



# Norway's path to **Net Zero**







# Nordic Net Zero

## BCG's recommendation for Norway

### Context and purpose

This document is a condensed version of our roadmap for Norway to reach Net Zero greenhouse gas (GHG) emissions by 2050. It has been prepared as part of BCG's Nordic Net Zero project.

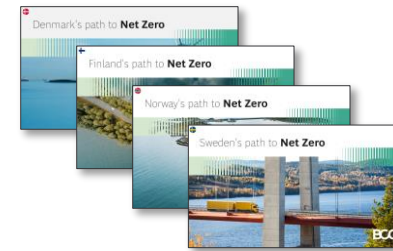
Our ambition with the Nordic Net Zero project was to identify a feasible and affordable pathway to Net Zero emissions in a way that enables green export and job creation along the way. We hope that our work can inspire companies to pursue green growth opportunities and policymakers to support them.

We have had team members in Denmark, Finland, Sweden, and Norway working on the project, supported by our global network of BCG experts. Additionally, we have had a close dialogue with several CEOs and Heads of Sustainability across the Top 100 Nordic companies. We look forward to continuing the discussions.

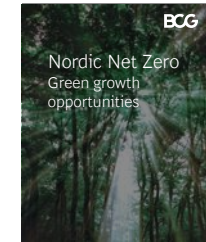
Source: BCG Nordic Net Zero project

### Additional resources

#### Full country decks



#### Nordic Net Zero report



#### Other relevant material

- [A CEO Guide to Net Zero](#)
- [Climate Paths 2.0](#)
- [BCG's Net Zero Strategy](#)
- [Green Public Procurement](#)
- [Center for Climate & Sustainability](#)

#### LinkedIn articles

- [Denmark](#)
- [Finland](#)
- [Norway](#)
- [Sweden](#)



# Highlights| Net Zero Pathway for Norway

Status Quo	<ul style="list-style-type: none"><li>Norway has set an ambitious target of 90%–95% CO<sub>2</sub>e reductions by 2050 vs. 1990</li><li>Net emissions have fallen since 1990, while gross emissions remain unchanged</li><li>Under current policies, Norway faces a ~23 Mt gap to its gross emission target in 2050</li></ul>
Net Zero Pathway	<ul style="list-style-type: none"><li>Our roadmap shows that a feasible and affordable pathway to Net Zero (and beyond) exists</li><li>Reaching Net Zero is achievable; three areas are critical to get right Decarbonized Oil &amp; Gas   Green Industrial Products   Decarbonized Road Transport</li><li>Rate of emission reductions will vary significantly per sector</li><li>Norway can abate ~50% of emissions for less than €20/tCO<sub>2</sub>e</li><li>Technology, policy instruments and behavior are key priorities to get right</li><li>Norway must prioritize climate efforts and investments smartly</li><li>Decarbonization happens in waves, but action needs to start now</li><li>Societal cost of Net Zero is €26 Bn in total, or €159 per person per year</li><li>Accumulated additional investments of €165 Bn needed by 2050</li></ul>
Green Growth for Value	<ul style="list-style-type: none"><li>Five Nordic Green Ecosystems stand out where companies can drive value creation Low-Carbon Materials and Manufacturing   Connected Emissions-Free Energy System   Green Buildings and Infrastructure   Sustainable Agriculture and Biosphere   Fossil-Free Transport and Logistics</li><li>60+ green growth opportunities identified across the five ecosystems</li><li>Norway's corporate landscape is well positioned to take climate action</li><li>Net Zero brings 1.9% GDP growth, 82k jobs, and a stronger recognition</li><li>Five prioritized actions can set Norway on the growth path to Net Zero</li></ul>



# NORWAY'S

## Climate target

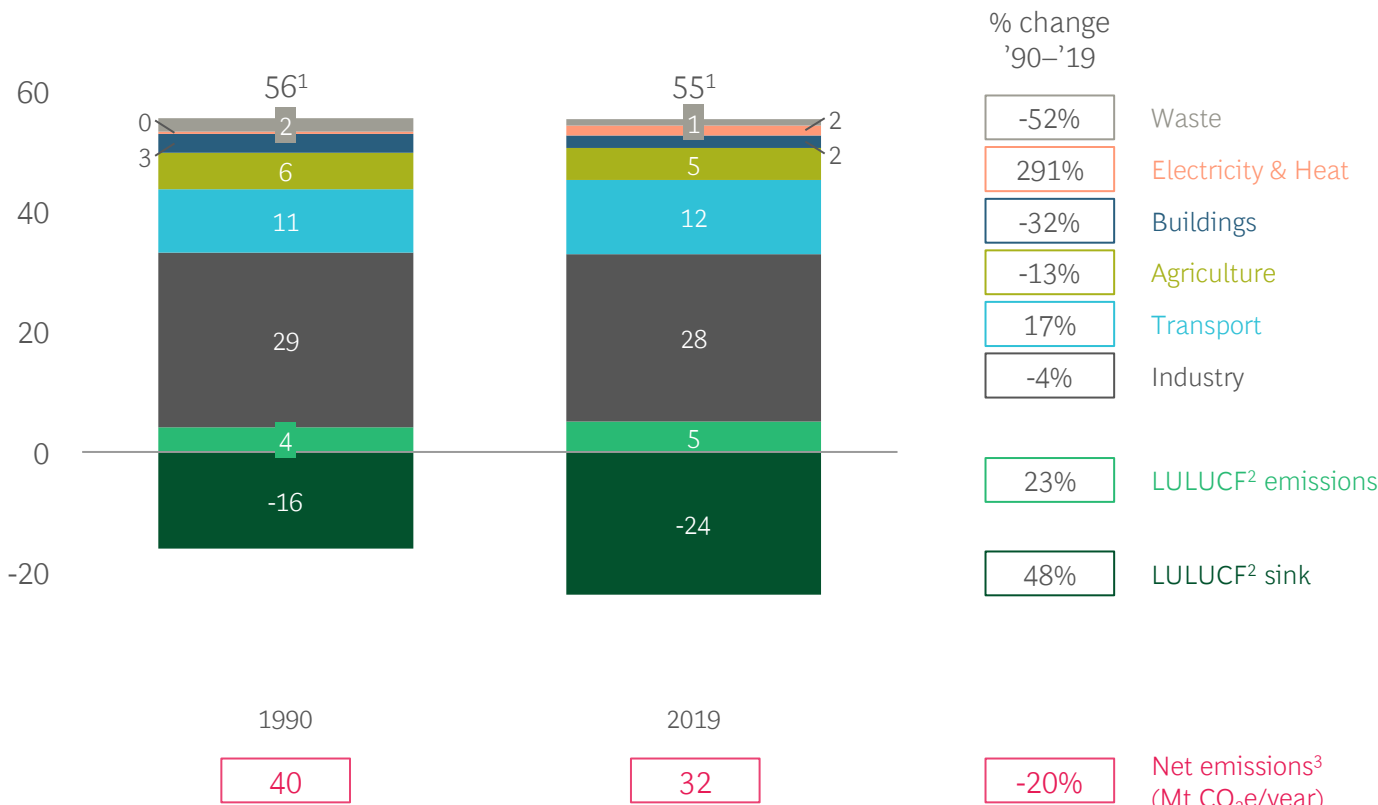
- 90–95%  
**CO<sub>2</sub>e**  
by 2050  
vs. 1990

