

Leoben, 12. March 2026

Master's Thesis

REQUIREMENTS FOR A SUCCESSFUL DECARBONISATION OF SMALL AND MEDIUM-SIZED QUARRY OPERATIONS

BACKGROUND

The transition to green energy, e.g. electric, is essential for decarbonising quarrying operations and making them fit for future generations. This transition, however, does not come without obstacles as it involves a series of changes and restrictions that need to be addressed beyond equipment replacement, e.g. energy infrastructure. In order to be able to evaluate a specific decarbonisation project, companies need to be able to assess certain components of the system. Amongst these are, e.g. fleet requirements, production plans, energy availability on-site, and grid constraints.

OBJECTIVES

The goal of this master's thesis is to evaluate different decarbonisation options for a given quarry, focussing on the CO₂ avoidance costs (€/CO₂ saved). This elaboration shall include a thoughtful and thorough investigation of relevant variables and parameters, the assessment of uncertainties and the actions to address them (e.g. missing data points, future technology development), and extrapolation capacities to other sites/projects beyond those tackled in this thesis.

METHODS

The successful student will work on real projects of an Austrian quarry operator. The activities will include:

- Literature research regarding decarbonisation alternatives for quarries
- Analysing the existing on-site working environment, electrical grid and infrastructure, and its availability and usability
- Work in close collaboration with OEMs for getting better knowledge of future technological developments
- Identify the relevant variables and parameters for decarbonisation scenarios evaluation like e.g. grid constraints, energy storage, etc.
- Conduct techno-economic evaluation of decarbonisation scenarios for a given quarry site, leading to integrated view on both technical, economic and environmental factors.

LANGUAGE	START DATE	RESPONSIBLE PERSON
English	As soon as possible	Priv.-Doz. Dipl.-Ing. Dr. Philipp Hartlieb philipp.hartlieb@unileoben.ac.at