Evolution of civil engineering degrees in Spain up to the present & on-going changes at the Civil Engineering School of A Coruña

Acacia Naves*, Isabel Martínez, Pablo Rodríguez-Vellando, Víctor Barrientos, Ana M. Vázquez and Pilar Roel

EUCEET Association

MŰEGYETEM 1782

BME

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UNIVERSIDADE DA CORUÑA

ESCUELA TÉCNICA SUPERIOR INGENIEROS DE CAMINOS, CANALES Y PUERTOS

Outline

1. Historical Evolution (1802-2010)
2. Impact of the Bologna Process (2010)
3. Current Landscape (27 Universities)
4. Curricular Structure and Specializations
5. New UDC Approach
6. Key Conclusions

Historical evolution

Spain’s Civil Engineering Schools

- Long tradition (from s. XIX)
- Evolved with the country's infrastructure needs
- Reflects technological, social, and educational transformation

s. XVIII - Spain began modernizing its infrastructure under the influence of Enlightenment ideals.

1802 King Charles IV established:

- ***Corps of Engineers of Roads***
- **First School of Engineers of Roads and Canals in Madrid**

Augustin de Betancourt (1758-1825)

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- Modelled after the *École Nationale des Ponts et Chaussées* in Paris
- The early curriculum covers subjects such as mechanics, hydraulics, descriptive geometry, and construction techniques.

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1835 It assumed **responsibilities related to seaports** & it was renamed the ***School of Engineers of Roads, Canals, and Ports***.

The curriculum expanded and adapted to the growing complexity of infrastructure projects:

Construction of Canal de Isabel II.

Development of Spain's railway system

1802 First School of Engineers of Roads and Canals in Madrid

1835 *School of Engineers of Roads, Canals & Ports*

First ***School of Public Works Assistants*** **1857** was established in Madrid → *Corps of Public Works Assistants* a government-dependet body

1802 First School of Engineers of Roads and Canals in Madrid

1835 *School of Engineers of Roads, Canals & Ports*

First *School of Public Works Assistants* 1857

Mid-20th Century

Engineering Schoos were **integrated into public universities,** with te goal of increasing the number of technicians

Plan 57 – Dual level system which established:

- 6 -year degrees for Engineers of Civil, Canal, and Ports
- 3-year degrees for Technical Public Works Engineers

The curricula were initially modeled on the Madrid curriculum, with minor modifications to adapt to regional needs and to the changes established in the different university education laws

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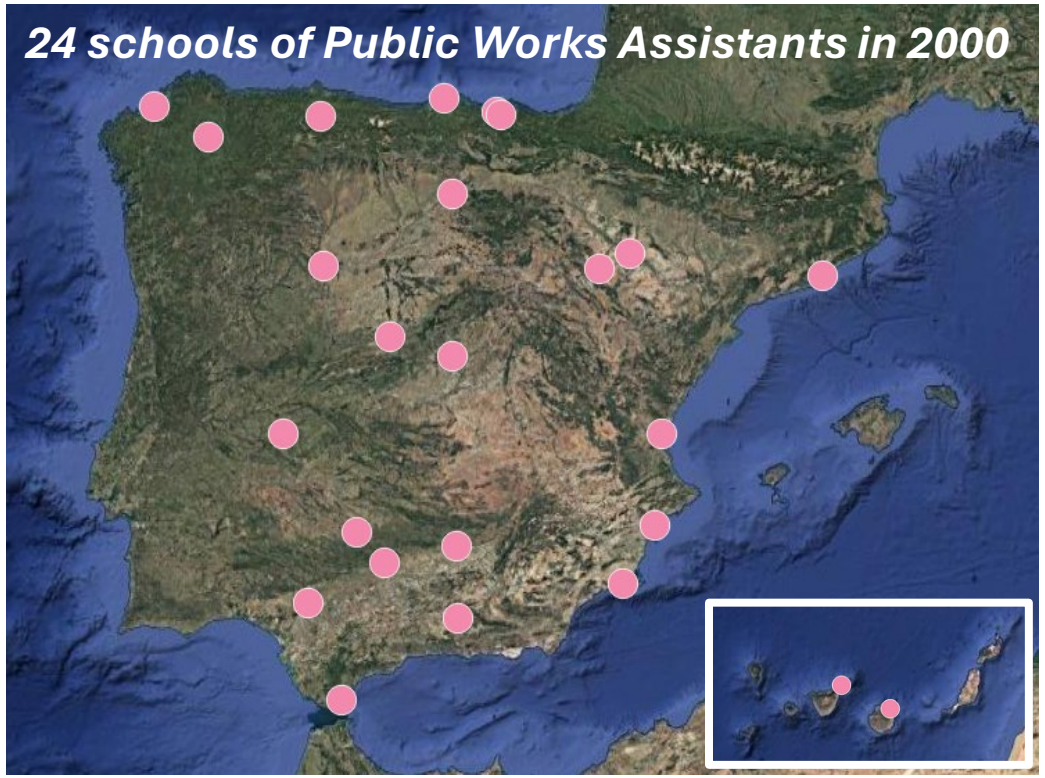

