

WP6 Activity 6.1.1 Report on technical barriers and drivers

IMIP-SOE3/P3/E0963

Project funded by the Interreg Sudoe programme through the European Regional Development Funds (ERDF)



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INTRODUCTION

The work is contemplated in the IMIP project of the INTERREG SUDOE Program, within Working Group 6: (GT6 Dissemination and transfer of knowledge)

These works focus ones the development of modules and construction systems to be used in rehabilitation and new construction are done, and those have to be implemented.

In this report, Analysis of barriers and drivers for the use of autochthonous wood and cork from the Sudoe area for construction and rehabilitation of public buildings.

The study is carried out within the scope of the Interreg Sudoe territories and we will focus more specifically on Portugal, France and Spain.

Table 1: Programme and Project objectives and results.

| Programme specific objective | To improve energy efficiency policies in public buildings and homes through the implementation of networks and joint experimentation. |
|------------------------------------|--|
| Project main objective | To support the change towards a low carbon economy using bioproducts (wood and cork) for smart, sustainable, and inclusive growth with a special focus on the public construction sector. |
| Project specific objectives | To design, validate and implement a new ecological construction system to improve energy efficiency in public buildings. Related activities are: |
| | To design an ecological construction system based on innovative wood and cork products supporting a low carbon economy, To test prototypes, To develop an Information and Communication Technology for design, modelling, and evaluation of potential construction solutions, To compare the modular and interconnected insulating panels designed with currently used insulating panels, To disseminate results and to train prescribers. |
| Programme result indicator | Percentage of actors in the energy efficiency sector participating in transnational cooperation projects. |
| Project results | An interconnected modular system of insulating panels made of wood and cork to improve energy efficiency of buildings, including their entire life cycle. |
| | A BIM plug-in to analyse the environmental benefits of bioproducts used in construction (carbon storage and substitute effect). |

OBJECTIVES

The objective of this analysis is to identify the barriers and drivers for the use of IMIP systems based on an autochthonous wood and cork materials from the Sudoe area for construction and rehabilitation of public buildings. In this way, and depending on the different uses of the IMIP construction systems, any contractor, designer or costumer can use the systems developed and make them compatible with their system in order to complete the project.

On the other hand, with this report it is possible to understand what type of barriers are currently affecting to implement the IMP systems on the sector and on the market. With this data it is possible to take references to identify possible solutions and develop improvements in technical, economics and social aspects with the objective to enhance the IMIP systems implementation.

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PRINCIPLES OF RESEARCH

This report focuses on finding the barriers in the different agents of society and in the construction sector and in all agents that are involved in the possible implementation of a new construction details like IMIP systems.

The main researched areas are:

Context and Circumstantial Barriers

Economic barriers Social and cultural barriers Political barriers

Sectorial Barriers

Raw material production Primary industrial barriers Construction sector barriers

CONTEXT AND CIRCUMSTANTIAL BARRIERS

The idea that wood-based construction presents a series of objective advantages over other types of constructions, such as those that are traditionally carried out with materials such as steel, concrete or brick, is increasingly widespread and argued. However, today in the SUDOE region, for cultural or any other reasons, this type of construction has not spread to its full potential, as in other parts of central and northern Europe or North America. Thus, currently, homes with these characteristics are a huge minority compared to the large number of buildings that have been finished in materials considered more traditional in the SUDOE region.

It should be noted that the sector enjoys good health in Spain, Portugal and South France for other types of wooden constructions used as accessories to housing, not only in carpentry and furniture, also in gardens or parks, such as pergolas, wooden porches, booths and gazebos.

This reality is very different in other parts of the European Union, as e.g. in Finland, where it is estimated that no less than 98% of single-family homes are built with wood from native trees, or as in countries like the United States or Canada, where wood dominates in 80% of the homes built.

However, and despite having to overcome a series of customs and historical prejudices, the construction of wooden buildings, especially of a modular nature, is growing progressively in the SUDOE area, because awareness of the economic benefits that they report, as well as the well-being and ecological values associated with them.

The arguments in favour of building with wood in the SUDOE area are solid:

- The economic advantages are obvious, since the final price of the building can be much lower and, in comparison, the construction process is very fast, to the point that the building can be completed in a few weeks or months.

- Wood is a very strong and durable material when used to build homes, despite what many might believe at first.

- These buildings have an undoubted ecological component in relation to the usual homes, because they integrate perfectly into any natural environment, fitting perfectly into natural landscapes. So, the aesthetic quality that these homes provide is better that the appearance of brick or cement houses. - Wooden houses are easily customizable, so the owner has the possibility of making many changes during construction. The same would be impossible in usual constructions, where it is almost impossible to vary what is reflected beforehand in the drafts or plans.

