in the EIS • Improved registration of master data and data transactions in the EIS • Revisions of environmental performance indicators • Implementation of new environmentally friendly practices/routines based on assessments of environmental performance • Evaluation of environmental performance: investments and expenses	Organization	Myhre et al. (2013)
• Conceptual coherence and relevance to sustainability assessment • Relevance to the conceptual category, theme and/or sub-theme • Sensitivity and sustainability targets/thresholds • Methodological approaches for data collection and analysis • Quality control • Spatial and temporal scales • Logistical requirements, information management, and costs	Municipality	Teixeira et al. (2016)
• Careful, transparent construction • Few key indicators • Appropriate type of indicators • Analysis of cross-linkages • Comparative indicators • Rising benchmarks over time • Broad coverage of indicator system • Practical tools • Transparent data collection • Data quality control • Easy to communicate and to understand • Learning process • Commissioning of indicators by government • Consideration of governmental structures • Participation of citizens • Budget	Municipality	Krank and Wallbaum (2011)

(Continued)

Table 32.2 (Continued)

Meta-evaluation good-practices factors	*Scale*	*Author*
• Agreement on indicators • Political support • Policy-oriented tools • Legal framework • Long-term implementation • Consideration of social, cultural environment • Appropriate promotion of indicator system • Compulsory participation • Awarding process • Accompanying measures		
• Target audience and type of language • Objective, scope and scale effects • Relationships with regional strategies • Decision-makers' and stakeholders' responses • Communication and promotion/dissemination • Technical and educational skills of the staff • Cost-benefit analysis • Governance and public participation process • Regularity issues, revision, updating procedures • Indicator organization and structuring • Management model and institutional cooperation	Organization	Gibson, 2017
• Indicator organization and structuring • Number of indicators • Dimensions covered by the SDI System • Methodological approaches used for indicator measurements • Common set of indicators • Governance and public participation process	Municipality	Torrico et al., 2011

At the local level, the model presented here was used to evaluate the energy efficiency indicators of sanitation services in the municipality of Loulé, Portugal (Teixeira et al., 2016). Seven key good-practices factors at the implementation stage of the performance indicators were checked by experts showing optimal performance for most of the indicators, confirming the added value of the performance indicator matrix for sustainability assessment of water-energy management at the municipality level.

Also at the municipal level, Krank and Wallbaum (2011) conducted a meta-performance evaluation of seven sustainability indicator programmes in developing countries of Asia (Indonesia, Thailand, China and India). The evaluation was conducted through a qualitative assessment by expert interviews and the meta-performance evaluation was carried out at the two levels (SDI system and individual indicators – see Table 32.2). This meta-evaluation allowed identifying crucial strengths and weaknesses of the sustainability indicator programmes, linking the success factors to their contexts. The results include innovative approaches to indicator types, data collection and data quality control, and a correlation between the anchoring of programmes in approved development plans and long-term implementation. According to the authors the results of this research can provide valuable guidance to users of existing sustainability indicator programmes and planners of new indicator programmes.

Another application at local level was conducted by Torrico et al. (2011). These authors developed a meta-performance evaluation of sustainability indicators in Spanish municipalities that have an Agenda 21 process. Six good-practices meta-performance factors were applied identifying the weaknesses, threats, strengths and opportunities and potential of the SDI, to allow comparison between similar municipalities and their progress towards a more sustainable development.

At the organizational level, Myhre et al. (2013), developed a conceptual framework of environmental performance indicators (EPI) for the Norwegian Defence sector, supported by an environmental information system (EIS). This framework was applied to the Norwegian Defence sector and included five meta-performance evaluation indicators (see Table 32.2). Meta-performance indicators intended to show how appropriate the EPI are, which leads to a review and improvement of these components. Furthermore, these meta-performance indicators showed an evaluation of overall monitoring activities and results, including the environmental impact of the data collecting process itself, and an evaluation of the sector's environmental performance measurement system and impact mitigation action.

