Trabajo Final de Grado Arquitectura Técnica

GERMANY - Mainz

modalidad de intercambio académico curso 2014-015

ROOF MATERIALS AND CLIMATE

INTRODUCTION

This report will propose research of roofing types in Europe and how the choice of the roofing materials are affected by the climate avoiding losing heat by the roof in different climate conditions

BACKGROUND

Roofing is often ignored as an energy efficient component of a house, but it has a profound effect on the other systems, especially air conditioning. An efficient total roof system can lower the energy required for cooling's home by 30 percent or more.

Roof color plays some role in attic temperature, but its role isn't nearly as significant as roof material and attic ventilation. Depending on the climate, a light or dark roof in a residential application may work in favor of, or combat, the primary conditioning needs (heating or cooling). If its interior comfort the key point to resolve, then adequate insulation in the roof or attic will have the biggest effect on thermal resistance. (Best Practices Guide to Residential Construction, 2015).

The research question is could there be lines that could be drawn on a map of Europe that show roofing materials changing because of the climate.

RESEARCH AIM AND OBJECTIVES

Against the background earlier outlined, this research project will be undertaken with the aim of carry out a statistics as to which different climate conditions are important of roofing design.

To achieve this aim, the following objectives will be pursued which include but is not limited to the following:

- Objective#1- Search available literature for two comparable studies.
- Objective#2- Design Research Methodology.
- Objective#3- Collect data on roofing materials.
- Objective#4- Analyze formal statistics comparing roofing materials with climate.
- Objective #5- Discuss the results and conclusions.

LITERATURE REVIEW

The experimental comparable study, (Sveipe, Jelle, Wegger, Uvsløkk, Thue, Grynning, Aunrønning, Rognvik, Gustavsen, 2010), had been carried out on a test module consisting of four fields. One reference field representing a timber frame wall built according to regulations from the 1970s in Norway and three fields represent different ways of improving the thermal insulation of the reference field. During this work, a new sensor for measuring surface condensation called the wetness sensor was introduced.

The results of the experiment show that this method of retrofitting may be acceptable with respect to condensation risk in certain structures within limited climate zones, humidity classes, and building envelopes.

SCOPE

The scope will be limited carry out the study just in Europe, just like a only attending to European rules and conditions.

DATA ANALYSIS

The proposed method of data analysis to support the proposition is to connect roof design parameters to climatic variables. The data collected will be based on treating 7 topics differently, which will be able to capture on graphs variations that influence wind, maximum and minimum temperature, use of insulation and slope values dependent on climate, just like insulation, roofing color. Figure 1 shows expectations connection between climate and roofing design, the rest of Figures 2,3,4,5,6,7 show roofing design and climate found from literature.

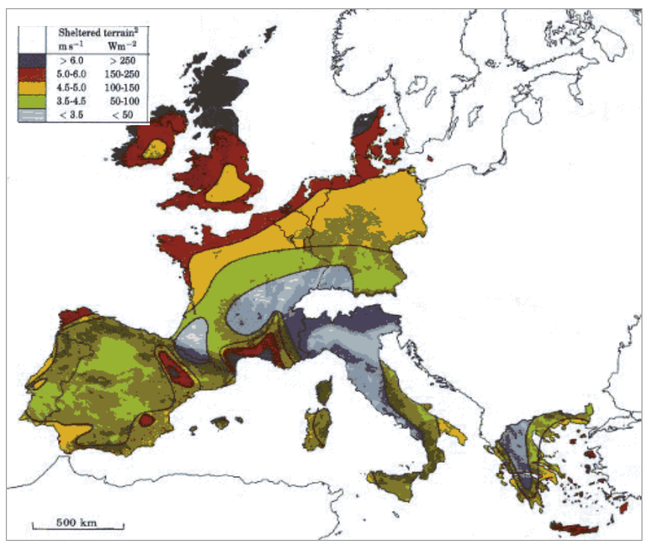


Figure 2: Observing the spatial distribution of the regional wind regimes in terms of full-load hours .
Source: University of Strahtclyde Engineering ESRU(2009).

