SUSTAINABILITY ASSESSMENT IN CUBAN CEMENT SECTOR- A METHODOLOGICAL APPROACH

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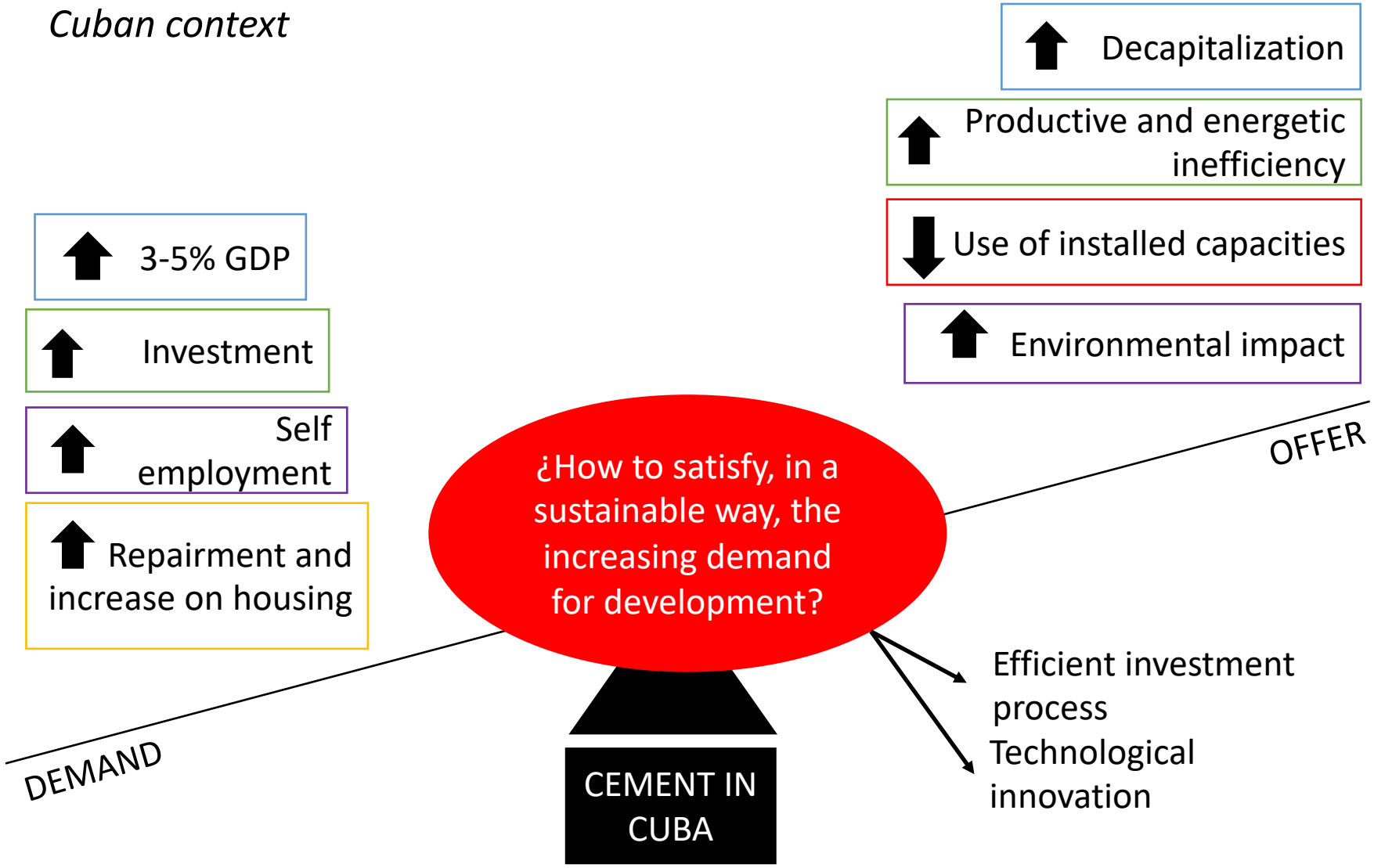
September, 2019

