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Krakow



CAN GEOPOLYMER CONCRETE PAVEMENTS CONTRIBUTE TO A SUSTAINABLE AND DURABLE FUTURE?

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CO₂ IMPACT CEMENT



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***Cement* : 4,65 billion tons (2016)**

***Concrete* : ca. 13 billion m³**

7% of global CO₂ emissions

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Cement : 200 million tons

Concrete : 600 million m³

3% of European CO₂ emissions

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Cement : 5 million tons

Concrete : 14 million m³

1.5 % Dutch CO₂ emissions



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7%



3%



1,5%

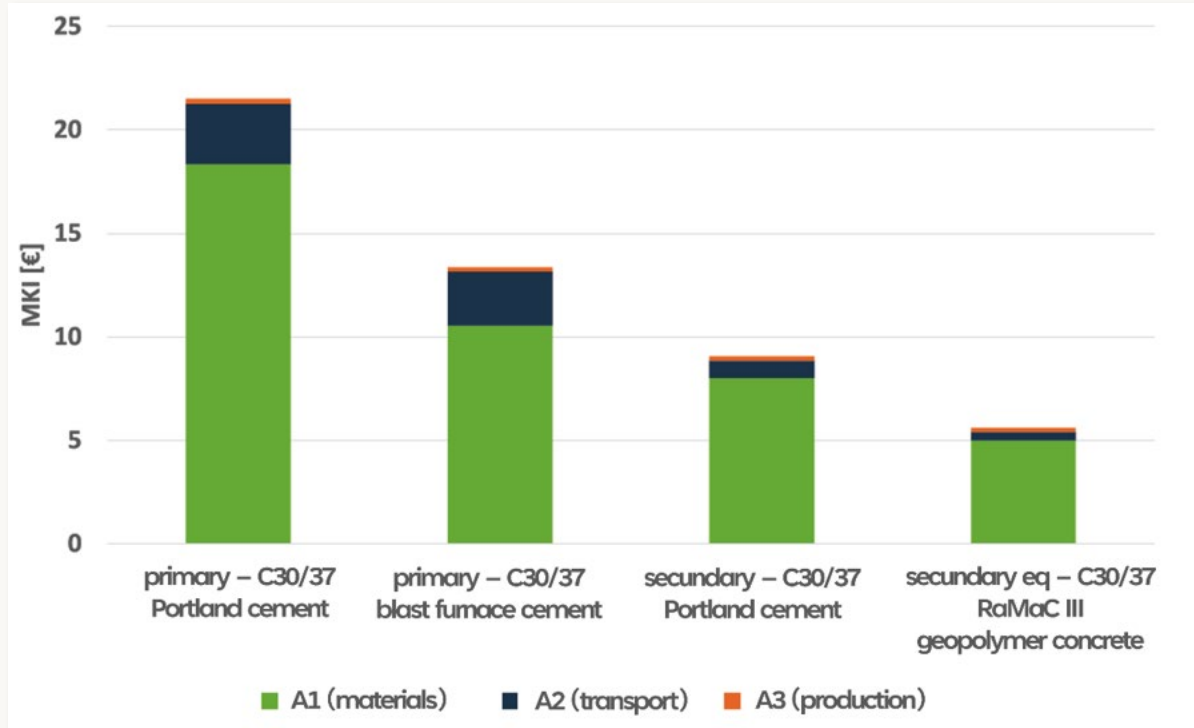
The Netherlands has been a global leader in the use of low-CO₂ cement for decades!

