



Global Sustainability Education Report

aspectus
The Engagement Agency



EIT InnoEnergy

Catalysing and accelerating the energy transition

EIT InnoEnergy is a force to bring people and resources together, a catalyst and accelerator of the energy transition. New ideas, products and solutions that make a real difference, and new businesses and people to deliver them to market.

We engage at every stage of the journey – from classroom to end-customer. Operating at the centre of the energy transition, we build connections worldwide, bringing together innovators and industry, entrepreneurs and investors, graduates and employers.

Our bespoke support to accelerate sustainable energy innovation, knows no borders or boundaries

- Start-ups, scale-ups, and innovators receive tailor-made support to boost and de-risk business cases and speed up time to market.
- Students and learners have access to eight master's programmes at 16 top technical universities and business schools, as well as online and blended courses.
- Industry are linked with innovation and alumni, providing commercially attractive technologies spanning the energy value chain, and top talent to enhance innovation.

As a result, in just ten years we have built the largest sustainable energy innovation ecosystem in the world

- €560 million has been invested into more than 480 sustainable energy innovations, all on track to generate €16 billion in commercial revenues.
- 90% of our start-ups already work with global brand names including ABB, BMW, EDF, Engie, Tata Steel and Vattenfall.
- Our EIT InnoEnergy Master School has attracted students from almost 100 countries. We now have 1,200 graduates and 1,500 students enrolled.

Our rich network of more than 500 key players from 18 different countries enables us to be a key vehicle for the energy transition. Together we make up the ingredients needed to bring a constant pipeline of sustainable energy innovation to market.

EIT InnoEnergy was established in 2010 and is supported by the European Institute of Innovation and Technology.



Executive summary

Creating sustainable energy is one of the most complex issues of our time and the need to accelerate the energy transition is more pressing now than ever before.

According to the UN Intergovernmental Panel on Climate Change unprecedented change is needed if global warming is to be kept to a maximum of 1.5 °C and we have just a decade left to act. Sustainable energy lies at the very heart of the great societal change that needs to be made. Yet our research suggests that the skills needed to progress the energy transition may be being overlooked by some of the top universities around the globe. With millions more jobs being created in the sustainable energy industry to 2030, skilled workers are absolutely vital.

However, on average the world's top 10 universities offer just half the number of energy and sustainability courses in comparison to their lower-ranked peers – 2.8 courses per institution versus 5.6 courses. These findings point to a significant opportunity for more universities to play an active role in developing and nurturing the skills required to achieve the energy transition.

Approach

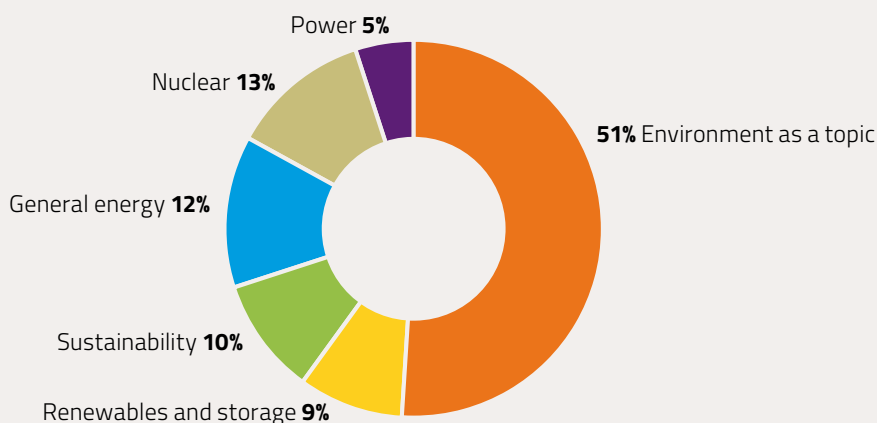
EIT InnoEnergy's research considers the standalone sustainable education output of 27 leading institutions across Europe, US, Asia and Latin America, focusing on institutions ranked highly by The Times Higher Education 2020 report unless otherwise stated. A list of the courses collated is available in the appendix including a handful of courses that EIT InnoEnergy helps to deliver. Data was gathered in the period immediately preceding the 2020/2021 academic year. While broader engineering, physics, maths and geography education contribute to the energy transition, this research seeks to identify those courses that teach the specific, in-depth skills most needed by industry to address the skills gap. As such, the research is not exhaustive. Rather it is designed to give a snapshot of the sustainability education landscape in these geographies, highlight the leaders and where gaps in sustainability education remain.

