Environmental Sustainability: Natural and Energy Resources

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UNICAM, Scuola di Scienze e Tecnologie, Sezione di Geologia

Research Day UNICAM
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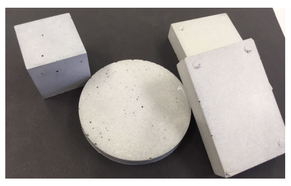
FROM WASTE TO RESOURCE

Recovering and recycling of materials for new sustainable products and processes

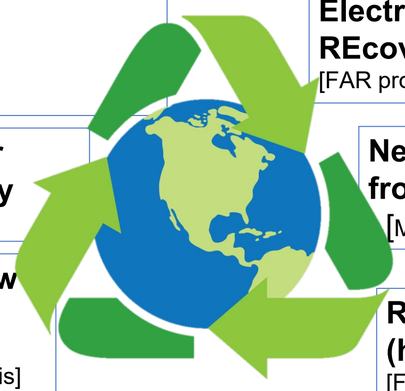
The recovery and valorization of industrial and urban waste aim to reduce exploitation of natural resources and emission of CO2 in the atmosphere, reducing landfilling favoring circular economy and increasing the sustainability level in the industrial sector. These studies are characterized by high levels of recovery rates of the waste used, ecosustainable characteristics of the new materials and processes developed, excellent physical-mechanical performance of the new high-grade products for the selected applications.

Recycling of Construction and Demolition Waste for new materials for the construction sector
[PRIN 2022 RUB2RES project E.Paris]
[POR/FESR NUOVAVITA project E.Paris]
[COESIONE TRAILEDLAB project E.Paris, P.Stabile]

Vitrification of bottom-ash for recycling in the glass industry
[VITRI project P.Stabile, M.Carroll]

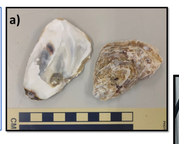


Industrial and urban wastes for new ecosustainable products
[EU-LIFE ECOTILES project E.Paris]
[POR/FESR STRADA CIRCOLARE project E.Paris]
[FTIM MASKVERDE project E.Paris]

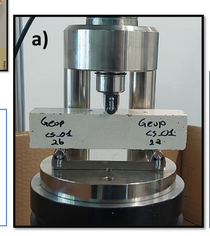


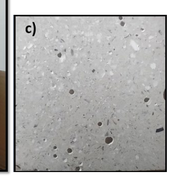
Recovery of critical elements from WEEE (Waste from Electrical and Electronic Equipment) [MITE project G.Giuli]
REcovery of critical Metals from INdustrial wastE (REMINE)
[FAR project G.Giuli]

New composite materials obtained from sea-derived waste
[MAECI project C.Santulli]



Recycling of natural fibrous waste materials (hemp, bagasse, kenaf)
[FIBRES project C.Santulli]





GROUNDWATER RESOURCES

Assessment and Management of Groundwater Resources in the Contest of Climate Change

Ongoing climate change is increasingly leading to desertification and/or aridification in Mediterranean countries. This problem, coupled with the increase in services related to the availability of water resources, has led to an exponential increase in the number of studies and research on the quantification, management and protection of groundwater resources. The development of conceptual and numerical models, including predictive models, describing the circulation mechanism of these resources and the possible scenarios of their future use is a challenge that is both strategic and necessary. The research group works closely with authorities and operators of water extraction plants within the framework of research contracts and participation in national and international tenders in order to assess the availability of groundwater resources and develop sustainable strategies for their use.