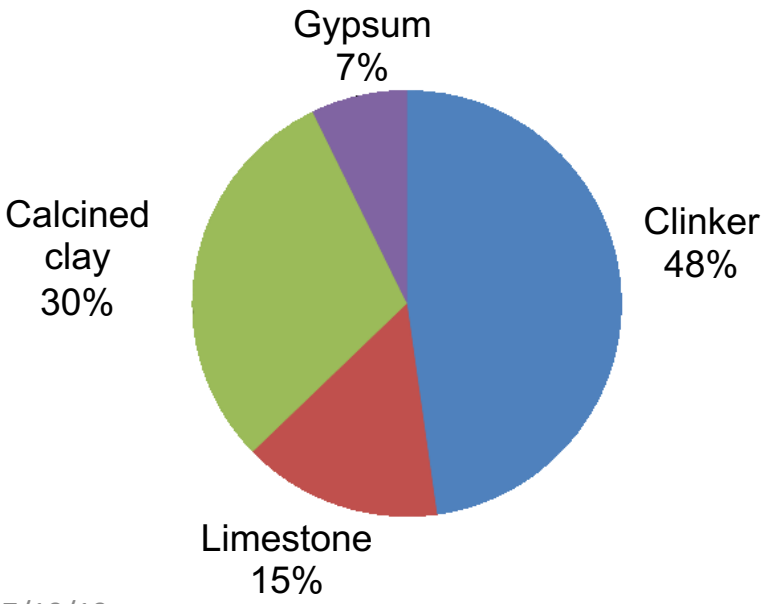
Cuban context



Cuban context

Technological innovation	Efficient investment process

Limestone Calcined Clay Cement **LC3**



Pre-investment, investment, operation

Impacts assessment oriented to sustainability

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Life Cycle Sustainability Assessment

LCSA = LCA + LCC + S-LCA

→ **ISO 14040-44**

Where:

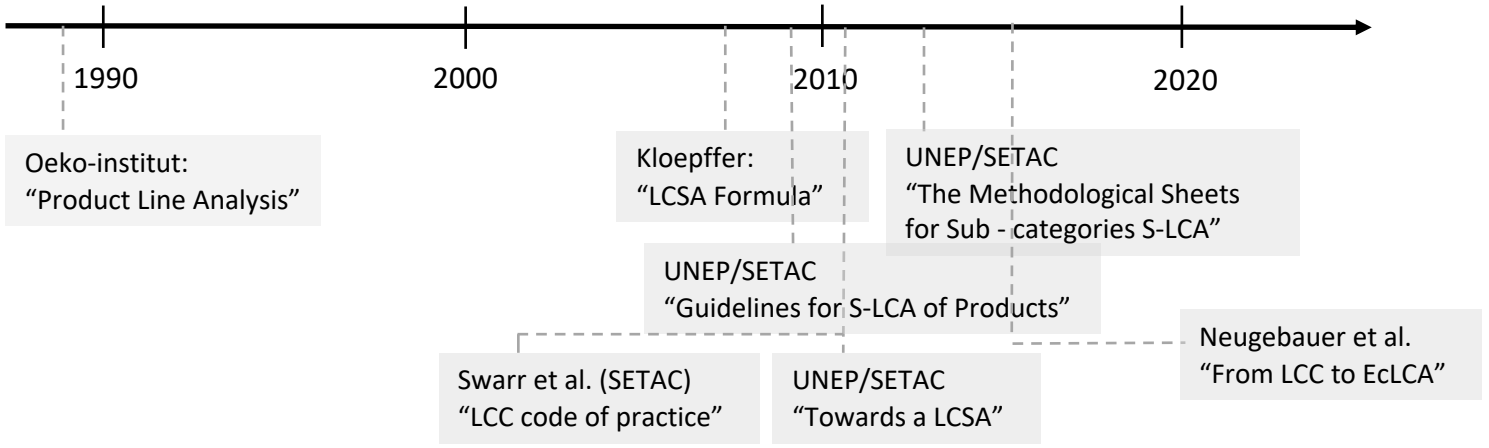
LCSA = Life Cycle Sustainability Assessement

LCA = Life Cycle Analysis (enviromental)

