

D6.2.1 Good practice guideline to improve energy efficiency in public buildings through local bio-resources.

PROJECT CONTEXT

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SUMMARY

This report is a good practice guideline on improving energy efficiency in buildings through the use of local bio-based materials. It compiles the main strategies identified to promote the use of solutions based on locally sourced bio-based materials, such as wood and cork. The main barriers and drivers identified in the previous activities of the project, as in the case of D6.1, have been taken as a starting point, but also considering other possible strategies mentioned in reference literature. The guide includes examples or initiatives developed in line with each of the strategies mentioned.

INTRODUCTION

The main objective of the IMIP project is to design, validate and implement a green building system based on natural bio-based materials, wood and cork, to improve energy efficiency in public buildings.

Wood is a natural insulator, with a lower thermal conductivity compared to concrete, steel-frame and masonry construction and is ideally suited to energy-efficient design, contributing to reducing heating and cooling costs. It is capable of insulating heat up to six times more than brick, 15 times more than concrete and 400 times more than steel.

But wood is not only a lightweight bio-based material whose production and industrial transformation processes implies lower energy consumption (associated with simpler work processes) and emit fewer greenhouse gas emissions than its competitors, it also stores atmospheric carbon.

On the other hand, Southwest Europe has few buildings made of wood compared to other European regions. Therefore, this is where the potential to mitigate climate change through material substitution is maximised.

In addition, the project thus also contributes indirectly to making visible and stimulating the demand for local bio-based materials (wood and cork), thus contributing to reducing rural depopulation and unemployment, promoting sustainable forest management and reducing the risk of forest fires.

In the report 6.1.1 "D6.1.1 Report on technical barriers and drivers", the main barriers and drivers for the use of autochthonous wood and cork from the Sudoe area for construction and rehabilitation of public buildings were identified. The document already outlined some strategies to address the identified barriers and problems.

The main strategies identified in this document and in other reports and initiatives are presented below, classified into the following categories or axes:

- Training and knowledge,
- Policies and regulations,
- Economic and financial,

- Innovation research and development
- Active and sustainable forest management
- Networking and joint action

STRATEGIES

Below we present the main strategies that can be applied in line with each category or axis, proposing some measures or actions that could be implemented in line with such strategies as well as identified good practices or initiatives that can provide the insights needed to move forward in this regard.

Training and knowledge

Training and professional upgrading in the use of new sustainable construction methods and materials is essential for all actors and different professionals involved in the construction process (planning, design, production, construction and assembly, dismantling, recovery, recycling, etc.).

Lack of knowledge often results in the limited use of wood and newly developed wood-based construction systems. So, a sufficiently broad range of training must be made available, targeted at different professional profiles and grades.

Technological changes and new innovative building systems and bio-based materials are also changing the organisation of work and the skills required, evolving towards prefabricated, industrialised, and modular construction. This creates some overlaps between the construction and timber sectors and between the traditional occupations of these two sectors. It is therefore essential to rethink and adapt the curricula of the different professions and to redesign them in a coordinated manner.

Furthermore, to promote the use of these more innovative systems in the construction and renovation of public buildings, it is essential to train contracting authorities in the selection of appropriate award procedures, as well as in the use of selection criteria, technical specifications and/or award criteria, preferably based on environmental and quality terms.

Therefore, taking this into account, and for the training and knowledge axis, some potential actions that could be implemented are:

- Develop raising awareness campaign on timber construction.
- Design guides to promote the use of construction systems based on local biological resources.
- Set up a training/upskilling strategy in the use of timber construction and biological resources.
- Develop and provide training for practitioners, on site workers, etc.
- Use European funding (i.e. ESF+) to invest in skills development projects

Identified good practices or initiatives linked to this strategy:

1. Resilientwood project, EU:

This project aims to offer recommendations to tackle specific challenges in the Woodworking Industries through strengthened social dialogue. The project focuses on the adaptation of the industry and its outlook after the Covid-19 crisis, including the adaptation needs linked to expected technological changes and the need to increase the attractiveness of the sector for skills attraction and retention, with special attention given to gender balance in the wood industry. Possible solutions to these challenges are investigated through a cooperation involving social partners and vocational education and training providers.

