

NOVEMBER 2023

# GLOBAL STATUS OF CCS 2023

Japan CCS Forum  
November 15, 2023



GLOBAL CCS  
INSTITUTE



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# CCS: SCALING UP THROUGH 2030

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- The CCS project pipeline has exhibited strong year-on-year growth over the last 6 years, growing at a compound rate of more than **35% per annum** since 2017.
  - As of July 2023, there are **392 facilities** in the pipeline, representing a 102% year-on-year increase. **41 facilities are in operation**, with a capacity to capture and store **49 Mtpa** and 351 facilities are in development.
  - Growth has been driven by strong policy, particularly in North America and Europe.
  - There is increasing diversity in CCS applications across industries; the ongoing development of CCS networks has resulted in a new industry category of “CO<sub>2</sub> transport and storage” facilities.
  - Whilst the progress is encouraging, achieving global climate targets will require annual CO<sub>2</sub> storage rates of approximately 1 Gtpa by 2030 and multiple Gtpa by 2050.
  - As more projects progress from planning and development to execution phase, permitting, public engagement and project management will increasingly become more critical.
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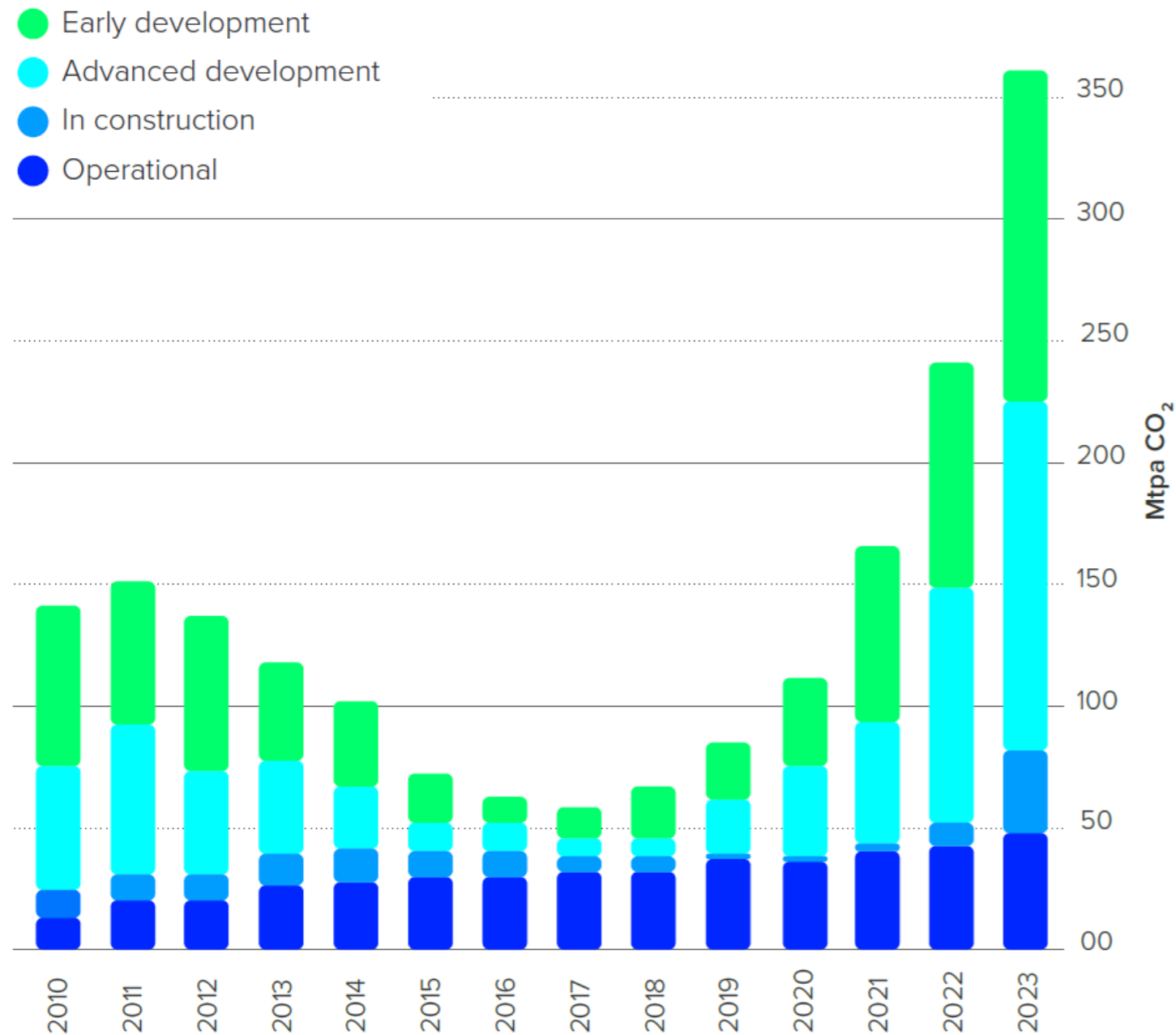
# STRONG POLICY DRIVES STRONG GROWTH