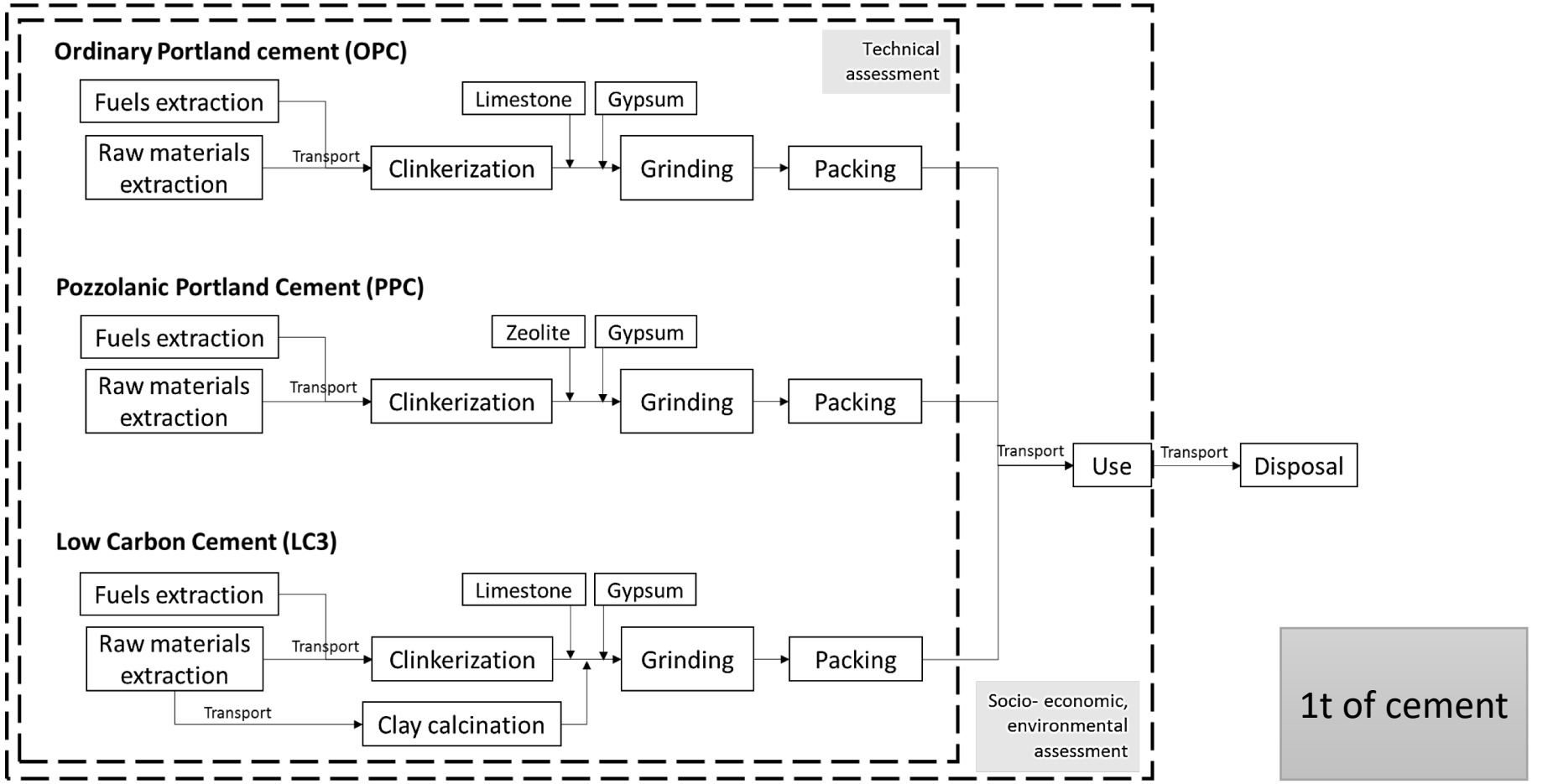
LCC = Life Cycle Costing

S-LCA = Social Life Cycle Analysis

LCSA Development



Goal, functional unit and system boundaries



Details for input data in different technologies for Cuban cement industry

Indicators	Pilot level	Industrial level	BAT level
Kaolinite clay distance (km)	150	60-150	<100
Type of fuel	Cuban crude oil	Pet-coke + Cuban crude oil	Gas + Waste
Clinker technology	Wet rotatory kiln	4 stage pre-heater + pre-calciner	6 stage pre-heater + pre-calciner
Clay calcining technology	Wet rotatory kiln	Retroffited calciner	Optimized flash calciner

Source: S. Sánchez Berriel et al., *J. Clean. Prod.*, vol. 124, pp. 361-369, 2016.

