

MNEXT

LUNCH & LEARN

BIOBASED TRANSITIONS:
SCALE NOW!

February 29, 2024

WELCOME!

WE WILL START AT 12:15H



LUNCH & LEARN

Program

12:15h: Introduction by Annine Rozema,
Researcher Biobased Construction – MNEXT

12:20h: Presentation by Martijn Zieverink,
Professor Biobased Transitions – MNEXT

12:45h: Questions/discussion

13:00h: Closure

Please ask your questions via the chat

Presentation slides will be shared afterwards

This Lunch & Learn will be recorded

BIOBASED TRANSITIONS: SCALE NOW!

Martijn Zieverink

Professor, Biobased Transitions, MNEXT



introducing MNEXT *Centre of Expertise for Materials- and Energy Transition*

ENERGY

MATERIALS

RENEWABLE
ENERGY
CARRIERS



SMART
ENERGY



BIOBASED
RESOURCES &
ENERGY



BIOBASED
TRANSITIONS



BIOBASED
BUILDING
BLOCKS &
PRODUCTS



BIOBASED
CONSTRUCTION



MARINE
BIOBASED
CHEMISTRY



Biobased Transitions team



Philippa Roots



Willem van Liemt



Martijn Zieverink



Maddalena Logrieco

A warm welcome to today's audience!

universities & universities of applied science

Fontys
 Ghent University
 HAN
 Hogeschool Rotterdam
 HZ
 Maastricht
 HU
 HOGENT
 Avans

institutes & (semi)-government

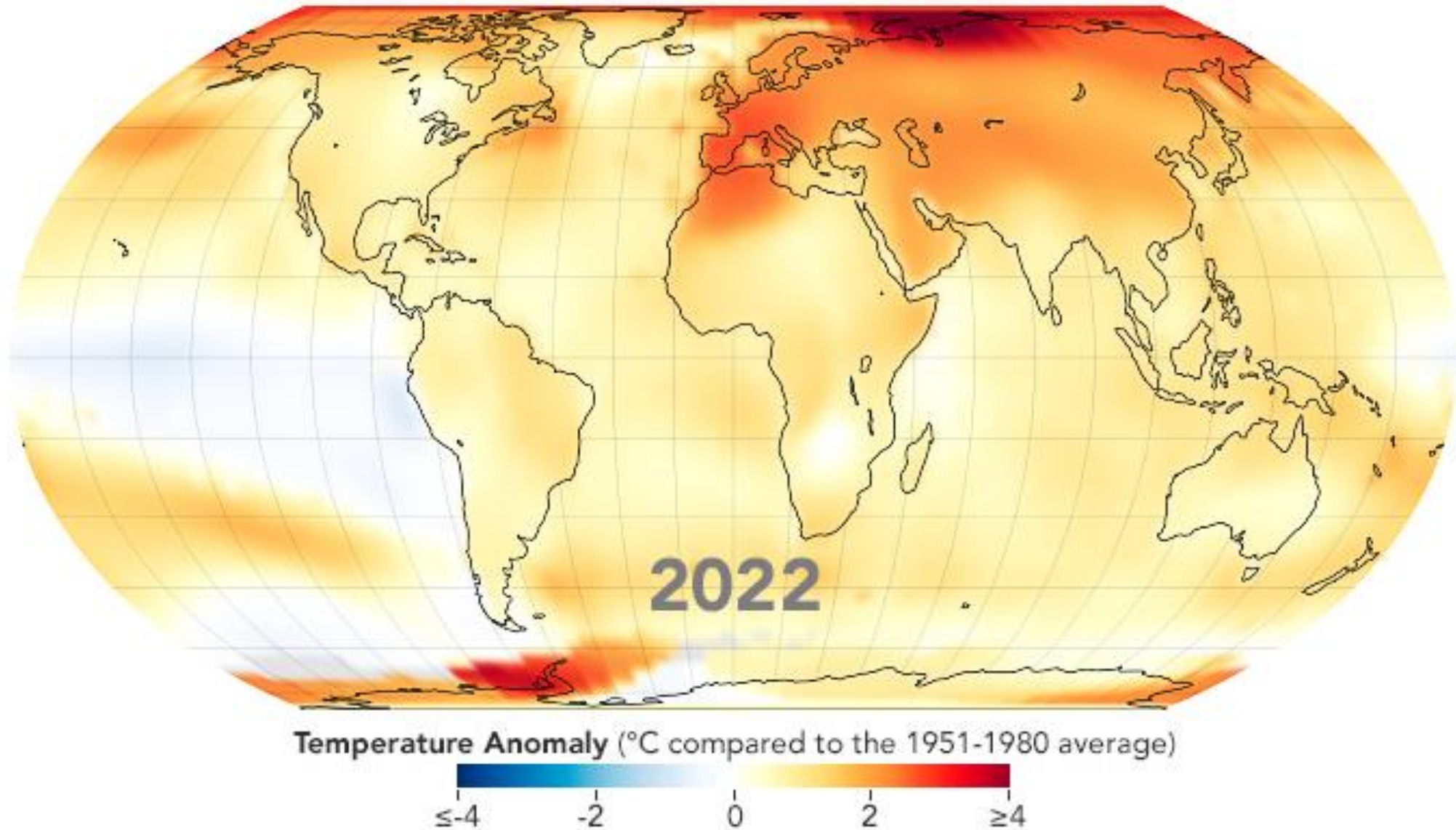
AMIBM
 RVO
 TKI Groene chemie en circulariteit
 Varta
 TNO
 Platform Renewable Fuels
 GoChem

Regional

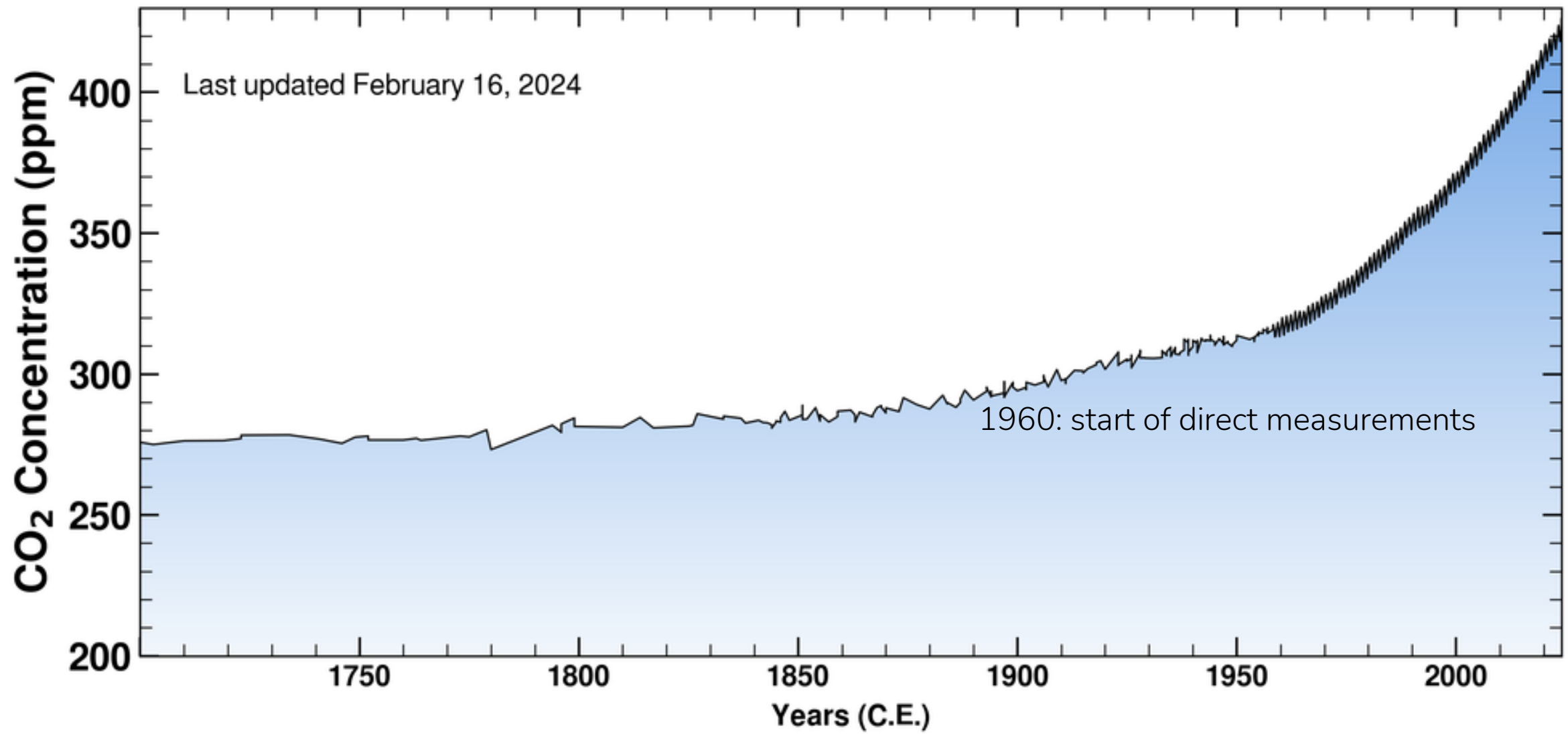
provincie Noord-Brabant
 provincie Zuid-Holland
 Regio West-Brabant
 Waterschap Aa en Maas
 gemeente Middelburg