- High proportion of blast furnace cements
- Use of fly ash, alternative fuels and raw materials
- Transport over water

SEARCHING FOR FURTHER IMPROVEMENTS



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GEOPOLYMER CONCRETE

The first patent for a geopolymer binder (alkaline activated slag) was filed in 1908 issued in the US (US PATENT, 1908). However, large-scale application accelerated in the sixties in Russia and Ukraine in particular, driven by a shortage of Portland cement in the former Soviet Union



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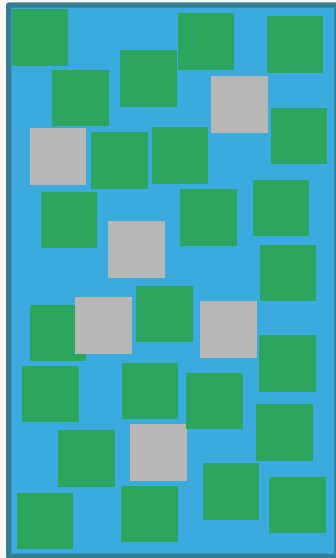


GEOPOLYMER CONCRETE



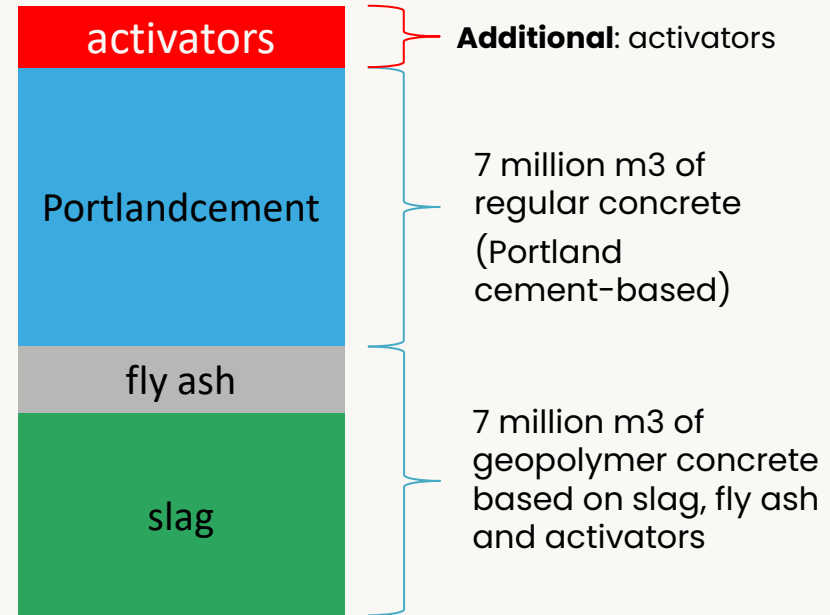
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Dutch concrete without geopolymers:



14 million m3 of regular concrete based on a mix of different types of cement and fillers. (average 50% clinker, 40% slag and 10% fly ash)

Dutch concrete with full application of slag and fly ash in geopolymer concrete:



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First pilots started in 2014



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PILOT PROJECTS



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First pilot projects started in 2016

At this moment, about 50.000 m² of road surface in the Netherlands have been made of geopolymer concrete

Most cycle paths (>95%)

Cycle paths are seen as an ideal test in practice:

- Identical method of application as through roads (machine)

- limited traffic load (limited impact in case of failure)

- almost identical load with regard to frost-thaw load (identical use of de-icing agents).