- Wood offers natural protection against sudden variations in heat or cold, because they are excellent thermal insulation. This is especially relevant in the SUDOE area in a context of climatic emergency. This results not only in the greater well-being of the people who live inside these houses, but also represents considerable energy efficiency and consequently savings in heating or cooling.

- It also provides good acoustic insulation and, in fact, many sound and recording studios are covered with this material, due to its optimal results. Cork, as a key SUDOE product, plays here a special role.

Considering all these circumstances, increasingly taken into account by the new generations, and the usual price of traditional homes in large cities and surrounding land, it is not unreasonable to venture that wooden houses will gradually find their place among the predilections of the SUDOE society.

The results of the IMIP project help to improve this technical and ecological transition. However, today, in the SUDOE area and during the development of the IMIP project, we still find different barriers that must be overcome in order to advance in a sustainable construction based on technically advanced products made with renewable raw materials from native trees. within the framework of sustainable forest management and following the challenges set by the transition towards a bioeconomy that contributes to mitigating climate change and all its effects.

- Economic barriers

The construction industry accounts for around 5% of the economy in the SUDOE area. In Spain, GDP relative to the construction sector stood at 5.2% during the first quarter of December 2022.

The latest CaixaBank Research Real Estate report reveals how costs in the construction sector, in the residential area, have increased significantly since the beginning of 2021, as a result of the strong reactivation of global demand, given the reopening of the economy after the pandemic. The trend worsened with the start of the war in Ukraine and the increase in the prices of basic construction materials. The price of industrial metals in international markets has fallen sharply and futures markets point to a certain stabilization of prices. In this context, it is expected that the costs of construction materials will moderate in 2023.

According to data from the Spanish Ministry of Transport, Mobility and Urban Agenda, the cost of residential construction materials was, in September 2022, 26.7% higher than the figure for January 2019. In this analysis we stick to cement, concrete, steel and wood as representative materials in construction.

Fig. 1 shows that in September 2022 cement and concrete were around 20% more expensive than at the beginning of 2019 and wood, 28%. The extreme case of steel is also seen, which became 84% more expensive and whose price in September was still 61% higher than that of January 2019.



Fig. 1. Strong increase in the costs of construction materials in Spain Variation between January 2019 and September 2022

The volatility and increase in material prices make the industry more conservative and less innovative. Consequently, it is necessary to apply policies and incentive measures to change the static trend of the sector.

- Social and Cultural barriers

The Mediterranean culture, as well as the area of the SUDOE region, (except mountain areas, especially certain Pyrenean areas), historically has not been prone to the use of wood as the only constructive element for its buildings. In most cases, the use of wood was reserved for the structural use of beams, joists, straps, as well as for use in the carpentry of doors and windows. The combination of masonry and brickwork completed the list of both structural systems, as well as enclosures and partitions. This fact made the coexistence and combination of different construction materials for a building historically exist.

After industrialization and especially at the beginning of the 20th century, wood in structural uses was replaced by metal beams or the use of reinforced concrete. These facts have partly increased the environmental impacts of the construction sector.

Scientific advances and knowledge of the causes of climate change, as well as the obvious climate emergency, have prompted new European directives, which imply a clear change in trend, due to the need to reduce these impacts on the environment. Thus, the EU Research Framework Programme Horizon 2020 (H2020), for the period 2014-2020, and also the current Horizon Europe Programme clearly highlight the challenge for developing and implmenting more sustainable construction systems and materials such as those derived from the IMIP project.

(https://www.horizonteeuropa.es/anteriores-programas/h2020)

One big problem with the return to wood-based systems is that there was an unfounded belief that wooden structures behaved worse than other systems in the terms of fire risk.

Today, at a technical level, these beliefs have been superseded, but at a social level there is still resistance to the use of wood as an integral system in the construction industry, which has made a lot of the wood industry dedicated to the transformation into the creation of building materials.

Currently this trend is slowly reversing with technicians prescribing and developers demanding these new, more sustainable wood-based systems. The industry is readapting, but the process is slow, and the economic costs associated with this reindustrialization are also slow, which produces a cost gap in relation to other, more polluting construction systems. This fact requires a period of readjustment and equilibrium of production and prices.

- Political barriers

As already mentioned in the previous section, there are European, National and Local programs such as the Framework Program (H2020 and Horizon Europe), the current 2020-2030 and the future 2030-2050 among other, where policies, strategies and plans are requiring society to find more sustainable ways of producing and to live. These policies, like the implementation of plans such as the European Interreg, try to promote the use of more sustainable systems and materials such as those derived from the IMIP project.

The H200 and Horizon Europe programmes and others, mark as a political objective to provide financing for sustainable industrial development.

"Access to risk financing aims to overcome the deficits in the availability of debt and capital financing for companies and R&D projects driven by innovation in all phases of development. It will support the development of venture capital at Union level together with the capital instrument of the Program for the Competitiveness of Enterprises and SMEs."