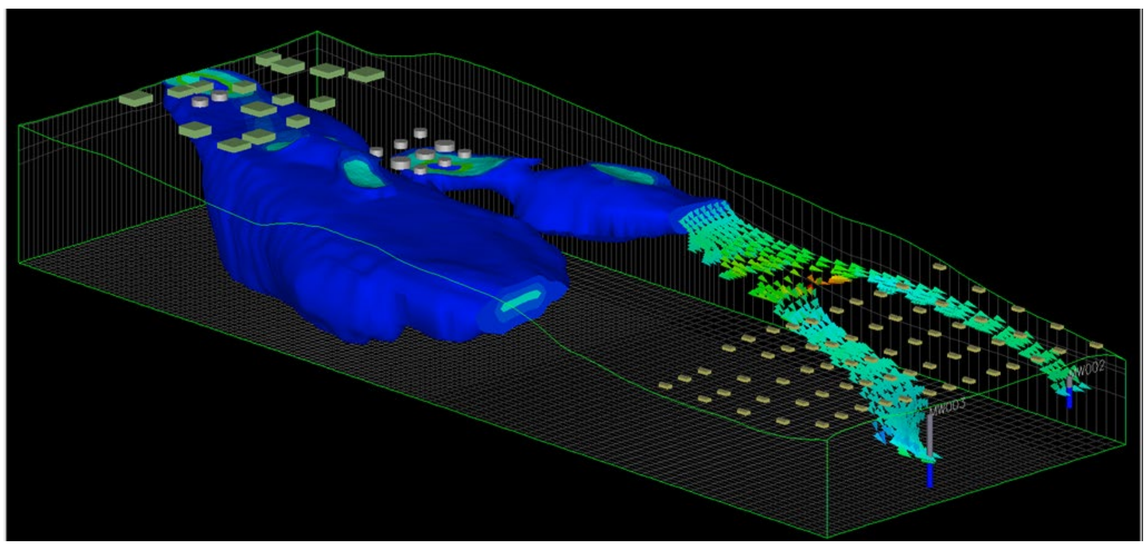


Figure 1. 3D numerical model and simulation of Groundwater flow of an aquifer

Figure 2. San Chiodo Spring (Umbria-Marche Appennine). Detail of the inner of the water intake structure

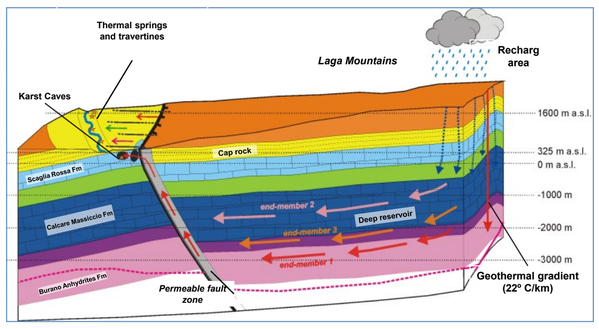
ENERGY RESOURCES

Geothermal Energy

In the renewable energy sector, within the Structural Geology research group, several projects (CUIA and MAECI-Great Relevance) have been funded for the definition and study of high and medium enthalpy geothermal reservoirs in southern Argentina, both in the sub-Andean area and in the Andes (Puna Plateau). Additionally, medium and low enthalpy studies have been conducted in our region, particularly in the Acquasanta Terme area (AP). The results have been published in high-impact international journals, and research activities are still ongoing in Argentina, involving researcher and student mobility through the Erasmus+ KA171 project.

ARGENTINA:

- **system of Rosario de La Frontera**
- **TuzglGeothermale - Tocomar system (Puna plateaux)**



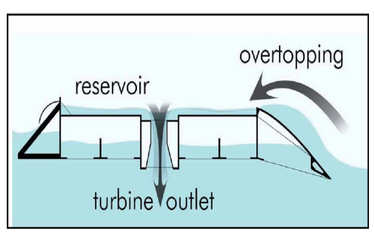
MARCHE:

- **The geothermal system of Acquasanta Terme**
- **Evaluation of geothermal exchange potential**
- **Energy requalification of buildings (Progetto FAR 2015-2016)**

Energy from Waves

Unicam's Geology Division was also a partner in a European Interreg Italy-Croatia project, building on previous studies of coastal dynamics and coastal regimes to propose solutions that integrate coastal protection with energy production from waves. As part of the project activities and deliverables, a pre-feasibility study was conducted for the Port of Ancona, aiming at the production of blue energy from the sea. Ongoing studies are currently assessing the energy potential along certain sections of the Marche coast, with the proposed use of "active" breakwater reefs that provide coastal erosion protection while simultaneously generating energy.

Interreg Italy - Croatia COASTENERGY EUROPEAN UNION



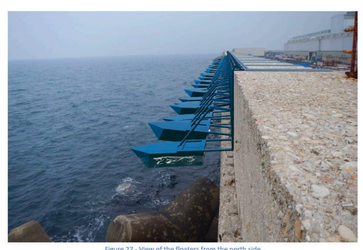


Figure 27 - View of the floaters from the north side

Interreg Italy - Croatia COASTENERGY EUROPEAN UNION

ECOPRO energia e sostenibilità 4.0

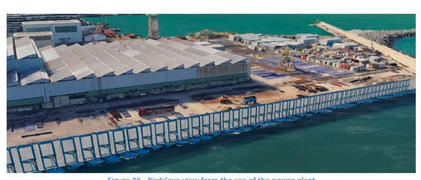


Figure 26 - Birds'eye view from the sea of the power plant