PILOT PROJECTS



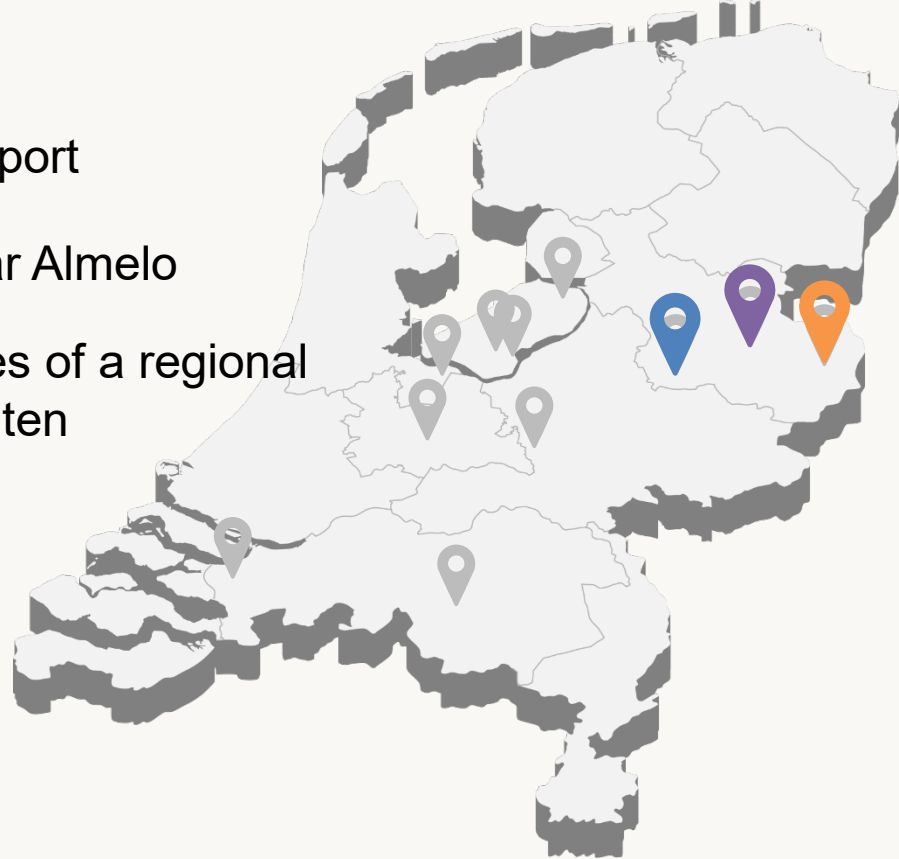
Roundabout near Twente Airport



Red colored bicycle lane near Almelo



Bicycle lanes along both sides of a regional road between Deventer - Holten



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PILOT PROJECTS

Roundabout near Twente Airport

Constructed: November 2017

Width main road: 5 m¹

Way of construction: Manual, both main road (between formwork with vibrating beam) and truck apron (with print)



