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Decarbonizing Africa’s Cement and Construction Value Chain: Barriers, Solutions and Capacity Needs

Session 10: System transformation areas

Business & Industry

24 March 2026

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AGENDA

1. Why cement and construction?
2. Key decarbonization levers along the value chain
3. Actionable solutions for Africa
4. Introduction to work in groups

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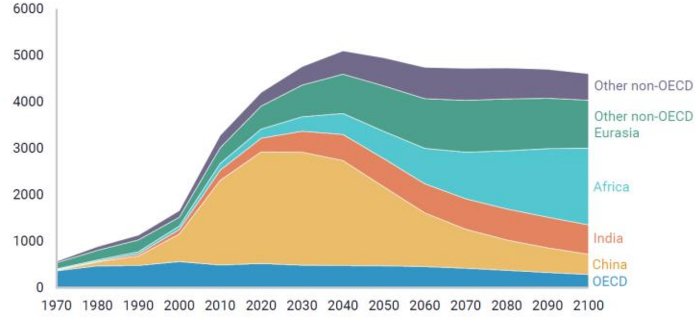
CEMENT AND CONSTRUCTION - RATIONALE

Africa's cement industry emits ca. 150–220 MtCO_2 per year (both energy and process emissions), making cement the single largest source of manufacturing emissions on the continent and the biggest source of total industrial CO_2, with strong growth ahead to 2050.

- Cement and concrete are critical for Africa's infrastructure and housing.
- African countries will experience highest increase in demand in the next decades.
- The sector is emissions intensive but offers clear, available mitigation options.
- Many African NDCs mention industry, but implementation pathways for cement and construction are often not clearly defined.

FIGURE 4
Historic and projected global cement production
Million metric tons, historical and Rhodium Climate Outlook mean projection



Source: Rhodium Group, United States Geological Survey

FIGURE 7
Regional direct GHG emissions from cement

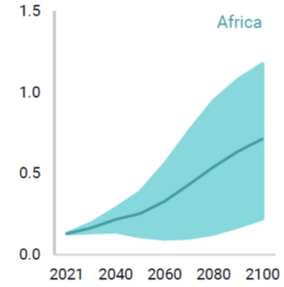
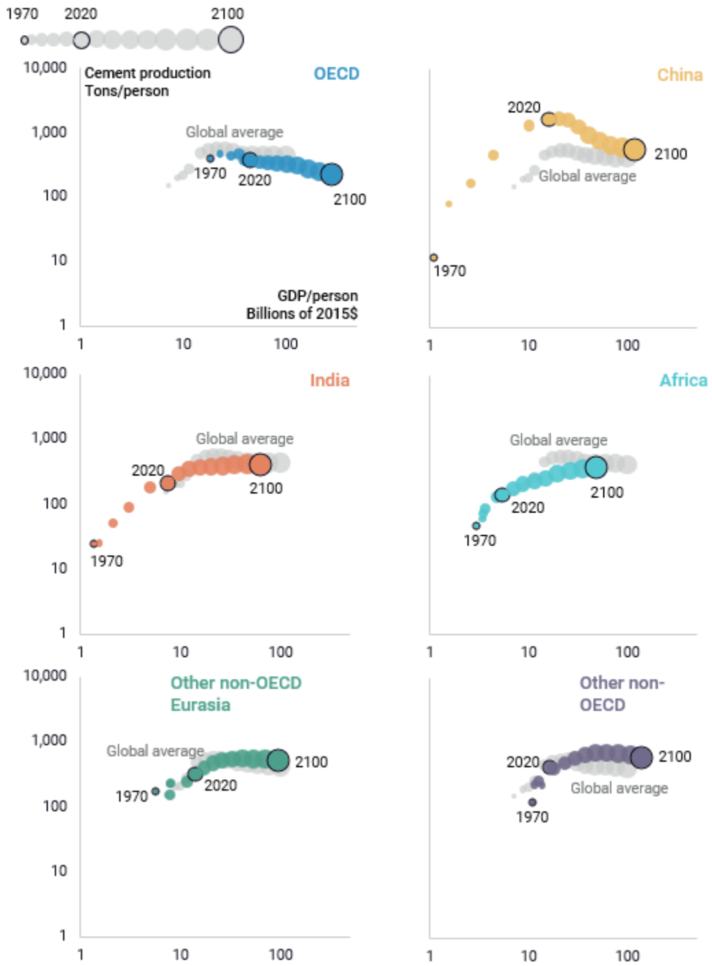