More information: <https://www.cei-bois.org/resilientwood>

2. Catedra Maderamen, Valencia-Spain:

Created by the UPV and the IVE, it aims to promote and develop activities that make visible the need for and importance of recovering wood in the design and improvement of the built environment, seeking its decarbonization, favouring circularity, creating equitable, healthy and resilient environments, through innovation, digitization and industrialization of the sector. The initiative promotes participation in competitive innovation projects, technology transfer and collaboration with companies in the sector, as well as the organization of competitions, conferences, and publications, in

addition to reinforce the training of architecture students in wood construction.

More information: <https://calab.es/catedra-maderamen/>

3. Digital Wood Artisan project, EU:

DWA is a project that aims to disseminate good practices at European level through the training of trainers that can provide innovative skills about the wood sector, to disadvantaged learners with innovative, effective, and consolidated methodologies. The will of the partnership was to create an effective and repeatable model at European level to disseminate woodworking techniques in a modern perspective, with the help of new ICT technologies. There are partners from 6 EU countries (Portugal, Italy, Finland, Cyprus, Spain, and Slovenia).

More information: <https://dwa-project.eu/>

Policies and regulations

One of the main barriers identified for the use of innovative construction systems and technologies based on local bioresources is related to legal and governance issues.

On the one hand, at the European level requirements for timber construction in the different national building codes are not harmonised. To this fact we must add that in most of the cases building codes do not reflect the technical and technological possibilities of modern timber construction. There are also other regulations such as fire and earthquake ones that vary greatly from country to country.

In this sense, it is necessary to review, adapt and harmonise the existing regulations, at European level with the aim of facilitating the use of this type of solutions in the European (common) construction market.

Wood is a naturally renewable material which sequesters carbon as it grows and stores carbon in harvested wood products. This makes it a perfect substitute for carbon intensive materials such as steel, concrete and plastics, contributing thus

reducing emissions. Besides, wood products, and in general biobased products, contribute to a circular economy as they can be reused, recycled, and recovered for low-carbon energy at end-of-life.

A good strategy to promote the use of these solutions in buildings would be the incorporation of life cycle assessments throughout the entire life cycle of buildings (integrated carbon footprint of a project) in the various applicable regulations. For example, it would be advisable to incorporate this perspective in the Energy Performance of Buildings Directive (EPBD), but also in other policy instruments as urban planning and land zoning documents or public procurement procedures. Moreover, and in line with the new proposed Ecodesign Regulation for Sustainable Products, the establishment of minimum criteria on reducing products' environmental and climate footprints, could also be applied to timber construction products which are not currently foreseen in the Regulation.

Finally, although the number of buildings constructed with wood has been growing steadily in recent years, the exemplary role of public administrations plays a decisive role in increasing the number of buildings renovated and/or constructed with bio-based materials. It is essential that the public administration supports this type of systems and materials through the incorporation of incentives in procedures, ordinances, and policies.

As an example, some of the specific actions that could be carried out in line with these strategies are as follows:

- Introduce a parallel GWP limit (CO₂eq) for construction materials used in public tender (aligned with EN15804 +A2)
- Include clauses in tenders to provide dedicated training on relevant timber construction skills for staff and new recruits.
- Procure selective demolition services.
- Promote specific databases in terms of WLC indicators.

Identified good practices or initiatives linked to this strategy:

1. **Réglementation environnementale RE2020, France;**

The RE2020 is a French national regulation for all new buildings and came into effect the 1st of January 2022. The difference between the previous regulation and the RE2020 is the combination of the energy, the carbon criteria in buildings and the summer comfort.

The regulation promotes the use of biosourced and geosourced materials, because it takes into account, in addition to energy efficiency and production of renewable energy, greenhouse gas emissions (GHG) generated throughout the life cycle of the building, from resource extraction to deconstruction, through the phases of manufacturing, construction, use and maintenance. Biobased and geobased materials generally have a low carbon footprint and, for some, insulating properties. They are therefore particularly well suited to meet the challenges of RE 2020.

More information: <https://www.ecologie.gouv.fr/reglementation-environnementale-re2020>

2. Indicate Project, EU:

The INDICATE initiative will bring together governments, industry and academia to tackle one of the most common barriers to enacting policies which will ensure climate neutral construction: a lack of reliable and comprehensive emissions data for buildings.