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2019

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2019

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2020



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2021

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2022

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2022

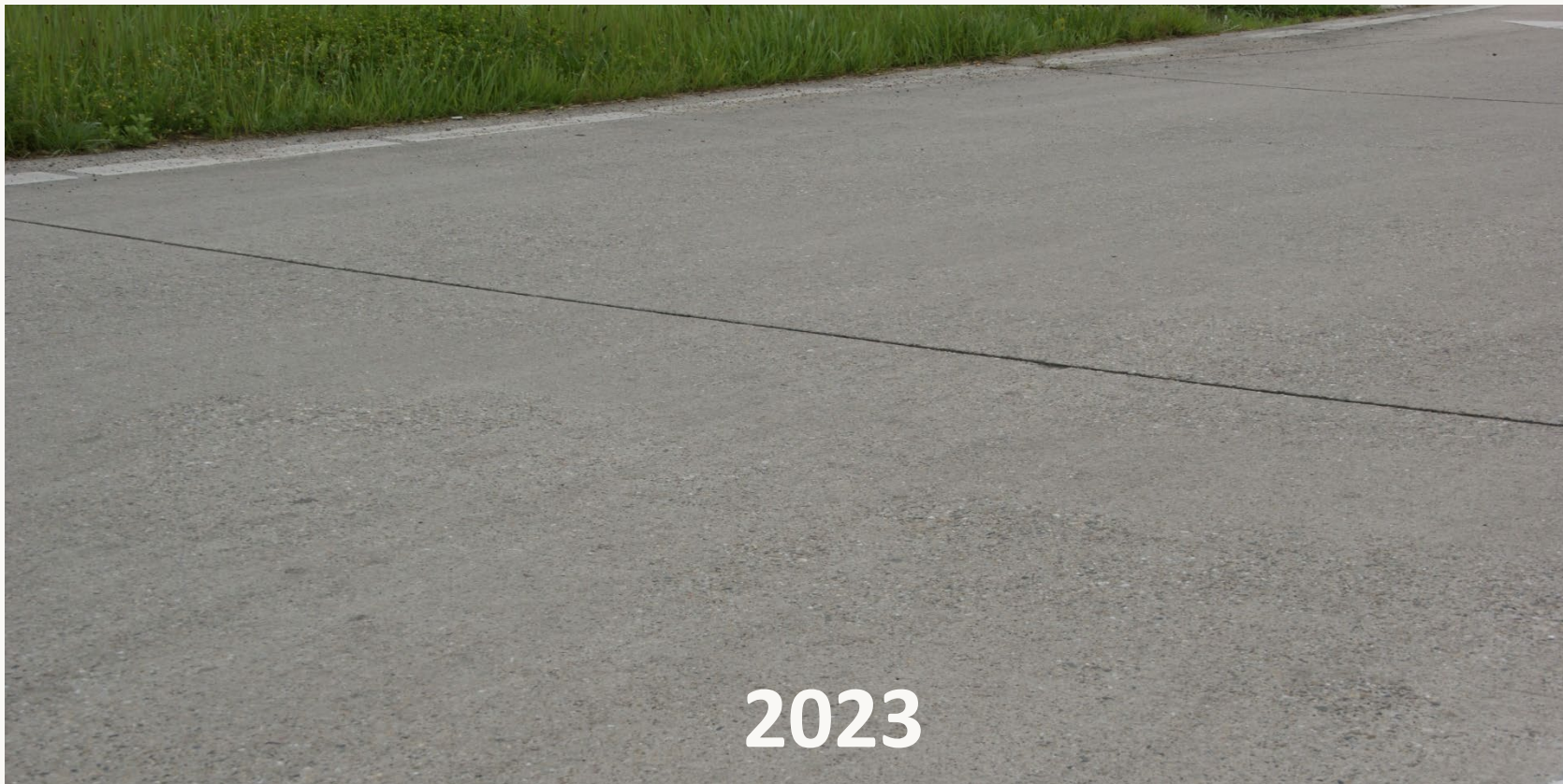


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Red coloured bicycle lane near Almelo

Constructed: autumn 2019

Width : 4 m¹

Length : about 1 km

Way of construction: Mainly with slipformpaver. Additional parts near crossings: manual



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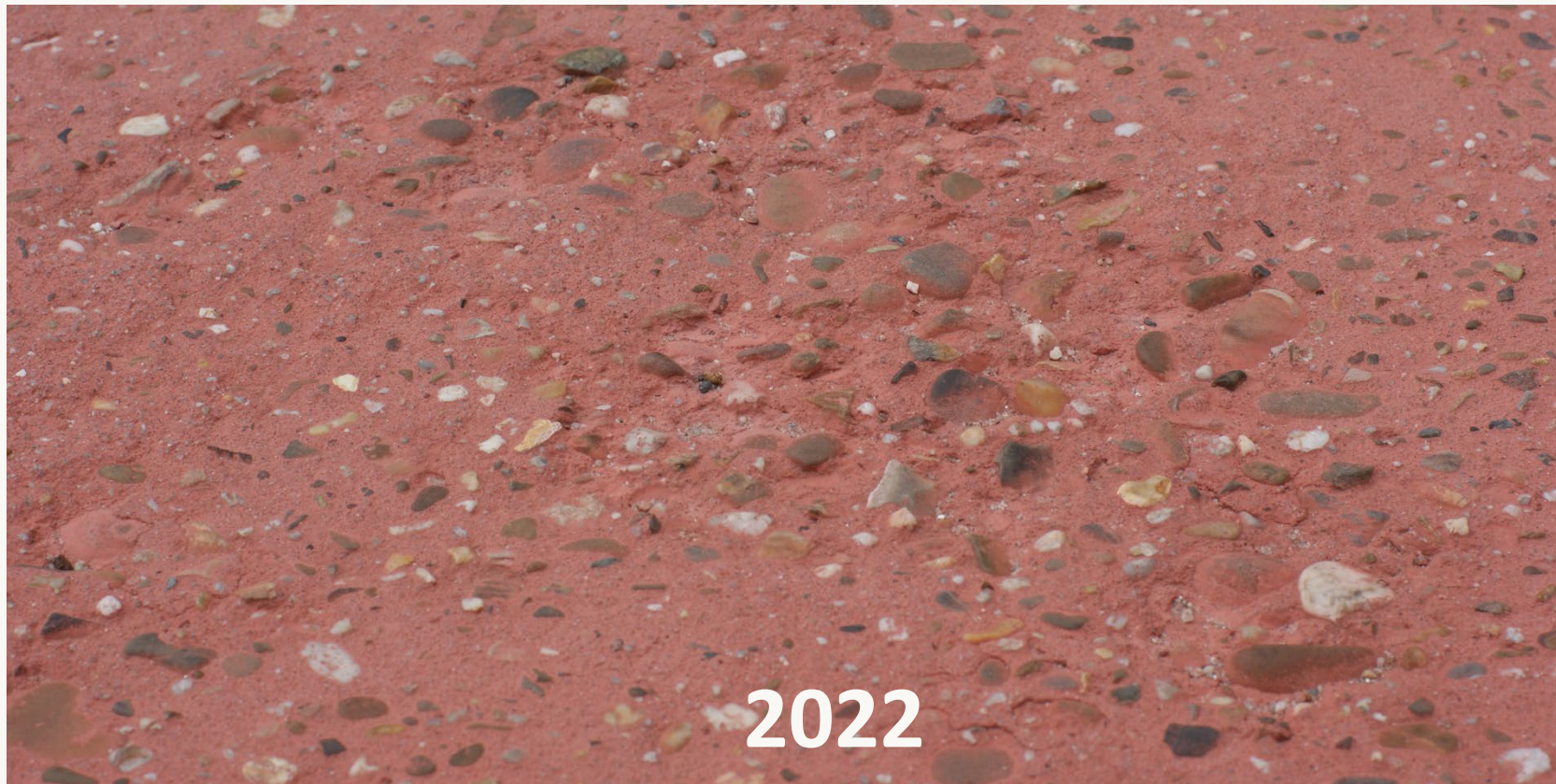