Note: CO<sub>2</sub>e = carbon dioxide equivalent  
Source: [Norwegian Gov't: "Norway's climate goals"](#)



# Net emissions have fallen since 1990, while gross emissions remain unchanged

Norway's historical GHG emissions  
(Mt CO<sub>2</sub>e/year)



1. Gross emissions excl. LULUCF sinks 2. Land Use, Land Use Change, and Forestry  
3. Net emissions = total emissions incl. LULUCF emissions minus LULUCF sinks incl. sink-enhancing levers  
4. LULUCF sinks increase 1990–2009 caused by large amounts of forest planted post WW2  
Source: UNFCCC; NIBIO; EEA; BCG analysis

Net emissions have decreased 20% since 1990, but gross emissions have remained stable

Transport (22%) on declining path since 2010 thanks to efficiency, biofuel blending, and electrification

Industry (50%) the largest bucket, driven mainly by Oil & Gas extraction (45% of Industry emissions)

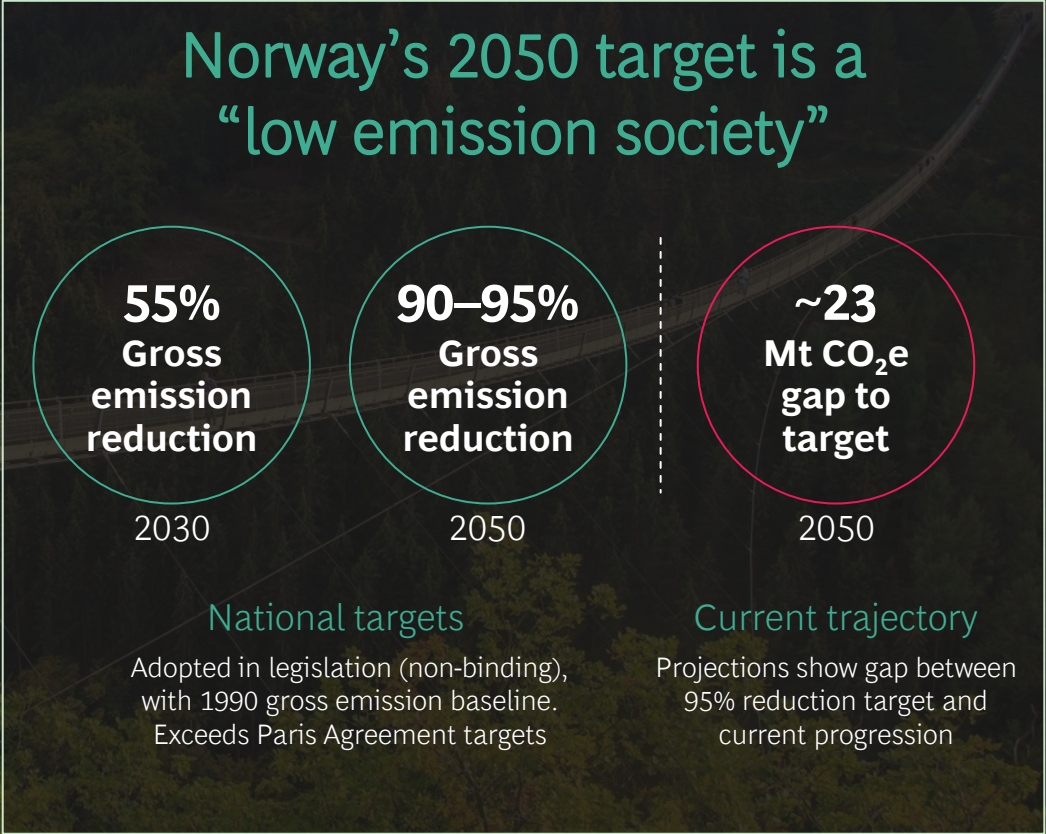
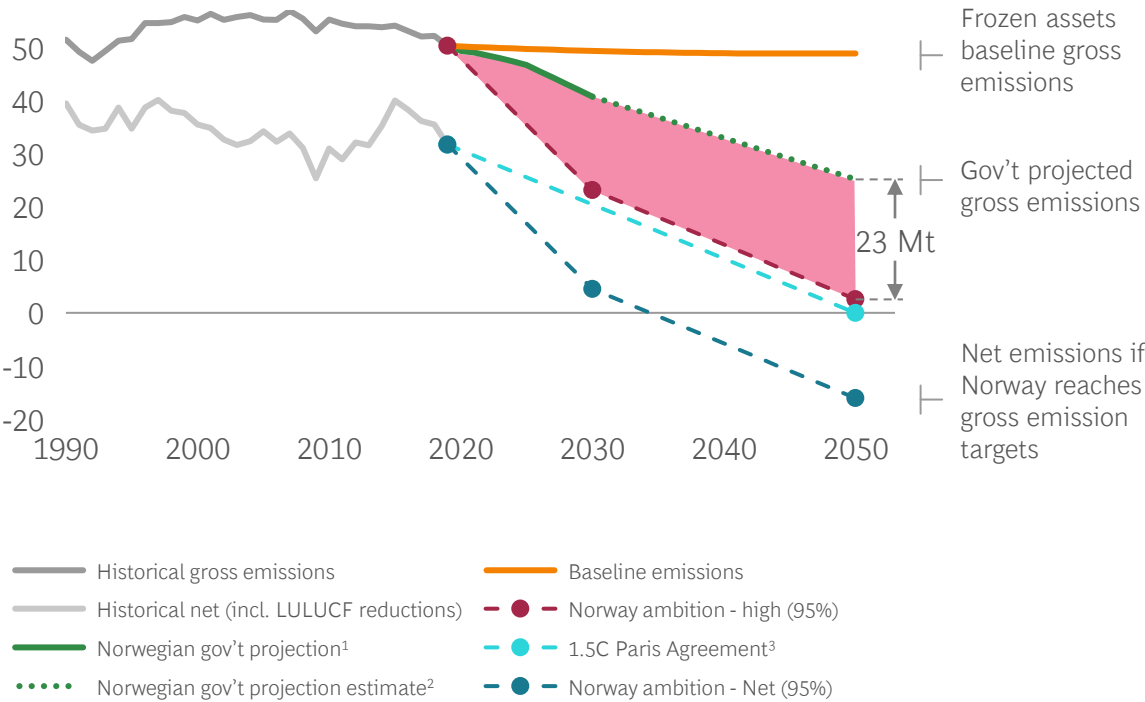
LULUCF sink removes 43% of gross emissions, but removals peaked<sup>4</sup> in 2009 and are expected to remain at current levels towards 2050





