Drawdown FAQ's

Prepared by Pachamama Alliance

The Basics

What is Drawdown - Drawdown is the point in time when the concentration of greenhouse gases in the atmosphere peak and begin to decline on a year to year basis.

Goal of the Drawdown Project - To identify, measure and model the 100 most impactful, substantive solutions to global warming that either reduce emissions or remove greenhouse gases from the atmosphere and to determine whether it is possible to achieve Drawdown within the next 30 years, by 2050.

Drawdown Team - Drawdown is a coalition of over 200 contributors from over 22 countries including 62 researchers, 130 advisors and 49 outside experts.

How to achieve Drawdown - To achieve drawdown we need to draw greenhouse gases down from the atmosphere back to the earth. This already happens every year via photosynthesis but we have to rebalance the quantity of emissions with the earth's capacity to bring those gases back home.

The Mandate - To map, measure and model substantive, technological, ecological, and behavioral solutions and analyze their potential to reduce and draw down greenhouse gases over a 30 year period.

Greenhouse Gases - Greenhouse gases include carbon dioxide, methane, fluorinated gases and several others all with different global warming impacts. To enable consistency, scientists calculate the warming potential of different greenhouse gases and convert it to a carbon equivalent to use as a common 'carbon' currency. In Drawdown, references to carbon dioxide include the impact of other, equivalent greenhouse gases, such as methane or fluorinated gases, based on their global warming potential.

The Science behind Drawdown

Assessment - The project focussed on existing solutions with sufficient data available for global modelling. The solutions were then evaluated based on their current performance, scalability, economic viability, potential to reduce greenhouse gases over 30 years and the balance of other positive/negative impacts.

Three-stage Process - Every solution was researched in a 3 step process:

(i) analyzing technical reports with financial and climate data;
(ii) reviewing to ensure data integrity;
(iii) modeling to assess integration of solutions and eliminate double counting.

Modelling - Each solution is measured and modeled to determine its global carbon impact between 2020-2050. The results include the (i) ranking (ii) carbon avoided, reduced, or sequestered (iii) the cost to implement and (iv) net cost/savings over a 30 year period. The impacts are quoted in gigatons of carbon dioxide referenced against a 'business as usual' baseline.

Scenarios - Three different scenarios were modelled using different underlying assumptions (e.g. future growth rates, cost reductions, improvements in tech etc). The most conservative scenario (the "plausible' scenario in the book) reaches drawdown by 2060, the middle "drawdown" scenario by 2050 and the more aggressive, or "optimum" scenario, reaches drawdown potentially as early as 2045.

The Findings

Ranking - The solutions are ranked based on total amount of carbon they can potentially avoid or remove from the atmosphere on a global basis over a 30 year period.

Sectors - The top 80 solutions are grouped into seven sectors:

Energy	Food	Women & Girls	Building & Cities	Land Use	Transport	Materials

Top 10 Ranked Solutions

#1 Refrigerant Management
#2 Wind Turbines (onshore)
#3 Reduced Food Waste
#4 Plant Rich Diet
#5 Tropical Forests
#6 Educating Girls
#7 Family Planning
#8 Solar Farms
#9 Silvopasture
#10 Rooftop Solar

Co-Benefits - Nearly all the solutions are 'no regrets' solutions, meaning, they have so many advantages they are commendable irrespective of their impact on greenhouse gases. These co-benefits include saving money, creating jobs, enhancing security, advancing human health, eliminating hunger, preventing pollution and restoring the environment.

The Plan - Of the 80 ranked solutions some have more impact than others, but there is no silver bullet and no 'small' solutions. Reversing global warming is not possible unless we do them all. Under the Drawdown Scenario, over a 30 years period, the 80 solutions would draw down 1,442 GT of carbon equating to a net carbon reduction of .59GT by 2050 - this is drawdown.

Net cost to reverse Global Warming - The total "first cost" to implement all 80 modelled solutions is $129 trillion over 30 years under the plausible scenario. That's $27 trillion over what "business as usual" would cost, for example the cost of using solar instead of coal. The net operating cost for all solutions over 30 years is actually a ***savings*** of $78 trillion. So at the point of drawdown in 2050 the total net savings will be $51 trillion!

Coming Attractions - In addition to the top 80 solutions, the book includes 20 "coming attractions". These are 20 emerging solutions that, while they are scientifically valid, as yet there is insufficient economic and/or scientific data to accurately model the net impact on carbon and cost. These innovations include marine permaculture, smart grids, the hyperloop, autonomous vehicles and living buildings.

Glossary

Global Warming: Global Warming refers to the surface temperature of the earth. Climate Change refers to the many changes that will occur due to the increase in greenhouse gases and consequential rise in temperature. Drawdown focusses on the reduction of greenhouse gases to reverse global warming.

Gigaton: The solutions are ranked in terms of gigatons of carbon dioxide removed from the atmosphere. A gigaton is a billion metric tons. To put this in perspective, imagine 400,000 Olympic sized pools. That's about a billion metric tons of water, or 1 gigaton. Or a blanket (~.42 inches deep) covering the entire USA would represent the scale of 1 metric gigaton of carbon emissions.