2022

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Bicycle lanes along both sides of a regional road between Deventer – Holten

Constructed: autumn 2019

Width : 2,25 m¹

Length : about 11 km

Way of construction: Slipformpaver



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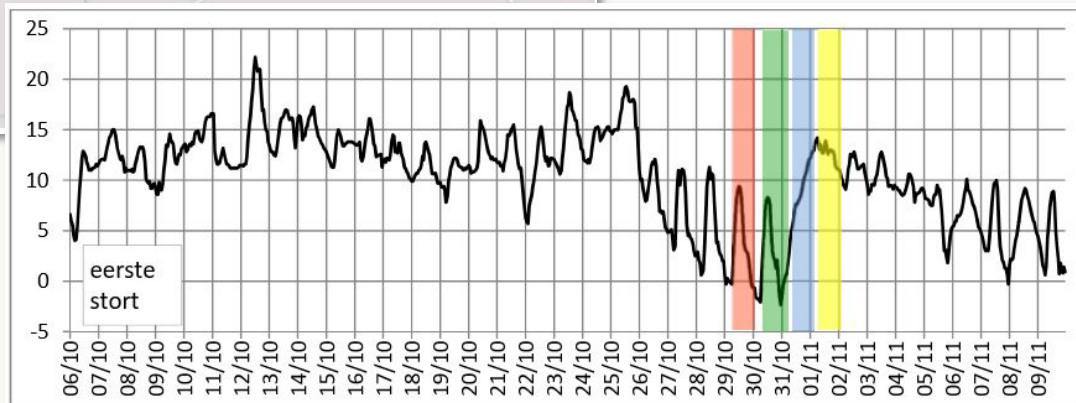
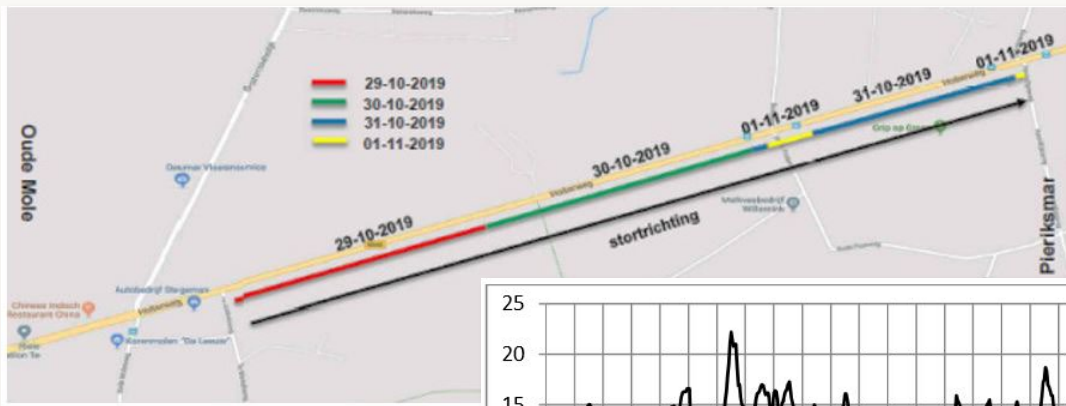