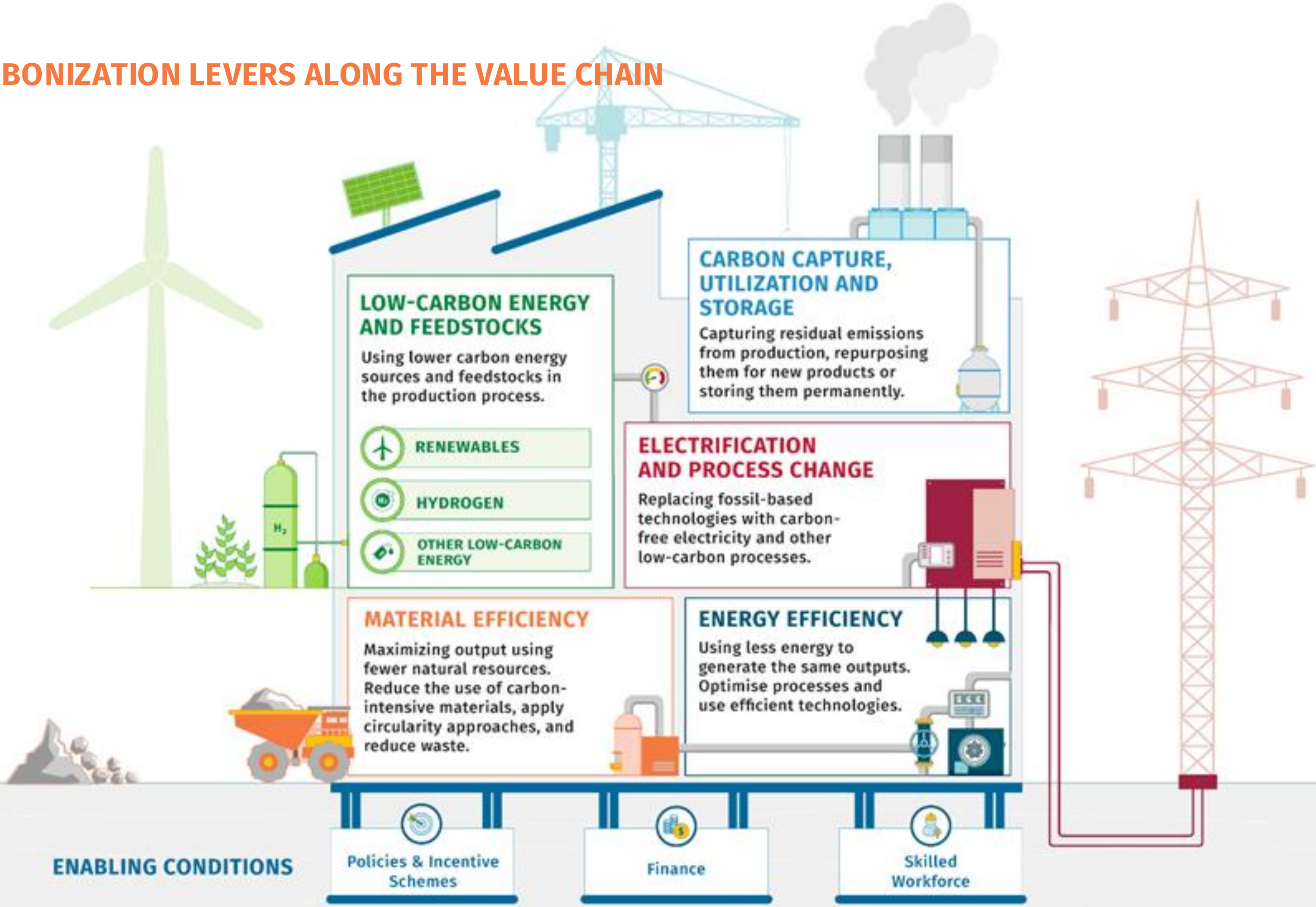
FIGURE 3
Economic and population drivers of cement demand
Tons per person as a function of GDP per person



