# ENVIRONMENTAL EDUCATION FOR FUTURE ENGINEERS AT THE UNIVERSITY OF THE BASQUE COUNTRY

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**ABSTRACT**

Since 2002, the University of the Basque Country has supported the Ecodesign Educational Program in collaboration with some local Institutions. The purpose of the so-called Basque Ecodesign Hub is to promote environmental education at the Faculty of Engineering of Bilbao as well as other universities of the region. Its activities are specifically designed to provide ecodesign training for future product manufacturing engineers. This Ecodesign Hub aims at creating a data bank of ecoindicators and software tools comprising technical and environmental data adapted to the region, and it is responsible for setting a national benchmark for ecodesign research. In 14 years, the Ecodesign Classroom has developed more than 140 industrial and research projects. Therefore, it has become a regional reference in its goal of promoting ecodesign and sustainable development among future engineers. Many of these projects place a special emphasis on their innovation level and their impact on the industrial sector. Therefore the Basque Ecodesign Hub has become the forefront of Environmental Education in the Faculty of Engineering, placing a clear focus on the technological transfer with companies at the expense of the general Education for Sustainable Development.

**KEYWORDS:** education for sustainable development; environmental education; ecodesign; life cycle assessment

# 1. INTRODUCTION AND CONTEXT

By the end of the 20th century, the enactment of new environmental legislation in the European and global market, together with the increasingly stringent demands from the end- user, forced industries to integrate ecological factors with business factors in industrial product design. This integration became mandatory not only for the manufacturing process but for every stage of a product's lifecycle, from the raw materials and the manufacture of the components to their elimination after disposal.

All of this gave rise to ecodesign, a technique that takes environmental aspects into account at every stage of the product development process in an attempt to obtain products with the lowest possible environmental impact. This led to the promotion of an integrated product policy in the Basque Country consisting of a series of incentives for eco-friendly products. In 2002, together with a pledge to raise the number of collaborating companies to 200 by 2016, an agreement was reached with 40 companies which undertook the introduction of ecodesign criteria in their manufacturing processes. This commitment implied the development of tools and infrastructures to facilitate the implementation and application of ecodesign criteria in local industries.

As an outcome of this agreement, the Ecodesign Learning Centre at the Faculty of Engineering of Bilbao was created on December 26, 2002. This initiative was promoted by the environmental management corporation Ihobe (public agency of the Basque Government), the Centre of Industrial Design (Foral Institution of Biscay), and the Faculty of Engineering. Since 2015, the Learning Centre is called Basque Ecodesign Hub and receives students from the University of the Basque Country (UPV/EHU), the University of Deusto and Mondragon University.

# 2. AIMS AND OBJECTIVES OF THE ECODESIGN LEARNING CENTRE

Over these last 14 years, the ultimate goal of the Basque Ecodesign Hub has been to promote and stimulate ecodesign and to integrate environmental criteria in product design. Approximately 15 final-year students per year have attended the Ecodesign Classroom. Most of them belong to the academic degrees in Industrial Design and Industrial Engineering.

On the one hand, the Ecodesign classroom's goal is to support the Education for Sustainable Development (ESD) in the Faculty of Engineering, building capacity amongst individuals, the

different Departments and the Direction of the Faculty. On the other, it aims at assisting in the coordination and dissemination of policy, research and practice regarding ESD.

A number of objectives and activities were drawn up to achieve these ideas, including the following:

1. **Providing ecodesign training.**

One of the centre's main objectives has been to offer final-year students of the Faculty of Engineering of Bilbao a special ecodesign course consisting of theoretical classes, research and practice in association with industrial companies. This means that future product manufacturing managers are currently receiving ecodesign training, thus responding to the demand from industries for professionals specialized in this area. A series of symposia have also been held to publicize the ecodesign knowledge generated by the workshops and projects, and make it available to companies.

2. **Creating a data bank of eco-indicators in the Basque Country.**

Of all the tools available to evaluate the environmental aspects of products, it became clear that what companies valued most of all was the use of eco-indicators, which they perceived as a user-friendly quantitative tool. Through their own research activities and by sharing knowledge with other universities, both the ecodesign document system and the Ecodesign Hub have aimed to set national standards in this field and provide assistance to other national centres.

3. **Developing theoretical ecodesign projects**

The purpose of developing theoretical ecodesign projects has been to create guidelines for the provided training and for the communication of the ecodesign methodology, and to integrate and consolidate the latter as a component of the design process.

The ecodesign is adapted to the needs of the different industrial sectors by creating a series of manuals (biodegradable plastics, building waste, etc.), providing theoretical and practical examples of application, researching new methodologies, etc.

4. **Supporting the Faculty of Engineering of Bilbao in creating projects for its master's degrees and PhD theses**

From their outset, the projects performed have served as master's degree projects for participating students and are officially recognized as such by the Faculty of Engineering. Every year two grants are offered to develop PhD theses related to the subject.