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## **In 2023:**

- Greater recognition of role of CCS in NDCs, National Roadmaps, etc.
- Strengthening general climate policy
- Establishment of national CCS targets
- Creation of International CCS ambition: Carbon Management Challenge
- Strengthening fiscal incentives – operational and capital support
- Development of CCS regulations

# CCS PROJECT PIPELINE: UNPRECEDENTED LEVELS



49

MTPA OF CO<sub>2</sub> CAPTURE CAPACITY IN OPERATION

32 Mtpa CO<sub>2</sub> in construction, 280 Mtpa CO<sub>2</sub> in development  
– total project pipeline capacity is 361 Mtpa CO<sub>2</sub>

41

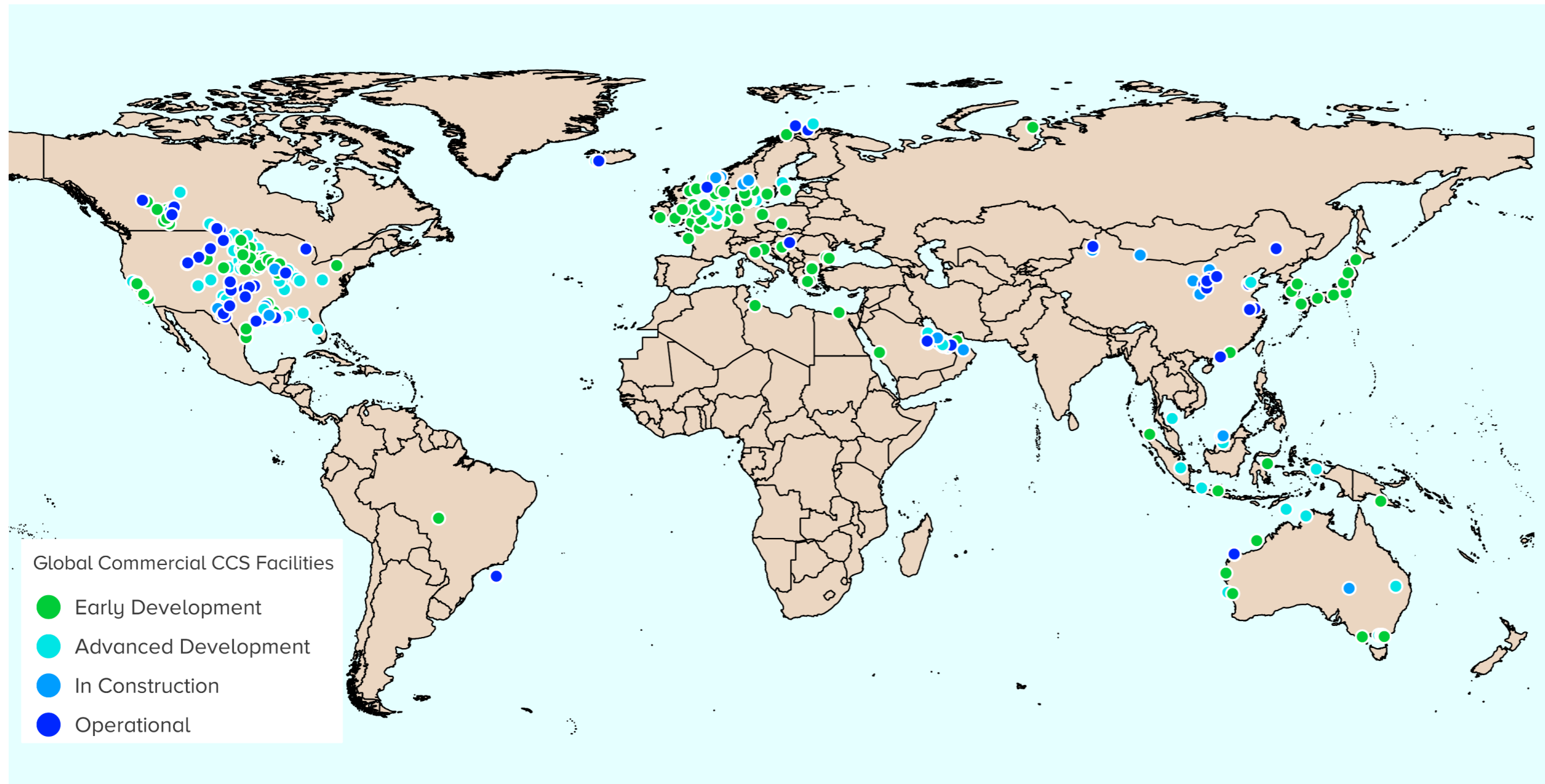
CCS FACILITIES IN OPERATION

26 in construction, 325 in development

198

NEW CCS FACILITIES ADDED TO THE PROJECT PIPELINE  
SINCE 2022 GLOBAL STATUS OF CCS REPORT

# GLOBAL CCS FACILITIES - 2023



41 Facilities in operation

