Advance Purchasing of Near-Zero Concrete for DOTs

RMI
ENERGY. TRANSFORMED.

Carbon-Free Buildings
Low-Embodied Carbon Program

Speakers

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World Economic Forum (WEF)

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World Economic Forum (WEF)

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State Industrial Advocate
Natural Resources Defense Council (NRDC)

Anish Tilak
Manager, Carbon-Free Buildings
RMI

Agenda

Presentations

- Welcome Remarks
- RMI - Introduction to Advance Purchasing
- First Movers Coalition (FMC) – Insights from Private Sector Demand Initiatives
- NRDC / RMI – Roadmap to Public Sector Advance Purchasing for Low Carbon Concrete

Discussion

- Q&A
- Audience Polling
- Open Discussion
- Closing

Objectives

1. Learn fundamentals about advance purchasing / advance market commitments (AMCs)

2. Learn key insights from private sector AMC initiatives, such as the FMC

3. Understand public sector opportunities and near-term actions for low-carbon concrete AMCs

Background – RMI Workshop Series

Low Carbon Concrete Infrastructure Workshops

Workshop 1 | June 2023

Case studies from Buy Clean / EPD program implementation – recording

Workshop 2 | August 2023

DOT Application of Limestone Calcined Clay Cement (LC3) – recording

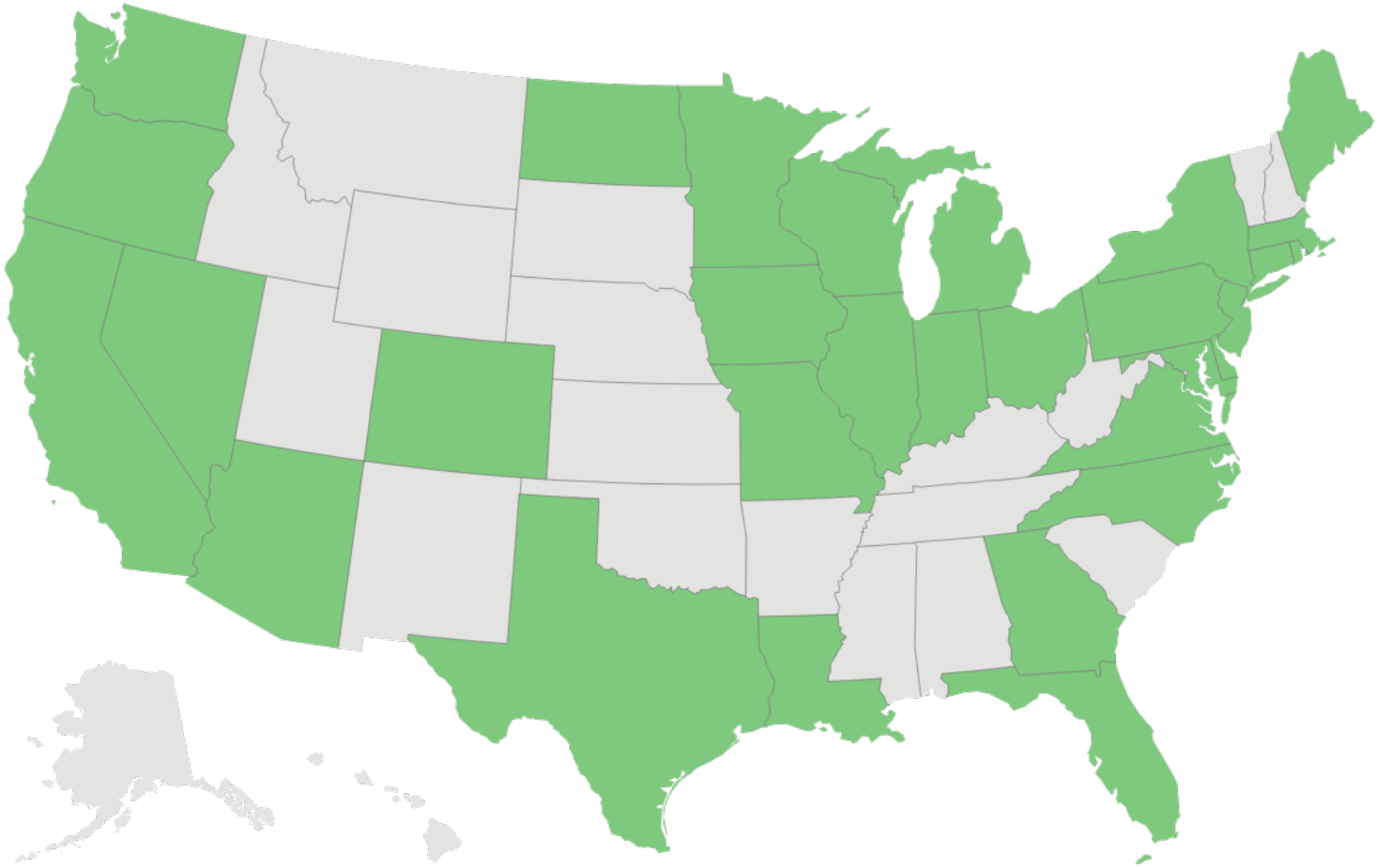
Workshop 3 | January 2024

A Deep Dive on Specifications – recording

Workshop 4 | May 2024

Near Zero and Zero Emissions Concrete – recording

State DOTs Engaged



Previous Speakers

Thomas Van Dam
Wiss, Janney, Elstner Associates, Inc.

Oğulcan Canbek
GCP Applied Technologies

Jordan Palmeri
Carbon Leadership Forum

Hailey Goodale
Colorado DOT

R. Douglas Hooton
University of Toronto

David Dobson
Oregon DOT

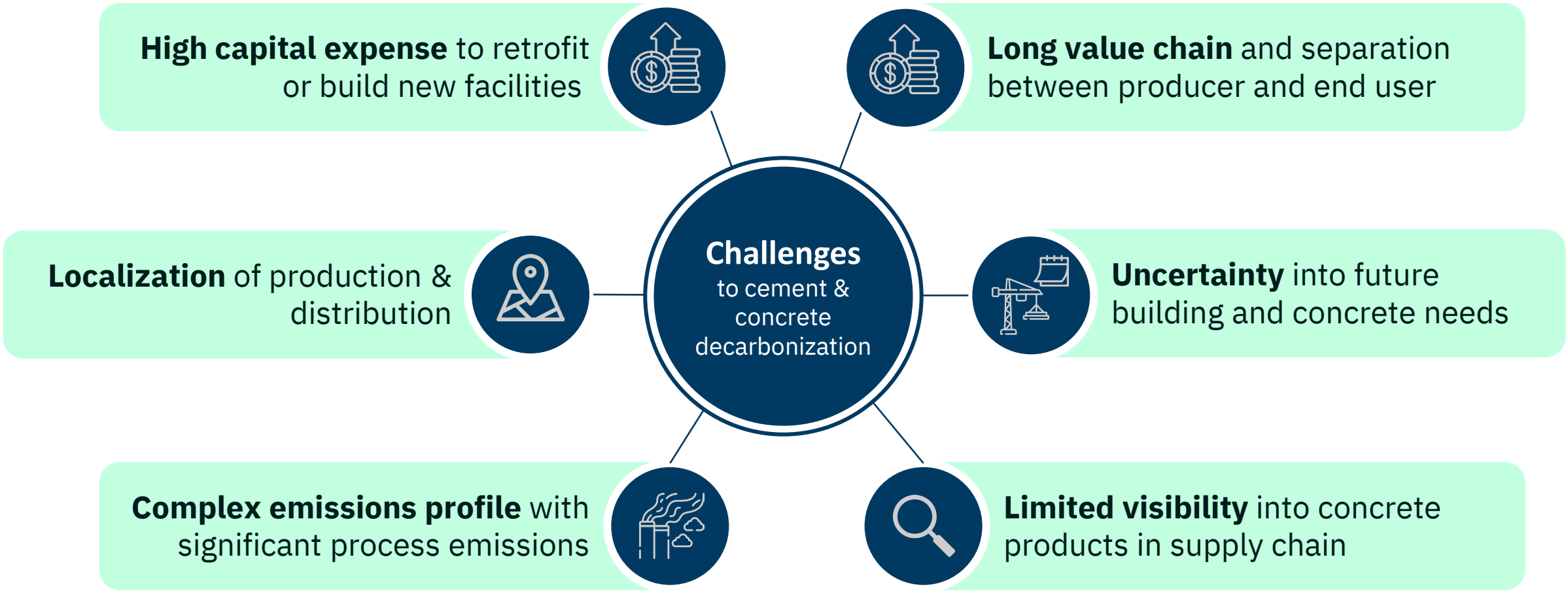
Ryan Rathbun
NJ DOT

Jacquelyn Wong, Joseph Harline
Caltrans

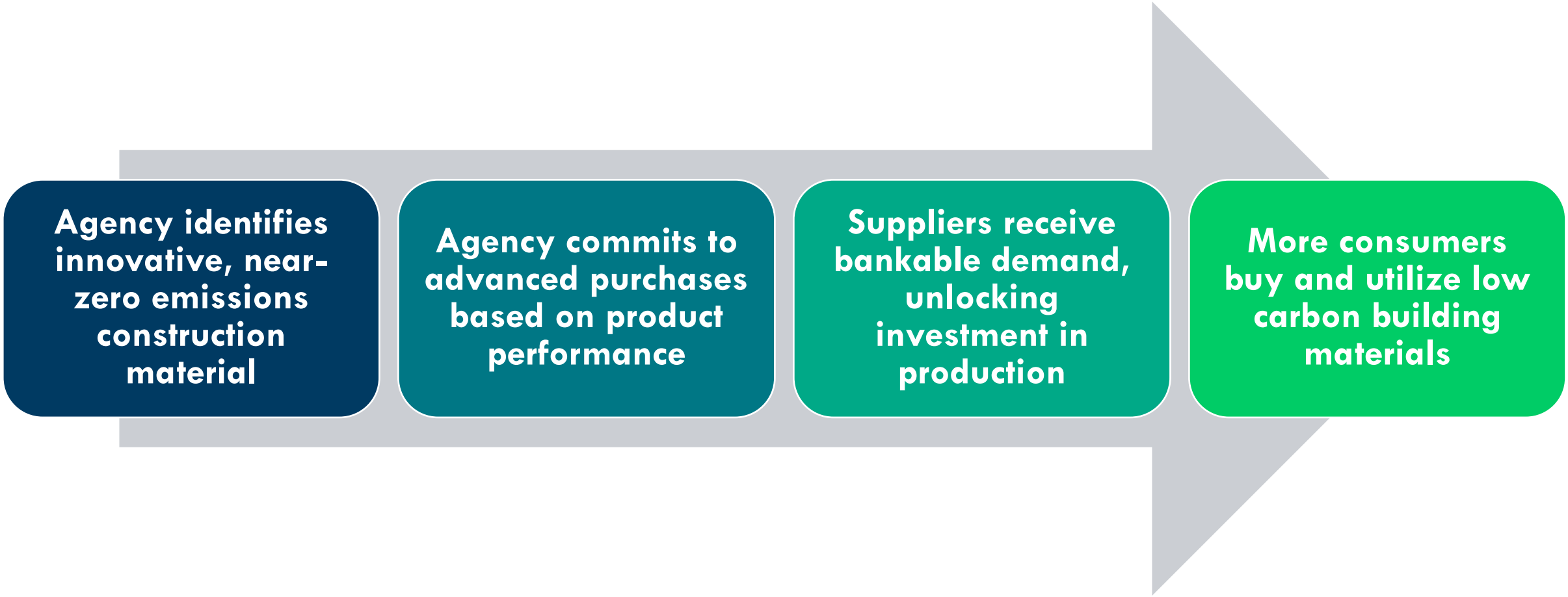
Sabbie Miller
UC Davis Department of Civil & Environmental Engineering

