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**Sustainable Development Goals mapping processes in Higher
Education Institutions: an overview**

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Abstract

Higher Education Institutions (HEIs) are key actors to achieve the Sustainable Development Goals (SDGs): they are not only important economic actors in the physical context they operate, but they also act as reference for transitions toward sustainable development. HEIs are now faced with the societal responsibility of providing guidance towards the SDGs, in educating future decision makers and practicing what they preach in all the dimensions of University's sustainability: education, research, campus management and urban outreach.

Mapping what is already being done by the major universities can be an important step to deepen the understanding of how to implement SDGs at a local level.

This thesis contributes to this step by mapping tools to identify key stakeholders engaged in contributing to the SDGs, keep database of what is already being done, identify strengths and gaps in the organization activities, gather information for reporting, communicating and showcasing the institution's contribution to the SDGs.

A systematic literature review was carried out in a first phase with the aim of identifying the SDGs mapping tools and methodologies used by HEIs, where the first ten relevant entries were analysed. Scientific publications were selected across those specifically focusing on SDGs mapping. Then, the first ten ranked universities in the Times Higher Education Impact Rankings (THE) 2020, that is the only global performance tables that assess universities against the SDGs, were used as a sample for analysing current best practices.

Results present a comparative analysis on Sustainable Development Goals mapping tools as adopted in Universities across the world. Conclusions show how the SDGs progress measurement represents a starting point for a comprehensive assessment of institutions' contribution to the achievement of the goals. This thesis offers a baseline to assess the current situation and help HEIs decision makers to design pathways towards SDGs.

Abstract (Italiano)

Le università ricoprono un ruolo centrale per il raggiungimento degli Obiettivi di sviluppo sostenibile (SDGs). Gli istituti di istruzione superiore si trovano oggi di fronte alla responsabilità sociale di essere non solo di supporto a tutti gli attori del territorio che lavorano per ristrutturare i propri obiettivi intorno a quelli delle Nazioni Unite, ma anche luoghi di elezione per formare i futuri autori del cambiamento tanto auspicato quanto urgente. Ma come si mappano i progressi nel raggiungimento degli SDGs all'interno delle quattro principali dimensioni dell'università, ovvero formazione, ricerca, gestione del campus e terza missione? La mappatura degli SDGs è uno strumento di valutazione e decision-making fondamentale per identificare in quali aree l'università sta già contribuendo agli SDGs, per tenere traccia di ciò si sta già facendo, quali sono i punti di forza e di debolezza, e infine per riportare, comunicare e condividere il contributo verso gli SDGs della propria istituzione in rete con le altre.

Una revisione sistematica della letteratura ha permesso di capire ad oggi quali strumenti e metodologie di mappatura degli SDGs sono stati utilizzati dalle maggiori università nel mondo. In una prima fase sono state analizzate fonti OSINT per identificare i procedimenti più condivisi; in secondo luogo, attraverso diversi database scientifici (google scholar, scopus, science direct) si sono cercate pubblicazioni relative al processo di mappatura degli SDGs anche fuori da istituzioni accademiche. Le prime dieci università classificate del Times Higher Education Impact Rankings 2020 (gli unici framework globali che valutano le università rispetto agli Obiettivi di sviluppo sostenibile delle Nazioni Unite), sono state utilizzate come campione di best practice per i record selezionati attraverso il web e la letteratura scientifica. I risultati sono stati categorizzati e sistematizzati per confrontare metodi e strumenti in una o più delle tre missioni dell'università (istruzione/formazione, ricerca e terza missione).

Strumenti per guidare le università nella mappatura e quindi nel decision-making rispetto agli SDGs sono cruciali per gestire una trasformazione verso la sostenibilità delle istituzioni universitarie. Questa tesi cerca di creare una base di dati, strumenti e metodologie per affinare gli strumenti decisionali sugli SDGs specifici per i contesti

universitari e aumentare la consapevolezza sui progressi di ciascuna istituzione. Questi risultati, condivisi con docenti e ricercatori, il personale amministrativo e gli studenti, e altri attori del territorio, sono utili per generare una cultura diffusa presso la comunità che vive fisicamente il campus e che prende decisioni strategiche sul futuro della ricerca, formazione e terza missione in tutte le 17 (e più) declinazioni degli SDGs.

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List of abbreviations

- | | |
|--|---|
| - 21C: 21st Century Curriculum (Western Sydney University) | - CT: Curriculum Transformation (University of Leicester, UK) |
| - ACTS: Australasian Campuses Towards Sustainability | - CTI: Ciencia, Tecnología e Innovación (Science, Technoogy and Innovation) |
| - AISHE: Auditing Instrument for Sustainability in Higher Education | - DESD: Decade of Education for Sustainable Development |
| - AoL: Assurance of Learning (La Trobe Business School) | - DSDG: Division for Sustainable Development Goals |
| - ARIUSA: Alianza de Redes Iberoamericanas de Universidades por la Sustentabilidad y el Ambiente (Alliance of Iberoamerican University Network for Sustainability and the Environment) | - EAUC: Environmental Association for Universities and Colleges |
| - ASU: Arizona State University | - ESD: Education for Sustainable Development |
| - CODS: Centro de los Objetivos de Desarrollo Sostenible para América Latina y el Caribe (Centre of the Sustainable Development Goals for Latin America and the Caribbean) | - ESDRC: Education for Sustainable Development Research Centre |
| - CORE: Curriculum, Operations, Research and Engagement (Western Sydney University) | - FCT: Fundação Para a Ciência E Tecnologia (Portugal) |
| - CPRP: Coeficiente de Producción de Resultados por Proyectos (Production of results by Project coefficient) | - GASU: Graphical Assessment of Sustainability in Universities |
| | - GRI: Global Reporting Initiative |
| | - HE: Higher Education |
| | - HEIs: Higher Education Institutions |
| | - HESD: Higher Education and Research for Sustainable Development |
| | - IAMs: Integrated Assessment Models |
| | - ICPUs: Industry and Community Project Units (University of Sydney) |

- IEEP: International Environmental Education Programme
- IJSHE: International Journal of Sustainability in Higher Education
- ILO's: Intended learning outcomes (University of Leicester, UK)
- ISF-UTS: Institute for Sustainable Futures at University of Technology, Sydney (Australia)
- IAU: International Association of Universities
- LBS: La Trobe Business School
- LMI: low- and middle income
- LOs: Learning Objectives
- MSDI: Monash Sustainable Development Institute (Australia)
- MQU: Macquarie University (Australia)
- MQUSF: MQU sustainability framework
- NUS: National Union of Students (UK)
- REDFIA: Red de Formación e Investigación Ambiental (Environmental Research and Training Network)
- RFA-ALC: Red de Formación Ambiental para América Latina y el Caribe (Environmental Training Network for Latin America and the Caribbean)
- PRME: Principles for Responsible Management Education
- SDGs: Sustainable Development Goals
- SDSN: Sustainable Development Solutions Network
- SLR: Systematic Literature Review
- SOS: Students Organising for Sustainability (UK)
- SPPG: Sustainability Policy and Planning Group (La Trobe University)
- STARS: Sustainability Tracking, Assessment & Rating System
- THE: Times Higher Education (Impact Rankings)
- TSF: Transferable skills network (University of Leicester, UK).
- UBC: University of British Columbia (Canada)
- UDCA: Universidad de Ciencias Aplicadas y Ambientales (University of Applied and Environmental Sciences) (Colombia)
- UHo: University of Holguin (Cuba)
- UMIST: University of Manchester Institute of Science and Technology
- UN: United Nations
- UNCED: UN Conference on Environment and Development
- UNDESA: United Nations Department of Economic and Social Affairs
- UNEP: UN Environmental Programme
- UNIBO: University of Bologna (Italy)
- Unisa: University of South Africa (South Africa)
- UoL: University of Leicester (UK).
- UPCH: Universidad Peruana Cayetano Heredia (Peru)
- UPF: University of Passo Fundo (Brazil).

- UTS: University of Technology, Sydney
(Australia)

1. INTRODUCTION

This thesis aims at identifying and understanding the different Sustainable Development Goals (SDGs) mapping tools and methodologies used by Higher Education Institutions. To achieve the research's objective a *systematic literature review (SLR)* was conducted. A first stage consisted of keywords searching on the Google Search engine where the first ten relevant entries were analysed when useful for identifying SDGs mapping methodologies and tools, secondly, SDGs mapping publications were searched through different scientific databases, finally, the first ten ranked universities of the *Times Higher Education Impact Rankings (THE) 2020*, the only global performance tables that assess universities against the United Nations' Sustainable Development Goals, were used as a sample for analysing existing SDGs mapping efforts in the Higher Education field.

This introduction is structured as follows: firstly, the SDGs are presented, secondly, the three missions of higher education institutions are described, afterwards an overview of sustainability in higher education is given, following, the relation between the SDGs and Higher Education Institutions (HEIs) is portrayed to then introduce SDGs mapping and HEIs approach to the activity.

1.1. Background

The last 30 years had observed numerous advances in discussions on sustainable development, recently, on 25 September 2015, The Sustainable Development Goals (SDGs) were adopted by the United Nations member states as part of the 2030 Agenda for sustainable development which set out a 15-year plan to achieve them. This new global framework was conceived as plan of action for people, planet, prosperity, peace and partnership, to set a vision for reducing poverty and achieving sustainable development. The agenda covers an extensive set of challenges and, according to Kestin et al. (2017) the expertise of Higher Education Institutions (HEIs) is essential for the achievement of the goals, furthermore, SDGs cannot be attained without these institutions (Leal Filho, Shiel, et al., 2019).

1.1.1. Sustainable Development Goals

The last 30 years had observed numerous advances in discussions on sustainable development, concept defined on the Brundtland report, a document entitled Our Common Future, by the World Commission on Environment and Development (Salvia et al., 2019). Sustainable development was defined as the “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” (WCED, 1987). This could be said to represent the official start of the Sustainable Development debate. During this time The United Nations played and still plays an important role on assisting countries on overcoming current and future sustainability challenges through their capacity-building systems, through their conferences and agreements, and more (Salvia et al., 2019).

Recently, on 25 September 2015, The SDGs were adopted by the United Nations member states as part of the 2030 Agenda for sustainable development which set out a 15-year plan to achieve them. The 17 Goals (**Table 1**), and 169 targets represent a universal call to take action to “end poverty in all its forms and dimensions”, an invitation to all sectors of society to mobilize for a sustainable, peaceful, prosperous and equitable life on earth for everyone now and in the future (Unesco, 2017).

This new global framework was conceived as plan of action for people, planet, prosperity, peace and partnership, to set a vision for reducing poverty and achieving sustainable development, the agenda seek to build on the Millennium Development Goals (2001-2015) and complete what these did not achieve (UNDP, 2017). The agenda was developed following the United Nations Conference on Sustainable Development (Rio+20) in Rio de Janeiro, Brazil in June 2012, in a three-year process where the UN conducted the largest consultation programme in their history in order to assess what the SDGs should cover (Leal Filho, Vargas, et al., 2019). The 2030 Agenda for Sustainable Development, with 17 SDGs at its core, was adopted at the UN Sustainable Development Summit in September 2015. This year, 2015, represented an important year for international policy shaping, several major agreements were adopted such as the Sendai Framework for Disaster Risk Reduction on March, the Transforming our

world: the 2030 Agenda for Sustainable Development on September and the Paris Agreement on Climate Change on December.

For the follow-up and review of the SDGs the central UN platform is the *annual High-level Political Forum on Sustainable Development*, the UN division providing support and capacity-building for the SDGs is the *Division for Sustainable Development Goals* (DSDG) belonging to the *United Nations Department of Economic and Social Affairs* (UNDESA), this department plays a key role in the evaluation of UN system wide implementation of the 2030 Agenda (United Nations, n.d.-a).

Table 1. *Sustainable Development Goals*

Goal	Description
1 No poverty	End poverty in all its forms everywhere
2 Zero hunger	End hunger achieve food security and improved nutrition and promote sustainable agriculture
3 Good health and well-being	Ensure healthy lives and promote well-being for all at all ages
4 Quality education	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
5 Gender equality	Achieve gender equality and empower all women and girls
6 Clean water and sanitation	Ensure availability and sustainable management of water and sanitation for all
7 Affordable and clean energy	Ensure access to affordable, reliable, sustainable and modern energy for all
8 Decent work and economic growth	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
9 Industry, innovation and infrastructure	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
10 Reduced inequalities	Reduce inequality within and among countries
11 Sustainable cities and communities	Make cities and human settlements inclusive, safe, resilient and sustainable
12 Responsible consumption and production	Ensure sustainable consumption and production patterns
13 Climate action	Take urgent action to combat climate change and its impacts

Table 1. Sustainable Development Goals (Continuation)

Goal	Description
14 Life below water	Conserve and sustainably use the oceans, seas and marine resources for sustainable development
15 Life on land	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation and halt biodiversity loss
16 Peace, justice and strong institutions	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
17 Partnerships for the goals	Strengthen the means of implementation and revitalize the global partnership for sustainable development

Although not legally binding, the strong interest and response to the SDGs across different countries and sectors since their adoption provide evidence of their influence on the strategies and actions of governments, businesses and organizations (SDSN Australia/Pacific, 2017a).

1.1.2. Higher Education Institutions missions

Although it is not possible to generalize all the universities around the world, it is possible to say that a university's mission is threefold (Kesten, 2019), Education (Teaching and Learning), Research and Outreach, these could be described as stated by the University of Minnesota in their mission statement (Board of Regents of the University of Minnesota, 2008):

“Research and Discovery [Research] - To generate and preserve knowledge, understanding, and creativity by conducting high-quality research, scholarship, and artistic activity that benefit students, scholars, and communities across the state, the nation, and the world.

Teaching and Learning [Education] - To share that knowledge, understanding, and creativity by providing a broad range of educational programs in a strong and diverse community of learners and teachers, and prepare graduate, professional, and undergraduate students, as well as non-degree seeking students interested in continuing education and lifelong learning, for active roles in a multiracial and multicultural world.

Outreach and Public Service [Outreach] - To extend, apply, and exchange knowledge between the University and society by applying scholarly expertise to community problems, by helping organizations and individuals respond to their changing environments, and by making the knowledge and resources created and preserved at the University accessible to the citizens of the state, the nation, and the world.”

‘Education’ and *‘Research’* are known as universities’ traditional missions and are considered the pivotal functions of universities, on the other hand, *‘Outreach’* is known as the third mission compressing activities such as technology transfer, lifelong learning or social engagement (Berghaeuser & Hoelscher, 2020). These three elements are important to sustainability mapping activities in order to have an integrated image of universities contributions to sustainable development. However, while the traditional missions are clearly understandable and applied outreach activities may still generate confusion.

Even though the third mission in higher education is a globally occurring phenomenon it is embedded locally and adapted to regional frameworks conditions. Consistently, there is no universal definition of outreach and activities of universities counted as part of it varies from one university system to another. Nevertheless, in recent research understanding of third mission has gained ground, it refers not only to the economic dimension of HEIs engagement but also to their social contribution (Berghaeuser & Hoelscher, 2020). The third mission has two key priorities: targeted use and transfer of academic knowledge to help resolve diverse societal challenges and transfer of technologies and innovations in the form of cooperation with public and private enterprises (University of Vienna, n.d.).

According to Pasternack et al. 2015 the third mission in many contexts is described as activities that take place within the context of education and research without being education and research alone (Berghaeuser & Hoelscher, 2020), they are characterised in that they:

“Go beyond the first two missions of universities (teaching and research); use resources linked to the core tasks of the university, such as knowledge, research results, technology, personnel (students and staff), infrastructure or financial funding; involve actors outside the academic-scientific sector; and relate to socio-economic developments” (p.59)

Subsequently, purely administrative or internal operational activities of HEIs that do not generate any impulse to society do not belong to the third mission, as these activities would still be carried out even if universities had no interest in their social environment. Third mission activities are usually classified as three dimensions: (1) knowledge and technology transfer, (2) further education and (3) social engagement (Berghaeuser & Hoelscher, 2020). Knowledge and technology transfer describe the “planned transfer of scientific and technological knowledge between individuals and organizations for the purpose of innovation through various activities” (p.59), transfer as a mutual interaction from which both sides profit. Further education refers to “the increased need for further scientific training, as highly qualified knowledge-based work is characterized by a high need for renewal due to the dynamics of knowledge development” (p.60), further learning does not only include forms of organized learning but also informal learning, it relies in a networked education system. Lastly, through social engagement universities can position themselves as competent partners of society while contributing to their wellbeing, additionally they can become more attractive for potential students through greater social visibility (Berghaeuser & Hoelscher, 2020).

Instead of analysing sustainability related efforts without making any distinction, identifying these efforts within the three-mission system (Education, Research and Outreach) can help an institution perform more useful analyses for their further development.

1.1.3. Sustainability in Higher Education

Over time, higher education has made notable progress in sustainability research, strategic planning, campus operations and outreach. Universities have shown their environmentally friendly attitude with the development of strategic plans and investment in sustainability programs (Savelyeva & McKenna, 2011). Since 1972, when the first UN conference on the Environment and Development was held, HEIs have been recognised as important actors for enhancing and applying Sustainable development processes (Friman et al., 2018).

Universities first official commitment to sustainability happened in the 1990s with the Talloires Declaration, an action plan to foster sustainability and environmental literacy (Friman et al., 2018). The 1990s decade was also designated as the “International Decade of Environmental Education” by UNESCO and the UN Environmental Programme (UNEP), both organisations also started and coordinated the International Environmental Education Programme (IEEP) (Leal Filho et al., 2015). According to Saénz (2012), in 1981, at Latin-American level, the Red de Formación Ambiental para América Latina y el Caribe, RFA-ALC (Environmental Training Network For Latin America and the Caribbean) was created to foster the incorporation of the environmental dimension in HEIs (Saénz, 2018, p. 67), this network promoted the creation of the Red Colombiana de Formación Ambiental in 1985, the Red Cubana de Formación Ambiental in 1994 and the Red de Formación e Investigación Ambiental (REDFIA) in Guatemala in 1996 (Saénz, 2018). In 1994, at European level, the Copernicus University charter was released, calling HEIs duty “to propagate environmental literacy and to promote the practice of environmental ethics in society, in accordance with the principles set out in the Magna Chart of European Universities and subsequent university declarations, and along the lines of the 1992 UN Conference on Environment and Development (UNCED) recommendations for environment and development education” (CRE-Copernicus, 1994). Then, in 1995 the Athens workshop “on how to re-orient education towards sustainable development” took place, triggered by the 1992 UNCED held in Rio de Janeiro, Brazil.

On 2000, the launch of the *International Journal of Sustainability in Higher Education* (IJSHE), a peer-refereed journal specifically focused on the dissemination of research on sustainability issues at HEIs, represented an advancement in Education for Sustainable Development (ESD) issues. Following, in the 2002 World Summit on Sustainable Development, the importance of the role of education in sustainable development in all sectors of education was highlighted (Leal Filho et al., 2015). In 2007, the Alianza de Redes Iberoamericanas de Universidades por la Sustentabilidad y el Ambiente - ARIUSA (Alliance of Ibero-american University Networks for Sustainability and Environment) was constituted to coordinate and cooperate to promote commitments to sustainability among HEIs in Latin America, the Caribbean and the Iberian Peninsula (Saénz, 2018). From 2005 to 2014, the resolution of the UN General Assembly declaring a Decade of Education for Sustainable Development (DESD) encouraged educational institutions to contribute to education for sustainability. The DESD included issues that seek to construct “a world in which the basic needs of each person can be met” (Albareda-Tiana et al., 2018). Other remarkable initiatives are the Principles for Responsible Management Education, founded in 2007, and the Higher Education Sustainability Initiative created in 2012. Both are initiatives known for their focus on sustainable development through education and its dimensions. All these events and declarations clearly show HEIs’ commitment to sustainability (Yáñez et al., 2019).

When talking about taking action, it is known that universities operations entail a wide range of facilities and activities and accordingly they have been increasingly incorporating sustainability in their operations, teaching, research, among others, they have also implemented different actions like transformation of their institutional missions and operations management, curricula and research programs modification or promotion of community engagement, HEIs should always aim for a holistic approach to foster sustainability while being aware that their initiatives can have a fundamental impact in the local context they are inserted on and that they are an influence to local communities by “serving as models of sustainability” (Leal Filho, Vargas, et al., 2019; Yáñez et al., 2019). Concerning management frameworks and tools,

we could mention the Global Reporting Initiative or ISO26000 about social responsibility, that have been adapted to the HE context, or tools that have been designed to help institutions assess their sustainable transformation process like the Sustainability Tracking, Assessment & Rating System (STARS), the Auditing Instrument for Sustainability in Higher Education (AISHE) or the Graphical Assessment of Sustainability in Universities (GASU) (Yáñez et al., 2019).

Recently, On 25 September 2015, The Sustainable Development Goals were adopted by the United Nations member states and these represent a new challenge and opportunity for HEIs and their involvement in the sustainability debate, the following section shows a general review of the SDGs in the HE field.

1.1.4. Sustainable Development Goals and Higher Education

For the SDGs to be achieved, everyone needs to do their part: governments, civil society and every human being. One of the central roles is played by HEIs, these are important economic actors in many regions and in general are active actors in matters related to sustainable development (Leal Filho, Vargas, et al., 2019). HEIs are faced with the societal responsibility of providing guidance, they also have the potential to lead the path in enabling communities to develop more sustainable ways of living and working (Shiel et al., 2015) and, as said by Ferrer-Balas et al., 2010, their role is not only to educate future decision makers but also to be themselves an organisation that practices sustainability in all its dimensions: education, research, campus management and outreach (Leal Filho et al., 2018).

Education has become a central pole to the achievement of the goals, among these, one stand-alone goal is dedicated to education (SDG4), it is mentioned in targets pertaining to other goals and it is undoubtedly linked to other goals in some way. The agenda covers an extensive set of challenges and, according to Kestin et al. (2017) the expertise of HEIs is essential for the achievement of the goals, furthermore, SDGs cannot be attained without these institutions (Leal Filho, Shiel, et al., 2019). In 2017, the SDG Accord was founded and launched by the Environmental Association for Universities and Colleges (EAUC), this accord represents a commitment learning institutions are

making to one another to do more to deliver the goals and to annually report on each signatory's progress, at 2018 the signatories were 110 institutions, 103 support organisations and 817 individuals – all spread across 85 countries (EAUC, 2017; EUAC, 2019, p. 4).

Literature on how universities are engaging with SDGs implementation is still on an early stage (Leal Filho, Shiel, et al., 2019) yet there has been some research documenting how universities are taking actions to embrace the SDGs within their institutions. Kopnina (2017, p. 2) noted how on three universities in the Netherlands several courses were related with sustainability, specifically with the objective of raising students' understanding of the importance of the outcomes of the SDGs (Leal Filho, Shiel, et al., 2019). Nottingham Trent University, UK, encourages programmes' leaders to integrate one or more SDGs into their teaching through their Curriculum Refresh framework, Victoria University of Wellington, New Zealand, has mapped their curriculum against SDGs to track their contributions and improve their offerings (Leal Filho, Shiel, et al., 2019), the university of Bologna has adopted the SDGs as a reference framework for governance action (Paletta et al., 2019), according to Aleixo et al. (2020), on average, out of thirty-three Portuguese HEIs each of them have six courses explicitly related with SDGs. The United Nations Educational, Scientific, and Cultural Organization (UNESCO) through the Higher Education Sustainability Initiative (HESI) tries to provide a platform for colleges and universities to engage with the United Nations SDGs and over 300 institutions have now joined the efforts (Leal Filho, Shiel, et al., 2019).

In the Latin American context, we find a strong tendency towards manifestation of HEIs commitment to the SDGs. A representative case comes from the University of Applied and Environmental Sciences (UDCA) from Colombia, which in the current version of their mission establishes their commitment to sustainable development, UDCA has adopted the SDGs incorporating them in the different dimensions of the academic life and has included, in 2017, the SDGs as a central theme of the Environmental Chair which is a compulsory course for students at the university. Also, the University of Los Andes, Colombia, has recognised the importance of the SDGs through the creation of the

Centro de los Objetivos de Desarrollo Sostenible para América Latina y el Caribe -CODS (Sustainable Development Goals Centre for Latin America and the Caribbean) in 2018. Some universities in Peru have likewise begun working on the implementation of the goals, such as the Universidad Peruana Cayetano Heredia (UPCH) that has included sustainable development in their vision and has formed a network of teachers from all faculties that would work on ESD issues and would be in charge of analysing the syllabuses offered by the institution from the 17 SDGs perspective (Saéñz, 2018).

In terms of SDGs assimilation in teaching and learning, universities can do so through the integration of the goals with the principles of ESD into their courses and curriculum can be oriented towards SDGs. Contribution can also be made through research of social, economic and environmental challenges, HEIs have an important role in providing this knowledge and solutions through their research programmes, they can encourage and promote interdisciplinary and transdisciplinary research needed to address the agenda. Institutions can map their policies to make them instrumental to SDGs implementation, they can establish a sustainability office to act on the establishment of an environmental management system for the university, or to promote different initiatives related to campus operations or sustainability awareness projects, among others (Mawonde & Togo, 2019).

1.1.5. SDGs Interlinkages

The United Nations and their SDG agenda recognises the interdependencies between and within the SDGs, they highlight that the goals should be addressed in a balanced way that accounts for SDGs interlinkages and between their social, environmental and economic dimensions (SDSN Australia/Pacific, 2017a). The 2018 Sustainable Development Goals Report examined some of the interconnection across Goals and targets, the report provides a section on the interlinked nature of the SDGs (United Nations, 2018) showing the relevance of the interconnection among goals.

In an increasingly hyper-connected world, any intervention on behalf of one Goal can lead to unintended consequences for the achievement of other goals. Interactions

among goals generally imply trade-offs (negative interlinkages), but they can also give rise to co-benefits. Thus, the key to the implementation of the 2030 Agenda lies in leveraging interactions among the Sustainable Development Goals away from trade-offs and towards co-benefits (United Nations, 2019). Therefore, identifying trade-offs is important for ensuring that progress in one goal or area does not lead to unexpected outcomes that undermine progress in others. Whereas positive interlinkages (synergies) are useful for addressing multiple areas at once (SDSN Australia/Pacific, 2017a). Dealing with such complex synergies and trade-offs poses a challenge for planners and decision-makers. But these systemic interactions offer already identified and sometimes unexpected solutions for seemingly insurmountable problems. Policymakers can adopt systemic approaches, following different pathways to sustainable development that offer multiple solutions and drivers, across different sectors and jurisdictions. Effective action in different systems will require that the links among them be acknowledged and addressed (United Nations, 2019).

Analysis of interlinkages can be relevant and useful to universities in different ways (SDSN Australia/Pacific, 2017a, p. 40):

- Important area of research where universities can provide significant support for policy making;
- It can help identify key connections across disciplines and initiate impactful interdisciplinary research projects;
- It is a central concept in most of the key competencies of education for the SDGs, including systems thinking, anticipatory competencies, and integrated problem-solving;
- It can help measure the broader benefits of education and identify ways it can be enhanced through other actions;
- Helpful to identify and amplify the broader/downstream co-benefits of major university projects, including research and operational projects, as well as assessing and mitigating potential negative impacts;

- It can help bridge different areas of the university like research, teaching and operations through the 'living labs' concept; and
- It can help identify potential trade-offs and co-benefits of implementing particular SDGs within operations, which can help prioritise actions with the most positive benefits.

Achieving the sustainable transformation of socioenvironmental-economic systems means carefully considering the interactions between Goals and targets. The most efficient – or sometimes the only – way to make progress on a given target is to take advantage of positive synergies with other targets while resolving or ameliorating the negative trade-offs with yet others (United Nations, 2019).

An increasing number of studies analysing possible trade-offs and complementarities among the different SDGs can be found. van Soest et al., (2019) analysed how Integrated Assessment Models (IAMs) can contribute to a wider analysis of the SDGs, they argue that IAMs can inform about the synergies and trade-offs in meeting multiple goals simultaneously, they compared the key interactions identified among SDGs in an expert survey and also use text mining to reveal past practices by extracting the themes discussed in the IAMs literature, linking them to the SDGs, and identifying the interactions among them. Nilsson et al. (2018) synthesized experiences and insights from the application of a conceptual framework for mapping and assessing SDG interactions, drawing on results from a major international research study applied to the SDGs on health, energy and the ocean, the authors analysed how interactions depend on key factors such as geographical context, resource endowments, time horizon and governance. Santika et al. (2019) examined the complexity of the interconnections between energy and the SDGs and gave examples of how those linkages could be quantified.

Barbier & Burgess (2019) developed an analytical model to estimate the welfare effects of progress in attaining one SDG while accounting for interaction in achieving others. Using one representative indicator for each goal the authors estimated the welfare changes for improvements in No Poverty (SDG1) net of any welfare gains and losses in

attaining each of the remaining 16 goals, they found that once interactions with other SDGs are taken into account the net welfare change for poverty reduction in poor economies from 2000 to 2016 is \$244 per person, which is almost 20% lower than the welfare estimate of \$299 per capita of poverty reduction on its own. The research concludes that such an analysis helps policy makers prioritize improvements towards one goal or set of goals and show explicitly the net gains and losses for achieving one goal while impacting others.

SDSN Australia/Pacific (2017) provides reference to some useful tools and examples (Section 4.5. Managing interlinkages, p. 41 Box 5) to help universities identify and manage interlinkages considering that working across disciplines, faculties or organisational areas to identify and manage interlinkages can be difficult because systems are siloed and structured to be competitive and working in a more systemic way carries overheads in terms of time, expertise and money.