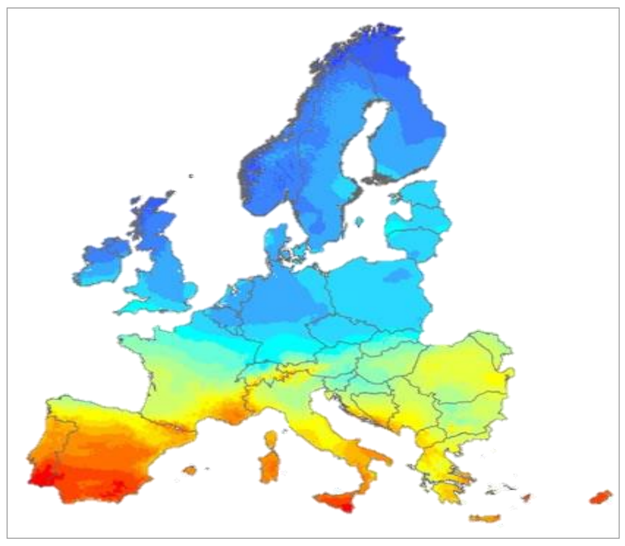


Figure5: Annual full load hours of optimally inclined PV modules.
Source: (Held 2011) based on data Suri et al. (2007) and a performance ratio of 0.75

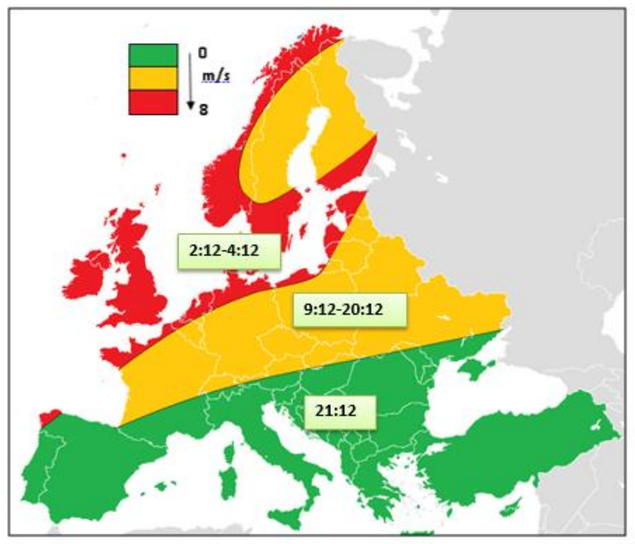


Figure 3: Adapting roofing slopes regarding regional wind regimes.
Source: University of Strahtclyde Engineering ESRU.

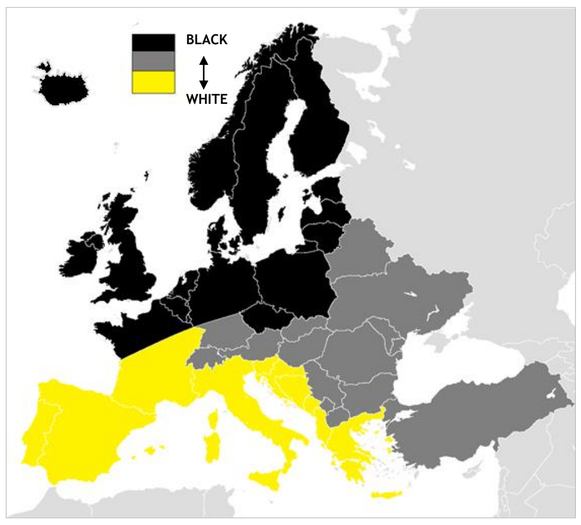


Figure 6: Roofing Color classification in Europe
Source: Adapting of Figure 4and Encyclopedia of Building & Environmental Inspection, Testing, Diagnosis, Repair (2015)

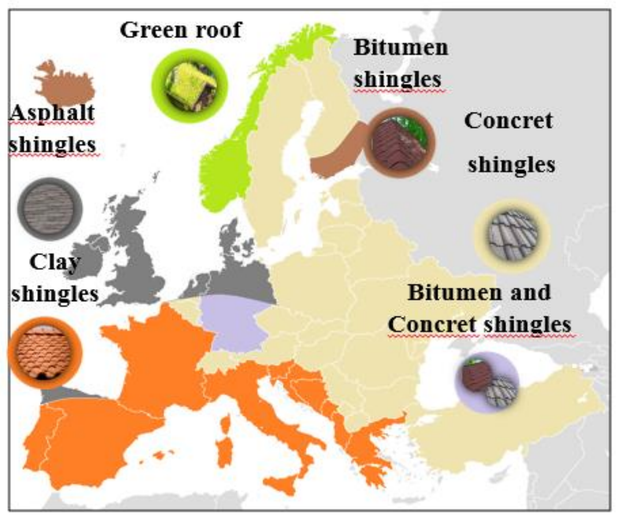


Figure 4:. Roofing Materials in Europe
Source: Roof coverings and best practices(2012)

