

University and Sustainable Urban Development Indicators for Analysis and Evaluation¹

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Abstract

University is an institution with a high potential to promote changes that lead to better social outcomes in terms of sustainability and social responsibility. Therefore, it seems highly necessary to know what sustainability strategies Universities are following, to what extent they are assuming their role as agents of change and in what lines of work they should deepen in order to achieve the Sustainable Development Goals. The objective of this paper is to present the results of a research work that analyses and evaluates, from an interdisciplinary approach, the role of universities in sustainable development. More specifically, the paper carries out an evaluation of the strategies adopted by three Spanish universities: Universidad Autónoma de Madrid, Universidad Carlos III de Madrid and Universidad de Castilla-La Mancha. The final output of this work is a system of University Sustainability Assessment Indicators, which will allow, on the one hand, monitoring of university actions in sustainability and, on the other, formulate new initiatives that improve university sustainability performance.

1. Introduction

The social role of the University has been widely studied. Some authors consider it as a key part of the process of creation and transmission of knowledge (Keeble and Wilkinson 1999, Lawson and Lorenz 1999). In the Triple Helix Model, University responds, through innovations, to new social demands with the support of both the government and the industry (Farré-Perdiguer et al. 2016), thus contributing to the economic and social development of its immediate environment (Clark 1998, Di Gregorio and Shane 2003, Shane 2004, Clarysse et al. (2005), O'Shea et al. 2005, Bercovitz and Feldmann 2006, Rothaermel et al. 2007, González de la Fe 2009, Salamzadeh et al. 2011). Other authors place the role of the university closer to training, research, exploitation and diffusion of technology as well as a source of skilled employees (Markusen 1996). There is no doubt that, as an institution, the university plays a relevant and influential role in its immediate environment, which has led it to expand its initial objectives towards others closely linked to sustainable development².

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² Since the Stockholm Summit (1972) several initiatives have been promoted in order to incorporate the sustainability concept into the different academic spheres. Some of these initiatives are: the Tbilisi Declaration (1977), Talloires Declaration (1990), Halifax Declaration (1991), Rio de Janeiro Declaration (1992), Kyoto Declaration (1992), Swansea Declaration 1993), University Charter for Sustainable Development (1993), Thessaloniki Declaration (1997), Lüneburg Declaration (2001), UN Decade of Education for Sustainable Development: 2005-2014 (2003), Barcelona Declaration (2004), Lübeck Declaration: University and Sustainability (2005), Graz Declaration (2005), Bonn Declaration (2009), Abuja Declaration (2009), Turin Declaration (2009), the Higher Education Sustainability Initiative (HESI) Rio+20

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The 2030 UN Agenda for Sustainable Development ratifies the commitment of the international community to the universal Development Goals and the importance of sustainability as a basis for the nation's welfare and their prosperity. Goal 4 aims to "ensure inclusive, equitable and quality education and promote lifelong learning opportunities for all" focusing on education as a key tool for development. More specifically, it is suggested that by 2030 "all students should be given the necessary theoretical and practical knowledge to promote sustainable development, through different means such as education for sustainable development, the adoption of sustainable lifestyles, human rights, gender equality, the promotion of a culture of peace and non-violence, global citizenship, the acceptance of cultural diversity and the contribution of culture to sustainable development".

In this scheme, University should contribute by ensuring equal access in 2030 for all men and women to technical, professional and higher quality training and by promoting the mobility of students from developing countries, especially those from less developed (United Nations, 2015). These proposals are also combined with the other 16 major Goals in which all the dimensions of sustainable development permeate the initiatives at global and local levels. This statement emphasizes the role of universities as drivers of sustainable development through training their students in the addressing of this challenge. Besides, universities are strategic institutions that exert broad influence in the immediate environment. Beyond its formative activity, university is also able to contribute to sustainable development through the management of its systems and structures, through research activity and actions aimed at the transformation of knowledge and by the building of capacity with stakeholders across its community (Shiel et al. 2016).

