PROJECT DRAWDOWN

3450 Sacramento Street #506
San Francisco, CA 94118
Email: info@drawdown.org

Mar 6, 2023

UNFCCC secretariat
UN Campus
Platz der Vereinten Nationen 1
53113 Bonn
Germany

Non-party stakeholder submission

Issue: The first global stocktake

Title: Call for inputs from Parties and observer States, UN Agencies and other international organizations and non-Party Stakeholders and observer Organizations, to the first global stocktake

Session Name: SB 58

Mandate: Decision 19/CMA.1, paragraph 19: requested the Chairs of the Subsidiary Body for Scientific and Technological Advice and the Subsidiary Body for Implementation to issue a call for the inputs referred to in paragraphs 36 and 37 of the same decision, taking into account that such inputs should be submitted at least three months before their consideration in the technical assessment.

PROJECT DRAWDOWN

Dear UNFCCC secretariat,

As a non-party stakeholder with provisional observer status, we are writing to submit a contribution to the Global Stocktake on behalf of Project Drawdown—a U.S.-based non-profit. We are grateful for the opportunity to present our work as it relates to the guiding questions for the technical assessment as well as the previous Technical Dialogues.

This cover letter is intended to serve as an executive summary for our submission as well as an index to relevant materials. We have organized our submission to complement and build from key discussion points and themes in the guiding questions as well as those that have surfaced throughout the Global Stocktake process to date. We are confident that the climate solutions presented in this document will help provide a comprehensive picture of the full range of climate action tools available to policymakers, communities, and individuals.

Project Drawdown is widely recognized as the world's leading resource for climate solutions. Our mission is to help the world reach drawdown—the future point when levels of greenhouse gases in the atmosphere stop climbing and start to steadily decline, thereby stopping catastrophic climate change—as quickly, safely, and equitably as possible.

In reference to guiding questions 1, 5, and 22 as well as the Summary Report from the first Global Stocktake Technical Dialogue paragraphs 50 and 96, our organization's history represents a small part of collective progress toward global climate goals and roughly corresponds to the period following the signing of the Paris Agreement. Since 2017, we have identified over 93 climate mitigation solutions that 1) are currently available, 2) are financially viable, 3) have proven potential to reduce greenhouse gases (GHGs) in the atmosphere, and 4) have sufficient data available to model the level of GHGs that can be mitigated, reduced, or sequestered (please see Table 1 below for a list of solutions that address short-lived climate pollutants and/or can be implemented immediately and Annex 1 for a full list of the 93 solutions). A subset of these solutions is also what we call "triple duty" solutions as they not only reduce emissions but also contribute to climate adaptation and advance development goals.