Analysis

Out of all 123 courses related to sustainable energy skills identified in the research, 51 percent focused on the areas of the environment such as management or engineering. Within this broad topic, typically several modules focused on managing or controlling problems such as air pollution and water quality, rather than equipping students to solve or partly remediate these issues.

Sustainability as a standalone topic accounted for ten percent of courses analysed, while nuclear accounted for 13 percent, broad energy courses for 12 percent and power for five percent. While renewables courses make up nine percent, specialist courses for topics such as smart cities and wind only make up two percent of all courses. Overall, the findings come in contrast to a recent industry survey which revealed that the energy industry skills most in demand are for energy storage, energy efficiency and renewable energy.

Figure 1. Courses related to sustainable energy skills identified in the research.



Top-ranking institutions across the globe including Oxford (ranked #1 by The Times), Cambridge (#3) and Harvard (#7), have a significantly smaller offering of sustainability-focused courses and are being out-performed by their lower-ranking counterparts in Europe, Latin America and Asia. Only 1.21 percent of all courses at the University of Oxford are sustainability focused, while the University of Cambridge's syllabus has just 0.59 percent and Harvard has 0.52 percent.

Meanwhile, research university KU Leuven (#45) in Belgium, which has been internationally recognised as the most innovative university in Europe, has the leading sustainability offering in the continent with a suite of five sustainability courses (6.84 percent) designed for the modern world, including master's degrees in sustainable development, energy management for smart cities and nuclear engineering. Shanghai Jiao Tong University in China, ranked #100 in the world, takes the lead in Asia boasting a syllabus of 20 sustainability courses (3.67 percent) which includes studies in English and Chinese specialising in low carbon power, low carbon environmental engineering and nuclear science. In Latin America, Universidade de São Paulo is out in front, a top 250 university whose syllabus is made up of 7.18 percent (13) sustainability courses covering global health and sustainability, nuclear engineering in agriculture and nuclear technology.

By comparison, the research shows that the seven US universities in scope, including some of the highest ranked and most prestigious universities in the world such as Stanford (#4), Massachusetts Institute of Technology (#5) Princeton (#6) and Yale (#8), only offer a combined total of 14 sustainability courses.

This leaves the US trailing behind the sustainability education offering in Asia (63 courses) Latin America (39 courses) and Europe (20 courses) and puts it in a position where it may become reliant on importing skills in the future.

KU Leuven: Excellence starts with sustainability

KU Leuven, one of Europe's oldest universities, works in collaboration with EIT InnoEnergy to deliver two master's degrees: Energy for Smart Cities and Smart Electrical Networks and Systems. KU Leuven takes an innovative 360-degree approach to sustainability through its education, research, business operations and social engagement.

Last year, as part of its first full sustainability report, KU Leuven committed to deepening its impact on sustainability and recognised that interdisciplinary collaboration would be vital to success. It considers education an ideal setting for combining ideas from different fields to develop technological and policy innovations and as such is taking a two-pronged approach. It is not only developing specific courses that will, "provide students with basic knowledge of global challenges," but also introducing sustainability aspects into existing courses so that all students can advocate for it.

Region by region

Asia

Although Asia leads on the overall number of sustainability courses available, offering a total of 63, it has the fewest number of courses per head of population. This is at odds with the overall rise in the prominence of Asia's educational facilities on the world stage. For example, in the 2020 QS World University Rankings, China boasted 19 of the world's top 200 research universities, up from 12 in 2016 – thanks to an increase in Government funding and complemented by the establishment of the C9 – China's answer to the Ivy League .