Among the novelties introduced in the last years, the most outstanding ones are the possibility to join these courses offered to students on other degree courses at other faculties and colleges in the region as well as the addition to the course syllabus of a module on sustainable building. Furthermore, the Ecodesign Hub has started working with other industrial sectors such as aerospace, power generation and renewable energy industries.

The skilled teachers and experts involved in the Ecodesign Classroom consider that training in ecodesign should be provided in some way to all industrial design students. Besides, they also consider that some competences should be incorporated to the curricula of the students of other specialties such as mechanical design, manufacturing, construction, environment, or energy.

## 3. PROJECTS CARRIED OUT IN THE ECODESIGN LEARNING CENTRE

At the Basque Ecodesign Hub we strongly believe that a broader perspective is essential for design engineering and we insist on the need for an interdisciplinary and more active learning methodology. In this context, more than 140 projects have been carried out successfully over the 14 editions of this Ecodesign Classroom, encompassing research studies, collaboration efforts with companies operating in the industrial sector, and, lastly, projects involving the documentation of technical data. This team working has proven effective in promoting ESD among the students.

Besides, these projects have increased the students' awareness of the relations between their engineering studies and sustainable development. Every year, their projects are publicly presented in a seminar, so the impact of these ecodesign projects can reach a remarkable number of students, possibly beyond 100 undergraduates per year.

## 4. WORKING GROUP

Here are the professors from the Faculty of Engineering of Bilbao, which collaborate with the Ecodesign Hub work in the Department of Graphic Design and Engineering Projects:

Rikardo Minguez –Associate Professor–, Javier Muniozguren –Full Professor–, Agustín Arias – Full Professor–, Jokin Gorozika –Associate Professor–, Nestor Goicoechea –Assistant Professor–, Iñaki Zuazo –Assistant Professor–, Egoitz Sierra –Assistant Professor–.

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***NUEVOS MODELOS DE INVESTIGACIÓN Y COLABORACIÓN EN INGENIERÍA GRÁFICA***

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## 1. CONTEXT

By the end of the 20th century, the enactment of **new environmental legislation** in the European and global market, together with the increasingly stringent **demands from the end-user**, forced industries to **integrate ecological factors** with business factors **in industrial product design**. This integration became mandatory not only for the manufacturing process but for every stage of a product's lifecycle, from the raw materials and the manufacture of the components to their elimination after disposal.

This led to the promotion of **an integrated product policy** in the Basque Country consisting of a series of incentives for eco-friendly products. In **2002**, an agreement was reached with **40 companies** which undertook the introduction of **ecodesign criteria in their manufacturing processes**.

As an outcome of this agreement, the **Ecodesign Learning Centre** at the Faculty of Engineering of Bilbao was created on December 2002. This initiative was promoted by the environmental management corporation **Ihobe** (public agency of the Basque Government), the **Centre of Industrial Design** (Foral Institution of Biscay), and the **Faculty of Engineering**.

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## 2. OBJECTIVES

Over these last 14 years, the ultimate goal of the Basque Ecodesign Hub has been to **promote and stimulate ecodesign and to integrate environmental criteria in product design**. Approximately **15 final-year students per year** have attended the Ecodesign Classroom. Most of them belong to the academic degrees in Industrial Design and Industrial Engineering.

The Ecodesign classroom supports the **Education for Sustainable Development (ESD)** in the Faculty of Engineering, building capacity amongst individuals and the different Departments of the Faculty.

Specific objectives and activities:

**Providing ecodesign training**

The centre offers final-year students of the Faculty of Engineering of Bilbao a **special ecodesign course** consisting of theoretical classes, research and practice in association with industrial companies. This means that **future product manufacturing managers** are currently receiving ecodesign training, thus responding to the demand from industries for professionals specialized in this area. A series of symposia have also been held to publicize the ecodesign knowledge generated by the workshops and projects, and make it available to companies.

**Creating a data bank of eco-indicators in the Basque Country**

Companies value the use of **eco-indicators**, which they perceive as a user-friendly quantitative tool. Through their own research activities and by sharing knowledge with other universities, the Ecodesign Hub aims to set **national standards** in this field and **provide assistance** to other national centres.

**Developing theoretical ecodesign projects**

The ecodesign is adapted to the needs of the different industrial sectors by creating a series of **technical manuals** (biodegradable plastics, building waste, etc.), providing theoretical and practical examples of application.

**Supporting the Faculty of Engineering of Bilbao in creating projects for its master's degrees and PhD theses**

From their outset, the projects performed have served as **master's degree projects** for participating students. Every year two **grants** are offered to develop **PhD theses** related to the subject.

## 3. PROJECTS CARRIED OUT AT THE ECODESIGN CENTRE

At the Basque Ecodesign Hub (www.basqueecodesignhub.eus) we strongly believe that a broader perspective is essential for design engineering and we insist on the need for an interdisciplinary and more active learning methodology.

**More than 140 projects** have been carried out successfully over the 14 editions of this Ecodesign Classroom, encompassing research studies, collaboration efforts with companies operating in the industrial sector, and, projects involving the documentation of technical data.

This team-working has proven effective in **promoting ESD among the students**.

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