



## Research article

## Development and validation of sustainability criteria of administrative green schools in Iran



Hossein Meiboudi <sup>a</sup>, Akramolmolok Lahijanian <sup>a,\*</sup>, Seyed Mohammad Shobeiri <sup>b</sup>,  
Seyed Ali Jozi <sup>c</sup>, Reza Azizinezhad <sup>d</sup>

<sup>a</sup> Department of Environmental Management, Faculty of Environment and Energy, Science and Research Branch, Islamic Azad University, Tehran, Iran

<sup>b</sup> Department of Environmental Education, Payame Noor University, Tehran, Iran

<sup>c</sup> Department of Environment, Islamic Azad University, North Tehran Branch, Tehran, Iran

<sup>d</sup> College of Agriculture and Natural Resources, Science and Research Branch, Islamic Azad University, Tehran, Iran

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## ABSTRACT

Environmental responsibility in school has led to the emergence of a variety of criteria to administer green schools' contributions to sustainability. Sustainability criteria of administrative green schools need validity, reliability and norms. The aim of the current study was to develop and validate assessment criteria for green schools in Iran based on the role of academia. A national survey was conducted to obtain data on sustainability criteria initiatives for green schools and the Iranian profile was defined. An initial pool of 71 items was generated and after its first edition, 63 items were selected to comprise the sustainability criteria. Engineering-architectural and behavioral aspects of this sustainability criteria were evaluated through a sample of 1218 graduate students with environmental degrees from Iran's universities. Exploratory factor analysis using principal components and promax rotation method showed that these 9 criteria have simple structures and are consistent with the theoretical framework. The reliability coefficients of subscales ranged between 0.62 (participation) and 0.84 (building location and position). The study's survey of correlation coefficients between items and subscales illustrated that those coefficients varied between 0.24 and 0.68.

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## 1. Introduction

In the monitoring of national environmental and sustainability issues, one of the main goals is to support decision making processes, thus improving sustainability management and achieving better development results. Despite the variety of approaches and tools for measuring sustainability, criteria almost always play a fundamental role. Sustainability criteria are one possible way of ensuring that sustainability issues are being consistently and transparently integrated into public and private affairs. Criteria provide sustainability assessment measurement, reporting, comparability and transparency to stakeholders.

Nowadays, green school sustainability criteria practices have

been initiated worldwide (Henderson and Tilbury, 2004; Mogensen and Mayer, 2005). Eco-Schools is an international program coordinated since 1994 by the international non-profit organization, Foundation for Environmental Education (FEE). It operates in 58 countries. FEE criteria for selecting Eco-Schools include 11 criteria, consisting of waste management, waste reduction, biodiversity, energy, water, transport, health, global sustainability, healthy nutrition, citizenship and climate change (FEE, 2016; Cincera and Krajhanzl, 2013). U.S. Green Building Council (USGBC) launched The Leadership in Energy and Environmental Design (LEED) 2009 Green Building Rating System for Schools New Construction and Major Renovations, which addresses 50 items in 7 criteria: Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, Indoor Environmental Quality, Innovation in Design and Regional Priority (Chan et al., 2015).

BREEAM (Building Research Establishment Environmental Assessment Method), in the United Kingdom, addresses 10 criteria: Management, Health and Well-Being, Energy, Transport, Water, Material, Waste, Land Use and Ecology, Pollution and Innovation

\* Corresponding author.

E-mail addresses: [links.state@gmail.com](mailto:links.state@gmail.com) (H. Meiboudi), [lahijanian.ak@gmail.com](mailto:lahijanian.ak@gmail.com) (A. Lahijanian), [sm\\_shobeiri@pnu.ac.ir](mailto:sm_shobeiri@pnu.ac.ir) (S.M. Shobeiri), [sajozi@yahoo.com](mailto:sajozi@yahoo.com) (S.A. Jozi), [r.azizi@srbiau.ac.ir](mailto:r.azizi@srbiau.ac.ir) (R. Azizinezhad).

(BREG, 2008). Green Star Education v1 in Australia addresses 9 criteria: Management, Indoor Environmental Quality, Energy, Transport, Water, Material, Land Use and Ecology, Emissions and Innovation (GBCA, 2015). CSUS (China Society for Urban Studies) in China addresses 6 criteria: Planning and Sustainable Site, Energy, Material and Water, Indoor Environmental Quality, Management, Education (CSUS, 2011).

Countries considering their own socioeconomic and cultural characteristics must be able to adapt these criteria from generalities and into their own particular circumstances (Datnow, 2005; Durlak and DuPre, 2008). For example, climatic conditions in the Middle East, where the temperature difference between day and night is significantly wider, thus requiring a great deal of energy consumption to make conditions livable, together with the sharp increase in the utilization of fossil fuels that greatly contributes to air pollution and raises the air temperature, have compelled local people to find a solution to this grave problem (Mahdavinejad et al., 2014). Therefore, it is necessary to establish sustainability criteria of administrative green schools based on socioeconomic and cultural background.