INDICATE seeks to accelerate policy development across Europe by generating critical baseline data for buildings, which can help guide policymakers to set carbon limits that cover the full lifecycle impact of buildings, from manufacture and construction, through to deconstruction and waste processing - the so-called “whole life carbon limits”.

More information: <https://www.indicatedata.com/>

3. Green Guide on environmental criteria for regional public procurement related to the building sector:

The objectives pursued with the guide are, to promote works and services acquisition with the lowest possible environmental impact, to achieve sustainable growth while ensuring a more rational use of public funds, to promote the procurement of environmentally friendly goods and services, to

value the useful life of products and services to the detriment of programmed obsolescence, to incorporate circularity criteria to achieve an efficient use of resources, to encourage the inclusion of quality and environmental management systems.

The guide deals with the inclusion of environmental measures in the different phases of public procurement, which are developed through a series of functional sheets (58 so far). The sheets are organized into 3 thematic categories: passive design measures, active design measures (including 2 subgroups related to resource efficiency: energy and water), products and services (including 5 subgroups: products, waste management, environmental certificates, environmentally friendly services, and durability.).

More information: <http://habitatge.gva.es/es/web/guia-verda/guia-verda>

Economic and financial

One of the barriers that construction and renovation projects with innovative building systems face is access to financing. When talking about solutions using bio-based materials, the reluctance is even greater, in many cases due to a lack of knowledge and to false beliefs in relation to the risks associated with these products, such as the greater risk of fire, or the lower durability of these materials.

In many cases, the use of these innovative systems is frequently linked to prefabricated systems that require a great initial planning effort, thus involving a great deal of upfront capital, which also generates uncertainty among potential investors.

All this often results in higher mortgage and insurance costs for this type of construction compared to concrete and steel.

The main strategies to address these barriers are, on the one hand, to educate and convince the financial sector of the benefits associated with this type of construction, destroying false myths. Engaging financial actors in the development of green and innovative financial instruments.

The main strategies to tackle these barriers are, on the one hand, to educate and convince the financial sector of the benefits associated with this type of construction, destroying false myths. Engaging financial actors in the development of green and innovative financial instruments. Finally, to develop consistent and reliable metrics, systems, or tools to measure, compare and evaluate the economic, social, and environmental benefits of investment projects.

As an example, some of the specific actions aligned with these strategies are as follows:

- Develop a financial incentive (i.e. Eco bonus) on low carbon projects.
- Tax rebates for building projects meeting low carbon materials.
- Increase landfill taxation rates.
- Introduce environmental impact in shadow costs (€/m²/year) widely used in public procurement in Europe.

Identified good practices or initiatives linked to this strategy:

1. EeMAP Project and Energy Efficient Mortgages initiative, EU;

The EeMAP Initiative aimed to create a standardised “energy efficient mortgage”, according to which building owners are incentivised to improve the energy efficiency of their buildings or acquire an already energy efficient property by way of preferential financing conditions linked to the mortgage. The Initiative represents the first time a group of major banks and mortgage lenders, as well as companies and organisations from the building and energy industries have proactively come together to discuss the private financing of energy efficiency.

The Energy Efficient Mortgage Initiative (EEMI), was created in 2015 and funded by EU Horizon 2020, has been the catalyst for the growth of a new, integrated, multi-stakeholder, energy efficient mortgage ecosystem. The EEMI aims to introduce a greener, more sustainable way of buying, renovating and living in our homes.

More information: <https://cordis.europa.eu/project/id/746205/es>
<https://energyefficientmortgages.eu/>

2. Certificazione S.A.L.E, Sistema Affidabilità Legno Edilizia, Italy:

SALE (Sistema Reliability Wood Building) is a private protocol born from the collaboration between Assolegno and Conlegno. It aims to identify green building construction companies that comply with current regulations and can guarantee comfortable, durable, and quality constructions.

In the last years, the protocol became the certification required to demand specific financial and insurance products related to mass timber buildings. Many lenders require it as an essential condition for issuing a mortgage, and will be able to access specific lines of mortgages for the green building construction sector at the major credit institutes and take out fire and major risk insurance policies at conditions facilitated.

The certification also facilitates the underwriting of insurance policies against fire and major risks and implies benefits for the contracting of some policies by builders.