Drawdown Framework for Climate Solutions

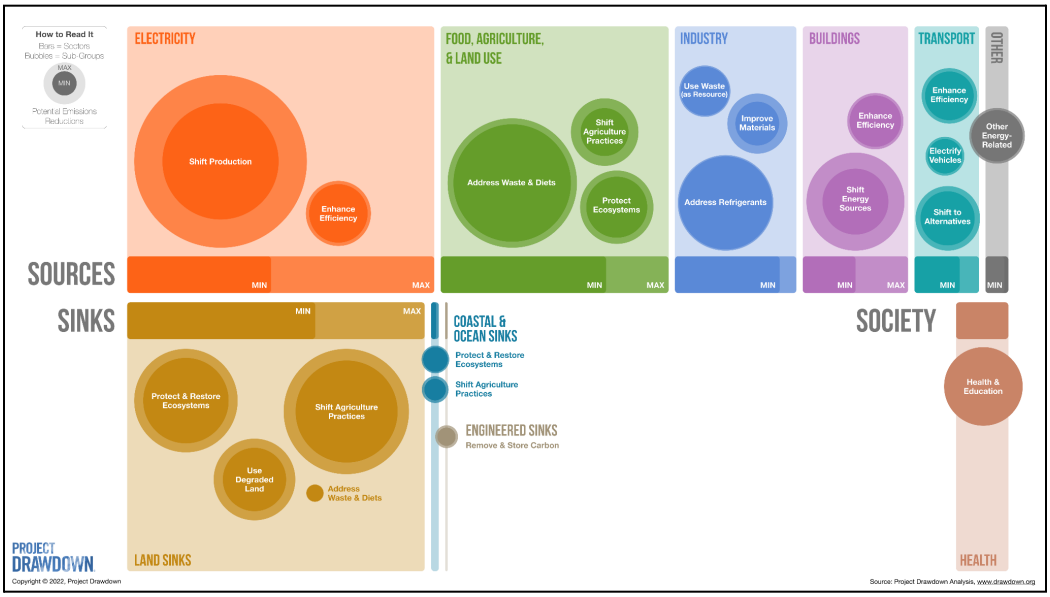


Figure 1: *Project Drawdown solutions grouped by sector. Circles denote GHG emissions reduction potential.*

All of these solutions must be implemented simultaneously within a holistic framework to address climate change and improve human well-being. As depicted in Figure 1, the solutions can be grouped as 1) reducing sources of GHGs, 2) supporting carbon sinks, and 3) improving society.

Taken together, the solutions could reduce GHG emissions between 1050 and 1637 gigatons of CO2-equivalent (CO2-eq) from 2020 to 2050. This represents enormous mitigation potential and provides a science-based path forward that can reduce climate risks and social inequities. As noted above, our solutions framework also generates co-benefits for people and the planet through improving health, food security, economic security, biodiversity, equity, adaptation, resilience to climate-caused disruptions, and more.

Recognizing that mitigation and adaptation measures in low- and middle-income countries (LMICs) cannot be undertaken at the expense of development, Project Drawdown has also identified a subset of 28 climate solutions that are 1) applicable for rural under-resourced

regions in LMICs and 2) provide clear co-benefits for 12 dimensions of human well-being (see Annex 2 for the full solutions set).[1]

