



Padova 15-17 September 2026

ABSTRACT BOOK

a cura della Società Geologica Italiana



SGI-SIMP 2026 PADOVA

Ter(r)ra: Risorse, Rischi, Rispetto



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Technological evolution for local and low-impact utilization of strategic raw materials for CERamics (TELLUS4CER): Project presentation

Vacchi M.¹, Iattici L.¹, Settembre Blundo D.¹, La Russa M.F.², Parisi F.², Ruffolo S.A.², Cilluffo G.³, Ganci I.³, Montana G.³ & Randazzo L.^{*3-4}

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Keywords: waste valorization, sustainability, resilient ceramic industry.

The Italian ceramic sector, while internationally recognized for its excellence, faces growing challenges related to environmental sustainability, resource management, and process efficiency. Its dependence on Critical and Strategic Raw Materials (CRM/SRM) and high energy consumption calls for a transition toward more circular and efficient production models. The TELLUS 4CER project - Technological Evolution for Local and Low-impact Utilization of Strategic Raw Materials for Ceramics - funded by the Italian Ministry of the Environment and Energy Security (MASE)¹, addresses these challenges by developing innovative solutions for the recovery and valorization of Recycled Raw Materials (RRM). The project aims to reduce environmental impact and improve sector efficiency by overcoming technological and operational barriers to RRM integration through advanced separation, purification, and digital traceability strategies. TELLUS 4CER is based on three main pillars: optimization of RRM treatment processes, eco-design of innovative ceramic formulations, and supply chain digitalization using statistical tools and simulation models. These approaches will enhance process efficiency, increase supply security, and reduce the carbon footprint of ceramic production. Through industrial research and pilot-scale validation, the project will develop technologies for selective RRM recovery and impurity removal, alongside optimized ceramic formulations with mechanical and aesthetic performance comparable or superior to conventional materials. A key innovation is the implementation of a digital passport for RRM, ensuring full traceability and certification of origin, quality, and environmental impact. The project also promotes industrial symbiosis with sectors such as construction and metallurgy to maximize waste reuse. Expected outcomes include increased use of RRM, reduced CO₂ emissions, and improved resource efficiency, supporting the transition toward a more sustainable and resilient ceramic industry. Leveraging digital technologies and artificial intelligence, TELLUS 4CER(<https://www.tellus4cer-innovability.it/>) will accelerate the adoption of circular solutions in line with circular economy and Industry 5.0 objectives.

Progetto di Ricerca Industriale e Sviluppo Sperimentale cofinanziato dal Ministero dell'Ambiente e della Sicurezza Energetica. Avviso pubblico: Progetti di ricerca, sviluppo e innovazione tecnologica sull'intera catena del valore delle Materie Prime Critiche (MPC) e delle Materie Prime Strategiche (MPS). Iniziativa internazionale: Mission Innovation 2.0 | Missioni: Green Powered Future (GPFM) - Clean Hydrogen (CHM). Decreto di riferimento: DM n. 386 - 17/11/2023. Numero progetto: MI_MPC_00023.