Fundamentals of Advance Market Commitments (AMCs)

Builders, developers, and end users face significant barriers to reduce scope 3 emissions from cement and concrete production



Advance Market Commitments

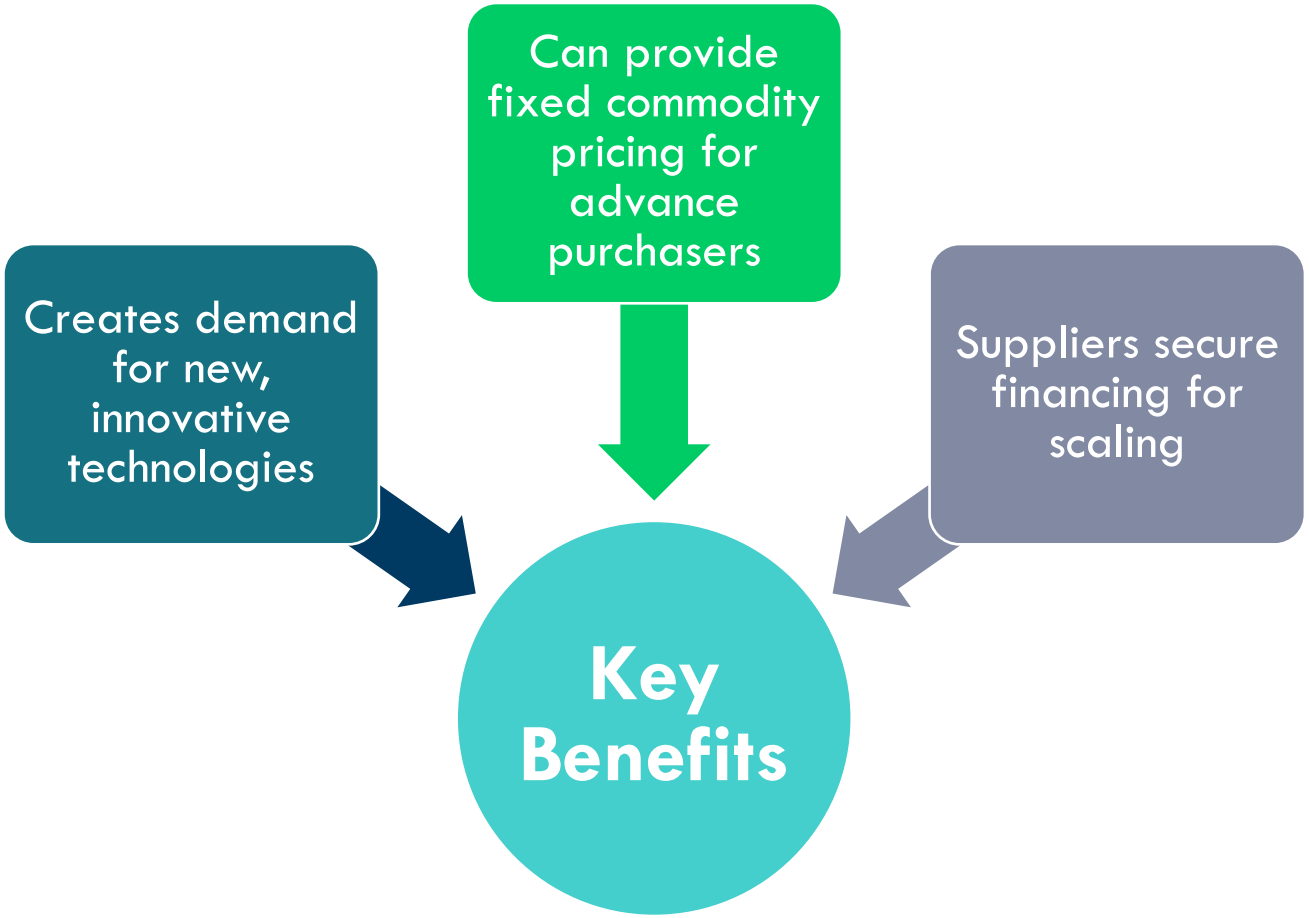


Advance Market Commitments

AMCs are binding legal contracts between purchasers and producers of "yet-to-be-developed" technologies.

Challenges to Decarbonization

- Early-stage technologies struggle to attract investment and scale commercially
- Lack of clear demand signals from the private sector limits growth.



How AMCs work

Agreement: between purchaser (government, corporations) and producer (cement manufacturers).

Commitment: to purchase a defined quantity and specification of a low-carbon product.

Financing: for producers by demonstrating demand certainty to investors.

Successes in the deployment of AMCs

- **Vaccine Development**
  - **COVID-19 Vaccines:** The COVAX initiative, leveraging AMCs to ensure rapid and equitable distribution of vaccines globally
- **Industrial Applications**
  - **Frontier AMC ($1 Billion):** Commitment for permanent carbon removal by 2030.

COVAX

Frontier

First Movers Coalition

WORLD ECONOMIC FORUM

First Movers Coalition

RMI Workshop: Advance Purchasing of Near-Zero Concrete for DOTs

19th November 2024

First Movers Coalition

I. FMC overview

First Movers are creating early market demand to bring emerging clean technologies to commercial scale

Vision

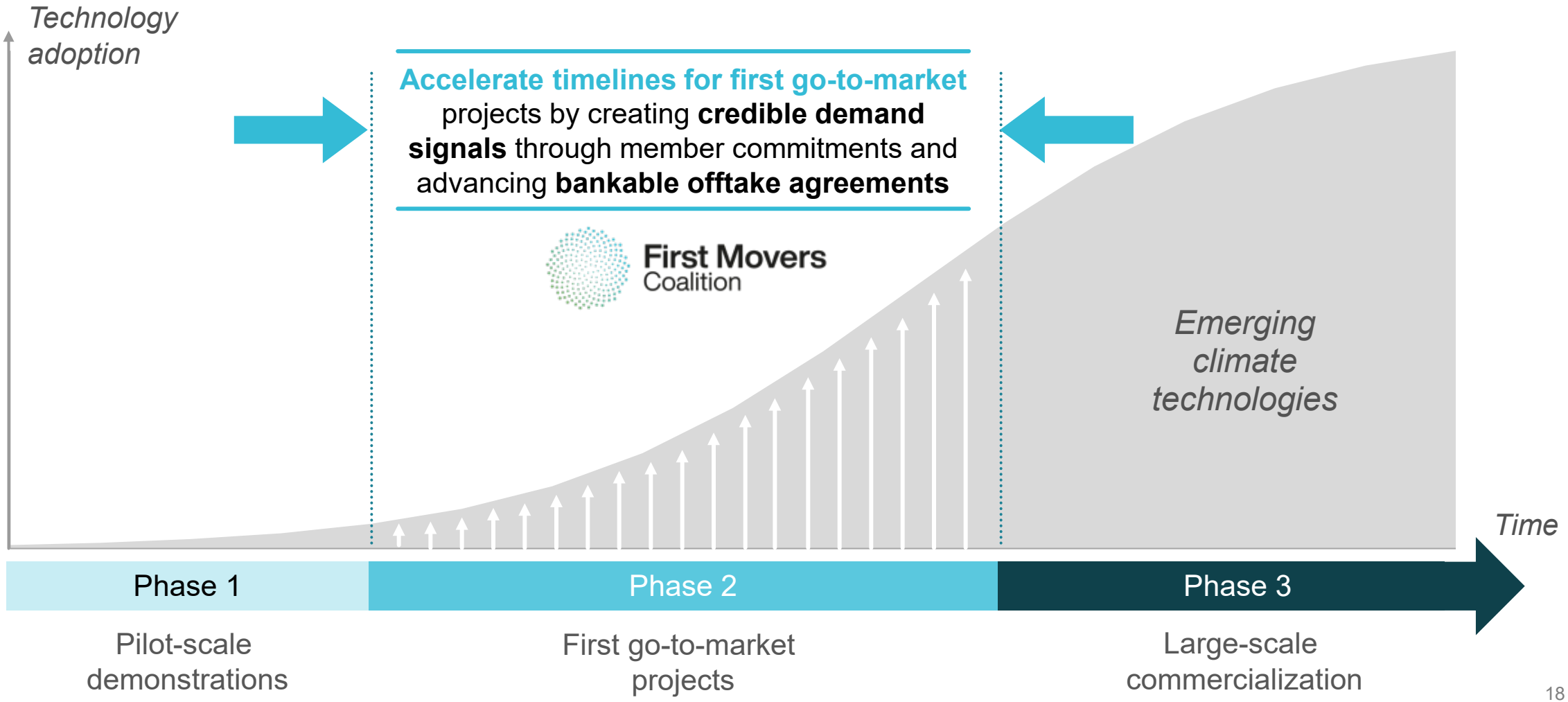
The First Movers Coalition (FMC) aims to harness the purchasing power of the world's leading companies to **unlock the untapped potential of emerging technologies needed to decarbonize** the world by 2050.

Mission

By 2050, 50% of the reductions needed for net-zero emissions must come from technologies not yet available at scale. FMC will **marshal the world's leading companies to apply their purchasing power to create guaranteed early markets for advanced technologies**. Building early demand by 2030 for near-zero-carbon goods and services will help scale the next generation of emission mitigation solutions for carbon-intensive sectors. FMC deploys **a suite of tools and activities to help its members turn commitments into bankable offtake agreements**.