The need for comprehensive sustainability criteria becomes evident when important public policy-making is decentralized to communities. The aggregation of data from lower levels could lead to a loss of accuracy and robustness in the analysis of particular situations. As reported by Meiboudi et al. (2016), on a national scale, the problems may be different, requiring tailored tools. Additionally, with more focus on sustainability criteria across the world, standardized criteria are one of the fundamental characteristics of these features, and include validity, reliability and norms. Thus, any rating based on any non-standard methods lacking accuracy and efficiency would not contribute to advancing the green school concept.

Developing sustainability criteria cannot be a purely scientific or technical process; rather, it should be an open communication and policy process (Ramos, 2009). Public participation, especially from universities, is one of the principal components for designing and implementing sustainability criteria sets, as stressed by several authors (e.g. Ioris et al., 2008; Ramos, 2009; Ridsdale and Noble, 2016). The importance of participatory design becomes more obvious on a national and regional scale, where the distances between experts, specialists and decision-makers overall are smaller and the interaction can be comprehensive and more effective.

Academia has the expertise necessary to develop the intellectual and conceptual framework to achieve a sustainable development goal. Universities must play a significant role in the education, research, policy formulation, information exchange and community outreach required to create sustainability criteria on a national scale.

As discussed, this study focuses on developing sustainability criteria for the green school in Iran from 2 perspectives: (i) developing sustainability criteria for administrative green schools in Iran based on role of academia; and (ii) assessing the adequacy of the items for assessing and achieving the exploratory factor structure embedded in the criteria.

## 2. Research methodology

The present study's goal is research and development, in both technique and data gathering for a descriptive survey. The research methodology was premised on the multitude of items that a green school must accomplish to help participants meet the criteria (Dautremont-Smith, 2012). With this understanding, questionnaires were formulated, pilot tested, and administered. The framework of methodology is organized into 4 sections as discussed below.

### 2.1. Survey questionnaire

The questionnaire consisted of three main sections; the first section covered respondent and personal data such as name, gender, age and university. Section two is investigated 9 criteria with related items. The respondents were asked to rate the appropriateness of the items on a five-point priority scale ranging from 1 (completely inappropriate) to 5 (completely appropriate). The third section included the whole list of pooled and grouped items. Again, the respondents were asked to identify the appropriateness score for each item, using the same five-point priority scale previously introduced. At the end of each group of criteria, the respondents were given the chance to add and rate any additional items.

We administered questionnaire to a group of 1218 graduate students with environmental degrees from Iranian universities. Of 32 universities in Iran with programs in environmental studies, graduate students from 27 universities completed the questionnaire and submitted their responses within the time allotted. This population size was chosen for the adequacy and appropriateness of the item analysis and exploratory factor analysis.

### 2.2. Data acquisition

Researchers have reported several criteria for the administrative of green schools, which, despite their multiplicity, convincingly converge in engineering-architectural and behavioral aspects (Meiboudi et al., 2016). In this research, sustainability criteria of administrative green schools in Iran was developed based on 9 criteria, including building location and position, indoor air criterion, green space, management, energy, waste management, transportation, education and participation, adopted from 5 different sustainability criteria for green schools and their accordance with Iran's conditions. The selected green school criteria are known and represent existing criteria well. In this regard, the criteria provided by FEE (FEE, 2016), LEED (USGBC, 2009), BREEAM Education 2008 (BREG, 2008), Green Star Education v1 (GBCA, 2015) and CSUS (CSUS, 2011) were used.

An initial pool of items was generated and 71 items were selected with each item linked to one of the 9 above-mentioned criteria. At first, with the aid of 9 professionals in the green school scope via unstructured interviews, the initial refining took place among the items selected. A professional is usually defined as someone who has experience or skill in a particular job or activity in administrative green schools. The outcome of this process led to removing 8 items in the questionnaire and reaching a total of 63 items. From these items, the preliminary version of the sustainability criteria on a national scale was built.

After the questionnaire was developed, the pilot study needed to be conducted before the main survey. The aim of the pilot study was to find out whether these questions were clear, how long it took for the participants to finish, whether they answered in a proper way, etc. It helped to identify some problems and polish the final questionnaire. The pilot study to assess the adequacy and suitability of the criteria's items were assigned to 50 graduate students with environmental degrees, who were asked their opinions about the articulacy and directness of the expression of these items among the criteria. During this stage, the statement of changes saw several items added and syntax stabilized. After this stage, it was necessary to implement the criteria in large population groups to enable analysis and to evaluate the engineering-architectural and behavioral aspects of this sustainability criteria.

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