companies

Arte Constructo	studio Gear Up
Bconscious	studio Zautsen
Avantium	Teijin Aramid
Green Serendipity	Indaver
Rodenburg Biopolymers	Cosun Beet
Proteonic	RWE
studio Gear Up	Piko
studio Zautsen	
Teijin Aramid	
Indaver	



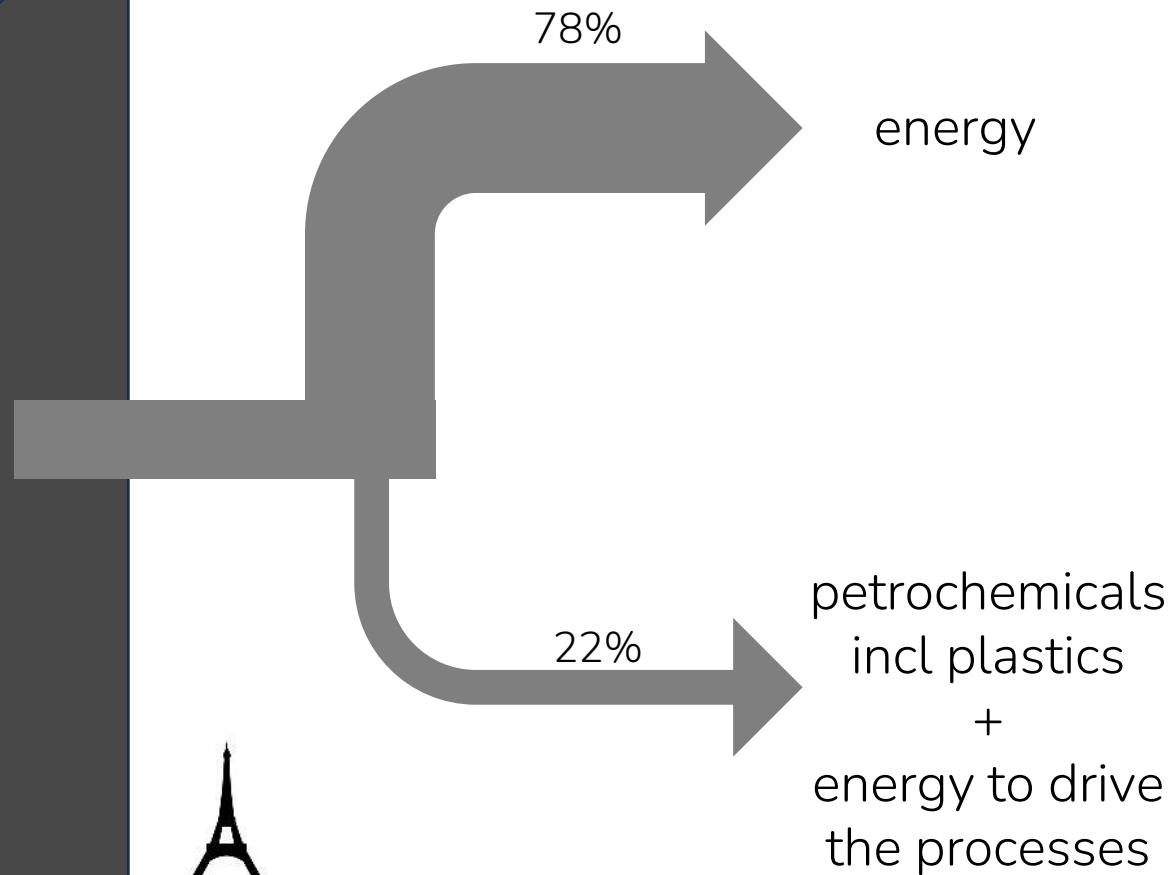
'the past nine years have been the warmest years since modern recordkeeping began in 1880'



each year

humans consume 16 gigaton of fossil materials (coal, gas and oil)

cube of 2.5 km x 2.5 km x 2.5 km



global chemical mass flows (2013)