First Movers Coalition

FMC is the largest coalition of companies looking to scale emerging tech across hard-to-abate sectors through early demand signals



First Movers Coalition

Eight sectors in scope of the FMC, representing **~25% of global GHG emissions** today & newest technology needs

Launched at COP26

Launched at WEF Annual Meeting 2022

Launched at COP27

Potential launch in 2025

Aviation

Steel

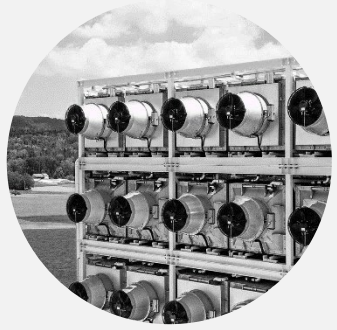
Aluminum

Cement / Concrete

Chemicals (Plastics – PET, PP and PE)

Shipping

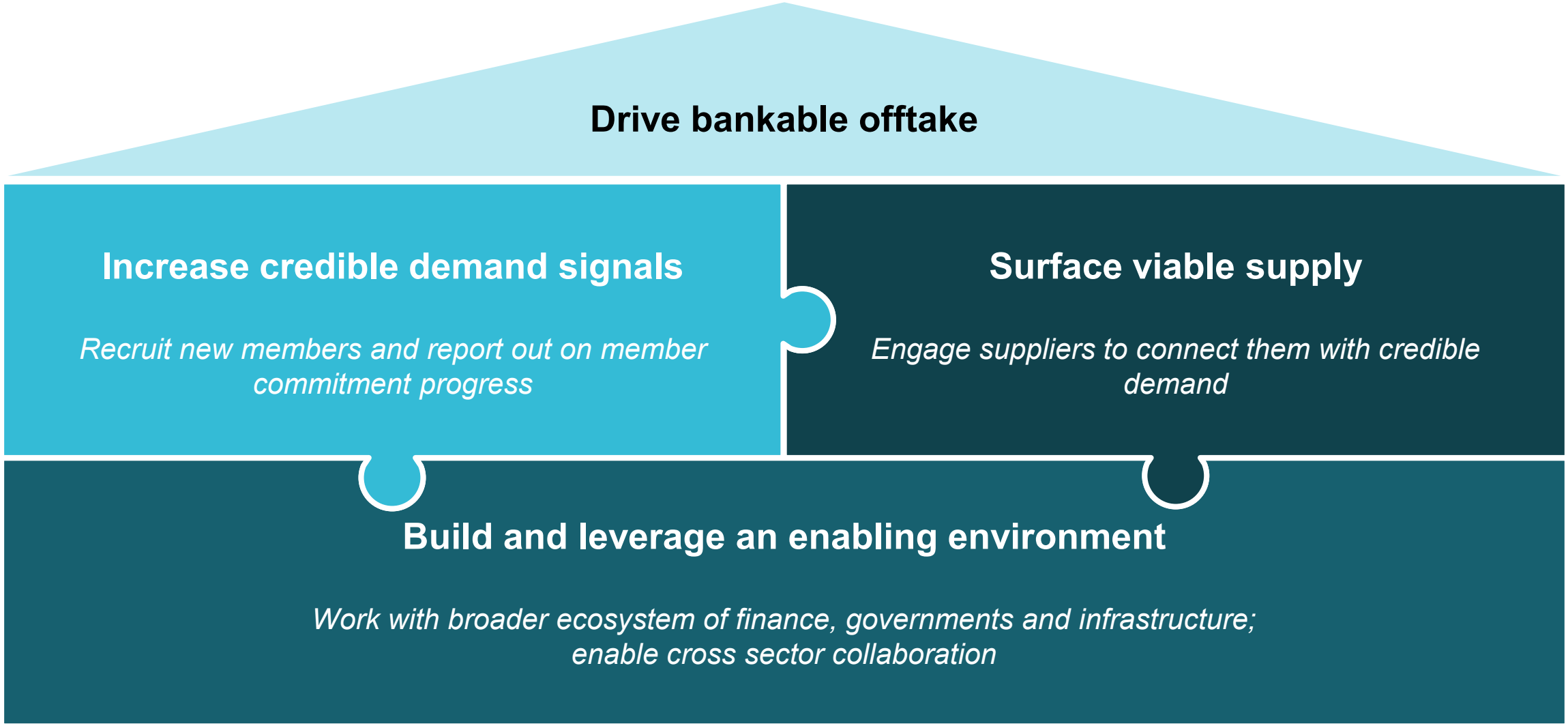
Trucking



Carbon Removal

First Movers Coalition

FMC priorities for 2024 | Moving from Commitment to Action



First Movers Coalition

Increase credible demand | Current members

AVIATION - 28 members

AIRBUS · American Express Global Business Travel · Apple · Autodesk · AVEVA · Bain & Company · Bank of America · Boeing · Boom · BCG · Choose · Deloitte · Delta · Deutsche Post DHL Group · eni · EY · FedEx · Fortescue · Lufthansa Group · Nokia · pwc · Qatar Airways · Rio Tinto · salesforce · Schneider Electric · United · University of Michigan · Vattenfall

STEEL - 28 members

AkerSolutions · Alfa Laval · Bharat Forge · Kalyani · CMC · Ecolab · Egui · enel · ENGIE · Ford · Fortescue · GE Vernova · gm · HYSTOR Energy · Iberdrola · Invenergy · Johnson Controls · mahindra · Mainstream Renewable Power · Marcegaglia · Norsk Stål · Ørsted · ReNew Power · Scania · Trane Technologies · Vattenfall · Vestas · Volvo · ZF

ALUMINIUM - 20 members

Apple · Ball · Bang & Olufsen · cba · Coca-Cola · Constellium · Danfoss · Elval · Ford · gm · Gränges · Hydro · logitech · Novelis · PepsiCo · speira · Trafigura · Velux · Volvo · Volvo

SHIPPING - 17 members

Maersk · Agility · Aker BioMarine · amazon · BHP · DP World · Hanwha Ocean · Fortescue · Höegh Autoliners · Lime · logitech · MOL Mitsui O.S.K. Lines · Rio Tinto · Trafigura · Western Digital · Wallenius Wilhelmsen · YARA

TRUCKING - 16 members

Agility · CEMEX · Dalmia Bharat · Fortescue · Heidelberg Materials · Holcim · nationalgrid · Norge Mining · PepsiCo · Rio Tinto · Scania · SSAB · Toll · Vattenfall · Volvo · Wallenius Wilhelmsen

CARBON REMOVAL 11 members

aes · Google · BCG · Capgemini · drax · EGA · Microsoft · MOL Mitsui O.S.K. Lines · salesforce · Swiss Re · Trafigura

CEMENT & CONCRETE 7 members

CMC · etex · gm · RMZ Corp · Vattenfall · Ørsted · ZGF

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FMC in numbers | Impact to date






101

Leading companies

signing **over 125 commitments** to purchase a minimum volume of innovative clean solutions across hard-to-abate sectors by 2030

$16

Billion in demand

for innovative climate technologies and near-zero emission goods and services in 2030

~100

Offtake agreements and investments

to purchase innovative clean solutions signed by FMC members

31

Million tonnes CO_2e

in expected annual emissions reductions in 2030

13

Government Partners

mobilizing demand and supply, and creating an enabling environment in their countries (50% of global GDP)

174

Projects

from **more than 100 companies** covering near-zero emissions final projects or value chain projects in the **First Suppliers Hub**

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5%
global GHG emissions today

Cement and Concrete | Commitment scope

Construction & Engineering

> We commit to **purchasing** at least 10% (by volume) of our cement / concrete per year as near-zero cement / concrete[1] inclusive of any SCMs by 2030

Real Estate / Developers / Advisory

> We commit to **ensuring / specifying** that at least 10% (by volume) of the cement / concrete procured for our projects per year is near-zero carbon cement / concrete[1] inclusive of any SCMs by 2030

Breakthrough technological pathways

Procurement of cement or concrete produced using breakthrough technologies, including (but not limited to)

- Carbon capture, utilization and storage (**CCUS**) to capture process-related emissions at source
- Clinker substitution using novel **SCMs**
- **Alternative cement chemistries** reliant on raw materials other than limestone

1. As per FMC definition

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Cement and Concrete | Detailed commitment

Subject of demand signal

First Movers will make a commitment for either cement or concrete:

1. Cement with embodied carbon below 184 kg CO_2e/ton
2. Concrete that meets the embodied carbon limits below

Specified compressive strength (f'c in psi)	Embodied carbon (kg CO_2e/m^3)
0 - 2500 psi	70
2501 - 3000 psi	78
3001 - 4000 psi	96
4001 - 5000 psi	117
5001 - 6000 psi	124
6001 - 8000 psi	144

Technological pathways

Solutions may include (but are not limited to):

- **CCUS**
- **Alternative cement chemistries**
- **Non-fossil-based and novel SCMs**
- **Fuel switching**
- Renewable electricity
- Decarbonated raw materials
- CO_2 mineralization during curing

Out-of-scope:

- Carbon offsets

Bolded abatement technologies seen as most critical to meeting FMC targets according to FMC research

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II. Importance of the demand signal

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Bankable Project Framework

A. Proven demand

B. Technology due diligence

- Independent verification of technical feasibility, and technology health / lifecycle
- Assessment of technology risk across the value chain

C. Traceable renewable source / water / feedstock supply

- Certificates of origin
- Proximity of source
- Long-term PPA (i.e., electricity supply capacity, connectivity, stability and price)