# Under current policies, Norway faces a ~23 Mt gap to gross emission target

Norway’s annual emissions and goals  
(Mt CO<sub>2</sub>e)



1. "With existing measures" forecast reported to UNFCCC and EEA 2. Approximate Gov't forecast to 2050 as mentioned in Norway's national budget 3. 1.5°C warming path as agreed in the Paris Agreement requires Net Zero emissions by 2050. Norway's 2050 ambition for 90%–95% reduction uses gross emissions as baseline, and thus far exceeds the Paris Agreement 1.5°C target which is a Net emissions target  
Source: UNFCCC; EEA; The Norwegian Climate law; [Norway's Climate strategy to 2050](#); [Norwegian Gov't: "Norway's climate goals"](#); BCG analysis



# Our roadmap shows that a feasible and affordable pathway to Net Zero (and beyond) exists

**94%**

Emissions can be abated by 2050, equaling ~46 Mt CO<sub>2</sub>e of 2050 gross emissions, equivalent to ~94% emission reduction vs. 1990 levels<sup>1</sup>

**-19**

Mt CO<sub>2</sub>e

Net emissions in 2050 when including LULUCF sinks

**26**

€ Bn

Net societal cost, equaling €159 per citizen per year until 2050

**165**

€ Bn

Investment required until 2050, generating ~82k new jobs

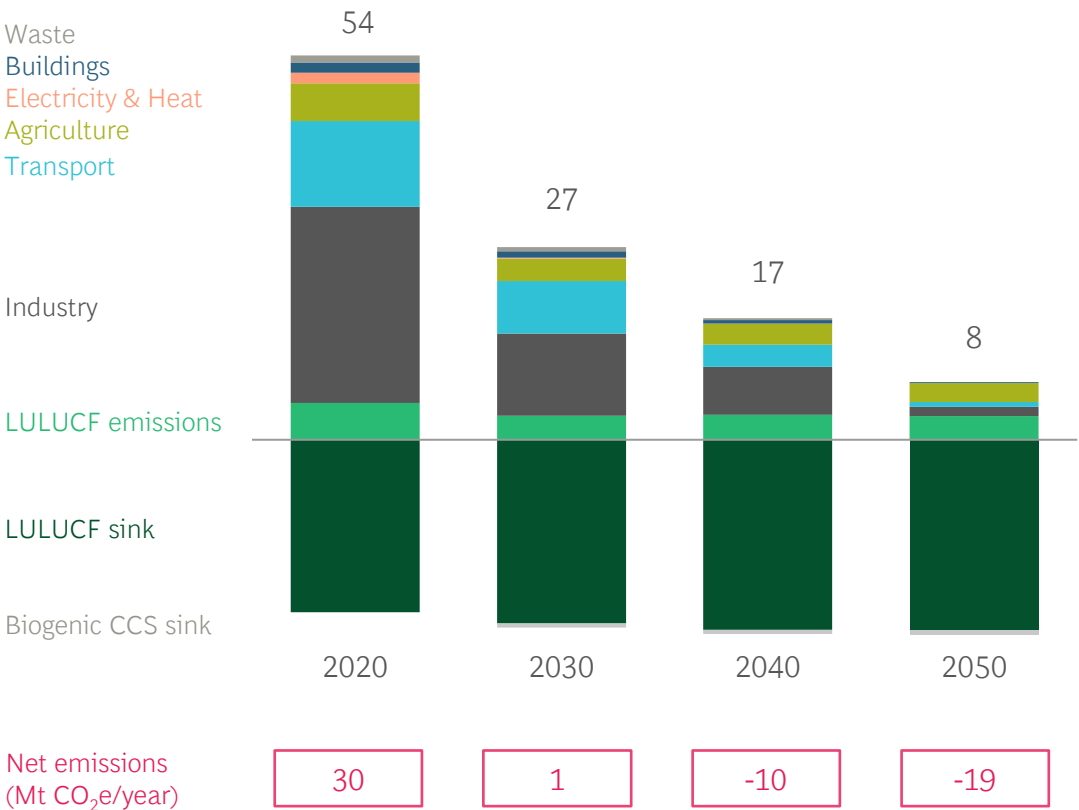
Norway has no Net Zero target, but as an implication of reaching -94% emission reduction, in line with the 2050 emission target, the pathway leads to -19 Mt CO<sub>2</sub>e annual net emissions in 2050. This number is based on the IPCC definition of Net Zero, where gross emissions are subtracted annual sink removals, including baseline sink uptake

1. BCG's roadmap to Net Zero leaves a residual ~2.9 Mt CO<sub>2</sub>e gross emissions in 2050, constituting a 94.1% reduction compared to 2050 frozen assets baseline emissions of ~48.9 Mt CO<sub>2</sub>e and a 94.4% reduction compared to 1990 levels of ~51.5 Mt CO<sub>2</sub>e p.a.  
Source: BCG analysis



# Reaching Net Zero is achievable

Norway’s decarbonization pathway 2020–2050, incl. LULUCF  
(Mt CO<sub>2</sub>e/year)



Source: BCG analysis

## Three critical areas in Norway’s decarbonization pathway



### Decarbonized Oil & Gas

- Electrification of Oil & Gas production with 10 TWh power from shore and 5 TWh from floating, off-grid offshore wind
- Topside CCS necessary for remaining emissions; maturing compact topside CCS technology by 2040 critical for deep decarbonization
- Natural prod. declines remove 5.8 Mt CO<sub>2</sub>e emissions by 2050, but consistent natural abatement not apparent before 2040



### Green industrial products

- Critical to address hard-to-abate ferroalloys, aluminum, cement, and chemicals, including scaling CCS tech and infrastructure from 2024
- Switch to emission-free inert anodes for aluminum starting in 2030, abating 3.3 Mt CO<sub>2</sub>e/year by 2050
- Biocarbon reductants ramp-up achieving 50% switch from coke/coal in ferroalloys by 2030, with 100% switch by 2050



