

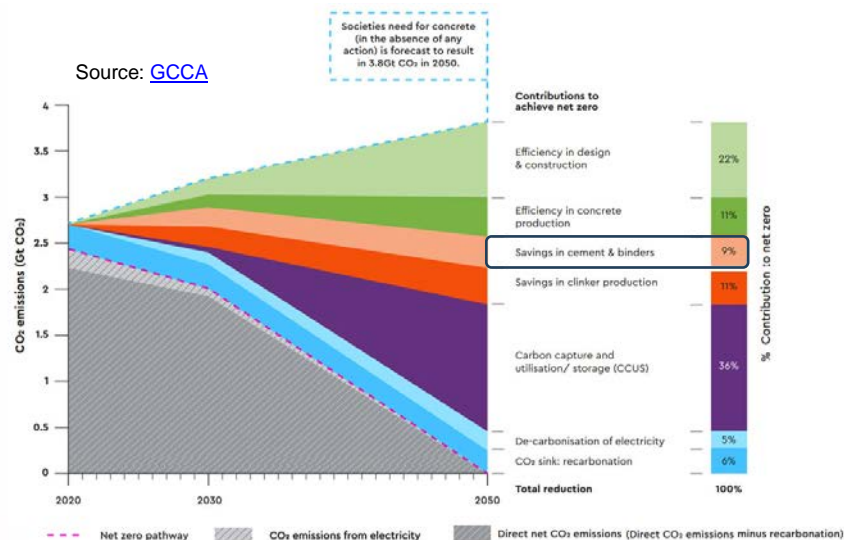
## Masterarbeit (MA)

# Investigating the Performance and Phase Assemblage in Low-Clinker Alkali-Activated Hybrid Binders

Cement and concrete are essential to modern life, forming the foundation of our buildings and infrastructure. While cement production accounts for nearly 7% of global CO<sub>2</sub> emissions, the industry is proactively addressing this challenge through clear roadmaps. The chart presented here, sourced from the Global Cement and Concrete Association, highlights the critical role of binder innovations in reducing emissions across the sector. This research aligns with the broader vision of developing more sustainable cement systems, helping to build a more resilient future.

A central strategy for lowering emissions is reducing clinker content by incorporating supplementary cementitious materials such as natural pozzolanas or calcined clays. These materials are abundant and environmentally sustainable, but their use at high replacement levels can alter hydration behavior and reduce early-age strength development. To address this, alkaline activators are commonly introduced to accelerate hydration reactions and enhance early performance. However, these activators also modify the phase assemblage formed during hydration, potentially influencing long-term mechanical properties and durability. Therefore, a deeper understanding of how these systems behave—both mechanically and chemically—is essential for advancing the design of robust, low-clinker cements and resulting concretes.

This project aims to use a multi-technique approach to gain deeper insight on the impact of alkaline activators into hydration mechanisms and phase assemblage in ultra-low clinker hybrid binders, ultimately supporting the creation of next-generation, low-carbon cementitious systems.



## Hinweis

Bearbeitungsbeginn: Ab April 15<sup>th</sup> 2025

## Kontakt

Für nähere Informationen und weitergehende Fragen wenden Sie sich bitte an:

Hania Miraki, M.Sc.

E-Mail: [Hania.miraki@student.kit.edu](mailto:Hania.miraki@student.kit.edu)