Different authors have defined what sustainable universities mean. Some believe that a sustainable campus should be environmentally healthy with a thriving economy through conservation of energy and resources, efficient environmental management, promoting equity and social justice, and extrapolating those values to the rest of the community (Alshuwaikhat et al. 2008). Others offer a more restricted concept and consider that the university should be a place where everyone has the opportunity to benefit from quality education, in which values, behaviours and styles of life for a sustainable future and a positive transformation of society are learned (Milutinovic et al. 2014). Therefore, there are different ways of understanding sustainability in universities, so that the incorporation of sustainable aspects has followed different itineraries. Some universities have focused exclusively on the incorporation of curricula related to the subject and on the development of research in this area while others have also established an environmental strategic plan with more ambitious objectives that include a sustainable campus with an environmental management. In addition, the sustainability concept has

(2012), Ibero-American Networks of Universities Alliance for Sustainability and the Environment (ARIUSA) (2013), 2030 Agenda for Sustainable Development (2015). In the Spanish case, the 2015 University Strategy underlined the importance of the interactions between the University and the Territory (Ministry of Education 2011a and b). One of the axes of this strategy is the university social responsibility and its contribution to the three aspects of the sustainable development (social, economic and environmental).

evolved towards multidimensional and interconnected approaches in which, along with environmental dimension, others related to social responsibility, ethical issues or the fulfilment of human rights occupy a relevant space³.

In this context, to diagnose the degree of engagement of the universities with the sustainability, evaluate their performance and keep track of their plans, require specific systems of statistics and indicators. In this line goes this paper whose main objective consists of building a set of indicators that seeks to identify sustainable actions performed by universities (internal indicators) and its influence on the closest urban environment (external indicators). This system of indicators would also provide an evaluation framework for the contribution of universities to sustainability and, finally, will serve to identify good sustainable practices from which to design models for the implementation of sustainability policies in the University. The sections of this paper are organized as follows. Section 2 addresses the role of indicators as instruments of measurement and analysis of sustainability and presents a proposal of sustainability indicators, evaluating their feasibility and making recommendations for the future. In Section 3, conclusions and future lines of research are presented.

2. Indicators for Sustainability Analysis and Evaluation

Sustainability concept has been widely studied from a theoretical point of view but its practical implementation faces significant difficulties for several reasons as the lack of an overall vision and common guidelines shared by the policy makers at the different levels. This makes it difficult to monitor and evaluate sustainable actions. In the 1990s, it was already warned about the need to increase statistical data by establishing economic or environmental indicators that would serve as sensors, measuring the achievements of the process towards sustainability. Thus, there were a number of international initiatives that developed indicator frameworks, mainly of an environmental nature, which only offered a fragmented vision of sustainability, again revealing the need to develop global environmental or sustainable development indexes.

When referring to the university level, this constraint is even more remarkable since there is no common framework for measuring or evaluating how universities contribute to sustainability. Some authors have emphasized the importance of having methodological frameworks that allow comparability of institutional evaluation (Shriberg, 2002). In the case of Spain, the Conference of Chancellors (Conferencia de Rectores de las Universidades Españolas, CRUE), also raised the need to establish a common system of indicators for the diagnosis of university sustainability, although without determining the ultimate purpose of this system. That is, whether it should be used to carry out a comparative analysis of Universities in terms of sustainability or be a benchmark for those who are still at an early stage in the path of sustainability⁴.

³ For the Spanish case, the legal reference to these issues is the Real Decreto 1393/2007, October 29, establishing the disposal of official university education.

⁴ Conference of Chancellors. Conclusions of the 7th Conference of the Environmental Permanent Workshop "Indicators and Sustainability in Universities" Working Group of CRUE for Environmental Quality and Sustainable Development.

2.1 Methodological proposal

There are several proposed models of categorization of indicators, such as the OECD State-Pressure-Response model, widely accepted, or the Greenmetric⁵ initiative for the measurement of university sustainability. However, both frameworks focus too heavily on the environment area, giving more weight to these indicators than to the other dimensions of sustainability. This work considered, when making the proposal for indicators, that these should be tools that provide us with synthetic information about the university reality from a sustainable point of view so that, with its evaluation, informed decisions can be taken. In addition, a specific operational categorization was required, reflecting, on the one hand, the internal aspects linked to sustainability, ie those related to training, research, governance and social and, on the other, the external aspects, that is those outside university that are influenced by university actions as the impact that comes from academic-scientific production and from cooperation and research agreements with other actors public or private. The external indicators proposed reflect the factors that can contribute, for example to the sustainable development of the nearest territorial environment.

In the same way, this battery of indicators would be classified according to the four basic dimensions of sustainability: economic, social, environmental and institutional.