Source: Rhodium Group

[Source: The Global Cement Challenge – Rhodium Group]

KEY DECARBONIZATION LEVERS ALONG THE VALUE CHAIN



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ACTIONABLE SOLUTIONS

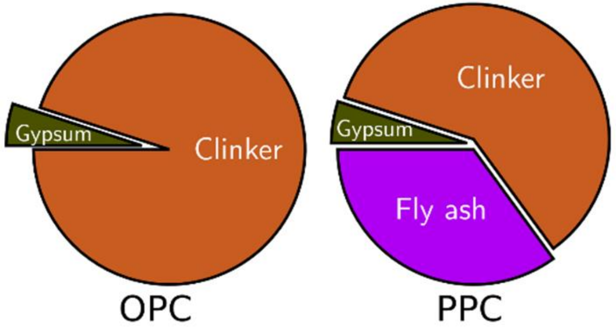
SUPPLEMENTARY CEMENTITIOUS MATERIALS (SCMS)

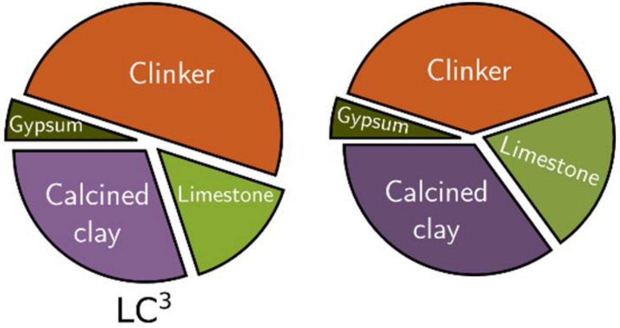
Key characteristics

- Supplementary Cementitious Materials (SCMs) are natural materials like calcined clay, or volcanic ash which due to their reactivity can replace clinker in the cement mix
- SCMs require much lower thermal input for their processing (800 deg. C, compared to 1450 deg. C for clinker), while many natural pozzolans can be used in a cement mix without prior thermal activation
- Clinker substitution potential: 95% clinker in OPC -> 35% clinker in LC3 35 or lower in some cases

Key benefits and opportunities

- Lower clinker content resulting in lower CO_2 emissions
- Lower production costs (OPEX)
- Allow for the use of existing clinker kilns in case of overcapacity
- Allow for capacity increase without investing into an expensive clinker kiln in case of undercapacity (lower CAPEX compared to traditional clinker expansion)





Estimated savings on OPEX – LC3 50 vs. CEM I

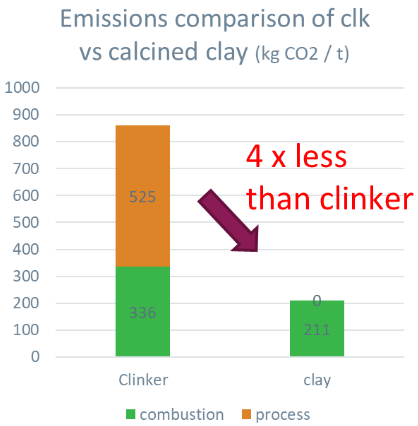
- STEC clinker: 720 kcal/kg clinker
- Fuel saving at USD 200/t coal (6000 kcal/kg coal): 5.3 USD/t
- Power consumption saving at USD 0.07/kWh: 2.4 USD/t

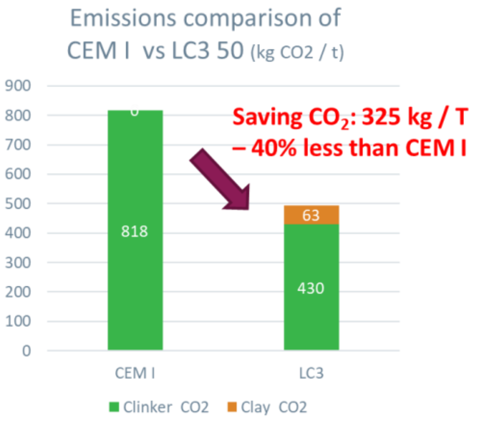
Total energy cost savings: USD 7.7 per tone of cement