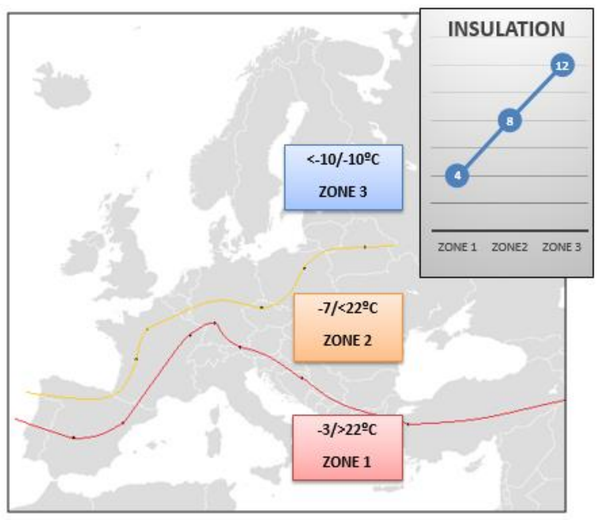
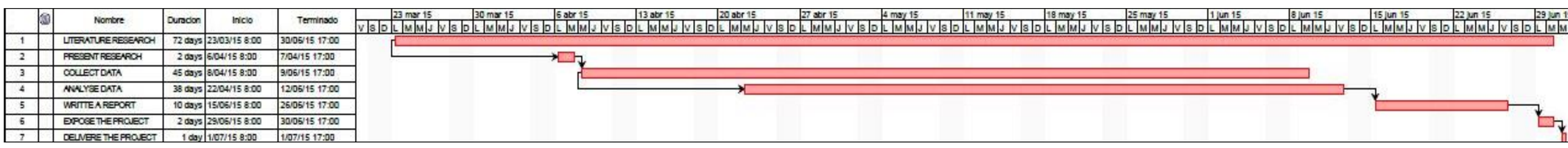


Figure 7:Minimum and maximum temperatures in Europe
Source: AEMET (2015), V:öppen (Wikipedia, 2015)

GANT CHART



	Nombre	Duracion	Inicio	Terminado
1	LITERATURE RESEARCH	72 days	23/03/15 8:00	30/06/15 17:00
2	PRESENT RESEARCH	2 days	6/04/15 8:00	7/04/15 17:00
3	COLLECT DATA	45 days	8/04/15 8:00	9/06/15 17:00
4	ANALYSE DATA	38 days	22/04/15 8:00	12/06/15 17:00
5	WRITTE A REPORT	10 days	15/06/15 8:00	26/06/15 17:00
6	EXPOSE THE PROJECT	2 days	29/06/15 8:00	30/06/15 17:00
7	DELIVERE THE PROJECT	1 day	1/07/15 8:00	1/07/15 17:00

ANTICIPATED OUTCOMES

The findings based on the methodology employed may yield the following outcomes:

1. Obtain enough and consistent comparable studies for understanding of the proposal and to start the next aims.
2. Adapt the comparable study design to our methodology..
3. The data collected will be from literature.
4. Statistics results should be able to draw lines to show area climate
5. Show a comparable study between climate and roofing materials.

REFERENCES

Méndez, A-Vilas, Ed. *Materials and processes for energy- Communicating current research and technological developments.* Found, March 2015.

Domenig, Ch. (November,2014) *Central-West Europe. Markets, Products, Strategy. Energy Efficient Roofing. Air Conditioning and the Low Carbon Cooling Challeng* . Found, 2015.

Cumberland, L. and Windsor, UK (July, 2008). *Network for Comfort and Energy Use in Buildings* [Electronic Version] Found in 2015 from NCEUB Service website: http://nceub.org.uk

Pout, C. and Hitchin E.R. (2008) *The future environmental impact of room air conditioners in Europe.* Found 2015

Kjellström1, E.- Bärring, L.- Jacob, D.- Jones, R.-Lenderink, G. and Christoph, Sch. (2006). *Modelling daily temperature extremes: Recent climate and future changes over Europe.* Found 2015

Dwight Beranek,A. (2005). *Unified facilities Criteria UFC Commentary on Roofing Systems.*

Energy-Efficient Roof, Ceilings and Attics (2015) [Electronic Version] Founded in 2015: http://frontierassoc.net/greenaffordablehousing/FactSheets/GAHCfactsheets/17%20low-sloped%20roofs%20final.pdf

Guimaräes Mercon, M. (2008) *Confort Térmico y Tipología Arquitectónica en Clima Cálido-Húmedo. Análisis térmico de la cubierta* ventilada. Found 2015 in: http://mastersuniversitaris.upc.edu/aem/archivos/2007-08-tesinascompletas/confort-termico-y-tipologia-arquitectonica-en-clima-calido-humedo

Roof Assemblies and Rooftop Structures (2004) [Electronic Version] Found 2015 in: http://www2.iccsafe.org/states/oregon/building/2004_PDFs/Chapter_15_Roof%20Assemblies%20and%20Rooftop%20Structures.pdf

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