Asia's top three universities for sustainability courses within scope in Asia are all located in China offering 48 of Asia's 63 sustainability courses across its Tsinghua (#23), Renmin (top 500) and Shanghai Jiao Tong (#157) universities. Indeed, Shanghai Jiao Tong, offers 20 courses, more than any other university from any other region within scope, while the Indian Institute of Science (top 350) offers two courses with a sustainability angle.



Indian Institute of Science: Strength in unity

Ranked #36 in The Times Higher Education Asia University Rankings and in the top 350 globally, the Indian Institute of Science is the gateway to engineering for many undergraduate students in the region. With a focus on research, it is also home to several leading centres including for climate change, sustainable technologies and energy. Its Interdisciplinary Centre for Energy Research brings together faculty members from across these centres and more to collaborate on solutions for the future energy needs of society. To further strengthen its research potential, it collaborates with world-renowned educators including MIT and Stanford as well as with global companies such as GE to develop breakthrough technologies.

Europe

The six European universities in scope offer a total of 20 sustainability courses, equivalent to around 1 percent of the total number of courses offered. KU Leuven University (#45) in Belgium leads Europe's sustainability offering with five sustainability courses including Master's degrees in sustainable development, energy management for smart cities and nuclear engineering.

Imperial College London (#10) offers the next best selection of sustainability courses with master's courses in sustainable energy futures, nuclear engineering, advanced material for sustainable infrastructure and environmental engineering. Oxford University, globally ranked #1 for five consecutive years (2017-2021) offers courses in three sustainability areas, including a PhD in wind and marine energy systems and master's degrees in energy systems and sustainable urban development.



KTH: Royal Institute of Technology: Learning by doing

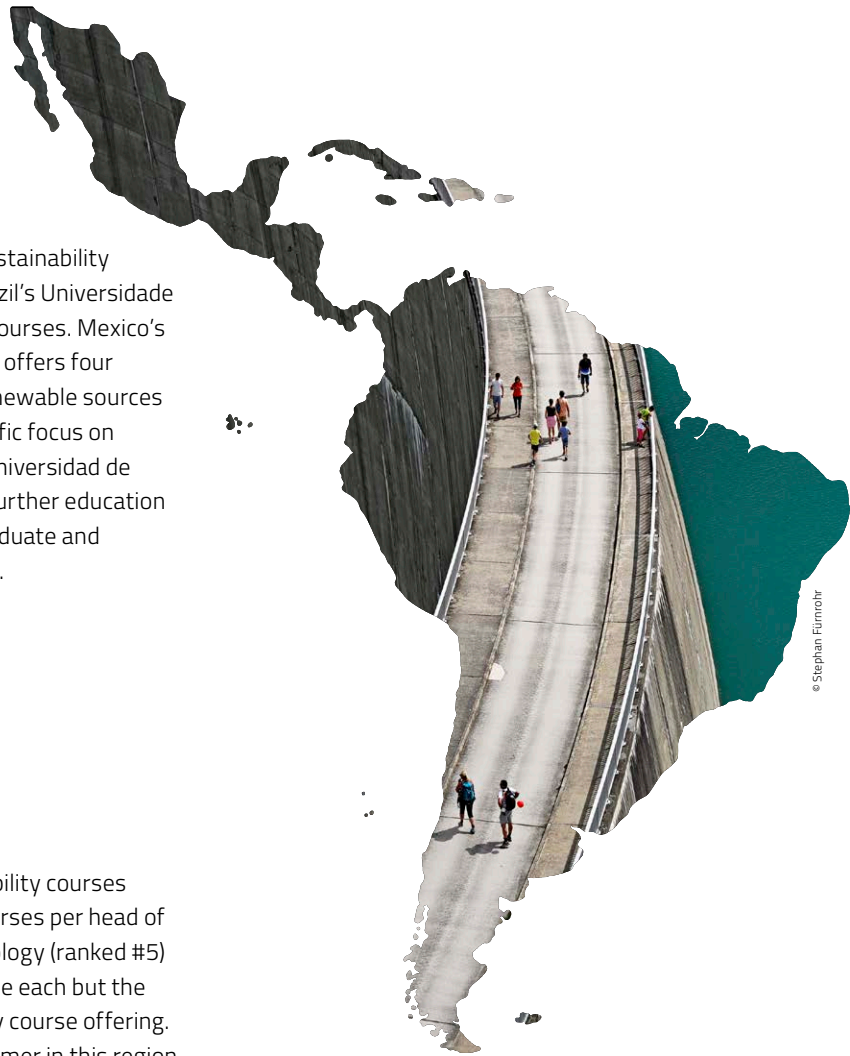
A team of EIT InnoEnergy master's students studying Environmental Pathways for Sustainable Energy Systems at KTH: Royal Institute of Technology in Stockholm (top 250) are designing an integrated hybrid hydrogen storage solution for a small island in Finland. The project is part of an EU-funded workstream to develop the self-sustainability of isolated micro-grid and off-grid sites such as islands.