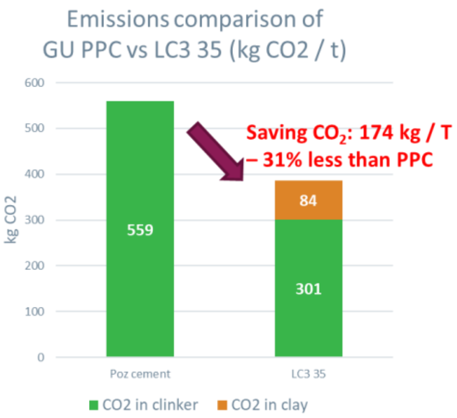
	OPC (95% clinker / 5% gypsum)	OPC (95% clinker / 5% gypsum) LC3 (50% clinker/ 15% limestone / 30% activated clay / 5% gypsum)	Impact
Fuel consumption kcal/ kg cement	684	525*	30% decrease in fuel
Power consumption kWh/t cement	85	51.1	40% decrease in power

https://www.flsmidth.com/en-gb/discover/cement-2021/revealing-the-numbers-behind-calcined-clay

Significant CO_2 emission reduction







Data and visualizations: courtesy of Cementis / EPFL

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ACTIONABLE SOLUTIONS

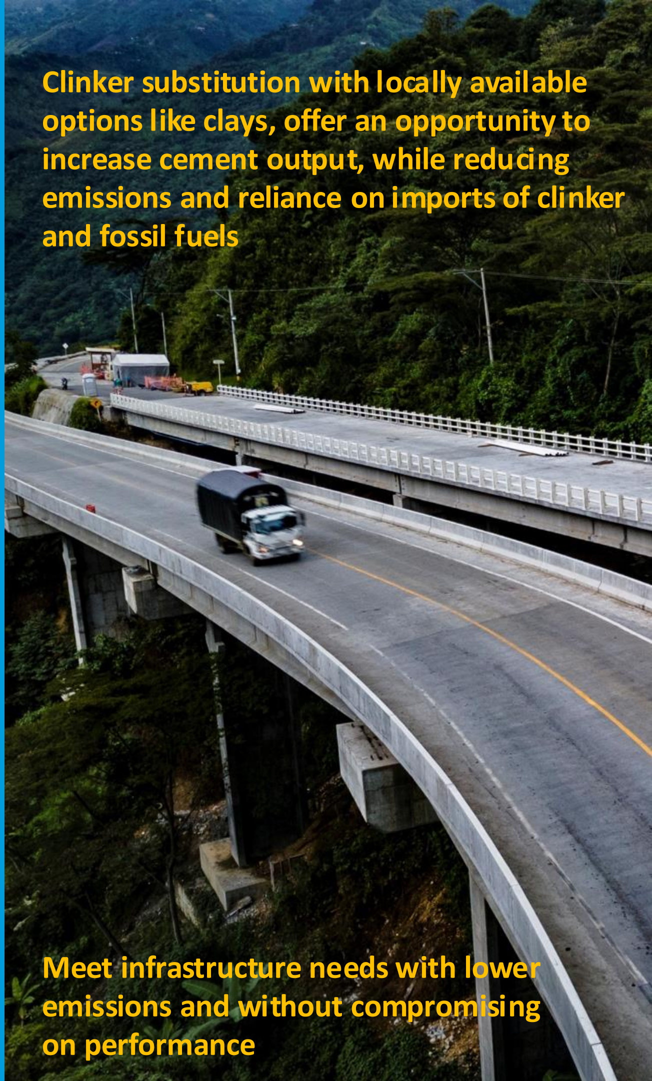
SUPPLEMENTARY CEMENTITIOUS MATERIALS (SCMs)