The first step in this work consisted of the identification of a battery of 105 indicators with information from a group of universities with different experiences in this area. This battery was tested for three Spanish Universities, the Autonomous University of Madrid, the Carlos III University and the University of Castilla-La Mancha with the objective of using the results to define a common methodological framework for indicators.

Some of the most relevant conclusions obtained with the universities' information were:

- Their responsible are aware of the need for change and transition towards a sustainable university model. This is reflected in the incorporation of sustainability as an objective of its Strategic Plans or in the different institutional commitments on the vision and mission of universities.
- The commitment with society, development, equality and environment, manifested in all the university areas (training, research, and management), is a current and future challenge for the universities. In some of them, the introduction of sustainability has focused exclusively on the incorporation of curricula related to the subject, while others have established an environmental plan with more ambitious goals including not only a sustainable campus with an environmental management but also the development of lines of research, teaching in this area and the strengthening of external collaborations that promote these objectives.
- Participating Universities belong to some type of initiative that promotes sustainability, for example, University Networks that work for sustainability with internal actions such as sustainability training and infrastructures for environmental

⁵ GreenMetric uses six criteria, each with a specific weight defined, in turn, by different indicators. The criteria are: Infrastructure (15%); Energy efficiency and the Fight against climate change (21%); Waste management (18%); Water resources (10%); Promotion of clean transport (18%); Environmental education (18%).

management of the Campus (Green Offices, Departments, etc.)

- Regarding internal aspects related to the economic dimension of sustainability, the participating universities, with some exceptions, practice a transparency policy by publishing their Accounts Reports. This information, usually not linked to sustainability, has a public nature and is subject to control. In some cases, Analytic Accounting has been developed. There is usually no specific item on sustainability in their budgets, although there is compliance with what is stated in their strategic plans.
- With regard to the internal aspects related to the social dimension of sustainability, many universities have departments or units dedicated to the management and implementation of measures for sustainability. Therefore, there are more human resources dedicated to this with an increasing number of groups and work teams committed to sustainability. Research and teaching activities in these fields have been intensified since the 2000s, although for most universities it can be said that there is still little research and teaching initiatives on the subject, with a predominance of the area of the Sciences on the Social Sciences. However, there is a growing presence of research and teaching initiatives that have accelerated scientific training and production in this area. There is also interest in developing sustainable activities beyond research and teaching that are materialized in awareness campaigns with the development of workshops, contests, etc. In addition, there are measures linked to the social responsibility of the University such as gender equality plans, conciliation policies, protocols against harassment, etc. There is also a great development in the area of sustainable mobility in practically all the participating universities with access plans, promotion of public transport, bicycles, etc. As well as infrastructure to comply with it (bicycle parking, points to recharge electric vehicles, etc.).
- Talking about the internal aspects related to the environmental dimension of sustainability, the participating universities had some specific policy related to environmental management, although there were many related to the management of resources, more specifically, energy related to the Improving efficiency or saving water. Likewise, in most universities, waste policy has a relevant weight. They also have organizational structures linked to environmental aspects. Universities have not established environmental management systems following international standards such as ISO 14001 that would guarantee compliance with the environmental regulations that affect them and measures for continuous improvement of environmental aspects. Only a few of these universities have certifications of this type. On the contrary, it is common to find sustainable building certifications following LEED certification. No fines or infractions related to the management of these universities have been detected.
- An important objective of the analysis was to capture the impacts that university activity had on its territory. In many cases, the analysis of information obtained shows a very close link with the surrounding territory, with many cases of close collaboration between the University, the productive sector and institutions, in line with the Triple Helix model. Universities often have collaboration agreements with external institutions that promote sustainability. In the same way, the University has established channels to know the impact of its academic-scientific production as well as mechanisms to know the employment situation of its graduates (Employment

Observatories and Reports of Labour Insertion). Similarly, many of them have employment grants to channel the demands of the nearest productive sector. From these conclusions, it was considered that not all the indicators included in the initial battery were adjusted to the specific characteristics of the universities. The battery was consequently reformulated in order to achieve more homogeneity in the proposal. The fundamental idea is that the output of this work, adjusted and compatible, can be the basis for improving the sustainable management of the participating institutions, helping to optimize decision-making by establishing sustainability-related objectives and priorities.