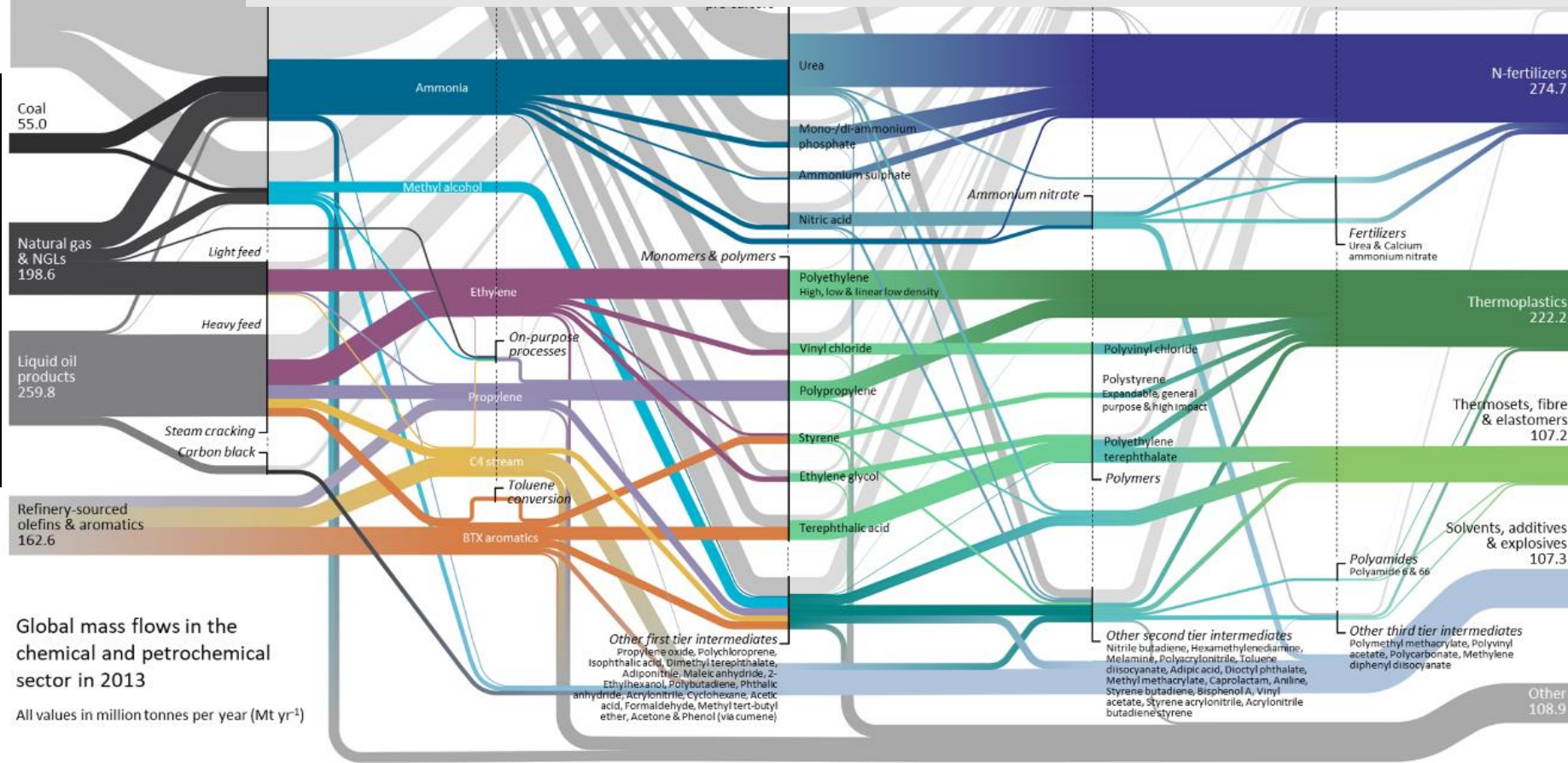
industry also consumes 400+ Mton fossil fuel releasing an additional 1.3-1.5 gigaton CO₂

Net
135 Mton
CO₂

677 Mton
fossil

Secondary reactants	
H ₂ O	274.0
O ₂	221.2
CO ₂	151.6
N ₂	142.4
H ₃ PO ₄	60.8
Other	109.4

CO₂ 286.8



275 Mton
fertilizer

329 Mton
plastics

216 Mton
other

petrochemical industry

contributes to **7%** of global greenhouse gas emissions (5.5% of CO₂)

and

is projected to increase **2.8x** by 2050 (population growth, increasing wealth)

however

to stay within '50% chance of only 2°C temperature rise'

requires

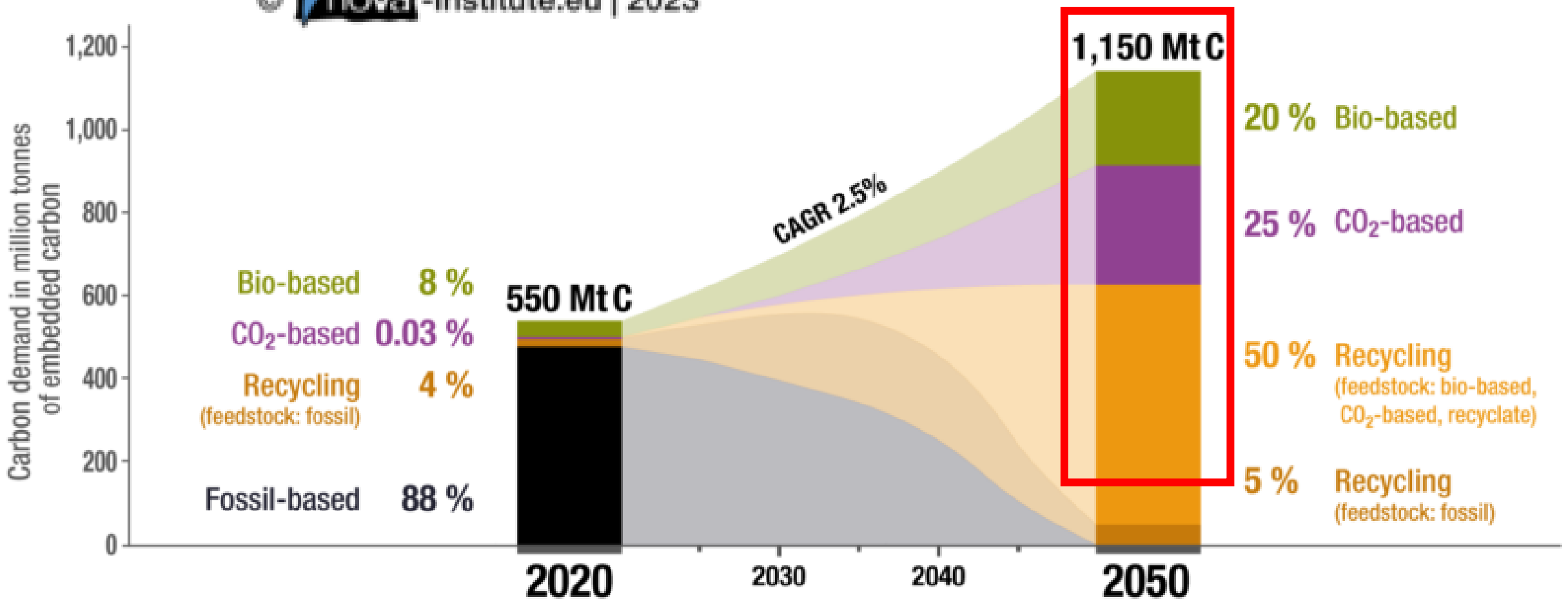
75% GHG reduction per ton product produced