D. Legal due diligence

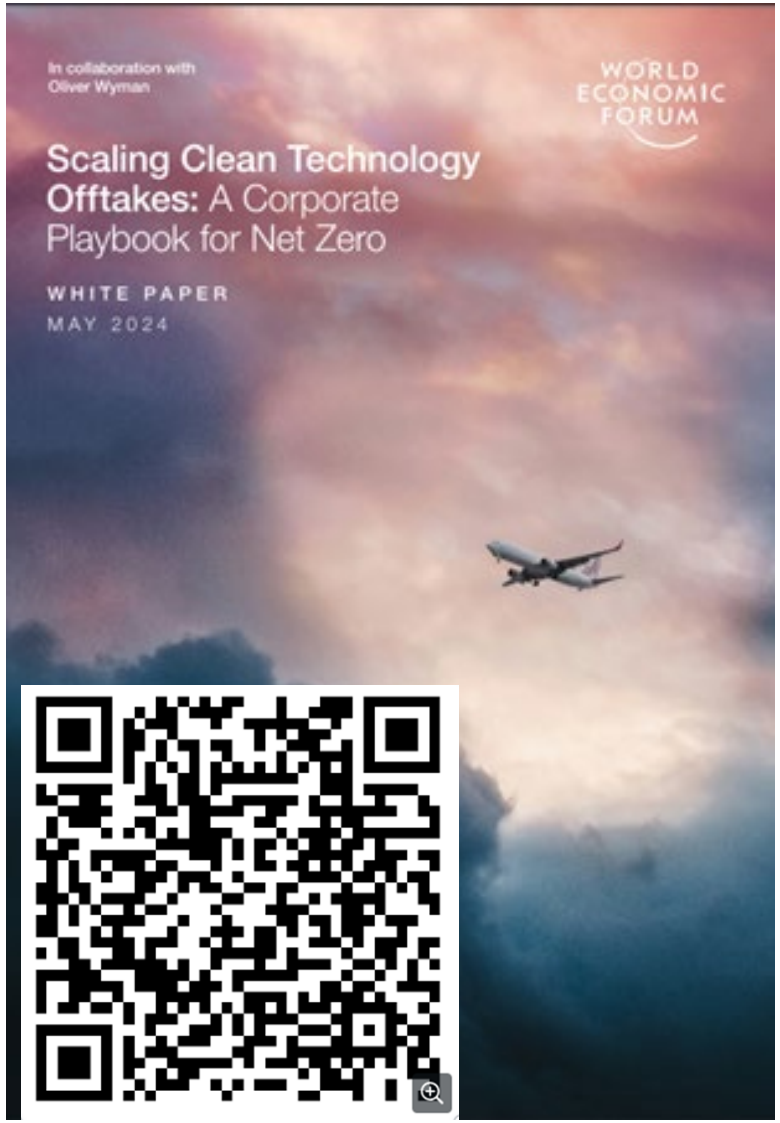
- Full-wrap, turnkey E&P contract
- O&M contract
- Lease agreement
- Licencing agreement

E. Supplier credential

- Technologically experienced (proven capability for at-scale production)
- Supplier credit history (e.g., long-standing clients)
- Sponsor / guarantee

F. Government involvement

- Policy incentives and disincentives
- Market support with auction contracts
- Credit risk support
- …



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To accelerate the market for emerging climate tech in hard-to-abate sectors, long-term offtake agreements are critical

There is clear market demand for low carbon products …

Example

101

FMC members have made buy-side commitments, often offering to pay a premium for low carbon products

… which requires viable supply from novel technologies and processes …

>20pp

Gap possible as green material demand surpasses supply in sectors like concrete and steel (by market share)[1]

… for which significant, affordable capital is needed …

~6x

Increase in climate finance p.a. needed by 2030 *(for buildings, industry, transport, and more)* to reach a 1.5°C trajectory[2]

… which in turn requires **bankable offtake agreements** to derisk investments

Strategic priority

1. WEF – this decade; market share of downstream players with science-based decarbonization commitments surpasses share of upstream players who would need to supply green materials to achieve these commitments, which is >20pp in some instances in markets like plastics, chemicals, aluminium, glass, concrete and steel; 2. To USD $4.3T For the next 26 years; BCG & Global Financial Markets Association climate finance report. <$0.7T in annual global capital is allocated to climate finance today; which is <15% of the required amount (link to report)

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Offtake agreements are extremely important to accelerate scale-up of cutting edge decarbonization technology, but also face significant challenges

Significant, affordable capital is needed to surface viable supply from novel technologies[1] …

… which in turn requires bankable offtake agreements to derisk investments

However, persistent challenges today include

Cost gap

Disconnect with segments willing to pay[2]

Maturity of new supply chains and necessary infrastructure

Technical risk

Time horizon of contracting

1. 6x increase in climate finance p.a. needed by 2030 (for buildings, industry, transport, and more) to reach a 1.5°C trajectory; USD $4.3T For the next 26 years; BCG & Global Financial Markets Association climate finance report. <$0.7T in annual global capital is allocated to climate finance today; which is <15% of the required amount (link to report); 2. Due to lack of physical proximity or proximity in value chain; BCG analysis

Green premium dilution | Full decarbonization has a relatively low impact on prices to end-consumers – this will require coordination across the value chain

Illustrative for material sectors

	Cement	Steel	Aluminum
Producer	Cement producer	Steel producer	Aluminum producer
	+75-140% /ton cement[1]	+15-30% /ton steel	+30-50% /ton aluminum
First consumer along value chain	Concrete producer	Car manufacturer	Car manufacturer
	+15-40% /ton concrete	+1-2% /car	+1-2% /car
End product	Construction company	Passenger car	Passenger car
	+1% /house		
	House		

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Elements of bankable offtake agreements

Through our discussions with financial institutions and corporates, the following important offtake elements have emerged as key to support increased financing

Offtaker credibility

An ideal candidate would be a company with

- Long-standing credit history
- Healthy P&L statement
- Relevant technological experience
- Plans to use the committed volume towards the production of a relatively mature technology (e.g. replacing grey hydrogen with GH2)

Offtake terms and conditions

Termination clauses should ideally include the following conditions

- Debt-free condition
- Full equity refund (if applicable)
- Loss-of-profit refund

Offtake volume

Financiers should aim to have as much of project revenue hedged through purchase agreements, aiming for nearly 100% coverage.

However, recognizing challenges with offtake, ideal contracted volume should be

- 75-80% of output volume secured through offtake, with an aim of 100%

Offtake duration

At the very least, offtakes should

- Cover the tenure of debt financing (typically 8-14 years)
- Align with timelines of tax credits and regulatory landscape
  - Due to current regulatory uncertainty and incentives, few offtakes extend beyond 2030
  - Prolonging production tax credits can help facilitate 10+ year offtake tenure

Offtake pricing and pricing structures

Ideally, offtake pricing should be within the competitive green premium range to mitigate contract breach risks and should

- Distribute project risk between supplier and buyer (such as a cost-plus model with a price cap), in the absence of insurance or guarantees

Source: 'Scaling Clean Technology Offtakes: A Corporate Playbook for Net Zero' WEF whitepaper, in collaboration with Oliver Wyman

Example: pricing mechanisms for SAF

In use for offtake agreements today

Input costs include feedstock cost, hydrogen cost, variable tolling fee, fixed tolling fee, and other fees

Pricing structure	Flat/fixed pricing	Index-plus	Cost-plus	Take-or-pay	Ownership
Description	Contracts where the price of SAF is locked in for the agreed upon quantities, regardless of change in jet-fuel market price or cost of inputs	Offtakers take the agreed-upon quantities, at the price based on the market index of jet fuel with a green premium	Offtakers take the agreed-upon quantities, at the price of input costs at the time of production, with a margin Might be subject to price cap	Offtakers pay for the products on a regular basis, whether they take delivery of the products	Offtaker and supplier form a joint venture partnership to produce and sell a product, with the offtaker committing to purchasing a certain quantity of the product at an agreed-upon price
Risks shared by buyers					
Security of supply	■	■	■	■	■
Feedstock risk			■	■	■
Technology risk				■	■
Operational risk				■	■
Construction risk					■
Return on investment					■
Considerations	• Uncommon • Risky for supplier	• Most common among energy players • Expected to grow more challenging as gap widens between HEFA4 feedstock and Jet A indices	• Common among energy players • Less risky for suppliers with feedstock constraints	• Too inflexible/high-risk currently for most offtakers, but will likely emerge stronger as markets mature	• Adopted by a few large energy players • Unlikely to be adopted by other players at scale due to the capital investment required

Source: 'Scaling Clean Technology Offtakes: A Corporate Playbook for Net Zero' WEF whitepaper, in collaboration with Oliver Wyman

Considerations for low-carbon cement/concrete

Compared to SAF, the use of low-carbon cement/concrete can be extremely varied between small, short-term and large, long-term infrastructure projects. These varying demand schedules can create a high-degree of revenue uncertainty for suppliers. Implementing appropriate offtake pricing mechanisms can help mitigate this and additional risks.

Considerations for green steel and cement/concrete compared to SAF

Consideration	Potential implications to offtake pricing mechanisms
For large-scale infrastructure projects, demand can be relatively stable.	*Offtake agreements can be structured around long-term contracts with **Fixed or Indexed Pricing** to provide cost stability.*
Price stability is crucial due to the nature of the construction bidding process for many projects.	***Fixed Pricing** shields buyers and suppliers from market fluctuations, while **Indexed Pricing** share the risk of market fluctuations between the buyer and seller.*
Supplier supply chain reliability and continuous production are critical to the buyer for maintaining project timelines and ensuring product quality and safety.	***Prepaid** or **Take-or-Pay Offtakes** ensure suppliers receive necessary funds to sustain operations, reducing the risk of supply disruptions, but may not be feasible for products with complex supply chains and/or bulkier.*
Infrastructure projects typically involve the incorporation of various safety, quality, and environmental standards.[1]	*Offtake agreements may include **clauses ensuring compliance** with specific standards to maintain consistency and meet regulatory requirements.*

1. Quality and environmental standards in the U.S. include (non-comprehensive) LEED certification, ASTM Standards, EPA regulations, ACI Standards, and Buy Clean California Act ;
Source: Oliver Wyman analysis