The reality is that today there are still many of the policies or agreements that have been established in the 1997 Kyoto protocols or in the 2015 Paris agreements, which are not being complied with and which slow down this change.

Local administrations have started to implement these policies progressively, but to date insufficiently. This delay in the implementation of action policies against climate change makes it necessary more intensely to reactivate the aforementioned policies for the implementation of systems that activate the industrial sectors in their different phases, with the aim of generating a sectoral economy that goes beyond the linear to circular, based on the objectives of low environmental impacts, and being more respectful of the environment.



On the other hand, technical regulations have already been established that are being consolidated through the European Eurocodes at the structural level (including structural applications of wood), the technical building codes at the peninsular level or through local regulations, which are most demanding in terms of sustainability, specifically for the industrial and construction sector. These new regulations begin to make it necessary to readjust the sectors to reduce the impacts and improve the energy efficiency of buildings. But its actual implementation is being slow and requires long periods of adaptation, which is why it is necessary to control and require it by public and political entities.



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Under the agreement to reform and strengthen the EU directive on energy efficiency, the agreement represents a further step in the implementation of the "Objective 55" package of measures to achieve the objective of the European Green Pact and the REPowerEU Plan. It states: "the annual energy savings obligation is almost doubled, in order to ensure continued progress. EU countries will need to achieve new savings each year equivalent to 1.49% of final energy consumption on average, from 2024 to 2030, compared to the current level of 0.8%. By the end of 2030 at the latest, they will have to gradually reach 1.9%. It is an important instrument to promote energy savings in end-use sectors such as buildings, industry and transport."

The agreement sets an EU energy efficiency target of 11.7% by 2030.

The reality is that the objectives set are still far from being achieved and it requires an execution and control policy that drives the sector in the right direction.

SECTORIAL BARRIERS

- Raw material production

In the SUDOE region, the forest area achieves in Spain 18.6 millions of hectares (covering 37.2 % of the territory), in France 17.3 millions of hectares (covering 31.5% of the territory), and Portugal 3.3 millions of hectares (covering 36.2% of the territory)

The total amount of forest in SUDOE and more specifically of the maritime pine (*Pinus pinaster*) as indicated in the report "D1.1.1 PRELIMINARY STUDY ON RENEWABLE AND AUTOCHTHONOUS BIOMATERIALS AVAILABILITY", spreads naturally in Atlantic-influenced regions of Portugal, Spain and France (subspecies *atlantica* at the Atlantic coast) and in the Mediterranean regions of France (including Corsica), Spain (subspecies *pinaster* or *mesogeensi* at the Mediterranean basin), Italy, Morocco, Algeria and Tunis (Fig. 2). Together France, Spain, Northern and Central Portugal regions represent almost 2.9 million ha of Maritime pine forested area.



Range of distribution of *Pinus pinaster* (adapted from Euforgen)

Fig. 2. Distribution of Pinus pinaster in the SUDOE region

Additionally, the cork oak (*Quercus suber*) is a typical species of the Western Mediterranean region, occurring spontaneously in Portugal and Spain, in the North Africa and also, in restricted areas of France and Italy. The total occupied area is currently around 1.43 million ha in Europe. More than the half of this area is located in the Iberian Peninsula. Most cork oaks integrate multifunctional agroforestry systems, which combine cork production with cattle grazing, hunting and other non-wood productions (Pereira, 2007).



Distribution of cork oak in Europe and North Africa (adapted from Euforgen).

Fig. 3. Distribution of Quercus suber in the SUDOE region

This quantity of raw material is enough to be able to supply the industrial sector for the manufacture of IMIP-type construction systems, as well as its subsequent application on the construction sector in a progressive and incremental way.

In order to extract, process and serve the raw material to the industrial sectors, it would be necessary to mobilize the production in sawmills and primary transformation industries to be able to harvest and use current resources in an adequate and sustainable manner and to be able to maintain stock levels, as well as the sustainability of the products.

The post-COVID pandemic materials crisis of 2022, as well as the economic crisis derived from the Ukraine war, has shown that in the SUDOE area it does not have a sufficient stock of construction materials to satisfy the needs of the construction sector, so it is necessary to schedule adequately to

encourage the aforementioned industry of the primary sector of raw materials in this case the management of wood from the SUDOE forests.

- Barriers in wood supply and primary manufacturing

The demand for local construction materials has increased in recent years, among other reasons due to the Covid pandemic crisis and the war in Ukraine. These are facts that have also produced a cut in imports from other eastern regions (including construction timber), due to the lack of supply and the consequent increase in prices. For these reasons, the prices of the raw material, of its industrial transformation and its distribution, increased considerably, producing changes in prices and terms in the industrial chain, as well as affecting the supply to the secondary woodworking industry: construction elements, carpentry, but also furniture and packaging (see Fig. 4). The alteration of industrial processes has disrupted all sectors, including raw materials, their transformation and their consequent application in construction. These problems have affected directly the development of the IMIP project.