### Decarbonized road transport

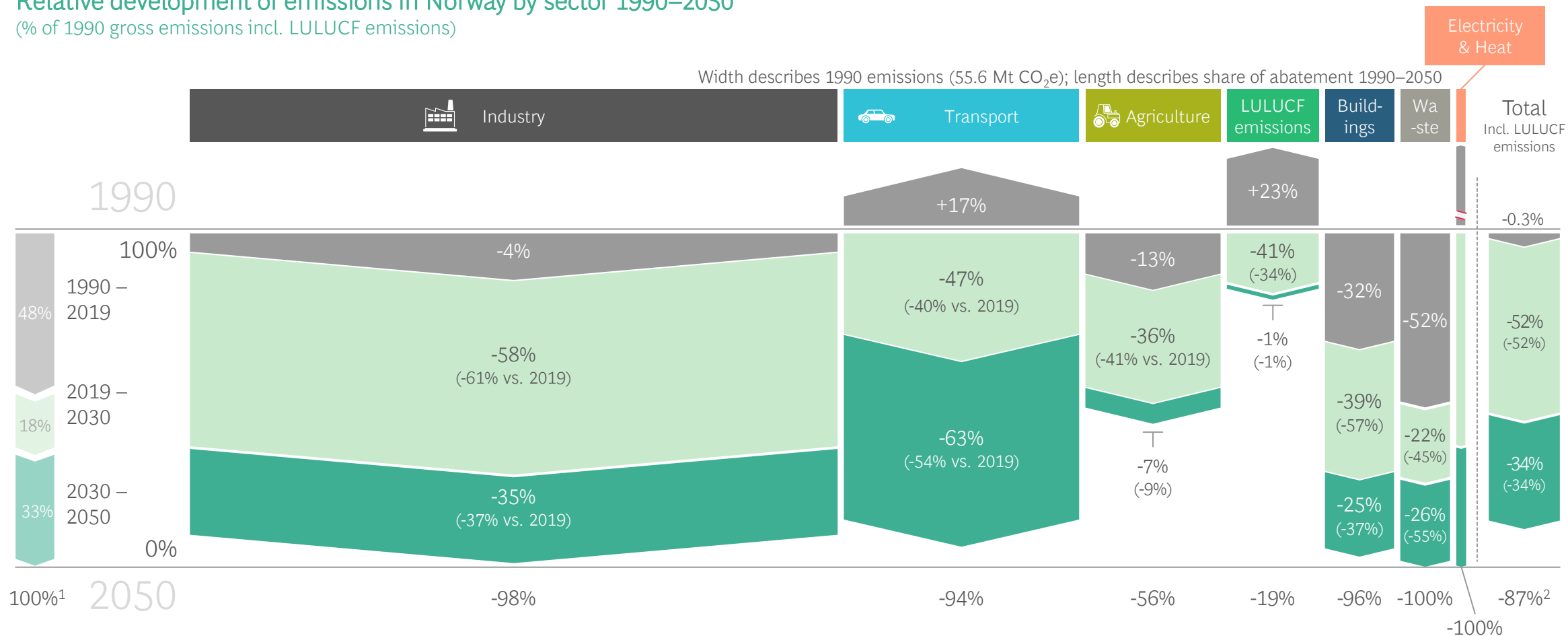
- Widespread electrification bringing EV share to 97% of car fleet
- 550k electric and 123k hydrogen light trucks
- 46k electric and 46k hydrogen heavy trucks and buses
- Nationwide ~1.7M chargers and ~500 hydrogen fuel stations





# Rate of emission reductions will vary significantly per sector

Relative development of emissions in Norway by sector 1990–2050  
(% of 1990 gross emissions incl. LULUCF emissions)