Data used for calculation

BACKGROUND DATA

World Business Council for Sustainable Development
Cement Sustainability Initiative

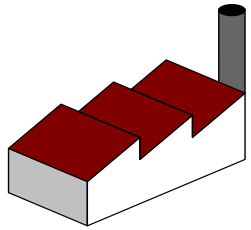
IPCC
INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

WMO UNEP

SimaPro

FOREGROUND DATA

SimaPro
New processes for Cuba



Cuban cement industry

Cuban transport means + raw materials distance

CALCULATED DATA

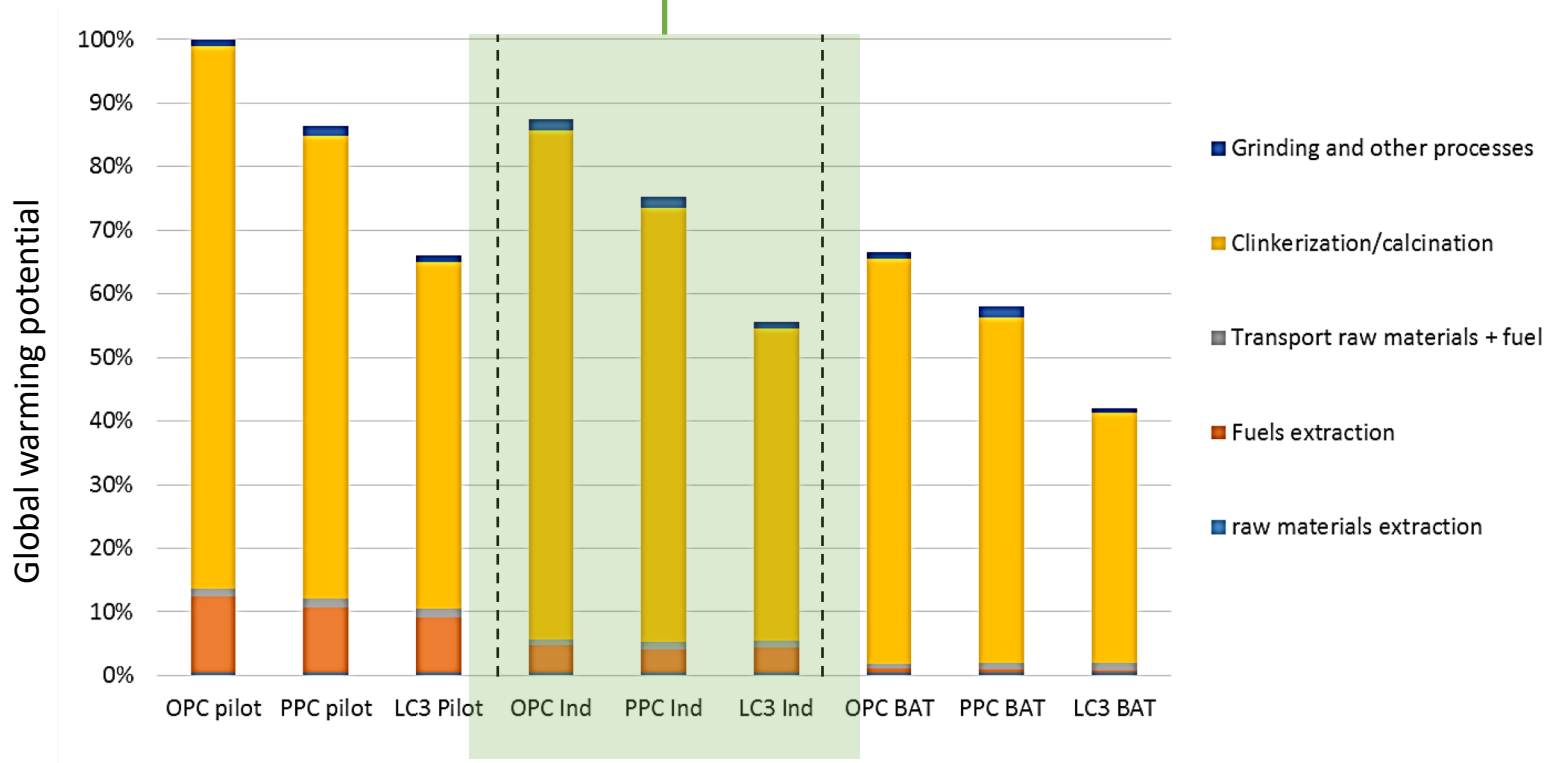
ENERGY
(MJ/t cem)