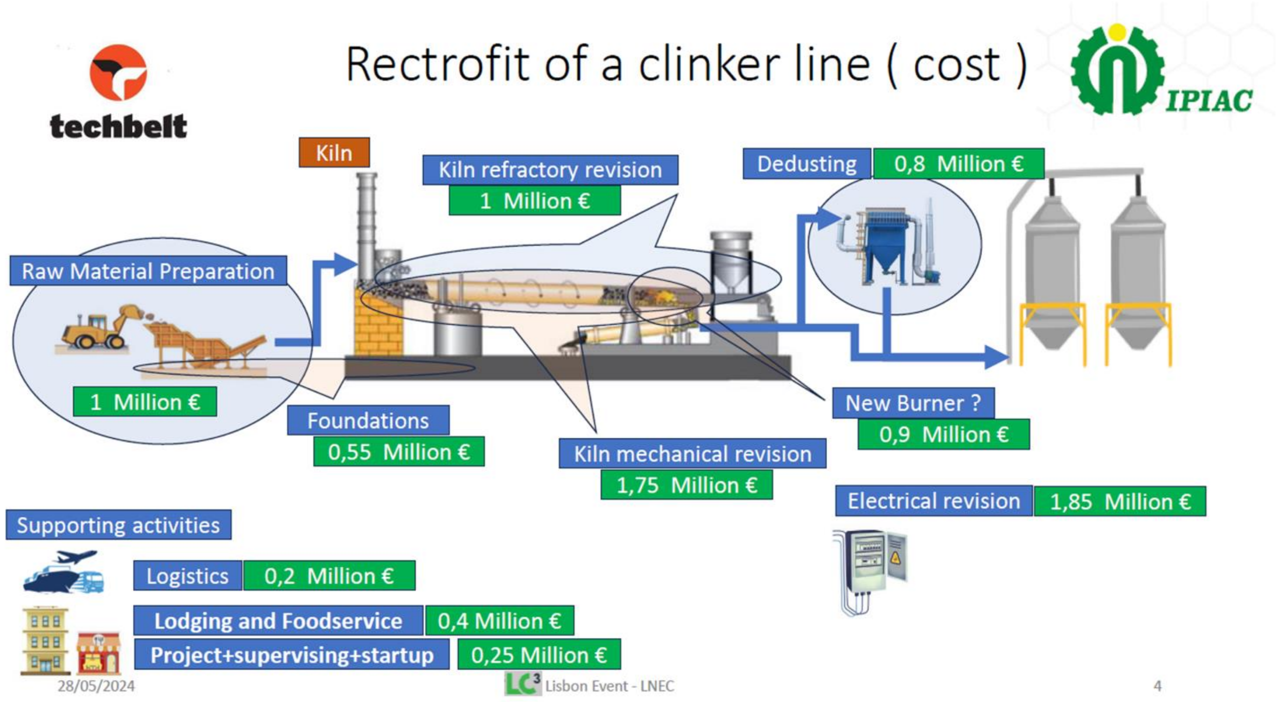
Why in Africa

- Limited limestone resources vs. abundant clay resources
- Lower import costs by using locally available materials
- Strengthen supply chain resilience by reducing exposure to imports of fuels and clinker
- Reduce exposure to exchange rate fluctuations by cutting imports
- Create local, sustainable jobs across the value chain and new business models
- Empowering women

What is needed

- Standards allowing for low clinker cement
- Building codes and regulations (e.g. technical specifications in procurement of infrastructure)
- Awareness of the market
- Demand push - procurement
- Financial mechanisms for de-risking and attracting private capital





Luanda, Angola

This plant's capacity of 300,000 tons of calcined clay per year, is equivalent to up to one million tons of LC3 cement per year.

Fast implementation (13 months)

Retrofit cost ~8.7 million EUR

The whole project is coordinated and supervised by the Cimangola / Techbelt under direction of IPIAC Portugal

courtesy of Cementis / EPFL

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SUSTAINABLE DEVELOPMENT GOALS

