

The Global Market for Direct Air Capture (DAC) 2023-2033

https://marketpublishers.com/r/G362130DC499EN.html

Date: June 2023

Pages: 193

Price: US\$ 650.00 (Single User License)

ID: G362130DC499EN

Abstracts

There is a growing market demand for clean technologies and products with reduced emissions. Direct Air Capture (DAC) is an emerging carbon dioxide removal strategy that uses advanced, mainly proprietary technology to capture and store or utilize carbon dioxide directly from the ambient air. Captured CO2 can be permanently stored in deep geological formations and depleted aquifers. Novel technologies can trap CO2 in rocks, via mineralization. Captured CO2 can also be used in a range of applications.

The ability to sell or convert CO2 into useful products provides a commercialization pathway for DAC, with products including:

Concrete and Cement.

Precursors for plastics, chemicals, feedstocks etc.

Synthetic Fuels.

Food processing.

Enhanced oil recovery.

While the market is in its infancy, with a relatively small amount of DAC plants in operation (mainly in Europe, USA, Canada and Japan), the potential of these technologies will play a growing role in the carbon capture market. Companies are being incentivized to develop the technology with the US government offering \$3.5 billion in grants.



Report contents include:

Analysis of the overall market for Carbon Capture, Utilization and Storage (CCUS).

Costs for DAC, current and targeted.

Pros and cons of DAC.

In-depth DAC technology analysis.

Comparative analysis of DAC to other carbon capture tech.

Commercialization and plants including production capacities.

Market challenges.

Key players analysis.

Markets for CO2 captured by DAC.

Profiles of 62 companies involved in Direct Air Capture (DAC). Companies profiled include AspiraDAC, Carbofex Oy, CarbonCapture Inc., Charm Industrial, Climeworks, Holocene, 44.01, Mission Zero Technologies, Noya, Occidental Petroleum Corp., and Removr.



Contents

1 ABBREVIATIONS

2 RESEARCH METHODOLOGY

- 2.1 Definition of Carbon Capture, Utilisation and Storage (CCUS)
- 2.2 Technology Readiness Level (TRL)
- 2.3 Key market barriers for CCUS

3 INTRODUCTION

- 3.1 What is CCUS?
 - 3.1.1 Carbon Capture
 - 3.1.1.1 Source Characterization
 - 3.1.1.2 Purification
 - 3.1.1.3 CO2 capture technologies
 - 3.1.2 Carbon Utilization
 - 3.1.2.1 CO2 utilization pathways
 - 3.1.3 Carbon storage
 - 3.1.3.1 Passive storage
 - 3.1.3.2 Enhanced oil recovery
- 3.2 The current Direct Air Capture (DAC) market
- 3.3 CCSUS Market map
- 3.4 Commercial CCUS facilities and projects
 - 3.4.1 Facilities
 - 3.4.1.1 Operational
 - 3.4.1.2 Under development/construction
- 3.5 CCUS Value Chain
- 3.6 Transporting CO2
 - 3.6.1 Methods of CO2 transport
 - 3.6.1.1 Pipeline
 - 3.6.1.2 Ship
 - 3.6.1.3 Road
 - 3.6.1.4 Rail
 - 3.6.2 Safety
- 3.7 Costs
 - 3.7.1 Cost of CO2 transport
- 3.8 Carbon credits



4 CARBON CAPTURE

- 4.1 CO2 capture from point sources
 - 4.1.1 Transportation
 - 4.1.2 Global point source CO2 capture capacities
 - 4.1.3 By source
 - 4.1.4 By endpoint
- 4.2 Main carbon capture processes
 - 4.2.1 Materials
 - 4.2.2 Post-combustion
 - 4.2.3 Oxy-fuel combustion
 - 4.2.4 Liquid or supercritical CO2: Allam-Fetvedt Cycle
 - 4.2.5 Pre-combustion

5 THE DIRECT AIR CAPTURE MARKET

- 5.1 Technology description
 - 5.1.1 Solid and liquid DAC
- 5.2 Advantages of DAC
- 5.3 Deployment
- 5.4 Point source carbon capture versus Direct Air Capture
- 5.5 Technologies
 - 5.5.1 Solid sorbents
 - 5.5.2 Liquid sorbents
 - 5.5.3 Liquid solvents
 - 5.5.4 Airflow equipment integration
 - 5.5.5 Passive Direct Air Capture (PDAC)
 - 5.5.6 Direct conversion
 - 5.5.7 Co-product generation
 - 5.5.8 Low Temperature DAC
 - 5.5.9 Regeneration methods
- 5.6 Commercialization and plants
- 5.7 Metal-organic frameworks (MOFs) in DAC
- 5.8 DAC plants and projects-current and planned
- 5.9 Costs
- 5.10 Market challenges for DAC
- 5.11 Market prospects for direct air capture
- 5.12 Players and production