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1957 – Integration in Engineering Schools in Universities & dual level system

1980s & 1990s

All engineering schools gradually introduced changes to their curricula:

- updating the contents
- adopting a five-year structure except for that in Madrid

Changes maintaining competencies core content to ensure a consistent professional profile across institutions (mandatory)

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1957 Engineering Schools were integrated into public universities and dual level system was established

1980s & 1990s changes to their curricula

1999 European Higher Education Area began

Bologna Plan

Restructuration of European higher education aiming a unified academic framework which would promote convergence and facilitate professional mobility among countries

Effect of Bolonga process

Negotiations between the Spain government, the universities and the professional associations agreed:

Bachelor's degree in civil engineering	Gave the attributions of ***Technical Engineer***
Master's degree (2y) in civil engineering	Allow the acquisition of the title of ***Civil Engineer***

Schools offering only
the degree in technical engineering

Recently established schools

Programs emphasizing professional skills and specialization
"Titled Civil Engineering Degree"

More traditional schools
(Madrid, Valencia, Barcelona & Coruña)
Two programs

One program taking a scientific and generalist approach

+

One program more closely aligned with professional practice

Double Bachelor's degree
Civil engineering + business
Civil engineering and technical architecture

Simultaneous Bachelor's degrees in 2 countries
Civil engineering in Valencia + Ecole de Ponts de Paris

More traditional schools
(Madrid, Valencia, Barcelona & A Coruña)

