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# Engineering Education towards Sustainability: Approaches for Institutionalization and Teaching Implementation



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## D-1

# A Sustainable Development Goal in 'Energy generation and transmission' subject

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The Sustainable Development Goals (SDGs), are a universal call for action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity.

Universities, as agents of society, must generate and transfer knowledge according to the objectives of the 2030 Agenda for Sustainable Development.

In this article, an example of good practices to work towards the SDGs, in particular of number 7: Affordable and clean energy in the university is presented.

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## Introduction

The General Assembly of the United Nations adopted in September 2015 the 2030 Agenda for Sustainable Development. This Agenda is a call for action by all countries – poor, rich and middle-income – to promote prosperity while protecting the planet. The member states of the United Nations adopted a resolution in which they recognize that the greatest challenge in the world today is the eradication of poverty and they affirm that without achieving it there cannot be sustainable development. They recognize that ending poverty must go hand-in-hand with strategies that build economic growth and address a range of social needs including education, health, social protection, and job opportunities, while tackling climate change and environmental protection.

The 2030 Agenda for Sustainable Development proposes 17 Sustainable Development Goals with 169 integrated and indivisible goals that cover the economic, social and environmental spheres.

The 2030 Agenda represents a great opportunity for the change demanded by the entire Society. Universities should be the key space to generate this transformation process. Since the approval of the Sustainable Development Goals (SDGs) by the United Nations in September 2015, Spanish universities have assumed an active role in fulfilling the 2030 Agenda and have incorporated the principles and values of Sustainable Development into their objectives, policies and university activities.

The University, as an agent of society, must generate and transfer the knowledge and innovation necessary to respond to the complex challenges of Sustainable Development. That is why in the Energy Generation and Transmission subject of the master's in industrial engineering it has been decided that in addition to the competences established by the legislation, work the SDGs and the particular the 7th which is the one that is most aligned with the subject. In this paper how this connection has been made is explained.

## Methodology

### Brief description of the subject

The 'Energy Generation and Transmission' subject is a 9ECTS subject of the first year of Master's in industrial engineering. The Master's in Industrial Engineering is an official master's degree that qualifies students to practice as Industrial Engineers.

The teaching-learning model in this master is based is the Deusto Education Model. This teaching model promotes meaningful self-directed learning, fostering students' all-round development (personal, social, ethical, academic and professional dimensions). The teaching methodology is focused on developing the practical aspects of Industrial Engineering using leading-edge techniques.

The 23 specific competences of the Master's in Industrial Engineering are established by the current legislation CIN/311/2009. The two specific competences developed in 'Energy Generation and Transmission' subject are:

- Knowledge and capacity for the analysis and design of electricity generation, transport and distribution systems.
- Knowledge and skills that allow understanding, analyze, exploit and manage the different sources of energy.

According to these two skills and related to the 7<sup>th</sup> SDG a project based learning activity has been proposed in this subject with the NGO Engineering for Cooperation-ICLI ("Ingeniería para la Cooperación - Lankidetzarako Ingeniaritza"). Engineering for Cooperation

ICLI NGO is a non-profit association, which integrates Engineers and Industrial Engineers and any other person who wishes to collaborate in tasks of cooperation and de-

velopment assistance. It aims to promote actions that help developing disadvantaged areas, trying - at the same time - to channel and promote the concerns that this line has the Industrial Engineering collective and society in general, as well as to involve other social agents in this homework.

### **Proposed activity**

The challenge that students have to face is to develop a project aimed at improving the life of a community located in a Developing Country.

For this, in a first session where the general conditions of development of a specific case are presented and the problem to be solved will be exposed.

The group of students is divided into 2 groups. Each of the groups will have to solve a single project. This project consists in "improving the life of an agricultural community through the maximization of tomato production", which requires at least 3 technical developments that must be coordinated among themselves to achieve a viable and sustainable solution. For this they must respond to the following requirements.

On the one hand it is necessary to achieve energy generation (solar and / or wind), to illuminate the workspace, during the hours when there is no natural light.

On the other hand, they must respond to the demand for energy to maximize the production of tomatoes, where they must choose to automate a ventilation system, which can be natural or forced and / or cool the greenhouse where the tomatoes are harvested. And finally, they must also heat the shower water for the hygiene of the 4 people who work in the production of tomatoes.

For all this they have a maximum budget of \$ 25,000

Students must prepare a report of the project and make a presentation in court. The court, composed of members of the NGO and the teacher of the subject will ask the group questions, to determine the degree of compliance with the objectives. Viability and economic sustainability will be assessed, as well as the technical solution adopted.

### **Conclusions**

All of us must become agents of change by acquiring knowledge, skills, values and attitudes that empower them to contribute to sustainable development, to achieve a more sustainable world and to fulfill all the goals set out in the SDGs.

Thus, to achieve this type of development, learning processes are crucial. The University understood as a key agent in the process of transformation towards sustainability. The inclusion in the university curriculum of the promotion of sustainable development and implementing active methodologies in the classroom, aims to train students in transversal competences. In this way, the SDGs can be achieved and ensure that all students acquire the knowledge, both theoretical and practical, necessary to promote sustainable development.

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