GLOBAL WARMING POTENTIAL
(Kg CO_{2eq} / t cem)

PRODUCTION COST
(USD/t cem)

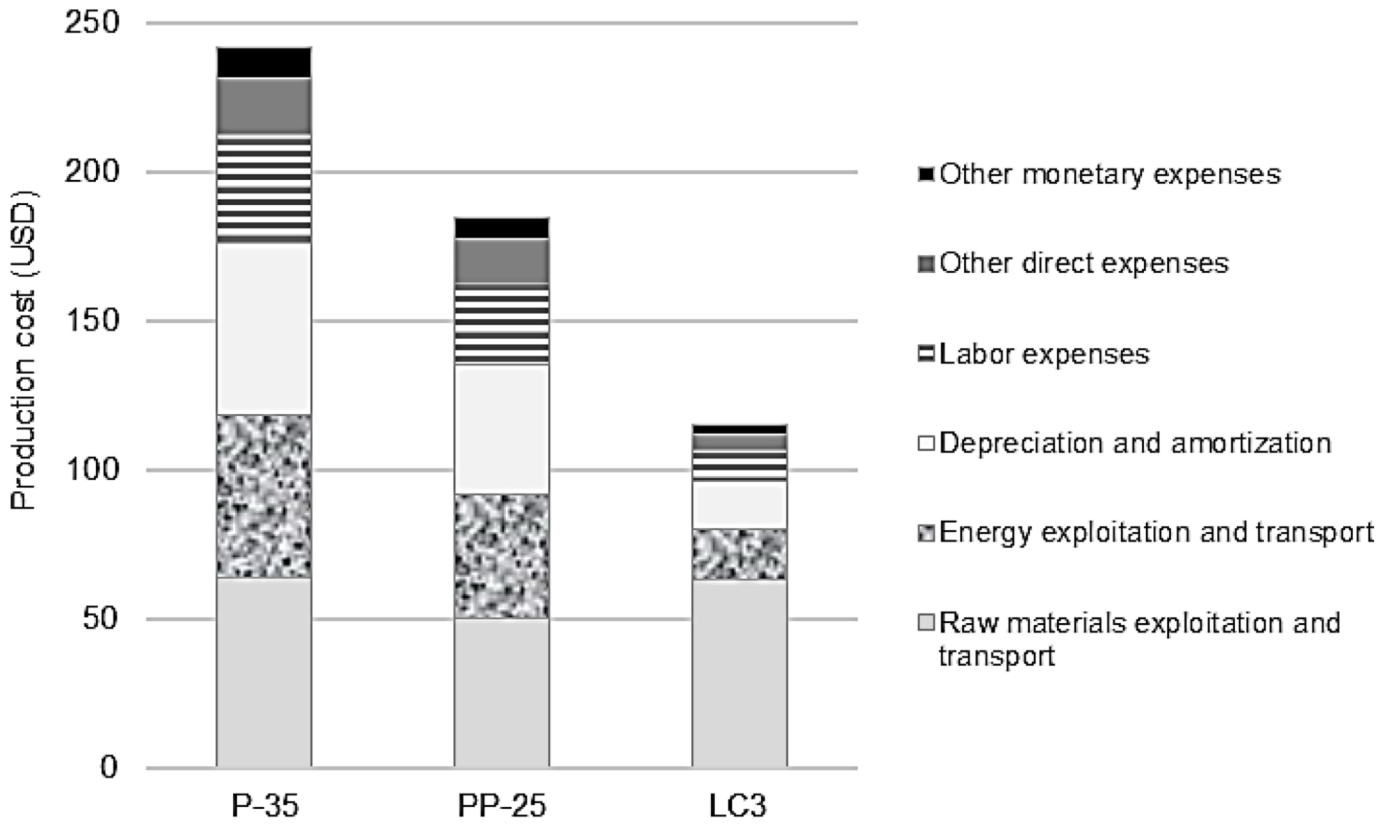
LCA results- Midpoint categories

Cement	Energy (MJ/t)	Emissions ($kgCO_{2eq}$/t)
P-35	5292.38	890.63
PP-25	4626.33	764.92
LC^3	4367.53	564.39



