



LIFE CYCLE ENVIRONMENTAL PERFORMANCE OF USING SUBSTITUTION FUELS IN CEMENT PRODUCTION



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Introduction

Cement is one of the most used construction material but its production needs important amounts of raw materials and energy and emits pollutants to air. Producers manage to reduce fossil fuels consumption by using different types of waste in the cement kiln.

A Life Cycle analysis permits to evaluate the environmental impacts of this substitution and to highlight the main sources of these impacts.

Materials & Methods

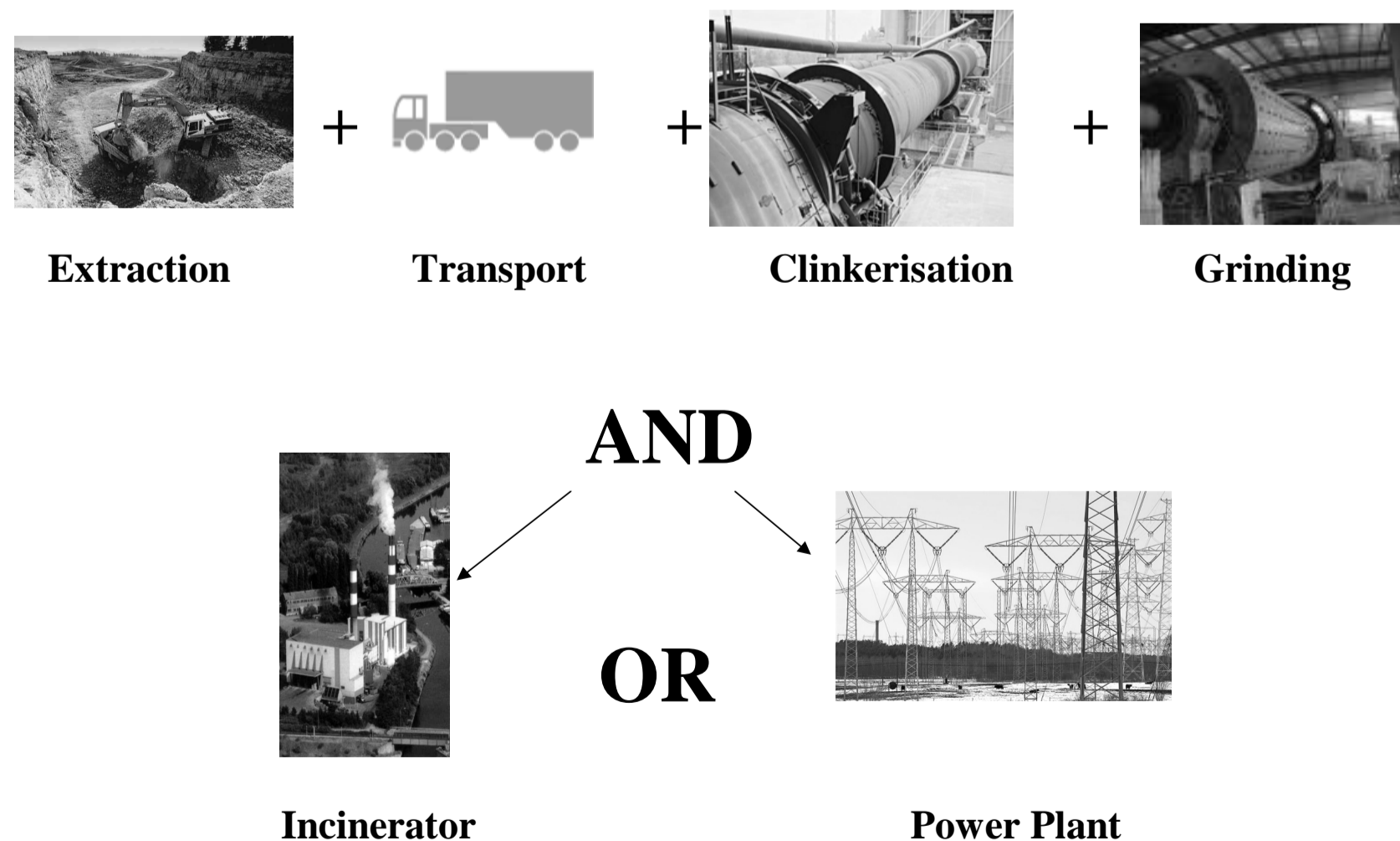
This study presents the comparison of two systems :

- A cement factory valorizing waste.
- A traditional cement factory without valorization of substitution fuels.

