

# CleanStone Final Project Conference

Rückgewinnung und Aufwertung von Steinaufbereitungsabfällen  
für ökologische Nachhaltigkeit

Recupero e valorizzazione degli scarti di lavorazione lapidea  
per la sostenibilità ambientale

## 31/03/2022

Partner di progetto



**UNIVERSITÀ  
DEGLI STUDI  
DI UDINE**  
hic sunt futura

800  
ANNI



UNIVERSITÀ  
DEGLI STUDI  
DI PADOVA

**ICEA**



**KÄRNTEN**  
University of  
Applied Sciences

  
**Confartigianato**  
VICENZA

**E. C. O.**

# CLEANSTONE

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## PRESENTATION OF THE PROJECT Cristian Marchioli (Univ. Udine)

Recupero e valorizzazione degli scarti di lavorazione lapidea per la  
sostenibilità ambientale

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# The Project

**CLEANSTONE** is an interdisciplinary project aimed at helping the stone-manufacturing sector turn into a modern, competitive sector based on technologies with a low environmental impact.

The project is based on **trans-national cooperation** among academia and industry, including quarrying companies operating within the project area.

The objective of CLEANSTONE is to analyse the extraction and manufacturing process for various types of natural stone, each one subject to different legal constraints and restrictions. This characterization requires:

- to analyse the natural-stone fabrication sector in the Italy/Austria region
- to identify and implement protocols and best-practices to significantly increase the efficiency and productivity of the process
- to identify and implement protocols and best-practices to minimize the environmental impact during the extraction and processing of minerals
- to identify the best recycling options for waste materials produced, reducing as much as possible the amount of stone waste disposed of into the environment
- to evaluate recycling options based on the local industrial context
- to disseminate the know-how produced by the project, thus making the sector more competitive.

# The Project

**CLEANSTONE** is the first attempt to integrate recycling and re-use techniques in a single framework designed specifically for businesses in the stone-manufacturing sector (mainly SMEs).

Main results:



- a set of **guidelines/criteria** to evaluate the environmental impact of stone fabrication, and innovative protocols which, if implemented, may allow for the enhancement of the economic value of waste products via **conversion into secondary raw materials**

- a **White Paper** containing proposals to modify the current legislation regarding the disposal of waste products in Austria and Italy, which at present does not fully recognize the potential value of re-use/re-cycling





# The Project

Key aspects:



Focus on environmental sustainability



Cooperation between companies and the world of research



Promotion of technological advancement and innovation

WEBSITE:

<https://www.cleanstone.eu/>

## A Little Bit of History...

### Previous EU projects in the stone sector

- 2005-2008: **PRO-STONE** *Eco-efficient and high productive stone processing by multifunctional materials*
- 2008-2010: **CLEAN CUT** *Development of a clean and energy efficient cutting system for the 12 millions tons of granite blocks yearly processed in enlarged EU*
- 2010-2012: **XSTONE** *Development of novel stone sawing equipment to valorise undersized and irregular stone blocks for a more rational use of natural stone quarry resources*
- 2012-2014: **HYDRASPLIT** *Development of an environmentally friendly and cost-effective modular hydraulic rock-splitter system for efficiently breaking large rocks for an improved use in stone quarry extraction*
- 2012-2015: **ROOFOF ROCK** *Limestone as the common denominator of natural and cultural heritage along the karstified part of the Adriatic coast*

# The Consortium

## University of Udine

Dept. Engineering and Architecture

## University of Padova

Dept. Civil, Environmental and  
Architectural Engineering

## Fachhochschule Kärnten

Dept. Civil Engineering and  
Architecture

## Confartigianato Vicenza

## E.C.O. Institut für Ökologie

## Associate Partners

Verona Stone District SCARL  
MINERAL ABBAU GmbH  
Consorzio Pietra Piasentina





(From raw material to sustainable products in 8 steps!)

Create a mine plan to map and coordinate the activity on site.

"We use drone and satellites to accurately map the site"

"The safe use of explosives on site is one of the key priorities here!"

**STAGE 8**  
Products recycled  
or re-used  
wherever possible  
to reduce lifetime  
carbon emissions.

"Lime can be used to capture carbon dioxide and reduce emissions"



Site

**STAGE 7**  
Products used to create sustainable solutions that positively impact on peoples lives.

"Limestone heated in the to turn it into ('caking')

**STAGE 5b**  
Add extra value to processed materials using additional processing technologies.

**STAGE 5a**  
Process materials using crushing and screening technologies.

**STAGE 4**  
Transport materials for processing (known as load and haul).

**STAGE 6**  
Transport finished products to customers and partner organisations.

**STAGE 2**  
Remove the top layer of material (the 'overburden').

"As Site Manager, I'm responsible for the safe and efficient operation of the site and its people."