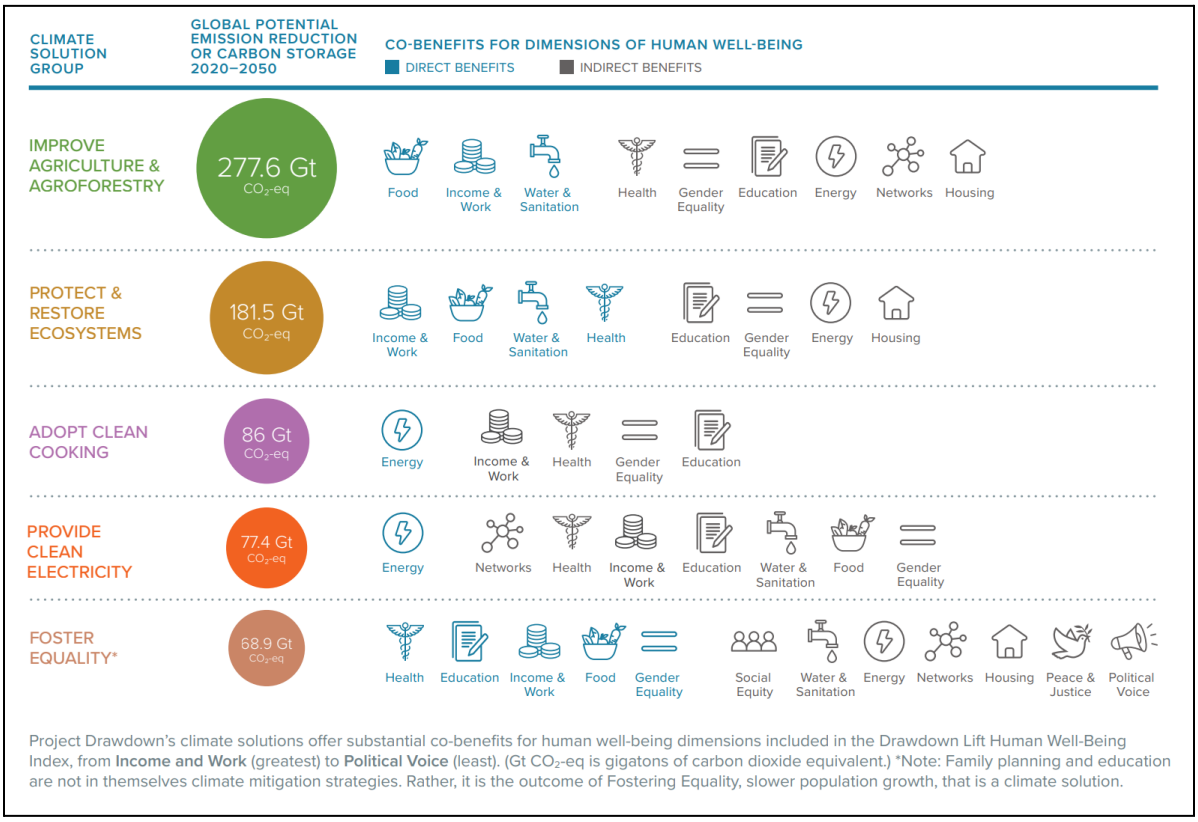


***Figure 2**: Project Drawdown's subset of 28 climate solutions (grouped into five sectors) with co-benefits for human well-being.*

This subset of 28 solutions has proven co-benefits in areas such as energy, food security, income and work, water and sanitation, health, gender equality, education, access to networks, housing, social equity, peace and justice, and political voice (see Annex 3 for a factsheet depicting the GHG emissions reduction potential and co-benefits; see the full report here: Climate-Poverty Connections). Furthermore, these solutions are particularly applicable to rural communities in Africa and South Asia where 85% of the world's population living in

[1]In reference to guiding questions 9, 10, and 19 and GST.TD.2022.SummaryReport.1 paragraphs 23, 29, 60, 114, 126, and 401

poverty resides.[2] With nearly 700 million people experiencing poverty globally, climate action *must* simultaneously address human well-being and development.[3]

In total, these solutions could reduce GHGs or increase carbon storage by 691.4 gigatons of CO2-eq over 30 years. This represents an enormous opportunity, and demonstrates that properly designed and implemented policies for low-carbon and resilient growth can also help address poverty and inequality, enabling people to live healthier, more prosperous, more inclusive, and more sustainable lives.

Notes to the Technical Dialogues

We are grateful for the conversations that took place during the preceding Technical Dialogues and we offer our contributions to help build upon those discussion points. We have categorized our notes below according to general themes that surfaced in the Technical Dialogue Summary Report.

Climate action

Noting paragraph 254 in the Summary Report of the first GST Technical Dialogue, Project Drawdown agrees with the need for a matrix highlighting the "low hanging fruits" as well as the enabling conditions for solutions that can act as immediate critical emergency brakes as society seeks to limit warming to under 1.5℃. In order to foster a balanced environment for these fast-acting solutions, we suggest the following four criteria as a baseline:

1. Align capital inputs with carbon emissions. For example, increase investments in the agriculture sector (accounting for 25% of GHG emissions) as it is significantly lagging behind other sectors.
2. Account for the time-value of carbon.

[2] Katayama, Roy, and Divyanshi Wadhwa. "Half of the World's Poor Live in Just 5 Countries." *World Bank Blogs*, 9 Jan. 2019, https://blogs.worldbank.org/opendata/half-world-s-poor-live-just-5-countries.
[3] World Bank Group. "Global Progress in Reducing Extreme Poverty Grinds to a Halt." World Bank press release, October 4, 2022. https://www.worldbank.org/en/news/press-release/2022/10/05/global-progress-in-reducing-extreme-poverty-grinds-to-a-halt.

3. Focus on "leverage points" or hotspots of problems or activities. For example, addressing methane leaks and disproportionately high-polluting power plants would have an outsized impact compared to the amount of action required.
4. Maximize co-benefits for people and nature.

Specifically, implementing solutions that address short-lived climate pollutants (SLCPs) in this decade not only serves as a "win within reach," but is vital to limiting global temperatures to less than 2°C. SLCPs have contributed up to 45 percent of warming to date, and solutions focusing on reducing SLCP emissions could slow overall warming by 0.6°C by 2050.

In this regard, we would like to direct the attention of the secretariat to the matrix found in Table 1 below, which showcases near-term actions that would generate an immediate and outsized impact compared to the effort required.