One program taking a scientific and generalist approach

+

One program more closely aligned with professional practice

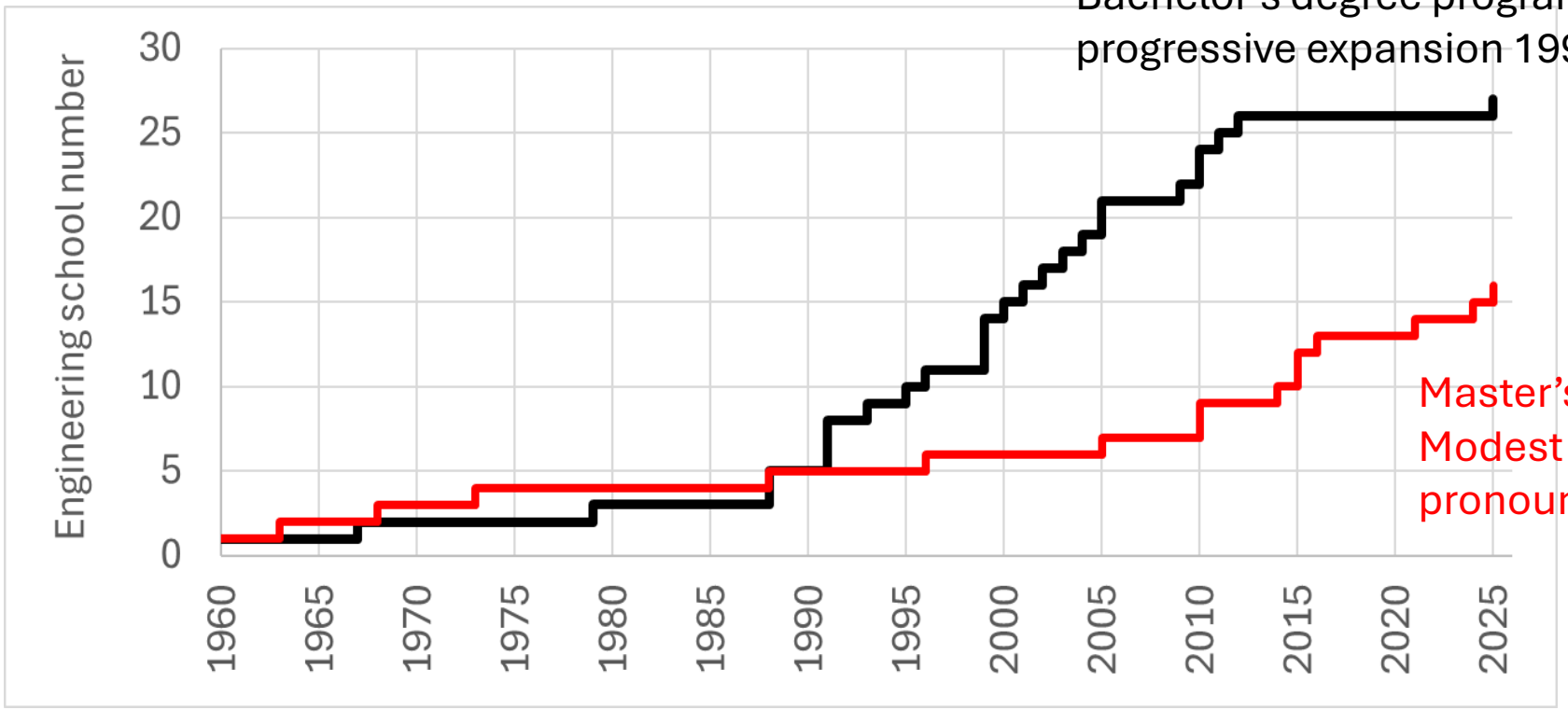
- They resemble the pre-Bologna qualifications

- They both were recognized as providing the same professional rights
- They both grant access to the Master's degree
- Their titles (without *civil engineering*) often lead to confusion.
- It has been difficult for prospective students to understand the differences between them

Those schools **have gradually merged the two programs into a single degree** that explicitly includes the term civil engineering in its **title.**

The School of Civil Engineering in A Coruña is currently the only institution that has not yet unified its Bachelor programs.

Increase in academic offering



Bachelor's degree programs
progressive expansion 1996-2012.

Master's degree program
Modest rise before 2010 &
pronounced increase thereafter.

Currently is possible to study:

- A civil engineering **Bachelor's degree in 27 engineering schools** scattered throughout Spain
- The **qualifying Master's degree** in civil engineering **at 12 public and 4 private universities**

Legally mandated competencies for Spanish Bachelor's degree in civil engineering include the ability to:

