

Assessing Sustainability: Research Directions and Relevant Issues

Francesco Scorza^{1(✉)} and Valentin Grecu²

¹ School of Engineering, Laboratory of Urban and Regional Systems Engineering, University of Basilicata, 10, Viale dell'Ateneo Lucano, 85100 Potenza, Italy
francesco.scorza@unibas.it

² Department of Industrial Engineering and Management, Lucian Blaga University of Sibiu, Sibiu, Romania
valentin.grecu@ulbsibiu.ro

Abstract. The growing research debate concerning sustainability and its applications in interdisciplinary domain represents a conjunction point where basic and applied science (scientific computation and applications in all areas of sciences, engineering, technology, industry, economics, life sciences and social sciences), but also qualified practitioners, compare and discuss advances in order to substance what we consider a the future perspective: “applied sustainability”. A relevant issue in order to compare and benchmark different position is the “sustainability performance assessment”. It means to discuss in a general view critical aspects and general issues in order to propose research directions and common parameters (indicators) to exchange and disseminate results and milestones in “sustainability” applications.

Keywords: Sustainability · Policy and planning · Development

1 To Define a Position: A Tentative

After United Nations 2030 development agenda setting-up Sustainable Development Goals (SDGs), expected to be one of the main influencing paper for mainstream global development policies in the coming years, and on the basis of the previous objective framework MDGs (Millennium Development Goals) the focus on sustainability increased both in theoretical perspectives but mainly in practical applications in every field of human action.

It is already possible to register an increasing global effort on “renewed sustainable development” with influences and constraints at multiple scale (from global action to national, regional and local dimension).

We refer to “renewed sustainable development” as a former concept, widely argued in multiple scientific domains (form planning [1] and management to decision science, from environmental science to economics and econometrics, from social science to operative research), but applied with increasing awareness in everyday human activity. So the envisaged renovation belongs more to the consciousness in taking into account

the need to verify sustainability as a balance between the use of resources and their reconstitution in a proper time-frame.

Most promising application domains belongs to the operative application in decision and policy making: knowledge management [2, 3]; land use and risk assessment [4–6]; organization management [7].

Such new starting point comes after excellent failure: Kyoto protocol is the main defendant on trial. It demonstrated how global agreement on challenging objectives could be undermined if human communities play the sole role of “les agès” in such process.

2 Renovation Opportunities from the Challenge of Complexity

Renovation means – of course – innovation: through ‘SDGs’ UN launched a permanent call for innovation where sustainability becomes a transversal value to be measured in order to define effective intervention process in every resource-consuming sector.

Such assumption re-launches the “Challenge of Complexity”. In other words it forces the research and the technical application towards interdisciplinary and, in particular, it asks for rigorous assessment methods in order to promote comparisons, sorting criteria, producing lessons learned from previous applications or outstanding projects.

If we focus the perspective in which ‘assessing sustainability’ means ‘assessing long term impacts’ on environmental or human resources, a requested innovation is to deliver products or supply chain models with required necessary features in a resource-scarce domain. If we consider social sustainability, the inclusiveness degree of social dynamics and policies represents an up to date indicator to be defined especially in the current EU development policy-making. If we point on sustainability assessment in anthropic practice: agriculture, industry, land use, urban development (including infrastructure), environmental risks, energy and/or – widely - climate change represents domains both for academic investigations and operative application regarding decision making, production, market and governance. But the list could be as longer as we enlarge the scope of subject areas or implementation domains. That’s the case if will focus on the hot spots: energy, water, and housing, environment, food, soil consumption, urban sprawl, technological innovations, social inclusion, as well as on their combinations.

The scientific debate we intend to stimulate will pay particular attention to methodologies, research reports, case study assessment concerning the various combinations of these and other areas in a multi- and interdisciplinary way.

General research questions to be answered to:

- how to enhance effectiveness in policy making, planning, development programs etc.? looking at actions or procedures based on (or derived by) SDGs or widely applying sustainability principles.
- Assessing sustainability through place based approach: innovation in methods and practices.
- Does an assessment matrix help/exist? Comparing different quantitative and qualitative approaches in sustainability evaluation.

- To learn from failures and to discuss success examples: the critical appraisal of on going concrete practices

3 Why Be Sustainable?

The interrelated challenges of financial instability, resource constraints, systematic degradation of eco-systems and social inequity redefine the overall conditions for business in the twenty-first century. An organization faces new demands in order to address these challenges, but also great opportunity for innovation. Although is sometimes neglected, the design and re-design of business models is an important aspect of innovation.