***Table 1**: List of solutions that reduce short-lived climate pollutants (SLCPs) or can be implemented immediately for very little cost (in order of GHG emissions reduction potential).*

Solution	GHG emissions reduction potential	Description	Relevant Short-lived climate pollutant (SLCP) or action with immediate benefit
Reduced Food Waste	2.9 - 3.4 Gt/year	Roughly one-third of the world's food is never eaten due to post-harvest loss in LMICs and wasting food in rich countries. By reducing loss and waste, we can reduce the need for land and resources used to produce food as well as the greenhouse gases released in the process, and improve global food security.	Methane
Plant-Rich Diets	2.6 - 3.4 Gt/year	Animal agriculture is a significant source of greenhouse gas emissions. Favoring plant-based foods reduces demand, thereby reducing land clearing, fertilizer use, and greenhouse gas emissions.	Reduces land clearing, fertilizer use, and greenhouse gas emissions.
Refrigerant Management	1.9 Gt/year	Fluorinated gases, which are widely used as refrigerants, have a potent greenhouse effect. Managing leaks and disposal of these chemicals can avoid emissions in buildings and landfills.	Hydrofluorocarbon

Alternative Refrigerants	1.4 - 1.6 Gt/year	Fluorinated gas refrigerants are powerful greenhouse gases. Lower climate impact refrigerants already widely available and transitioning would fulfill commitments under the Kigali Agreement.	Hydrofluorocarbon
Clean Cooking	1 - 2.5 Gt/year	Clean cooking can reduce pollution from burning wood or coal in traditional stoves and protect human health.	Black Carbon
Methane Leak Management	0.8 - 1.1 Gt/year	Methane, a potent greenhouse gas, is emitted during the production and transportation of oil and natural gas. Managing methane emissions in this sector can reduce greenhouse gases in the atmosphere.	Methane
Improved Rice Production	0.3 - 0.5 Gt/year	Flooded rice paddies produce large quantities of methane. Improved production techniques, including alternate wetting and drying, can reduce methane emissions and sequester carbon.	Methane
Forest Protection	.18 - .29 Gt/year	In their biomass and soil, forests are powerful carbon storehouses. Protection prevents emissions from deforestation, shields stored carbon, and enables ongoing carbon sequestration.	Enables ongoing carbon sequestration
Nutrient Management	0.09 - 0.38 Gt/year	Overuse of nitrogen fertilizers—a frequent phenomenon in agriculture—results in the production of nitrous oxide, a potent greenhouse gas. More judicious use of fertilizers can curb these emissions and reduce energy-intensive fertilizer production.	Reductions in fertilizer applications, while maintaining current yields (solution also addresses Nitrous Oxide, which is not an SLCP).

Together the solutions presented in Table 1 above have the potential to massively reduce the concentration of SLCPs in the atmosphere–thereby decelerating near-term warming by almost half by 2030. This will provide additional time to decarbonize developed economies and ramp up low-carbon growth in emerging economies. As with our previous solution sets, this set of “wins within reach” have several human well-being co-benefits including improving air quality, public health, gender equality, food and water security, income for farmers, and more.

We also note with interest the numerous mentions of “nature-based solutions” and would like to offer important context as this phrase can be ambiguous, creating opportunities for

"greenwashing." While these solutions often have important benefits for the climate, environment, and human well-being, they are best used when emissions have been reduced as much as possible. There simply isn't enough land, for example, to restore or offset today's emissions while growing enough food for the increasing human population.

We recommend these essential principles to guide investors in nature-based solutions:

- Carbon accumulates much slower than emissions happen. Offsets meant for today's emissions may not store enough carbon to offset the intended emissions until 20 years in the future.
- Protecting existing habitats should be prioritized as it produces better climate outcomes than allowing degraded areas to regrow, restoring habitats, or starting plantations.
- In general, forests store more carbon than other ecosystems and must be protected–especially tropical and temperate rainforests, as well as mangroves.
- Agriculture-related nature-based solutions, such as no-till farming, are less likely to have permanent impacts on carbon reduction for sequestration. However, the many co-benefits of no-till farming are valuable components of the practice.

