UNIVERSITÀ DEGLI STUDI DI SALERNO
Via Giovanni Paolo II
84084 Fisciano (SA)
Tel. 089 96 4029 Fax 96 4343
www.unisa.it

2017

Simona IANNIZZARO

LA SOSTENIBILITA' DI SISTEMI COMPLESSI: METODI E INDICATORI APPLICATI A UN CAMPUS UNIVERSITARIO

UNIVERSITÀ DEGLI STUDI
DI SALERNO
Dipartimento di
Ingegneria Civile

CORSO DI
DOTTORATO DI RICERCA IN
Ingegneria Civile, Edile-Architettura,
Ambientale e del Territorio

Tesi di Dottorato

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dott. ing. Simona Iannizzaro

Relatore
prof. ing.Vincenzo BELGIORNO

XV Ciclo Nuova Serie - Coordinatore: prof. ing. Ciro FAELLA

ABSTRACT

The present research aims at defining a methodological proposal to evaluate the environmental performances of a complex structure, in order to reduce the pressures and the environmental impacts of the various activities carried on, thus improving the overall sustainability of the system.
Considering all the variables of a complex system, including water and energy management as well as the system accessibility, the main objective is a place-based model, focused on the local context and addressed to the end user, pursuing the minimization of the sustainability footprint.
The definition of *sustainability*, the main research topic, is not nearly as simple as it might seem: an introductive framework of the concept of sustainability brings back to the "sustainable development" defined in the Bruntland report as "the development that meets the needs of the present without compromising the ability of future generations to meet their own needs".
Currently, this appears as the only way to reduce the natural resource consumption that tends to exceed what the planet's ecosystems can renew.
The present work reconstructed the history of the *sustainability* concept, which has become an issue of global concern in planning and scheduling the objectives for a sustainable development, since the first ecologists movements in the 1960s to summit and conferences of the main international organizations.
Simultaneously, on the basis of the scientific literature review, the framework of the same concept was defined. Such approach pointed out the multidisciplinary aspect of sustainability, which lays on the balance of three factors, known as the "three pillars of sustainability": environmental, economic and social dimension.
Several tools and methodologies have been proposed from the researchers, in order to meet the increasing need for sustainability quantification: different indicators and indices have been suggested, to summarize information and characteristics of the analyzed topic, in order to provide ratings and assessments focused on the target range.
The analysis of state of the art about environmental indicators focused on the evaluation tools useful for a reference context, namely a real system, resulting from the aggregation of diverse elementary units.
The experimental set up of the main University campus of Salerno, chosen as an example of complex system, raised the need for a baseline, in terms of environmental sustainability. This was given through the evaluation of the various campus operations and their negative impacts, with particular reference to solid waste management, water consumption, energy efficiency, transportation and pollutant emission.
For each field, raw data were collected and processed to gather information and knowledge of the principal aspects defining its environmental characteristics. This approach highlighted strengths, limits as well as improvement to be achieved and, in turn, addressed the selection of the most suitable indicators to be used within the proposed methodology.
The research activity showed that the particular analysis context can produce very heterogeneous results, so that a methodology focused on a specific set of indicators has been proposed, in order to address a reiterated evaluation of the environmental performances rather than pursuing ranking objectives.

Therefore, the present work did not lead to a simple classification of complex systems in terms of environmental sustainability, but to the proposal of a sequential comparative method, promoting an approach aiming at the sustainable improvement of the environmental performances.