26 Facilities in construction

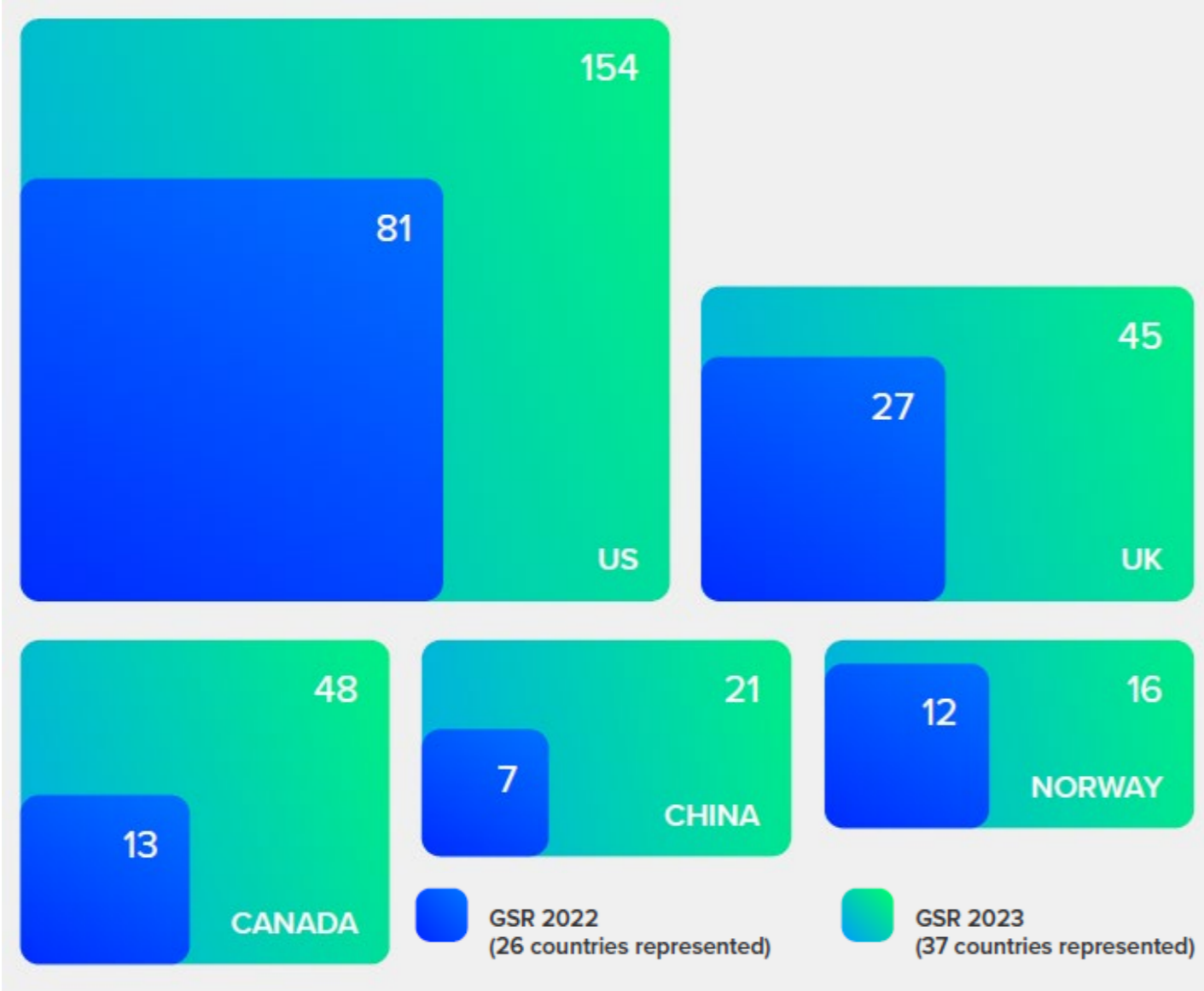
325 Facilities in development

**102%**  
year-on-year increase in  
number of CCS facilities  
in development pipeline.

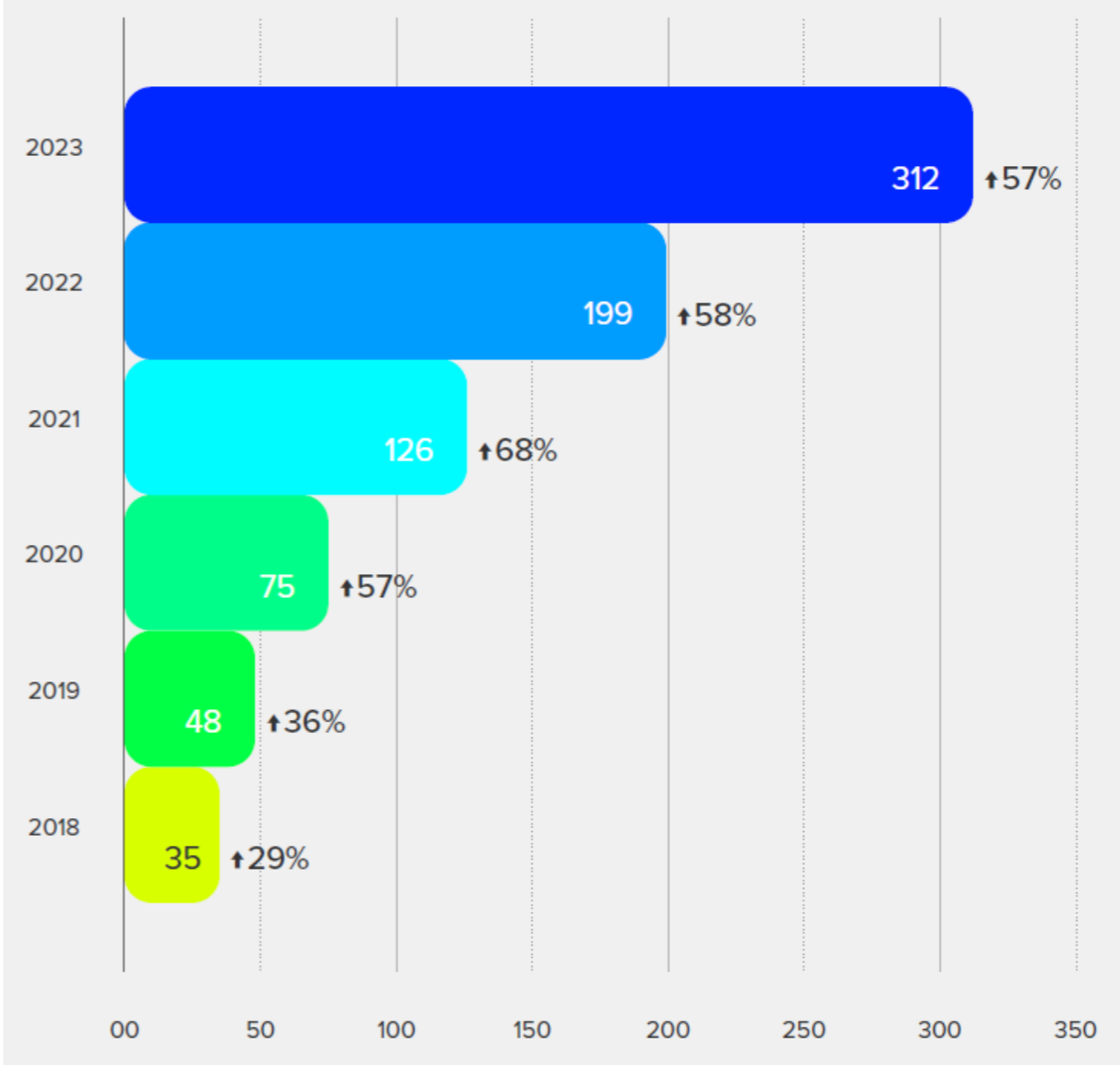
\*Includes Navigator Heartland Greenway network

# MORE CCS FACILITIES IN MORE COUNTRIES

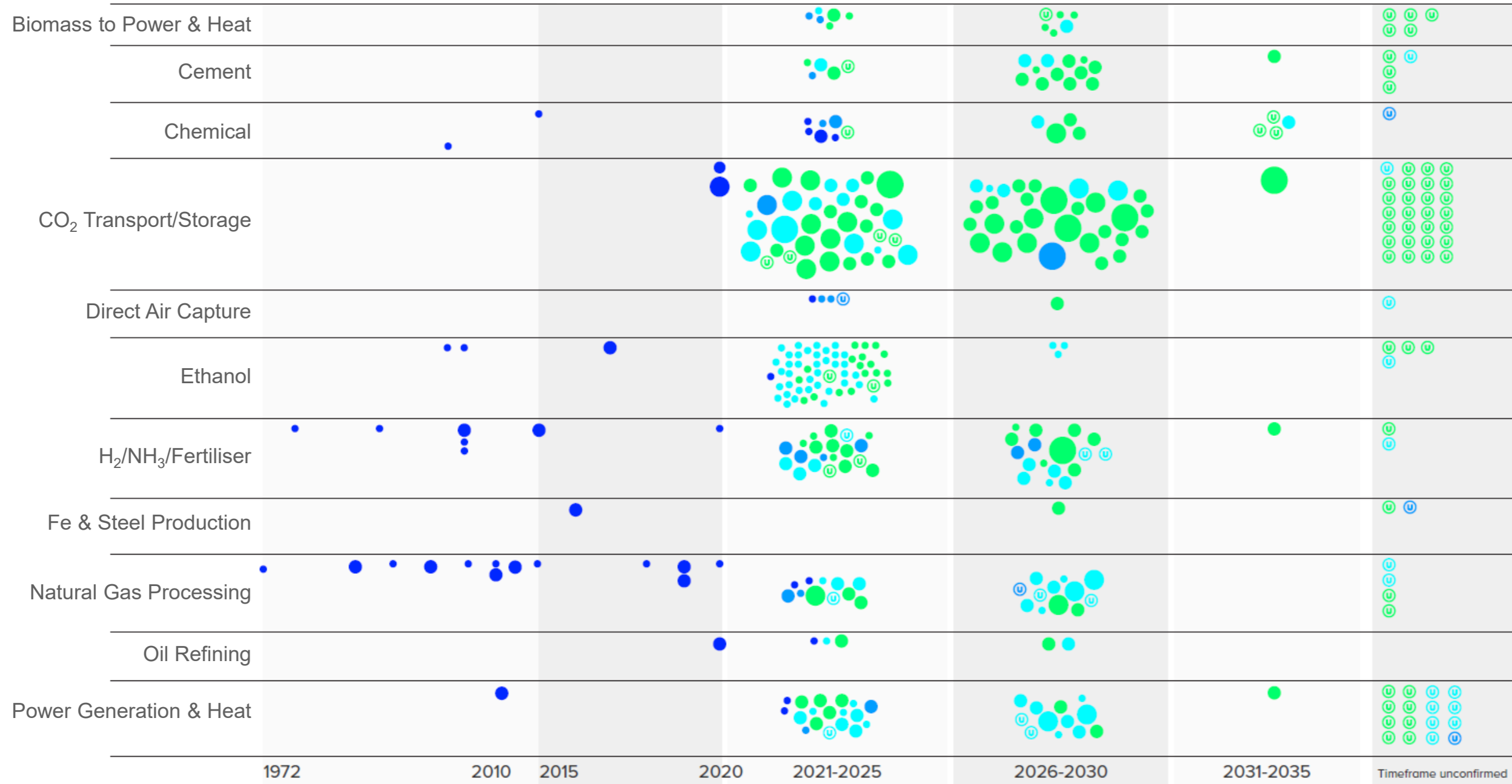
2022 to 2023 growth in CCS projects (in development to operating): top 5 countries