Carbon Embedded in Chemicals and Derived Materials

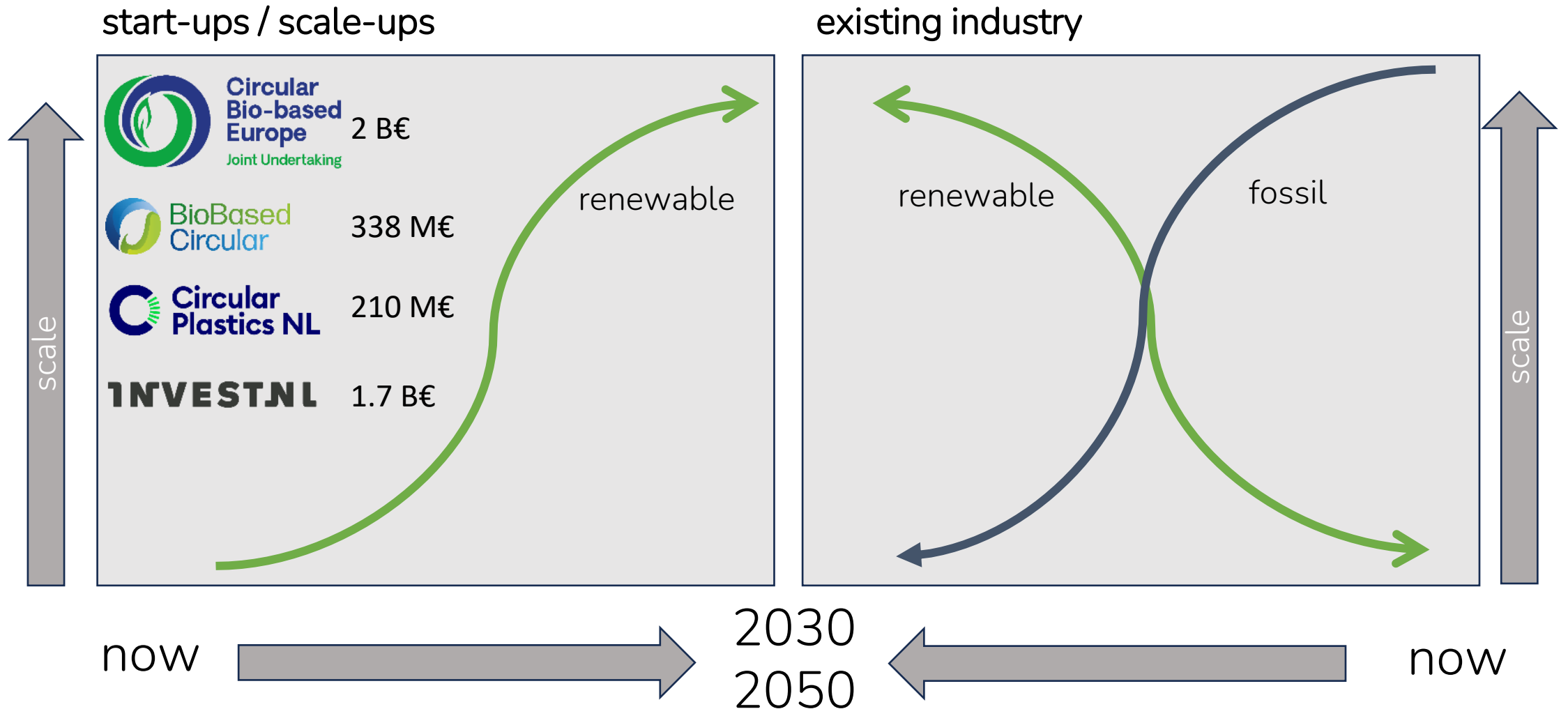
updated nova scenario for a global net-zero chemical industry in 2050



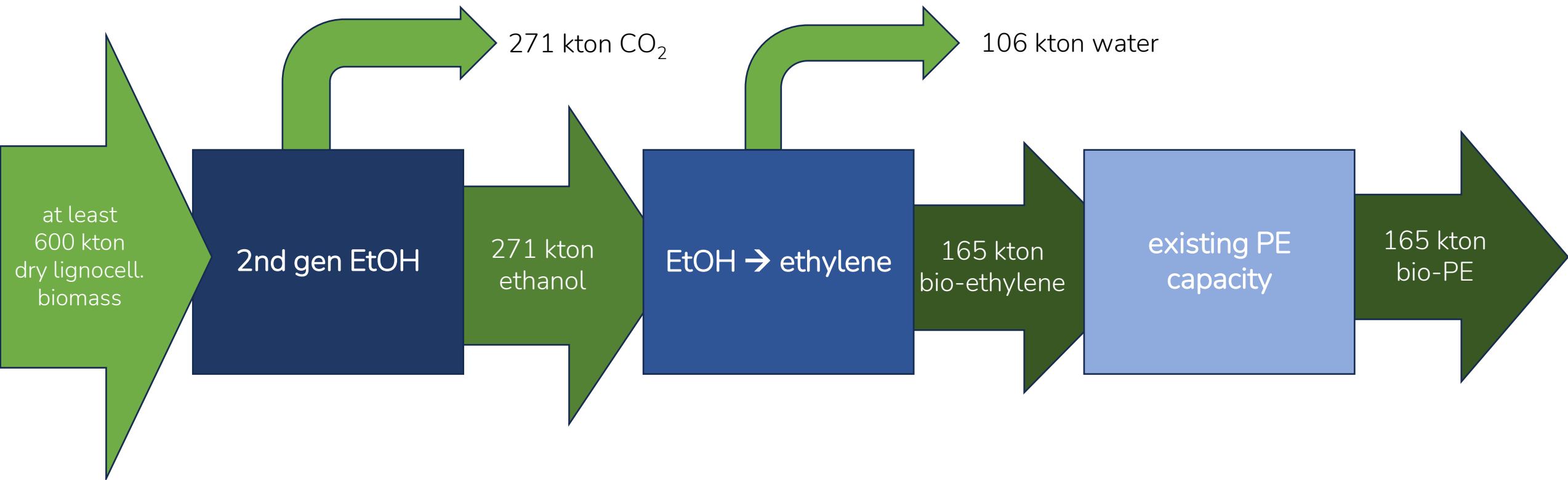
almost none of this currently exists at scale



at least two roads lead to Rome

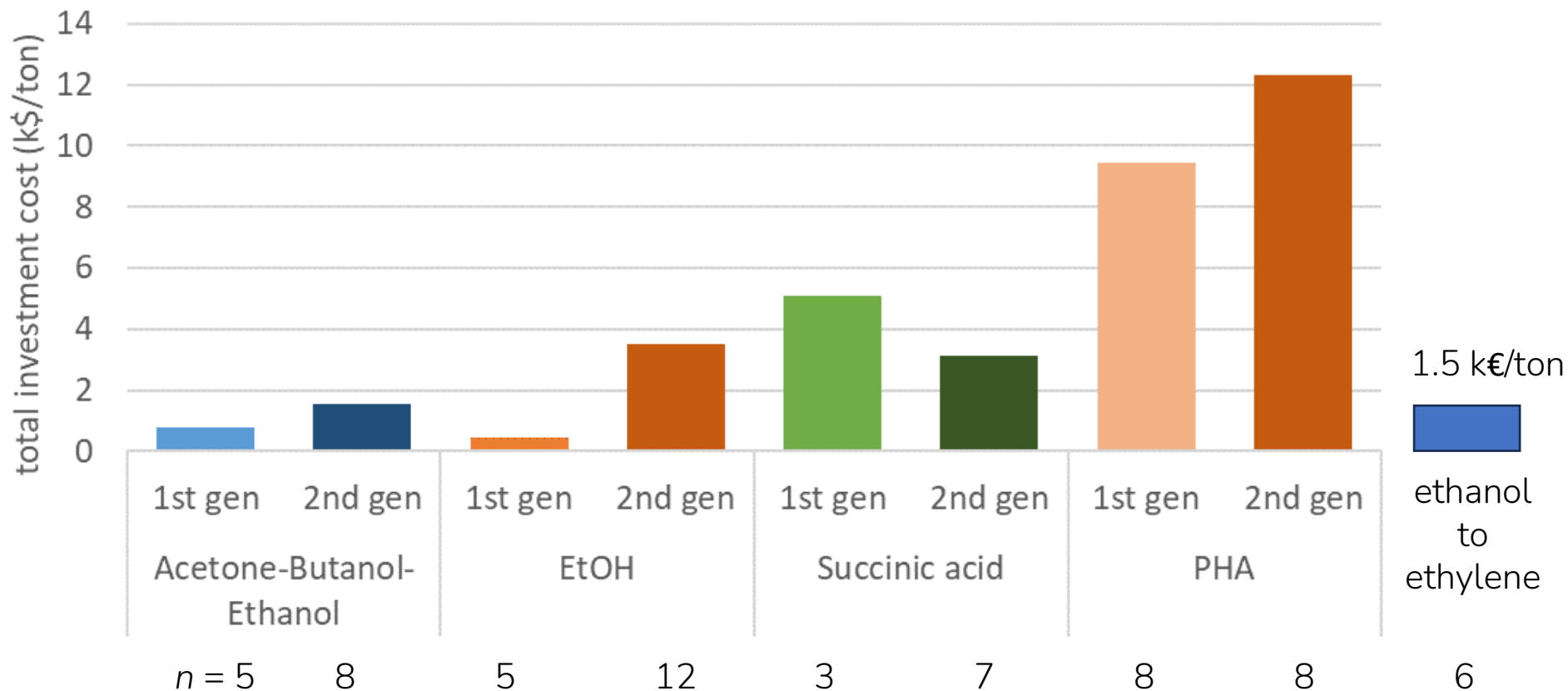


example: replace 1% of EU ethylene with bio-ethylene
EU 2022 = 16.5 Mton ethylene