2.2 Battery of indicators for the evaluation of sustainable university performance

For the definition of the battery of indicators, the following premises were established:

1. The non-use of a high number of indicators since otherwise would be impractical and manageable. To this end, the relevance of some indicators, for example, those actions that are obligatory by law, has been not considered appropriate to introduce them.
2. The existence of available information related to the defined indicators in order to favour the achievement of the proposed objectives.
3. The maintenance of the internal and external classification of indicators as well as the division into four dimensions: *economic*, *social*, *environmental* and *institutional*.

Starting with the *institutional dimension*, it refers to the governance of sustainability, that is, the most general vision of the University on this issue. The indicator set includes policies, management or those measures conducive to the corporate social responsibility of the institution. Two indicator types have been included: on the one hand, those related to the vision of sustainability in the Strategic Plans, ie the existence of a real commitment reflected in the University Statutes itself or in its mission. They are indicators related to the commitment to development, the environment, reducing environmental impact and to social issues. On the other, those indicators that reflect the initiatives that promotes sustainability, such as participation in different global or regional networks of Universities for Sustainable Development. Likewise, it is important to include here indicators related to the institutional infrastructure developed by the University, such as Vice-Chancellors that deal with this type of issues.

With regard to internal aspects, the *economic dimension* of sustainability refers to the impact of the organization on the economic conditions of its stakeholders at a local, national and global level. In this sense, it is important to include indicators that show the integration of sustainability as a specific item in the university budget. In the same way, it is important to know the indirect items, those that, without being defined in a specific chapter of sustainability, are clearly of that nature, for example, everything destined for parks, gardens, buildings for energy saving, responsible shopping, etc. In this same block would include indicators related to the transparency of the University i.e. if it has a web portal of transparency or systems of economic control accounting or analytical accounting to know the status of each academic unit.

The internal aspects linked to the *social dimension* of sustainability reflect the impacts of the organization's activities on the social systems in which it operates. Indicators should reflect the performance of the university in relation to labour, human rights, society and

social responsibility. In these way indicators defined are:

- ✓ Human resources, departments, units dedicated directly or indirectly to the management and implementation of measures for sustainability. These are all types of personnel (teachers, administrative staff and services) involved in tasks that correspond or are linked to sustainability and which appear as such in the organizational chart of the University.
- ✓ Training in sustainability, that is, educational programs that directly or indirectly include the perspective of sustainable development in its curricular aspects. Likewise, it is of great interest to know what initiatives are carried out for continuous training in sustainability.
- ✓ Sustainability research, number of research groups oriented to this type of issues, research institutes and specific projects.
- ✓ Equality plans established by the University as well as administrative equality units that allow its follow-up. In this regard, it is considered important to have measures that promote family reconciliation as well as women's health plans.
- ✓ Sustainable mobility, understood as one that allows reducing the environmental impact of transportation to access the University as well as the development of measures for sustainable internal campus mobility.
- ✓ Reduced mobility consisting of accessibility plans for the population with mobility problems.

The internal *environmental* dimension of sustainability addresses several issues related with environmental impacts as well with environmental management:

- ✓ Impacts on living and inert natural systems, including ecosystems, soil air and water. Environmental indicators cover performance in relation to inflows (materials, energy, and water) and output (emissions, discharges, waste).
- ✓ Environmental legal compliance highlighting the existence of fines or penalties for environmental non-compliance.
- ✓ The existence of a specific policy that defines the commitment of the university with the environmental aspects.
- ✓ The organizational structure to evaluate the environmental aspects derived from its activity.
- ✓ The realization of environmental awareness campaigns in its workers and the rest of the university community.
- ✓ The existence of environmental management systems or environmental certifications that may be linked to the management systems themselves or to specific certifications as ecological buildings.

Table 1. Sustainable indicators: internal aspects

Internal Aspects. Institutional Dimension	<ul style="list-style-type: none"> ✓ Sustainability in university policy, strategic plans ✓ Standards, codes of conduct for sustainability. Ethical Codes ✓ Environmental Policy ✓ Initiatives that promote sustainability: awareness campaigns, etc.
Internal Aspects. Economic Dimension	<ul style="list-style-type: none"> ✓ Integration of sustainability into the budget with a specific heading ✓ University transparency portal ✓ Design and application of an analytical accounting system, own and specific. ✓ Volume and participation in the total of the economic resources allocated in the last financial year dedicated to sustainability ✓ Volume of other items indirectly associated with sustainability in the last financial year ✓ Breakdown by total type of environmental expenditure and investments in the last financial year
Internal Aspects. Social Dimension	<ul style="list-style-type: none"> ✓ Amount of human resources allocated, directly or indirectly to sustainability issues