For more information see www.drawdown.org and www.pachamama.org

Summary of Drawdown Solutions
By Overall Rank

This table provides the detailed results of the Plausible Scenario, which models the growth solutions on the Drawdown list based on a reasonable, but vigorous rate from 2020-2050.

1. Refrigerant Management
2. Wind Turbines (Onshore)
3. Reduced Food Waste
4. Plant-Rich Diet
5. Tropical Forests
6. Educating Girls
7. Family Planning
8. Solar Farms
9. Silvopasture
10. Rooftop Solar
11. Regenerative Agriculture
12. Temperate Forests
13. Peatlands
14. Tropical Staple Trees
15. Afforestation
16. Conservation Agriculture
17. Tree Intercropping
18. Geothermal
19. Managed Grazing
20. Nuclear
21. Clean Cookstoves
22. Wind Turbines (Offshore)
23. Farmland Restoration
24. Improved Rice Cultivation
25. Concentrated Solar
26. Electric Vehicles
27. District Heating
28. Multistrata Agroforestry
29. Wave and Tidal
30. Methane Digesters (Large)
31. Insulation
32. Ships
33. LED Lighting (Household)
34. Biomass
35. Bamboo
36. Alternative Cement
37. Mass Transit
38. Forest Protection
39. Indigenous Peoples' Land Management
40. Trucks
41. Solar Water
42. Heat Pumps
43. Airplanes
44. LED Lighting (Commercial)
45. Building Automation
46. Water Saving - Home
47. Bioplastic
48. In-Stream Hydro
49. Cars
50. Cogeneration
51. Perennial Biomass
52. Coastal Wetland
53. System of Rice Intensification
54. Walkable Cities
55. Household Recycling
56. Industrial Recycling
57. Smart Thermostats
58. Landfill Methane
59. Bike Infrastructure
60. Composting
61. Smart Glass
62. Women Smallholders
63. Telepresence
64. Methane Digesters (Small)
65. Nutrient Management
66. High-speed Rail
67. Farmland Irrigation
68. Waste-to-Energy
69. Electric Bikes
70. Recycled Paper
71. Water Distribution
72. Biochar
73. Green Roofs
74. Trains
75. Ridesharing
76. Micro Wind
77a. Energy Storage (Distributed)
77b. Energy Storage (Utilities)
77c. Grid Flexibility
78. Microgrids
79. Net Zero Buildings
80. Retrofitting

Coming Attractions

1. Repopulating the Mammoth Steppe
2. Pasture Cropping
3. Enhanced Weathering of Minerals
4. Marine Permaculture
5. Intensive Silvopasture
6. Artificial Leaf
7. Autonomous Vehicles
8. Solid-State Wave Energy
9. Living Buildings
10. Direct Air Capture
11. Hydrogen-Boron Fusion
12. Smart Highways
13. Hyperloop
14. Microbial Farming
15. Industrial Hemp
16. Perennial Crops
17. A Cow Walks onto a Beach
18. Ocean Farming
19. Smart Grids
20. Building with Wood

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Drawdown Solutions by Sector

Land Use
Tropical Forests
Temperate Forests
Peatlands
Afforestation
Bamboo
Forest Protection
Indigenous Peoples' Land Management
Perennial Biomass
Coastal Wetlands

Energy
Wind Turbines (Onshore)
Solar Farms
Rooftop Solar
Geothermal
Nuclear
Wind Turbines (Offshore)
Concentrated Solar
Wave and Tidal
Methane Digesters (Large)
Biomass
Solar Water
In-Stream Hydro
Cogeneration
Methane Digesters (Small)
Waste-to-Energy
Micro Wind
Energy Storage (Distributed)
Energy Storage (Utilities)
Grid Flexibility
Microgrids

Food
Reduced Food Waste
Plant-Rich Diet
Silvopasture
Regenerative Agriculture
Tropical Staple Trees
Conservation Agriculture
Tree Intercropping
Managed Grazing
Clean Cookstoves
Farmland Restoration
Improved Rice Cultivation
Multistrata Agroforestry
System of Rice Intensification
Composting
Nutrient Management
Farmland Irrigation
Biochar

Transport
Electric Vehicles
Ships
Mass Transit
Trucks
Airplanes
Cars
Telepresence
High-speed Rail
Electric Bikes
Trains
Ridesharing

Materials
Refrigerant Management
Alternative Cement
Water Saving - Home
Bioplastic
Household Recycling
Industrial Recycling
Recycled Paper

Women and Girls
Educating Girls
Family Planning
Women Smallholders

Building and Cities
District Heating
Insulation
LED Lighting (Household)
Heat Pumps
LED Lighting (Commercial)
Building Automation
Walkable Cities
Smart Thermostats
Landfill Methane
Bike Infrastructure
Smart Glass
Water Distribution
Green Roofs
Net Zero Buildings
Retrofitting