LCC results- Production costs

BAT Scenario



S-LCA results- Potential of change

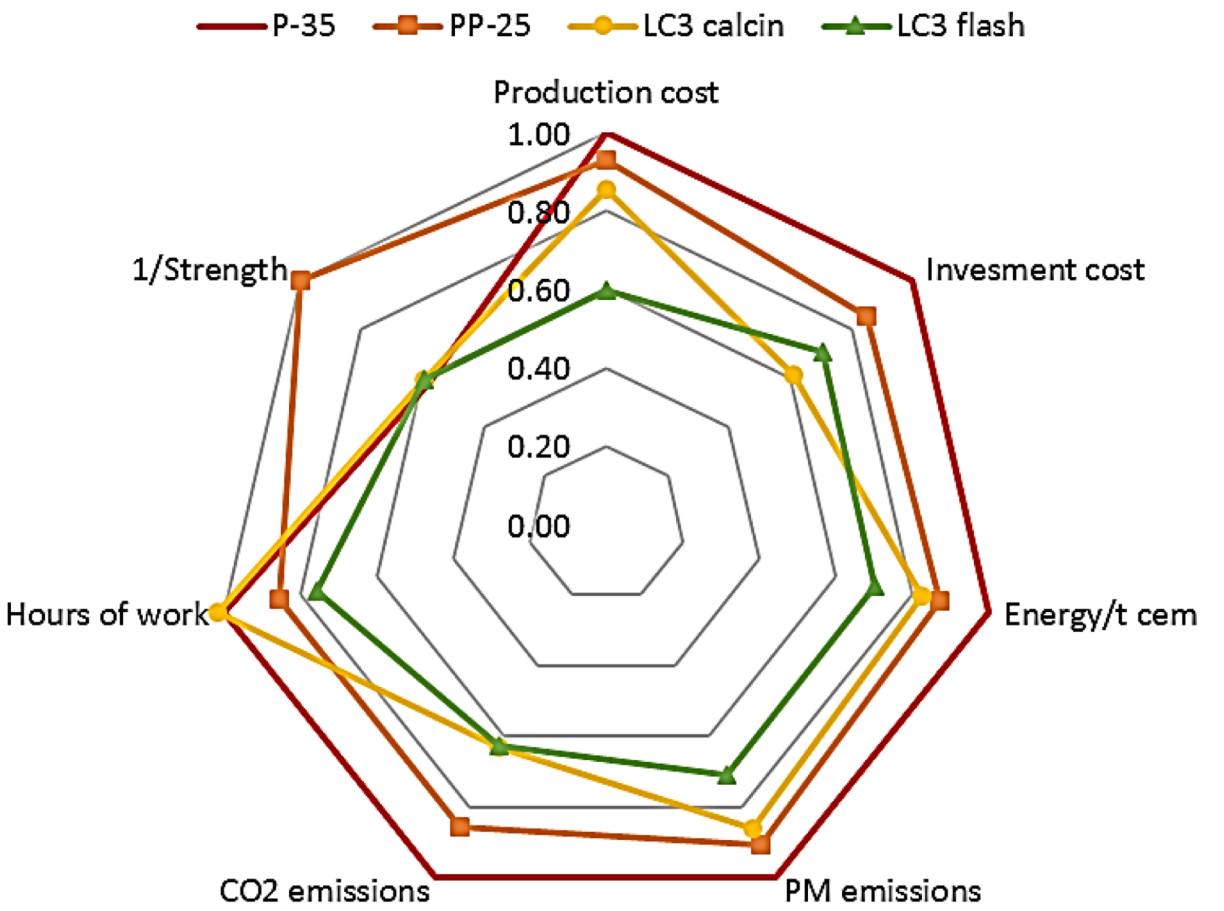
Potential of change				
	Subcategories		Indicators	
Insignificant	11%		14%	
Minor	11%		7%	
Moderated	67%	78%	50%	79%
Significant	11%		29	