According to França [8], redesigning business models has been identified as a greater source of lasting competitive advantage than new products and services per se. Most of the managers that have reported benefits from becoming sustainable, as their company's sustainable activities have added profits, also say that these activities have led to business model changes.

The economic reasons that can be understood by managers from a selfish profit-oriented perspective are doubled by the international context. The State of the World 2004 report focuses on the consumer society and it argues that sustainable development initiatives have not resulted in overall lower use of resources and foresee even a higher consumption rate, given the need for economic development in the poorest countries that are to achieve the Millennium Development Goals and eradicate extreme poverty and hunger [9]. These reports stress the idea that consumption without limits is a huge threat to the planet.

To avoid such outcomes, there is an urgent need to consider whether and how, notions of sustainable development can be incorporated into the management of business [10].

4 Indicators for Sustainability Performance Assessment

Indicators have been defined in a number of different ways: the Dictionary of Environment and Sustainable Development [11] defines an indicator as: "a substance or organism used as a measure of air or water quality, or biological or ecological well-being".

The ISO 14000 [12] series defines an environmental indicator as: "a specific expression that provides information about an organisation's environmental performance, efforts to influence that performance, or the condition of the environment."

The OECD [13] provides another useful definition of an indicator as: "a parameter or a value derived from parameters, which provides information about a phenomenon. The indicator has significance that extends beyond the properties directly associated with the parameter values. Indicators possess a synthetic meaning and are developed for a specific purpose."

Even if the term might appear to be vague, indicators have been widely used for monitoring and assessment of numerous environmental impacts of operations, and are increasingly used in social and economic arenas [14]. To date the emphasis of the vast

majority of indicators has been placed on reporting, rather than management of impacts on mining on sustainable development. Consequently, to date, the most important criteria that define useful indicators are the capacity to simplify, quantify, analyse and communicate otherwise complex and complicated information, and the ability to make particular aspects of a complex situation stand out and thus reduce the level of uncertainty in the formulation of strategies, decisions or actions.

‘Indicators arise from values (we measure what we care about), and they create values (we care about what we measure)’ [15]. The main feature of indicators is their ability to summarise, focus and condense the enormous complexity of our dynamic environment to a manageable amount of meaningful information [16]. By visualizing phenomena and highlighting trends, indicators simplify, quantify, analyse and communicate otherwise complex and complicated information [14].

There is a widely recognised need for individuals, organisations and societies to find models, metrics and tools for articulating the extent to which, and the ways in which, current activities are unsustainable [17]. This need arises on multiple layers ranging from supra-national (e.g. the negotiation of protocols for environmental protection), national (e.g. via some version of “greening” GDP) and sub-national levels (e.g. in regional development forums) [18].

5 Conclusions

The focus on the “triple bottom line” that addresses issues related to the environmental impact, social responsibility and economic performance can determine the impact of industry on the environment and on the society. As presented above, many companies are addressing sustainable development and have different approaches in doing so. In order to achieve these objectives there is a need not only to re-think the practices in the industry, but also to re-define the instruments used to measure and monitor the achievements that have been made in the transition process towards sustainability.

The classical, standard financial indicators that have been used to assess the business effectiveness have been completed by sustainable performance assessment indicators, given the increased pressure and demand for sustainable practices, thus sustainability reports have become a trend in the corporate reporting [19].

As presented elsewhere [7], the sustainable organization needs to take into account several aspects that have been synthesized in performance indicators. These indicators not only measure the economic performance, as they used to do until recently, but also assess social responsibility and environmental performance. They are known as sustainability indicators and translate sustainability issues into quantifiable measures with the ultimate goal to address key sustainability concerns [20] and to provide information on how the company contributes to sustainable development [21].

Thus, it is clear that it is essential for any company to have integrated information on sustainable development for the decision-making process, as it is very complicated to rely on too many indicators.