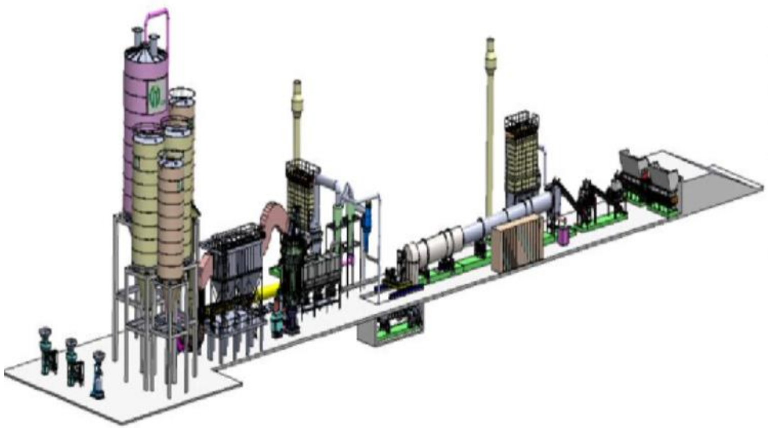
IPIAC

Middle East Calcined Clay LLC

ecosolutions
Sustainable habitat

Limestone Calcined Clay Cement LC3

Plug & Clay
Plug & LC3



Key Points

- Specific Heat Consumption Around 550 Kcal/Kg (Depending On Combustible)
- Electrical Power Consumption
  = Calcining Line = 23 Kw/Ton
  = Grinding + Baggaging Line / +- 50 Kw/Ton
- Output = 100 000 Tons/Year = 300 000 Tons/Year
- Burner Power 8mw
- M3 Of Concrete On The Construction +- 500 M3
- Covered Area = 2000 M2

ESTIMATED CAPEX	
Calcination Line	+- 5 M
Grinding plus Bagging	+- 2 M
TOTAL	+- 7 M

Oman

This plant’s capacity of 100,000 tons of calcined clay per year, is equivalent to 300,000 tons of LC3 cement per year.

It will produce LC3 that can be blended with OPC by the customers.

Fast implementation - Plug & Play design

CAPEX ~7 million EUR

Project is implemented by Middle East Calcined Clay LLC

courtesy of Cementis / EPFL

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GREEN PUBLIC PROCUREMENT

Key characteristics

- Green procurement is the practice of buying goods and services, and public infrastructure, that has a reduced environmental impact throughout its life cycle.
- In practice: Several US states (e.g. New York) and the federal “Buy Clean” initiative require low-embodied-carbon concrete or key materials in public works: contractors must submit EPDs for concrete and meet an emissions standard for global warming potential (GWP) per m^3 of concrete for state public works projects.

Key benefits and opportunities

- By signaling the will to buy low- and near-zero emission materials, governments can drive demand, signal industry transformation, and align public investment with climate goals
- By leveraging existing policies such as ecolabel programs and green building certifications or similar approaches, GPP helps countries turn climate goals such as Nationally Determined Contributions (NDCs) and industrial decarbonization roadmaps into real-world projects and market transformation.
- Implementing GPP Pledge Level 3 policies in four countries (Canada, Germany, UK, US) could reduce emissions from public cement procurement from 39 Mt CO_2 to 6 Mt CO2/year by 2050 (85% reduction).

For example:

In India, public procurement accounts for approximately **27% of total steel demand.**

In China, public construction is estimated to drive around **33% of national demand** for both steel and cement, corresponding to roughly 350 million tonnes of steel and 775 million tonnes of cement annually.

The public sector accounts for the overwhelming majority of infrastructure commitments in Africa: 2016–2020 data show about 89% of total infrastructure financing commitments came from public sources[1]

[1] Developing Africa’s infrastructure for productive transformation: Africa's Development Dynamics 2025 | OECD

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SUSTAINABLE DEVELOPMENT GOALS

Government commitments and definitions are key requirements for successful implementation of the GPP

India’s ‘Green Taxonomy’ and emission categories for steel		
Rating	Value	Units
2 Star	2.0 - 2.2	tonnes CO2e / tonne crude steel
3 Star	1.6 - 2.0	tonnes CO2e / tonne crude steel
4 Star	< 1.6	tonnes CO2e / tonne crude steel

In early December 2024, the Indian Ministry of Steel stated the intention to publish a ‘green taxonomy’ for the steel sector, which will include three levels of emission categories based on a star / grading system.

The intention is to use the star rating system from the National Green Steel Policy to inform a GPP strategy that will mandate different public entities and departments to procure various levels of 3 to 4 to 5 Star steel.