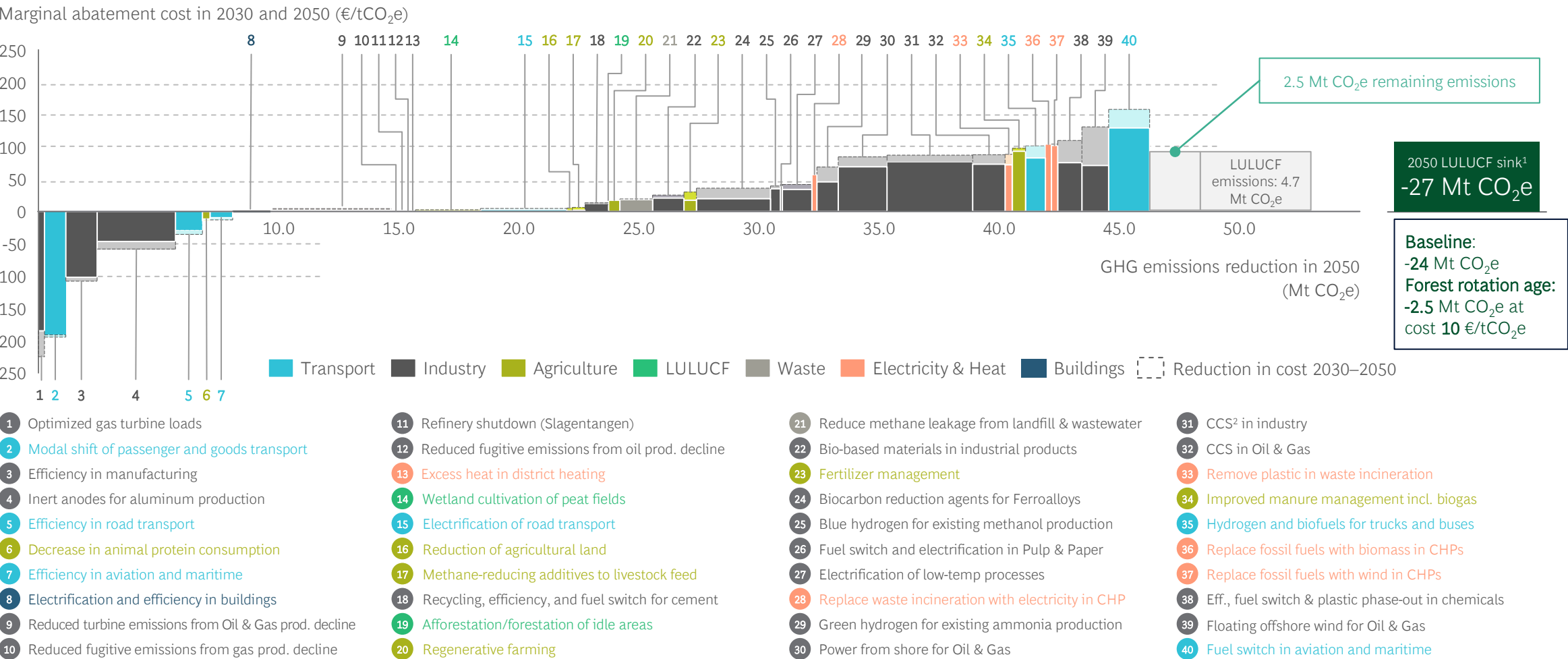


Source: UNFCCC; BCG analysis



# Norway can abate ~50% of emissions for less than €20/tCO<sub>2</sub>e

## Marginal abatement cost curve in frozen assets scenario



1. Not to scale 2. Carbon Capture & Storage  
Source: BCG analysis





# Technology, policy instruments, and behavior are key priorities to get right

Source: BCG analysis

**Technology**  
Fund, develop, mature, and scale key abatement technologies that are needed in current hard-to-abate sectors



**Behavior**  
Influence and educate organizations and individuals to establish lasting behavioral change towards sustainability (e.g., waste minimization, efficiency, consumption, new tech adoption)

**Policy instruments**  
Implement coherent policies to coordinate efforts across economy by encouraging and enabling adoption of efficient abatement levers

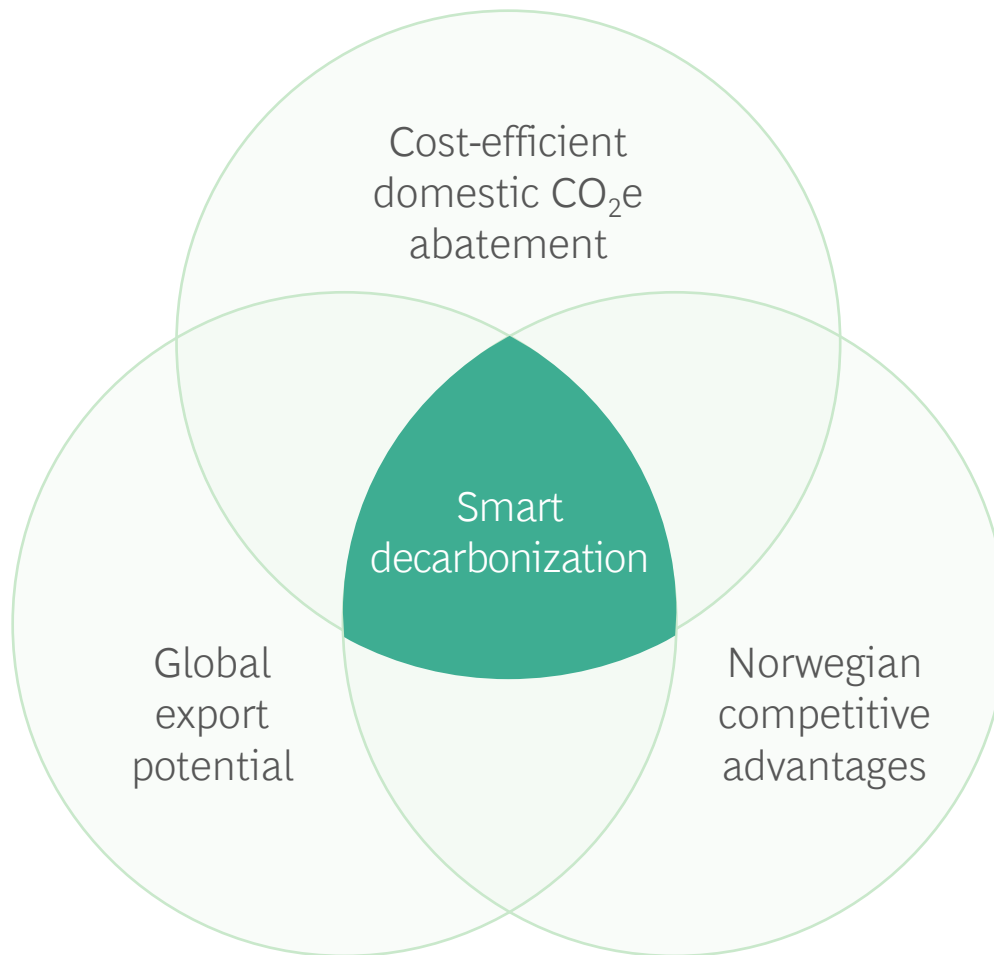


## Infrastructure

Plan, fund, construct, and maintain infrastructure that enables decarbonization



# Norway must prioritize climate efforts and investments smartly



Source: BCG analysis

## "Smart decarbonization"

Take a holistic approach to climate action, prioritizing time, efforts, and capital on climate actions with:

- Cost-efficient domestic CO<sub>2</sub>e abatement
- Global export potential
- Norwegian competitive advantages