new technology can be very expensive

estimates of total investment cost (k€/ton capacity) at ≈ 100 kton/a scale

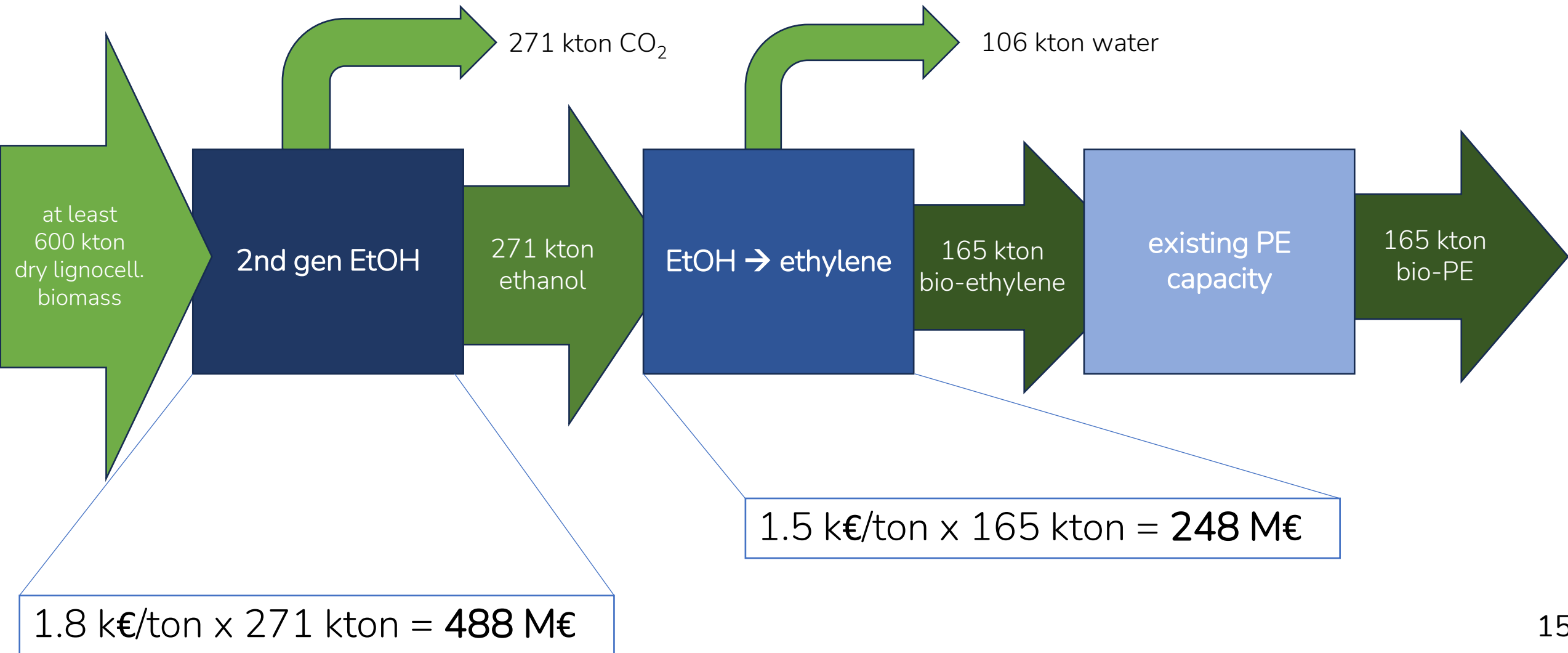


number n refers to number of data points

Median value shown

MZI, unpublished research

estimated investment cost = 750 M€ (+/- ...)
replace 1% of EU ethylene with bio-ethylene



reality can be tough

'want tussen droom en daad staan wetten in de weg en praktische bezwaren' – Willem Elschot

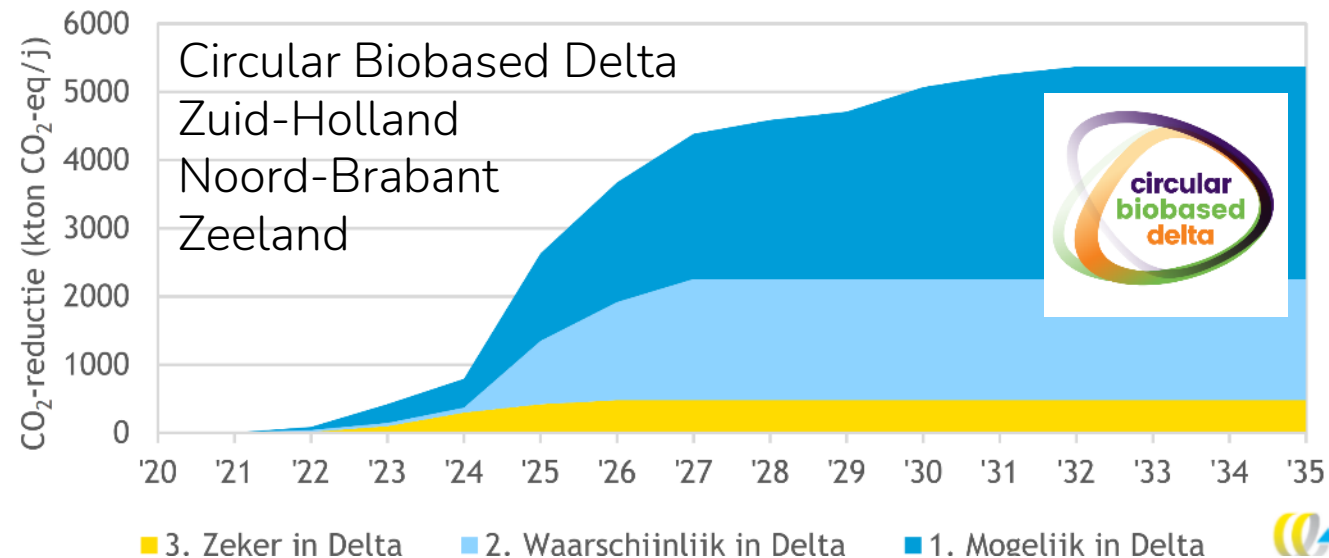
forecast December 2020

21 hi-potential projects identified
delivering 5 Mton CO₂ reduction per year
requiring 3.2 billion € investment

actual March 2024

top 5 projects shelved or disbanded
equivalent to 60% of hoped for impact
estimated 100 million € actually raised

Jongsma et al. CO₂-reductie met de Circular Biobased Delta Aanzet voor een routekaart voor de periode tot 2030, CE Delft 2020



📅 december 13, 2023 👤 Jacqueline van Gool

Avantium staakt investeringen in Ray-technologie door hogere kosten FDCA-fabriek

Avantium heeft vandaag aan de investeerders een update van de oplevering van de FDCA-fabriek en productie voor 2024. Avantium verwacht in 2026 zou het bedrijf daar 100 miljoen euro aan omzet uit kunnen halen, maar nu is het waarschijnlijk dat het bedrijf de investeringen in haar Ray technologie zal moeten stopzetten.