**STAGE 3**  
Drill holes, insert explosives and blast rock face to loosen material.

**Support and Administration Services**

The industry takes a **WHOLE LIFE APPROACH** to quarrying. This aims to reduce the impact of quarrying at all stages of the process **including final use or recycling**.

**JOB ROLES**  
**KEY**

- ADM Administrators
- BLAE Blasting Engineer
- BLAS Blasting Supervisor

-  CMT Commercial Team
-  EGEO Engineering Geologists
-  ENG Engineers

- GEO Geologists
- HR Human Resources
- HS Health and Safety

-  **LARC** Landscape Architect
-  **MAT** Maintenance Engineers
-  **PFM** Plant Fleet Manager

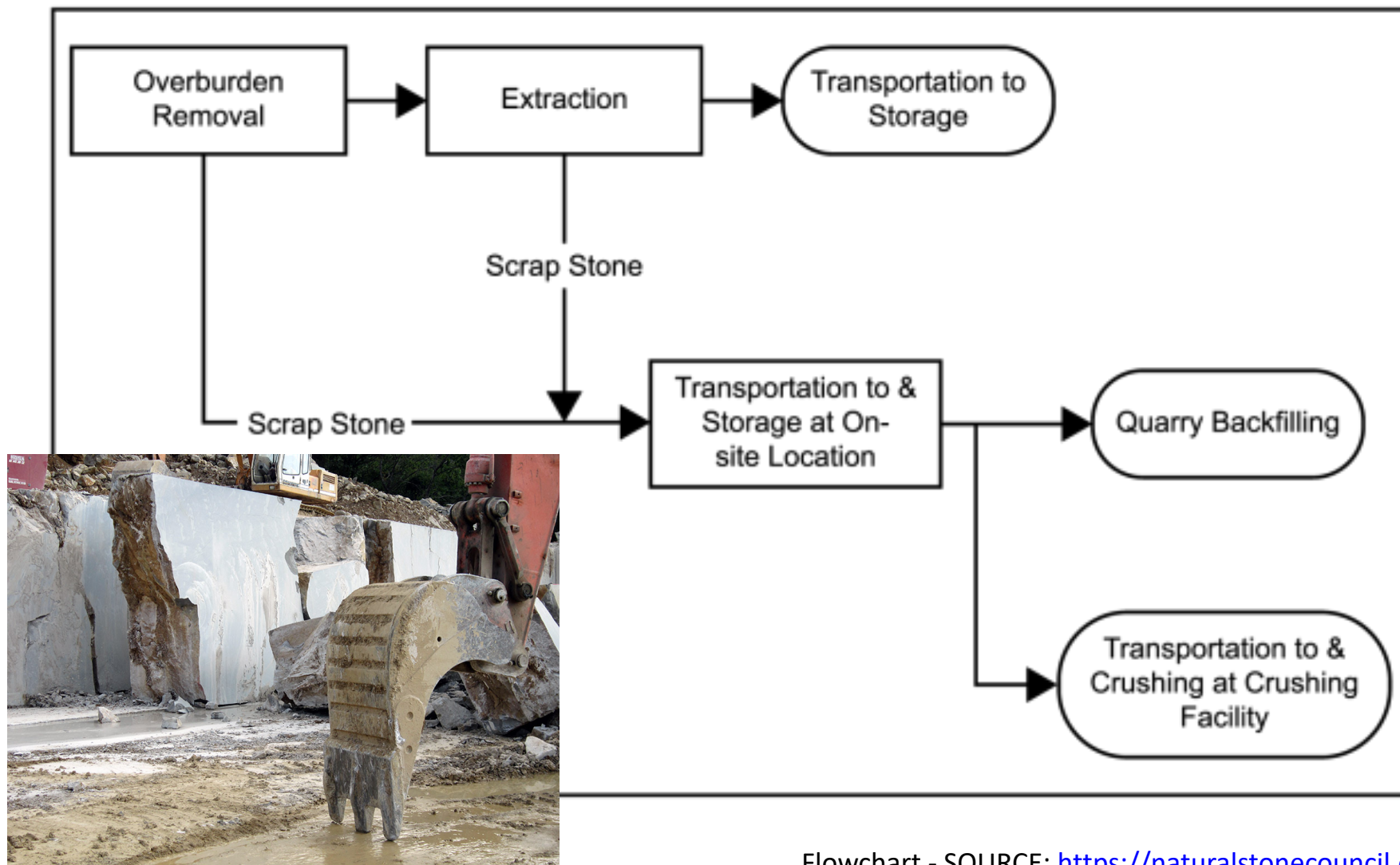
- PE Processing Engineers
- OPT Operators
- QCT Quality Control Technicians