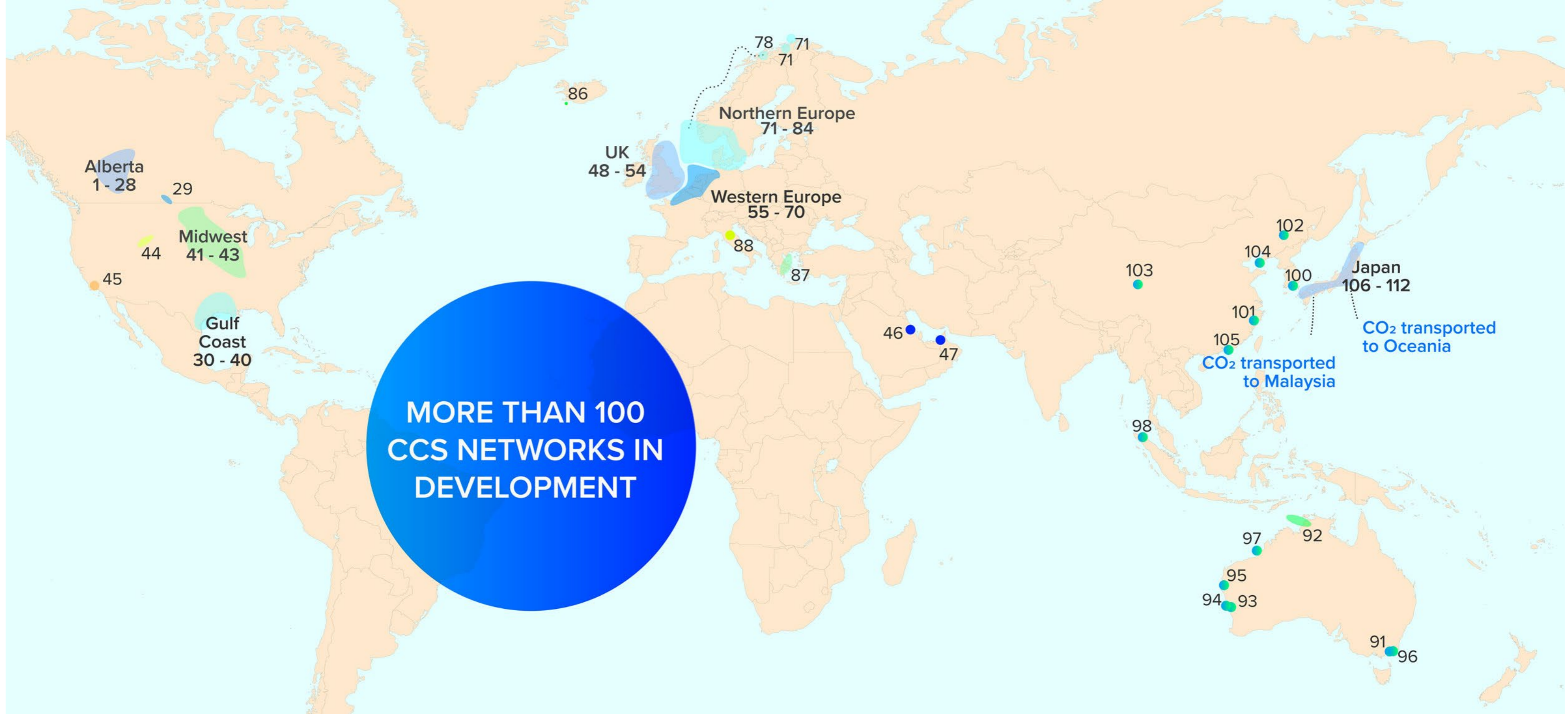
Capture capacity of CCS projects in construction and development (Mtpa CO<sub>2</sub>)