Avantium bevestigt dat de FDCA-fabriek in het eerste kwartaal van 2024 in productie kan starten. De bouw van de fabriek heeft flink meer gekost dan verwacht, tegen eind 2024 oplopen tot 255 miljoen euro. Dat is zo'n 63 miljoen euro meer dan het oorspronkelijke project. Het bedrijf wijt de kostenstijging aan inflatie, ongunstige marktomstandigheden en andere factoren die het mogelijk maken om projecten momenteel te maken hebben.

Financieel pakket

Om de oplopende kosten van de FDCA-fabriek te dekken, kender Avantium een financieel pakket van het Plastic Investment Groningen (PIG) consortium, Werley en Avantium.

Tom van Aken – CEO Avantium

In Europe, for example, **access to capital for financing high-risk and capital-intensive technologies remains a challenge.** For a high-risk, capital-intensive company like ours, access to capital in the US seems many times easier. This doesn't mean US-based bio-based chemical and material companies are more successful than their European peers. The European market for sustainable material technologies seems more advanced than other geographies, supported by new regulations.

<https://www.packaginginsights.com/news/avantium-ceo-licensing-strategy-capital-access-issues-xyx-technology-and-the-bio-based-future.html>

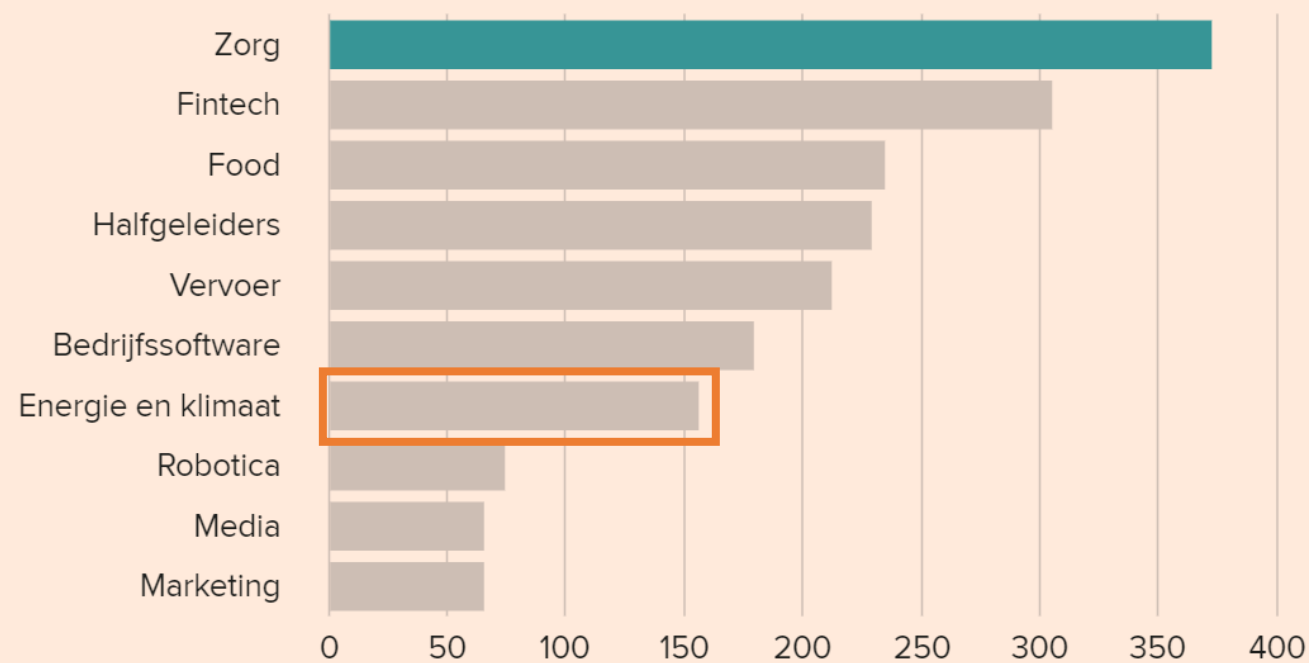
Brabantse Ontwikkelings Maatschappij zoekt miljarden steun voor scale-ups



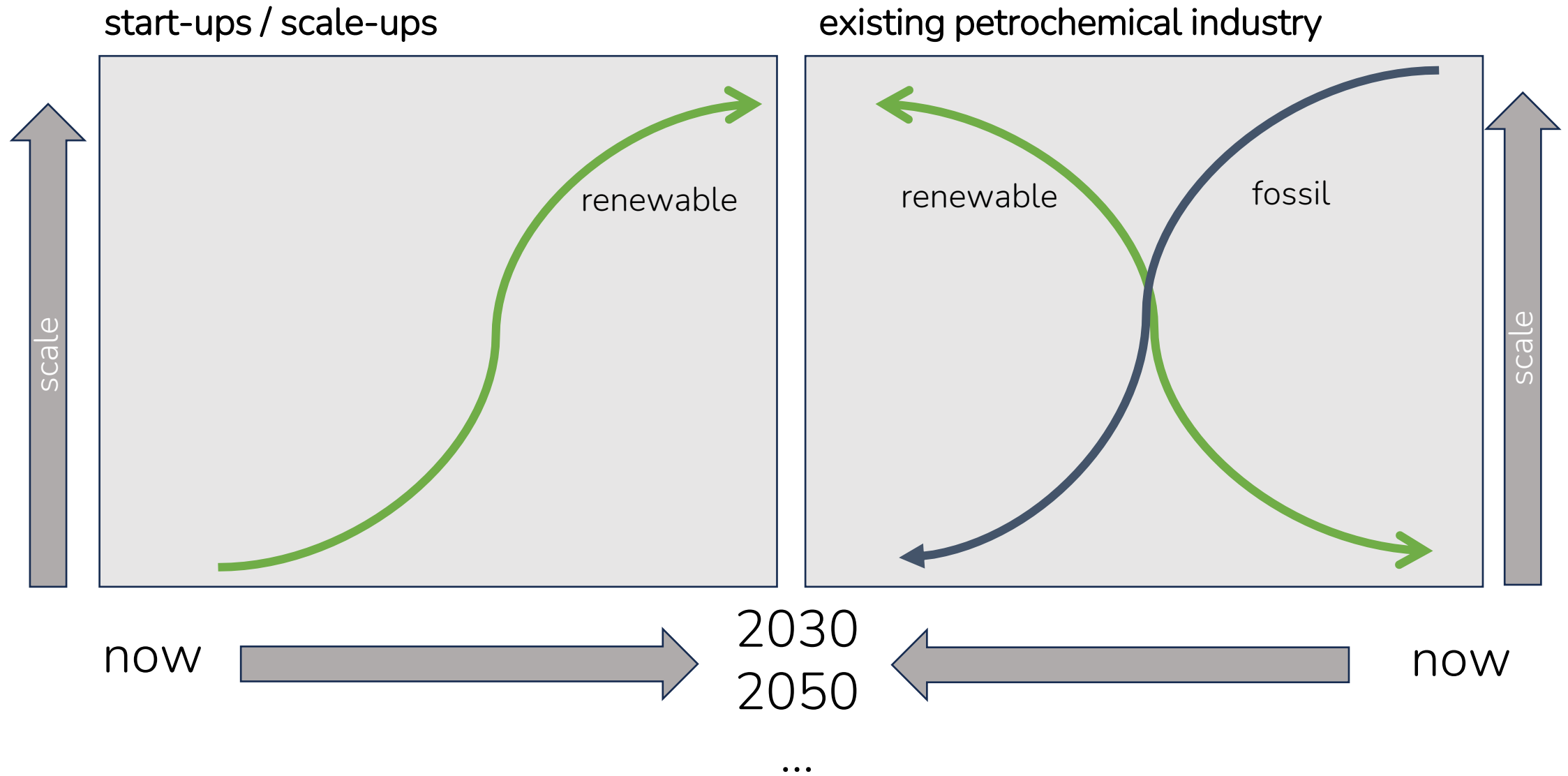
Heiko Jessayan

Waar ging in 2023 het durfkapitaal naartoe?