References

1. Las Casas, G., Murgante, B., Scorza, F.: Regional local development strategies benefiting from open data and open tools and an outlook on the renewable energy sources contribution. In: Papa, R., Fistola, R. (eds.) *Smart Energy in the Smart City*, pp. 275–290. Springer International Publishing, Berlin (2016)
2. Scorza, F., Casas, G.L., Murgante, B.: Overcoming interoperability weaknesses in e-government processes: organizing and sharing knowledge in regional development programs using ontologies. In: Lytras, M.D., Ordonez de Pablos, P., Ziderman, A., Roulstone, A., Maurer, H., Imber, J.B. (eds.) *WSKS 2010. CCIS*, vol. 112, pp. 243–253. Springer, Heidelberg (2010). doi:[10.1007/978-3-642-16324-1_26](https://doi.org/10.1007/978-3-642-16324-1_26)
3. Scorza, F., Las Casas, G.B., Murgante, B.: That's ReDO: ontologies and regional development planning. In: Murgante, B., Gervasi, O., Misra, S., Nedjah, N., Rocha, A.M.A.C., Taniar, D., Apduhan, B.O. (eds.) *ICCSA 2012, Part II. LNCS*, vol. 7334, pp. 640–652. Springer, Heidelberg (2012)
4. Amato, F., Pontrandolfi, P., Murgante, B.: Supporting planning activities with the assessment and the prediction of urban sprawl using spatiotemporal analysis. *Ecol. Inf.* **30**, 365–378 (2015)
5. Amato, F., Maimone, B.A., Martellozzo, F., Nolè, G., Murgante, B.: The effects of urban policies on the development of urban area. *Sustainability* **8**(4), 297 (2016)
6. Amato, F., Martellozzo, F., Nolè, G., Murgante, B.: Preserving cultural heritage by supporting landscape planning with quantitative predictions of soil consumption. *J. Cult. Herit.* (2016, in press)
7. Grecu, V.: The global sustainability index: an instrument for assessing the progress towards the sustainable organization. *ACTA Univ. Cibiniensis* **67**(1), 215–220 (2015)
8. França, C.L.: *Introductory Approach to Business Model Design for Strategic Sustainable Development*. Blekinge Institute of Technology, Karlskrona (2013)
9. The Intergovernmental Panel on Climate Change Report (www.ipcc.ch). The United Nations Millennium Forum Declaration reports (www.un.org/millennium/declaration). Millennium Ecosystem Assessment Reports (www.millenniumassessment.org) and UNEP's Fourth Global Environment Outlook: environment for development report (www.unep.org/geo/geo4/)
10. Birkin, F., Polesie, T., Lewis, L.: A new business model for sustainable development: an exploratory study using the theory of constraints in Nordic organizations. *Bus. Strategy Environ.* **18**(5), 277–290 (2009)
11. Gilpin, A.: *Dictionary of Environment and Sustainable Development*. Wiley, Hoboken (1996)
12. Corbett, C.J., Kirsch, D.A.: International diffusion of ISO 14000 certification. *Prod. Oper. Manag.* **10**(3), 327–342 (2001)
13. OECD – Organization for Economic Co-operation and Development, Natural Resource Accounts. Environmental Monographs no 84, OECD, Paris OSM. Interactive forum on bond release in arid and semi-arid areas. Office of Surface Mining, U.S. Department of the Interior. Denver, Colorado, September 1996
14. Warhurst, A.: Sustainability indicators and sustainability performance management. Mining, Minerals and Sustainable Development [MMSD] project report, 43 (2002)
15. Meadows, D.H.: *Indicators and information systems for sustainable development* (1998)
16. Godfrey, L., Todd, C.: Defining thresholds for freshwater sustainability indicators within the context of South African Water Resource Management. In: 2nd WARFA/Waternet Symposium: Integrated Water Resource Management: Theory, Practice, Cases, Cape Town, South Africa. Practice, Cases, Cape Town (2001)

17. Singh, R.K., Murty, H.R., Gupta, S.K., Dikshit, A.K.: An overview of sustainability assessment methodologies. *Ecol. Ind.* **9**(2), 189–212 (2009)
18. Ramachandran, N.: *Monitoring Sustainability: Indices and Techniques of Analysis*. Concept Publishing Company, New Delhi (2000)
19. GRI-Global Reporting Initiative. *Sustainability Reporting Guidelines 2002 on Economic, Environmental and Social Performance*. Global Reporting Initiative, Boston, USA (2002). <http://www.globalreporting.org>
20. Azapagic, A.: Developing a framework for sustainable development indicators for the mining and minerals industry. *J. Cleaner Prod.* **12**, 639–662 (2004)
21. Azapagic, A., Perdan, S.: Indicators of sustainable development for industry: a general framework. *Trans. IChemE Part B Proc. Saf. Environ. Prot.* **78**(4), 243–261 (2000)