1.1.6. Sustainable Development Goals mapping

Contribution to SDGs progress measurement represents a starting point for a comprehensive assessment of institutions' contribution to the achievement of the Goals, this can help decision makers determine priorities for action. Mapping SDGs against institutions' activities can work as a baseline to know where they stand and to design pathways for contributing to the achievement of the SDGs and monitoring devices (Schmidt-Traub et al., 2017). Measuring progress on SDGs achievement becomes crucial to properly manage transformation to sustainable actions and development of SDGs implementation strategies.

SDSN Australia/Pacific (2017, p. 31) suggests 'Mapping what you are already doing' as the first step universities can take to start and to deepen their engagement with the SDGs. Their statements could apply for all institutions in general, mapping what an organization is already doing to support and contribute to the SDGs across all their areas and within specific areas, it can represent "a great starting point for discovering possibilities for deeper engagement" and it is also a "powerful tool for showcasing what is already in place", as well as for identifying synergies across the institution (SDSN

Australia/Pacific, 2017a, p. 32). The exercise of mapping can be used, for example to identify key stakeholders engaged in contributing to the SDGs, keep database of what is already being done, identify strength and gaps in the organization activities, gather information for reporting, communicating and showcasing the institution contribution to the SDGs and many more (p.35).

According to them (p.36) the main approaches to mapping are:

- “Desktop assessment: This approach involves a desktop review of the data sources and a manual assessment and assignment of activities to the SDGs. Technically and logistically this is the simplest approach. However, it is a labour-intensive process, and would be most suitable for small data sets of high-level information, such as faculty-level research strengths and university objectives.
- Self-identification: This approach involves asking people to self-identify which SDGs their activities align with. This has the advantages of engaging the people who are most familiar with an activity and building their understanding of the SDGs. [...] this approach will work better with a small number of key people (such as faculty research coordinators), when there is high-level support, and existing relationships. It can also be a good way to ‘verify’ mapping done through other approaches.
- Keyword searches: This approach uses SDG-specific keywords to search through large sets of activity-related data, such as research publications or course listings. This approach can be time consuming to set up, to identify the right keywords, to find good software for analysis, to gain access to the right kind of data, and to test that the results that come out make sense. However, once it is set up it can be automated to some extent, a great advantage for being able to update the results on a regular basis and for tracking progress on the SDGs.”

There have been different efforts to create tools for SDGs mapping such The SDG Impact Assessment Tool for self-assessment of how an activity or organisation affects the SDGs (SDSN Northern Europe & Gothenburg Centre for Sustainable Development, 2019), or The SDG Compass which is a guide to support companies in aligning their strategies

with the SDGs and in measuring and managing their contribution (Global Reporting Initiative (GRI) et al., n.d.). In the case of HEIs we have the '*Getting started with the SDGs in universities, a guide for universities, higher education institutions, and the academic sector*' which provides practical guidance on how to get started with deepening contributions of universities to the SDGs (SDSN Australia/Pacific, 2017a). This guide overtakes different topics regarding SDGs on universities and includes a couple of tools to carry a mapping activity. In terms of SDGs measurement in the HE field, the most widely known ranking is the *THE* Impact Rankings which evaluates university performance in all the goals, it uses calibrated indicators to provide comprehensive and balanced comparisons across three broad areas of **research, outreach, and stewardship** (Times Higher Education (THE), 2020) (for more information on scoring methodology visit *THE Impact Rankings 2020*, 2020).

The integrating nature of the SDGs can be a powerful way to avoid false choices between economic growth, environmental protection and social well-being, by identifying the multiple wins across the three domains of sustainable development: environmental, social and economic. These three dimensions of sustainable development can only be effectively addressed by a systems approach where multiple actions lead to multiple benefits (United Nations, n.d.-b).

Systems Thinking: According to Wiek et al. (2011) systems thinking “is the ability to collectively analyse complex systems across different domains (society, environment, economy, etc.) and across different scales (local to global), thereby considering cascading effects, inertia, feedback loops and other systemic features related to sustainability issues and sustainability problem solving frameworks” (Molderez & Ceulemans, 2018, pp. 759–760). Arnold & Wade (2015) define systems thinking in terms of its purpose as “a set of synergistic analytic skills used to improve the capability of identifying and understanding systems, predicting their [behaviours], and devising modifications to them in order to produce desired effects. These skills work together as a system.”

A lack of systems thinking, and integrated assessments may hinder the effective implementation of the SDGs. According to Bennich et al. (2020) it has been

demonstrated how systems analyses allow policy makers to negotiate trade -offs and exploit synergies as they formulate SDG strategies, supporting the identification of coherent policy by studies. However, systems-based working is complex to deliver in practice, perhaps because existing governance systems are based on competition (between countries, between government departments and between sectors) or because they favour economic growth over environmental and social goals (Morton et al., 2019). Understanding of systems thinking thus becomes an important factor for data collection and SDGs mapping actions.

1.2. Objectives

The objectives of the thesis are as follows:

- *General Objective*

Identify and present SDGs mapping tools and methodologies that could be used by Higher Educations Institutions to map their contribution to the goals.

- *Specific objectives*

- Identify which methodologies and/or tools universities have used to map their contribution to the Sustainable Development Goals;
- Understand how the different methodologies and tools to map institution's actions onto SDGs have been used;
- Identify and report SDGs mapping approaches used by different universities.
- Identify which University mission has been the least mapped against SDGs by universities.

1.3. Research question

Considering the aims of this thesis the research question to be answered is:

Which methodologies and/or tools are being used by Higher Education Institutions to map their contribution to the SDGs?

1.4. Methodology and methods

To achieve the thesis objectives, the research question will be answered through a *systematic literature review (SLR)* approach, which is “a research method and process for identifying and critically appraising relevant research, as well as for collecting and analysing data from said research” (Snyder, 2019, p. 334(2)). A first stage consisted of keywords searching on the Google Search engine where the first ten relevant entries were analysed when useful for identifying SDGs mapping methodologies and tools. Secondly, SDGs mapping publications were searched through different scientific databases, this stage focused on SDGs self-declared mapping cases. Finally, the first ten universities on the 2020 *THE* Impact Rankings were used as a sample population for analysing existing SDGs mapping efforts by HEIs already recognised for their interest in sustainability practices.

The research methodology will be structured as follows:

1. Use the keywords “Sustainable development goals” AND “mapping” AND (“higher education” OR “university”) on the Google search engine, analyse the first ten relevant entries when useful for identifying SDGs mapping methodologies and/or tools;
2. Collection of different literature on SDGs mapping through a SLR with specific scientific databases in two stages, first by reading abstracts and filtering and secondly, full-text reading for selecting useful papers;
3. Collect and analyse information on universities’ SDGs mapping through web portals of the first ten universities in the 2020 *THE* Impact Rankings that will be used as the research population sample;
4. Analyse the data selected to identify the methodologies and tools used to SDGs mapping and extract their main characteristics;
5. Report findings;
6. Analyse the records to determine the least mapped University mission in the sample;

7. Analyse the methodologies and tools used by the sample universities with the aim of determining the mapping methodology approach the different institutions in the sample have followed;
8. Report the patterns, and useful information for the Higher Education field found;
9. Conclusions.

1.5. Thesis outline

This thesis is expected to illustrate the current SDGs mapping methodologies and tools based on a SLR of the SDGs mapping activity. The document consists of 5 chapters: Introduction, Methodology, Results, Discussion and Conclusions

Chapter 1: Introduction of the thesis topic, the objectives and summary about the methodology used to achieve them.

The *Introduction* is structured in sections: Background (this section presents a literature review on the SDGs, HEIs missions, sustainability in HE, SDGs and HE and, SDGs mapping), objectives, research question and methodology and methods (methodological approach). These represent the foundation of the research.

Chapter 2: The *Methodology* presents the methodological approach description as well as the design of the investigation. The SLR approach to answer research questions is summarised and its protocol containing information such search strategy and selection process is presented on the 'Methods' section.

The methodology design consists of a series of steps presented on the 'Methodology' section; a first stage comprises the search for records through the Google search engine where the first ten relevant entries were analysed when useful for identifying SDGs mapping methodologies and tools. A second one comprises the search for papers on SDGs mapping through scientific databases. Finally, the first ten universities of the *THE* Impact Rankings of 2020 were used as a sample for analysing existing SDGs mapping efforts in the Higher Education field. Limitations are also stated.

Chapter 3: The *Results* of the systematic literature review carried out to answer the research question and achieve objectives is presented. Findings are presented in the

following order: SDGs mapping in HE, Google search engine; SDGs mapping in HE, scientific databases and; HEIs SDGs mapping illustrative cases.

Chapter 4: The findings and results will be presented in a way that they respond to the objectives set for the thesis. Findings that consist on discussing the different SDGs methodologies/tools found throughout the SLR as well as the identification of University missions that were mapped and SDGs mapping approaches.

Chapter 5: Contains a conclusive summary of the research thesis and suggestions for further developments.

2. METHODOLOGY

The proposed methodology aimed at producing a framework to guide HEIs in their SDGs mapping exercises. Accordingly, a SLR of different SDGs mapping activities carried by HEIs to map their contribution to the SDGs was carried out with the purpose of identifying and understanding the methodologies and tools that are being used. Finally, findings were synthesized in a systematic narrative way. This chapter will discuss the methodological approach of the research as well as the methods used to achieve the objectives.

2.1. Methods

Contribution to SDGs progress measurement represents a starting point for a comprehensive assessment of universities' contribution to the achievement of the Goals, this exercise can help decision makers determine priorities for action, it can work as a baseline to know where they stand and to design pathways for contributing to the achievement of the SDGs and monitoring devices (Schmidt-Traub et al., 2017). However, when carrying out a mapping exercise many HEIs do not know where to start, which direction to follow neither what is needed to map SDGs against their activities with success, to help universities in this path this thesis aimed at presenting a general overview of the methodologies and tools other institutions are currently using for SDGs mapping. It is important to note that the expected outcome represents a general overview that can and should be interpreted according to each institution context and

needs. In order to achieve the aim a SLR was chosen as the best approach to support the development of the research.

2.1.1. Systematic Literature Review (SLR)

Systematic literature reviews originated in medicine and have been developed to synthesize research findings in a systematic and reproducible way (Snyder, 2019). A SLR is “a research method and process for identifying and critically appraising relevant research, as well as for collecting and analysing data from said research” (Snyder, 2019, p. 334(2)). In the healthcare field diverse guidelines to conduct a SLR have been produced such the PRISMA statement or the Cochrane Handbook for Systematic Reviews of Interventions. However, SLR is not restricted to healthcare, many researchers have developed SLR in different knowledge fields.

According to PRISMA-P Group et al. (2015, p. 3), a systematic review “attempts to collate all relevant evidences that fits pre-specified eligibility criteria to answer a specific research question. It uses explicit, systematic methods to minimize bias in the identification, selection, synthesis, and summary of studies.” By integrating findings, an effective and well done SLR can address diverse research questions with firm foundations that allow drawing conclusions and making decisions. Some key characteristics of a SLR are: a clearly stated set of objectives, a reproducible methodology, defined eligibility criteria, a systematic presentation of the characteristics and findings of the included studies as well as their validity assessment (PRISMA-P Group et al., 2015).

Consequently, it is important to remind that the objective of this systematic literature revision was to review and analyse different ‘self-declared’ SDGs mapping cases on the HE field in order to answer the research question and achieve the objectives stated in chapter 1. When conducting a SLR a specific plan for the review should be designed for the consideration of transparency, transferability, and replicability of the work (Mengist et al., 2020), this plan is known as the review’s protocol. To define the literature review protocol for this paper, the Methods section of the PRISMA-P 2015 checklist was adapted and used (**Table 2**), even though designed for the healthcare

sciences its general language makes it useful for this and other studies (complete table can be found at PRISMA-P Group et al., 2015, pp. 5–6, Table 3).

Table 2. *Recommended items to include in a systematic review protocol, adapted from PRISMA-P 2015 checklist, Methods section (PRISMA-P Group et al., 2015, pp. 5–6, Table 3).*

Topic	Checklist item
Eligibility criteria	Specify the study characteristics (e.g. study design, setting, time frame) and report characteristics (e.g., years considered, language, publication status) to be used as criteria for eligibility for the review
Information sources	Describe all intended information sources with planned dates of coverage
Search strategy	Present draft of search strategy to be used for at least one electronic database, including planned limits
Study records	
Data management	Describe the mechanism(s) that will be used to manage records and data throughout the review
Selection process	State the process that will be used for selecting through each phase of the review
Data collection process	Describe planned method of extracting data from reports, any processes for obtaining and confirming data from investigators
Data items	List and define all variables for which data will be sought, any pre-planned data assumptions and simplifications
Data Synthesis	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data, and methods of combining data from studies, including any planned exploration of consistency.
	If quantitative synthesis is not appropriate, describe the type of summary planned

The items in **Table 2** for this research will be defined in the following subsections.

2.1.1.1. Eligibility criteria and Information sources

a. SDGs mapping in higher education, Google search engine

Records were selected according the criteria outlined below:

- Geographical location: No restrictions;
- Languages of publications: Entries in English, Spanish, Italian and Portuguese were considered;
- Years: No restrictions;
- Publication status: No restrictions;
- Study designs: No restrictions;
- Searching keywords: “Sustainable development goals” AND “mapping” AND (“higher education” OR “university”);
- Number of entries considered: First ten entries by relevance.

Information sources: Google Search engine.

b. SDGs mapping in higher education, scientific databases

Studies were selected according the criteria outlined below:

- Geographical location: No restrictions;
- Languages of publications: Articles reported in English, Spanish, Italian and Portuguese were considered, due to resource limits publications that needed to be translated from other languages were not considered for the study;
- Years of publication: Studies were selected for inclusion based on the time frame from 2016 to 2020, the SDGs were launched on September 2015 therefore just publications from 2016 onwards were included;
- Publication status: No restrictions;
- Study designs: Only articles that specifically declared themselves as SDGs mapping studies were considered, SDGs mapping can be related with sustainability assessment or other similar concepts such social impact, however only the SDGs mapping ‘self-declared’ cases were included;

- Excludable article types: Conferences abstracts, conference information, mini reviews, news, product reviews, short communications, book reviews and correspondence. The review needs publication types that have a clearly defined and explained SDG mapping methodology which would not be found on short article types.

Information sources: Literature search strategies were developed to be used by the author in the electronic databases ScienceDirect, Emerald, Scopus, Google Scholar, ERIC, Taylor & Francis, Nature and Scielo. The search strategy was limited to the English language with the only exception of the database Scielo where terms in Spanish were used.

c. HEIs SDGs mapping illustrative cases

Records were selected according the criteria outlined below:

- Geographical location: No restrictions;
- Sample size considered: First ten universities on the 2020 THE Impact Ranking;
- Languages of publications: Entries in English, Spanish, Italian and Portuguese were considered;
- Years of publication: Literature was selected for inclusion based on the time frame from October 2015 to 2020;
- Publication status: No restrictions;
- Study designs: No restrictions;
- Searching keywords on universities' web portals: "Sustainable development goals" OR "SDGs", "SDG report", "Sustainability report".

Information sources: THE Impact Rankings, Universities' web portals.

2.1.1.2. Search strategy

Only articles specifically declared as SDGs mapping studies were considered, no context or language restrictions were applied, although only articles reported in English, Spanish, Italian and Portuguese were included in the analysis. Date restrictions were applied. Article type restrictions were applied for database search since the interest

was on papers that contained clearly defined mapping methodologies/tools (2.1.1.1.). The specific research strategy was created by the author with guidance and review by the thesis supervisor. The search strategy was developed and applied for the information sources stated on section 2.1.1.1., the searching terms used by source are shown in **Table 3**.

Table 3. *Searching terms used and total number of publications obtained from each information source.*

Information source	Searching terms	String	N° of articles*	Date of search
Google search engine	"Sustainable development goals" AND "mapping" AND ("higher education" OR "university")	"Sustainable development goals" AND "mapping" AND ("higher education" OR "university")	10	09/05/2020
Science Direct	"Sustainable development goals" AND "mapping"	Keywords ("sustainable development goals" AND "mapping") – Year(2016-2020) – Articletype(REV,FLA,EN,CH,CRP, DAT,DIS,EDI,ERR,EXM,PNT,PGL,RPL,OSP, VID,OT)	322	13/04/2020
Emerald	"Sustainable development goals" AND "mapping"	abstract:"Sustainable development goals" OR (title:"Sustainable development goals") AND (abstract:"mapping") OR (title:"mapping")	369	13/04/2020

Table 3. *Searching terms used and total number of publications obtained from each information source. (Continuation)*

Information source	Searching terms	String	N° of articles*	Date of search
Scopus	"Sustainable development goals" AND "mapping"	TITLE-ABS ("Sustainable development goals" OR "SDG" AND "mapping") AND (LIMIT-TO (DOCTYPE , "ar") OR LIMIT-TO (DOCTYPE , "re") OR LIMIT-TO (DOCTYPE , "ch") OR LIMIT-TO (DOCTYPE , "bk") OR LIMIT-TO (DOCTYPE , "ed")) AND (LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (PUBYEAR , 2019) OR LIMIT-TO (PUBYEAR , 2017) OR LIMIT-TO (PUBYEAR , 2016))	105	13/04/2020
Google Scholar	"Sustainable development goals" AND "mapping"	allintitle: "Sustainable development goals" OR "SDG" AND "mapping"	18	13/04/2020
ERIC	"Sustainable development goals" AND "mapping"	"Sustainable development goals" AND "mapping"	1	13/04/2020
Taylor & Francis	"Sustainable development goals" AND "mapping"	[All: "sustainable development goals"] AND [All: "mapping"] AND [Publication Date: (01/01/2016 TO 31/12/2020)]	470	14/04/2020

Table 3. *Searching terms used and total number of publications obtained from each information source. (Continuation)*

Information source	Searching terms	String	N° of articles*	Date of search
Nature	"Sustainable development goals" AND "mapping"	"Sustainable development goals" AND "mapping"	5	14/04/2020
Scielo	"objetivos de desarrollo sostenible" AND "contribución"	"objetivos de desarrollo sostenible" AND "contribución"	3	14/04/2020
Universities web portals	"Sustainable development goals" OR "SDGs" OR "SDG report" OR "Sustainability report"	"Sustainable development goals" OR "SDGs"	13	05/2020
		"SDG report"		
		"Sustainability report"		

*Number of publications obtained on the search results before the selection process (2.1.1.3. b.).

2.1.1.3. Study records

a. Data management: For the papers related to SDGs mapping papers found through scientific databases, the reference management software Mendeley was used for the screening process, after the title reading stage the selected publications were saved in

the software by folders (one for each database) for abstract reading. Following, for full-text reading, the pdf version of the publications was downloaded and likewise managed with the software.

To facilitate citation when writing this paper, the open source reference management software Zotero was used to manage the final papers included for analysis.

b. Selection process:

At first, for SDGs mapping - scientific databases, potentially eligible articles were selected with an identification process through title and abstract reading based on the inclusion criteria. Secondly, a full text screening stage was made to finally select studies for inclusion in the analysis. For these, for the SDGs mapping in HE, Google search engine and HEIs SDGs mapping illustrative cases, the inclusion criteria can be seen on **Table 4**.

Table 4. *Inclusion/exclusion criteria for screening stages by source*

Criteria	Decision
SDGs mapping in higher education, Google search engine	
Records in English, Spanish, Italian or Portuguese	Inclusion
No mapping methodology and/or tool is presented	Exclusion
SDGs mapping in higher education, scientific databases	
Searching terms exists as a whole in the title, keywords or abstract section of the article	Inclusion
Articles written in English, Spanish, Italian or Portuguese	Inclusion
Records related to HEI	Inclusion
Papers that are not accessible through Politecnico di Torino access	Exclusion
Papers published before 2016	Exclusion
Studies that do not present a clearly defined mapping methodology and/or tool	Exclusion

Table 4. *Inclusion/exclusion criteria for screening stages by source (Continuation)*

Criteria	Decision
HEIs SDGs mapping illustrative cases	
Articles written in English, Spanish, Italian or Portuguese	Inclusion
Records before October 2015	Exclusion
No SDGs mapping activity, methodology or tool is presented	Exclusion

For *SDGs mapping in higher education*, Google search engine, the first ten entries for the designed string were saved through Zotero, from these, two corresponded to the same source, a webinar organized by SDSN Australia, New Zealand and Pacific on Mapping University contributions to the SDGs (SDSN Australia/Pacific, 2017b) one being the direct video reproduction through the YouTube platform and the other the SDSN Australia/Pacific web page with the video, the rest of entries corresponded to different sources to form a total of nine records for analysis, therefore, more entries were considered, the eleventh entry corresponded to the Guide “Getting Started with SDGs in Universities: A Guide for Universities, Higher Education Institutions, and the Academic Sector” by SDSN Australia/Pacific (2017a) which was already on the first ten, following, the twelfth entry was a book with no open access, consequently the thirteenth entry was then considered for final analysis, eventually ten (10) sources of information were analysed in total.

The selecting flow process for the *SDGs mapping in higher education, scientific databases* is presented in

Figure 1. In the initial search a total of 1377 records were found (for numbers by database see **Table 3**). At first, a title screening was carried, if titles contained the words “Sustainable development goals” or “SDG” or related concepts such “sustainability agenda(s)” or “sustainability mapping” or when there was uncertainty the papers were selected for a second screening stage, here papers were reduced to 185 (Science Direct: 84, Emerald: 41, Scopus: 22, Google Scholar: 15 and Taylor & Francis: 17, Nature: 5 and

Scielo: 1). On a second stage, abstract reading, the number of possibly eligible publications was reduced to 52 (Science Direct: 19, Emerald: 16, Scopus: 6, Google Scholar: 4 and Taylor & Francis: 5, Nature: 1 and Scielo: 1). Before abstract reading, with the software Mendeley's tool 'Check Duplicates', search for repeated papers was done, also, during this screening stage papers were organized in alphabetical order and manual checking for duplicates was also performed. Finally, the author performed a full-text scanning to decide whether these publications meet the inclusion criteria and a total of 6 articles fulfilled them. The final list of articles was downloaded to proceed with the analysis.

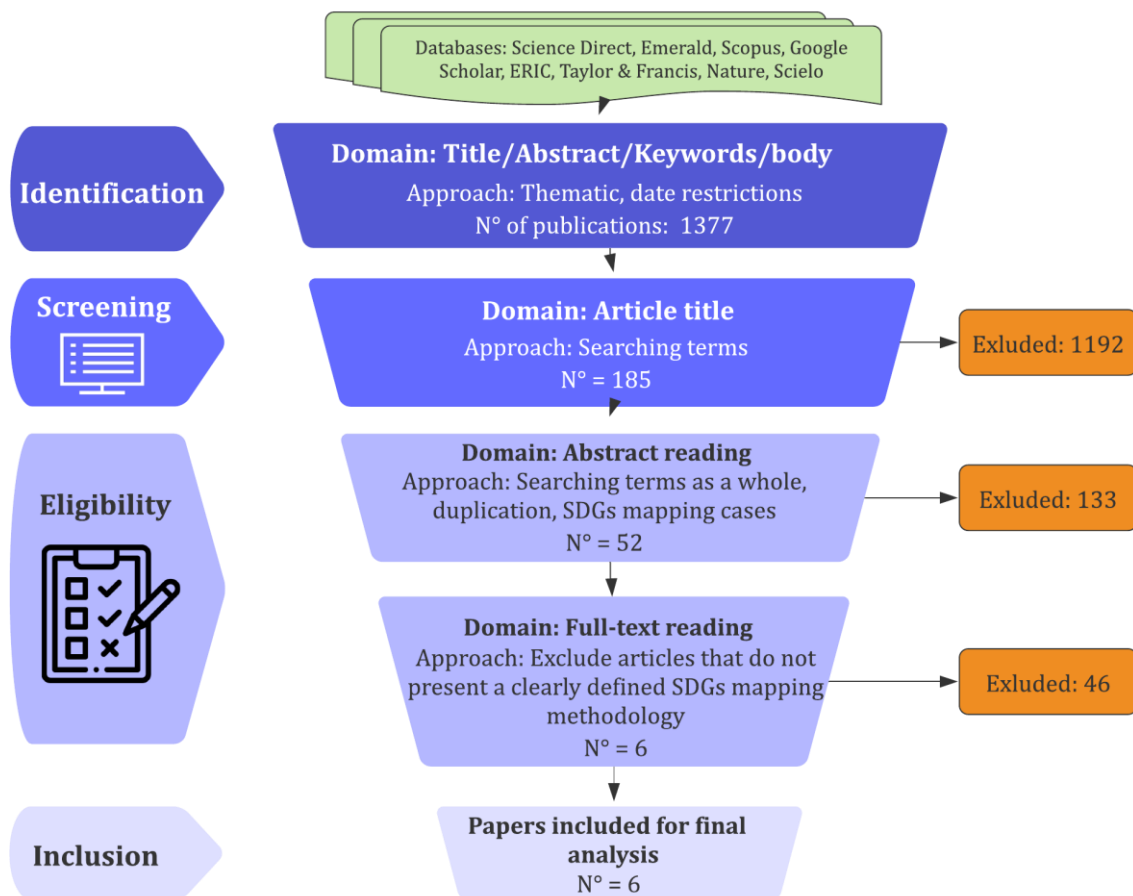


Figure 1. Database search for systematic review flow diagram.

Reasons for exclusion include SDGs mapping in other fields, not an SDGs mapping case, no methodology/tool is introduced, among others related to the inclusion/exclusion criteria previously defined.

For *HEIs SDGs mapping illustrative cases*, the review aimed for SDGs reports or sustainability reports that could give information on SDGs mapping activities, web pages were also explored to have a view of what each university was presenting in terms of SDGs contribution; information related to the mapping exercises was extracted from reports when available.

c. Data collection process and Data items

The author extracted data from the publications independently. Readers should therefore be mindful of possible errors in the completed review due to the single extraction employed.

Data abstracted includes SDGs mapping methodology, context of application, university's mission or another dimension mapped, outcomes and related useful information. The three university missions considered were education, research and outreach (presented in Section 1.1.2.), however, mapping in other dimensions was still presented although not analysed.

2.1.1.4. Data synthesis

Each record included was analysed based upon common characteristics through a descriptive narrative. Applying a common analytical framework to each source allows to integrate and present the extracted information in a standard way and like this provide a consistent systematic narrative synthesis. However, due the nature of some resources, like grey literature, explicit information related to each source was extracted since some characteristics cannot be found in all of them. Data synthesis will be presented in the form of text and tables.

Guided by the aims of the research stated in Section 1.2. the following common information was sought and extracted for all the records included for analysis:

1. Title, author, year of publication;

2. Geographical context;
3. Aims (What does a specific document aims at presenting);
4. Summary/examples of results or conclusions;

For all the SDGs mapping records when possible the following information was extracted:

1. HEI(s)
2. What is being mapped? (in terms of university dimensions);
3. Mapping methodology and/or tool;
4. Data sources.

For the Google search engine records treated, information about *SDGs mapping* was extracted when available, for these it was also stated which type of source contained the information reported, that is, a web page, blog or a document in different formats.

In the case the Universities illustrative cases, the author aimed for a specific type of document which was University's annual reports, it was indicated if these were specifically dedicated to report on the SDGs or if they were sustainability reports.

2.2. Methodology

The research methodology will be structured as summarized in **Figure 2**.

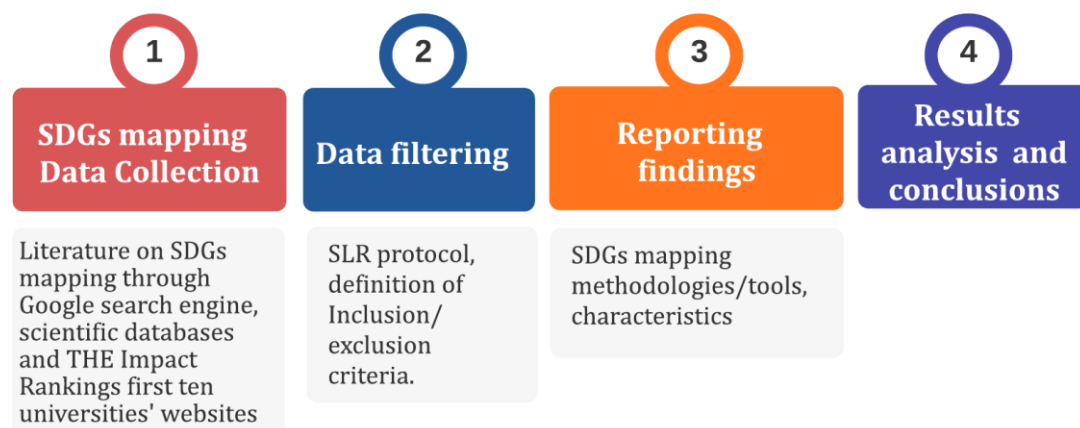


Figure 2. Thesis methodological development summarizing scheme

The methodological approach to achieve the research aims consists of 9 broad steps:

Step 1: Using the keywords “Sustainable development goals” AND “mapping” AND (“higher education” OR “university”) on the Google search engine, analyse the first ten relevant entries when useful for identifying SDGs mapping methodologies and/or tools;

Step 2: Collection of different literature on SDGs mapping in HE through a SLR in two stages, first by reading abstracts and filtering and secondly, full-text reading for selecting useful papers;

Step 3: Collect and analyse information on universities’ SDGs mapping through web portals of the first ten universities in the 2020 *THE* Impact Rankings that will be used as the research population sample;

Step 4: Analyse the data selected to identify the methodologies and tools used to SDGs mapping and extract their main characteristics;

Step 5: Report findings;

Step 6: Analyse the records with the aim of determining the least mapped University mission in the sample;

Step 7: Analyse the methodologies and tools used by the sample universities to determine the mapping methodology approach the different institutions in the sample have followed;

Step 8: Analyse possible patterns on methodologies and tools used to map SDGs against Institutions’ activities, more specifically those aimed at mapping one or more of the three University missions;

Step 9: Conclusions.