# APPLICATION OF CCS ACROSS INDUSTRIES





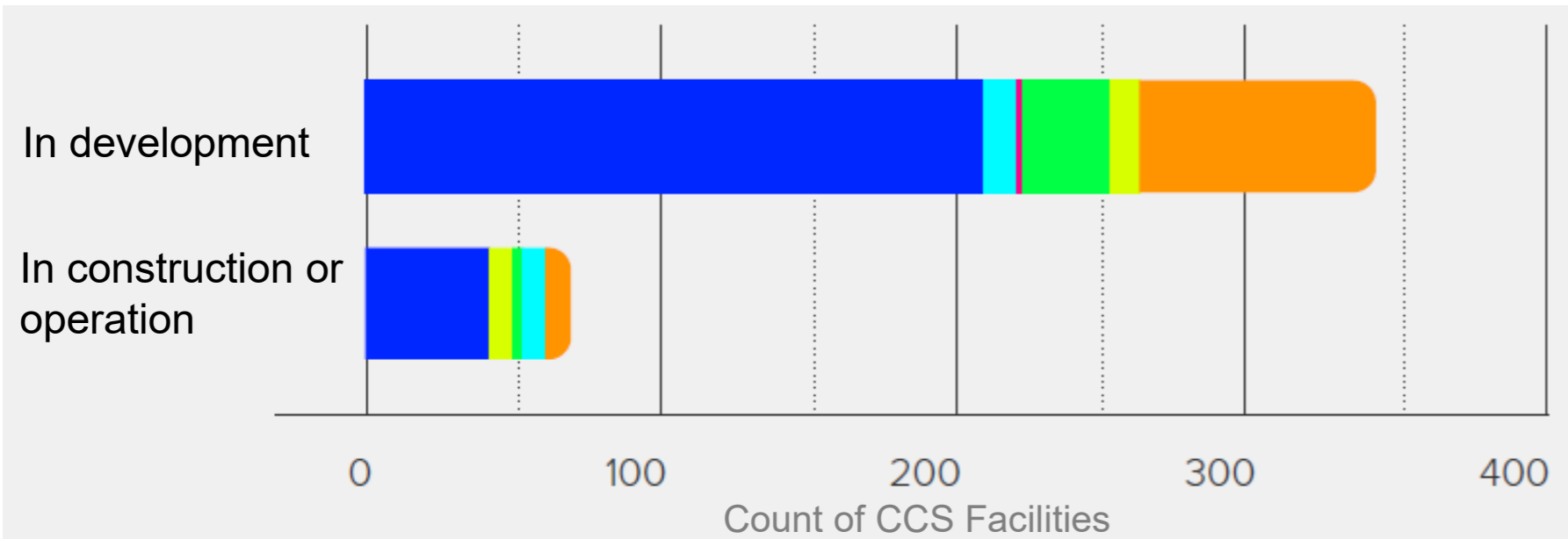




# CO<sub>2</sub> TRANSPORT & STORAGE

More complex CO<sub>2</sub> transport logistics emerging

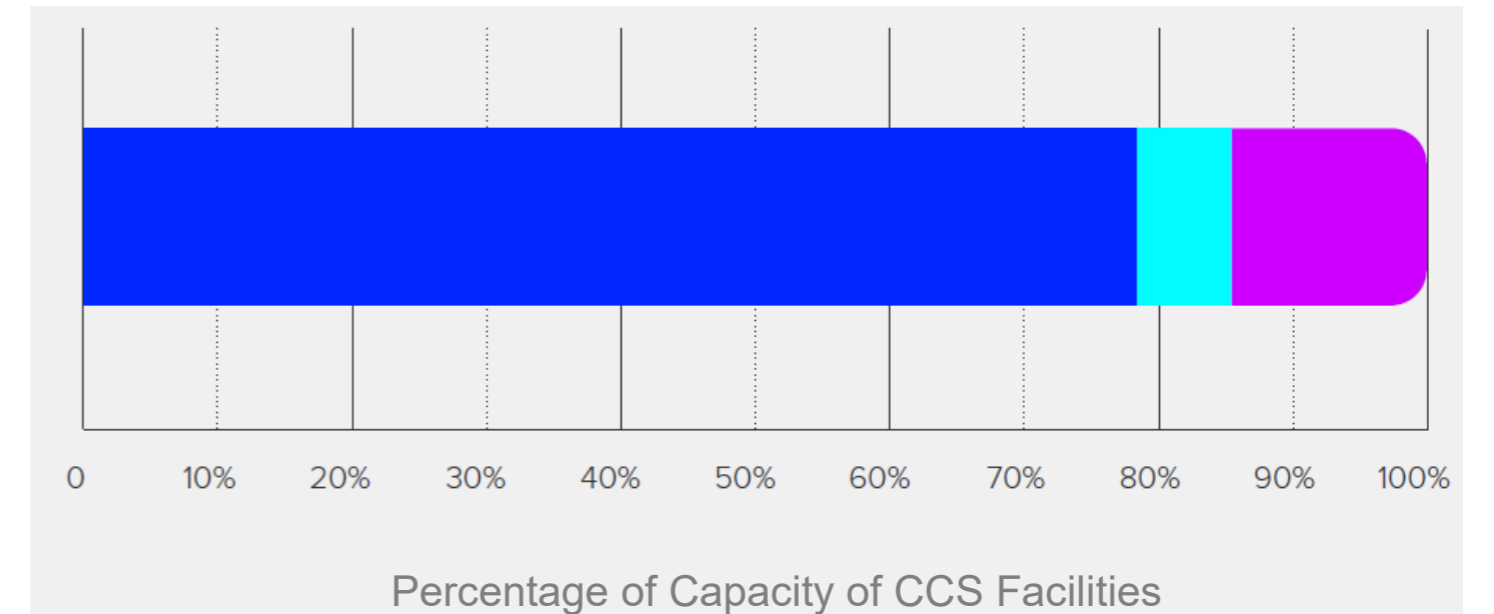
CCS Facility by CO<sub>2</sub> Transport Mode