Investeringen in Nederland per sector in € mln

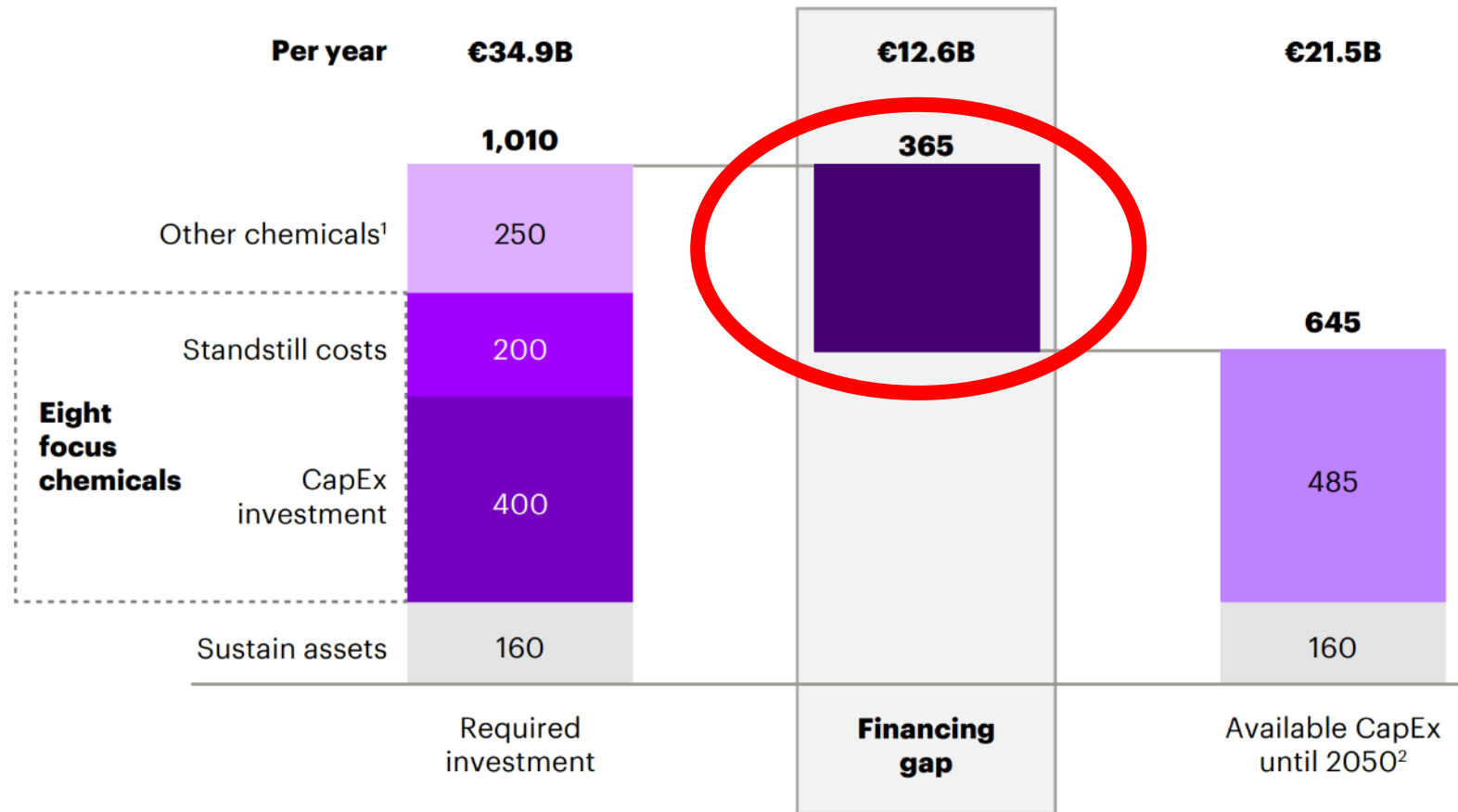


at least two roads lead to Rome



messaging by industry: we have a funding gap

To determine the **cost of the EU Green Deal's net-zero target**, Accenture and NexantECA looked at the production technology process routes used across European chemical plants for those eight chemicals [...] the research determined that meeting the 2050 goal for the production of these chemicals will require **€400 billion to €600 billion** in capital expenditures for core equipment and the design, construction and modification of facilities.



Ulbrich et al. The chemical industry's road to net zero Costs and opportunities of the EU Green Deal report by Accenture and NexantECA, commissioned by Cefic

<https://www.accenture.com/content/dam/accenture/final/a-com-migration/r3-3/pdf/pdf-174/accenture-chemicals-costs-opportunities-eu-green-deal.pdf#zoom=40>

20 Feb 2024: Antwerp Declaration for a EU industrial deal (20 sectors)

“Basic industries in Europe are grappling with historical challenges: demand is declining, investments in the continent are stalling, production has dropped significantly, and sites are threatened.

We want to drive the transformation of our companies.

For this, we urgently need decisive action to create the conditions for a stronger business case in Europe. ‘The Antwerp Declaration’ outlines a pathway ahead. By placing the European Industrial Deal at the forefront of Europe’s strategic agenda, the EU would pave the way for a resilient, competitive, and sustainable Europe. This is the only way to show the rest of the world that the Green Deal works for all.”

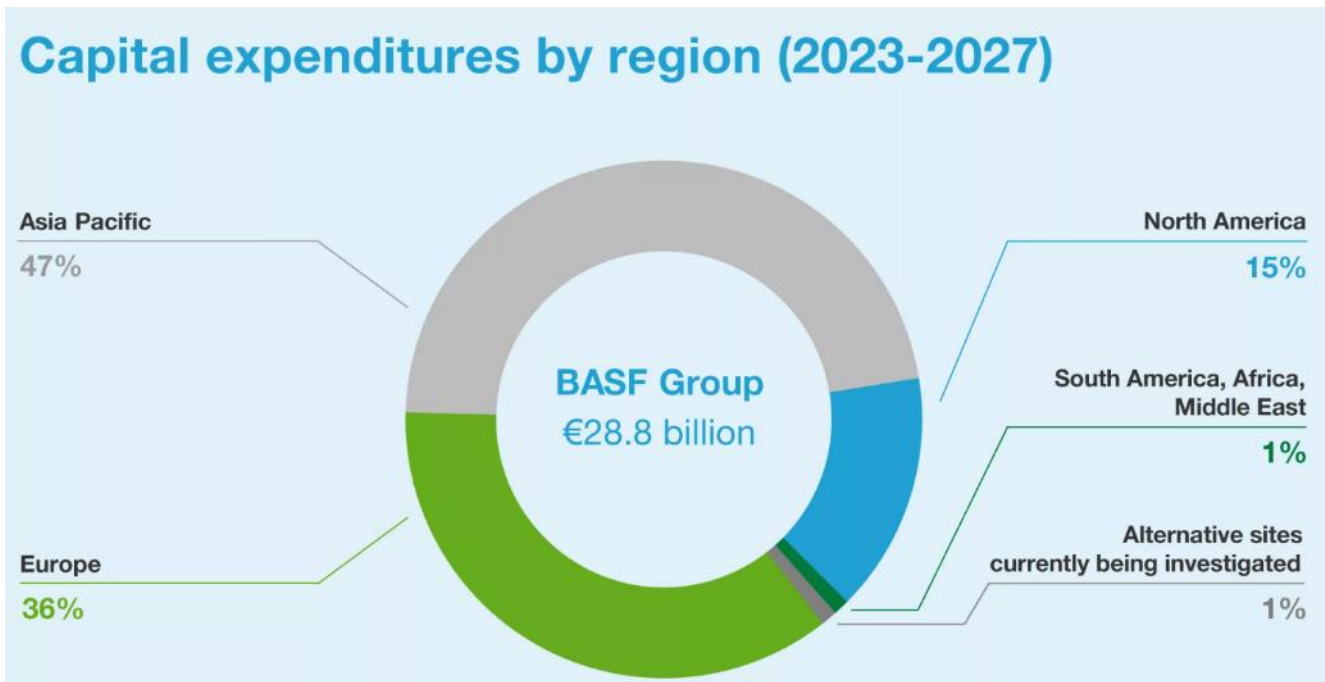
Martin Brudermüller, President of the
European Chemical Industry Council