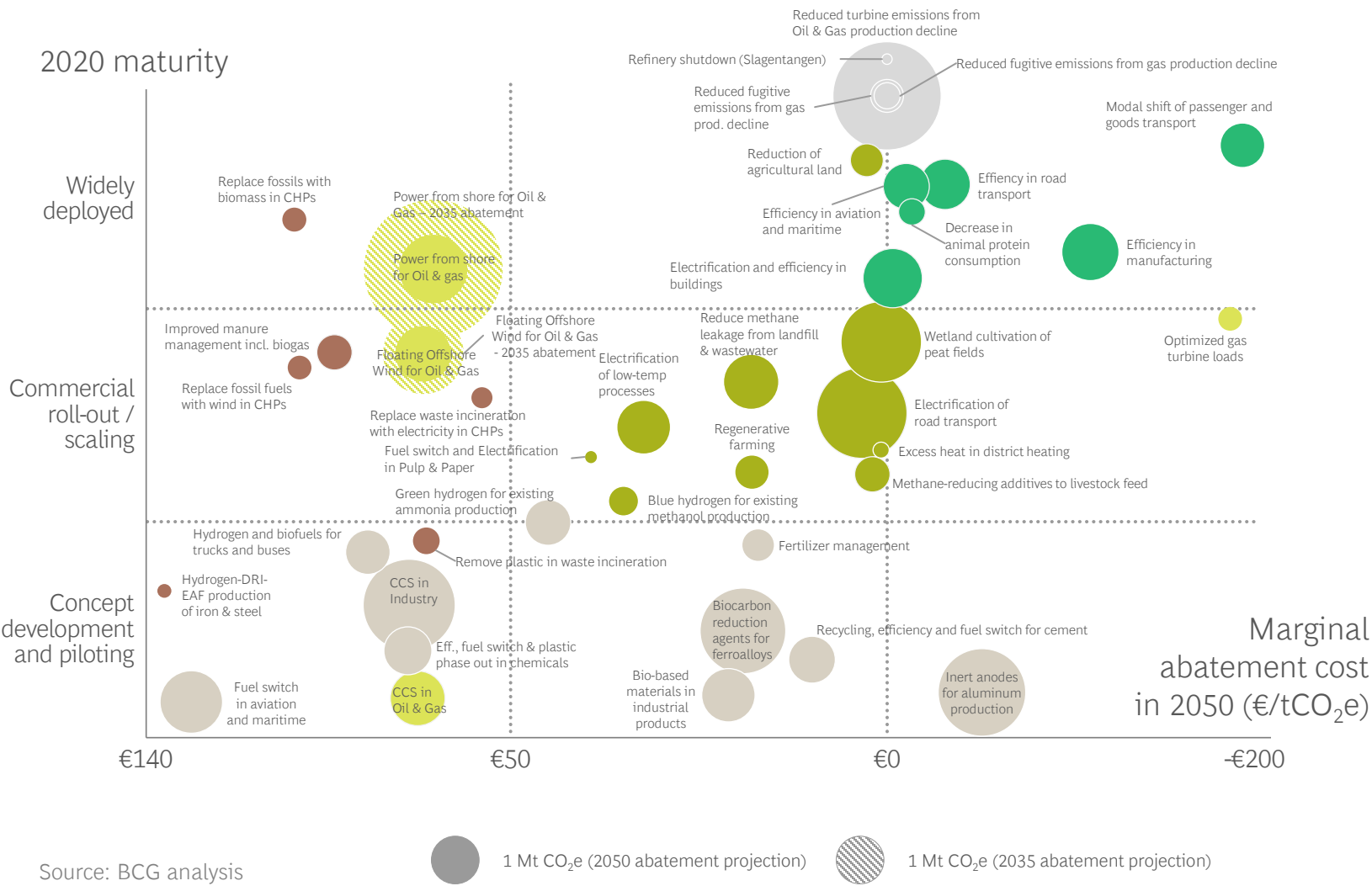
**Embed "Smart Criteria" in public and private decision making**

- Include climate as criteria in public procurement and investments
- Accelerate investments in cost-efficient energy efficiency and electrification solutions
- Develop knowhow in high-potential technologies such as Power-to-X and CCUS





# Decarbonization happens in waves, but action needs to start now



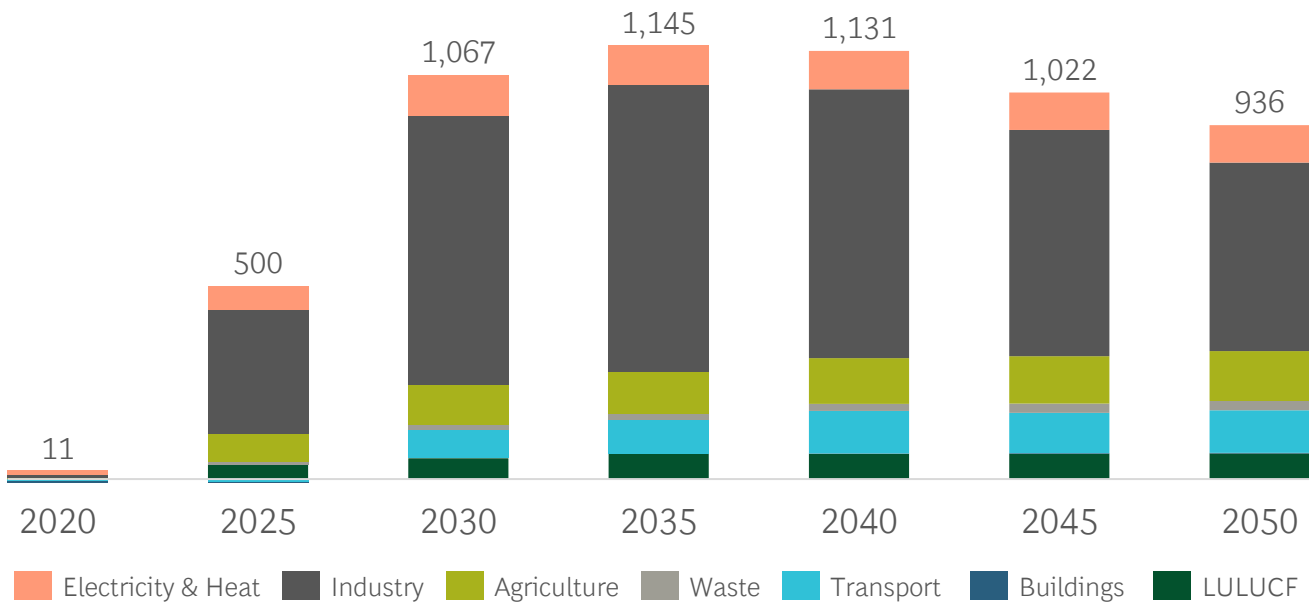
## Six abatement lever types

- Profitable levers:** Abatement levers for <0 €/tCO<sub>2</sub>e, reliant on behavioral change and individual decisions
- High-impact levers:** Abatement levers for <50 €/tCO<sub>2</sub>e, ready to scale, capable of abating ~11 Mt CO<sub>2</sub>e
- Decarbonized Oil & Gas levers:** Abatement levers critical to decarbonizing O&G sector and providing "license to operate"
- Niche applications levers:** Costlier abatement levers at >50 €/tCO<sub>2</sub>e, with low individual abatement potential and narrow application scope
- Critical technology levers:** Immature abatement levers, enabling abatement of ~13.9 Mt CO<sub>2</sub>e in hard-to-abate sectors
- Oil & Gas natural production declines:** Emission reductions from natural declines in Oil & Gas production offshore, as well as communicated refinery shutdowns



# Societal cost of Net Zero is €26 Bn in total, or €159 per person per year

Yearly marginal abatement cost to society 2020–2050  
(€M/year)



**Marginal abatement cost to society** is the aggregated additional cost incurred by all stakeholders in society from implementing abatement levers, compared to status quo. It is a net cost accounting for both additional costs and savings, and includes the discounted cost of any investments associated with a lever.