2.3. Limitations

The author independently extracted data from the publications. Readers should therefore be mindful of possible errors in the completed review due to the single extraction employed. For papers found through scientific databases only self-declared

SDGs mapping records were considered which influenced the final sample size of the study and may have excluded useful cases as well as the number of universities selected from *THE* Impact Ranking. This is therefore an exploratory research in nature.

3. RESULTS

This section is dedicated at presenting and describing the data obtained from the sample of papers selected, findings will be presented objectively and there will be no discussion on what these results mean. The information provided is not meant to be representative across all SDGs mapping activities but have been systematically selected to illustrate which methodologies and/or tools some universities have used so far to map their contribution to the SDGs, it is therefore meant to be explorative.

The information extracted is presented by each general data source, that is, the Google search engine, scientific databases and universities' web portals.

3.1. SDGs mapping in higher education, Google search engine

As a result of inserting the keywords “Sustainable development goals” AND “mapping” AND (“higher education” OR “university”) on the Google search engine the entries seen on **Table 5** were obtained as result, these are presented in alphabetical order. On this table we can observe the titles, author, year of publication, geographical context and source type of each of the ten records. Later, the data extracted from these sources will be presented per each one of them.

Table 5. *Records included for analysis, source: Google search engine*

Title	Author	Year of publication	Geographical context	Source type
Annual SDG Accord Report 2019, Progress towards the Global Goals in the University and College sector	The SDG Accord	2019	International initiative	Report

Table 5. *Records included for analysis, source: Google search engine (Continuation)*

Title	Author	Year of publication	Geographical context	Source type
Getting Started with SDGs in Universities: A Guide for Universities, Higher Education Institutions, and the Academic Sector.	SDSN Australia/ Pacific	2017	Australia, New Zealand and Pacific	Guide
Higher Education and Research for Sustainable Development (HESD) - IAU	International Association of Universities, The Global Voice of Higher Education	n.d.	International initiative	Web portal
Mapping higher education for sustainable development in Portugal	Fonseca, L., Portela, A., Duarte, B., Queirós, J., & Paiva, L.	2018	Portugal	Academic journal article
Mapping of sustainability policies and initiatives in higher education institutes	Shawe, R., Horan, W., Moles, R., & O'Regan, B.	2019	Ireland	Academic journal article
Raising & Mapping Awareness of the Global Goals	Carteron, J.-C.; Decamps, A.; Suter, B.	2019	International initiative	Report
SOS-UK SDG Curriculum Mapping Support Package	Students Organising for Sustainability (SOS) - UK	n.d.	United Kingdom	Web portal
Sustainable Development Goals University of Leicester	University of Leicester	n.d.	England (UK)	Web portal
The Role of Higher Education in Advancing the UN's Global Goals	Mahalak, A.	2018	United States of America	AASHE Blog
Video: Mapping university contributions to the SDGs (Webinar)	SDSN Australia/ Pacific	2017	Australia, New Zealand and Pacific	Video (webinar)

-
- ***Annual SDG Accord Report 2019, Progress towards the Global Goals in the University and College sector*** (The SDG Accord, Led by the Global Alliance, 2019)

Aim: Present a summary of the main findings from the second year of the SDG Accord where 51 out of 110 signatory institutions presented their reports on their work with the SDGs.

Context: International.

What is the SDG Accord? It is an international initiative launched on 2017 and developed by the Global Alliance to allow the tertiary education sector to demonstrate its commitment to playing its part in meeting the SDGs and sharing best practice.

What does the report present? It presents some key findings and gives case studies examples and testimonials. They consider that while the sustainability journey of each institution reflects its unique context, connecting them together through the SDG Accord offers the opportunity for scaling of impact.

Relevant results:

- One of the biggest achievements is increased mapping of the sector's work towards the SDGs. Mapping is proving to be one of the best starting points for institutions at the beginning of their SDG journey. This is shown with the fact that over two thirds (70%) of respondent institutions have mapped their activities to the SDGs partially or entirely and 62% of respondents report publicly on their SDG work. It is relevant to note that submissions were spread across 19 countries, and those in the United Kingdom made up two thirds of the 51 reports;
- The SDGs that institutions outline they have the biggest impact on were SDG 4 Quality Education, SDG 3 Good Health and Wellbeing, and SDG 5 Gender Equality. On the other hands, the SDGs that institutions felt they had least impact on in the

last 12 months were SDG 1 No Poverty, SDG 2 Zero Hunger and SDG 6 Clean Water and Sanitation;

- It was asked to institutions to rank their integration of the SDGs as either low, medium or high on four key areas: 1. Leadership, Staff and Governance, 2. Campus, Community and Operations, 3. Partnerships, Society and Engagement, and 4. Learning, Research and Students. The results showed that across these areas policy and strategy commitments to the SDGs were found to be in place for all 4 areas, which may indicate that it is probably the first step most institutions make. Institutions were likely to rate themselves as 'high' in the integration of the SDGs in the *Leadership, Staff and Governance* category, and rate themselves 'low' in the *Partnerships, Society and Engagement* category, which points towards a top down approach commonality and suggests that there is work to be done when it comes to collaborating with other institutions and organisations.

Some institutions' recommendations to progress the agenda further: *"Map and report formally on your contribution to the SDGs. Create benchmarks and targets. This ensures you are being transparent and aspirational"; "If your institution undertakes research, change the research application to necessitate researchers outlining which of the SDGs the work contributes towards"; "Explicitly incorporate the SDGs across the whole curriculum. It has relevance to every single course and module offered [...]"; "Look for innovative ways to increase staff and student capacity to address the SDGs."*

SDGs mapping on the report: The reports does not present explicitly explained examples of SDGs mapping process, however, as conclusion the report talks about the importance of the mapping process as it shows institutions, how much they already do towards the SDGs, which they may not have realised previously. It enables them to work out where they are doing well and where there is room for improvement, create internal benchmarks, and suggest targets. They present the *Sustainability Leadership Scorecard* as a tool available to support the sector with the mapping activity (*free to use and available to universities and colleges in the UK and Ireland. International users can access but with an annual fee, four areas can be mapped 'Learning, teaching and research';*

'Leadership and governance'; 'Estates and operations' and 'Partnerships and engagement'; EAUC, n.d.).

Other relevant annotations: There are four different types of signatory to the SDG Accord: institution, individual, supporting organisation and students' organisation, apart from other obligations institutions are the only signatory that have the obligation to annually report to the UN High Level Political Forum. The Institution category can include any organisation delivering further or higher education teaching or training, and so signatories vary greatly in size and scope.

- ***Getting started with the SDGs in universities: A guide for universities, higher education institutions, and the academic sector*** (SDSN Australia/Pacific, 2017a)

Aim: The guide seeks to outline the key roles universities have in contributing to the UN SDGs and the benefits of becoming engaged. It provides guidance on how to get started with deepening contributions to the SDGs.

Context: Australia, New Zealand and Pacific.

What does the guide cover? Divided in four sections it covers: 1. Why the SDGs matter to universities, it elaborates on why universities are crucial for the SDGs achievement; 2. How universities can contribute to the SDGs through their functions of education, research, operations and external leadership; 3. A step-by-step guide to help universities engage with the SDGs; 4. Tools and guidance for SDG integration.

Relevant developments of the guide: Section 3 provides a step-by-step SDG integration process; steps universities can take to start and to deepen their engagement with the SDGs. These steps are shown in ***Figure 3***. These steps are intended to offer general guidance and universities depending on their context and starting point may undertake several steps, just one step or even skip steps or change their sequence, it is important to recognise that there is no precise way to implement the SDGs because universities differ from each other in many ways like structure, size, priorities, access to funding among others.

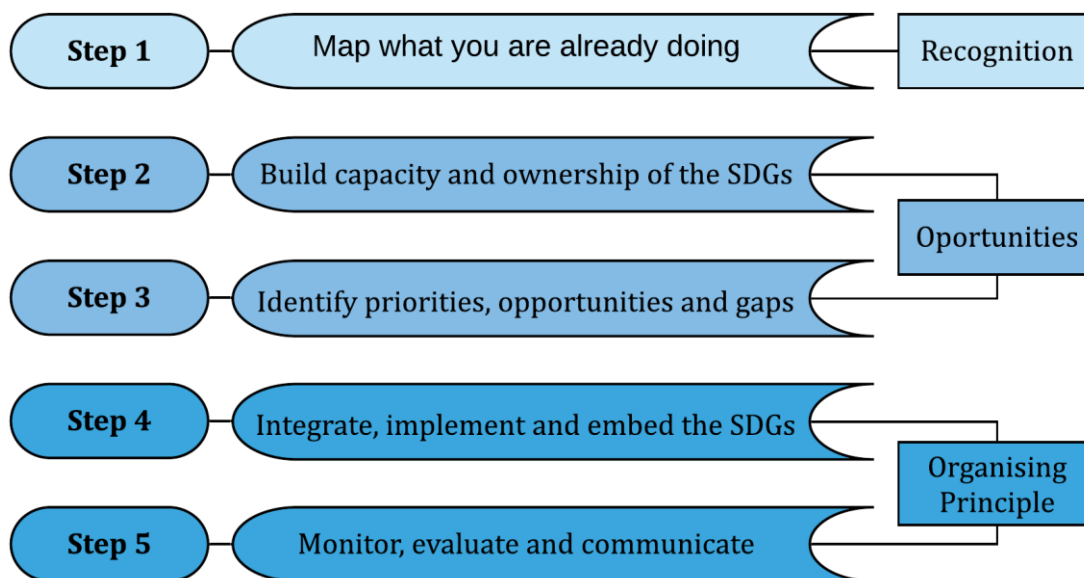


Figure 3. *Overview of the step-by-step SDG integration process, adapted from SDSN Australia/Pacific, 2017a*

SDGs mapping: The guide describes the Step 1 on **Figure 3** as a great starting point for discovering possibilities for deeper engagement, as previously shown, the first step universities can take on SDGs integration is mapping what they are already doing to contribute to the goals. It is suggested that before beginning to map university activities it is important to have a clear understanding of the purpose of the mapping exercise and what data they are seeking for and from it since this will help to identify sources and focus on the area of enquiry.

Mapping tools: The document presents two tools that help achieve a mapping exercise which are ‘Mapping university contributions to the SDGs’ and ‘How to run a stakeholder engagement workshop’ explained in their Sections 4.1 and 4.2 respectively and which are briefly summarized down below.

- *Mapping university contributions to the SDGs*

Here, a set of approaches that can be used to identify and ‘map’ how the university contributes to the SDGs through its research, educational and operational activities, as well as some of the considerations for selecting and designing the best approach was

presented. It is highlighted that mapping can be challenging as universities are often large and complex institutions and can contribute to the SDGs in many different ways, nevertheless, the key to ensure the process is manageable is to be clear about the objectives and outcomes of the mapping, as said before, and to choose and approach and data source accordingly. The mapping approaches presented on the guide were as shown on **1.1.6**, these are: Desktop assessment, self-identification and keyword searches. Examples of ‘data sources’ that can be used as the basis for mapping include *research*: research strategies, flagship initiatives, researchers, projects/grants, publications, and research excellence rankings; *education*: graduate and undergraduate courses/units, course coordinators, and student club and society interests; *operations*: university strategies, policies, objectives, initiatives, and operational areas and; *reporting*: Indicators against which the university currently reports.

A couple of further resources to help universities get started are given:

* *Practical approaches to mapping university contributions to the SDGs* (Webinar) by SDSN Australia/Pacific and ACTS (2017): youtu.be/PbET71egLzw. (**Video: Mapping university contributions to the SDGs (Webinar), presented later in this section**)

* *Compiled list of SDG keywords* (spreadsheet) by Monash University and SDSN Australia/Pacific (2017): http://apunsdsn.org/wp-content/uploads/2017/04/Compiled-Keywords-for-SDG-Mapping_Final_17-05-10.xlsx

- *How to run a stakeholder engagement workshop*

It is stated that a well-designed cross-university workshop is a great opportunity to discuss how the university could engage with the SDGs and can be a highly rewarding and energising experience for all the participants. The suggested outlines to run the workshop are as follows:

Template cross-university SDG workshop (p.37, Box 2.)

Potential objectives:

- To build a basic understanding of the SDGs;

- To bring key people on board with the SDGs and build champions;
- To identify strengths, gaps, priorities, and opportunities for university engagement with the SDGs, and develop a plan for putting them into action;
- To create links and a shared purpose for people working in different areas of the university.

Length: Half to full day.

Participants: University leadership, key sustainable development leaders in the university, external relations, representatives from each faculty and from operational areas, student reps (for example from relevant clubs and societies), key external stakeholders.

Presentations (first half):

- What are the SDGs and how is the world responding to them?
- How can the ambitions of the SDGs be translated into action?
- Interesting and relevant examples of how the SDGs have been used (within the area, by external stakeholders, by other universities);
- Short reflections from a variety of stakeholders on the opportunities of the SDGs for the university.

Discussion questions / breakout groups (second half)

- How does what I do align with the SDGs? How could I do more to contribute to them?
- How does the current work of the university relate to or contribute to the SDGs – which SDGs and how?
- What are our strengths, what are our gaps and opportunities? How do these align with the university's priorities and values?
- How can we use the SDG framework to improve and showcase what we currently do?
- What are the areas of common interest within the university? Can we use these linkages as the basis for collaboration?
- What are the structural barriers/challenges? What needs to change to promote more action?
- What needs to happen to realise opportunities? What are next the steps?

Outcomes

- Workshop report;
- Plan of action for the university;
- Communication to the whole university.

Tips

- Ensure that the content and activities are meaningful to all the participants, regardless of their background or area of the university. For example, ensure that discussion questions make sense from the perspective of all participants;
- Use a combination of presentation and activities that allow discussion.

It is underlined that the actual structure and content of the workshop will need to be customised to suit the audience, their familiarity with the SDGs and the objectives of the activity.

The guide also provides two mapping case studies on their Annexes B.6 and B.12:

* B.6. Mapping curriculum through the SDGs, Victoria University of Wellington (p.48): As part of their contribution, the curriculum content of the Victoria's 3000 plus courses were reviewed through an SDG lens. The university wanted to see which schools and faculties had the greatest existing sustainability content in their courses, and equally which of the 17 goals either featured strongly or were under-represented. A consultant was engaged to develop an automated process of scraping content off Victoria's online Course Finder and then searching the course descriptions for the **occurrence of keywords specifically developed for each of the 17 goals**.

* B.12. Mapping research to the SDGs, Institute for Sustainable Futures, University of Technology, Sydney (UTS) (p.50):

In 2016 the Institute for Sustainable Futures at UTS (ISF-UTS) created a tool for mapping its research against the SDG framework, tool and process intended to help ISF-UTS see where research work was linked to the SDGs, which could in turn help

determine how to strengthen alignments, and make decisions about whether to address any identified gaps. ISF-UTS also developed a collaborative process to encourage research directors to engage with the SDGs in a meaningful way and to promote accurate understanding and buy-in across the Institute. It created a simple Excel tool, which 10 research directors used to indicate where they found a link between an SDG (at the Target level) and an active or recent project in their research area. The results were then collated and analysed to show the depth and breadth of ISF-UTS' alignment to the SDGs. The link for the UTS' research mapping against the SDGs is given as: <https://www.uts.edu.au/research-and-teaching/our-research/institute-sustainable-futures/our-research/sdgs-mapping-our-research>. There brief information on their results is presented as well as a university contact.

- ***Higher Education and Research for Sustainable Development (HESD) – IAU***
(International Association of Universities, The Global Voice of Higher Education, n.d.)

What is the web page aim? The portal is presenting and linking the International Association of Universities' (IAU) dedicated portal on Higher Education and Research for Sustainable development: www.iau-hesd.net. It is explained that the web portal presents IAU's strategy to support SD in HE, reports on all IAU activities in the field, provide useful resources about SD in HE and map inspiring initiatives by HEIs and organizations to reach the SDGs.

Context: International.

HESD web portal: it provides access to actions and initiatives developed around the world to promote sustainability, it has an specific section dedicated to the SDGs (Agenda 2030 and the SDGs) where initiatives are presented by each goal, one can access an specific goal and will find its description and related actions that have been done. For instance, if one examines Goal 4 (Quality Education), several initiatives such Education for Sustainable Development Research Centre (ESDRC), Green Metric World Universities Ranking or SDG Accord Climate Emergency Letter are found.

SDGs mapping: On the *Agenda 2030 and the SDGs* menu, link to the SDSN Australia/Pacific (2017a) guide, presented above in this document, is given but no other specific tool or methodology specifically dedicated to the SDGs mapping is presented on the welcoming page of the menu, typing the words “SDGs” AND “mapping” on the search bar returns three entries but the presentation of the tool “SDG Impact Assessment Tool” was the only entry related the topic, the tool is said to be free and available online for anyone to use on the link <https://sdgimpactassessmenttool.org/> with registration of a user account. If the words “SDGs” and “map” are typed on the search bar nine entries are returned, some of these are France’s roadmap to the agenda and a refugee’s welcome map which were not related with the SDGs mapping activity, the only tool returned was the Sustainability Tracking Assessment & Rating System (STARS), which is a self-reporting framework for colleges and universities to measure their overall sustainability performance.

- SDG Impact Assessment Tool (Gothenburg Centre for Sustainable Development, n.d.)

The SDG Impact Assessment Tool is a free online learning tool that visualizes the results from a self-assessment of how an activity, organisation or innovation affects the SDGs. It aims to stimulate the user to get a better understanding of the complexity of sustainable development and the different aspects of the SDGs. This tool is developed to be used by researchers, teachers, companies, agencies, civil organisations or by anyone who has a project or a solution to assess. The tool was developed by the Gothenburg Center for Sustainable Development at Chalmers University of Technology and the University of Gothenburg, in collaboration with SDSN Northern Europe and Mistra Carbon Exit and it is dedicated to help the academia and other businesses to describe their impact on the 17 Global Goals.

- ***Mapping higher education for sustainable development in Portugal***
(Fonseca et al., 2018)

Aim: To map the BSc and MSc courses offered by Portuguese HEIs that address Sustainability (or Social Responsibility, or Ethics) in their curricula.

Context: Portugal.

HEIs: Porto University, Lisbon University, Coimbra University, Minho University, Porto Polytechnic Institute, Bragança Polytechnic Institute, Lisbon Polytechnic Institute, Leiria Polytechnic Institute.

SDGs mapping: No, SDGs are not mentioned on the paper in any way.

Methodological approach to mapping sustainability: Curricular unit content analysis, the BSc and MSc courses (52 in total) offered by the 8 HEIs selected (based on the Web of Universities ranking on January 2017) were analysed by accessing their websites. The curricular units (464 in total) of the 52 BSc and MSc, were scrutinized, to identify those that addressed Sustainability (or Social Responsibility, or Ethics), the nature of the curricular unit (compulsory or optional) and the applicable number of teaching hours. When the available information was of generic and subjective nature, professors of the Master's in Engineering and Quality Management offered by Minho University were interviewed and the researchers' knowledge of the investigation context was also used, to reinforce the credibility of this analysis. The statistical distribution of the percentage of curricular units covering Sustainability and Sustainable Development, the number of hours of these curricular units were calculated.

Relevant results: 58 curricular units were identified as addressing Sustainability syllabus (12.5% of total), with 14% for the 4 Universities and 10% for the 4 Polytechnic Institutes.

- ***Mapping of sustainability policies and initiatives in higher education institutes*** (Shawe et al., 2019)

Aim: To map sustainability policies and initiatives of a select number of HEIs and explore HEI sustainability integration on campus and through outreach.

Context: Ireland.

HEIs: Not dedicated to a specific institution.

SDGs mapping: No.

Methodological approach to mapping sustainability: Literature review, from the original 50 papers, 17 were selected for a detailed review as these dealt specifically with outreach (8 papers) and education (9 papers). Secondary data were gathered through online searches. Key words used were sustainability in higher education institutes, university sustainability, education for sustainability, outreach, and campus sustainability. International and national (Irish) case studies were selected, sixteen case studies were carried out in total. Primary data were gathered through site visits and interviews with energy and transport managers, and academics. HEIs active in campus sustainability as well as several in the developing stages were contacted and selected for comparison. Site visits to selected cases were conducted. The remainder of the information was obtained from the HEI websites and their sustainability related material. Terms such as the name of the institution along with sustainability, green campus, environmental sustainability, sustainability policies, networks, sustainability strategy, and strategic plans were searched for. For outreach, terms searched for included the name of the HEI with outreach, community engagement, civic engagement, public engagement and community involvement. Outreach activities that did not involve the environment were not included.

Relevant conclusions: There is a focus on campus-based activities with outreach often neglected in comparison.

- ***Raising & Mapping Awareness of the Global Goals*** (Carteron et al., 2019)

Aim: Present the 2019 report from Sulitest, for the third consecutive year an update of Sulitest's report "Raising & Mapping Awareness of the Global Goals" was presented at the High-Level Political Forum (HLPF).

Context: International.

What is Sulitest? International movement, led by an independent NGO, offering tools for raising awareness and mapping the SDGs. The Test is an online, Multiple Choice Question test available in 10 languages. 16 specialised modules on local specificities and 4 on the SDGs. Sulitest mission is to raise awareness and improve sustainability

literacy on a global scale. The main aim of Sulitest is to provide teachers and trainers with a set of SDG-related tools relevant for their courses.

SDGs mapping: As each question is linked to one or several SDGs, the data collected from the Test offers a glimpse into the global awareness of SDGs based on 2019 sample of Sulitest users. The tools for “*Mapping and raising awareness*” are included as part of the Phase 1 of the Sulitest movement, the tool ‘the Test’ is focused on the area of “Knowledge” and “Awareness”. 4 modules are dedicated to the SDGs, Specialised modules on SDG 7, 11,12 and on SDG Framework. *Phase 2* allows enhancing robustness and includes new tools and initiatives requested by the community that are currently in development. *Phase 3* includes areas that can be developed in the future, the movement looks to the possibility of creating a Certificate in Sustainability Literacy.

What is being mapped? Sustainability awareness, with 4 test modules dedicated to the SDGs.

Mapping tools:

‘The Test’: It is in an online, multiple-choice question format. For each organization that decides to carry out the Test, one or more people are “examiners” and organise a Test Sessions with the automated online tool and invite their students or colleagues to participate. The test is composed of different modules: First, The *International Core Module*, a set of 30 international questions that cover global issues and is taken by everyone regardless of their country of origin; usually combined with a *Specialized Module* with 20 additional locational or topical questions covering national, regional and cultural specificities, topical modules touch on a variety of issues, such as the two specialized modules on the SDG process and on SDG 7 (Energy), on SDG11 (focused on waste) and on SDG12 (focused on Circular Economy). In addition, organizations may choose to create *Customized modules*, a specific set of questions adapted to their own needs. Lastly, an optional anonymous *voluntary survey* is provided to the respondents to collect data for research purposes, data such socio-demographic characteristics and sensitivity to sustainability issues. If the candidates are students, some questions about prior education on sustainable development are added.

The test is designed with: A foundational matrix that provides a coherent, educational and systemic framework; questions tagged with up to three thematic tags to ensure balanced representation of concepts within each Test; alignment with the SDGs framework to provide indicators on the Global Agenda.

The modules currently available in this initial Phase 1 focus on knowledge. The knowledge subjects are divided into four themes: “Sustainable humanity and ecosystems on planet earth”, “Global and local human-constructed systems to answer humanity’s need”, “Transitions towards sustainability” and “We each have roles to play to create and maintain individual & systemic changes.

Each question is linked to up to three of the SDGs, which provides a process for monitoring the progression of core literacy in all 17 fields covered by the SDGs. As a result, Sulitest can provide tangible indicators to help individuals and organizations assess and improve their awareness and knowledge of the SDGs. The International Core module of the Test is the only module covering the full scope of the 17 SDGs.

Specialised modules: *UN DESA Module:* Training Citizens on the SDGs, developed to train people on the functioning and the framework of the SDGs roadmap, in order to improve their ability to contribute to the global agenda. This module was launched in 2017 and is now fully available online for the community. It is a 15-question module covering 4 main dimensions (SDGs global framework, specific SDGs, systemic vision and interlinkages and process and UN bodies in charge). *SDG-specific modules with UN agencies:* developed to support deeper knowledge on individual goals. The 2018 HLPF, Transformation towards sustainable and resilient societies, focuses on the review of the following goals: SDG6 Clean Water and Sanitation; SDG7 Affordable and Clean Energy; SDG11 Sustainable Cities and Communities; SDG12 Responsible Consumption and Production; SDG15 Life on Land.

‘The Quiz’: A tool to engage students and staff in 15 minutes. The facilitator displays the Quiz on a projector screen and participants use their computer, tablet or phone to connect. Played as an interactive game between several teams, it is based on 10 questions that can be taken from the International Core module or from a specialised

module. Each question is displayed in real time, and each team member has one minute to respond. After each question is completed, team scores are displayed on a graph, along with a Learning Statement. At the end, a summary displays the overall results and the winning team. The Quiz game can be used during board meetings, classes and other events for quick, fun engagement and to help raise awareness of sustainability.

Relevant results: There were 29,151 test-takers from 191 universities and organizations in 35 countries who took the Test between July 2018 and July 2019, this sample is not representative of the overall population but it gives some insight into the potential of the tool for monitoring sustainability literacy at a global scale.

About trend related with the 17 SDGs, it is interesting to notice that there are no SDGs with a very low level of awareness (i.e. under 10%) nor SDGs with complete awareness (i.e. over 90%). However, significant differences are identified between the SDGs with the lowest (39%) and the highest level (66%) of awareness in our sample (SDG6 and SDG8, respectively), heterogeneity that highlights the need for the development of education and initiatives to raise awareness on specific SDGs. SDGs characterised on average by a lower level of awareness are the ones with a strong focus on social challenges (SDG1, SDG2, SDG5, SDG6 and SDG10), except for SDG15 Life on Land. On the other hand, SDGs characterised on average by a higher level of were SDGs with a highly transversal scope (SDG4, SDG11, SDG16 and SDG17). Adding to this group we have SDG8 Decent Work and Economic Growth and SDG14 Life below Water with the two highest average scores.

- ***SOS-UK SDG Curriculum Mapping Support Package*** (Students Organising For Sustainability (SOS) - UK, n.d.)

What is the web page aim? To present a support package for mapping the UN Sustainable Development Goals across the formal curriculum through a student-led audit developed by the University of Winchester and NUS (National Union of Students).

Context: United Kingdom.

SDGs mapping: Yes. Four stages and twelve activities **Table 6**. The paid support-package offers three levels of support: minimal, medium and full support with different fees.

Table 6. *SDG Curriculum Mapping, adapted from (Students Organising For Sustainability (SOS) - UK, n.d.)*

Stage	Activity	Minimal support	Medium support	Full support
Preparation	Collection and Preparation of data	Institution	Institution	Institution
	Design of audit spreadsheet	SOS-UK	SOS-UK	SOS-UK
	Preparation and customization of training materials	SOS-UK	SOS-UK	SOS-UK
	Recruitment of student auditors	Institution	SOS-UK	SOS-UK
Audit	Training students	SOS-UK	SOS-UK	SOS-UK
	Pre- and post-surveying of involved students to understand impact (optional)	SOS-UK	SOS-UK	SOS-UK
	Ongoing support of students throughout audit	SOS-UK	Institution	SOS-UK
Reporting	Tidying up and sending across raw data	SOS-UK	SOS-UK	SOS-UK
	Production of simple graphs for use in reports, slides, etc.	Institution	SOS-UK	SOS-UK
	Production of full audit report	Institution	Institution	SOS-UK
Engagement	Workshop with staff, senior leaders, etc. to explain rationale	Institution	Institution	SOS-UK
	Workshop with staff, senior leaders, etc. to review results	Institution	Institution	SOS-UK

- **Sustainable Development Goals | University of Leicester** (University of Leicester, n.d.-b)

What is the web page aim? Presentation of the University of Leicester’s report on the SDGs. It presents a short video on the university’s contribution to the goals and allows an exploration by goal, additionally it is possible to download the full report.

Context: England (United Kingdom).

HEI(s): University of Leicester (UoL).

SDGs mapping: Yes, the mapping activity is presented through the report “Impacting the Global Goals by DEGREEs, Developing Education for Good with Research Excellence and Engagement”.

The web portal allows to explore each SDG, they present a summary of results on their contribution in the areas of teaching, research, university activities and courses/modules relating to the goal. The report presents complete view of the findings and presents as an appendix the methodology UoL used to map their contributions to the SDGs.

What is being mapped? Teaching, research, strategy and operations and community & public engagement. It is stated that due to data constraints only teaching and research have been fully reported.

Mapping methodology: (University of Leicester, n.d.-a, p. 22).

Data were collected at the end of the 2017/18 academic year in four categories; teaching, research, strategy & operations and community & public engagement. Only teaching and research results were fully reported due to data constraints.