- QS Quantity Surveyor
- STM Site Manager
- TRN Training and Competency

SOURCE: <https://www.quarrying.org/>



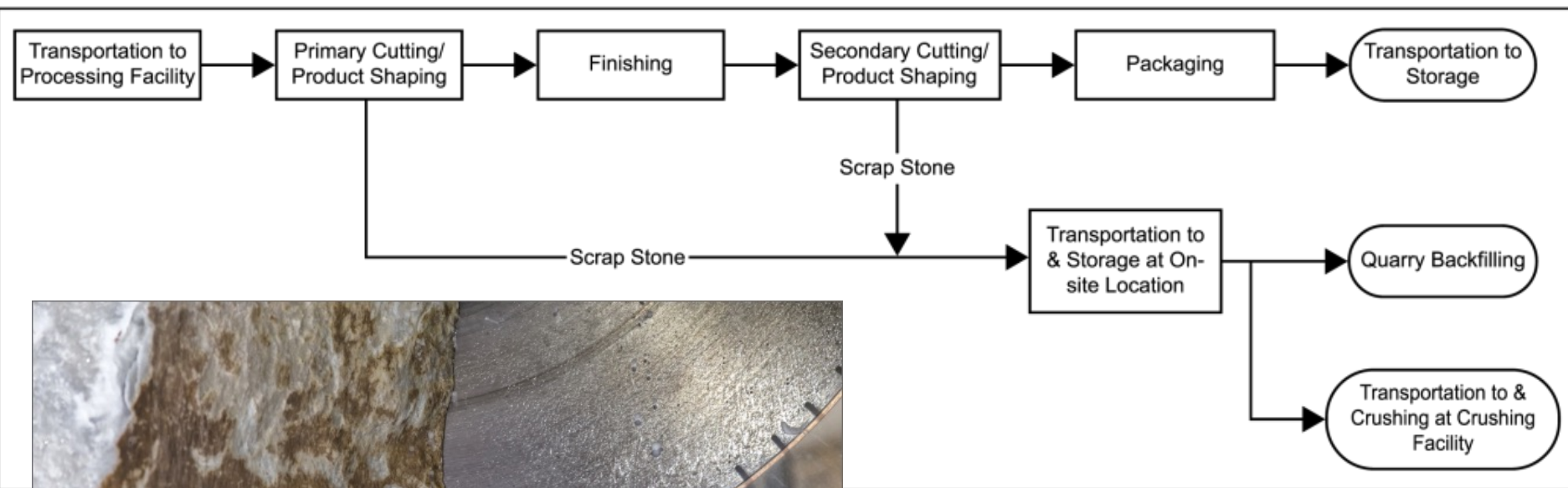
# The Extraction Process



Flowchart - SOURCE: <https://naturalstonecouncil.org/>

Picture – SOURCE: <https://www.sappt.it/en/the-quarries-of-the-piasentina-stone/>