Note: Chart shows cost to society by abated emissions—investments take place at earlier years  
Source: BCG analysis



€159

Average annual cost per person per year



€26 Bn

Total societal cost to achieve Net Zero Roadmap



0.18%

Avg. annual expenditure as share of GDP until 2050

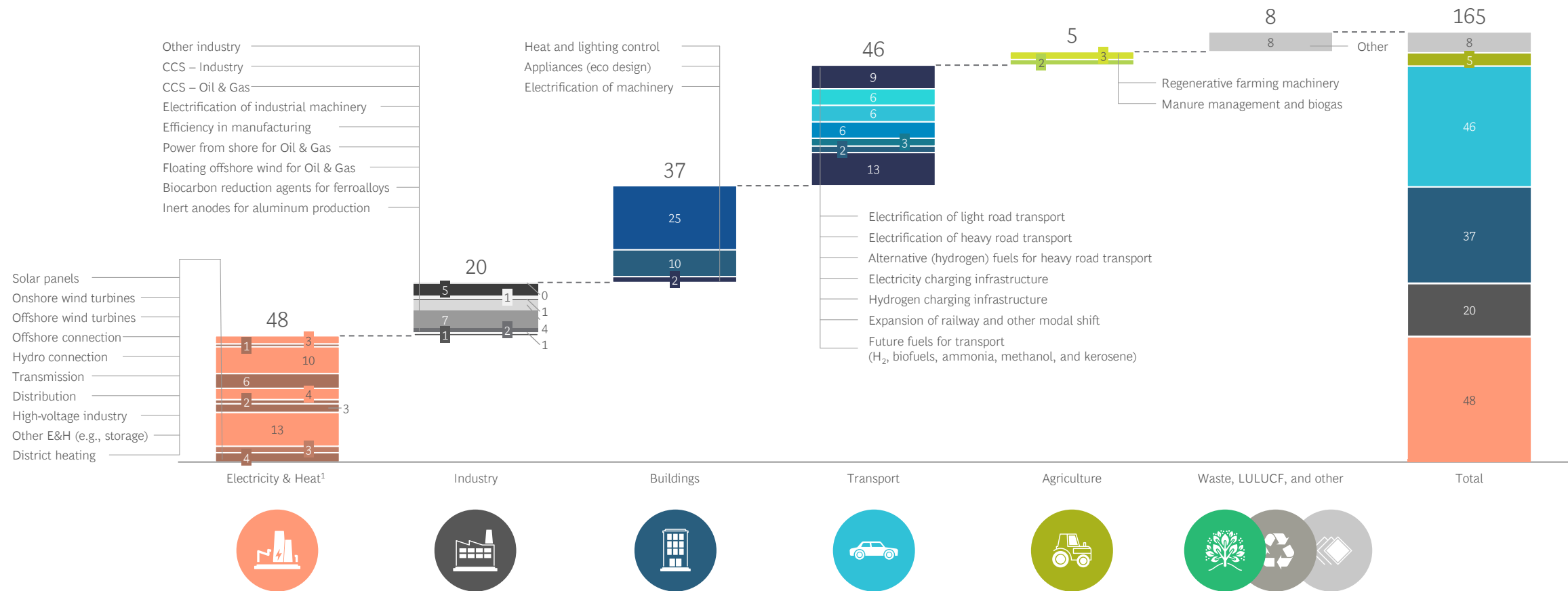




# Accumulated additional investments of €165 Bn needed by 2050

Largest spend on expanding renewable power production and transport

Cumulative additional investments 2020–2050  
(€Bn cumulated, in real terms 2019)



1. Significant proportion of Electricity & Heat investments are related to electrification and decarbonization of industry and industrial processes  
Source: BCG analysis



# Five ecosystems stand out where companies can drive value creation



## Low-Carbon Materials & Manufacturing

Green production, use and recycling of materials and products



## Connected Emissions-free Energy System

Extensive renewable power and heat generation, expanded smart grid capacity



## Green Buildings and Infrastructure

Sustainable design, engineering, construction, use, and recycling of buildings and infrastructure



## Sustainable Agriculture and Biosphere

Sustainable and value adding land-use management, crop and livestock farming, forestry, and wood production