	<ul style="list-style-type: none"> ✓ Number of responsible, offices, and services on sustainability ✓ Sustainability training (grades, postgraduate courses, specific subjects, etc.) ✓ End-of-degree work / specific sustainability projects ✓ Research groups (number and % of total) ✓ Research projects in the last five years ✓ Doctoral theses in the last five years ✓ Institutes, research centers linked to sustainability ✓ Equality plans at present ✓ Equality units ✓ Specific measures for family reconciliation ✓ Health plans for woman ✓ Sustainable Mobility Plans ✓ Use of internal ecological mobility ✓ Reduced mobility plans ✓ Accessibility
Internal Aspects. Environmental Dimension	<ul style="list-style-type: none"> ✓ Environmental indicators <ul style="list-style-type: none"> ○ Energy (energy consumption, renewable energy initiatives, ecoefficiency energy measures, etc.) ○ Water (consumption, recycling, reuse and saving, Wastewater discharges) ○ Waste (amount generated, treatment, etc.) ○ Soil (percentage of green areas) ○ Noise (campus measurements, reduction plans, etc.) ○ Emissions (measurements, reduction plans) ✓ Organizational structure to assess environmental aspects ✓ Compliance with environmental legislation, fines and penalties ✓ Environmental management systems ✓ Environmental certifications ✓ Environmental awareness campaigns

External indicators seek to see the impact of university activity in relation to its territorial environment. It has been estimated that the main impact comes from academic-scientific production and cooperation and research agreements with other public and private actors. It is understood that these indicators essentially contribute directly to the sustainability of the territory, and also that in the case of the internal ones, they are classified in four dimensions: economic, social, environmental and institutional.

Table 2. Sustainable indicators: external aspects

External Aspects. Institutional Dimension	<ul style="list-style-type: none"> ✓ Public declaration or pronouncement assuming commitment and sustainability objectives ✓ Strategy for a responsible purchasing and consumption ✓ Institutional linkage in the field of sustainability with external actors (government, social agents, associations, etc.)
External Aspects. Economic Dimension	<ul style="list-style-type: none"> ✓ Grants and subsidies (for studying, research, investment, or for the organization) received by the University in relation to sustainability ✓ Other external resources, public and private received ✓ Grants and subsidies related to sustainability provided by the University to its local or regional environment
External Aspects.	<ul style="list-style-type: none"> ✓ Awards for external sustainability practices

Social And Environmental Dimension	<ul style="list-style-type: none"> ✓ Sponsorship of a sustainability award for University local or regional environment. ✓ Monitoring and evaluation of university research output ✓ Monitoring and evaluation of the labour insertion of its graduate and postgraduate students. ✓ University-Firms collaboration in teaching and research projects and activities
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Conclusions

Both international (Declaration of objectives of the United Nations Agenda 2030) and national commitments emphasize the role of universities as vehicles for achieving sustainable development. However, there are different ways of understanding sustainability in the University, partly motivated by the existence of different aims, different models of governance, corporate culture, many of them historically determined by economic and social development. From this point of view, it is not possible to establish hierarchies between universities or to speak about reactive or excellent positions in terms of sustainability. From a more operational point of view it is more useful and interesting to establish good practices or models of universities more sustainable universities in a broad sense.

Therefore, based on the analysis of specific actions carried out in sustainability by three Spanish universities, this paper proposes a set of indicators to diagnose the internal and external aspects of university sustainability from the four dimensions of sustainability: economic, environmental, social and sustainability. The first block of indicators has to do with the sustainable actions of the University in each of the defined dimensions and, the second, refers to the external aspects, under the initial hypothesis that in many cases there is a very close link between the University and the surrounding territory. University has influence, with its sustainable actions in the urban development. Thus, many of the objectives set by the University to improve its sustainability depend on external elements and is also conditioned by the environment in which it is inserted by limiting or guiding its lines of action.

The validity of the battery of indicators will depend on their monitoring in the time and the proposals for improvement depending on the sustainable objectives or, in many cases, on legislation compliance. The rest of the indicators from the original battery are future proposals in order to develop information and actions in the medium and long term.