# The Cutting Process

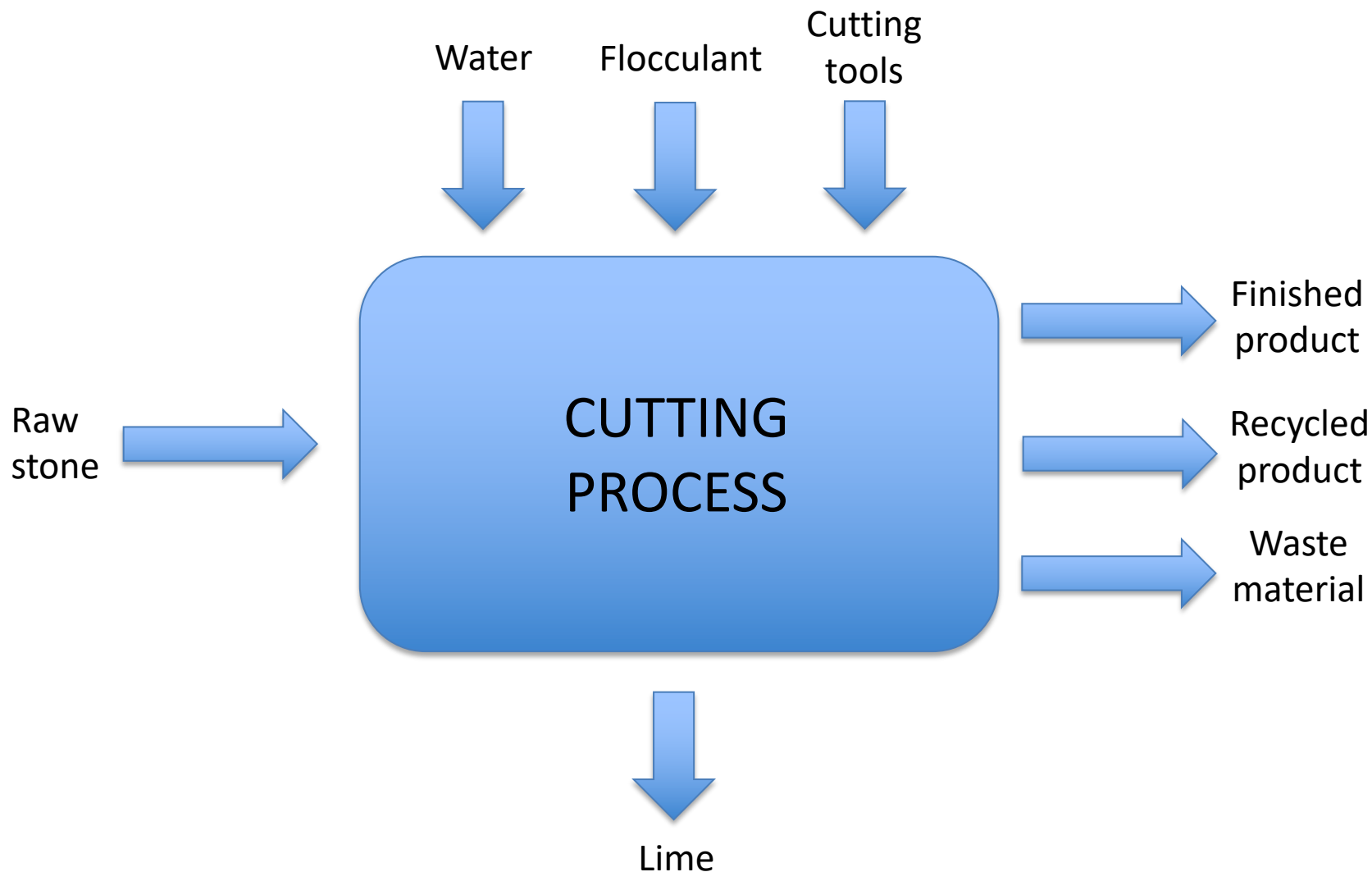


Flowchart - SOURCE: <https://naturalstonecouncil.org/>

Picture – SOURCE: <https://www.cleanstone.eu/>



## The Cutting Process: How We See It...



# The Project Work Packages

WP	Description
WP1	Project Management (Ref. Univ. Udine)
WP2	Communication (Ref. Confartigianato)
WP3	<b>Development of innovative protocols for assessing and reducing the environmental impact of stone processing</b> <b>(All partners involved)</b>
WP4	<b>Identification/development of new best practices for the recovery of waste as secondary raw material</b> <b>(All partners involved)</b>



## Summary of Milestones

### **WP3 Development of innovative protocols for assessing and reducing the environmental impact of stone processing**

Milestone	Description
M3.1	Development of numerical models
M3.2	Analysis of local legislation (Italy/Austria) for quarry's waste disposal
M3.3	Environmental impact assessment of dispersion of quarry's dusts
M3.4	Identification of protocols/best practices to minimize the environmental impact of quarrying activities
M3.5	Environmental analysis of stone cutting process

## Summary of Milestones

### **WP4 Identification and development of new best practices for the recovery of waste as secondary raw material**

Milestone	Description
M4.1	Identification of testing protocols for the physico/chemical characterization of waste material aimed at evaluating the recycling potential
M4.2	Physico/chemical characterization of waste material
M4.3	Identification of recycling options
M3.4	Economical assessment and ranking of recycling options



## Organization of Activities

- **University of Udine** lead partner for all numerical simulation activities
- **University of Padova** lead partner for all mineralogical processing activities
- **FH Karnten** lead partner for all activities concerning construction material processing and conservation
- **Confartigianato Vicenza** lead partner for the exploitation strategy and for the networking activities
- **E.C.O.** lead partner for all activities concerned with evaluation of environmental impact of stone processing activities

**Thank you  
for your kind attention!**