More information: <https://www.certificazionesale.it/>

3. Built by Nature Fund, Europe:

Built by Nature's Fund is a philanthropic grant-making fund that is looking for game changing initiatives that will accelerate the timber transformation across the built environment, for the benefit of the public good.

It funds projects that address key barriers to mass timber adoption in the market and offers grants of up to €250,000 per initiative.

More information: <https://builtbn.org/bbn-fund>

4. Green Construction through Wood Program (GCWood), Canada:

GCWood Program encouraged the greater use of wood in construction projects with the aim to support Canada's transition to a low-carbon economy. The program objective was to bring awareness to and increase capacity for innovative tall wood buildings, timber bridges and low-rise wood buildings.

The program provided non-repayable contributions of up to 100% of a project's eligible incremental costs for the demonstration of innovative uses of wood products and systems. The funding offset the cost of being the "first

mover” of novel engineered wood projects or supported the development of knowledge and tools to support the success of future projects.

Knowledge and information developed using GCWood funding was required to be made available via a creative commons approach to allow broad sharing with the design and construction communities.

More information: <https://natural-resources.canada.ca/science-and-data/funding-partnerships/funding-opportunities/forest-sector-funding-programs/green-construction-through-wood-gcwood-program/20046>.

Innovation, research, and development

Strengthening the innovative ecosystem is a major strategy to leverage construction with bio-based systems and materials.

Wood-based constructions products accounts for only 3% of building materials in the EU, thus support for R&D&I relating to alternative building materials are an important means of exploiting the potential of timber and bio-based construction.

Digitalisation is becoming an essential issue for the forest and timber industry. The development potential offered by digitalisation and Industry 5.0 covers many aspects of the value chain of the forest and wood industry.

There is still much scope for research in areas such as support for forest planning and decision making, solutions to facilitate felling planning and transport, or the development of digital tools and data for: life cycle analyses (LCAs), more accurate sustainability assessments, or increasing growth rates in forestry and timber production. Furthermore, the development of mentioned tools and databases, would boost the use on biological resources by supporting tendering, procurement, and investment processes.

All these solutions will lead to higher productivity in the sector, increased efficiency and waste reduction, thus, improving the competitiveness of the sector and its market positioning.

Actions:

1. Digitalization of businesses in the wood-based value chain (e. g. robotics, sensor technology, networking, of plants and machines)
2. Promotion of research activities into product development in the field of biorefinery, bio-composite materials (3D printing), fibre construction materials (plaster, wallpaper, etc.) and bio-based adhesives and binders
3. Value chain innovation, including data management, where data, digital, and new technologies support tendering, procurement, and investment to make the change possible.

Identified good practices or initiatives linked to this strategy:

1. Irta Plan of the Regional Government of the Valencian Community, Spain:

Program of subsidies for projects, works and applied research and product development, boosting ecological transition and innovation in the built environment.

Eligible actions will contribute to the ecological transition, supporting the fight against climate change, relying on innovation and considering the essential low carbonization of the built environment through the incorporation of innovative solutions that need to be validated in a real environment, through measures such as:

Promotion of integrated eco-design, Promotion of bioconstruction and the use of natural and proximity materials, Integration of circular economy principles, and integration of construction 4.0, among many others.

They are subsidized from 50 to 100% of the budget of the requested action according to the order of bases.

More information: <https://habitatge.gva.es/es/web/arquitectura/ajudes-pla-irta-2023>

2. Lawoodtech, France:

The WoodTech is an initiative created by the Xylofutur competitiveness cluster in January 2021. It is an ecosystem of start-ups, investors and partners wishing to contribute to the dynamism of the forest-wood sector. Its vocation

is to support the development of innovation throughout the wood material value chain, from logging to green chemistry. Entrepreneurs are thus present on almost all of this value chain. Their solutions directly use the wood material or offer a service by allowing the exploitation. Start-ups can be helped by WoodTech at the project stage, in the seed phase or in Series B.

More information: <https://www.lawoodtech.fr/>

3. *Dataholz catalog,*

Catalogue of wood and wood-based materials, building materials, components and component connections for timber construction covering thermal, acoustic, fire and ecological performance levels, released by accredited testing institutes. These datasheets will generally be accepted as proofs of compliance by building authorities.