Teaching: As part of a wider Curriculum Transformation (CT) project, an audit was carried out to identify existing sustainability-related teaching and opportunities to incorporate more ESD within the curriculum. Intended learning outcomes (ILO's) were specifically used to identify what students should know or be able to do by the end of the module. The ILOs had to engage with any of the United Nations SDGs or with the university's transferable skills network (TSF). Modules have been identified that contain teaching relating to the UN's 17 SDGs – both core and optional modules. They have only been able to use the ILO's as a reference to see whether the module contains the SDGs and, as they are brief, it is hard to ascertain which specific ones they contain. For example, when the environmental issues are mentioned it is assumed that SDGs 13, 14 and 15 are included but this could include elements of renewable energy, etc.

Research: Mapping the institution's research was difficult as there is no current or standardised method to capture all the related research. Firstly, lists of keywords relating to the 17 different SDGs were created using keywords and query codes from Aurora Network (Initial Query Codes - SDG Analysis: bibliometric of reference) and from Monash University and SDSN Australia/Pacific (Compiled keywords for SDG mapping) as reference. The aim was to use these keywords to match words in publication titles using Excel, however this proved to be very difficult, so they changed their method. Research publications from the last 5 years (2013-2018) were mapped using query codes, including keywords relating to each SDG, to search for keywords within publication titles, abstract and keywords in the Scopus online database. Some lists had to be adapted during the exercise, as some keywords had different meanings for different subjects (e.g. for SDG11 (Sustainable Cities) "transport" was used when searching for transport systems research however transport can be used in other contexts, such as the transport of molecules around the body).

Data sources: Programmes curriculum, Scopus database.

Relevant results: 71% undergraduate students and 83% postgraduates have access to SDG-related modules. The top five Goals University of Leicester's combined academic work contributes to are: SDG3, SDG9, SDG 13, SDG16 and SDG 15. 5128 publications on health and well-being since 2012, 3015 students have access to modules focusing on industry, innovation and infrastructure, the university has the UK's largest non-residential Passivhaus building – a sustainable building which reduces carbon emissions, the Leicester Hate Crime Project is Britain's biggest ever study of hate crime victimization.

Other relevant annotations: For the areas of what they call 'Institution', 'Impact' (university activity) and 'Engagement' they present examples instead of quantitative data by each SDG, some might have examples of the three while some might have examples of just one of them. For instance, in the case of Goal 6 (Clean Water and Sanitation) only an example for impact is presented, this was: Dr Harjinder Sembhi and Dr Darren Ghent are working with EarthLinks UK and The Energy and Resources Institute (Delhi) to develop new datasets on vegetation stress that will provide the

evidence base for intervention strategies for better agriculture and water management. This will feed into targeted policy briefs and recommendations required to protect critical zones across the IndoGangetic Plain. The report does not present specific course/modules relating to each Goal, this can be found on the web page navigation of each SDG.

- **The Role of Higher Education in Advancing the UN's Global Goals**
(Mahalak, 2018)

What is the web page aim? The author wrote about her annotations from the Association for Advancement of Sustainability in Higher Education conference where the theme was “Global Goals: Rising to the Challenge”.

Context: USA.

SDGs mapping: No. The web page does not present any mapping case neither does it elaborates on SDGs mapping activities. It is a short blog entry.

Other relevant annotations: It is briefly mentioned that offices of sustainability in universities are mapping their indicators and strategic planning around the SDGs. The author states that there are many ways to integrate the UN’s Sustainable Development Goals framework into the framework of campus communities, HEIs can and should be drivers of momentum for the Sustainable Development Goals in their communities through research, entrepreneurship, facilities, purchasing power, and student leadership development. Ways to connect a university campus to the work of the UN and the SDGs are given, for example: Individual students, faculty, and staff can join the United Nations Association of the United States of America for more resources on how to start a campus chapter of UNA-USA (membership is free for any student 26 years or younger); universities can apply to the AASHE Sustainability Awards for recognition of their efforts advancing the Sustainable Development Goals on campus; join the UN’s Higher Education Sustainability Initiative or engage in a voluntary local review of the Sustainable Development Goals on their campus.

- **Video: Mapping university contributions to the SDGs (Webinar)** (SDSN Australia/Pacific, 2017b)

Aim: The webinar “Practical approaches to mapping university contributions to the Sustainable Development Goals”, co-hosted by SDSN Australia/Pacific and the Australasian Campuses Towards Sustainability (ACTS), aimed to help universities get started with the SDGs mapping process.

Context: Australia, New Zealand and Pacific.

HEI(s): Speakers were: *Leah Dudley*, Macquarie Sustainability, Macquarie University; *Dr Tahl Kestin*, SDSN Australia/Pacific Network Manager (Moderator); *Caitlin Leahy*, Institute for Sustainable Futures, University of Technology, Sydney; *Dr Susan Pepper*, Monash Sustainable Development Institute, Monash University and; *Andrew Wilks*, Sustainability Office, Victoria University of Wellington.

SDGs mapping: The webinar heard from a panel who have carried out SDGs mapping in their own universities. Drawing on their experiences and learnings in undertaking the mapping, the panel discussed the range of approaches available, their benefits and uses, and practical guidance and tips on how to carry them out.

First the moderator introduces the topic stating that recognising existing contributions is the first step in the SDGs engagement process and that we can learn from the experience of others to get started. Extracted information on SDGs mapping from the webinar is presented by university below:

- *Macquarie University (MQU):*

Aim of the mapping: Create alignment with international standards, Identify gaps within the MQU framework, Quantify MQU’s contribution to achieving the SDGs, Create a basis for which MQU can move forwards and build strategic direction, ensure students are being provided with relevant and up to date information to take into industry.

What is being mapped? The university's sustainability framework based on the learning and teaching framework from 2012 underpinned by 5 overarching theories of learning skills with subthemes under them.

Mapping methodology: 1. Understand keywords, themes and definitions in both MQU sustainability framework (MQSF) and the UN SDGs; 2. Map each MQSF subthemes onto each UN SDG; 3. Calculate the overall percent that each UN SDG is covered by each of the main framework pillars.

Data sources: UN SDGs, MQSF.

Relevant results: 60% of Harmony & Well-being (theory of learning skills) subthemes mapped onto the SDG of 'No Poverty' (SDG1). The results were represented in a heat map (MQSF vs UN SDGs), the heat map represents the extent to which each framework aligns with the UNSDGs in a scale from red to green with green representing a high proportion of framework alignment (75% or above), yellow indicates moderate alignment (41% to 74%) and red indicates a significant gap in alignment (0% - 40%). They found out that 'Natural Resources' (MQSF) to be the most critical gap all throughout. 'Natural Resources' and 'Climate Change' (MQSF) both presented a significant gap with the SDGs Quality Education (SDG4) and Gender Equality (SDG5).

Other relevant annotations: The speaker advised to take the time to fully understand the UN SDG framework as well as each university's definitions and framework to have clear their own situation.

· *Institute for Sustainable Futures University of Technology, Sydney (ISF-UTS):*

Aim of the mapping: Mapping ISF research work to the SDGs. To help the institute externally, in terms of communicating their work and internally to help them determine where they could go from there, to help the institute with internal planning.

What is being mapped? ISF research projects.

Mapping methodology: 1. Engage the 10 research directors of the institute (10 different research areas) into mapping the current projects (2016) based on linkages

assumptions between the goals, targets and projects; 2. Development of excel mapping tool, mapping to the target level where directors would put a 1 or a 0 to demonstrate the link between a project and a particular target (illustrative example on **Table 7**); 3. Data collection and analysis; 4. Presentation of results internally through presentations at different meetings back to the research directors and also to broader audiences, and also externally in a summarized illustrative way.

Table 7. *Illustrative example of the ISF-UTS' research mapping tool.*

Goals	Goal 1: No Poverty		...	Goal 17
Targets	1.1 By 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than \$1.25 a day	1.2 By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions		17.19 By 2030, build on existing initiatives to develop measurements of progress on sustainable development that complement gross domestic product, and support statistical capacity-building in developing countries
ISF project				
<i>Project X</i>	1	0	...	0
<i>Project Y</i>	0	0	...	1

Data sources: Research projects.

Relevant results: The most links were found to be with Goal 6 -Clean Water and Sanitation, Goal 9 – Industry, Innovation and Infrastructure and Goal 12- Responsible Consumption and Production. It was shown that all areas of research were linked to at least 5 goals.

Other relevant annotations: Using the methodology explained it was only possible to determine if there was a link or not but not its strength. Most directors considered that the activity benefit them, and some decided to use the tool in their planning processes in their own areas. The speaker advised having clear objectives and scale of the exercise (an institute, school a faculty or the whole university). When asked about tips to

motivate researchers to participate in giving information she explained how they not just announced the initiative at important meetings but also did some background work on the existing research projects of each area so directors would only have to fill the spreadsheet with zeros and ones, plus they received feedback from some researchers into how to simplify the tool.

· *Monash University:*

Aim of the mapping: Increase their understanding of how Monash University Research/Learning and Teaching relates to the SDGs in order to identify their strengths and weaknesses; raise the level of dialogue at researcher, discipline and cross-faculty levels as well as with industry, government and SDSN partners in order to increase collaboration and impact; increase awareness, particularly among Monash staff and students, of potential opportunities and challenges; promotion of people, programs and impacts and; to create a tool available to Monash Sustainable Development Institute (MSDI) and the faculties.

What is being mapped? Research.

Mapping methodology: An assumption was made that there are map able relationships between research(ers) and the SDGs that can be easily manipulated to demonstrate intriguing and useful visual patterns, connecting and SDGs keyword with a researcher. 1. Develop a 'Keyword by SDG' list, a table of SDGs related keywords was created within an Excel spreadsheet using a variety of sources such UN documents, Google searches and personal communications; 2. Link researchers with keywords, use the keyword to find researches who self-identify with the keywords and search publications and awards data to find researchers working in keyword areas; 3. Define vertices and edges in NodeXL and graph the result, presenter's note: it doesn't matter how many times a researcher links to a particular keyword only 1 connection is made, e.g. 10 publications & 2 awards against the same keyword = connection; for visual representation the author weighted researchers by keywords associations and weighted keywords by researchers associations by using the Harel-Koren Fast

Multiscale layout algorithm and forced grouping, nodes were SDG keywords and, Faculties and Institutes centres; visualisation was also made through a dashboard.

Relevant results: The mapping provided the number of researchers identified as working in SDG space, faculty-based researchers who are highly active in SDG space and disciplines where the university was research active (and where weaknesses were).

Other relevant annotations: The exercise faced problems such time consumption because of manual keywords screening to which they developed an automated process to solve it or missed keywords which they solved by using SDSN collated list which was broader. As advise the speaker suggested first to understand the university's own situation and decide whether the mapping exercise will be done at a high level or at an in-depth level to which they could use the keywords list Monash University created (Monash University & SDSN Australia/Pacific, 2017). Additionally, it was suggested to engage researchers and work closely with faculties to be able to collect more complete information.

· *Victoria University of Wellington:*

Aim of the mapping: Review all courses offered to assess which had relevant SDGs content in order to understand strengths and weaknesses, to identify connections, to set a benchmark for monitoring progress and to start a dialogue around curriculum development.

What is being mapped? Teaching.

Mapping methodology: They engaged a consultant (Paul Dowd); 1. Identification of data sources; 2. Keywords list development to align the SDG to the courses the university was offering; 3. Automated website scrape; 4. Quality assurance to the automated process to taste the validity of the keywords; 5. Analysis and; 6. Distribution of findings around the university in a short paper format.

Data sources: Online course finder with curriculum courses content.

Relevant results: As an outcome the presenter showed a table in which they represented the number of courses aligned with each goal by faculty and by school.

Other relevant annotations: The speaker advised to try to design the process as efficient as possible and in a way that it can be repeated to continue monitoring.

3.2. SDGs mapping in higher education, scientific databases

Through the SLR carried a total number of six articles complied to the inclusion criteria, that is, the articles that will be presented here are about SDGs mapping in HEI. On **Table 8** we can observe the titles, author, year of publication and geographical context of each of the six records. Later, the rest of the sought data to be extracted will be presented per each publication.

Table 8. *Records included for analysis, source: scientific databases*

Title	Author	Year of publication	Geographical context
Are the sustainable development goals being implemented in the Portuguese higher education formative offer?	Aleixo, A. M., Azeiteiro, U. M., & Leal, S.	2020	Portugal
Energy efficiency actions at a Brazilian university and their contribution to sustainable development Goal 7	Rebelatto, B. G., Lange Salvia, A., Reginatto, G., Daneli, R. C., & Brandli, L. L.	2019	Brazil
Governing the university in the perspective of the United Nations 2030 Agenda: The case of the University of Bologna	Paletta, A.; Bonoli, A.	2019	Italy
Implementation of SDGs at the University of South Africa	Mawonde, A.; Togo, M.	2019	South Africa
Investigación en la Universidad de Holguín: compromiso con la Agenda 2030 para el desarrollo sostenible. (Research at the University of Holguín: commitment with 2030 Agenda for a sustainable development)	León Pupo, N. I., Castellanos Domínguez, M. I., Curra Sosa, D., Cruz Ramírez, M., & Rodríguez Palma, M. I.	2018	Cuba

Table 8. *Records included for analysis, source: scientific databases (Continuation)*

Title	Author	Year of publication	Geographical context
Reflections on the learning objectives for sustainable development in the higher education curricula – three cases from the University of Belgrade	Orlovic Lovren, V.; Maruna, M.; Stanarevic, S.	2020	Serbia

- ***Are the sustainable development goals being implemented in the Portuguese higher education formative offer?*** (Aleixo et al., 2020)

Aim: To examine the vertical integration of the sustainable development goals in Portuguese public HEIs to investigate whether the graduate and postgraduate offer in these HEIs is aligned with the SDGs.

Context: Portugal.

HEI(s): 33 Portuguese public higher education institutions.

What is being mapped? Curriculum.

Mapping methodology: 1. Classify the information disclosed in different categories that represent the different SDGs with a system code (List of categories for each SDG) based on the SDGs and their targets; 2. Each course was analysed by means of the presence/absence of criteria (categories of the code) in each SDG; 3. Analysis of the scientific domains and scientific areas of the courses covering SDGs, using the Fundação Para a Ciência E Tecnologia (FCT) list as a tool to divide the scientific areas.

Mapping data sources: Designations and objectives of the 2,556 undergraduate and master's degrees. For courses which designation did not permit a direct classification on the SDGs, then the content of the courses' objectives was analysed.

Relevant results: 198 courses directly address at least one SDG; more master's degrees embrace SDGs than undergraduate degrees; most courses address only one SDG (136/198); social sciences and humanities was the scientific domain with most courses involving SDGs; most addressed SDGs: 15 and 7 and least addressed SDGs: 1 and 5.

Other relevant annotations: Vertical integration: integrates sustainability through specific sustainability-related courses. Portuguese HE system is dual: Polytechnique institutes and universities. Code for SDG 15 is given as example, the categories considered in the system code comprehend the following list of words and sentences: biodiversity, biodiversity conservation, combat desertification, ecosystem, ecosystem services, extinction, forestation, landscape ecology, habitat fragmentation, soil degradation, sustainable forest management and sustainable agriculture (p.342).

- *Energy efficiency actions at a Brazilian university and their contribution to sustainable development Goal 7* (Rebelatto et al., 2019)

Aim: To analyse recent actions of energy efficiency implemented by University of Passo Fundo, a higher education institution located in the south of Brazil, and their contributions to Goal 7.

Context: Brazil.

HEI(s): University of Passo Fundo (UPF).

What is being mapped? University campus operations.

Mapping methodology: 1. Description of three initiatives towards energy efficiency that UPF has applied; 2. Collected data presentation (and how these contribute to goal 7), 3. Discussion of this data and SWOT analysis was made.

Mapping data sources: The energy data and information on energy efficiency practices were provided by the UPF Electric System Sector.

Relevant results: In a whole perspective, the three initiatives follow specific targets of SDG 7. The Free Energy Market is related to the access of reliable and affordable energy; the Solar Photovoltaic Generation Park increases the share of renewable energy in the

global mix; and the use of LED lamps is connected to doubling the global rate of improvement in energy efficiency.

Other relevant annotations: No.

- *Governing the university in the perspective of the United Nations 2030 Agenda: The case of the University of Bologna* (Paletta & Bonoli, 2019)

Aim: To provide an innovative framework to analyse how universities are rethinking courses and curricula, teaching, research programmes, campus operation and partnership to address the Agenda 2030.

Context: Italy.

HEI(s): University of Bologna (UNIBO).

What is being mapped? Teaching, research, third mission and institutional governance and management.

Mapping methodology: First, set up of a working group (rector, professors, some executives, staff and others) for the creation of a model for the measurement and reporting on the performance of a University in relation to their sustainability objectives. After, measurement took place mainly through the definition of numerical indicators and, where deemed relevant, through the display of boxes dedicated to presenting initiatives undertaken by UNIBO on issues pertaining to the individual objectives. Contribution was measured in four dimensions of performance: teaching, research, the third mission, institutional governance and management. **Table 9** shows an example of the numerical indicators and the boxes illustrating the initiatives presented with respect to the four performance dimensions on all 17 SDGs that the university used.

Table 9. *Illustrative example of UNIBO's Performance dimensions and indicators, adapted from Table I 'Performance dimensions and indicators' (Paletta & Bonoli, 2019, p. 508,509)*

Performance Dimension	Indicators and box
Teaching	Students enrolled (number) for a course containing at least one course marked as connected to an SDG (A.A. 2016/2017).
	Study courses and specialization specifically active on the subjects covered by each SDG (number) and relative amount of registered students (A.A. 206/2017).
Research	Publications inside Scopus database (number), in which at least one author of the University appears, who deals with issues related to SDGs (analysis on papers published in the decade 2006/2017).
	Number of publications per capita of UNIBO staff compared to the international benchmark (100), in relation to SDGs.
Third mission	Public engagement events (number) organised in collaboration with the University in the cities where it operates.
	Box on University initiatives to help solve the issues indicated by SDGs, which involve external subjects: e.g. "Unibo for refugees" (SDG 1 – no poverty); business incubators (SDG 9 – industry, innovation and infrastructure); University museum system – number of visitors and opening hours (SDG 11 – sustainable cities and communities); the agricultural company of the University (SDG 15 – life on land); participation in the "Magna Charta" Observatory (SDG 16 – peace, justice and strong institutions); AlmaEngage (SDG 17 – partnerships for the goals)

Table 9. *Illustrative example of UNIBO's Performance dimensions and indicators, adapted from Table I 'Performance dimensions and indicators' (Paletta & Bonoli, 2019, p. 508,509). (Continuation)*

Performance Dimension	Indicators and box
Institution	Water consumption per year and percentage of devices with water efficiency installed at the University. CO2 emissions (tonnes) in the past 12 months
	Box on: University bodies and figures responsible for the protection of gender opportunities and the gender equality plan (SDG 5 – gender equality); initiatives to support staff with disabilities (SDG 8 – decent work and economic growth)

Mapping data sources: Quantitative data mainly provided by the Data Warehouse of the University of Bologna and in a residual way by: a survey given to the Coordinators of the University Courses, content analysis carried out on research projects and international cooperation projects activated by the university and searches by keywords, Boolean operators and indices, queries made on the Scopus database.

Relevant results: A report consisting of 70 pages, 186 numerical indicators and 30 illustrative boxes of initiatives related to the SDGs have been reported.

Other relevant annotations: Participates in the Green Metric Survey; strategic plans related to sustainability in its 3 dimensions; the University has endorsed the 17 SDGs of the United Nations as a reference framework for governance and as a tool for measuring the progress made toward a sustainable society.

- *Implementation of SDGs at the University of South Africa* (Mawonde & Togo, 2019)

Aim: To demonstrate how universities can play a pivotal role in implementing SDGs.

Context: South Africa.

HEI(s): University of South Africa (Unisa).

What is being mapped? University's operations; outreach, teaching and learning (education) and research initiatives.

For *Education* the study focused on the Environmental Management programme because it is one of the programmes that is most likely to contain sustainable development or SDG-related content and topics.

Mapping methodology: 1. Interviews with key informants (people who are most familiar with sustainability initiatives); 2. Document analysis (policies and research information); 3. Campus observations to triangulate data collected in the previous steps. 4. Trustworthiness was enhanced through member checking where the campus director received transcribed information for verification.

The interview questions were varied across all interviewees. The interview guideline for the Unisa Sustainability Office had questions which cover Unisa sustainability policies, implementation, sustainability planning and projects. Questions for Unisa operations manager focused on campus environmental management, while BSc Honours in Environmental Management students were asked about their involvement in sustainability initiatives at Unisa. The respondents were selected purposively, the campus operations manager and sustainability officer were involved in the study, as they had the technical knowledge of campus initiatives aligned with SDGs. Campus sustainability is part of their workload, so they possess the necessary knowledge related to the research. Students undertaking BSc Honours in Environmental Management were selected because of their knowledge of the contents of their curriculum.

Mapping data sources: Respondents; Unisa Environmental Sustainability Policy of 2012; Unisa Waste Management Policy of 2017; Unisa Energy and Carbon Policy of 2016; Unisa 2015 and 2018 Annual Reports; Unisa website; Unisawise magazine of 2011; observations. The documents were selected because of their content, they carry the necessary Unisa policies and other information relevant to the research.

Relevant results: Unisa is challenged by financial limitations and as an open distance education and learning institution, it struggles to involve students in sustainability projects. The paper concludes that while the most obvious contribution of universities to SDGs is towards quality education (SDG 4), higher education, including distance education institutions, can play an active role in implementing other SDGs as well.

Other relevant annotations: Distance education institution.

- *Investigación en la Universidad de Holguín: compromiso con la Agenda 2030 para el desarrollo sostenible. (Research at the University of Holguín: commitment with 2030 Agenda for a sustainable development)* (León Pupo et al., 2019)

Aim: To study the contribution of the University of Holguin (UHo) to the SDGs.

Context: Cuba.

HEI(s): University of Holguin (UHo).

What is being mapped? Research.

Mapping methodology: Three phases: 1. Characterisation of the research activity in the university; 2. Characterisation of obtained results in function of the accomplishment of the SDGs; 3. Proposal of actions to reinforce the university's contribution to the achievement of the SDGs.

1. On the first phase, the characterisation of the research management activity is carried, the organisational structure is described as well as its strategic objectives; Science, Technology and Innovation (CTI, Ciencia, Tecnología e Innovación from Spanish) management processes are determined and also the human resources involved and the investigative units that exit. This phase had as objective to establish the bases for the study and to understand how the organisation is prepared to contribute, from its structure and processes, to the achievement of the SDGs. As main methods and techniques documentary review, observation and interview were used. Essentially, a group of official documents were reviewed, among those the Strategic Planning of the Ministry of Higher

Education and the UHo, the work objectives for the periods 2012-2016 and 2017-2021, the CTI policy of the Ministry of Higher Education and the UHo in that period and the annual balances of the scientific activity technique from the years 2015 to 2017 are highlighted.

The individual and group semi-structured interview is used to define how the investigations are carried out, the criteria for the proposal and selection of projects, satisfactions and dissatisfactions with the investigation process, perception from the different organizational levels of the strengths and weaknesses of the investigative activity and its contribution to the development of the territory and consequently to the achievement of the SDGs. The vice chancellor for research, the CTI director and the president of University's Scientific Advisory Council were interviewed individually. The research vice-deans and postgraduates, the CTI methodologists and the project managers are interviewed in groups. For inclusion in the interview, an intentional sampling is carried out in which the main actors involved in the research process participate. The questions asked are mostly open-ended and are aimed at finding out the criteria of senior management, the opinions of officials, suggestions from specialists and impressions of the main executors. For the group interviews, planned meetings with the vice-deans and methodological workshops with the project managers were used. Observation is carried out during group interviews to obtain information related to behaviours, aptitudes and work environments oriented to research activities. Due to the direct involvement of the authors in the management of CTI, participant observation is used to define work processes and forms of management. In general, the triangulation of all these sources is used to contrast what was established, that is, what the different actors involved perceive and what actually happens in the investigation process.

2. The second phase is oriented to collect and analyse the main projects and results obtained to determine how these have been aligned with the Goals and targets of the Agenda 2030. The main sources of information were: The plans and balances of the scientific activity, the CTI models, the project files and the reports issued by the CT Directorate; the objective was to contextualise what has been

achieved from the UHo and enhance its contribution to the fulfilment of the SDGs. The period between 2015 and 2017 was used for the analysis. In this phase, the descriptive statistical analysis of the collected data is carried out, frequencies of results by projects are counted and it is identified to which SDG these respond and the corresponding year.

3. The third and last phase determined which were the main strengths and weaknesses of the research management activity in the UHo, considering its potentialities, the development needs of the territory and the country, its real results and the SDGs; this was done using as a tool a SWOT matrix analysis. Based on this analysis, a set of actions to reinforce the University's contribution to the Agenda 2030 was proposed. The objective is to bring UHo research closer to a significant contribution in a development based on the SDGs.

Mapping data sources: Official documents of the Ministry of Higher Education and the UHo: Strategic plans and CTI Policy (2017-2021) of the Ministry of Higher Education and from the UH, working objectives (2012-2016, 2017-2021) and annual balance of the scientific activity (2015-2017). Interviews: vice-rector, director and CTI management specialists, president of the scientific advisory council, vice-deans and heads of projects. Observations and statistical analysis.

Relevant results: The results obtained showed that UHo's biggest contribution is in the objectives of education, economic growth and solid institutions.

Other relevant annotations: Descriptive statistical analysis carried on phase 2, it was identified to which SDGs projects responded to. Creation of the 'Coeficiente de Producción de Resultados por Proyectos (CPRP)' which is a coefficient that indicates the average number of results that have been obtained per project in each of the SDGs in a year.

- ***Reflections on the learning objectives for sustainable development in the higher education curricula – three cases from the University of Belgrade***
(Orlovic et al., 2020)

Aim: To explore the integration of the sustainable development concept and goals into the curriculum of higher education studies using the example of three faculties of the University of Belgrade.

Context: Serbia.

HEI(s): University of Belgrade.

What is being mapped? Curriculum.

Mapping methodology: 1. Selection of “sustainability courses” and “courses that include sustainability”; 2. qualitative content analysis of the course level learning outcomes, each of three researchers, coming from different faculties, selected the most relevant SDG to then use the relevant formulations of the Learning Objectives (LOs) from the UNESCO publication (2017) for comparison with the course learning outcomes formulated by the departments; 3. Interpretation of the findings, made according to the specific context of each of the faculties, as seen from the point of view of the researchers teaching there.

Three of the thirty-one faculties of the universities were used for the mapping, these were: Faculty of Philosophy, Faculty of Security Studies and Faculty of Architecture. Each of three researchers, coming from different faculties, selected the most relevant SDG – having in mind the scope of the study at the respective Faculty: SDG 4 “Equitable, quality education and lifelong learning (LLL) for All” for the Faculty of Philosophy, Andragogy study group; SDG 16 “Peace, Justice and Strong Institutions” for the Faculty of Security Studies/SS, HSRM, CP and SDG 11 “Sustainable Cities and Communities” for the Faculty of Architecture/ Architecture module.

Mapping data sources: Three types of data have been used as units for analysing the curricula: the course title, formulation of the course level learning outcome and short descriptions of the content.

Relevant results: Based on the experience of the Faculty of Architecture, the courses implemented by linking theory and practice may significantly contribute to achieving the LOs and to implementing the education for sustainable development. At the University of Belgrade, strategic documents are missing that would encourage and oblige the faculties to apply the concept of sustainability.

Other relevant annotations: The selection of “sustainability courses” and “courses that include sustainability” from the curricula was performed starting from the criteria defined by the STARS, developed by ASHE (2017).

3.3. HEIs SDGs mapping illustrative cases

The first ten universities on the 2020 *THE* Impact Rankings were used as a sample population for analysing existing SDGs mapping efforts by HEIs already recognised for their interest in sustainability practices and in contributing to the SDGs achievement, these universities can be seen on **Table 10**.

Table 10. *THE Impact Rankings 2020, First ten places (Times Higher Education (THE), 2020).*

Rank	University	Country
1	University of Auckland	New Zealand
2	University of Sydney	Australia
3	Western Sydney University	Australia
4	La Trobe University	Australia
5	Arizona State University (Tempe)	United States
6	University of Bologna	Italy
7	University of British Columbia	Canada
8	University of Manchester	United Kingdom
9	King’s College London	United Kingdom
10	RMIT University	Australia

THE Impact Rankings (Times Higher Education (THE), 2020)

The *Times Higher Education* Impact Rankings (THE) measure global universities' success in delivering the United Nations' Sustainable Development Goals. These are the only global performance tables that assess universities against the United Nations' SDGs. The rankings use calibrated indicators to provide comprehensive and balanced comparisons across three broad areas: research, outreach and stewardship. They evaluate university performance in all the 17 SDGs in their second edition, 2020. Universities can submit data on as many of these SDGs as they are able. Each SDG has a series of metrics that are used to evaluate the performance of the university on that SDG. Any university that provides data on SDG 17 and at least three other SDGs is included in the overall ranking. A university's final score in the overall table is calculated by combining its score in SDG 17 with its top three scores out of the remaining 16 SDGs. SDG 17 accounts for 22 per cent of the overall score, while the other SDGs each carry a weight of 26 per cent. This means that different universities are scored based on a different set of SDGs, depending on their focus.

Looking for sources related to SDGs mapping and reporting, the keywords "Sustainable development goals" OR "SDGs", "SDG report", "Sustainability report" were inserted on each university website, the selected information sources are presented in **Table 11** by university and in the ranking order. On this table we can observe the university, document type of the source, year of publication and website. Data extracted from these sources will be presented per each of the universities on following subsections.