- 5.13 Co₂ utilization pathways
- 5.14 Markets for DAC
 - 5.14.1 Fuels
 - 5.14.1.1 Overview
 - 5.14.1.2 Production routes
 - 5.14.1.3 Methanol
 - 5.14.1.4 Algae based biofuels
 - 5.14.1.5 CO2-fuels from solar
 - 5.14.1.6 Companies
 - 5.14.1.7 Challenges
 - 5.14.2 Chemicals, plastics and polymers
 - 5.14.2.1 Overview
 - 5.14.2.2 Scalability
 - 5.14.2.3 Plastics and polymers
 - 5.14.2.4 Urea production
 - 5.14.2.5 Inert gas in semiconductor manufacturing
 - 5.14.2.6 Carbon nanotubes
 - 5.14.2.7 Companies
 - 5.14.3 Construction materials
 - 5.14.3.1 Overview
 - 5.14.3.2 CCUS technologies
 - 5.14.3.3 Carbonated aggregates
 - 5.14.3.4 Additives during mixing
 - 5.14.3.5 Concrete curing
 - 5.14.3.6 Costs
 - 5.14.3.7 Companies
 - 5.14.3.8 Challenges
 - 5.14.4 CO2 Utilization in Biological Yield-Boosting
 - 5.14.4.1 Overview
 - 5.14.4.2 Applications
 - **5.14.4.3 Companies**
 - 5.14.5 Food and feed production
 - 5.14.6 CO2 Utilization in Enhanced Oil Recovery
 - 5.14.6.1 Overview
 - 5.14.6.2 CO2-EOR facilities and projects
- 5.15 Storage
 - 5.15.1 CO2 storage sites
 - 5.15.1.1 Storage types for geologic CO2 storage
 - 5.15.1.2 Oil and gas fields



5.15.1.3 Saline formations

5.15.2 Global CO2 storage capacity

5.15.3 Costs

6 COMPANY PROFILES 141 (62 COMPANY PROFILES)

7 REFERENCES



List Of Tables

LIST OF TABLES

- Table 1. Technology Readiness Level (TRL) Examples.
- Table 2. Key market barriers for CCUS.
- Table 3. CO2 utilization and removal pathways
- Table 4. Approaches for capturing carbon dioxide (CO2) from point sources.
- Table 5. CO2 capture technologies.
- Table 6. Advantages and challenges of carbon capture technologies.
- Table 7. Overview of commercial materials and processes utilized in carbon capture.
- Table 8. Global commercial CCUS facilities-in operation.
- Table 9. Global commercial CCUS facilities-under development/construction.
- Table 10. Methods of CO2 transport.
- Table 11. Carbon capture, transport, and storage cost per unit of CO2
- Table 12. Estimated capital costs for commercial-scale carbon capture.
- Table 13. Point source examples.
- Table 14. Assessment of carbon capture materials
- Table 15. Chemical solvents used in post-combustion.
- Table 16. Commercially available physical solvents for pre-combustion carbon capture.
- Table 17. Advantages and disadvantages of DAC.
- Table 18. Advantages of DAC as a CO2 removal strategy.
- Table 19. Companies developing airflow equipment integration with DAC.
- Table 20. Companies developing Passive Direct Air Capture (PDAC) technologies.
- Table 21. Companies developing regeneration methods for DAC technologies.
- Table 22. DAC companies and technologies.
- Table 23. DAC technology developers and production.
- Table 24. DAC projects in development.
- Table 25. Costs summary for DAC.
- Table 26. Cost estimates of DAC.
- Table 27. Challenges for DAC technology.
- Table 28. DAC companies and technologies.
- Table 29. Example CO2 utilization pathways.
- Table 30. Markets for DAC.
- Table 31. Market overview for CO2 derived fuels.
- Table 32. Microalgae products and prices.
- Table 33. Main Solar-Driven CO2 Conversion Approaches.
- Table 34. Companies in CO2-derived fuel products.
- Table 35. Commodity chemicals and fuels manufactured from CO2.



- Table 36. CO2 utilization products developed by chemical and plastic producers.
- Table 37. Companies in CO2-derived chemicals products.
- Table 38. Carbon capture technologies and projects in the cement sector
- Table 39. Companies in CO2 derived building materials.
- Table 40. Market challenges for CO2 utilization in construction materials.
- Table 41. Companies in CO2 Utilization in Biological Yield-Boosting.
- Table 42. CO2 sequestering technologies and their use in food.
- Table 43. Applications of CCS in oil and gas production.
- Table 44. Storage and utilization of CO2.
- Table 45. Global depleted reservoir storage projects.
- Table 46. Global CO2 ECBM storage projects.
- Table 47. CO2 EOR/storage projects.
- Table 48. Global storage sites-saline aquifer projects.
- Table 49. Global storage capacity estimates, by region.