The functional unit, identical for both systems, has been chosen as the same amount of :

- produced cement
- valorized waste
- produced electricity

The boundaries of the systems include :

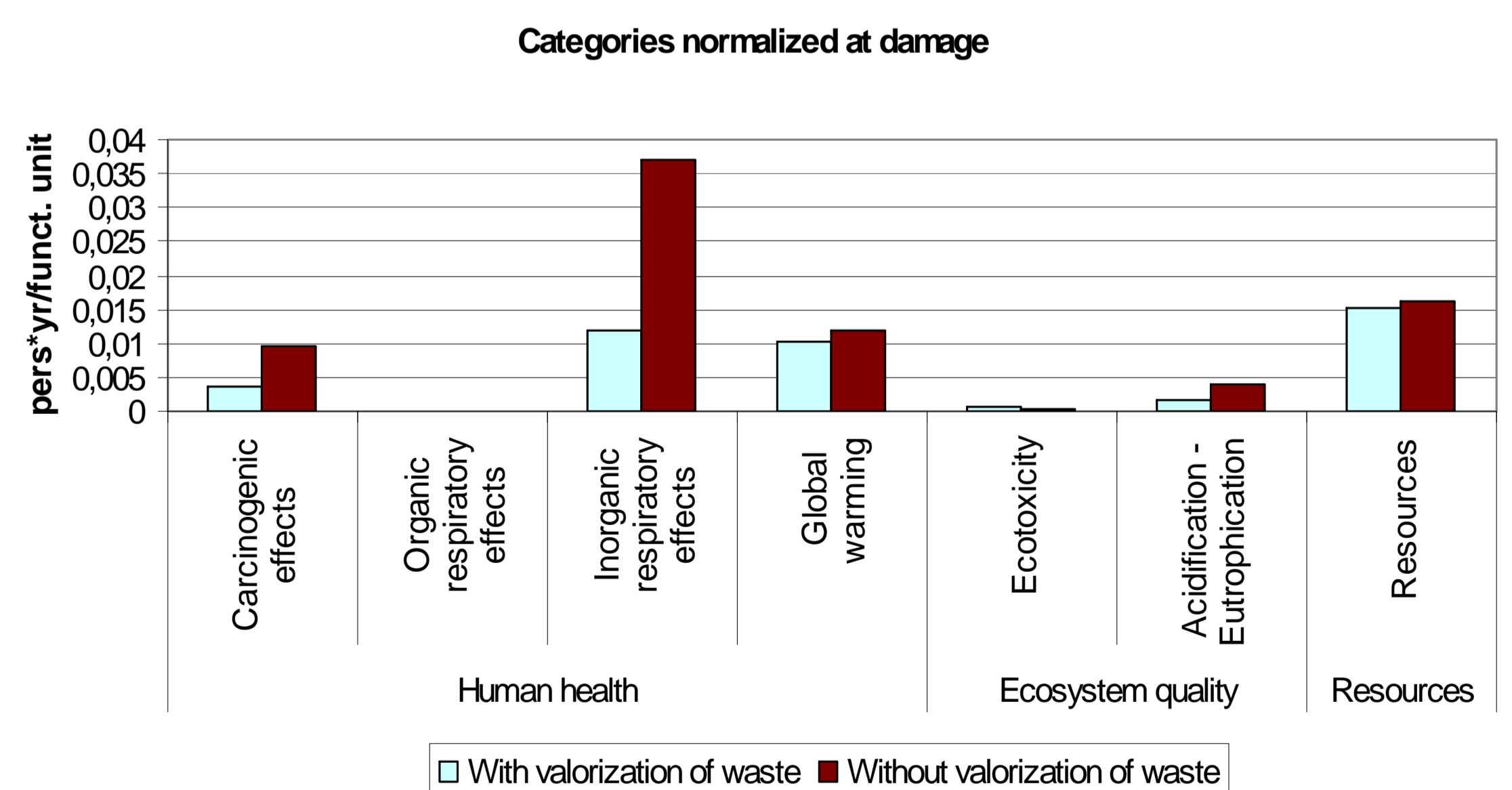


Results & Discussions

The figure below shows normalization results of both scenarios for 7 categories of Eco-Indicator 99.

Categories which contributes to the environmental impact are :

- Inorganics respiratory due to the emission of NO_x and SO_x during the clinkerisation step.
- Global warming due to the emission of carbon dioxide which comes from the clinkerisation step ($\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$) and from the combustion of the fuels.



System with waste valorization obtains an environmental gain. Impact is reduced by 15% for global warming, 7% for primary energy and 67% for inorganics respiratory.

Conclusions

The LCA methodology has been successfully applied to two systems using waste either in a cement plant or in an incinerator. For identical waste, valorization in a cement plant reaches better environmental results than valorization in an incinerator.