Monitoring, Evaluation, and Learning

Building off of the many critical points about monitoring, evaluation, and learning (MEL) noted during the Technical Dialogues, we recognize the need for greater capacity and resources for LMICs to better track progress toward their national commitments.[4] We would also like to emphasize that, given the immense urgency of climate action and these constraints on MEL, it is critical to move forward with solutions, such as those provided in Table 1 above, Annex 1, and Annex 2, that have a proven ability to reduce greenhouse gasses, are financially viable, and easily scalable. The lack of capacity for the MEL sector cannot stand in the way of climate action. For policymakers and stakeholders in LMICs, it is critical to move forward with these proven solutions while MEL resources are being developed.

Business and private sector

We are heartened by the rich discussion on involving the private sector in global climate action plans and join the wider call to action for businesses, employers, and employees.[5]

[4] In reference to GST.TD.SummaryReport.1 paragraphs 154, 191(b), 290(e), and 361.
[5] In reference to GST.TD.SummaryReport.1 paragraphs 63, 305 (i), and 309 (d).

Project Drawdown continues to emphasize that “every job is a climate job” and we urge the secretariat to join us in this framing in order to illuminate the role that the private sector and individuals play in addressing the climate crisis.

In reference to guiding question #15 and paragraphs 63, 305(i), and 309(d) in the Technical Dialogue Summary Report, we offer the Drawdown-Aligned Business Framework (see Annex 4) as a guiding document for best practices. Key elements of the Framework are categorized along eight key leverage points for businesses. They include:

- Emissions reductions
- Climate disclosures
- Stakeholder engagement and collaboration
- Climate policy and advocacy
- Products, partnerships, and procurement
- Business Model Transformation
- Investments and financing
- Long-term thinking

Additional input on the guiding questions for the Technical Assessment component of the first Global Stocktake

In addition to our contributions to guiding questions 1, 5, 9, 10, 19, and 22 detailed above, we offer further information with regard to the following guiding questions.

Guiding questions 11, 12, 15, and TD Summary Report paragraph 35

Project Drawdown appreciates the need for a clear understanding of financial channels and has mapped portions of climate finance according to sector. We would like to make this data available for the purposes of the Global Stocktake (see Figure 3 below).