Table 11. *Records included for analysis, source: University's website*

University	Document type	Year	Website
University of Auckland	Sustainability report	2019	https://www.auckland.ac.nz/en.html
University of Sydney	SDGs report	2019	https://www.sydney.edu.au/
	Business School PRME report	2018-2019	
Western Sydney University	Sustainability report	2018 (Last one on web)	https://www.westernsydney.edu.au/

Table 11. *Records included for analysis, source: University's website (Continuation)*

University	Document type	Year	Website
La Trobe University	Business School PRME report	2016-2018	https://www.latrobe.edu.au/
Arizona State University	-	-	https://www.asu.edu/
University of Bologna	SDGs report	2016	https://www.unibo.it/it
	SDGs report	2017	
	SDGs report	2018	
University of British Columbia	Sustainability Report	2018-2019	https://www.ubc.ca/
University of Manchester	SDGs report	n.d.	https://www.manchester.ac.uk/
King's College London	Sustainability Report	2016-2017	https://www.kcl.ac.uk/
	Sustainability Report	2017-2018	
RMIT University	Sustainability Report	2018	https://www.rmit.edu.au/

3.3.1. University of Auckland, New Zealand

Founded in 1883, Auckland is New Zealand's largest university with over 40,000 students. The mission of the University of Auckland is to be a "research-led, international university, recognised for excellence in teaching, learning, research, creative work, and administration, for the significance of its contributions to the advancement of knowledge and its commitment to serve its local, national and international communities" (The University of Auckland, n.d.-a).

The University of Auckland is committed to pursuing sustainability via research, teaching and learning, operating practices, partnerships and capacity building. These commitments are formalised in 'The University of Auckland Charter', Strategic Plan (The University of Auckland Strategic Plan 2013-2020) and The University of Auckland Sustainability Policy, as well as international agreements, such as the Universitas 21

Statement on Sustainability, where the university is a signatory (The University of Auckland, n.d.-b).

- *The University of Auckland: Sustainability Report 2019* (The University of Auckland, 2019)

What does the report present? An outline of some activities in the University that contribute to the achievement of the SDGs. Most of the activities presented can be identified under research, teaching, operations, public engagement and partnerships. The report presents both quantitative (metrics) and qualitative (case studies) data.

What is being mapped? Research, teaching, engagement/stakeholder relationships (public engagement and partnerships) and operations.

Mapping methodology: Methodological approach to mapping is stated for the case of research as: Publications and related research metrics are reported under each SDG based on the SDG keywords compiled by the Sustainable Development Solutions Network (SDSN) Australia, New Zealand & Pacific in 2017.

For the selection of initiatives case studies to report, the university shortlisted the most qualitative case studies that came through comprehensive consultation with key stakeholders undertaking these activities.

Mapping data sources: Research publications, key stakeholders.

Relevant results: The report presents for each goal the university's initiatives to contribute to the goals, related to teaching, operations, engagement as well as research, e.g. SDG5: Teaching and operations: The University is taking action to address the underrepresentation of women in STEM subjects as students and within the STEM workforce. As an example, the Faculty of Engineering has adopted a goal of increasing first year female undergraduate enrolments to at least 33% (from the current 27%), and they have partnered with a number of major New Zealand companies to support this goal. The Faculty also has several outreach programmes to encourage more girls to consider an engineering career. Research: 1789 publications between 2009 and 2018; 37% of all New Zealand publications (2009-2018); 58% internationally co-authored

publications (2009-2018). SDG17: Engagement: The University of Auckland hosted New Zealand's second SDG Summit in September 2019 to bring together people from all sectors to develop and commit to positive action and accountability on the critical SDGs within our broader spheres of influence. The Summit led to the expansion of key partnerships to deliver accelerated action on the 17 SDGs.

3.3.2. University of Sydney, Australia

Founded in 1850 and with around 73000 students (2019), it is Australia's first university. The University is operating more sustainably through a range of practical initiatives. Currently the university is consulting with their community to develop a University-wide sustainability strategy that will help prioritise where they can make the most impact.

- *University of Sydney, Sustainable Development Goals Update* (The University of Sydney, 2019b)

What does the report present? The report presents the University's contributions to each SDG. Quantitative data is presented for areas such Education and Research, for the first one number of units of study addressing the goal and for the latter one number of publications containing related keywords. Additionally, examples of university's activities contributing to each goal are also presented.

What is being mapped? Education, Research and activities/operations.

Mapping methodology: It is stated on the results of each goal that for the research mission mapping the SDSN keywords list was used, however no other insight on the mapping methodology used is given.

Relevant results: Aside from the presentation of University's contributions by SDG no overall analysis is given, i.e. no information onto which goals does the university focus or contributes more according to the exercise is indicated and conclusions are not drawn.

- *Transforming management education beyond shareholder primacy, The University of Sydney Business School Sharing Information on Progress Report 2018-2019* (The University of Sydney Business School, 2019)

The University of Sydney Business School has begun a comprehensive mapping of its teaching, research and operations against the UN SDGs, as part of its commitment to the UN's Principles for Responsible Management Education (PRME). The school has now established the development of an SDG aligned implementation strategy as one of the important initiatives in the School's future strategy (2020-2025): '*Business Not as Usual 2.0*'. Business Not as Usual 2.0 will embed the SDGs as part of all future routine program and research reviews, as well as in all aspects of the Schools operations and activities (p.1).

What does the report present? The Business School report on the PRME progress outlines the School's achievements in relation to each of the Principles for Responsible Management Education and details for future action. The school declares their willingness to progress implementation of the following Principles, starting with those that are more relevant to their capacities and mission: Principle 1 – Purpose, Principle 2 – Values, Principle 3- Method, Principle 4- Research, Principle 5 – Partnership, Principle 6 – Dialogue.

What is being mapped? Curriculum (Education), research, student experiential learning*.

*The School's Work Integrated Learning unit has actively sought partnerships with not-for-profits for student experiential learning activities. The School offers Industry and Community Project Units (ICPUs). These are elective units that provide students with the opportunity to work on authentic problems and issues set out by industry, community and government organisations. In collaboration with a major industry partner and academic lead, students work in a group with other students from a range of disciplinary backgrounds. Together they research, analyse and present solutions to real world problems set by the external partner organisation. Students then have the opportunity to present their project to the industry partner.

Mapping methodology:

Education: Curriculum mapping exercise that would allow the school to assess the extent of integration of the SDGs in the individual Units of Study. The School briefly surveyed teaching staff and undertook keyword searches of the Unit of Study outlines.

Research: The exercise was done by briefly surveying research staff. It was found that a more systematic approach was needed and in response, a process is being developed to capture SDG coverage such as the inclusion of an SDG criteria as part of their journal publication system.

Activities: A selection of key examples to illustrate how the SDGs are embedded in the activities of the School.

Mapping data sources: Unit of study outlines, research and teaching staff.

Relevant results: In response to the curriculum mapping, the School has put in place, as part of all routine program reviews, an evaluation of the depth and coverage of the SDGs, the School has commenced a process to transform the curricula to express the School's 2020 Business Not as Usual strategy. This has included initiatives focusing on real business sustainability problems, inclusive leadership, collaborative creativity and peer learning, and a greater emphasis on experiential learning. The School has also put in place mechanisms to map unit of study content and assessment against the SDGs as part of all program review cycles going forward. Results are presented in a table form for all mapped areas and there is also a showcase of a small selection of more detailed descriptions of some examples that embed one or multiple SDGs.

Other relevant annotations: The SDGs mapping exercise against curriculum is presented as part of Principle 3 – Method, “We will create educational frameworks, materials, processes and environments that enable effective learning experiences for responsible leadership.” (p.12). Research is presented as part of Principle 4 – Research, “We will engage in conceptual and empirical research that advances our understanding about the role, dynamics, and impact of corporations in the creation of sustainable social, environmental and economic value” (p.26).

3.3.3. Western Sydney University, Australia

Founded on 1989, the single multi-campus University of Western Sydney has six campuses: Bankstown, Blacktown, Campbelltown, Hawkesbury, Parramatta, and Penrith; and around 48500 students. As an SDG educational signatory to the SDSN Australia, New Zealand and Pacific Initiative, the University is well placed to meet this educational commitment. There are existing education and research strategies, as well as planned new curriculum partnerships and initiatives that will support this work. Western Sydney University is also host to a UN endorsed Regional Centre of Expertise on Education for Sustainable Development, namely RCE Greater Western Sydney and is already working in this space regionally and globally.

“Sustainable Futures” supports the education mission of the University to develop citizens’ for a sustainable future and deliver on the University’s commitment to the Sustainable Development Goals 2030. Western Sydney University has responded to this commitment by identifying the SDG linkages to their CORE (Curriculum, Operations, Research and Engagement) framework. Underpinning this are the cross-cutting themes of education (SDG 4) and partnerships (SDG 17), as well as leadership. Western Sydney University’s Schools are delivering teaching for impact around the 17 Sustainable Development Goals and their interconnections.

- *Transforming Our Future, Sustainability Report 2018* (Western Sydney University, 2018)

What does the report present? The report showcases the 2018 achievements across the university’s CORE and emphasises the connections and linkages to the SDGs. ‘Transforming Our Future’ also foreshadows the world ranking in 2019 in the THE Impact Rankings.

What is being mapped? Curriculum, operations, research and engagement.

Mapping methodology: Not reported.

Relevant results: As part of the 21st Century *Curriculum* (21C) Project, Sustainable Futures and a team of academics from 5 schools have developed the Global

Sustainability program. The sub-major explores the interrelationship between humans and the natural and built environment from multiple paradigms, there students must undertake a 60-hour internship/research project to turn their learning into action. This will provide students a unique, signature learning experience for students involving local and global partners committed to sustainable development. This cross-school, multidisciplinary offering is open to all undergraduate students at Western Sydney. *Research* at Western spans four interdisciplinary themes aligned with internationally recognised strengths, National Research Priorities and the future of Western Sydney: Education and work: SDG 4; environment and sustainability: SDG 13, 14, 15; health and wellbeing: SDG 3 and; urban living futures and society: SDG 11, 12. In terms of engagement, the first Asia Pacific SDG Youth Challenge was launched by Western and UGM Indonesia. The Challenge reached over 8,800 young people in 23 projects across 7 countries in a peer-to-peer learning model. The initiative received international recognition. *Campus operations*: Over the past 5 years, Western Sydney University has become a recognised leader in Green Star certified design and construction in the region, with a total of 8 certified Green Star projects.

Other relevant annotations: No mapping methodology is introduced neither in the report nor in the university web page on the 'Sustainable Futures' menu that has the information related with the university's commitment to the SDGs.

3.3.4. La Trobe University, Australia

Founded on 1964, La Trobe has been one of Australia's pioneering universities. The university has now a network of campuses, with over 28,000 students at the Melbourne Campus and over 7,500 at the campuses in Albury-Wodonga, Bendigo, Mildura, Melbourne City (Collins Street), Shepparton and Sydney. La Trobe University sustainability is governed by the University's Sustainability Policy and Planning Group (SPPG). The University develops Sustainability Plans to guide their future Sustainability initiatives to support SD and lead positive change, they state they're currently developing their 2019-2022 Sustainability Plan. They University created the Green Impact program for staff to undertake practical actions to make the university more sustainable through joining or creating Green Impact teams.

The latest sustainability report uploaded is that of 2013 (Impacting Futures – 2013 SR), which corresponds to a date before the SDGs. On the university's annual report there's a section for sustainability reporting but in the last uploaded report (2018) there is no explicit information on SDGs contribution, the University reports on energy, waste, paper, water, transport and GHG emissions but no relation to the SDGs is explicitly made.

When searching for useful reports the only SDG-related information belongs to the Business School which is the one that is going to be presented below.

- *PRME Report 2016-2018, La Trobe Business School* (La Trobe Business School, n.d.)

An important role of PRME for the La Trobe Business School (LBS) is focusing on building student capability through a deeper understanding of the United Nations' SDGs. The SDGs and the six PRME principles provide a framework for La Trobe Business School to engage our students in the critical issues of corporate responsibility and sustainability. (p.4). La Trobe Business School was honoured to become a PRME Champion in Australia in 2016, with the position recently extended to 2021. Champions are recognised as ambassadors of the United Nations PRME initiative. The School engages with and support local businesses and peer institutions, including playing a visible role in PRME Chapters, PRME Regional Meetings and with Global Compact Local Networks.

What does the report present? La Trobe Business School is presenting the PRME progress, the report identifies the School's continuing work in advancing and integrating the six PRME principles and the SDGs more broadly into curricula, research and partnerships. The report mainly presents achievements of the School's goals towards the PRME principles, about the SDGs it briefly identifies achievements, research projects and other activities LBS is involved with that are linked to the SDGs (p.46).

What is being mapped? Curriculum, research, partnerships.

Mapping methodology: Not presented.

Relevant results: Cumulatively, across the three principles, the work of the Business School aligns with three SDGs: SDG 4 Quality Education; SDG 5 Gender Equality; SDG 10 Reduced Inequalities.

Other relevant annotations: Nine core undergraduate subjects across the Business School are currently being reviewed and evaluated to further embed teaching about corporate responsibility, sustainability and the SDGs through the careful design of the AoL process. The Assurance of Learning (AoL) process is a methodical collection and review of data about student learning outcomes across all program levels: undergraduate, postgraduate and higher degree research. This process also incorporates existing University policy in the quality improvement process to ensure that graduates are achieving the promoted outcomes of their degree programs. The process is embedded within all course development and subject delivery and provides a robust reporting mechanism for ensuring areas of concern are identified and recommended changes are documented, implemented and their effectiveness evaluated. Having fully established Assurance of Learning procedures in place provides the School with the capacity to effectively identify areas for further expansion in integrating PRME and SDG themes into the curriculum.

3.3.5. Arizona State University (Tempe), United States

Arizona State University (ASU) began life as the Tempe Normal School in 1885 and was originally an institution for training teachers. It wasn't until 1958 that it took the name it uses today. ASU is one of the largest public universities in the United States, with more than 80,000 students. The Tempe campus is in downtown Tempe and is considered the university's original campus.

There was no link to the portal on the *THE* Impact Rankings. Information was seek for in the general web page of the Arizona State University, however, No SDG report was found, there were Sustainability Operations reports (2016, 2017, 2018) but no information on SDGs was given on them, there was also a Sustainability Highlights document (2018) where SDGs were only mentioned twice when talking about

empowering female entrepreneurs (Arizona State University, 2019, p. 9), the only SDGs related menu on the University's portal shows the 17 SDGs featuring experts on each of them but no other information is given. The ASU's web portal does present sustainability operations and practices but does not present any SDG mapping exercise or related information.

3.3.6. University of Bologna (UNIBO), Italy

With 87,758 students (a.y. 2017/18) the origins of the University of Bologna go way back; it is considered to be the oldest university in the Western world. Founded on 1088 as the Bologna "Studium" by students and for students. For quite some time the University has been adopting management and operation models based on the principals of sustainable development. All lines of action are pursued in the interest of the wider Sustainable Multicampus project. The University planning and reporting processes, which document objectives, activities and results, now take full account of the 17 sustainable development goals. The commitment and contribution of Alma Mater to the achievement of sustainable development via their institutional activities is witnessed, above all, by the revision of the key objectives underpinning the 2016-2018 Strategic Plan and the current 2019-2021 Strategic Plan with reference to the 17 goals and 169 associated targets proposed in the 2030 Agenda. Additionally, in order to monitor the impact of the various University activities in terms of their sustainability, commencing from 2016 the University of Bologna has adopted an additional reporting tool that measures their contribution to the achievement of the 17 UN SDGs. Lastly, in order to raise the awareness of the entire teaching community about sustainable development topics, all those responsible for teaching activities were asked, as part of their teaching planning work for the 2017/2018 A.Y., to indicate if and to what extent their course units contribute to achieving one or more of the 2030 Agenda SDGs.

On the University's web portal there is a dedicated menu called "AlmaGoals" which presents the 17 goals with highlights on Teaching, Research, Outreach (Third mission) and Institution operations mapping per each of the SDGs.

What do the reports present? The contributions generated by the university's institutional activities, including training, research and social and public engagement, aimed at the achievement of the 17 SDGs of the U.N. 2030 Agenda.

What is being mapped? Teaching, research, third mission and Institution (to the four university dimensions of activities carried out at the University of Bologna).

Mapping data sources: The data comes mainly from the University Data Warehouse, a database powered by the Alma Mater Studiorum's management systems, also drawing upon ad hoc surveys by the coordinators of the study programme, content analysis of research projects and cooperation programmes, and SCOPUS queries.

- *Report on U.N. Sustainable Development Goals 2016* (Technical Committee for Social Reporting, University of Bologna, 2017)

Mapping methodology: Description of how certain metrics were quantified in the document:

Publications in SCOPUS: Research regarding the number of publications was taken from the Scopus database, considering all articles from 2007-2016 which contain a specific sequence of keywords and an author affiliated with University of Bologna. Keywords were chosen for each UN SD goal by considering the general declaration of the goals and all targets of each goal.

"Cited by" in SCOPUS: The number of documents that have cited the author for a document's publication in the DB Scopus. Date of extraction: 4th May 2017.

International benchmarking: Benchmarking includes universities within the top 50 of the QS World Universities Ranking 2016/2017 comparable to the University of Bologna in terms of: Size (XL - more than 30,000 students); Focus (FC - all 5 QS faculty areas, including the school of medicine); Research Intensity (Very High - more than 13,000 publications in the last 5 years); Status (Public).

The total number of articles was determined as described in "PUBLICATIONS IN SCOPUS". The total number of articles for each university and each goal was scaled against the number of academic staff as listed by QS for the World University Ranking

2016/2017 and published on www.topuniversities.com. By doing so, any dimensional effect caused by simply considering the total number of publications was eliminated. Finally, for each goal the University of Bologna's ratio with the average of the ratios for the 14 universities in the benchmark group was compared. The result is the index number "benchmark = 100"; an index number higher than 100 means that "per capita publications" by UNIBO academics is higher than the average of the universities in the international benchmark group. If the index is lower than 100, UNIBO academic productivity is lower than the benchmark.

National benchmarking: Following the parameters used for the selection of the international benchmarking, three Italian universities were selected from the first 400 in the QS World Universities Ranking 2016/2017. The Scopus research criteria and the index number calculation criteria were the same as that of international benchmarking.

Course units: This data came from a survey investigating the link between the single course unit of a study programme and the U.N. Sustainable Development Goals. The survey was sent by email to the coordinators of 216 study programmes at the University of Bologna. The response rate was 84.3% of the study programmes active in A.Y. 2016/2017, covering about 80% of all course units at the University of Bologna. The questionnaire was made with the list of all course units of each programme, and the coordinators indicated, for each course unit, its connection with a SD Goal.

Students: The number of students enrolled in a study programme containing a course unit "tagged" for that SD Goal in A.Y. 2016/2017.

Collaborations, teaching, mobility: The number of collaboration, teaching and mobility projects which were active as of 31 December 2016.

FP7, H2020¹ research projects: The number of FP7, H2020 research projects active as of 31 December 2016.

¹ FP7, H2020 are European Union research and innovation framework programmes, FP7 belongs to the period from 2007 to 2013 coming after there is Horizon 2020, its successor will be Horizon Europe beginning in 2021

Cooperation and social engagement research projects: The number of cooperation and social engagement projects active as of 31 December 2016.

Patents (including new plant varieties): The number of active patents and vegetal varieties registered in 2016 by the university (both ownership and co-ownership), including their various international extensions.

Relevant results: E.g. of results, SDG11: 194 course units, 106 publications in SCOPUS 2007-2016, graph of events of public engagement.

- *Report on U.N. Sustainable Development Goals 2017* (Technical Committee for Social Reporting, University of Bologna, 2018)

Mapping methodology: Description of how certain metrics were quantified in the document:

Publications in SCOPUS: As stated in the 2016 report, considering all articles from 2007-2017.

“Cited by” in SCOPUS: The number of documents that have cited the author for a document’s publication in the DB Scopus.

H-Index: The h-index was developed by the physician Jorge Eduardo Hirsh and counts the highest number of papers having at least the same number of citations. It expresses an easy to read 1:1 relationship between publishing articles and citations. In the bibliometric sectors is widely used to measure the impact in terms of scientific output of a researcher. Here is used to measure the scientific output of the University of Bologna, using the keywords’ clusters, extracted from each SDG, to contain and limit its topics and objectives.

International benchmarking: As stated on the 2016 report with the benchmarking including universities within the top 10 European Universities ranked in QS World Universities Ranking 2017/2018 comparable to the University of Bologna in terms of size, focus, research Intensity and status. Therefore, the comparison by each goal was done comparing the University of Bologna’s ratio with the average of the ratios for the 10 universities in the benchmark group.

National benchmarking: For this report the three Italian universities were selected from the first 400 in the QS World Universities Ranking 2017/2018.

Course units: This data came from a survey investigating the link between the single course unit of a study programme and the U.N. Sustainable Development Goals. The survey was conducted asking to all teachers the link for each their course units using a web procedure. More than 95% of course units of the A.Y 2017/2018 has a link with at least one SDG.

Students: The number of students attending a course unit “tagged” for that SD Goal in A.Y. 2017/2018.

Collaborations, teaching, mobility: The number of collaboration, teaching and mobility projects which were active in 2017.

FP7, H2020 research projects: The number of FP7, H2020 research projects active on 2017.

Cooperation and social engagement research projects: The number of cooperation and social engagement projects active in 2017.

Patents (including new plant varieties): The number of active patents and vegetal varieties registered in 2017 by the university (both ownership and co-ownership), including their various international extensions.

Relevant results: A total of 4405 SDGs related course units; 152 sustainability related research projects. Example of Third mission contributions: SDG4, 2204 students on lifelong learning programmes. Example for the “Institution” dimension contributions: SDG10, the guarantee committee for equal opportunities, employee wellbeing and non-discrimination at work – CUG. This committee makes proposals, provides consultation and monitors the development of a culture that promotes equal opportunities, enhances employee wellbeing and prevents discrimination, with reference to Italian current legislation and art. 14 of the University Statute. It avails of the internal services for the promotion of employee wellbeing provided by Alma Mater and works closely with the Harassment Adviser.

- *Report on U.N. Sustainable Development Goals -2018-* (Technical Committee for Social Reporting, University of Bologna, 2019)

Mapping methodology: Description of how certain metrics were quantified in the document:

Publications in SCOPUS: For this report articles from 2013 to 2018 were considered. Each year they are trying to improve the methodology in order to present data as coherent as possible. Therefore, any relevant difference between the years may due to the new sets of keywords and algorithm.

“Cited by” in SCOPUS: The number of documents that have cited the author for a document’s publication in DB Scopus.

H-Index: As stated in the 2017 report.

International benchmarking: As stated on the 2016 report with the benchmarking including universities within the top 10 European Universities ranked in QS World Universities Ranking 2020 comparable to the University of Bologna in terms of: • Size; Focus; Research Intensity and Status.

National benchmarking: The three Italian universities were selected from the first 400 in the QS World Universities Ranking 2018/2019.

Course units: This data came from a survey investigating the link between the single course unit of a study programme and the U.N. Sustainable Development Goals. The survey was conducted asking to all teachers the link for each their course units using a web procedure. More than 95% of course units of the A.Y 2018/2019 has a link with at least one SDG.

Students: The number of students attending a course unit “tagged” for that SDG in A.Y. 2018/2019.

Collaborations, teaching, mobility: The number of collaboration, teaching and mobility projects which were active in 2018.

FP7, H2020 research projects: The number of FP7, H2020, LIFE, INTERREG, research projects active on 2018.

Cooperation and social engagement research projects: The number of cooperation, social and industry engagement projects active in 2018.

Patents (including new plant varieties): The number of active patents and vegetal varieties registered in 2018 by the university (both ownership and co-ownership), including their various international extensions.

Glass ceiling index: The Glass Ceiling index is the ratio between the share of women in the teaching staff (level A + level B + level C) and the share of women in the role of full professor (level A). The value of this index can vary from 0 to infinity. An index value of 1 indicates that there is no difference between women and men in terms of the probability of reaching the maximum career level (full professor); an index value lower than 1 means that the share of women in the maximum achievable role (full professor) is higher than their average presence among all teaching staff (level A + level B + level C); an index value higher than one indicates the presence of a “glass ceiling effect”, with women less represented in top positions (level A) than in the overall teaching staff (level A + level B + level C). In general, the greater the value assumed above one on the Glass Ceiling index, the stronger the glass ceiling, and the harder it is for women to take on leading roles within academia.

University-Industry framework collaboration agreements: The Framework (Collaboration) Agreement represents the strategic engagement tool that allows the University of Bologna to strengthen long terms and trustful relations with industry. This Agreement is based on a joint approach, where both the University and the industry share and develop collaborations across disciplines and programs, in order to increase results and avoid fragmentation within the institution. The University of Bologna has developed an internal support unit to coordinate such activities and to Foster new collaborative actions with industry partners.

Relevant results: A total of 1174 SDGs related course units; 104 third mission and teaching projects according to the SDGs and 182 FP7, H2020 research projects.

Institution e.g. SD15: The University of Bologna Experimental Farm - AUB, since 1974, support research and experiments conducted by departments of the Agricultural and Food Sciences and Veterinary Medical Sciences. In general, it is an 'observatory' of agriculture and an important training-ground for students.

3.3.7. University of British Columbia, Canada

Established in 1908, the University of British Columbia (UBC) has 64,798 total students in Canada and more than 54,800 students on its Vancouver campus. In 1990, UBC signed the Talloires Declaration, it was also the first university in Canada to adopt a sustainable development policy in 1997, and the first to open an office devoted to campus sustainability in 1998. UBC has committed to the integration of its operational and academic efforts in sustainability and the UBC Sustainability Initiative, established in 2010, is its way of advancing this broad goal. The UBC Sustainability Initiative undertakes key cross-cutting functions such as connector, curator and facilitator of a wide breadth of sustainability programs and activities across campus.

- *Annual Sustainability Report, 2018 – 2019* (The University of British Columbia, n.d.)

What does the report present? The actions that significantly deepen the UBC's commitment to sustainability across teaching, learning and research, operations and infrastructure, and community. It presents the University's efforts to map UBC Sustainability activities to the SDGs as an early attempt to identify which goals and targets UBC is actively working towards through its three sustainability pillars and explore areas where it might collaborate with other organizations to advance shared goals.

What is being mapped? Teaching and learning, research, operations and infrastructure, community engagement.

Mapping methodology: The report states as methodology that: UBC actions were matched to the language of each SDG goal and/or target. For this exercise, only one

piece of evidence was required to count UBC as working towards the goal. Evidence belonged to one of 11 types:

- i. UBC strategic plan;
- ii. UBC policy;
- iii. Staff unit policy;
- iv. Staff unit doing direct work on an area;
- v. Infrastructure project;
- vi. Funded ongoing program/project/campaign;
- vii. Active support for partnership networks;
- viii. Academic course that covers content related to the goals or targets;
- ix. Faculty with research interests that cover content related to the goal or targets;
- x. Research project;
- xi. Research unit.

No other insight on how the process was carried was presented.

Relevant results: This evaluation found strong commitment from UBC to advancing Goal 4: Quality Education, Goal 9: Industry, Innovation, and Infrastructure, and Goal 11: Sustainable Cities and Communities, but was limited in scope. For nine out of 17 SDGS, UBC is working to advance them across all three sustainability pillars. For six out of 17 SDGS, the University is working in two out of three sustainability pillars. For two out of 17 SDGS, it is working in one sustainability pillar.

Other relevant annotations: Overall results were presented, as well sustainability initiatives for the mapped university dimensions, however such initiatives and statistical data related were not explicitly matched to each SDG neither any of them mentioned specific goals.

3.3.8. University of Manchester, United Kingdom

The University of Manchester, in its present form, was created in 2004 by the amalgamation of the Victoria University of Manchester and the University of Manchester Institute of Science and Technology (UMIST). After 100 hundred years of

working closely together both institutions agreed to form a single university, and on 22 October 2004 they officially combined to form the largest single-site university in the UK. The Victoria University of Manchester developed out of Owens College, which was founded in 1851, and from 1872 incorporated the Royal School of Medicine and Surgery, which had been formed in 1824 as a medical school owned by doctors while the UMIST can trace its origins to the Manchester Mechanics' Institution, founded in 1824 as part of a national movement for the education of working men. The university has 40250 enrolled students (The University of Manchester, 2020).

The University has introduced several sustainability initiatives, including: The implementation of a green travel plan; the implementation of a Fairtrade policy; the appointment of an environmental and sustainability officer and a waste coordinator; the establishment of an Energy Team and a University-wide Sustainability Steering Group. Sustainability is also increasingly at the heart of many of the top-flight research groups. The University is home to the UK's largest single campus-based community of researchers with interests in sustainability and the environment, and research groups such as the Tyndall Centre for Climate Change Research, the Joule Centre for Energy Research, the Centre for Urban Regional Ecology, the Sustainable Consumption Institute and the Global Development Institute are committed to ongoing research into sustainability issues.

- The University of Manchester Sustainable Development Goals (The University of Manchester, n.d.)

What does the report present? It communicates the range of activities The University of Manchester engages in that contribute to the United Nations' SDGs.

What is being mapped? Research, learning and students (Teaching), public engagement and responsible internal processes (operations).

Mapping methodology: Drawing on the Sustainable Development Solutions Network's *Getting Started With The SDGs* guidance, the first stage of the report was a comprehensive data collection process to identify initiatives across the University on four main dimensions – research; learning and students; public engagement; and

responsible internal processes – that mapped onto the SDGs. The report presents two kinds of data: metrics and case studies.