A deeper analysis of this system of indicators opens up future research routes. One of them would take as a starting point the results of this work to try to define the variables that help to explain the diversity of degrees of progress of the university's sustainability programs. This evaluative framework could act as a guide in the progressive performance of university sustainability plans. It would also make the progress of the universities in terms of sustainability more visible to society, contributing to greater public awareness and promoting a greater involvement of stakeholders at local and regional level. In this way, the University activates its role of change, favouring the transition between development models, the current non-sustainable, and the necessary, to reach, that must be.

References

- Alshuwaikait, H., Abubakar, I. (2008): “An integrated approach to achieving campus sustainability: assessment of the current campus environmental management practices”, *Journal of Cleaner Production* 16, 1777-1785.
- Bercovitz, J., & Feldmann, M. (2006). Entrepreneurial universities and technology transfer: A conceptual framework for understanding knowledge-based economic development. *Journal of Technology Transfer*, 31(1), 175–188.
- Clark, B. (1998). *Creating entrepreneurial universities: organizational pathways of transition*, Oxford: Pergamon Press.
- Clarysse, B., Wright, M., Lockett, A., Van De Velde, E., & Vohora, A. (2005): “Spinning Out New Ventures: A Typology of Incubation Strategies from European Research Institutions”, *Journal of Business Venturing* 20, 183-216.
- Di Gregorio, D. & Shane, S. (2003): “Why Do Some Universities Generate More Start-Ups than Others?” *Research Policy* 32, 209–227.
- Farré-Perdiguer, M., Sala-Rios, M., & Torres-Solé, T. (2016). Network analysis for the study of technological collaboration in spaces for innovation. Science and technology parks and their relationship with the university. *International Journal of Educational Technology in Higher Education*, 13(8).
- González de la Fe, T. (2009). El modelo de triple hélice de relaciones universidad, industria y gobierno: un análisis crítico. *ARBOR Ciencia, Pensamiento y Cultura* CLXXXV 738, julio-agosto.
- Keeble, D. & Wilkinson, F. (1999): “Collective Learning and Knowledge Development in the Evolution of Regional Clusters of High Technology SMES in Europe”, *Regional Studies* 33(4), 295–303.
- Lawson, C. y Lorenz, E. (1999): “Collective Learning, Tacit Knowledge and Regional Innovative Capacity”. *Regional Studies* 33(4), 305–317.
- Markusen, Ann (1996): “Sticky Places in Slippery Space: A Typology of Industrial Districts”, *Economic Geography* 72(3), pp. 293–313.
- Milutinovic, S., Nikolic, V. (2014): “Rethinking higher education for sustainable development in Serbia: an assessment of Copernicus charter principles in current higher education practices”, *Journal of Cleaner Production* 62, 107-113.
- Ministerio de Educación (2011a): *Estrategia Universidad 2015. Contribución de las universidades al progreso socioeconómico español 2010-2015*, Secretaría General de Universidades, Madrid.
- Ministerio de Educación (2011b): *La responsabilidad social de la Universidad y el desarrollo sostenible*, Secretaría General de Universidades, Madrid.
- O’Shea, R. P., Allen, T., Chevalier, A., & Roche, F. (2005): “Entrepreneurial Orientation, Technology Transfer and Spinoff Performance of U.S. Universities”, *Research Policy* 34 (7), 994–1009.
- Rothaermel, F. T., Agung, S. D. & Jiang, L. (2007). Entrepreneurial activities at universities: Past research, current state, and future directions. *Industrial and Corporate Change*, 16(4), 691–791.
- Salamzadeh, A., Salamzadeh, Y. & Darey, M. (2011). Towards a systematic framework for an entrepreneurial university: a study in Iranian context with and IPOO Model. *Global Business and Management Research*, 3 (1), 31-37.
- Shiel, C., Filho, W.L., do Paço, A. & Brandli, L. (2016). Evaluating the engagement of universities in capacity building for sustainable development in local communities. *Evaluation and Program Planning*, 54, 123-134.
- Shriberg, M. (2002). Institutional assessment tools for sustainability in higher education: Strengths, weaknesses, and implications for practice and theory. *International Journal of Sustainability in Higher Education*, Vol. 3 Issue: 3, pp.254-270, doi: 10.1108/14676370210434714
- United Nations (2015): *Proyecto de documento final de la cumbre de las Naciones Unidas para la aprobación de la agenda para el desarrollo después de 2015*, A/69/L.85, Nueva York, 08/12/2015.