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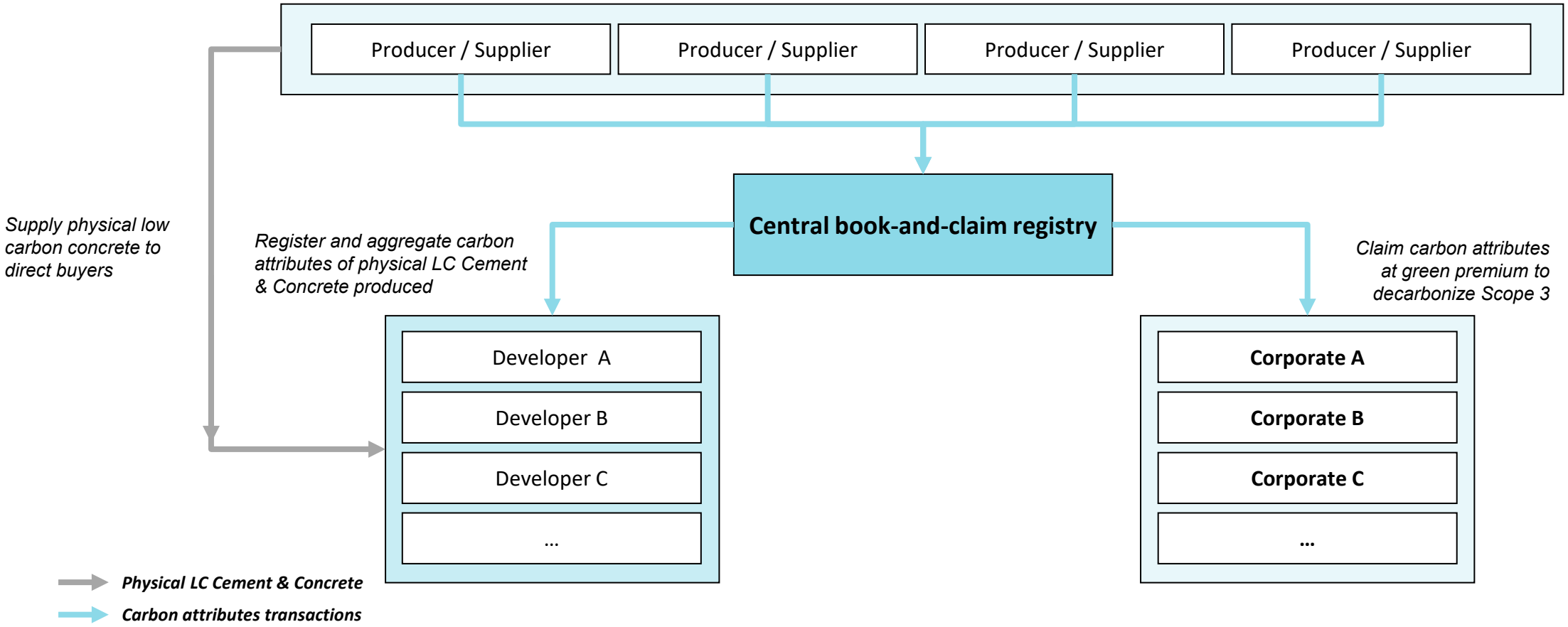
Book and Claim Chain of Custody Model emerging as an Alternative Tool to Strengthen Demand



A wholistic, auditable, and clear book and claim system that allows for credit purchase of corporates around the world is key to global demand scaling as offtakes outside of incentivized markets where suppliers are located

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III. Cement & Concrete market dynamics

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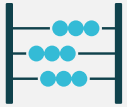
High-level green cement market challenges to overcome with further development and innovation

Lack of clear, consistent regulation incentivizing low-emissions cement production & purchases



Lack of:

1) Clear carbon accounting guidance

2) Harmonized book-and-claim systems & registries to overcome cement & concrete's geographical limitations

Procurement tends to be short-term deals due to uncertainty of projects

1) High prices vs. conventional cement, in segments with traditionally low margins (e.g., construction)

2) Difficulty in passing costs along the value chain and people in the middle of the value chain may not get credit for paying a premium

Lack of performance-based standards which are needed for novel solutions like alternative cement chemistries

Low supply of low emissions cement and high supplier project risks, despite variety of tech pathways to create green cement

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Despite market challenges, FMC members are making progress

North America

ZGF

Agreement with **local concrete suppliers** to increase use of SCMs in two recent projects

Middle East

Targeting the integration of **10% green concrete in civil and mechanical projects**, replacing traditional cement with eco-friendlier SCMs such as GGBS and fly ash.

Consolidated Contractors Company

Europe

VATTENFALL

Agreement with **CemVision** for development and supply of near-zero emission cement

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FMC US Workshop, July 2024: Cement & Concrete Sector Summary

The opportunity:

- In the context of the US Dept of Energy's **Industrial Demonstrations Program** providing $1.6bn to cement & concrete suppliers with promising decarbonization projects, offtake of near-zero emissions cement & concrete can de-risk investment and unlock further capital.
- **The solutions for achieving a net-zero cement & concrete industry by 2050 already exist** but scaling these and achieving a **manageable green premium** for decarbonized products remain important open questions.

Key barriers & challenges:

- Companies with a **willingness to pay a green premium** may operate far down the value chain from the production of near-zero emissions cement, or far geographically
- This makes it **harder to pay a green premium at the physical offtake stage**.

Key solutions:

Technologies, including:

- **Carbon capture** solutions
- Using **alternative raw materials**
- Employing **alternative cement chemistries**.

Value chain collaboration to pass on the green premium appropriately down the value chain was also flagged as a key component in achieving offtake.

New chain of custody models, such as book & claim, to separate the purchasing of green attributes and the physical product could help downstream buyers bridge the green premium. Collaboration with auditors and standard setters, and alignment with existing systems and protocols such as Environmental Product Declarations, SBTi and GHG Protocol, are likely to be crucial factors for success.

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What the public sector is uniquely positioned to do

Purchasing

- Implement Federal or State **Buy Clean programs**
- **Set example** to private companies of buying significant quantities of new, low-carbon materials to reduce market skepticism
- **Set example** of purchasing cement/concrete in a long-term advanced market commitment deal to de-risk suppliers' investments in low-carbon cement/concrete
- Along with corporates, leverage a **book-and-claim system** for purchasing low-carbon materials

Wider activities

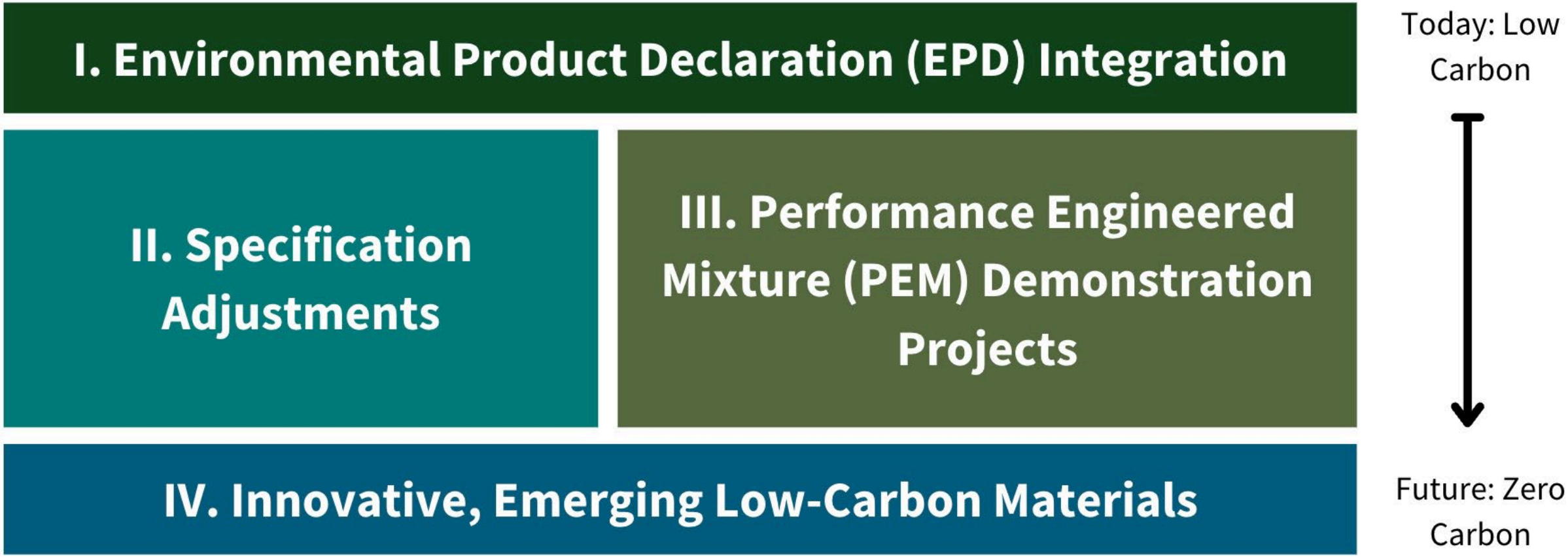
- Building code revision to move to **performance-based standards**
- Work with **innovation/research labs** to invest in promising technologies

RMI & NRDC Presentation

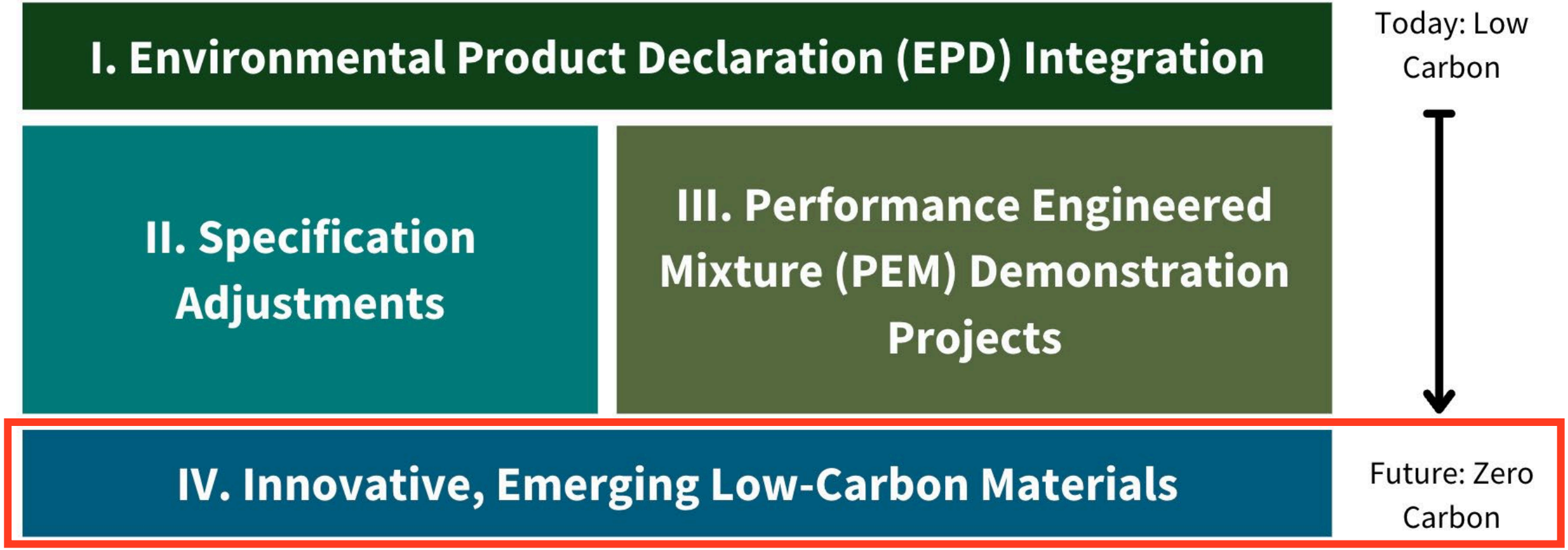
A Roadmap to Public Sector Advance Purchasing of Near-Zero Emissions Concrete

