

# Being Concrete About Concrete: Examining the Architects' Not-So-Virtuous Material

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## ABSTRACT

In 2000, global CO<sub>2</sub> atmospheric emissions from the cement industry were approximately 829 million metric tons — 3.4% of total CO<sub>2</sub> emissions worldwide. Only fourteen years later, this percentage quadrupled to a staggering 12.9%. Sustainable architectural design and construction techniques are commonly idolized in theory but rarely pursued or enforced in practice. Material choices and the carbon levels they embody have a tremendous impact on the environment. Used in building projects ranging from pavements to dams, to high rises, to residential structures, cement and concrete are two materials demanded and revered globally by architects, engineers, and designers. The sheer volume of concrete used worldwide implies the production and use of concrete in architecture has a tremendous impact on our natural as well as built environment. Through scientific research and real-world case studies, this paper challenges the use of concrete as a primary building and design material primarily because of its high embodied carbon, which is increasingly unacceptable in sustainable building practices. This research argues that a combination of approaches including greater retention of existing concrete structures and sustainable improvements on concrete must become standard practice as well as the use of alternative construction systems and materials to produce a greener future without compromising structural and design integrity.



Figure 1. Global Warming Potential (DWP, concrete). (Source: Materialepyramiden.dk. "Byggeriets Materialepyramide," 2019. <https://www.materialepyramiden.dk>).

## Global cement production has risen sharply, but appears to have levelled off

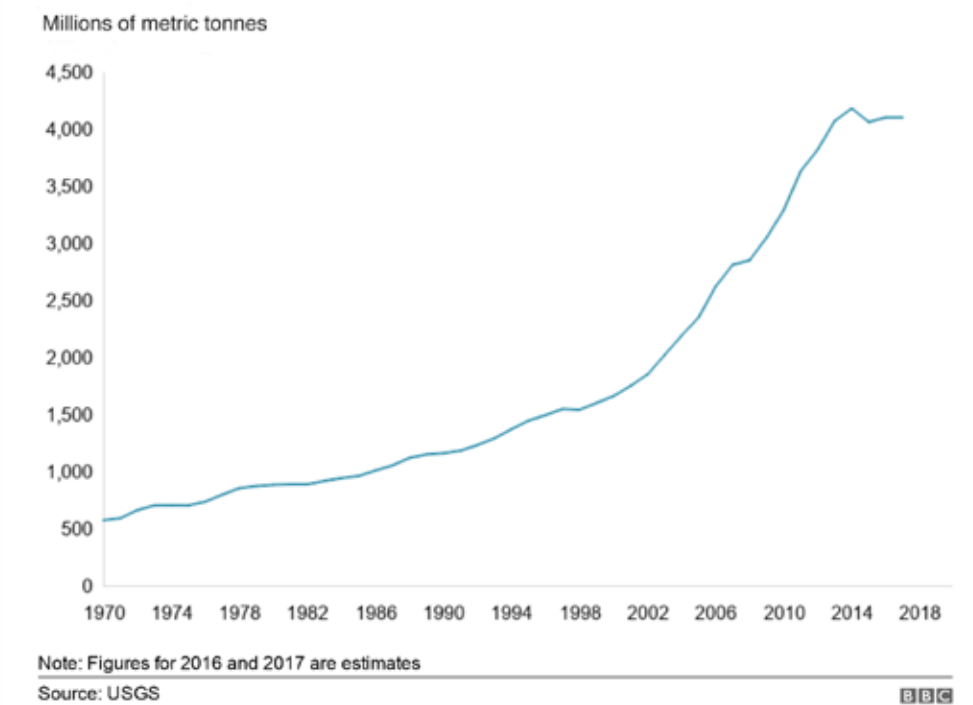


Figure 2. Cement production. (Source: Rodgers, Lucy. "Climate Change: The Massive CO<sub>2</sub> Emitter You May Not Know About." BBC News. BBC News, December 17, 2018).

