

## SUSTAINABLE STONE BY PORTUGAL AGENDA – Valorization of natural stone for a digital, sustainable and qualified future

### Summary

**Scope** – The Agenda Sustainable Stone by Portugal has as its main objective to enhance the relevant mobilizing and aggregator work that has been carried out in the context of the Natural Stone Sector for the creation of a new generation of products and production processes, strongly disruptive and innovative, that strengthen the capacity of the sector to grow internationally, contributing to the growth and consolidation of the sector as a strategic factor for the sustainable development of the Portuguese economy. More specifically, the Agenda aims to develop and implement a new ecosystem of specialization, with international projection, that allows the effective valorisation of technological knowledge, enabling the implementation of the industrial processes necessary for a digital and sustainable transition, using new products, technologies and techniques with a markedly sustainable nature.

### Main objectives

**SO1.** Promotion of knowledge and innovation, through the development of economic dynamics that have the capacity to generate innovation and competitiveness in the Natural Stone Industry;

**SO2.** Economic valorisation and internationalization: includes activities that can add value due to the internationalization of the economy, contributing to greater efficiency in the use of the resources;

**SO3.** Sustainability of mineral resources: aggregates activities that combine the economic use of resources with sustainable management models in the environment/territory relationship;

**SO4.** Promote the training and development of specific skills that raise new motivations for the sector and increase the qualification of human resources;

**SO5.** Cooperation and networking: a strategic axis that crosses the entire strategy that increases the visibility of the sector and the integration of interests and knowledge.

### Expected results

**PPS1.** Innovative stone product

**PPS2.** New system for surplus and by-product valorisation

**PPS3.** Innovative robotic solution for stone extraction and transformation

**PPS4.** New sustainable stone process

**PPS5.** New process for stone industry digitalization

**PPS6.** Innovative digital hub for the local economy

### Work Packages

**WP1 “Upstream 4.0”** – The natural stone extraction process has undergone significant developments over the years. These developments have increasingly allowed quarries to be more productive, with less waste produced, greater safety for everyone and more environmentally friendly. However, with the advancement of new technologies, there are still processes that can be improved. This Agenda aims to introduce more efficient and sustainable technologies and methodologies associated with Industry 4.0 to contribute to the creation of a circular economy that promotes collaborative processes between all participants in the value chain and enhances raw materials and final products. WP 1 aims to respond to the following challenges: products (blocks) must have the necessary parameters for their commercialization (namely, homogeneity, adequate measurements, without visible imperfections, etc.); move towards zero waste; the environmental impact must be as small as possible; improve logistics associated with Natural Stone processes.

**WP2 “Digital stone”** – Digitalization in the natural stone industry implies that the main elements of the value chain are prepared with an innovative set of disruptive technologies and technical skills that, over a period of 5 to 10 years, will allow this sector to keep up with the rapid evolution of the market in which it competes. : the Construction Materials sector. To achieve this objective, the current WP was carefully designed to respond to the main challenges of the digital transition associated with manufacturing processes, being aligned with the new paradigm of sustainable valorisation of raw materials throughout the entire value chain. This set of technologies aims not only at valuing raw materials and reducing waste, but mainly at using manufacturing surpluses in new materials. In other words, promoting, through digitalization, the development of a circular economy strategy, bringing a second life to the products of this industry.

**WP3 “Connect stone”** – The use of BIM technology is increasingly widespread, creating challenges for the stone industry due to the variability of materials. Markets are looking for new technologies that increase the degree of predictability of stone behaviour and that can be implemented in BIM objects. This WP aims to (i) create predictive models of stone behaviour, increasing consumer confidence in this construction material, (ii) introduce the 6th (i.e.