All information and data presented here have been determined either by testing, calculations or means of assessment by accredited testing institutes or accepted research institutions. All tests, calculations and assessments were completed according to current codes and standards. In order to demonstrate compliance with building regulations all parameters and datasheets can be used as proof for the application of building permit or submitted to building authorities. This database is a service provided free of charge. All information presented is protected by copyright and covered by a disclaimer of warranty. Holzforschung Austria – Austrian Forest Products Research Society (HFA-ÖGH) and the Technical University of Munich will try to rectify any mistakes and errors.

Codes and standards, building regulations and law must be observed. The given data does not reflect building regulations requirements but indicates the performance characteristics of the components. Structural design must be performed for each project. dataholz.eu merely helps in the design- and building process. Each project must be assessed and monitored on an individual basis, including the quality of workmanship.

More information: <https://www.dataholz.eu/en.htm>

4. Rosewood 4.0 project– Knowledge platform for regional forest innovation:

The ROSEWOOD4.0 project harnessed the expertise available in different regions of Europe to promote the sustainable mobility of wood. The project transferred knowledge on best forestry practices and new innovations to other regions and developed cooperation between actors. The project was funded by the European Union's Horizon 2020 research and innovation programme.

The ROSEWOOD4.0 network collected a wide range of forestry practices during the project in the Knowledge Platform (<https://www.forestinnovationhubs.rosewood-network.eu/>), a website open to all and free of charge. With 21 partners from 18 countries, the network offers a wide range of solutions, most of them digital. The portal currently hosts more than 300 different practices and innovations.

Active and sustainable forest management

One of the key aspects in promoting an increase in the use of wood-based solutions is the promotion of sustainable forest management systems.

Sustainable forest management involves managing and using forests in such a way that they are not only environmentally, but also economically and socially, sustainable. One important element of sustainable forest management is preserving forests' biodiversity and ecosystem services. It is also important to reduce forests' vulnerability to natural disruptions such as forest fires and insect infestations.

The Programme for the Endorsement of Forest Certification (PEFC) and the Forest Stewardship Council (FSC), with over 200 Mha of certified forests worldwide, are the largest sustainable forest certification systems.

According to official data, in Spain, 2,679,482 ha (14% of total) have PEFC certification, and 614,733 ha (3%) have FSC certification. In comparison, 86.5% of Austrian forests, 84.7% of Finnish forests, 75.3% of German forests, 59% of Swedish forests, and 32.9% of French forests are PEFC certified. So, there is plenty of room for improvement in this respect.

On the other hand, in order to successfully address the implementation of new construction solutions based on wood and cork, it is essential to estimate the potential demand for wood and cork associated with the different growth scenarios foreseen in each region or country, in order to assess whether there is sufficient local/national wood production and supply capacity to cover the estimated demand, and if not, to establish the appropriate measures and/or incentives to cover it.

As an example, some of the specific actions aligned with these strategies are as follows:

- Support to forest owners, especially the smaller ones, promoting their grouping to increase their competitiveness in the market and the benefits they obtain from their forests.
- Encouraging and developing local and regional alliances between planners, architects and wood-processing businesses.
- Securing the regional availability of renewable raw materials for the bioeconomy (establishment of a bioeconomy cluster)
- Promoting hardwood technologies to improve the use of native hardwood species in the construction sector and other technical applications.

Identified good practices or initiatives linked to this strategy:

1. FORTRA tool, Wood traceability through blockchain technology, Galicia-Spain:

FORTRA (Forest Traceability) is a platform that the Regional Government of Galicia (Xunta de Galicia) makes available to forestry companies with the aim of providing traceability to wood products, recording the operations carried out by all the companies that are part of the transformation process, from the forest to the arrival of the final product on the market.

It allows companies to build a network to digitally connect the entire value chain of the Galician wood sector, so that they can inform customers and consumers of the characteristics of their products made from wood, including their carbon footprint, as well as the forest from which they come and the operations that were necessary for their production.

With it, the Xunta intends to promote the use of proximity products (produced and transformed in Galicia), as well as responsible purchases (products with low or zero carbon footprint) and respectful with the environment (legal origin, obligation to repopulate after logging or forest certification).