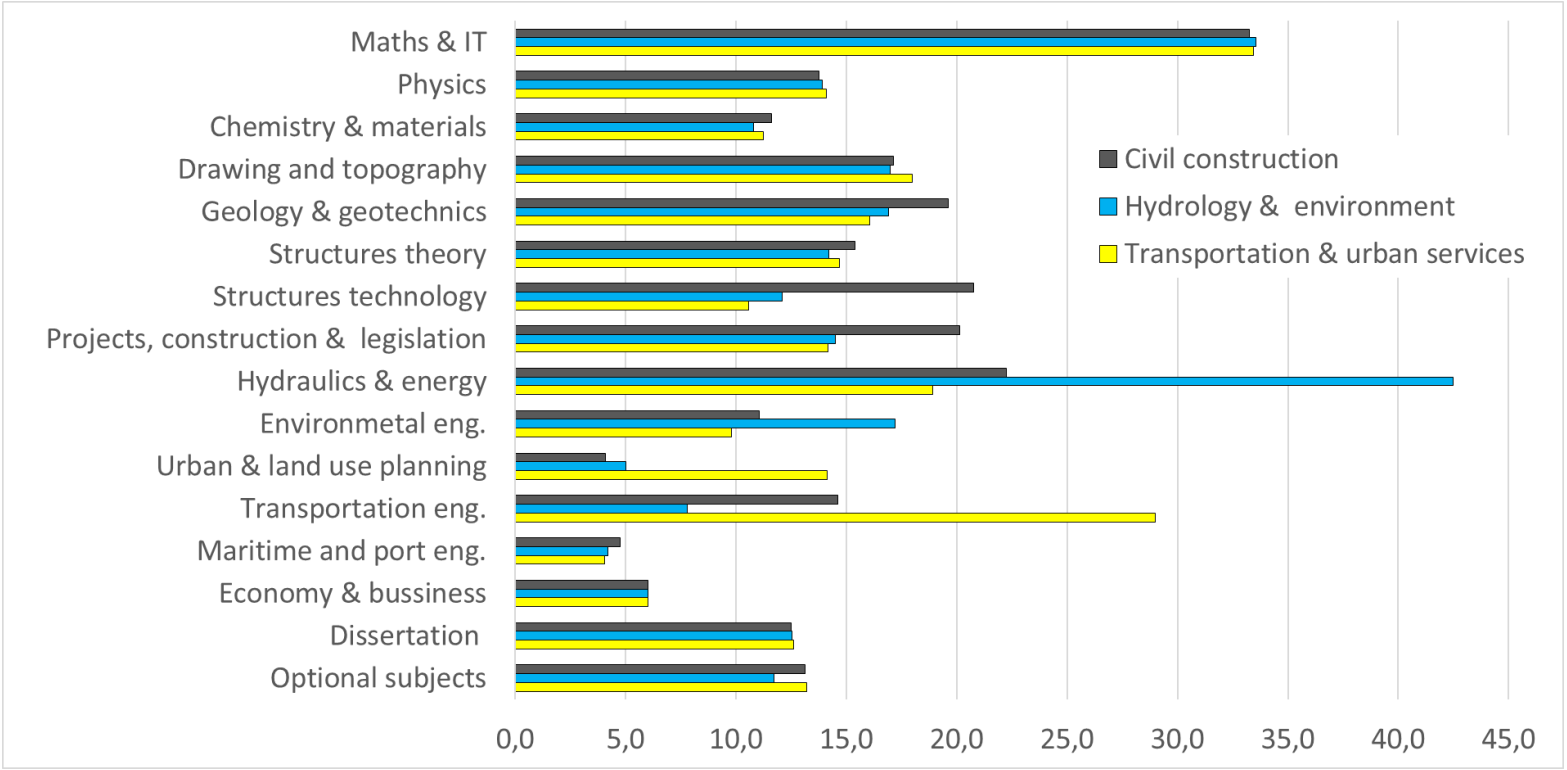
- Plan, design, manage, and supervise civil engineering projects
- Apply relevant legislation
- Conduct structural and geotechnical analysis
- Engage in research and innovation
- Understand the environmental and social impact of engineering solutions.

This core content to ensure a **consistent professional profile** across Universities

Students are allowed to pursue different **specializations or branches**:

- civil construction
- hydrology and environment
- transportation and urban services.

Average distribution of the 240 ECTS of the Bachelor's degree into categories defined by subject matter for each of the three specializations.