Typical forestry supply chain (Source Espinoza and Smith, 2015)



This situation has shown that in the SUDOE area there is not enough stock of raw materials to meet the needs of the construction sector, so it is necessary to adequately program the increase of the aforementioned industry in the primary sector and especially the industrial transformation sector with wood sawmills from the forests of the SUDOE area.

- Barriers in wood construction manufacturing industries

The wood-based construction materials production chain requires an industrialized industry that can optimize the industrial processes for the production of materials and systems. This industry is crucial to be able to implement, distribute and finally apply on site efficiently and quickly to lower production costs that balance the high labor costs of the sector.

In the Iberian Peninsula (Spain and Portugal) as well as in the south of France, there are few factories producing industrialized wood-based systems in advanced construction products. This makes it necessary to increase the use of alternative systems to the current ones such as IMIP construction systems. The promotion of increasing this type of industry can meet the new demand for sustainable construction systems based on autochthonous and sustainable raw material, such as timber of *Pinus pinaster* and panels of *Quercus suber*.

Main industries of construction products from the sudoe region wood (including CLT):

Spain:

| Egoin | https://egoin.com |
|----------|-------------------------|
| Xilonor | https://xilonor.es |
| Sebastià | https://www.sebastia.eu |

Portugal:

Arolla https://www.arolla.pt

France:

Piveteaubois Phttps://www.piveteaubois.com

Considering the small amount of own production and distribution in the SUDOE area in comparison with other regions in Europe (especially Central and Northern Eureope), it is necessary to promote this type of industry. For this, strategic programs of the regions can be established through industrial development policies focused on strategies based on territorial circular bioeconomy.

- Construction sector barriers

The construction industry is a sector with little adaptability where changes take longer to implement than in other economic or even industrial sectors. This is due to the fact that the implementation production chain requires a highly anchored and sectorized industry, where many agents are involved at each level of the supply chain. Any change in this chain affects the other agents and is always carefully studied, since any type of error in the application of new construction systems can lead to long delays in the work or cause pathologies that can cause major deterioration in the building and in its durability.

The responsibility of both designers/architects/engineers and builders in the face of existing legislation is very high, so any error can cause very expensive repairs and serious damage to both buildings and their users.

For this reason, any change or adaptation requires a contracting and testing period to ensure its proper implementation in the chain of design, prescription, manufacturing and implementation in the construction and commissioning phase.

In this sector in the SUDOE region we can find lethargy in the application of new technologies and the implementation of more sustainable systems by the different agents involved in the process, such as:

-Projectors and technicians: architects and engineers

-Builders and subcontractors

-Quality control offices

-Professional colleges

-Technological institutes and universities

The most appropriate solution to overcome these barriers is: on the one hand, technical training courses for both professional technicians and technicians from quality control offices and technological institutes and/or universities, who validate the proposals.

On the other hand, the practical training of the builders is absolutely necessary in order to be able to implement the new systems in the appropriate way and avoid possible pathologies derived from a bad implementation. Likewise, promote diffusion and economy in dry laying systems, such as those that concern us. Finally, emphasize the use of more sustainable and less impact construction systems such as IMIP, compared to those based on reinforced concrete or brick fabrics.

The IVE (Valencian Institute of Building) tries to promote this type of updating and teaching innovation within the construction sector in its training area:

https://www.five.es/formacion/

IMIP training courses have been implemented using this well known and accepted training platform.

FINAL CONCLUSIONS

There are various barriers that can hinder the application of corrective measures that help to comply with so many structural changes, and be able to reduce greenhouse gas emissions, environmental impacts, as well as the need to regenerate a circular bioeconomy based on more sustainable materials (local resources with low environmental impact). The reasons for the change are not only due to this conscious need for a paradigm shift to reverse climate change, but must also be implemented due to its mandatory nature and compliance with European directives.

These barriers are of different entities:

-Context and Circumstantial Barriers

-Sectorial Barriers

All the barriers that are detailed, have a solution in the short, medium and long term, as long as the measures proposed from the European, National and local policies and directives are implemented.

To conclude, we can affirm that the IMIP sustainable construction products and systems are extremely versatile and can be fully combined with other traditional existing building materials and systems. Thanks to its low environmental impacts and its properties, IMIP presents no limitations to architectural, residential or utility building projects. For this reason, it can be increasingly used for the construction of domestic houses and multi-storey buildings, as well as for industrial and commercial buildings.

Therefore, it is understood that with the measures mentioned in this deliverable, the implementation of this type of system will continue to increase progressively and incrementally.

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