- Pipeline
- Ship
- Rail
- Combination
- Onsite injection
- Under evaluation

78% of CCS facilities in construction or development by capacity expected to use dedicated geological storage

CCS Facility Capacity by Storage Type



- Dedicated geological storage
- Enhanced oil recovery
- Under evaluation

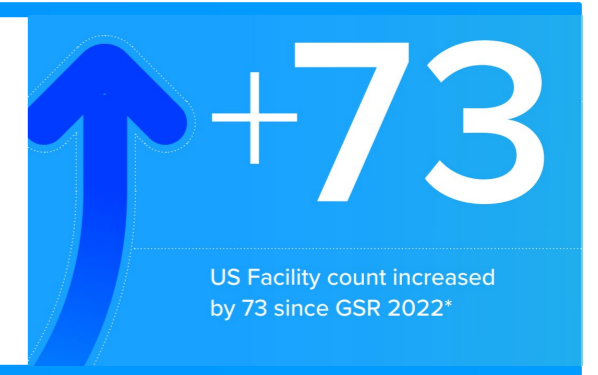
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# FINANCE AND INVESTMENT

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- Financing prospects improved due to strengthened policy support and/or price signals
- Equity investment and M&A activity in CCS increasing
  - USD 4.9 billion ExxonMobil acquisition of Denbury
  - GSR23 notes over USD 2.2 billion investment in CCS companies including Climeworks, Svante, Summit Carbon Solutions, Amogy, Infinium, Ion Clean Energy, Heirloom
- Project debt finance remains very rare – must become common to support accelerated deployment

# CCS DEVELOPMENTS IN THE USA



- US facility count (all stages of development) increased by 73 compared to GSR2022 – benefitting from Inflation Reduction Act (2022), CHIPS & Science Act (2022) and Bipartisan Infrastructure Law (2021).
  - BIL includes over USD 12 billion in investments in carbon management.
  - IRA lowers carbon capture thresholds, increases the dollar value of tax credits and adds provisions for direct pay and tax credit transferability.
- Ethanol, ammonia, hydrogen and fertiliser production, as well as power generation and heat are the top applications for carbon capture in the USA.
- The Department of Interior is developing regulations for offshore storage and the Pipeline & Hazardous Material Safety Administration is updating CO<sub>2</sub> pipeline standards.
- The US EPA has received an unprecedented number of Class VI permit applications (169 wells associated with 58 projects, as of October).
- Regulatory and permitting uncertainty or delays, as well as lack of community support in some areas, pose risks to CCS deployment in the US\*.

\* Navigator ventures announced cancellation of its pipeline project after the cut-off of the GSR, so not reflected in the report.



# CCS DEVELOPMENTS IN CANADA & BRAZIL



## 19 hubs

Canada's Alberta awards 19 hubs through provincial TIER system – in addition to 6 sequestration hub agreements announced in spring 2022.



## 40 MtCO<sub>2</sub>

Brazil's Petrobras injects 10.6 MtCO<sub>2</sub> into pre-salt reservoirs in Santos Basin in 2022, yielding a cumulative 40.8 MtCO<sub>2</sub> – surpassing its 40 MtCO<sub>2</sub> target – and aims to reinject 80 MtCO<sub>2</sub> by 2025.

## Canada

- Federal Government released its carbon management strategy\* and announced investment tax credit covering up to 50% of the capital cost of CO<sub>2</sub> capture projects until 2030.
- There is also a proposal to introduce carbon contracts for difference (CCfDs).
- Alberta awarded 19 additional CCS hubs under the Technology Innovation & Emissions Reduction Regulations.

## Brazil

- Petrobras CCS project in the Santos Basin injected 10.6 Mt CO<sub>2</sub> in 2022 and aims to inject cumulative total of 80 Mt CO<sub>2</sub> (since start of operations) by 2025.
- CO<sub>2</sub> storage regulations bill passed by the Brazilian Senate – yet to pass the Chamber of Deputies.

\*Announced after the cut-off of the GSR, so not reflected in the report.