Research metrics: Currently there are few replicable or standardised ways to measure research impact against the SDGs. :

- * The SDSN keyword list compiled by Monash University and SDSN Australia/Pacific. This was the most comprehensive list and benefited from the transparency and accessibility of the published keywords. However, it yielded a high number of publications that arguably may not have such direct relevance to those specific SDG.

- * An ‘Elsevier methodology’, used for the report *Sustainability science in a global landscape* produced by Elsevier in collaboration with SciDev. Net. The Elsevier/SciDev.Net report aggregated the 17 SDGs into six key themes: Dignity, People, Prosperity, Planet, Justice and Partnership. The team disaggregated the theme-based lists of keywords into SDG-based lists where necessary, assigning keywords to SDGs using the SDSN list as a guide. This had a much narrower scope and yielded fewer and arguably very focused results. However, it was noted it didn’t cover all aspects of the SDGs, meaning that a potentially high number of relevant publications were being filtered out.

- * A ‘homegrown’ keyword list which started from the SDSN list for each SDG and removed keywords most likely to produce publications without direct relevance to the goal.

Using SDG1 as an example, the University saw that results varied widely across the three different methods. In addition, its areas of strength against each SDG differed depending on the methodology used. As a result of the experiments, the methodology using the homegrown list was discarded because its results were overly dependent on subjective decisions about the keywords removed. It was decided to use both externally produced lists for the research metrics. This will allow for better comparison with future reports from other universities. As a result, the ‘Research in numbers’ section for each of the SDGs in this report includes: a SDSN-based figure for the past decade of the University’s publications ‘publications 2009-18’; a corresponding Elsevier-based figure for ‘Research output’; a SDSN-

based figure for proportion ‘of all UK publications 2009-18’ and a corresponding Elsevier-based figure for ‘National contribution’ (both calculated by dividing the number of Manchester publications by the number of publications at all UK institutions for the Goal); and an Elsevier-based figure for ‘Citation impact’, based on comparing the level of citation of Manchester publications with that of all publications globally for the SDG anywhere. (The amount of data required to calculate this figure made it impossible to do so using the larger publication sets that would have resulted from the SDSN keyword list).

In addition, and in line with the approach used for the *THE* University Impact Ranking, the University reported under SDG17 Partnerships for the Goals the number and proportion of publications co-authored with researchers internationally, and also added those with researchers from low- and middle income (LMI) countries using the Elsevier methodology. Again, all research metrics were based on publications during the period 2009-18.

Teaching metrics: Because of the size of the institution and large number of course units (3,365 at undergraduate and master’s level) it was not possible to survey all programme leaders. Instead the reporting team undertook their own centralised curriculum audit. Using SDG keywords highlighted in programme descriptions, all 3,365 course unit descriptions in 2017/18 were analysed and linked to the SDGs in two ways: *Direct impact:* if the unit allowed students to understand how to tackle the Goal (e.g. understanding vaccines, circular economy); and *Indirect impact:* if the unit covered a general area relating to the SDG (e.g. physiology, economics), allowing students to understand the basics and build on this knowledge to contribute to the SDGs.

From this it was possible to count the number and proportion of units relevant to specific SDGs and the number of student engagements with them. ‘Student engagements’ is not the same thing as ‘number of students’ because the same student can engage with a specific SDG many times over by electing to do multiple modules.

Case studies: Qualitative case studies were selected to understand the University’s contribution to the SDGs through a comprehensive consultation process, including

review of the relevant university websites, a staff survey, consultation with social responsibility leads and managers, and input from staff with particular expertise for each of the four dimensions. **Research** case studies were developed by consulting individual researchers, research institutes and managers, communications and marketing officers and the University's research and business engagement support services. The final selection was made by a working group with academic and professional experts from across the University in sustainability. **Learning and students** case studies were compiled based on the curriculum audit and wide-ranging internal consultation. **Public engagement** case studies were developed in consultation with engagement managers and the University's cultural institutions, as well as researchers engaging with the community. **Operations** case studies were compiled with help from a wide range of professional services staff across the University.

Over 140 staff members contributed to the data collection process. Case studies for inclusion in the report were selected based on their clear contribution to the respective SDG, their impact and their distinctiveness, while also striving for diverse range of initiatives from across the University.

Mapping data sources: Programme descriptions, informants (e.g. individual researchers), Scopus database, staff.

Relevant results: In terms of research the five Goals that presented the highest number of publications between 2009 and 2018 were SDG10 (32130), SDG9 (31601), SDG8 (23871), SDG3 (21399) and SDG12 (18307); the Goal with less return publications was Goal 17 with 621 publications. The top five of goals with the highest number of student engagement on modules were SDG3 (22450), SDG16 (18835), SDG8 (15468), SDG10 (11896) and SDG4 (11397); the Goal with the lowest number of student engagement was Goal 2 with 1159 students closely preceded by Goals 14 and 6 with 1316 students and 1621 students, respectively. SDG4 was the Goal where more case studies on public engagement were collected with a total of 50 case studies followed by SDG10 and SDG11 with 34 and 31 case studies respectively. In terms of University operations, the Goal with most case studies presented was Goal 12 with 43 cases followed by SDG3 with

41 and SDG8 with 39 cases; finally, the SDGs with the least case studies collected were Goal 5 and 16 with 14 cases and Goal 2 with 8.

3.3.9. King's College London, United Kingdom

King's College London was founded in 1828-9 by a group of eminent politicians, churchmen and others. King's has over 31000 students. King's College London recognises it has a big responsibility towards being sustainable and protecting the environment. The University has various policies and systems to provide the framework for reducing its impact, whether it be in relation to energy saving, waste and recycling or sustainable transport and to help ensure that we operate in an environmentally sustainable way.

The Sustainability Team carried out a baseline survey to identify King's contribution to the achievement of the SDGs through the research and teaching carried out at the university, as well as additional projects run by students and staff and the university as a whole to effect change both within campus and in the outside world. The results of the survey were released in the 2016/17 Environmental Sustainability Report. The University aims to repeat the survey every two years, with the next update to be published once a review of modules is completed in 2019. The next update will therefore be published once the review has been completed. Since the update was supposed to take place during 2019 the *Environmental Sustainability Report 2017-18* (King's College London, 2019), which is the last report available online, presents the same results of the previous one in respect to the SDGs mapping exercise, similarly to the one of 2016/17 the reporting team has highlighted the relevant goals in each section of the report (Carbon, water, engagement, others), therefore information will only be extracted from the sustainability report for 2016/17.

- *Environmental Sustainability Report 2016-17* (King's College London, 2018)

What does the report present? The Annual Environmental Sustainability Report outlines how King's has embedded sustainability into its operations in 2016–17. It links the University's targets and progress to the SDGs.

What is being mapped? Projects, policies and research outputs by King's as a whole; specific staff interests; and the teaching of modules and courses.

One can also see SDG symbols used throughout the report that highlight how a specific area relates to the Global Goals. Areas are related to the University's targets in terms of Carbon emissions, water and recycling, supply chain, biodiversity, leadership and governance, engagement and education and public engagement with spotlights made on topics related such, sustainable transport, sustainable food, ethical investment, sustainable laboratories and residences.

Mapping methodology: It is stated that there was no established methodology to use at the time that the baseline SDG study was carried out, so it was developed for the project. A two-year review cycle of King's contribution to the SDGs was considered to be the right frequency. In the report it is stated that there is an opportunity to learn from and work with others to improve the methodology as more organisations carry out similar exercises and methodologies are refined, however, the report does not give any detail on the methodology developed while carrying the exercise.

Relevant results: *Areas of significant contribution to the SDGs:* Perhaps unsurprisingly for a university with multiple health schools, the major contribution that King's is making to the SDGs surrounds Goal 3 – Good Health and Well-Being. Online research surrounding this goal identified over 1,000 staff, almost 900 modules and 45 projects contributing to this goal. As an educational institution, by its nature King's contributes to Goal 4 – Quality Education. The research for this report took King's general contribution as a given, but still found almost 100 staff, more than 50 modules and 14 projects that contributed directly to Goal 4. The other goal where King's makes a stand-out contribution to the SDGs is Goal 16 – Peace, Justice and Strong Institutions. The research identified almost 300 hundred staff, more than 100 modules and 9 projects that contribute to this goal. *Areas of least contribution to the SDGs:* While the research for this report found that King's contributed to all 17 SDGs in different ways, there were three goals where there was a notable lack of impact identified: Goal 2 – Zero Hunger; Goal 6 – Clean Water and Sanitation; and Goal 12 – Responsible Consumption and Production.

Other relevant annotations: The baseline study to identify areas in which King's contributes to the achievement of the UN's SDGs was carried on March 2017. The report collated feedback from staff about their perceptions of the SDGs, and the utility and importance of raising awareness about the goals and assessing and publicising the University's contribution to achieving them. Potential paths forward were suggested by members of staff, alongside any reservations, which could help to guide future approaches to aligning King's work with the SDGs.

3.3.10. RMIT University, Australia

RMIT is a global university of technology, design and enterprise with 86,839 students enrolled (2018). One of Australia's original tertiary institutions, RMIT was established in 1887 as the Working Men's College with the aim of bringing education to the working people of Melbourne. During the 1990s, the institution gained university status and developed campuses in Bundoora and Brunswick in the city's northern suburbs, and later in Ho Chi Minh City and Hanoi in Vietnam. In 2013, RMIT opened a research and industry collaboration centre in Barcelona, Spain.

RMIT is committed to the practice of incorporating sustainability principles and practices into learning and teaching, research and operational activities. The Sustainability Policy models institution-wide excellence in integrating sustainability into all activities. It aims to make RMIT a living laboratory, encouraging research that engages with internal infrastructure, process and people. The Sustainability Committee works to embed sustainability into the governance structure and strategic planning process to set a standard and show leadership commitment across RMIT. The University is part of the SDSN Australian/Pacific initiative to engage universities to support and contribute to the SDGs.

RMIT-wide SDGs project: RMIT, represented by its Sustainability Committee, is currently undertaking an ambitious and innovative project to raise awareness of the SDGs across the academic areas of the University and demonstrating its capabilities in partnering with industry, government and community to achieve them. The RMIT-wide SDGs

Project, initiated in June 2018, aims to improve University accountability in relation to its contributions to the SDGs.

Creation of an *SDG Transformation Platform* to develop RMIT into a recognised global leader in university-led SDG-oriented transformation, innovation and engagement. Grounded in an adaptive and ethical learning approach, designed to be reflective and experimental, mobilising and engaging key stakeholders from across the university community, including external stakeholders, and applying critical attention to its broader internal and external systems (RMIT University, 2019a).

- *Sustainability Annual Report 2018* (RMIT University, 2019b)

What does the report present? The report documents RMIT's progress, highlights key achievements and provides context on its sustainability agenda. The report shows the impact that teaching and learning, research and operations have on the environment, local economies and society. It also highlights RMIT's commitments and progress towards becoming a more sustainable organisation.

What is being mapped? Research.

Mapping methodology: Qualitative and quantitative keyword search analysis was conducted to map RMIT research contributions to SDGs.

Relevant results: In 2018 RMIT delivered 621 research projects in service of the Sustainable Development Goals. SDG3 presents the highest number of projects with 124 followed by SDGs 11, 12 and 10 with 119, 113 and 108 research projects respectively. The Goals with the lowest number of projects were SDG14, SDG13, SDG1 and SDG 5 with 28, 31, 38 and 41 projects respectively.

At the end of the report, the SDG Index table identifies the SDGs and respective main SDG targets addressed by the University's sustainability agenda published in the Annual Sustainability Report 2018.

Other relevant annotations: The report has been prepared in accordance with the Global Reporting Initiative (GRI) Standards: Core option. In line with GRI requirements, the report presents RMIT's significant economic, social and environmental impacts and

contributions, both current and those that RMIT can reasonably foresee. The report addresses where these impacts have occurred and how RMIT has contributed to them.

RMIT employed a dedicated Sustainable Development advisor to oversee an institution wide SDG project aimed at maximising RMIT's contribution and improving accountability and collaboration. The project involves four concurrent phases **Figure 4**.

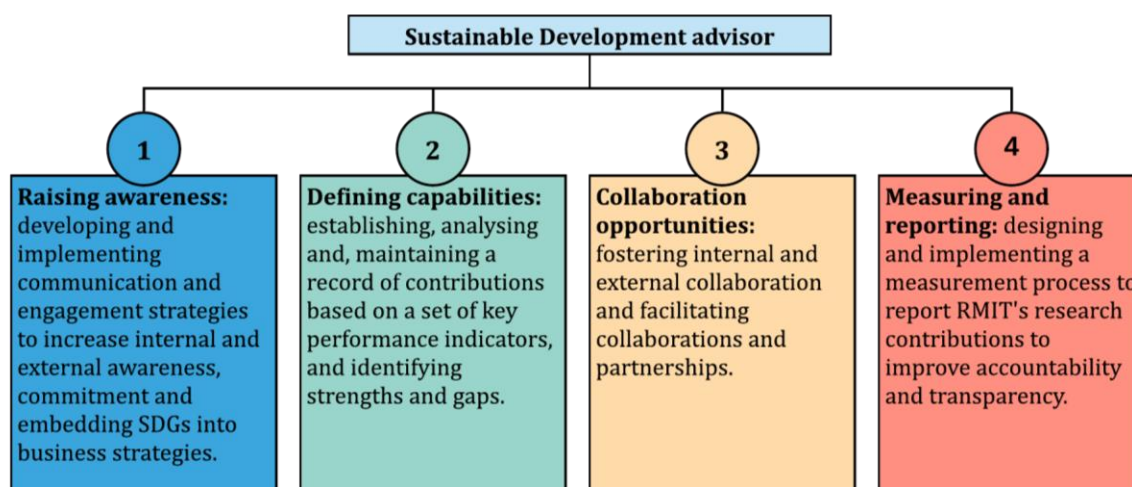


Figure 4. *RMIT University's Sustainable Development advisor's SDG project, adapted from (RMIT University, 2019b, p. 20)*

A Materiality Assessment was conducted to identify the sustainable development goals that are aligned with RMIT's core business and strategic outcomes.

3.4. Summary of mapping methods and techniques

Different methods were found throughout this research, in **Table 12** a synthesis of these are presented along with the number and specific universities that made use of them as well as their characteristics, a brief description of each method is also given and a summary of the application strategy as well as knowledge and resources needed.

Some of the HEIs were not included in this synoptic table because their methodology reported was not clear enough, these were the University of Auckland, the University of Sydney and RMIT University because even though they reported having used SDGs-related keyword lists as a tool they did not specify how they used such tool to map their

activities, whether they carried a manual analysis or an automated one, therefore, these are not reported in the table. The record by Aleixo et al. (2020) was neither included because there was no specification on the names of each of the thirty-three universities analysed by the authors which means the number of students by university could not be searched for which is a relevant characteristic of the synoptic table. In summary, only records containing certain common specificities of the HEIs are included in the table, 12 universities in total.

For all the techniques and methods here mentioned advanced knowledge of the SDGs is required when drawing conclusions on the data collected, a first key element of an SDGs mapping activity is, as previously mentioned, to define the mapping objectives. The reader may see each University several times within the table owing to the fact that universities used a mix of techniques to be able to achieve their objectives. All HEIs in the sample are public institutions and their type is university, no polytechnics are reported on the table.

From **Table 12**, **Figure 5** and **Figure 6** can be obtained. **Figure 5** presents each method used in the sample of records by university size (in terms of number of students) and where these universities are found, such methods are distinguishable from their qualitative or quantitative nature. On the other hand, **Figure 6** is a specification of the previous figure showing the name of the universities and which methods each university used in their mapping exercises

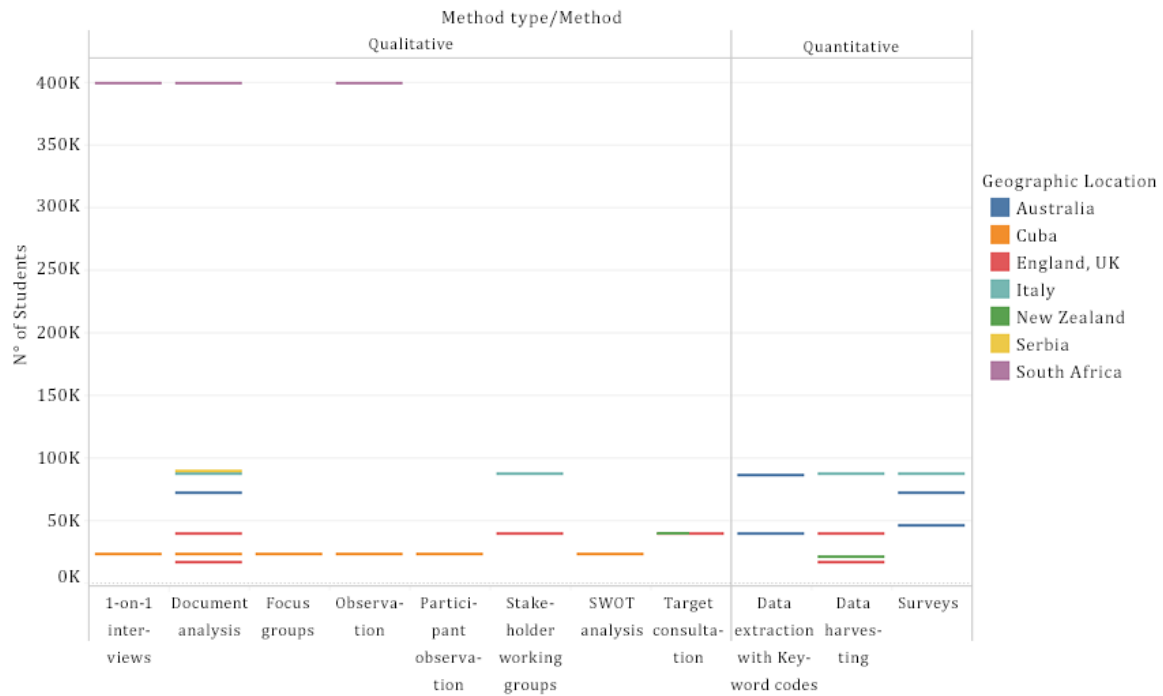


Figure 5. *SDGs mapping method vs University size*

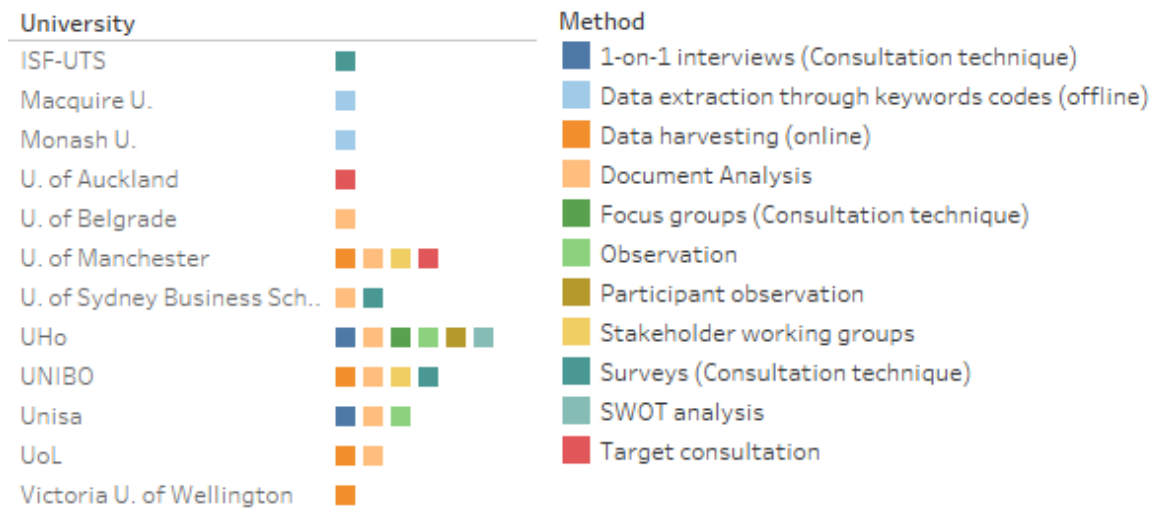


Figure 6. *University vs Methods*

Table 12. Methods/techniques used to approach SDGs mapping in HEIs

Tool/Method	Objective/ aim	Type	Application strategy	Knowledge required	Resources needed	Universities that have made use of it		HEI typology	Geographic Location	Main characteristics		University's mapping objectives
										N° Students	Status	
1-on-1 interviews (Consultation technique)	Used to collect data from a small group of subjects about opinions knowledge, behaviour, attitudes, feelings and preferences. These can be structured, semi-structured or unstructured. In case interviews cannot be done face-to-face, besides a normal phone call, video conferencing tools can be used to interview participants/respondents (Gill et al., 2008)	Qualitative	Set objectives of the interview; select a representative sample from the population of interest, this can be for example researchers, teachers, students, administrative staff and/or others depending on the mapping objectives; design the interview, it can be unstructured, semi-structured or structured depending on your objectives. Conduct the interview, transcribe and analyse it	At least one person of the team carrying the exercise should have experience in conducting interviews due to the different nature of possible interviewees (facilitation skills), basic knowledge of the topic (e.g. SDGs)	Skilled human resources, office supplies, such computers, and other needed equipment, if the interview were to be carried in person, transportation fees are also needed	2	University of South Africa	University	South Africa	Around 400 000 students (University of South Africa, n.d.)	Public	To map teaching and learning, respondents were students undertaking BSc Honours in Environmental Management that were selected because of their knowledge of the contents of their curriculum
							University of Holguín	University	Cuba	23 732 students enrolled at 2019-2020 (Universidad de Holguín, n.d.)	Public	To define how the investigations are carried out, the criteria for the proposal and selection of projects, satisfactions and dissatisfactions with the investigation process, perception from the different organizational levels of the strengths and weaknesses of the investigative activity and its contribution to the development of the territory and consequently to the achievement of the SDGs. This with the aim of characterising the research activity (First step to map the University's research, complemented with other methods)
Data extraction through keywords codes (offline)	Uses specific keywords/query codes to search through large sets of data available offline such University official documents, it can be done manually (high time consumption) or automated (with the use of an adequate software)	Quantitative	Develop a clear understanding of the SDGs, develop a list of keywords related to each of the SDGs (already existing lists could be used and adapted), perform keyword searches whether manually (high time consumption) or with the help of automated processes (software)	Understanding of the SDGs, IT skills (management of the software)	Skilled human resources, office supplies (e.g. computers)	2	Macquarie University	University	Australia	40 209 (Macquarie at a Glance, n.d.)	Public	To map the University's sustainability framework based on the learning and teaching framework (Education), at the end the overall percent that each UN SDG is covered by each of the main framework pillars was calculated

Table 12. *Methods/techniques used to approach SDGs mapping in HEIs (Continuation)*

Tool/Method	Objective/ aim	Type	Application strategy	Knowledge required	Resources needed	Universities that have made use of it		HEI typology	Geographic Location	Main characteristics		University's mapping objectives
										N° Students	Status	
Data extraction through keywords codes (offline)	Uses specific keywords/query codes to search through large sets of data available offline such University official documents, it can be done manually (high time consumption) or automated (with the use of an adequate software)	Quantitative	Develop a clear understanding of the SDGs, develop a list of keywords related to each of the SDGs (already existing lists could be used and adapted), perform keyword searches whether manually (high time consumption) or with the help of automated processes (software)	Understanding of the SDGs, IT skills (management of the software)	Skilled human resources, office supplies (e.g. computers)	2	Monash University	University	Australia	86 753 (2018) (<i>Monash at a Glance</i> , n.d.)	Public	To map the University's research, with a developed SDG keywords list on excel keywords were linked with researchers and like that identify the number of researchers identified as working in SDG space
Data harvesting (online)	Process to extract valuable data out of target websites to then put them into one's database in a structured format. It relies on computer programming and AI	Quantitative	As in other methods it is important to firstly define which data the team will be looking for and possible sources. Usually, an SDG keywords list is defined to then be used for data harvesting	Knowledge of computer programming, IT skills, use of query codes and databases	Skilled human resources, office supplies	4	University of Leicester	University	England, UK	16 855 (a.y. 2018/19) (<i>Where Do HE Students Study?</i> / HESA, n.d.)	Public	To map their research, calculating for example the number of publications related to the specific SDG. This was done searching for keywords within publication titles, abstract and keywords in the Scopus online database
							Victoria University of Wellington	University	New Zealand	Over 22 000 students (Victoria University of Wellington, 2020)	Public	To map 'Teaching' through an automated University website scrape, this based on an SDGs keywords list
							University of Bologna	University	Italy	87 758 students (a.y. 2017/18) (Technical Committee for Social Reporting, University of Bologna, 2019)	Public	Mapping the University's research activity, the number of publications was taken from the Scopus database, considering articles which contained a specific sequence of keywords and an author affiliated with the University (Keywords were chosen for each UN SD goal by considering the general declaration of the goals and all targets of each goal)

Table 12. *Methods/techniques used to approach SDGs mapping in HEIs (Continuation)*

Tool/Method	Objective/ aim	Type	Application strategy	Knowledge required	Resources needed	Universities that have made use of it		HEI typology	Geographic Location	Main characteristics		University's mapping objectives
										N° Students	Status	
Data harvesting (online)	Process to extract valuable data out of target websites to then put them into one's database in a structured format. It relies on computer programming and AI	Quantitative	As in other methods it is important to firstly define which data the team will be looking for and possible sources. Usually, an SDG keywords list is defined to then be used for data harvesting	Knowledge of computer programming, IT skills, use of query codes and databases	Skilled human resources, office supplies	4	University of Manchester	University	England, UK	40 250 (2020) (The University of Manchester, 2020)	Public	The team searched the titles, keywords and abstracts of publications in the Scopus database using two different lists of keywords for the SDGs to finally calculate a set of defined metrics (these were selected by the mapping team and the University's bibliometric specialist that trialled three different methodologies for research metrics and compared their performance in capturing the essence of the SDGs)
Document Analysis	To extract information about a specific topic from materials that could relate to it, for instance University's strategic plans, curriculums and alike	Qualitative	Define target data and potential data sources, for example, course modules for the case of teaching and learning mapping. It is relevant to define the criteria that will the team tell whether or this data is related to the SDGs or not.	Clear understanding of the SDGs as well as familiarity with the type of documents that will be analysed	Skilled human resources, office supplies	7	University of Leicester	University	England, UK	16 855 (a.y. 2018/19) (Where Do HE Students Study? / HESA, n.d.)	Public	To map their teaching (Education) using ILO to identify whether the different modules contained or not the SDGs (as a whole).
							University of South Africa	University	South Africa	Around 400 000 students (University of South Africa, n.d.)	Public	Document analysis with the aim of mapping the University's research, for example, policy documents related with research management
							University of Holguín	University	Cuba	23 732 students enrolled at 2019-2020 (Universidad de Holguín, n.d.)	Public	<div> To characterise the research activity from is organisational structure to their strategic objectives (First step to map the University's research, complemented with other methods). Official documents were reviewed, one example is the Strategic Planning of the Ministry of Higher Education and the UHo </div> <div> Collect and analyse the main research projects and results obtained to determine how these have been aligned with the Goals and targets of the Agenda 2030 </div>

Table 12. Methods/techniques used to approach SDGs mapping in HEIs (Continuation)

Tool/Method	Objective/ aim	Type	Application strategy	Knowledge required	Resources needed	Universities that have made use of it		HEI typology	Geographic Location	Main characteristics		University's mapping objectives
										N° Students	Status	
Document Analysis	To extract information about a specific topic from materials that could relate to it, for instance University's strategic plans, curriculums and alike	Qualitative	Define target data and potential data sources, for example, course modules for the case of teaching and learning mapping. It is relevant to define the criteria that will the team tell whether or this data is related to the SDGs or not.	Clear understanding of the SDGs as well as familiarity with the type of documents that will be analysed	Skilled human resources, office supplies	7	University of Belgrade	University	Serbia	Around 90 000 students (<i>University of Belgrade / StudyInSerbia</i> , n.d.)	Public	Content analysis of the course level learning outcomes, selecting the most relevant SDG to then use the relevant formulations of the Learning Objectives (LOs) from the UNESCO publication (2017) for comparison with the course learning outcomes formulated by the departments; to finally Interpret the findings, according to the specific context of each of the faculties selected for analysis, as seen from the point of view of the researchers teaching there.
							University of Sydney Business School	University (its Business School)	Australia	73 000 (Enrolled in the University of Sydney) (The University of Sydney, 2019a)	Public	Keyword searches in the Unit of Study outlines to assess the extent of integration of the SDGs
							University of Manchester	University	England, UK	40 250 (2020) (The University of Manchester, 2020)	Public	To calculate teaching metrics. Using SDG keywords highlighted in programme descriptions, all 3,365 course unit descriptions in 2017/18 were analysed and linked to the SDGs in two ways: Direct impact: if the unit allowed students to understand how to tackle the Goal and Indirect impact: if the unit covered a general area relating to the SDG, allowing students to understand the basics and build on this knowledge to contribute to the SDGs.
							University of Bologna	University	Italy	87 758 students (a.y. 2017/18) (Technical Committee for Social Reporting, University of Bologna, 2019)	Public	Content analysis of research projects and cooperation programmes to calculate predefined metrics, for instance the number of cooperation and social engagement projects active or the number of collaboration, teaching and mobility projects

Table 12. Methods/techniques used to approach SDGs mapping in HEIs (Continuation)

Tool/Method	Objective/ aim	Type	Application strategy	Knowledge required	Resources needed	Universities that have made use of it		HEI typology	Geographic Location	Main characteristics		University's mapping objectives
										N° Students	Status	
Focus groups (Consultation technique)	Focus groups are used for generating information on collective views and, the meaning that lie behind those views, these are also useful in generating a good understanding of participants' experiences and beliefs, these usually should consist of six to ten people. Used to determine the preferences of people or to evaluate strategies and concepts. The questions participants are asked are typically qualitative and open-ended, therefore the information is open to interpretation	Qualitative	Definition of objectives, selection of key stakeholders, designing the meeting, definition of the facilitator/moderator.	Advanced facilitation skills and subject expertise, basic project management and event organisation skills,	Skilled human resources, space, office supplies, transportation if needed	1	University of Holguín	University	Cuba	23 732 students enrolled at 2019-2020 (Universidad de Holguín, n.d.)	Public	To define how the investigations are carried out, the criteria for the proposal and selection of projects, satisfactions and dissatisfactions with the investigation process, perception from the different organizational levels of the strengths and weaknesses of the investigative activity and its contribution to the development of the territory and consequently to the achievement of the SDGs. This with the aim of characterising the research activity (First step to map the University's research, complemented with other methods).
Participant Observation	Participant observation refers to when evaluator participants as he or she observes, talking with stakeholders and participating in their activities. As a participant, the evaluator gains a more in-depth understanding of their activities and stakeholder perceptions (American University Online, 2015; Kawulich, 2005)	Qualitative	Definition of objectives, the processes for conducting observations, deciding what and when to observe, self-presentation, establishing rapport, selecting key informants, keeping field notes, and writing up one's findings	Experience in conducting such kind of field work, understanding of the SDGs	Skilled human resources, office supplies, transportation when necessary	1	University of Holguín	University	Cuba	23 732 students enrolled at 2019-2020 (Universidad de Holguín, n.d.)	Public	To define work processes and forms of management (To characterise the research activity, first step to map the University's research, complemented with other methods)

Table 12. *Methods/techniques used to approach SDGs mapping in HEIs (Continuation)*

Tool/Method	Objective/ aim	Type	Application strategy	Knowledge required	Resources needed	Universities that have made use of it		HEI typology	Geographic Location	Main characteristics		University's mapping objectives
										N° Students	Status	
Observation	Generally, it refers to when an evaluator observes the population of interest activities in action. Observation allows the evaluator to see what is happening, without interacting with stakeholders, towards seeing their behaviour only (American University Online, 2015)	Qualitative	Definition of objectives, deciding what and when to observe, the processes for conducting observations, keeping notes, and writing up findings	Experience in conducting such kind of field work, understanding of the SDGs	Skilled human resources, office supplies, transportation when necessary	2	University of South Africa	University	South Africa	Around 400 000 students (University of South Africa, n.d.)	Public	To triangulate data obtained through document analysis in the case of research and data obtained from interviews in the case of teaching and learning
							University of Holguín	University	Cuba	23 732 students enrolled at 2019-2020 (Universidad de Holguín, n.d.)	Public	Carried out during group interviews to obtain information related to behaviours, aptitudes and work environments oriented to research activities (To characterise the research activity, first step to map the University's research, complemented with other methods)
SWOT analysis	Strategic tool used to identify strengths, weaknesses, opportunities and threats of project, an activity, a company or others. A comprehensive SWOT analysis provides insight into where is there space to grow, allows to identify advantages and delivers the foresight to identify looming threats so preparation can be done	Qualitative	Draw up a SWOT Analysis matrix, gather a team from a range of functions and levels, use Brainstorming techniques to build a list of ideas about where your institution currently stands. Once you have examined all four aspects of SWOT, you will likely be faced with a long list of potential actions to take, look for potential connections, for example, could the institution use some of its strengths to open up further opportunities? or, would even more opportunities become available by eliminating some weaknesses? After, prioritize ideas so that the institution can focus time and money on the most significant ones (SWOT Analysis, n.d.)	Advanced knowledge of the institution, activity, project, plan, etc., project management skills (if the matrix will be drawn by a team)	Skilled human resources, office supplies	1	University of Holguín	University	Cuba	23 732 students enrolled at 2019-2020 (Universidad de Holguín, n.d.)	Public	To determine the main strengths and weaknesses of the research management activity in the UHo, considering its potentialities, the developments needs of the territory and the country, its real results and the SDGs. Based on this analysis, a set of actions to reinforce the University's contribution to the Agenda 2030 was proposed.