Incidence of diseases attributable to cement production

Local employment

Sector efforts for technological development

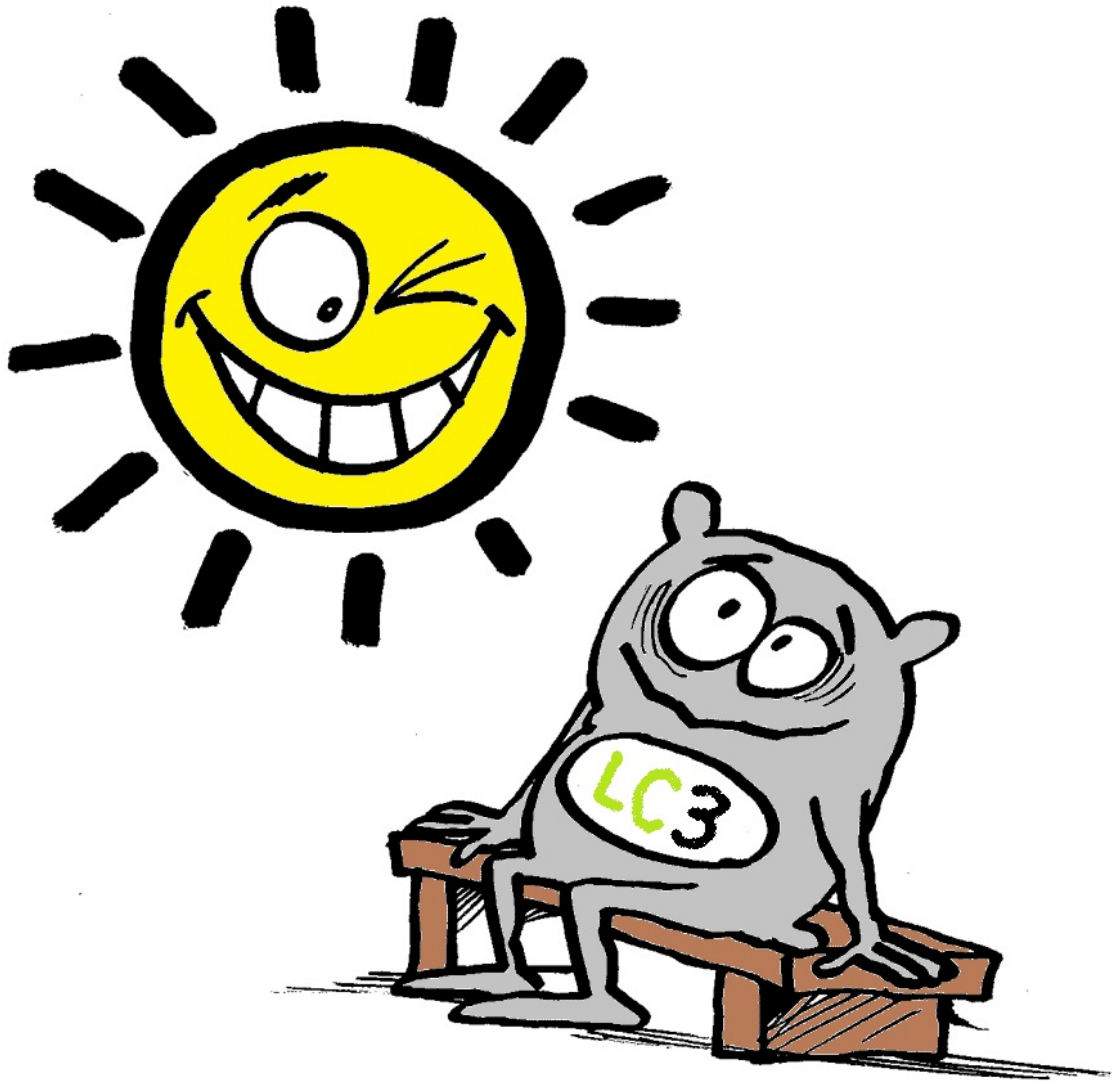
LCSA Results integration



Concluding remarks

- Cuban industry needs a recapitalization to meet growing demand
- LC^3 has a great potential to meet an increase in cement demand in the short term
- Environmentally speaking: LC^3 is better than OPC even for worst production scenario
- Up to 30% CO_2 reduction
- Up to 15% lower production cost (OPEX)
- Social impacts have a significant potential of change if LC^3 is introduced

Thank you!



Adapted from Martirena