# CCS DEVELOPMENTS IN EUROPE

119

projects across Europe



- There are now more than 100 facilities in development in Europe.
- Hydrogen, ammonia and fertilizer, power generation and heat, cement and biomass to power/heat are the top applications for carbon management in Europe.
- Net-Zero Industry Act aims to have 50 Mtpa storage developed by 2030 and seeks to shorten regulatory timelines.
- The EU through the Innovation Fund, is to invest in 22 CCS and CCU projects (and counting).
- A number of bilateral agreements and declarations are being signed across Europe to facilitate cross-border collaboration and transportation of CO<sub>2</sub>.
- North Sea sites dominates for CO<sub>2</sub> storage in Europe, but other offshore storage opportunities are also emerging. Denmark, and Poland are also considering onshore storage.

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## CCS DEVELOPMENTS IN EUROPE (2)

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- The **Danish** Government is supporting CCS with Euro 3.6 billion allocated for two tenders. The Danish Energy Agency selected Ørsted Bioenergy & Thermal Power for support.
- The **UK** Government aims to invest GBP 20 billion in CCS to capture 20 - 30 Mtpa by 2030. Hynet, East Coast, Acorn and Viking CCS Clusters were selected as Track-1 and Track-2 clusters.
- Porthos project in **Netherlands** reached FID\*, whilst Aramis project that will offer CO<sub>2</sub> transport infrastructure from Rotterdam to multiple storage fields in the high North Sea is progressing.
- In **Norway**, progress on Longship continues whilst other exploration licenses are being awarded for CO<sub>2</sub> storage.
- **Germany** and **France** are developing and progressing their CCS strategies and also looking into carbon contracts for difference.

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\* Announced after the cut-off of the GSR, so not reflected in the report.



# CCS DEVELOPMENTS IN MIDDLE EAST AND AFRICA

8%

Regional operating capture capacity ~8% of global total



- Regional operational CCS capacity currently accounts for 8% of global total capacity.
- Net-zero targets and strong emphasis on industrial diversification in the region is driving CCS deployment.
- In the **UAE**, ADNOC took FID on the Habshan facility\*.
- The Al Jubail CCUS industrial hub in **Saudi Arabia** targets capturing 9 Mtpa by 2027 and 44 Mtpa by 2035.
- Hosting COP28 turns spotlight on region's commitment to sustainability – making adoption of CCS even more pressing and attractive.

\* Announced after the cut-off of the GSR, so not reflected in the report.

# CCS DEVELOPMENTS IN ASIA PACIFIC

+34

APAC facility count increased  
by 34 since GSR 2022\*

- APAC facility count increased by 34 compared to GSR2022; the region now hosts more than 50 CCS facilities of which 12 are operating and 8 are in construction.
- Natural gas processing and chemical manufacturing are the top applications for CCS in the APAC region.
- Significant policy/regulation development across the region, but much left to be done.
- Transboundary transport of CO<sub>2</sub> emerging as a significant issue and opportunity.
- Projects positioning to receive third party CO<sub>2</sub> for storage for a fee.
- Increased international collaboration in the region.

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## CCS DEVELOPMENTS IN ASIA PACIFIC (2)

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- In **China**, three projects became operational in 2023 – Asia's largest coal-power plant CCS facility, the first offshore CO<sub>2</sub> storage facility, and carbon capture at an oil refinery. China now hosts 11 operating facilities including its first commercial-scale, 109 km long CO<sub>2</sub> transport pipeline.
- **Japan** progressed its CCS roadmap and announced support for seven CCS networks that will capture CO<sub>2</sub> in Japan for storage in the offshore waters off Japan and in the wider Asia-Pacific region.
- **Malaysia, Indonesia, Thailand, Brunei** and **Timor-Leste** are all moving forwards to develop opportunities to receive CO<sub>2</sub> from other countries.
- In **Australia**, the House of Representatives passed a bill to ratify the 2009 & 2013 amendments to the London Protocol to allow transboundary transport of CO<sub>2</sub> for geological storage. The legislation will now be considered by the Senate.



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# INCREASING AMBITION GOING INTO COP28

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- The US, through the IRA, has given immense stimulus carbon management; numerous analysis show the US will likely host between 200 and 250 Mtpa of carbon capture capacity by 2030.
- The UK's CCUS roadmap foresees 20 to 30 Mtpa of installed capacity by 2030.
- The EU needs to have 300 to 550 Mtpa of installed CCUS capacity by 2050 to meet its NZE target. Net-Zero Industry Act aims to have 50 Mtpa storage developed by 2030.
- Japan announced its CCS Long-Term Roadmap in 2023, setting a target for Japan's first commercial CCS projects to commence by 2030 and storing up to 240 Mtpa of CO<sub>2</sub> by 2050.
- The KSA has announced the target of capturing and storing 44 Mtpa by 2035.
- In Brazil, Petrobras aims to inject 40 Mt between 2023 and 2025.

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# REALISING CCS AT SCALE GLOBALLY

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- Reaching the required scale for CCS will require us all to work together.
- Existing pledges and commitments, if delivered, can get us to hundreds of million tonnes per annum scale.
- In order to reach gigatonne per annum scale globally, deployment in emerging markets and developing economies should increase significantly.
- For CCS to be scaled up to the levels required, the highest levels of safety, environmental stewardship, accountability, community engagement, and societal benefits need to be incorporated into projects.
- Achieving the 2030 level of global deployment required also hinges on cutting project lead times.
- Large role for governments in developing policy to drive investment.



# THANK YOU

Download the report here:

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