Table 12. *Methods/techniques used to approach SDGs mapping in HEIs (Continuation)*

Tool/Method	Objective/ aim	Type	Application strategy	Knowledge required	Resources needed	Universities that have made use of it		HEI typology	Geographic Location	Main characteristics		University's mapping objectives
										N° Students	Status	
Stakeholder working groups	The method is designed as a workshop that enables focused discussions between groups of stakeholders	Qualitative	The method consists of five steps: information, selecting topic, discussion, deliberation, and vote; of which some can be repeated if more than one proposed scenario is to be enriched by each group (The universities here listed not necessarily applied all the steps). Before carrying the workgroup, it is necessary to define objectives and select participants as well as clearly defined a working schedule (Engage2020, n.d.)	Advanced facilitation and project management skills as well as professional knowledge of the subject to be discussed, IT skills may also be needed.	Skilled human resources, space, office supplies, transportation if needed	2	University of Bologna	University	Italy	87 758 students (a.y. 2017/18) (Technical Committee for Social Reporting, University of Bologna, 2019)	Public	The creation of a model for the measurement and reporting on the performance of a University in relation to their sustainability objectives
							University of Manchester	University	England, UK	40 250 (2020) (The University of Manchester, 2020)	Public	For final selection of research case studies, a working group with academic and professional experts from across the University in sustainability was set up (the first step was a consultation process)
Surveys (Consultation technique)	Made of at least a sample of the target population, a method of data collection (questionnaire as the most common) and individual items that become data that can be analysed statistically. Surveys can be conducted in person, by phone or online (United States Department Of Health And Human Services. Administration For Children And Families. Office Of Planning, Research And Evaluation., 2017)	Quantitative	After the definition of objectives and designing the survey, one should identify and select potential sample members to then contact sampled individuals and collect data. It is important to evaluate and test questions as well as select the mode for posing questions and collecting responses. Accuracy and consistency should be checked, and adjustments made to correct for identified errors	Project management and organisation skills, IT skills, advanced facilitation skills	Skilled human resources, office supplies, transportation when necessary	3	ISF-UTS	University (its Investigation Institute)	Australia	46 259 students (enrolled at the UTS) (University of Technology Sydney, 2019)	Public	To map the Institute’s research, an excel tool was developed where research directors would mark 1 or 0 whether an SDG target was linked with the project or not.
							University of Sydney Business School	University	Australia	73 000 (Enrolled in the University of Sydney) (The University of Sydney, 2019a)	Public	The School briefly surveyed teaching staff to map the School's curriculum (complemented by keyword searches). The School surveyed also research staff

Table 12. *Methods/techniques used to approach SDGs mapping in HEIs (Continuation)*

Tool/Method	Objective/ aim	Type	Application strategy	Knowledge required	Resources needed	Universities that have made use of it		HEI typology	Geographic Location	Main characteristics		University's mapping objectives
										N° Students	Status	
Surveys (Consultation technique)	Made of at least a sample of the target population, a method of data collection (questionnaire as the most common) and individual items that become data that can be analysed statistically. Surveys can be conducted in person, by phone or online	Quantitative	After the definition of objectives and designing the survey, one should identify and select potential sample members to then contact sampled individuals and collect data. It is important to evaluate and test questions as well as select the mode for posing questions and collecting responses. Accuracy and consistency should be checked, and adjustments made to correct for identified errors	Project management and organisation skills, IT skills, advanced facilitation skills	Skilled human resources, office supplies, transportation when necessary	3	University of Bologna	University	Italy	87 758 students (a.y. 2017/18) (Technical Committee for Social Reporting, University of Bologna, 2019)	Public	To investigate the link between the single course unit of a study programme and the U.N. Sustainable Development Goals. The survey was sent by email to the coordinators of 216 study programmes at the University. The questionnaire was made with the list of all course units of each programme, and the coordinators indicated, for each course unit, its connection with a SD Goal
Target consultation	Consulting stakeholders is an important instrument to collect information for evidence-based policy making. Their views, practical experience and data will help deliver higher quality and more credible policy initiatives, evaluations and fitness checks. It also ensures greater transparency and legitimacy of the policy development process and contributes to a more successful policy implementation (European Commission, n.d., p. 380)	Quantitative	Definition of consultation scope and objectives, identification of stakeholders, envisaged consultation activities, their timing and language regime (European Commission, n.d., p. 379)), determine the consultation tools, carrying the exercise	Project management and organisation skills, IT skills, advanced facilitation skills, knowledge of the subject (SDGs)	Skilled human resources, supplies,	2	University of Auckland	University	New Zealand	over 40 000 (The University of Auckland, n.d.-a)	Public	Selection of initiatives case studies to report, the university shortlisted the most qualitative case studies that came through comprehensive consultation with key stakeholders undertaking these activities
							University of Manchester	University	England, UK	40 250 (2020) (The University of Manchester, 2020)	Public	To select qualitative case studies to understand the University's contribution to the SDGs. Consultation with social responsibility leaders and managers, and input from staff with particular expertise for each of the four dimensions, e.g. For research, case studies were developed by consulting individual researchers, research institutes and managers, communications and marketing officers and the University's research and business engagement support services

4. DISCUSSION

In this chapter, the thesis findings and how these help in achieving the objectives are discussed. In the following passages the discussion is focused on the three University missions: *Education, research and outreach*. Although mapping cases in other dimensions were previously presented on the results section, this discussion will analyse the general main characteristics of the presented methodologies, it will also try to identify which of the three university missions is the least mapped, and try to understand the reasons for it, as well as underline the main characteristics of the methodologies/tools used by the universities in the sample to map each one of the missions to the SDGs.

First, we could name the records obtained through the Google search engine that did not contain any SDGs mapping methodologies and/or tools information or that were not aimed at mapping any of the three university missions presented in Section 1.1.2. and therefore, are not analysed, these are presented in **Table 13**. As stated at the beginning only literature containing SDGs mapping cases were considered, although sustainability mapping (Fonseca et al., 2018; Shawe et al., 2019) can be useful for a SDGs mapping exercise it does not represent the aim of this thesis.

Table 13. *Records that do not include SDGs mapping cases (Google search engine entries)*

Title	Author	Year
Annual SDG Accord Report 2019, Progress towards the Global Goals in the University and College sector	The SDG Accord	2019
Higher Education and Research for Sustainable Development (HESD) - IAU	International Association of Universities, The Global Voice of Higher Education	n.d.
Mapping higher education for sustainable development in Portugal	Fonseca, L., Portela, A., Duarte, B., Queirós, J., & Paiva, L.	2018
Mapping of sustainability policies and initiatives in higher education institutes	Shawe, R., Horan, W., Moles, R., & O'Regan, B.	2019

Table 13. *Records that do not include SDGs mapping cases (Google search engine entries)*
(Continuation)

Title	Author	Year
Raising & Mapping Awareness of the Global Goals	Carteron, J.-C.; Decamps, A.; Suter, B.	2019
The Role of Higher Education in Advancing the UN's Global Goals	Mahalak, A.	2018

From this, we can see that 60% of the ten entries selected through the Google search engine, although they mentioned the SDGs in different ways, are not explicitly talking about SDGs mapping in universities or do not present any methodology/tool, for instance, the SDG Accord report that although it mentioned the relevance of the SDGs mapping exercise it does not present any specific example of it, neither does it contain any methodology and or tool that could be analysed, that is also the case of the 'Higher Education and Research for Sustainable Development (HESD) – IAU' web portal which presents and links the IAU's dedicated portal on Higher Education and Research for Sustainable development (www.iau-hesd.net) and is therefore not explicitly dedicated for SDGs mapping content; nonetheless unlike the SDG Accord HESD portal does mention a mapping tool although not explained, the "SDG Impact Assessment tool" which was mentioned in the introduction of this paper and was briefly presented along with the portal on the 'Results' section, this tool, directed at SDGs mapping in organizations in different fields and useful for HEIs, is not used in any SDGs mapping cases of the sample studied so there is not an applied case to discuss the tool, thus it will not be analysed. Some other records do not present specific universities' SDGs mapping exercises however, they do present SDGs mapping methodologies and/or tools, i.e. the Sulitest report (Raising & Mapping Awareness of the Global Goals) that represents a tool for mapping sustainability and SDGs awareness, nevertheless this tool is not aimed at any of the three university missions and could be considered part of another university dimension (*Awareness*). We can then say that few of the first

relevant entries on the search engine do represent a SDGs mapping methodology/tool or a SDGs mapping case the thesis aimed to analyse.

Secondly, we can see that few SDGs mapping cases were found through scientific databases, from an initial number of 1377 articles a total of 6 fulfilled the inclusion criteria; this could be because of the SLR design but it could likewise be implied that it could also be due to the fact that few institutions decide to publish their SDGs mapping work in a scientific journal, these are usually presented in a report form which is considered grey literature and usually, the scope of preparing these reports is not to publish this work on scientific journals but to communicate what universities are doing in terms, in this case, of SDG implementation and these reports are commonly directed towards the general public instead of the academia. The case of the UPF (Brazil), found through the scientific databases, will not be further analysed either, the UPF mapped the university's campus operations in terms of three energy initiatives that at the moment were shown to be contributing specifically to the achievement of Goal 7, showing how these initiatives have contributed to the goal's targets by describing these initiatives and showing results for instance in terms of reduction of energy consumption or increase in the share of renewable energy production, that is, they used the Goal 7 target as a base to measure their contribution to this specific goal; as seen on this summarized description and in the results, the University did not map any of the three university missions but campus operations, consequently, this case won't be discussed.

For the *THE Impact rankings* sample selected some universities did not report any methodology, that is the case of Western Sydney University and La Trobe University; there is also the case of Arizona State University where no useful information was found through the web portal. These and other cases such as King's College London, that manifested that there was not established methodology and did not report on any mapping process either and, the University of British Columbia (Canada), which stated as methodology what could rather be considered as sources of information instead of a methodological approach to extract information from those, do not allow to carry an analysis on SDGs mapping methodologies/tools for these universities.

Meanwhile, for the guide by SDSN Australia/Pacific (2017) because the cases it presents are also presented in their webinar these are then analysed as part of the latter. Since the guide is a tool in itself to guide universities in their SDGs implementation path, with a dedicated a section to SDGs mapping, this source will not be analysed as an SDGs mapping example but as a tool, that is how much it has been used by the sample of universities selected.

Consequently, the literature included for final methodology/tool analysis in the following sub-sections are those shown in **Table 14**.

Table 14. *Records included for discussion*

Title	Author	Year
Getting Started with SDGs in Universities: A Guide for Universities, Higher Education Institutions, and the Academic Sector.	SDSN Australia/ Pacific	2017
SOS-UK SDG Curriculum Mapping Support Package	Students Organising for Sustainability (SOS) - UK	n.d.
Sustainable Development Goals University of Leicester	University of Leicester	n.d.
Video: Mapping university contributions to the SDGs (Webinar)	SDSN Australia/ Pacific	2017
Are the sustainable development goals being implemented in the Portuguese higher education formative offer?	Aleixo, A. M., Azeiteiro, U. M., & Leal, S.	2020
Governing the university in the perspective of the United Nations 2030 Agenda: The case of the University of Bologna	Paletta, A.; Bonoli, A.	2019
Implementation of SDGs at the University of South Africa	Mawonde, A.; Togo, M.	2019
Investigación en la Universidad de Holguín: compromiso con la Agenda 2030 para el desarrollo sostenible. (Research at the University of Holguín: commitment with 2030 Agenda for a sustainable development)	León Pupo, N. I., Castellanos Domínguez, M. I., Curra Sosa, D., Cruz Ramírez, M., & Rodríguez Palma, M. I.	2018

Table 14. *Records included for discussion (Continuation)*

Title	Author	Year
Reflections on the learning objectives for sustainable development in the higher education curricula – three cases from the University of Belgrade	Orlovic Lovren, V.; Maruna, M.; Stanarevic, S.	2020
The University of Auckland: Sustainability Report 2019	University of Auckland	2019
University of Sydney, Sustainable Development Goals Update	University of Sydney	2019
Transforming management education beyond shareholder primacy, The University of Sydney Business School Sharing Information on Progress Report 2018-2019	The University of Sydney Business School	2018-2019
Report on U.N. Sustainable Development Goals	University of Bologna	2016, 2017, 2018
The University of Manchester Sustainable Development Goals	University of Manchester	n.d.
Sustainability Annual Report 2018	RMIT University	2018

Some of these sources presented more than one case study (different universities), these are analysed as separate cases, this is the case of the “Video: Mapping university contributions to the SDGs (Webinar)” by SDSN Australia/ Pacific (2017). The article “Are the sustainable development goals being implemented in the Portuguese higher education formative offer?” (Aleixo et al., 2020) presents results based on a survey composed of 33 institutions, however there is no distinction of universities, consequently it will be treated as the single record it is. For the case of the University of Bologna we can see that there are two sources of information belonging to the university, those are the article “Governing the university in the perspective of the United Nations 2030 Agenda: The case of the University of Bologna” (Paletta & Bonoli, 2019) and the SDGs reports found through UNIBO’s web portal, since both of these are related to the UNIBO’s SDGs mapping exercise they will be analysed as one. The

Business School of the University of Sydney will be considered as a separate entity from the University owing to the fact that this unit introduced a different methodology in its report.

It is important to note that even though the sources in **Table 14** all present a methodology, only a part of them did an in-depth explanation which is understandable due to the nature of the reports, while some others summarized their methodologies in few words which makes it hard to carry a profound analysis and identification of possible patterns. Considering that this study is intended to present an overview of some methodologies and/or tools used by HEIs to map their contributions to the SDGs it could be said that the *Results* section is fulfilling this purpose while this section is trying to highlight the main results in an interpretative way, universities are invited to adapt the methodologies here presented to their own needs, mapping objectives and context.

4.1. Mapping methodologies/tools

The different SDGs mapping tools and/or methodologies used by HEIs that were identified through the SLR and previously presented in chapter 3 are not meant to be representative across all SDGs mapping activities but as stated before they have been systematically selected to illustrate which methodologies and/or tools some universities have used so far to map their contribution to the SDGs, therefore, in this paper only an exploratory analysis was carried.

In the first place we could analyse the SDSN Australia/Pacific guide: *“Getting Started with SDGs in Universities: A Guide for Universities, Higher Education Institutions, and the Academic Sector”* (SDSN Australia/Pacific, 2017a), although only the University of Manchester manifested explicitly to have used the guideline, four universities in the sample have cited as a tool the *Compiled list of SDG keywords* created by SDSN Australia/Pacific and Monash university, list that is linked on the guide as a helpful resource, these universities were: the University of Leicester, the University of Auckland, the University of Sydney and the University of Manchester. This guide and list were developed at the start of the implementation of the Agenda 2030, three years

have since then passed, although still useful we can say that it does not represent the possible experience that has been gained during these years, additionally, the guide was based and contains information that could be more useful for HEIs in the Australian, New Zealand and Pacific context rather than other contexts; even though it can still be used by universities in general, some context particularities may have been omitted. This compiled list was said to be used for research mapping. In addition, the guide presented the example of a cross-university workshop design and stated that such workshop is an opportunity to discuss how the university could engage with the SDGs, going to the universities in the sample we can see that this tool has not been used in a similar way by any of the universities in the sample, we have cases like the one of SOS-UK that suggests a workshop at the end of the curriculum mapping to engage staff, senior leaders and others with the exercise results, and the ones of the University of South Africa (South Africa), the University of Holguin (Cuba), the University of Auckland, the University of Sydney Business School and the University of Manchester which made use of interviews with key informants or stakeholders for the SDGs mapping, however these were not workshops and represented instead a source of information through which data was obtained. It could be implied that a top-down approach is usually taken when carrying SDGs mapping exercises, however, giving an explanation to why this kind of workshop were not carried becomes very complex and would require a better understanding of each university and each context in which they are operating which is not the aim of this thesis and discussion.

SOS-UK has developed a student-led methodology, however, in the web portal there were no examples of the HEIs using the tool neither the universities in the sample based on the UK made use of it.

Since improving mapping processes is a work underway, universities generally developed their own methodologies to map their contribution to the SDGs, HEIs such the University of Bologna or the University of Manchester clearly explained how they obtained the metrics that were used, others such the University of Holguin gave a clear phase by phase methodology on what specifically they did to determine how they were contributing to the Goals. The University of Bologna decided the set-up of a working

group (rector, professors, some executives, staff and others) for the creation of a model for the measurement and reporting on the performance of a University in relation to their sustainability objectives, the University measured the performance of the institution against the SDGs through numerical indicators where possible and also with illustrative initiatives, UNIBO developed the measurement model to account for the contribution of the three University missions plus their institutional governance and management. On the other hand, the University of South Africa made use of interviews with key informants, document analysis and campus observations to measure the contribution of their teaching and learning, research, outreach and operations to the SDGs.

Some universities made use of selected units to carry their Goals mapping exercises, for instance the University of Belgrade decided to map the curriculum in three of the 31 faculties, represented different groups into which the faculties are divided (social sciences and humanities, medicine, science and technology), idea of the authors of the research to initiate an analysis of the curricula of their departments as an aspect of sustainability of faculties within the University of Belgrade was conceived because of processes inspired by the membership and the activities of the Coordination Council of the network of universities under the Inter University Sustainable Development Research Program (IUSDRP) and the European Sustainability Science and Research School (ESSSR) that the University joined in 2016 and 2019, respectively. In other universities initiative is being taken by their business schools and their commitment with PRME, for example the University of Sydney where the Business School presents their contribution to the SDGs on their PRME report. Consequently, it can be said that carrying a SDGs mapping exercise does not necessarily mean that universities have to map all their activities at once and units of application could be selected as a starting point, this can be more relevant for universities with large number of faculties/schools and students.

The previously mentioned methodologies and others are further analysed in sections 4.1.1.1, 4.1.1.2 and 4.1.1.3 while trying to make a distinction by each of the three University' missions.

From **Table 12**. Methods/techniques used to approach SDGs mapping in HEIs, we can know the frequency of use per each method/technique applied for mapping SDGs, such frequency can be seen on **Figure 7** where it is possible to observe that ‘Document analysis’, ‘Data harvesting’ and ‘Surveys’ were the most used while ‘SWOT Analysis’, ‘Focus groups’ and ‘Participant observation’ were the least used, all the latter are qualitative methods while from the most used two of them are quantitative and one is qualitative, the use of these methods can depend on the university size as well as the university dimension that is being mapped, it is also relevant to note that most of the universities analysed used a mix of techniques to achieve their objectives.

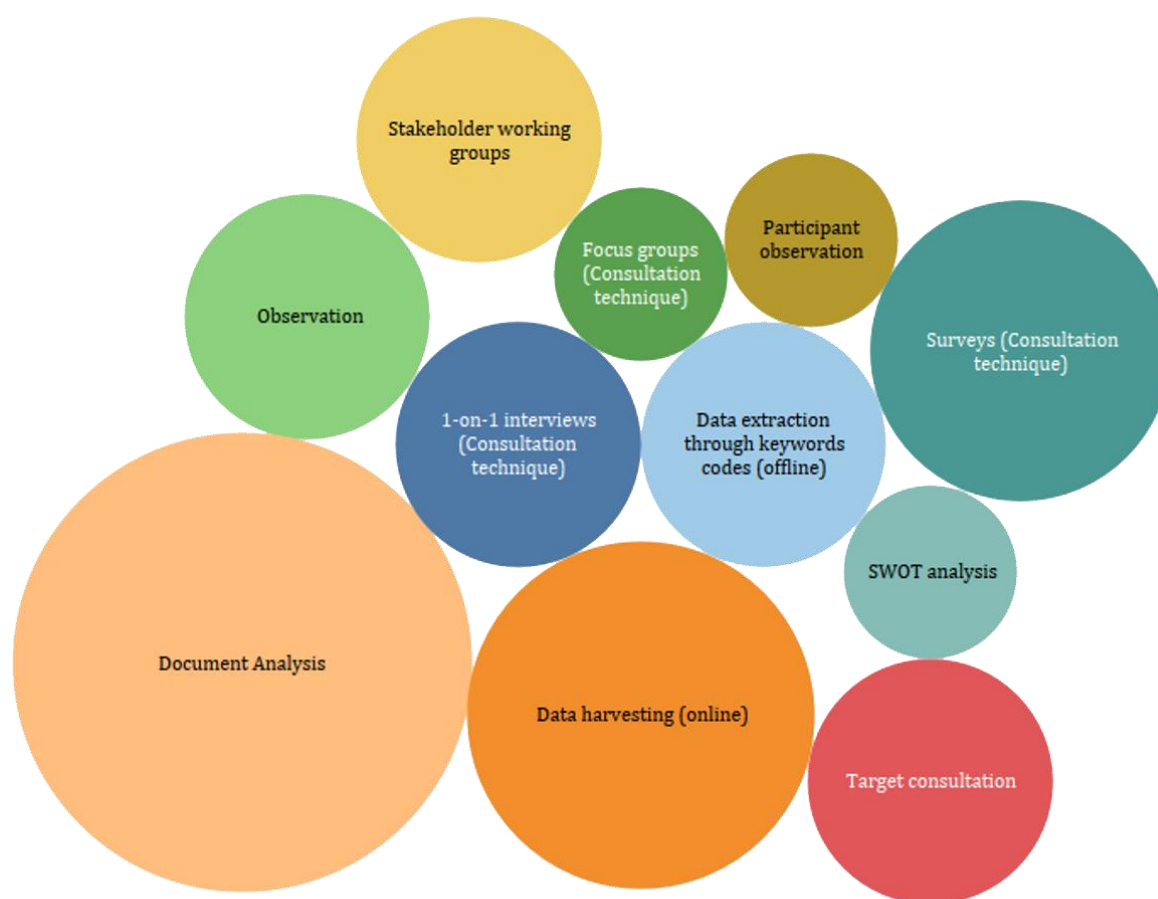


Figure 7. *Frequency of methods used by universities in the sample*

4.1.1. The University's three missions mapping

Some universities manifested mapping different dimensions, and presented results of those, but methodology insights were not given for all these dimensions mapped like the case of the University of Sydney, although they mapped *Education, Research and Operations*, they only explained the mapping methodology for research, for these cases only the dimension for which a methodology was reported is considered.

As seen in **Figure 8** out of the three University missions, *Outreach* was the mission universities in the sample mapped the least with a 16% of records talking about mapping SDGs against this mission, on the other hand, *Research* was the most mapped mission closely followed by *Education* with 44% and 40%, respectively. We can observe a considerable gap between outreach and the other two missions. If we were to analyse the reasons why this can be happening, we could start by bringing back what was mentioned in the background about the fact that there is no universal definition of outreach and activities of universities counted as part of it varies from one university system to another (Berghaeuser & Hoelscher, 2020), this can affect a university's understanding of the Third mission and the development of standardised methodologies to map it against the SDGs, consequently, an outreach mapping exercise can become really complex for universities. Almost five years have passed since the beginning of the implementation of the SDGs, this makes the field fairly recent and influences the fact that HEIs are relying on exploratory activities to be able to map not only their outreach mission but also education and research, although these present more advancement. According to UNESCO (2005) developing and disseminating necessary knowledge, values, skills, and awareness to create a sustainable and fair future can be achieved by bridging the gap between knowledge generation and the transfer of this knowledge to society via service and outreach and by implementing sustainable practices internally (Wakkee et al., 2019), that means that attention should also be paid to the Third mission in universities because outreach activities can be the bridge for sustainability knowledge practice and can contribute to the achievement of the Goals. As a consequence of the lack of attention showed, we can say that there is much work to be done in the mapping against the SDGs of the outreach mission.

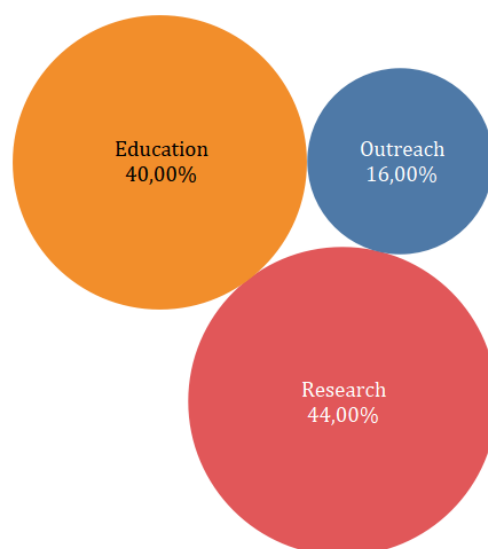


Figure 8. *University's three missions in SDGs mapping in universities (percentage).*

Table 15 presents the universities that reported a SDGs mapping methodology for the different University missions, the case of the record belonging to the Students Organising For Sustainability (SOS) - UK (n.d.), aimed at mapping University's curriculum, was not included since it does not represent an specific university SDGs mapping case study.

Table 15. *University's three missions in SDGs mapping in universities.*

Author / University	University mission mapped
University of Leicester	Teaching (Education), research
SDSN Australia/ Pacific:	
Macquarie University (MQU)	Learning and teaching framework (Education)
Institute for Sustainable Futures, University of Technology, Sydney (ISF- UTS)	Research
Monash University	Research
Victoria University of Wellington	Teaching (Education)
Aleixo, A. M., Azeiteiro, U. M., & Leal, S.	Education
Mawonde, A.; Togo, M.	Education, research initiatives, outreach, operations
León Pupo, N. I., Castellanos Domínguez, M. I., Curra Sosa, D., Cruz Ramírez, M., & Rodríguez Palma, M. I.	Research

Table 15. *University's three missions in SDGs mapping in universities. (Continuation)*

Author / University	University mission mapped
Orlovic Lovren, V.; Maruna, M.; Stanarevic, S.	Curriculum (Education)
University of Auckland	Research, teaching (Education), engagement/stakeholder relationships (outreach) and operations
University of Sydney	Research
The University of Sydney Business School	Curriculum (Education), research, activities
University of Bologna; Paletta, A.; Bonoli, A.	Teaching (Education), research, third mission (Outreach) and Institution
University of Manchester	Research, teaching (Education), public engagement (outreach) and activities
RMIT University	Research.