### Project Reference

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### Leading Institution

SOLANCIS – Sociedade Exploradora de Pedreiras S.A. (Portugal)

### Partners

Itecons – Instituto de Investigação e Desenvolvimento Tecnológico para a Construção, Energia, Ambiente e Sustentabilidade (Portugal), Several Ways – Engenharia de Sistemas de Informação Lda. (Portugal), Filstone – Comércio de Rochas S.A. (Portugal), Mármore Galvão – Eduardo Galvão Jorge & Filhos S.A. (Portugal), Marmocazi – Indústria de Mármore Lda. (Portugal), IST – Instituto Superior Técnico (Portugal), IST-ID – Associação do Instituto Superior Técnico para a Investigação e Desenvolvimento (Portugal), IDMEC – Instituto de Engenharia Mecânica (Portugal), Instituto Politécnico de Santarém (Portugal), Genoa Spark (Portugal), Dimpomar – Rochas Portuguesas Lda.(Portugal), INOV-INESC Inovação – Instituto de Novas Tecnologias (Portugal), HRV – Equipamentos de Processo S.A. (Portugal), POSTEJO – Pré-Fabricados de Cimento S.A. (Portugal), Instituto Politécnico de Leiria (Portugal), Universidade NOVA de Lisboa(Portugal), APCMR; Frontwave – Engenharia e Consultadoria S.A. (Portugal), FRAVIZEL – Equipamentos Metalomecânicos S.A.: (Portugal), ASSIMAGRA – Associação Portuguesa dos Industriais de Mármore Granito e Ramos Afins (Portugal), CEI – Companhia de Equipamentos Industriais Lda. (Portugal), Inovopedra – Ind. Inovadora de Rochas Ornamentais Lda. (Portugal), Município de Porto de Mós (Portugal), Universidade de Évora (Portugal), Poligrama – Granitos S.A. (Portugal), ACPMR – Associação Cluster Portugal Mineral Resources (Portugal), JULIPEDRA – Indústria de Transformação de Mármore Lda. (Portugal), Marfilipe – Mármore e Granitos S.A. (Portugal), Streamvalue Consulting Lda. (Portugal), (continued)

Sustainability) and 7th (i.e. Maintenance) dimensions of BIM in international markets of stone, using a previously tested BIM platform (i.e. Inovstone4.0), (iii) the development of new "green" coatings for the markets and (iv) the valorisation of stone through the use of new "green" coatings. This WP will also work on a BIM Marketplace platform and the development of an automatic combined scanning and 3D testing machine to measure the properties of stone blocks.

WP4 "Circular stone 4.0" – The WP has 4 activities focused on valuing raw materials that have no commercial value, developing 4.0 products, systems and technologies, which can create a new paradigm of sustainability for Natural Stone, through the circular economy and responding to the challenge of zero waste.

WP5 "Smart stone factory4.0" – The simultaneous coexistence of "collaboration and competition" (coopetition) is a relevant topic related to collaborative networks, business ecosystems and other types of long-term, typically competitive partnerships. This is the solution suggested to guarantee the economic sustainability of industries with a high incidence of industrial SMEs in European territory. This WP will focus on activities that allow the development of new digital and sustainable processes for Natural Stone.

WP6 "Stone sustainable empower" – Based on sustainability, this WP covers all emerging areas for European competitiveness: digitalization, decarbonization and people. The focus is to train and provide people with tools and resources through theoretical and practical knowledge in real production environments. This WP will also study the sector's ecological footprint, in order to find a reference/starting point for improvement. This WP is transversal to all the innovations that will result from the other WPs. The objective is to connect technological innovation to skills innovation.

WP7 "Promo stone" – The aim is to structure a publicity plan around the STONE BY PORTUGAL brand: (i) technological dissemination, and (ii) technical-scientific dissemination of results, adapting the content disclosed to different target audiences, and ensuring the visibility of the project in the market and industry, the creation of relationships with new partners, scientific communities and commercial organizations. Additionally, it is expected that the contribution of this Mobilizing Agenda will represent a lever for the development of new innovative initiatives by partners and competitors, thus promoting business competitiveness and constant innovation in the natural stone sector and also the Portuguese stone brand. Furthermore, this WP includes the management and coordination of the Agenda, ensuring its execution and, simultaneously, creating performance evaluation metrics.



Figure 1. Funding of Sustainable Stone by Portugal.