

# Evaluation of energy efficiency measures in tertiary sector buildings

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## 1 Background

Buildings in developed nations of Europe take up to 40% of the consumption of primary energy, and also produce up to 36% of CO<sub>2</sub> emissions. To combat this, EU has set up multiple policies and measures to provide a legal framework through which the public sector will constitute an important driver to stimulate interest towards more efficient products, buildings and services, as well as to trigger behavioural changes in energy consumption by citizens and enterprises. Energy independence from fuels imported outside of the EU and additional public funds freed to be used for other purposes are additional long-term benefits of this concerted effort too.



Net zero energy office building in Portugal (LNEG)

## 6 Methods

The energy class of the building will be determined using BIM software produced by the Technical Chamber of Greece and National Observatory of Athens, called TEE-KENAK. It contains libraries based on European standards (ISO 13790) for building energy auditing.



## 7 Results

After the energy class is determined, scenarios of typical improvements undertaken in tertiary sector buildings will be considered, with respective gains in energy efficiency calculated, both in a relative and economic sense. Our case study could be generalized so as to help with the future classification of similar buildings that share similar stock.

## 5 Aims

In this project, a building in Greece which houses tertiary services will be selected and an evaluation on its energy efficiency will be performed, to characterize the building's energy class and suggest ways to improve it.

## 2 Legal Framework

EU has voted multiple policies regarding energy efficiency, proving its important status in achieving the objectives set by the Kyoto protocol and its 20-20-20 targets.

- Directive 2006/32/EC was the main pillar for providing a framework for improving energy efficiency in multiple sectors
- Key, especially for the building sector, were the introduction of the 2010 Energy Performance of Buildings Directive and the 2012 Energy Efficiency Directive. Minimum energy requirements were set for both newer buildings constructed and older buildings to be renovated, as well ways of classifying existing buildings.
- Newest policy that came into law in October 2014 was the Energy Efficiency Communication, setting targets even higher (at 30%).

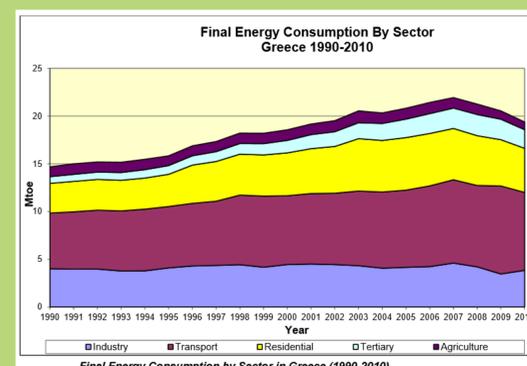
## \*References

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## 4 Tertiary sector

In Greece, the importance of improving energy efficiency in the tertiary sector can be seen by the magnitude of growth in terms of energy consumption, since it has almost tripled since 1990, following an average growing trend of 6.7% per year.

However, in years 2008 and 2009, and much more in 2010, there was a reduction in consumption which is possibly due to the fact that it's one of the sectors that were the first to sustain the effects of the economic recession Greece suffers from, and further enhanced by the increase in energy prices.



## 3 In Greece

Transposition of the policies concerning energy efficiency of buildings in Greece came in a belated fashion, through the following ministerial decisions and laws:

- N.3661/2008, which was a mere translation of the European Performance of Buildings Directive
- N.3855/2010 (FEK 95/A 23.6.2010), which introduced various energy improvement measures, energy service companies and third party financing arrangements.
- Finally, Δ6/Β/οικ.5825/30-03-2010 (FEK Β' 407) Joint Ministerial Decision of both ministries of Economy and Ministry of Environment, Energy and Climate Change came to pass the "Regulation of Energy Performance of Buildings" (KENAK), Greece's EPBD implementation.

Special thanks to the teaching personnel of the Technical Educational Institute of Athens