Background - low-carbon concrete for DOTs

Low-Carbon Concrete for Infrastructure Projects



Low-Carbon Concrete for Infrastructure Projects



Medium to Low EC OPC Alternatives

Existing

Emerging

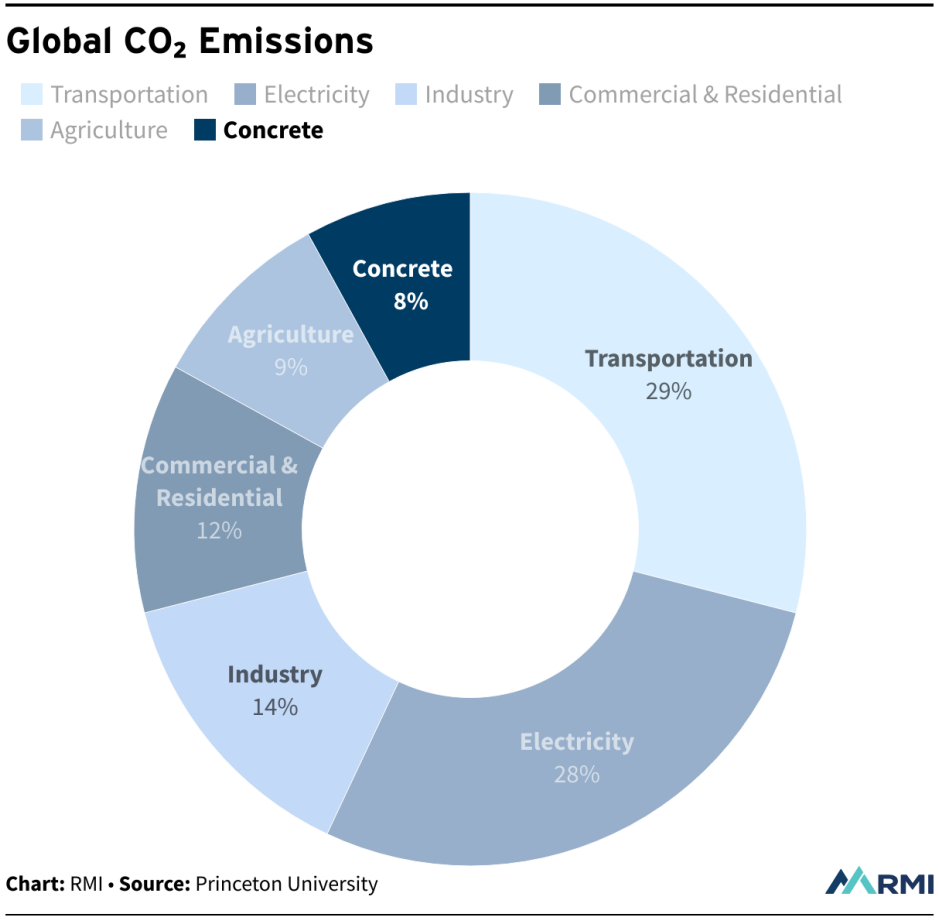
Non-Portland cement – alternative binders Traditional SCMs	Alternative raw materials Alternative SCMs (e.g. calcined clay)	10-50% reduction
Carbon-sequestering aggregates Carbon injection	Performance enhancing admixtures Carbonation curing	30-60% reduction
	Alternative cement processes / chemistries Biocement CCUS	Beyond 60% reduction

Barriers to Adoption of Emerging Tech

- **Technological Readiness and Innovation Risks**
  - Technological Immaturity
  - Uncertainty in Performance
- **High Initial Costs and Financing Challenges**
  - Green Premium
  - Difficulty in Securing Financing
  - Limited Access to Capital
- **Supply Chain and Infrastructure Limitations**
  - Fragmented Supply Chain
  - Lack of Specialized Infrastructure
  - Raw Material Availability
- **Market Demand and Policy Barriers**
  - Inconsistent Market Demand
  - Lack of Performance-Based Standards
  - Regulatory and Policy Gaps
- **Market Resistance and Liability Concerns**
  - Risk-Averse Industry
  - Liability for New Materials

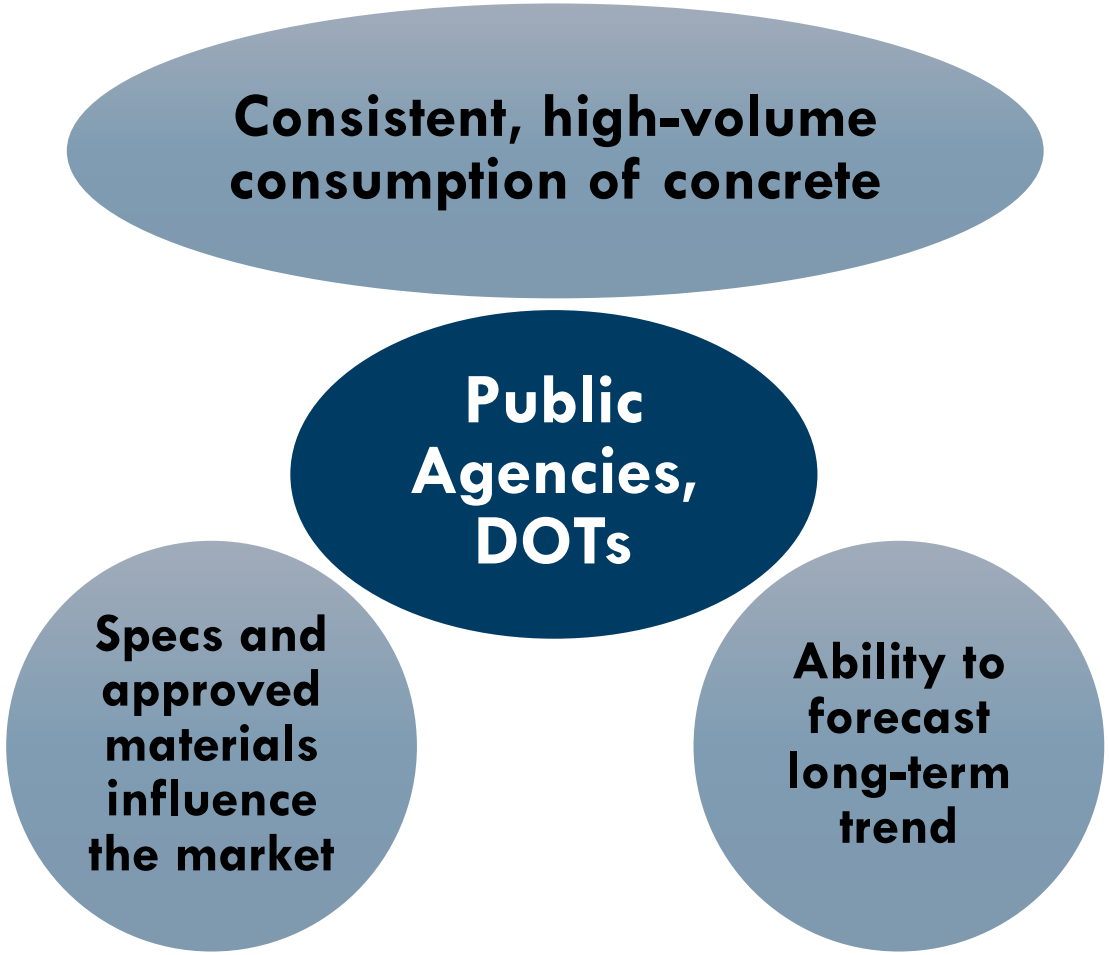
Why does the public sector matter?

Why are public sector AMCs important?



50% of U.S. concrete demand comes from public procurement, giving the government substantial influence to drive change.

Public sector concrete AMCs are critical



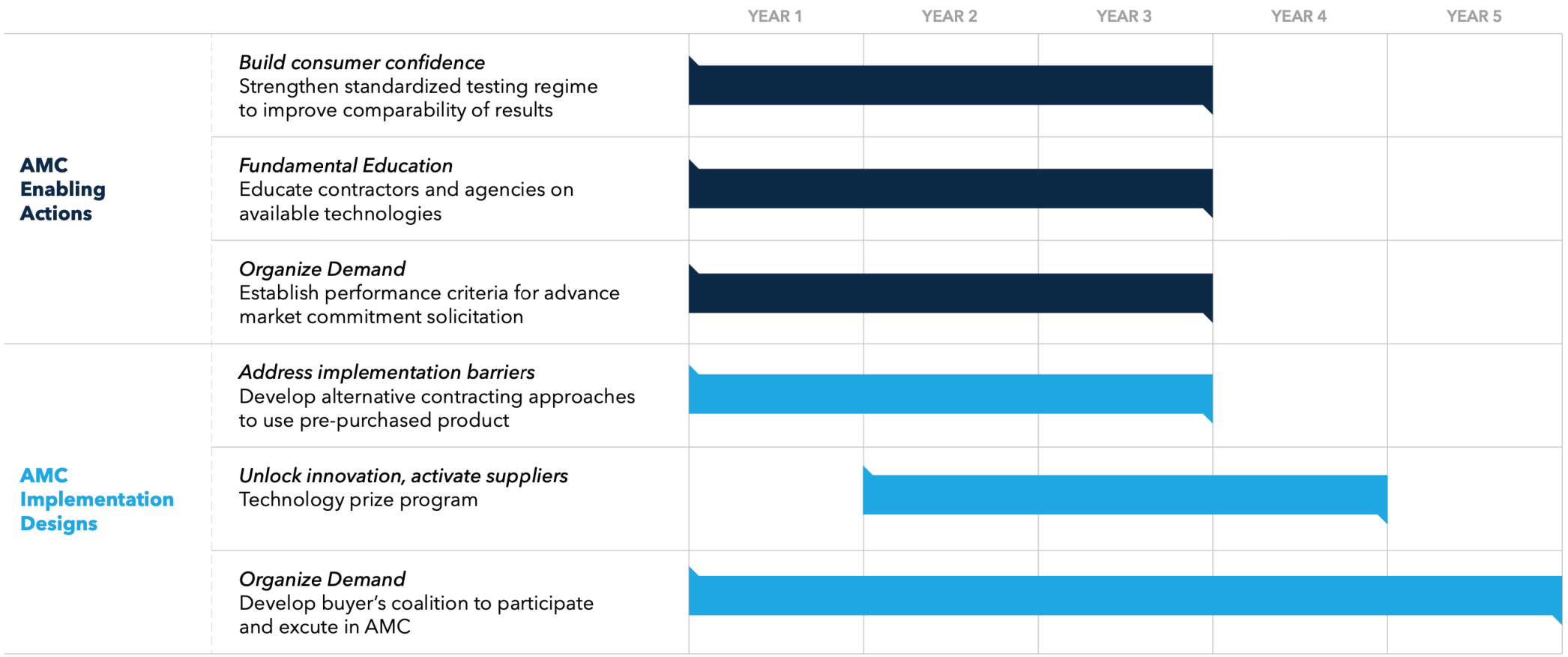
Implementation strategies for AMCs

The hard truth: public sector advance purchasing is a difficult, if not impossible, task today