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SUSTAINABLE DEVELOPMENT GOALS

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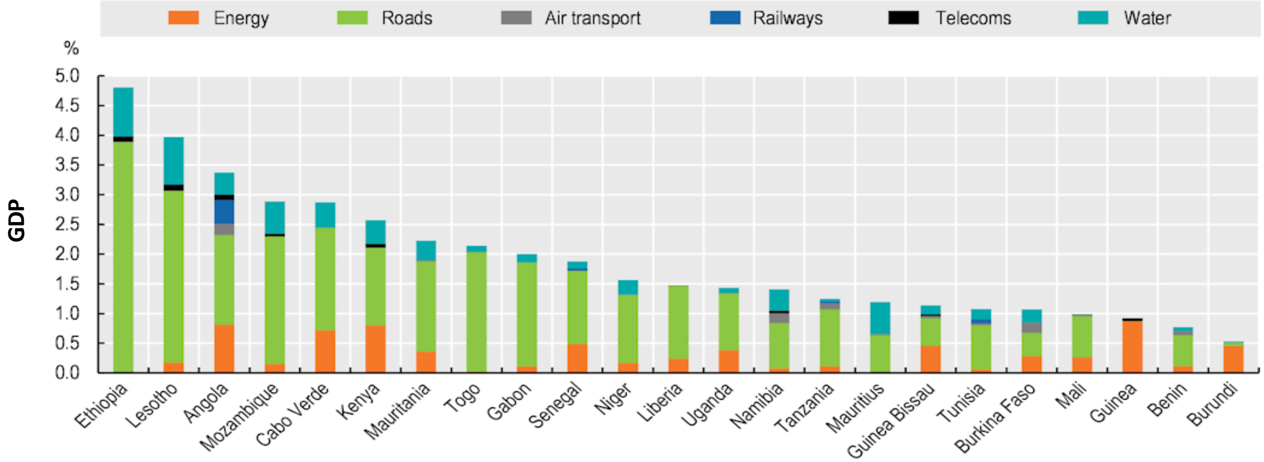
GREEN PUBLIC PROCUREMENT



Direct government capital expenditure for infrastructure in selected African countries, average 2010-17 (% of gross domestic product)[1]

[1] Developing Africa's infrastructure for productive transformation: Africa's Development Dynamics 2025 | OECD

Getting started with GPP requires understanding the current policy landscape and identifying practical pathways for action:

- → **Reviewing** procurement laws, strategies, and technical specifications to identify opportunities for introducing climate-related criteria
- → **Aligning** procurement requirements with national standards, product labels, or performance-based benchmarks for materials like cement and steel
- → **Consulting** with relevant ministries, procurement agencies, industry stakeholders, and standards bodies
- → **Embedding** low-emission requirements in procurement manuals, tender documents, and evaluation procedures
- → **Assessing** market readiness and considering how to use public demand to stimulate supply chain transformation

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GROUP DISCUSSIONS

- All 4 groups (2 English, 2 French) will follow the same questions, focusing on NDEs countries and presented solutions (SCMs and GPP)

- We will look at:
  1. Current situation and challenges,
  2. Enabling measures for implementation,
  3. Capacity gaps in your countries.

- We would like you to be specific about the challenges, enabling measures and capacity needs you see.
- Please speak from your country experience
- Choose a rapporteur and someone to keep time.
- Use questions to guide your discussion.
- Write clearly and keep it concrete.
- Try to ensure everyone speaks at least once, especially NDEs.

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SUSTAINABLE DEVELOPMENT GOALS

GUIDING QUESTIONS

Q1. Do you see potential for implementation of the presented solutions in the cement sector in your country? Which do you think presents the greatest opportunity?

Q2. From the presented solutions to sector decarbonization, what are the **main challenges for their adoption**? Please consider:

- Available technology / know-how how to use them
- Data / MRV
- Standards and regulation
- Institutional coordination and capacity
- Finance constraints / investment risk
- Market acceptance / awareness
- Infrastructure / logistics (e.g. clay supply, transport)

Q3. What do you think is needed in your country (enabling measures) to realistically support implementation of those solutions in the next 3–5 years?

Q4. Where are the **main capacity gaps** on the government / NDE side in your country regarding these solutions?

Thank you!

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