List Of Figures

LIST OF FIGURES

- Figure 1. Schematic of CCUS process.
- Figure 2. Pathways for CO2 utilization and removal.
- Figure 3. A pre-combustion capture system.
- Figure 4. Carbon dioxide utilization and removal cycle.
- Figure 5. Various pathways for CO2 utilization.
- Figure 6. Example of underground carbon dioxide storage.
- Figure 7. Carbon Capture, Utilization, & Storage (CCUS) Market Map.
- Figure 8. CCS deployment projects, historical and to 2035.
- Figure 9. Existing and planned CCS projects.
- Figure 10. CCUS Value Chain.
- Figure 11. Transport of CCS technologies.
- Figure 12. Railroad car for liquid CO2 transport
- Figure 13. Estimated costs of capture of one metric ton of carbon dioxide (Co2) by sector.
- Figure 14. Cost of CO2 transported at different flowrates
- Figure 15. Cost estimates for long-distance CO2 transport.
- Figure 16. CO2 capture and separation technology.
- Figure 17. Global capacity of point-source carbon capture and storage facilities.
- Figure 18. Global carbon capture capacity by CO2 source, 2021.
- Figure 19. Global carbon capture capacity by CO2 source, 2030.
- Figure 20. Global carbon capture capacity by CO2 endpoint, 2021 and 2030.
- Figure 21. Post-combustion carbon capture process.
- Figure 22. Postcombustion CO2 Capture in a Coal-Fired Power Plant.
- Figure 23. Oxy-combustion carbon capture process.
- Figure 24. Liquid or supercritical CO2 carbon capture process.
- Figure 25. Pre-combustion carbon capture process.
- Figure 26. CO2 captured from air using liquid and solid sorbent DAC plants, storage, and reuse.
- Figure 27. Global CO2 capture from biomass and DAC in the Net Zero Scenario.
- Figure 28. Potential for DAC removal versus other carbon removal methods.
- Figure 29. DAC technologies.
- Figure 30. Schematic of Climeworks DAC system.
- Figure 31. Climeworks' first commercial direct air capture (DAC) plant, based in Hinwil, Switzerland.
- Figure 32. Flow diagram for solid sorbent DAC.



- Figure 33. Direct air capture based on high temperature liquid sorbent by Carbon Engineering.
- Figure 34. Global capacity of direct air capture facilities.
- Figure 35. Global map of DAC and CCS plants.
- Figure 36. Schematic of costs of DAC technologies.
- Figure 37. DAC cost breakdown and comparison.
- Figure 38. Operating costs of generic liquid and solid-based DAC systems.
- Figure 39. Co2 utilization pathways and products.
- Figure 40. Conversion route for CO2-derived fuels and chemical intermediates.
- Figure 41. Conversion pathways for CO2-derived methane, methanol and diesel.
- Figure 42. CO2 feedstock for the production of e-methanol.
- Figure 43. Schematic illustration of (a) biophotosynthetic, (b) photothermal, (c) microbial-photoelectrochemical, (d) photosynthetic and photocatalytic (PS/PC), (e) photoelectrochemical (PEC), and (f) photovoltaic plus electrochemical (PV+EC) approaches for CO2 c
- Figure 44. Audi synthetic fuels.
- Figure 45. Conversion of CO2 into chemicals and fuels via different pathways.
- Figure 46. Conversion pathways for CO2-derived polymeric materials
- Figure 47. Conversion pathway for CO2-derived building materials.
- Figure 48. Schematic of CCUS in cement sector.
- Figure 49. Carbon8 Systems' ACT process.
- Figure 50. CO2 utilization in the Carbon Cure process.
- Figure 51. Algal cultivation in the desert.
- Figure 52. Example pathways for products from cyanobacteria.
- Figure 53. Typical Flow Diagram for CO2 EOR.
- Figure 54. Large CO2-EOR projects in different project stages by industry.
- Figure 55. CO2 Storage Overview Site Options
- Figure 56. CO2 injection into a saline formation while producing brine for beneficial use.
- Figure 57. Subsurface storage cost estimation.
- Figure 58. Schematic of carbon capture solar project.
- Figure 59. Carbonminer DAC technology.
- Figure 60. Carbon Blade system.
- Figure 61. Direct Air Capture Process.
- Figure 62. Orca facility.
- Figure 63. Holy Grail DAC system.
- Figure 64. Infinitree swing method.
- Figure 65. Audi/Krajete DAC unit.
- Figure 66. Neustark modular plant.
- Figure 67. 3D model of 100,000 tpa DAC plant



Figure 68. RepAir technology.

Figure 69. Skytree pilot DAC unit.

Figure 70. Soletair Power unit.



I would like to order

Product name: The Global Market for Direct Air Capture (DAC) 2023-2033

Product link: https://marketpublishers.com/r/G362130DC499EN.html

Price: US\$ 650.00 (Single User License / Electronic Delivery)

If you want to order Corporate License or Hard Copy, please, contact our Customer

Service:

info@marketpublishers.com

Payment

First name:

To pay by Credit Card (Visa, MasterCard, American Express, PayPal), please, click button on product page https://marketpublishers.com/r/G362130DC499EN.html

To pay by Wire Transfer, please, fill in your contact details in the form below:

Last name:	
Email:	
Company:	
Address:	
City:	
Zip code:	
Country:	
Tel:	
Fax:	
Your message:	
	**All fields are required
	Custumer signature

Please, note that by ordering from marketpublishers.com you are agreeing to our Terms & Conditions at https://marketpublishers.com/docs/terms.html

To place an order via fax simply print this form, fill in the information below and fax the completed form to +44 20 7900 3970