Barriers

- Common construction contract models preclude use of pre-purchased products
- Lack of performance-based specification and contracting for concrete construction
- Technical application of emerging near-zero carbon concrete requires behavioral change
- Fragmented value chain with many stakeholders to educate

Near-term steps to unlock advance purchasing



1. Build consumer confidence

Objective

- Strengthen standardized testing regime to improve comparability of results

Demonstrate performance-based standards

- Prescriptive-based standards have historically limited the menu of materials available
- Alternatively, performance-based standards can:
  - Increase the flexibility of qualifying materials
  - Accommodate the entry of novel low-carbon blended cements e.g., ASTM C1157

Strengthen state testing regimes

- DOTs play a major role in setting norms in the concrete market.
- DOTs can improve the applicability of their testing results nationwide by:
  - Creating a database to share concrete mix testing
  - Additional resource sharing

Expand state testing regimes

- Testing facilities can go beyond pavement testing and include different concrete applications.
- State DOTs may consider launching their own testing facilities.
  - e.g., MnRoad, Lab-to-Slab Initiative at the UC Davis Pavement Research Center
- DOTs can work with DOE's IDP awardees to test emerging low carbon concrete products.

Case Study: Supporting Legislation

- Concrete and Asphalt Innovation Act of 2023

2. Provide fundamental education

Objective

- Raised understanding of, and confidence in available cement and concrete technologies

Knowledge Sharing Platforms

- Providing a platform that promotes collaboration and dissemination of critical performance data and essential technical skills
- Allows organizations to quickly adapt to market changes.

Industry Training

- Live or on-demand training programs support skills development in industry.
- Improves understanding and accelerating the adoption of new technologies.

Industry Led Collaboration Groups

- Connecting experts and industry leaders directly with contractors and agencies.
- Provides a centralized forum for propagating best practices, optimizing knowledge exchange and promoting collaboration.

Case Study: Supporting Legislation

- Concrete Industry adoption of Portland Limestone Cement (PLC)

3. Identify key criteria for an advance purchase

Objective

- Establish a detailed set of material and business performance criteria

Material Criteria

- Material criteria must be developed and met to initiate AMCs between buyers and suppliers.
- Criteria will focus on durability, strength, workability, and environmental impact, specifically greenhouse gas reductions vs. Baseline.
- Material performance must be demonstrated via appropriate testing.

Business Criteria

- Business criteria must be developed and met to ensure that the product developed will meet market demand. E.g., target price, business plan, production growth plan
- Milestone payments may be distributed on a staged basis as certain business performance criteria are met including R&D completion, manufacturing capacity and scaling requirements.

Contract Drafting

- When an agency is ready to develop template contracts for an AMC agreement, the agency may refer to other AMCs that have already been made, partner with other interested agencies, and reference publicly available agreements.
- A contract would include the necessary terms, conditions, pricing, and geographic considerations for successful procurement.

Case Study

- Gavi COVAX Advance Market Commitment
- NASA Commercial Orbital Transportation Services (COTS) program

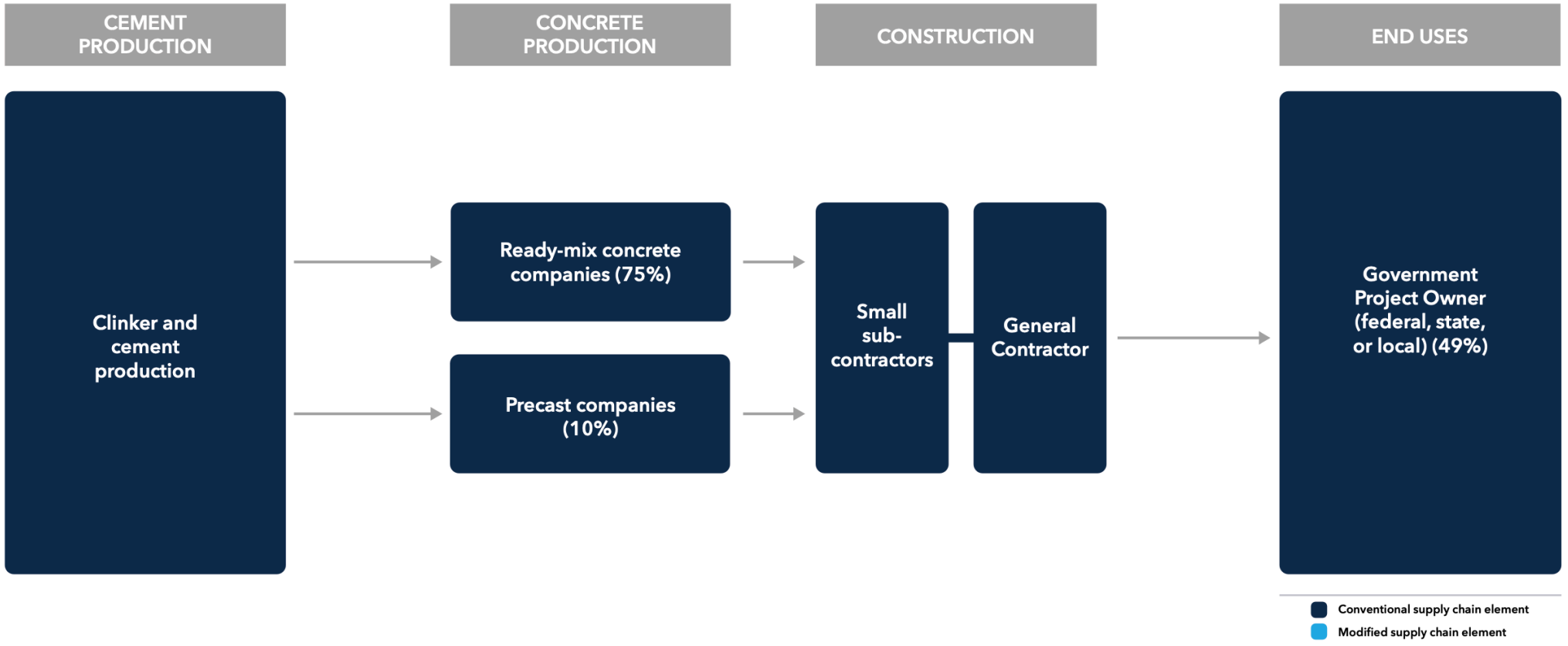
4. Demonstrate alternative contracting models

Objective

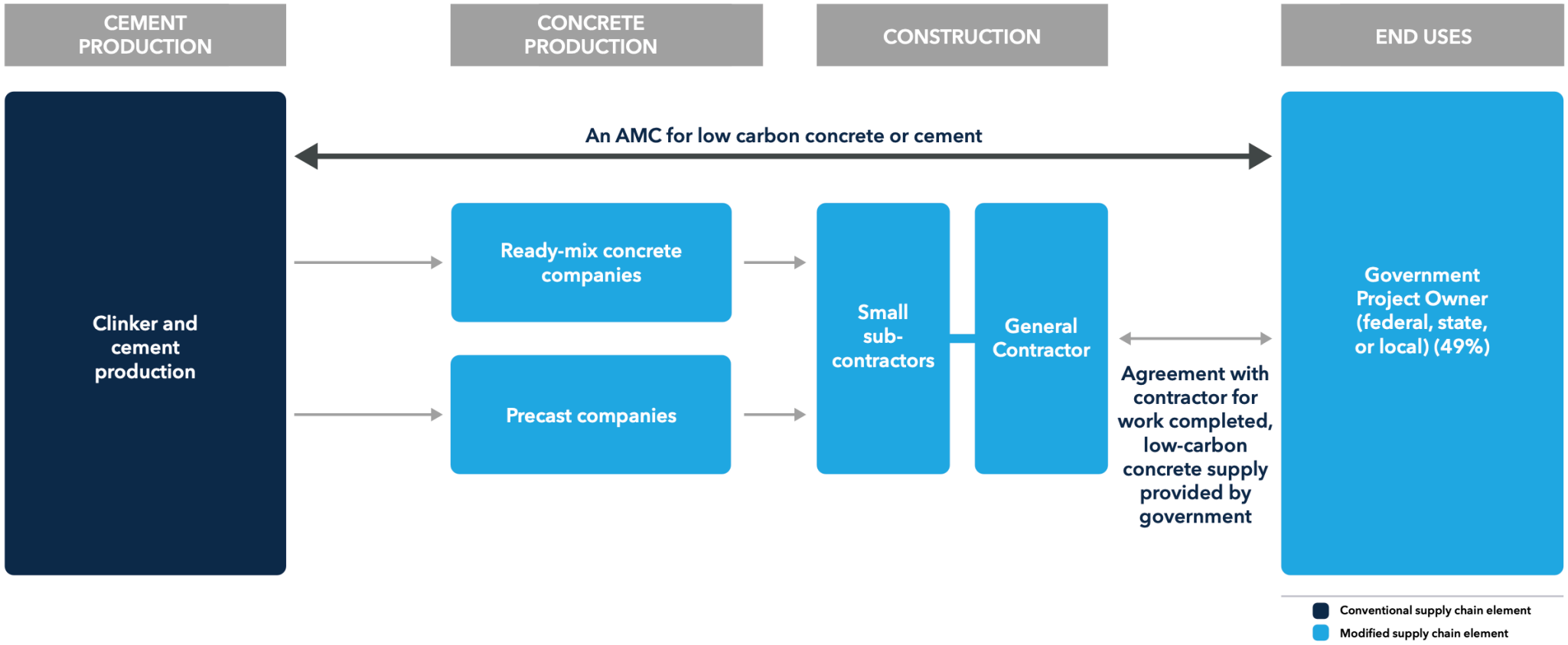
- Align supply chain structure and market actors to incentivize innovation in low-carbon cement and concrete production, while reducing market fragmentation.