More information:

https://fortra.xunta.gal/fortra/paxina/fortra?_referer=%252Ffortra&locale=es#codigo-de-trazabilidade

<https://lignumfacile.gal/es/recursos/fortra-trazabilidad-de-la-madera-mediante-tecnologia-blockchain>

2. Forest Area Aggregation, Portugal:

Small-size private-owned forest areas are common in Portugal in particular North of the Tagus River. Small patches of forest hinder proper forest management, often leading to increased unmanaged areas more prone to wildfires, pests and diseases. The Baixo Vouga Forest owners association has developed a program of forest area aggregation to tackle this problem by grouping of contiguous areas with the overall aim of facilitating management operations. This will consequently reduce the occurrence of hazards, improve and increase well-managed areas, increase return and motivate investment. To implement the program, at least 5 forest owners with at least 5 properties, summing-up no less than 10 hectares are required. Then a GPS-based inventory is carried out and a forest management plan is developed. The program is based on quota-based investments and revenues that will be distributed among those involved with the aim of increasing the engagement, motivation and appreciation of all the agents involved. So far, several areas have been aggregated covering different number of forest owners.

More information: <https://afbaixovouga.pt/areas-florestais-agrupadas/>
<https://www.forestinnovationhubs.rosewood-network.eu/pt/content/areas-florestais-agrupadas>

Networking and joint action

The creation of networks and the promotion of dialogue and joint actions between all actors involved in the sustainable bio-based solutions and timber-based value chains is a key strategy to increase the use of these materials and solutions in building rehabilitation and construction.

The creation of platforms and initiatives that connect the different actors (businesses, public administration, academia, interest groups, and capital) allows the identification of barriers and risks associated with the common objective of increasing the use of these solutions in the market, and to articulate the necessary responses and mechanisms in each case and moment, as well as to share experiences and lessons learned, thus creating the necessary conditions for the desired change to take place.

It is also important to consider the scale of action of the different actors (local, regional, national, European) and the possible connection or integration in other networks.

Identified good practices or initiatives linked to this strategy:

1. European Wood Policy Platform (WoodPOP) initiative:

The 'European Wood Policy Platform' (woodPoP) was initiated by Finland and Austria on 1st December 2022, as part of the Austrian Wood initiative of the Austrian forest fund. The platform was set up by 17 countries and the representatives of 8 programmes promoting the use of wood. This platform serves to promote wood-based policy dialogue, exchanging information on best practices, developing joint reports and studies on the wood industry and boosting communication about the sector. High-level experts from politics, administration, economy, and research are able to discuss challenges for material and energetic use of wood, providing strategic impetus for the platform to foster innovative cross-sectoral exchange in context of the bioeconomy and the circular economy.

More information: <https://info.bml.gv.at/en/topics/forests/eu-and-international-affairs/woodpop-kick-off-in-innsbruck-austria.html>

2. Timber Perception Lab - Accelerating Change at MIND

The Timber Perception Lab aims to improve the perception of mass timber in the Milanese, Italian and EU context through collective learning and a strategic communication strategy involving key stakeholder groups (developers, investors, cities, designers, insurers, and assets owners) and to enable them in the joint experimentation of solutions that can empower the Italian market. To improve participation, the Timber Living Lab exist both physically and virtually. A digital space enables stakeholders to discuss and exchange knowledge; while the physical space, built around the MIND (Milan Innovation District) Prototype, host joint experiments and showcase innovations.

More information: <https://timberperceptionlab.org/en/>

3. *Wood4bauhaus, Wood Sector Alliance for the NEB, Europe:*

The European wood-based sector has launched the Wood4Bauhaus open platform for knowledge sharing, co-creation and skills development. Wood4Bauhaus aims to contribute to shaping a better and sustainable future with beautiful, healthy and inclusive living spaces as part of a sustainable, low carbon-built environment. The platform shall foster an open, long-term dialogue with all interested stakeholders and help sharing good practices about the Circular Economy and Green Buildings. Its main goal is to inspire as many actors as possible to co-create in a bottom-up approach and develop contributions to the New European Bauhaus from European to regional and local level, all in the common interest to advance and exploit as much as possible nature-based materials, innovative building systems and smart solutions for the benefit of European citizens. The alliance will therefore:

- Encourage research and innovation for novel and innovative use of wood in the built environment,
- Foster new collaborations and cocreation of different stakeholders across disciplines, sectors, and society, and
- Facilitate knowledge sharing and skills development especially also towards future generations.

More information: <https://wood4bauhaus.eu/>

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