<https://cefic.org/media-corner/newsroom/antwerp-declaration-for-a-european-industrial-deal/>



<https://antwerp-declaration.eu/>

there is a quiet irony



<https://www.basf.com/tw/en/who-we-are/organization/locations/asia-pacific/our-engagement-in-china.html>

BASF Zhajiang Verbund site (under construction) up to **10 Billion euro** investment

Built and operated under the sole responsibility of BASF, upon completion, the site will be BASF's **largest single investment to date** and ultimately BASF's third-largest site worldwide

https://www.basf.com/cn/en/media/GC-report/GC-report-2022/basf-in-greater-china.html#accordion_v2-00cddb849c-item-6c4ebc539f

Martin Brudermüller, CEO of BASF

not so quiet irony



BASF, SABIC AND LINDE REACH FINAL STEPS IN THE CONSTRUCTION OF THE DEMONSTRATION PLANT FOR ELECTRICALLY HEATED STEAM CRACKERS

12/09/2023



[HOME](#) > [NEWS & MEDIA](#) > [LATEST NEWS](#) > [BASF, SABIC AND LINDE REACH FINAL STEPS IN THE CONSTRUCTION...](#)

The joint project between BASF, SABIC, and Linde to build the world's first electrically heated steam cracker furnaces hit an important milestone recently with the installation of the last transformers for the demonstration plant.

This is one of the final and most crucial steps of the construction and has taken place [about a year after construction started](#).

Completion is scheduled for the end of 2023, followed by a stepwise commissioning.

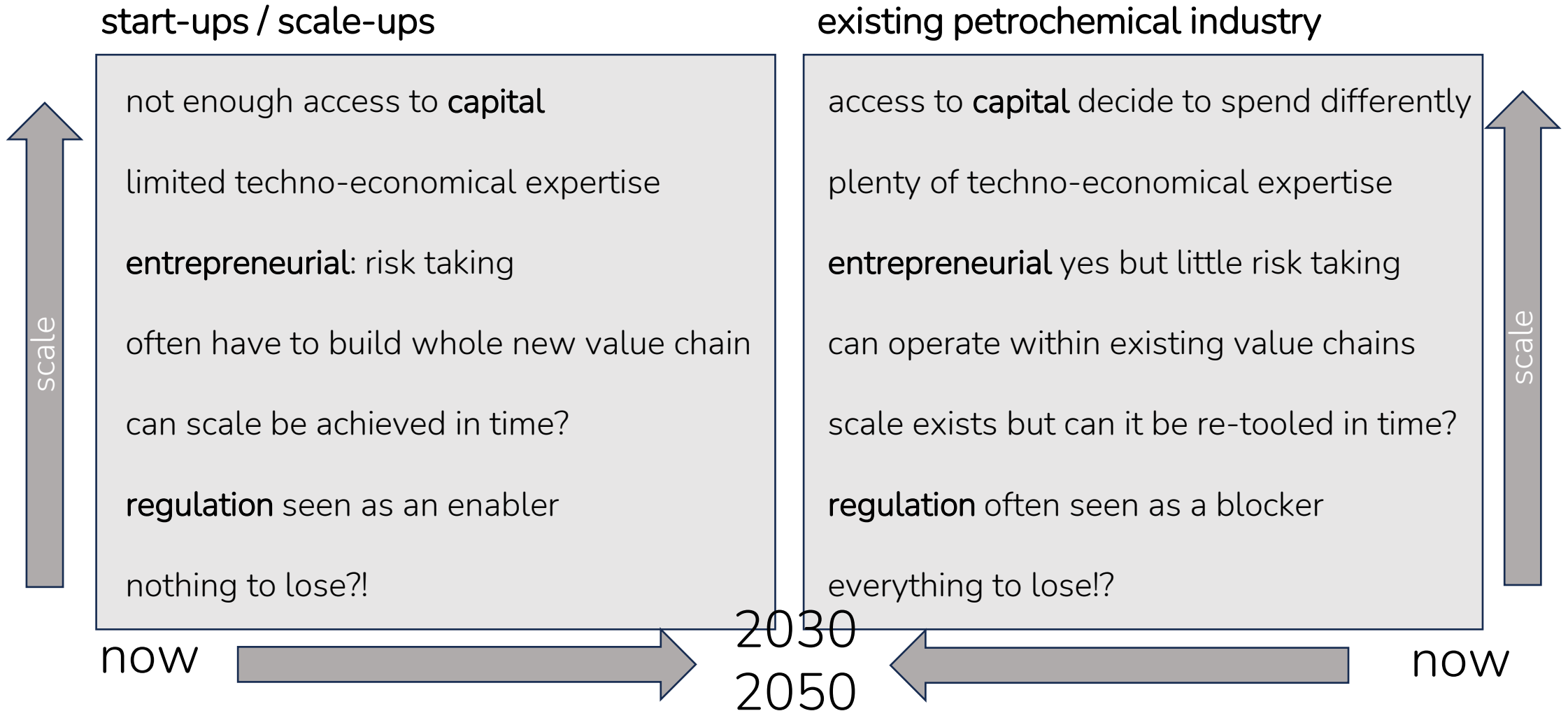
The electricity-based heating concepts for olefin production, which will be tested at the plant in the future, require a total of six megawatts of renewable energy. The transformers convert current to the voltage required at the plant. There are nine transformers in total, and through each of them flows several thousand amps of current.

Thanks to the novel heating concepts, and by using electricity from renewable sources instead of natural gas, electric steam cracker furnaces, one of the most energy-intensive production processes, can potentially reduce CO2 emissions by at least 90% compared to conventional technologies.

<https://www.sabic.com/en/news/41898-basf-sabic-and-linde-reach-final-steps-in-the-construction-of-the-demonstration-plant-for-electrically-heated-steam-crackers>

The German Ministry for Economic Affairs and Climate Protection is sponsoring the project with 14.8 million euros as part of the “Decarbonization in Industry” funding program, financed by the European Union’s NextGenerationEU fund.

hypotheses



Biobased Transitions team



Mission

Understand what it takes to increase the production of biobased materials and chemicals and decrease the use of fossil feeds by both existing and new industries



Thank you for your attention!

if you'd like to:
collaborate
(dis)agree
or have a coffee with me

Martijn Zieverink
+31 6 45298981
mmp.zieverink@avans.nl

<https://www.linkedin.com/in/martijnzieverink/>

LUNCH & LEARN

NEXT LUNCH & LEARN

Bridging the Gap: The Potential & Challenges of PHA!

Guilherme de Souza Reis, Researcher
Biobased Resources and Energy at MNEXT

Thursday March 28, 12:15h

Register
now