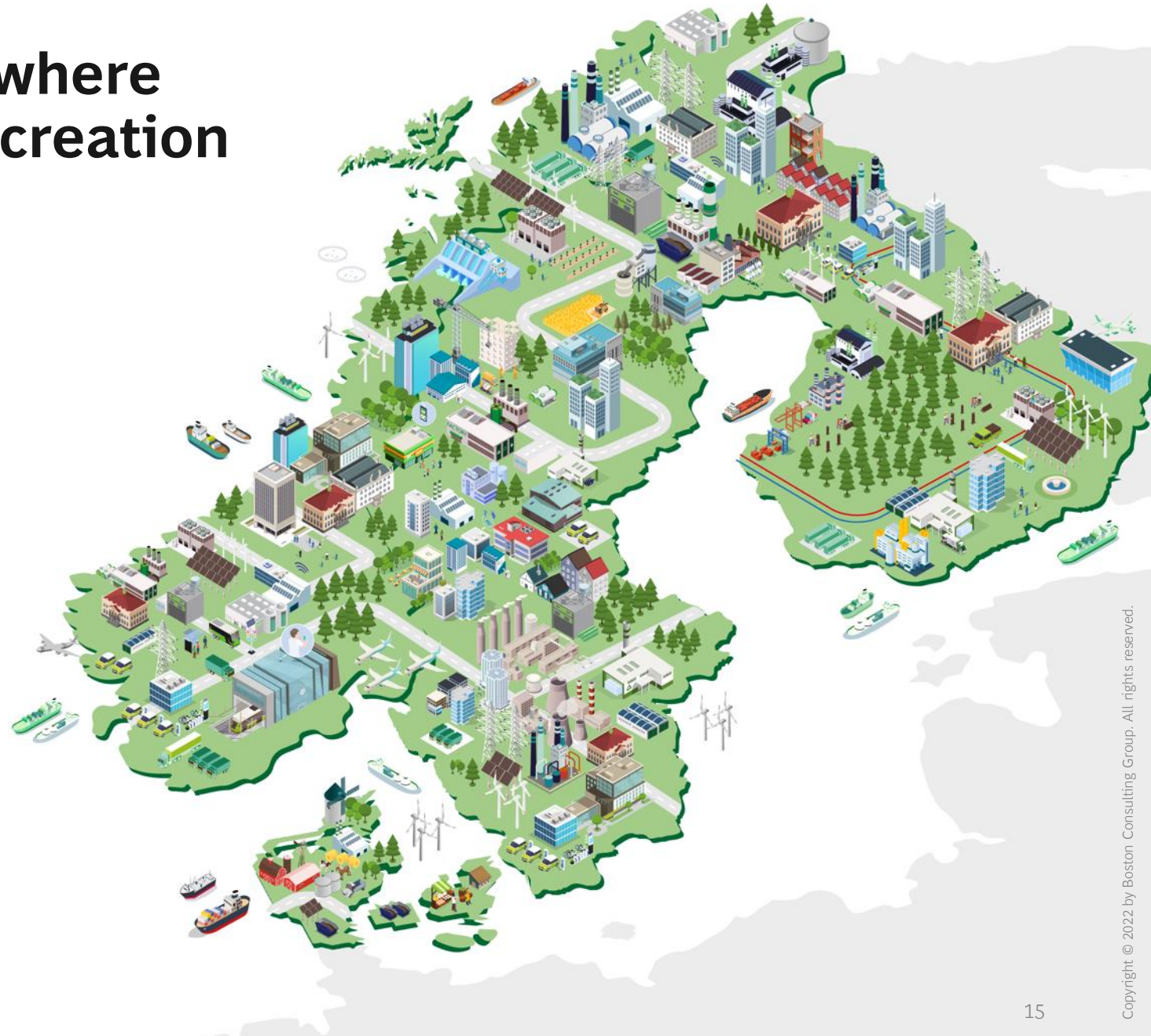


## Fossil-free Transport and Logistics

Efficient and sustainable vehicle, vessel, and aircraft production and operation

## Transition Financing

Enable the green transition across all ecosystems through green bonds, loans, trading, investments, etc.





# 60+ green growth opportunities identified across the ecosystems

Opportunities					
1 Sustainable raw material extraction					
2 Green iron and steel					
3 Green cement and concrete					
4 Other low-carbon building materials					
5 Industrial energy efficiency solutions					
6 Electric equipment and machinery					
7 Low-carbon process heat solutions					
8 Energy transition minerals and metals					
9 Low-carbon and bio-based chemicals					
10 Sustainable and degradable plastic					
11 Green and sustainable products					
12 Industrial fugitive emissions management					
13 Circular industrial waste management					
14 CCUS <sup>1</sup> for energy intensive industry					
15 Green power procurement					
16 Offshore Wind					
17 Onshore Wind					
18 Solar Photovoltaics					
19 Concentrated Solar Power					
20 Geothermal					
21 Hydro Power					
22 Nuclear Energy					

Opportunities					
23 Power-to-X and e-fuels					
24 CCUS <sup>1</sup> in low-carbon energy production					
25 Direct Air Capture					
26 Low-carbon building heat solutions					
27 District heating systems					
28 Energy storage solutions					
29 Fuel cells					
30 Smart grid solutions					
31 Distributed energy solutions					
32 Energy and carbon trade					
33 Sustainable building design					
34 Low-carbon building materials					
35 Biogenic building materials					
36 Energy efficiency solutions in buildings					
37 Emissions-free construction processes					
38 Asset project advisory in construction					
39 Circular building materials and waste					
40 Smart energy solutions in buildings					
41 On-site renewable energy systems					
42 Source green energy for buildings					
43 Regenerative farming					
44 Vertical farming					

Opportunities					
45 Alternative food proteins					
46 Sustainable aquaculture					
47 Manure management					
48 Low-carbon fertilizer					
49 Methane-reducing feed additives					
50 Sustainable food packaging					
51 Energy efficiency in agri and forestry					
52 Sustainable forest mgmt.					
53 Wood-fiber innovations					
54 Electric agri and forestry equipment					
55 Biofuels and biogas					
56 Waste treatment solutions					
57 Low-carbon materials for transport					
58 Energy efficiency solutions in transport					
59 Electric vehicles					
60 Battery technology					
61 Sustainable vessels					
62 Sustainable maritime solutions					
63 Digital optimization tools					
64 Green alternative fuels					
65 Modal shift					
66 Circularity and recycling practices					

1. Carbon capture utilization and storage  
Source: BCG analysis

Primary ecosystem

Adjacent ecosystems

Low-Carbon Materials and Manufacturing

Sustainable Agriculture and Biosphere

Connected Emissions-free Energy System

Fossil-free Transport and Logistics

Green Buildings and Infrastructure





# Norway's corporate landscape is well-positioned to take climate action

~65%

of Top 100 Norwegian companies have a climate target

## Norwegian corporates have high climate awareness

- ~65% of Norwegian companies have either a Net Zero (28%) or less ambitious target (36%)
- Leading sectors are fossil fuels and materials where >80% of companies have climate targets

~70%

of companies' scope 1 & 2 emissions are covered by targets

## Corporations are taking climate responsibility

- The biggest emitting sectors are also leading the way with materials and fossil fuels covering ~70%+ of emissions in targets
- Transport services struggling with only ~40% of emissions covered

100%

of corporations see themselves as part of the solution

## Companies provide decarbonization solutions

- Norwegian top 100 companies believe they can supply solutions to decarbonize across all climate action types, from producing renewable energy to storing carbon through CCS



### Economic growth

Investments expected to enable  
**+1.9% GDP uplift**, driven  
primarily by the industry and  
energy sectors



### Employment

Potential to create **~82k new jobs**  
(direct and indirect), by developing  
green value opportunities



### Strengthened brand

Green technology and its competence  
help Norway position itself as an  
**international climate leader**

**Net Zero brings  
1.9% GDP growth,  
82k jobs, and a  
stronger recognition**



# Five prioritized actions can set Norway on the growth path to Net Zero



## Develop and commit to a national roadmap

Develop a long-term national decarbonization roadmap to Net Zero

Clarify immediate actions and decisions, including abatement levers

Commit to future actions and decision points towards 2050



## Expand new renewable power production

Expand renewable power production capacity by at least 13 GW to cover increased demand from electrification, industry, and transportation

Make policies that prioritize preparations for expansion of offshore wind in particular



## Upgrade power grid and key infrastructure

Invest € 37 billion in upgrading the power grid to handle larger demand and greater variations between regions and hours of the day

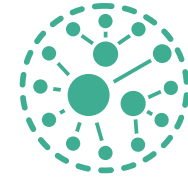
Incentivize smart, flexible systems to increase efficiency and mitigate demand peaks



## Define smart climate policies and requirements

Fast track development of smart climate policies to stimulate action (incl. feed-in tariffs, CO<sub>2</sub>e tax and free dynamic allowances, and a carbon-border tax, etc.)

Define clear guidelines for public procurement and investments



## Nurture and secure green growth opportunities

Develop and commit to green growth opportunity roadmaps, invest in export infrastructure, establish long-term guaranteed offtake agreements, make funds available for R&D

Establish Climate Partnerships with green growth ambitions





# The team is ready to discuss – please reach out



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