Liability Concerns	Alternative Contract Models
• Risk adverse construction industry • Owners limited from prescribing specific pre-purchased products.	• Direct Contractor-Cement Supplier Agreements • Mandated Use of Approved Low-Carbon Materials

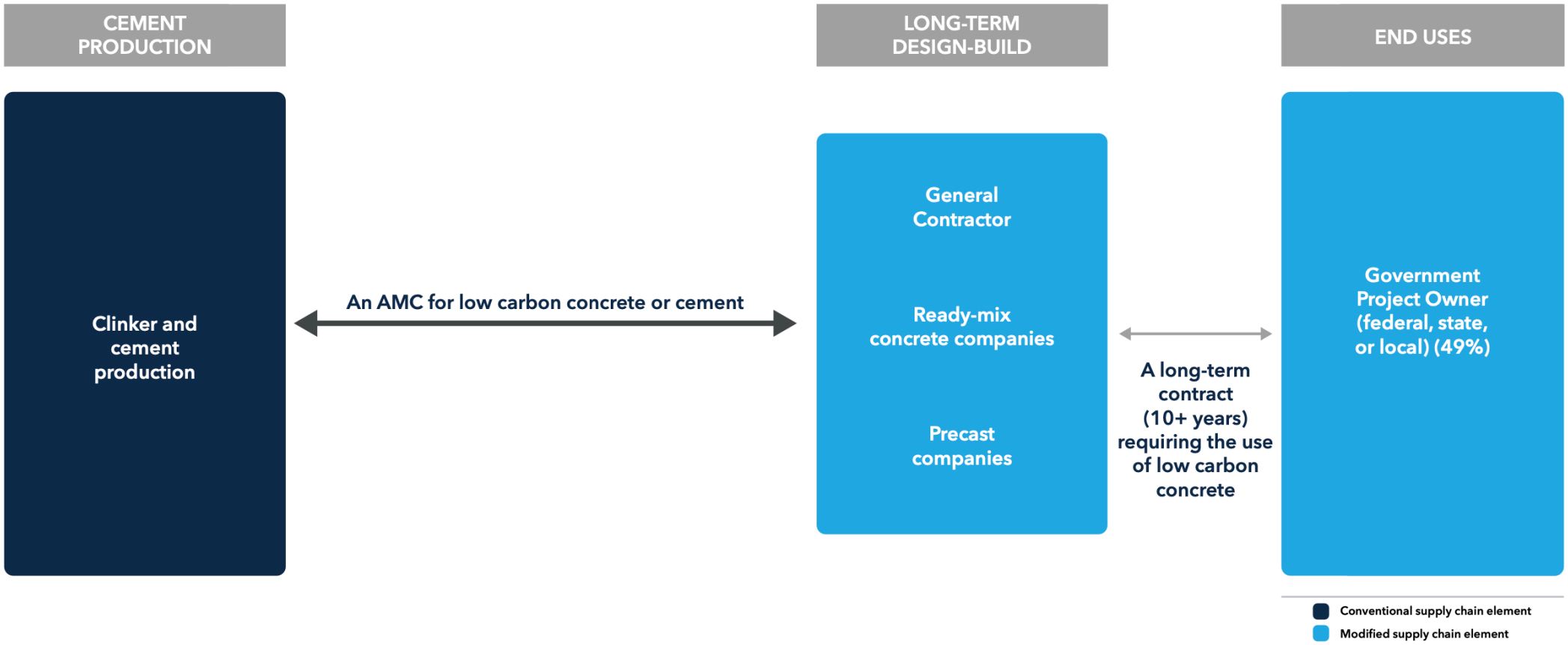
Conventional Supply Chain Model



Alternative Supply Chain Model



Alternative Supply Chain Model



5. Unlock innovation with a prize program

Objectives

- Stimulate innovation in low-carbon concrete technologies by launching a technology prize program that encourages competition and activates suppliers.
- Provide platform to pilot these technologies and beta-test advance purchase

Incentivize Lowest Carbon Concrete

- **Goal**: Encourage suppliers to compete on cost and carbon emissions reduction.
- **Outcome**: The winning technology will undergo beta testing in real project applications.

Establish Standards & Guidelines

- **Material Standards** define performance criteria to ensure new technologies are suitable for current concrete applications.
- **Carbon Footprint Guidelines** set specific production emissions requirements to ensure significant reductions.
- **Demonstration projects** provides real-world testing, building confidence for AMC deployment.

Case Study: Global Cooling Prize

- **Technology-Agnostic Approach:** Allowed access to various solutions, focusing on affordability, scalability and performance under real-world conditions.
- **Impact:** Enabled leading manufacturers and startups to advance prototypes through rigorous testing, setting a model for incentivizing climate-focused technology.

6. Coordinate with other buyers

Objectives

- Provide producers assurance to make larger investments than would be possible through individual engagements
- Send a clear demand signal for additional low-carbon products through purchases from end user customers

Connecting Suppliers & Buyers

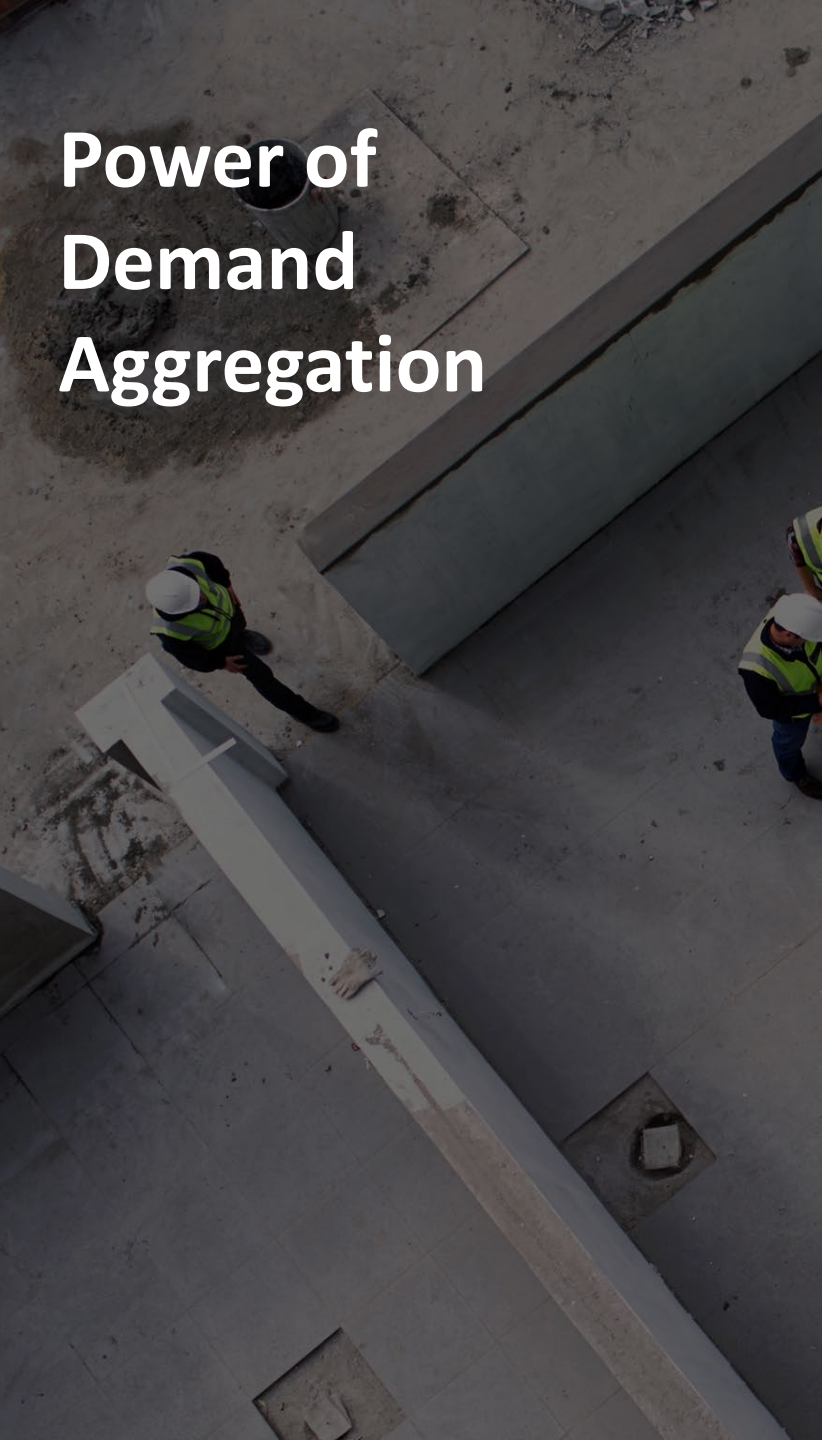
- Convene a group of committed buyers
- Enable direct interaction between cement producers and buyers to streamline AMC agreements
- Create flexible contracting models suitable for both public and private buyers.

Explore certificate models to unlock demand

- Mechanisms such as book & claim can unlock geographical limitations to demand and support offtake agreements

Case Study: Sustainable Aviation Buyers Alliance

- **Strategy:** Pooled buyer demand drove SAF production, also offering technical resources and support.
- **Impact:** Demonstrates the power of organized buyer demand and reducing costs.



Power of Demand Aggregation

RMI and Center for Green Market Activation (GMA) are developing a book & claim certificate to unlock demand

- **Demonstrate stronger demand signal** for low-carbon cement and concrete to help grow the market
- **Secure better deal terms** through purchasing EACs in bulk and engaging with multiple off takers at once
- **Provide bankable assurance** to producers to make investments via longer-term market signals
- **Benefit from peer-to-peer learning** while navigating complex, new markets
- **Ensure environmental integrity** by leveraging alliance sustainability frameworks and collective action

Q & A

Interactive Polling Session

Open Discussion

Conclusion

1. Public sector demand is key to unlocking a climate-aligned concrete industry

2. Near term steps can set the stage for public sector AMCs

3. Demonstration projects, specification adjustments, alternative contracting models, and prize programs are key steps

The event recording and other resources will be posted on this page within 24 hours

Carbon-Free Buildings
Low-Embodied Carbon Program

Thank you!

For more information visit
rmi.org/buildings