- **Civil construction mention** intensifies contents on **structures technology and projects and construction.**
- **Hydrology and environment mention** intensifies hydraulics, energy and environmental engineering.
- **Transportation and urban services mention** focuses on transportation engineering and urban and land use planning.

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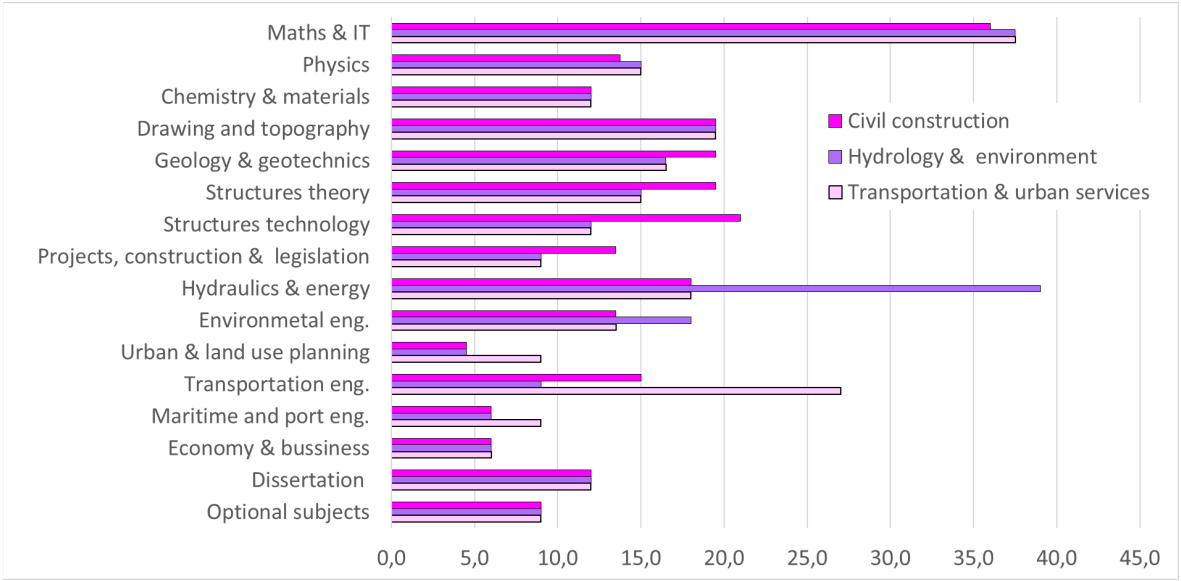
A new curriculum of a **Civil Engineering Bachelor's degree** of the University of A Coruña (UDC) has been recently designed

It **merges** the two civil engineering degrees currently offered with **a revamped curriculum**

The distribution of the contents:

- Follows in general the **same distribution pattern** than the rest of Spanish degrees
- Greater number of ETCS on **mathematics and IT** by School tradition
- Greater number of ETCS of **maritime and port engineering** due to the importance of this sector in the city and the region
- Fewer number of ETCS about **projects, construction, and legislation**.

The proposal is nowadays being evaluated at the Spanish Administration.



Conclusions

- We have **reviewed the history** of civil engineering degrees in Spain, focusing on changes **after Bologna Plan**
- Nowadays, **27 engineering schools** across Spain offer the **Bachelor's degree** programs and **16 ones** (being 4 of them private institutions) offer the qualifying **Master's degree**.
- The analysis of the curricula offered by Spanish Bachelor's degrees has been performed identifying the distribution of the 240 ECTS into categories defined by subject matter:
  - Basic engineering subjects such as mathematics, IT, physics, and chemistry are similar
  - The curricula show specialization-specific intensifications in civil construction, hydrology or transportation
- A new civil engineering Bachelor's curriculum has been recently designed at the University of A Coruña, using this analyses as input.
- It is expected to be taught in 2026/27.

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