Fig.2. Omgevingstemperatuur (KNMI station Heino)

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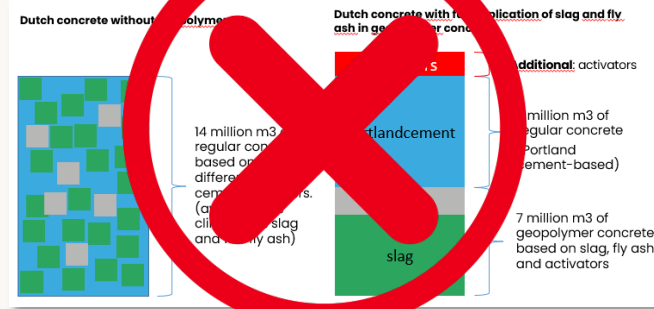
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CONCLUSION

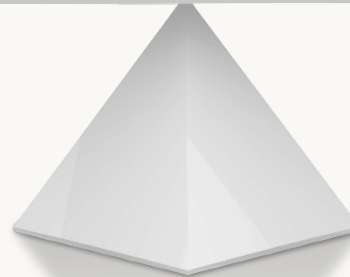


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Project
gain



System
gain



CONCLUSION

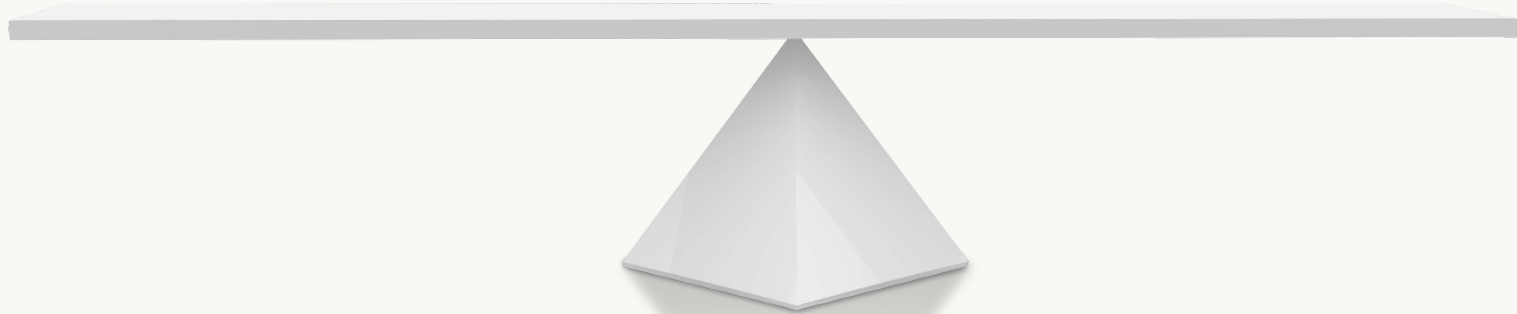


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CO₂
reduction



functional
demands





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