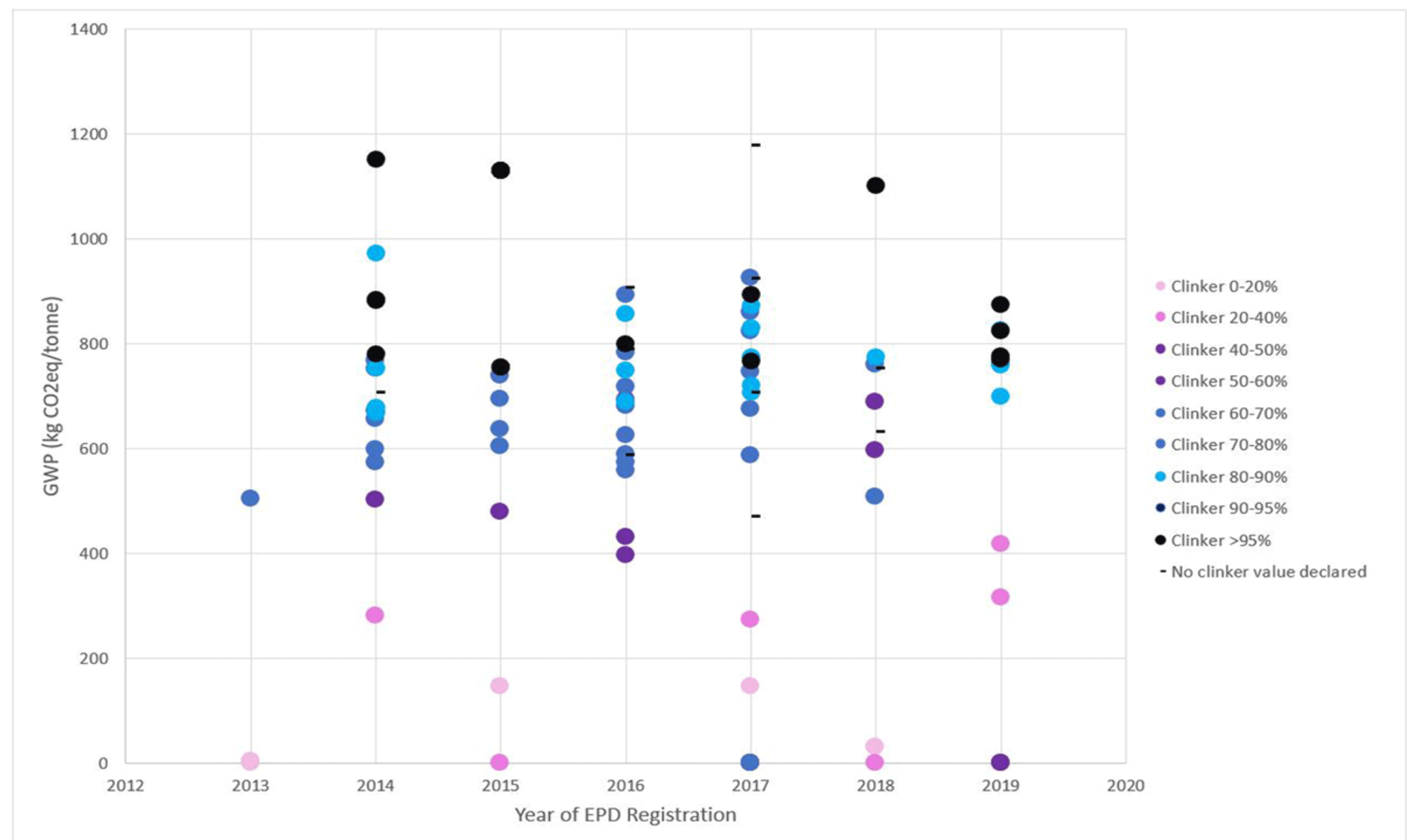


Figure 3. CAnderson\_GraphGlobal warming potential (GWP) from cementitious Environmental Product Declarations (EPD) by year and clinker content. (Source: Anderson, Jane, and Alice Moncaster. "Embodied Carbon of Concrete in Buildings, Part 1: Analysis of Published EPD." Buildings and Cities 1, no. 1 (2020): 198–217. <https://doi.org/10.5334/bc.59>).