4.1.1.1. Education methodologies

The methodologies presented usually aimed at mapping the universities' curriculum through the identification of each **SDG key topics** that would then be searched within the courses' syllabuses. (Aleixo et al., 2020) for example, created a system code composed of a list of keywords (categories) associated to each one of the SDGs that was applied to the courses, the keywords criteria were based on the SDGs and their targets and the presence/absence of these in the courses was evaluated by each Goal. The University of Sydney manifested on the other hand using the already existing *Compiled keywords for SDG mapping* by SDSN Australia/Pacific and Monash University, the University's business school perform keyword searches as well on the Unit of Study outlines and complemented it with a survey to their teaching staff. Another university that performed keyword searches for the mapping exercise was the University of Manchester which used SDG keywords highlighted in programme descriptions to analysed all 3,365 course unit descriptions in 2017/18 and link them to the SDGs, from that it was possible to count the number and proportion of units relevant to specific SDGs and the number of student engagements with them. Victoria University of Wellington developed a keywords list to align the SDGs to the courses the university

was offering and carried the keyword searches exercise through and automated website scrape.

The University of Manchester complimented their quantitative analysis of their courses with the presentation of case studies based on the previously mentioned curriculum audit and based also on a wide-range internal consultation, the cases studies were selected based on their clear contribution to the respective SDG, their impact and their distinctiveness, while also striving for diverse range of initiatives from across the University.

The UoL conducted an audit of their curriculum based on the ILO's of the modules which allow them to identify if these contained or not the SDGs, however, it was expressed that their designed methodology did not allow them to know which specific SDG was contained in the modules which renders the methodology less effective.

In particular, The University of Belgrade based their analysis on the UNESCO LOs (2017), the researchers that perform the mapping exercise carried a qualitative content analysis of the course level learning outcomes of specific selected relevant SDGs for each of their faculties to then use the relevant formulations of the UNESCO for comparison with the course learning outcomes formulated by the departments, they analysed if the content of the courses covered the LOs for each SDG selected. The study results are then limited by the fact that the analysis was made for just a few SDGs (SDG4, SDG16 and SDG11), this was influenced by the circumstances, that is, it was designed for the research which had a time frame and not as an initiative of the University.

A different methodology was used by the University of South Africa, Unisa performed interviews with key informants, for the case of teaching and learning mapping they selected BSc Honours in Environmental Management students because of their knowledge of the contents of their curriculum. The study's results on teaching and learning are quite summarized and only talk about SDG4. Considering the complex nature of the SDGs, interviews may not be the most adequate method, it could instead compliment other methodological approaches to the SDGs mapping against the *Education* mission since it seems to be highly time consuming to be able to be

comprehensive, interviews with really small samples and conducted and analysed in short periods of time may end up being lacking to map *Education* against all the SDGs.

The University of Bologna set up a working group and developed their own methodology to measure their contribution to the SDGs, the reporting group of UNIBO made clear how certain metrics were calculated, for the teaching metrics they calculated for example the number of course units with attention each SDG, the number of collaboration, teaching and mobility agreements active as of the end of the reporting year and, the number of student who chose those course units for the academic year being reported; the data for the course units came from a survey investigating the link between the single course unit of a study programme and the U.N. Sustainable Development Goals. The survey was conducted asking to all teachers the link for each their course units using a web procedure. Additionally, for SDG4 the University measured the parameters for *Quality Education*, these are comprised within three main areas which are student attractiveness (e.g. incoming exchange students, % of international students), social inclusion (e.g. value of scholarships per capita, students followed by the service of disabled, enrolled university students by gender) and, programmes offered and main results (number of degree programmes, number of degree programmes taught in English, graduates with regular enrolment and others.) (Technical Committee for Social Reporting, University of Bologna, 2019, p. 19). Furthermore, for SDG 5-Gender equality measurement, UNIBO calculated the *Glass ceiling index* (ratio between the share of women in the teaching staff and the share of women in the role of full professor), in general, the greater the value assumed above one on the Glass Ceiling index, the stronger the glass ceiling, and the harder it is for women to take on leading roles within academia.

To sum up, for the mapping of the *Education* mission against the SDGs universities in the sample have made use of different tools, usually guided by their own developed methodologies, some have carried keyword searches on their courses syllabus, others have decided to perform interviews with key-stakeholders or to carry a content analysis based on the UNESCO LOs, some like UNIBO calculated different metrics and others like the University of Manchester complimented the keyword searches with the

presentation of case studies. In the end, the exercises here presented seem to still represent first approaches to map teaching and learning to the SDGs since there are not pre-defined methodologies, however, universities can draw what, considering their perspective and context, can be more useful for their own exercise based on the successful and not so successful stories of institutions that have already mapped their activities against the SDGs.

4.1.1.2. Research methodologies

There's no current standardised method to map a University's contribution to the SDGs in any of the three missions, therefore capturing an institution's whole research linked to the Goals becomes difficult. The methodologies applied by universities in the sample usually aimed at mapping the publications generated by the university as a whole or by a faculty/institute in order to identify their scientific contribution to the SDGs. As in the *Education* mission mapping, for research **keyword and query codes** were a common in the sample of universities. For instance, the UoL created and adapted lists of keywords for the 17 SDGs using as a reference the query codes from Aurora Network and the *Compiled keywords for SDG mapping* from Monash University and SDSN Australia/Pacific; UoL search for keywords within publication titles, abstract and keywords in the Scopus online database for the last 5 years (2013-2018). The University of Auckland based their work also in the *Compiled keywords for SDG mapping* complementing this with cases studies of research initiatives that were selected through comprehensive consultation with key stakeholders undertaking these activities. The University of Sydney, although there was no clear explanation of the development of the mapping exercises, manifested having used the SDSN Australia/Pacific SDG keywords list.

Other examples are Monash University, the University of Manchester and RMIT University. Monash University developed a table of SDGs related keywords within an Excel spreadsheet to then link these with the researchers who self-identify with the keywords and search publications and awards data to find researchers working in keyword areas, the exercise provided the number of researchers identified as working in SDGs, faculty-based researchers who are highly active in SDG space, disciplines

where the university was research active and where weaknesses were. The University of Manchester worked with the University's bibliometric specialist to trial three different methodologies for research metrics and compared their performance in capturing the essence of the SDGs, one of this methodologies was an internally developed list, in the end it was decided to use two externally produced methodologies for the research metrics these were: The SDSN keyword list compiled by Monash University and SDSN Australia/Pacific and an 'Elsevier methodology', used for the report *Sustainability science in a global landscape* produced by Elsevier in collaboration with SciDev. Net.; this was part of the first stage of the mapping process which consisted on a comprehensive data collection process to identify initiatives across the University; using both methodologies would allow them a better comparison with future reports from other universities. In addition, the University reported under SDG17 Partnerships for the Goals the number and proportion of publications co-authored with researchers internationally, and also added those with researchers from LMI countries using the Elsevier methodology; furthermore, the University selected research case studies by first consulting individual researchers, research institutes and managers, communications and marketing officers and the University's research and business engagement support services to finally make a definite selection by a working group with academic and professional experts from across the University in sustainability. RMIT University stated having used a keyword search analysis to map their research contribution to the SDGs, nonetheless the report did not explain much about how the mapping was developed or if the keywords were selected by the university or if instead, they used an existing list.

There were cases in which universities used different methodologies to map their research against the SDGs such the University of Holguin or the ISF-UTS. The ISF-UTS developed an excel mapping tool to be used by 10 research directors of the university where they would be able to establish the existence or not of a link between a project and a particular target of the 17 SDGs with 1/0 inputs based on the linkages assumptions between the goals, targets and projects, most of the directors involved in the exercise considered the tool to have benefits for their planning process. The UHo on

the other hand, developed a three-phase methodology with the aim of understanding the current University's research contributions to the SDGs and propose actions to reinforce that contribution: first, UHo characterised its research activity in terms of research management organisational structure and strategic objectives to establish a base for the understanding of how the organisation is prepared to contribute to the achievement of the SDGs, for this stage in the methodology, documentary reviews (of official research-related documents of the University and of the Ministry of Higher Education of Cuba), interviews to key stakeholders (to define how the investigations were carried out and the criteria for the proposal and selection of projects and other relevant characteristics of research management) and, observation (to define work processes and forms of management) were used as methods; secondly, the University collected and analysed the main projects and results obtained to determine how these have been aligned with the Goals and its targets, for this stage they made use of statistical analysis to calculate frequencies of results by projects and identify to which SDG these projects respond to and the corresponding year, for this analysis the authors developed a coefficient that would tell them the average number of results that have been obtained per project in each of the SDGs (CPRP).

Researchers mapping Unisa's contributions to the SDGs carried research-related document analysis to obtain research information but did not gave details on how the analysis was carried, an analogous case is that of the University of Sydney business school which expressed having briefly surveyed their research staff but did not specify characteristics of this staff or characteristics of the survey and said to be developing a more systematic approach to capture SDG coverage.

As seen in the previous section, UNIBO made clear, in its reports and the article by Paletta & Bonoli (2019), the methodology developed to map its different dimensions against the SDGs and research is not an exception. The mapping team performed a content analysis on research projects and searches by keywords, Boolean operators and indices, and queries made on the Scopus database, keywords were chosen for each UN SDG by considering the general declaration of the goals and all targets of each goal. Some of the metrics the University calculated were the number of publications in

Scopus in a determined period of time (2013-2018 in their last report) which contained a specific sequence of keywords and an author affiliated with the University; the number of documents that have cited the author for a document's publication in the DB Scopus; the h-index which counts the highest number of papers having at least the same number of citations (it expresses an easy to read 1:1 relationship between publishing articles and citations), used by them to measure the scientific output of the University of Bologna, using the keywords' clusters, extracted from each SDG, to contain and limit its topics and objectives. UNIBO benchmarked the University both nationally and internationally, for international benchmarking they included top universities of the QS World Universities Rankings (top 10 universities of the 2020 Rankings for their 2018 report) that were comparable with UNIBO in terms of size, focus, research intensity and status (public), the number of publications in Scopus was determined and the number publications of articles for each university and each goal was scaled against the number of academic staff as listed by QS for the World University Ranking so any dimensional effect caused by simply considering the total number of publications could be eliminated to finally compared the universities ratios for each Goal against UNIBO's ratio; for national benchmarking a similar comparison to that of the international benchmark was carried, in this case three Italian universities were selected from the first 400 in the QS World Universities Ranking (2018/2019 for the 2018 report), moreover, the University counted the number of research projects founded by the European Union through the programmes FP7 and H2020 for the year being reported. Other indicators calculated are the research facilities in UNIBO, the financial amount invested by the University for the activation of PhD courses and others that can be found on *Table I* of Paletta & Bonoli (2019, pp. 508, 509).

As a result, it can be observed that lists of SDGs-related keywords seem to be the most appropriate tool to map an institutions research since keyword searches have proved to be useful for the Universities and researchers in the sample. From the author's point of view, after analysing all the single cases, the University of Bologna has presented the clearest methodology out of the universities/researchers in the sample, they expressed how the first step was the creation of a working group whose task was to develop a

measurement model, the authors explicitly explained the metrics that were calculated and provided as well a scientific article that can be found through a scientific database search, additionally it is stated that the reporting model was developed in English for a wider dissemination and metrics, like the number of publications in Scopus, are replicable and usable by other institutions.

4.1.1.3. Outreach methodologies

As seen in **Figure 8**, University's Third mission has been the least mapped by universities and researchers in the sample, nonetheless it was possible to find a few examples. First, the University of Manchester explained that case studies were used to show the contribution of their public engagement activities with the SDGs, it was stated that the selected case studies were developed in consultation with engagement managers and the University's cultural institutions, as well as researchers engaging with the community. The university of Auckland, which reported case studies as well, has described to have selected the most qualitative case studies through comprehensive consultation with key stakeholders undertaking such public engagement activities. Unisa has carried a document analysis of documents such their Community Engagement and Outreach Policy, in addition, they interviewed key stakeholders which had been identified as having knowledge of sustainability initiatives taken by the University in different dimensions.

Finally, the UNIBO calculated specific metrics related to their outreach activities, for instance, the number of cooperation and social engagement active projects, the number of students enrolled on lifelong learning programmes and the number of teachers participating on lifelong learning programmes in education studies, or the number of public engagement events organised in collaboration with the University in the cities where it operates. Moreover, the University presents a 'box' of initiatives related to the third mission, initiatives to help solve the issues indicated by the SDGs, which involve external objects: e.g. "Unibo for Refugees" initiative, business incubators, the University museum system (number of visitors and opening hours), the agricultural company of the University.

4.2. Mapping approaches

Additionally, following the logic of the previous section which focused on the three University missions and remembering the SDGs main mapping approaches presented in section 1.1.6 (Desktop assessment, self-assessment and keyword searches), we could deduce that the mapping exercises followed the approaches seen on **Table 16**. The mapping approach was deduced only for those papers which reported a methodology and that were mapping at least one of the three missions (13 records, 2 belonging to UNIBO).

Table 16. *SDGs mapping approaches used by the studied sample.*

Author/University	Mapping approach
University of Leicester	Desktop assessment, keyword searches.
SDSN Australia/ Pacific:	
Macquarie University (MQU)	Keyword searches.
Institute for Sustainable Futures, University of Technology, Sydney (ISF- UTS)	Self-assessment.
Monash University	Keyword searches.
Victoria University of Wellington	Keyword searches.
Aleixo, A. M., Azeiteiro, U. M., & Leal, S.	Keyword searches.
Mawonde, A.; Togo, M.	Desktop assessment; self-assessment.
León Pupo, N. I., Castellanos Domínguez, M. I., Curra Sosa, D., Cruz Ramírez, M., & Rodríguez Palma, M. I.	Desktop assessment; self-assessment.
Orlovic Lovren, V.; Maruna, M.; Stanarevic, S.	Desktop assessment.
University of Auckland	Keyword searches (research).
University of Sydney	Keyword searches (research).
The University of Sydney Business School	Self-assessment, keyword searches.
University of Bologna and, Paletta, A.; Bonoli, A.	Desktop assessment, self-assessment, keyword searches.
University of Manchester	Desktop assessment, self-assessment, keyword searches.
RMIT University	Keyword searches.

Based on the information previously inferred we can draw **Figure 9** there we can observe that *Keyword searches* is the most used approach by universities in the sample with a 46,67%, following, we have those cases in which all the three main mapping approaches were used along with those where *Desktop assessment* and *Self-assessment* were used, both with 13,33%. This is coherent with the fact that, as seen in section 4.1.1, the most mapped university mission was that of research were keyword searches seems to be an appropriate approach and the most used, in some of the records (e.g. Victoria University of Wellington, University of Sydney, University of Manchester) this approach was also used for mapping universities' curriculum (Education) against the SDGs which can explain the major difference with other approaches.

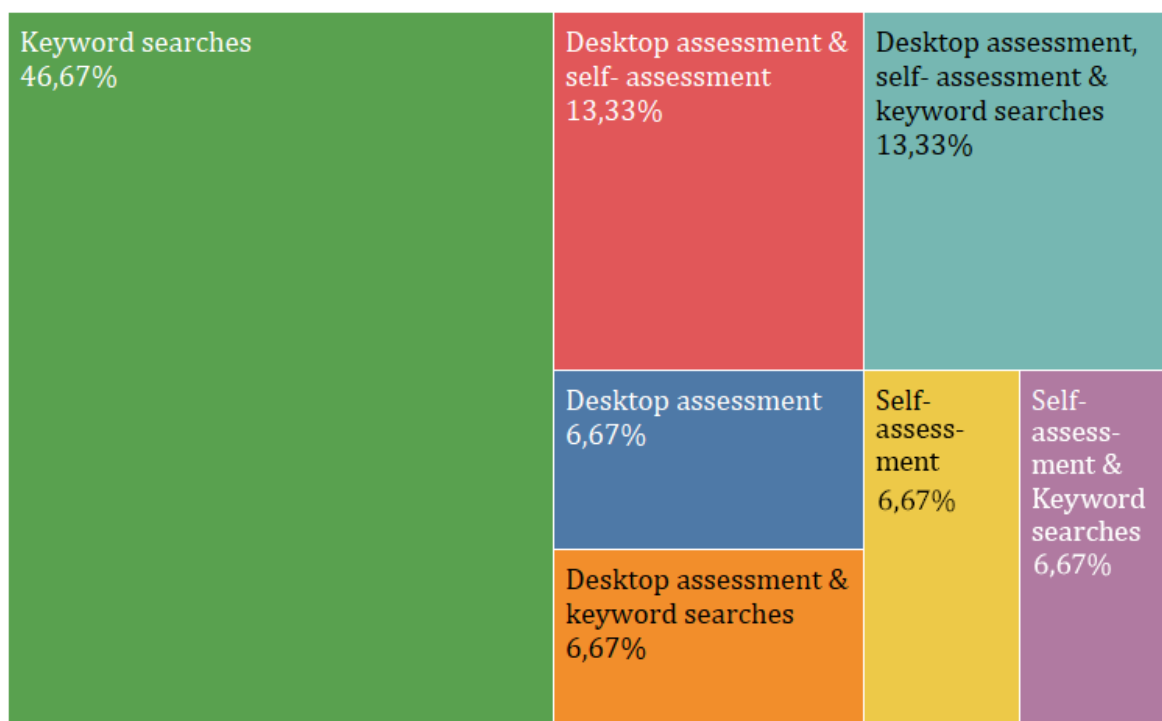


Figure 9. SDGs mapping approaches used by the studied sample (percentage).

4.3. Geographical distribution of the sample

Another interesting characteristic of the sample is its geographical distribution, the papers found and universities analysed are geographically concentrated in Australia as seen in **Figure 10**, six of the universities analysed are located in Australia while two are located in New Zealand and two in the United Kingdom, we can note that five of the

cases come from European Countries (UK, Portugal, Serbia and Italy) and eight from Oceania (Australia and New Zealand) while only one case is coming from Africa (South Africa) and one is coming from central America (Cuba).

At the beginning of the discussion section we talked about the SDSN Australia/Pacific guide and highlighted the fact that this guide contained and may be more useful for institutions located in similar contexts, even though this study collected cases from other parts of the world, making more diverse the sample size, it is still lacking ground to allow us to make further recommendations and conclusions, nonetheless the cases here presented can still be useful to guide HEIs in their SDGs mapping exercise being mindful of the limitations.

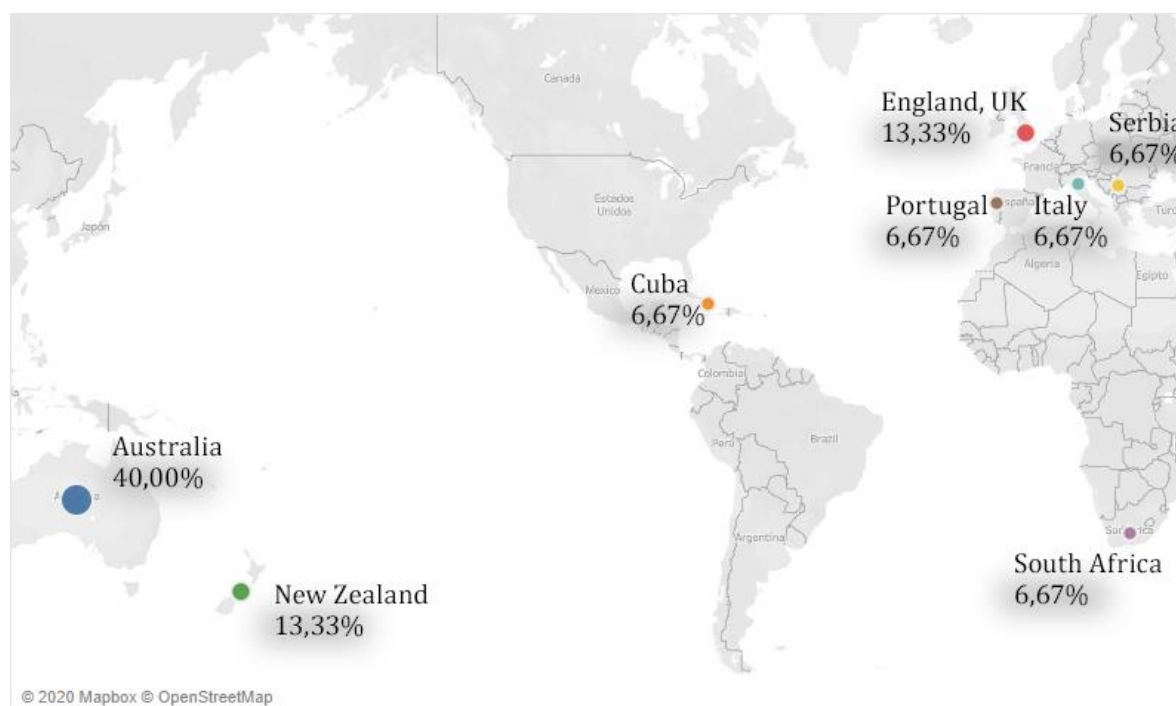


Figure 10. *Geographical distribution of records analysed*

4.4. Results and thesis objectives

Through the methodological approach designed for this thesis it was possible to reach the objectives defined in Section 1.2, through the SLR and analysis it was possible to identify different methodologies and/or tools some universities have used to map their contribution to the Sustainable Development Goals, mapping approaches were

identified and analysed and, the least and most University's missions mapped were also identified. It was possible to understand, for the cases in which methodologies were clear enough, how the universities used and developed different tools methodologies to map their contributions.

4.5. General SDGs mapping recommendations

It was possible to observe different approaches to SDGs mapping through the different cases in the sample, in this section the aim is to bring together the different steps universities took to achieve their mapping objectives and try to present a general step by step on how to approach an SDGs mapping exercise. It was stated before that the size of the sample here studied represents a limitation to carry on an in-depth analysis, however, a first attempt to present a general methodology will be presented, readers should therefore be mindful of the called limitations throughout the paper.

First, this thesis recommends that HEIs engage different actors of the institution to commit towards the SDGs since this exercise could help identify possible champions for further works on SDGs engagement. It is suggested to add a preliminary phase before data collection for SDGs mapping, this preliminary phase could consist of the definition of an SDGs board composed by different stakeholders of the university such students, professors, technical and administrative staff. This preliminary stage could be complimented with a workshop, as suggested by SDSN Australia/Pacific (2017) with the aim of creating the opportunity to discuss how the university could engage with the SDGs and to work on topics relevant to the SDGs that the team should have clear such systems thinking and reporting on impacts.

After the preliminary phase, the mapping exercise could be started, for this phase it is important to define the mapping objectives and which dimension(s) of the university will be mapped, focus can be put for example on one or the three University missions or it can be decided to map as well dimensions such campus operations and SDGs awareness; subsequently, it should be defined which data the team will be looking for as well as the sources of these data, methods and methodologies for data collection should be clearly defined; the definition of this information can help the university use

time and resources more efficiently. The next step consists of data collection, in this paper the analysis was focused on the three University missions consequently the approaches for the mapping of these will be summarised, however, as previously mentioned other university dimensions can be mapped. For the case of *Education* and *Research*, 'keyword searches' approach has been the most utilised, here existing SDG-related keywords lists can be used and adapted to the university's context and understanding of the Goals, these keywords can be linked to courses as well as research publications through the use of different tools such excel and Scopus database, the team can decide to make use of already defined metrics for research for example and measure them for the papers in which a linked to the SDGs was found. For the case of *Outreach* activities case studies can be selected as well as selection of metrics related to this kind of activities can be defined and measured like the case of the University of Bologna (**Section 3.3.6**).

Finally, the collected data can be analysed and reported, mapping results can be presented on annual SDGs reports where the University's contribution to the achievement of the goals can be displayed. Additionally, it is suggested to communicate these results to broader audiences of the University, since not all of the stakeholders of the institutions may read annual reports (for example, students, administrative staff and others) it is important to think of other forms of communication, for instance, through presentations at different meetings of administrative staff. For the presentation of results, it is recommended to do it in a summarised and illustrative way.

Summarising, an SDGs mapping exercise can be composed by three broad stages each of them containing different steps, these are:

1. Preliminary phase;
 - a. Definition of an SDGs working team;
 - b. Workshop or activities of engagement of the team where SDGs-related relevant topics are treated and ways in which the university can engage with the SDGs are defined;
2. Mapping phase;

- a. Definition of mapping objectives;
 - b. Definition of University dimensions the specific exercise will be mapping;
 - c. Definition of data the team will be seeking for and possible sources;
 - d. Data collection;
3. Data analysis and presentation.
 - a. Analysis of collected data;
 - b. Report writing and/or preparation of the methods for displaying results.

5. CONCLUSIONS

By presenting an overview of SDGs mapping tools and methodologies that some HEIs have developed and used so far this study fills in a research gap. HEIs were reminded of their essential role in the SDGs achievement not only with reference to SDG4 (Quality Education) but the 17 of them. With the aim of identifying and presenting these mapping tools and methodologies a SLR was carried through the Google Search engine and scientific databases and, a sample of 10 universities were selected from the top 10 of the 2020 *THE* Impact Rankings to illustrate what universities recognised for their efforts to contribute in the achievement of the Goals are doing. By doing so, this research aimed also at encouraging HEIs around the world to map their contributions to the SDGs and be able to design strategies for further contribution and strengthening of their current efforts. Mapping what an institution is already doing can be the first step HEIs can take to start and to deepen their engagement with the SDGs. This exercise can be helpful to identify key stakeholders engaged in contributing to the SDGs, to identify strengths and gaps in the organization activities, to gather information for reporting, communicating and showcasing the institution contribution to the SDGs.

Even though the study design and the stage of maturity of the SDGs mapping field resulted in a small sample selected, which means that this research cannot claim to be comprehensive of the field as a whole, the data collected allow to draw some valid conclusions:

- HEIs in different contexts are currently working and reporting on their contributions to the SDGs being conscious of their crucial role in the Goals achievement;
- Because there are not standardised methodologies to map HEIs contributions to the SDGs, universities have been developing their own methodological approaches to the exercise, learning from the process and trying to share the created knowledge with other institutions;
- HEIs as a group should seek to develop more standardised ways for SDGs mapping allowing like that more institutions to draw from these, even though each university has their own contextual needs, flexible and adaptable methodologies can become useful to guide institutions in their paths towards SDGs mapping and further engagement;
- HEIs should work more on the Third mission and its contribution to the Goals as this mission is, as the other missions, important for the fulfilment of the SDGs, outreach can represent a bridge between the university, society and economy and therefore should not be neglected.

The scientific relevance on this paper lies on the fact that it presents an overview of the current state of the knowledge of HEIs' SDGs mapping, this study highlights what some HEIs are doing in this regard, it outlines what some universities are doing to understand their contribution to the Global Goals and how these kind of exercises have helped them take steps forward and strengthen their contributions.

Finally, universities should try to strengthen relations with one another to benefit from the opportunities provided by sharing experiences. Universities should also try to take advantage of "the many opportunities SDGs provide to them, not only in respect of teaching and research but especially in respect of their outreach activities" and act as leaders in support and promotion of the SDGs (Leal Filho, Shiel, et al., 2019, p. 294).

5.1. Possible future developments

- Further developments could include a greater number of SDGs mapping sample cases as well as conducting a peer review SLR; working on a better understanding of the different dimensions of HEIs can also represent further developments since in this study analysis was focused only in the three University missions;
- Future developments could include different sustainability mapping tools used by HEIs that could be useful for identifying HEIs' contribution to the UN SDGs;
- Future research could engage on the development of comprehensive SDGs mapping guides for HEIs, encouraging universities to further commit to the SDGs while at the same time helping them understand that they are already doing something and that being aware of what they are already doing represents a starting point for deepening their contributions to sustainability and the Goals.

Lastly, it is relevant to remember that SDGs mapping can be crucial to properly manage an institution sustainability transformation and to correctly develop SDGs implementation strategies. Contribution to SDGs progress measurement represents a starting point for a comprehensive assessment of institutions' contribution to the achievement of the goals and it can work as a baseline to know where they stand and design pathways for contributing to the achievement of the SDGs. Accordingly, this research is also looking to create the opportunity for different fields to develop more advanced SDGs mapping frameworks so different stakeholders can put them to use and increase their contribution to the SDGs achievement.

5.2. The role of planning in implementing SDGs in the Higher Education context

According to Leal Filho, Skanavis, et al. (2019) if HEIs are to integrate sustainability across their institutions planning is essential to build up long term advantages, statement which also applies to the SDGs. Planning for sustainable development may help universities in identifying benefits throughout its management and operations.

Planning with actions focused on social, economic and environmental gains offers the potential to ensure the future growth of HEIs. Planners need to conceive ways to implement policy and solutions for the implementation of plans and the contribution of their outcomes to the SDGs. A sustainability strategy is characterised by a five-stage process: Assessment, Planning, Implementation, Evaluation and Reassessment/Modification, therefore planning becomes an essential part of sustainable strategies implementation. A planning procedure may assist in implementing sustainability-related efforts.

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Master's degree program in
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