The island of Kökar is unusual in that while it only has around 235 permanent inhabitants, it can see as many as 18,000 tourists which creates highly volatile energy demand. The team have been tasked with developing a back-up energy system based on hydrogen that is both economically and technically feasible.

For the students involved, the principle is simple: learn by doing. By blending together their skills across sustainability, engineering and business the team are creating a workable solution that can address this real-life challenge while also preparing them to enter the workforce.

Latin America

Latin America offers the highest number of sustainability courses per head of population at 39, with Brazil's Universidade de São Paulo (top 250) delivering 13 of these courses. Mexico's Tecnológico de Monterrey University (top 800) offers four courses including energy management and renewable sources which is one of only three courses with a specific focus on renewables out of the 123 courses in scope. Universidad de los Andes (top 800) in Colombia offers seven further education courses in sustainability including an undergraduate and master's degree in Environmental Engineering.



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US

The US universities in scope offer 14 sustainability courses ranking it second in terms of sustainability courses per head of population. Massachusetts Institute of Technology (ranked #5) and Harvard (#7) offer one sustainability course each but the University of Chicago (#9) has no sustainability course offering. Stanford University (#4) is the standout performer in this region in terms of its sustainability offering with five courses available, including majors in environmental engineering, atmosphere and energy, energy resources engineering, environmental systems engineering and earth systems.



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Conclusion

All universities need to play an active role in contributing to climate change and the energy transition. An effective, global response to climate change can only be achieved by a cross-border approach to innovation where people from all backgrounds and geographies have the skills and knowledge required to play an active part in achieving the energy transition. Many universities are already well equipped to facilitate this, having years of experience in collaborating with their peers to bring industry, educators and innovators together around a common issue. Universities such as KU Leuven and KTH: Royal Institute of Technology are leading the way in this.

Equally, the courses available to prospective students need to consider the challenges that await. According to separate research conducted by EIT InnoEnergy, the skills most in demand are in energy storage, energy efficiency and renewable energy however, of the 123 courses this research considers, only three are in these fields; Cambridge University's MPhil in Energy Technologies covers energy efficiency while Tecnologico de Monterrey University and Tsinghua University offer courses focused on renewable energy. None of the 123 courses in scope offer a focus on energy storage, demonstrating the need for academia to do more to support the development of these critical skills. Indeed, at present there are very few courses for energy storage which ultimately led EIT InnoEnergy to collaborate with leading European universities to improve availability including with Finland's Aalto University to create a Master's in Energy Storage. With its focus on weaving the UN's sustainable development goals into everything that it does – from its courses, to its operations – Aalto University is leading by example.

Availability of energy and sustainability courses and modules is key to plugging the skills gap which remains a challenge for the global energy transition. Now more than ever future generations need to be equipped with the skills and knowledge required and all universities can play a more active role in facilitating this regardless of location or where they place in the league tables. The more talented and bright minds we have focused on the problem from different angles, the quicker we can overcome it.



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