At the organizational level, Gibson (2017), applied 11 good-practice factors of meta-performance evaluation of the Higg Index 2.0 in the textile and apparel industry in the USA. Industrials experts through online surveys conducted the evaluation. The meta-performance evaluation allowed improvements in the Higg Index 2.0 and other sustainability assessment tools, namely the need of: (1) training to use this index, (2) adding a scalable model for smaller industries, (3) marketing, (4) a more simple interface, (5) sustainability enforcement, (6) certification/verification process. As Searcy (2012) highlights, these meta-performance applications can help to evaluate the effectiveness of indicator systems use for successful implementation of Corporate Sustainability Performance Measurement Systems. Evaluation at corporate level is still scarce compared to local, regional or country-level SDI systems.

Also at the organizational level, Hsieh and Jeon (2010), developed sustainable development indicators to evaluate hotel environmental awareness and commitment, following the categories defined by Ramos and Caeiro (2010): planning and conceptualization, implementation, operation and act, follow-up. The results allowed assessing the pro-environmental policies that are being implemented in the hotel industry.

Other studies didn't adopt yet the framework but advise and propose guidelines for its use, namely in the context of a geographical area, like a natural park (Marques et al., 2013), or at regional level (Mascarenhas et al., 2014) or national level (Ramos and Caeiro, 2010), with emphasis on informal and self-assessment processes.

Most of the examples presented earlier give emphasis or have the collaboration of technical staff and stakeholders in the meta-performance assessment process. The selection of a diverse group of experts is critical to ensure the credibility, transparency and robustness of the sustainability assessment processes (Jasinski et al., 2016). As Ramos et al. (2014) stress and as highlighted in this chapter, stakeholders' involvement (non-experts and experts) can effectively contribute to the design, data gathering and evaluation of sustainability indicators and respective meta-evaluation process.

As some authors emphasize, examples of meta-evaluations are beginning to emerge but still underdeveloped and are rare (Krank and Walbaum et al., 2011; Wallis et al., 2011; Morse, 2015; Morse, 2016). Nevertheless, they are possible and should be pursued, as presented and explored in this research. Adaptations to the needs and constraints of each particular case are necessary and meta-performance evaluation factors and indicators (see Table 32.1) can be selected or tailored to each specific situation.

Final remarks

Although the advantages of SDI systems as tools to assess and report sustainability and the extent to which sustainability indicator frameworks have proliferated, mainly at the country and local levels, most of these frameworks do not include meta-evaluation and/or sensitivity analysis procedures or – even less – indicators to operate this kind of analysis. Some work has been carried out to meta-evaluate sustainability indicators and indices, but none of it has tried to meta-evaluate an SDI system as a whole. It is mainly focused on analysis of the sensitivity of mathematical algorithms that support indices or on more particular thematic tools or domains, such as EIA, or ecological indicators.

In this chapter, a framework was presented to design and assess the effectiveness of sustainability indicators. This approach is based on a list of key meta-evaluation factors of good practice and indicators that will allow a more objective and transparent evaluation of overall performance monitoring activities and results. The proposed framework should be implemented through gradual and prioritized steps to mitigate practical difficulties, due to the complexity of institutional reporting processes.

The presented meta-evaluation approach assumes the collaborative contribution of stakeholders in the whole process. Stakeholders' roles in this method move beyond the simple checking and passive consultation of sustainability indicators, to act as committed co-meta-evaluators.

As argued by Ramos and Wallis (2017), sustainability indicators and related approaches have long been used to assess sustainability, therefore now is a good time to rethink their roles and applicability. Researchers in this area are faced with several challenging issues, and many of them are directly and indirectly related with the need of meta-evaluation of sustainability indicators, such as: How useful are indicators for the society and for effective stakeholders' use? How effective have indicators been at progressing sustainability/sustainable development? How do we assess the impact of sustainability indicator assessments? How should indicators be tailored to produce real impact on decision-making and policy processes? What are the strengths/benefits, drawbacks, opportunities and threats/barriers of using indicators? How resilient is the indicator concept and what innovations can be expected? The sustainable development goal posts keep changing; are we as indicator researchers keeping abreast of change? And if so, how?

Finally, are indicators flexible enough to include emerging issues and deal with overlooked aspects of sustainability? Particularly those involving global changes and threats, goal and target/limit uncertainty, sustainability ethics, cultural, aesthetics and general non-material values, blurred distinction between peacetime and wartime, collaborative learning, voluntary monitoring and crowd sourcing, and "new" versus "old" limits of the natural human system (Ramos, 2009).

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