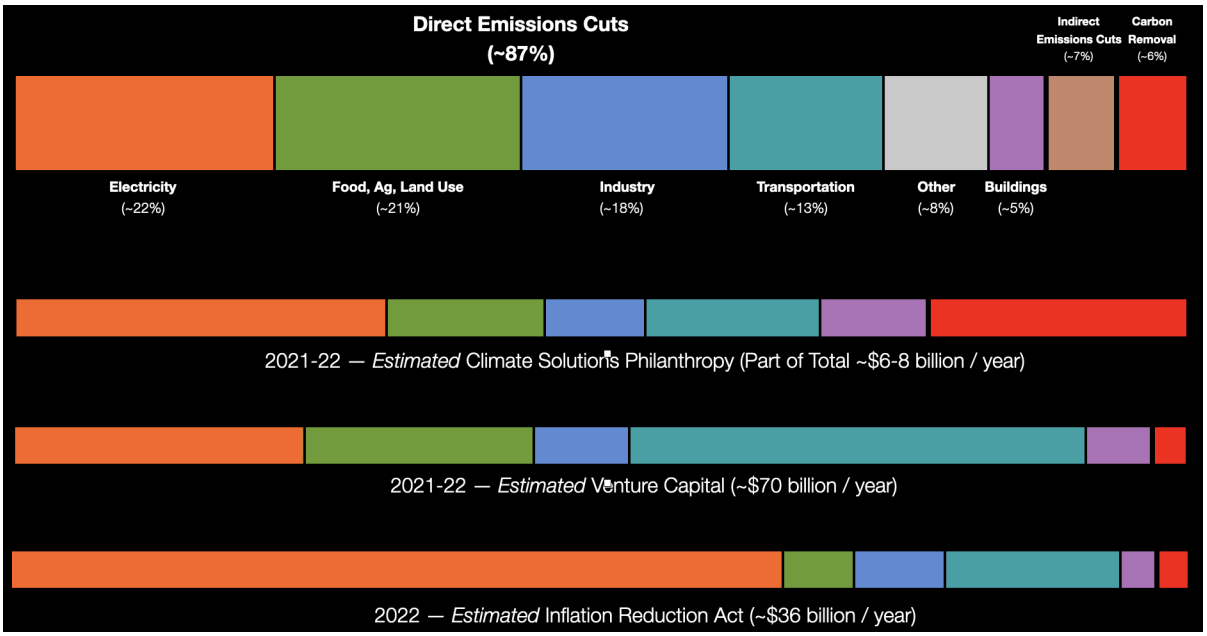


Figure 3: Climate Finance Misalignment - top bar shows GHG contributions by sector (in carbon units); bottom three bars show investment (in U.S. dollars).

Guiding question 18

PD undertook a high-level analysis of eight African countries (Congo, Ethiopia, Malawi, Niger, Rwanda, Senegal, Tanzania, and Uganda), to highlight the extent to which their Nationally Determined Contributions (NDCs) 1) recognize broader socio-economic development goals and 2) include triple-duty climate solutions that contribute to mitigation, adaptation, and human well-being (please find the full analysis in Annex 5).

In the analysis, we identified four opportunities moving forward for subsequent iterations of countries' NDCs:

- Enhance the recognition of human well-being dimensions,
- Emphasize climate solutions that boost human well-being,
- Recognize the mitigation potential of agriculture and agroforestry climate solutions,
- Prioritize renewables for climate, energy, and human well-being goals.

PROJECT DRAWDOWN

Project Drawdown is grateful to the UNFCCC secretariat for stewarding this monumental undertaking of the first Global Stocktake, and congratulates you on your skilled facilitation of the process to date.

Please find a full list of annexes below listed alongside the relevant guiding questions and Technical Dialogue Summary Report paragraphs. We remain available for any questions you may have regarding this submission.

Sincerely,

Kristen P. Patterson

Kristen P. Patterson
Director, Drawdown Lift
Project Drawdown

List of Annexes:

- Annex 1: Full list of Project Drawdown solutions (web version available here)
- Annex 2: Subset of 28 mitigation solutions with co-benefits for adaptation, poverty alleviation, and human well-being
- Annex 3: Climate-Poverty Connections Factsheet (web version in English or French available here)
- Annex 4: Drawdown-Aligned Business Framework (web version available here)
- Annex 5: Supercharging National Climate Plans: An analysis of Nationally Determined Contributions in eight African countries (web version available here)

PROJECT DRAWDOWN

Annex 1

Full list of Project Drawdown solutions (web version available here)

Solution	Total GHG emissions reduction potential from 2020 - 2050	Description
Abandoned Farmland Restoration	12.48 - 20.32 Gt	Restoration can bring degraded farmland back into productivity and sequester carbon in the process.
Alternative Cement	7.70 - 15.56 Gt	Conventional cement production is a significant source of carbon dioxide. Reformulation can reduce emissions by millions of metric tons each year.
Alternative Refrigerants	42.73 - 48.75 Gt	Fluorinated gas refrigerants are powerful greenhouse gases. Alternatives, such as ammonia or captured carbon dioxide, can replace them over time.
Bamboo Production	7.70 - 19.60 Gt	Bamboo rapidly sequesters carbon in biomass and soil and can thrive on degraded lands. Long-lived bamboo products can store carbon over time.
Bicycle Infrastructure	2.73 - 4.63 Gt	Infrastructure is essential for supporting safe and abundant bicycle use, which curbs emissions by reducing the need for fossil-fuel-dependent transportation.
Biochar Production	1.36 - 3.00 Gt	Biomass slowly baked in the absence of oxygen becomes biochar. This can be buried to sequester carbon and potentially enrich soil.
Biogas for Cooking	4.65 - 9.70 Gt	Anaerobic digesters process backyard or farmyard organic waste into biogas and digestate fertilizer. Biogas stoves can reduce emissions when replacing biomass or kerosene for cooking.
Biomass Power	2.62 - 3.59 Gt	Biomass feedstock can replace fossil fuels for generating heat and electricity. Perennial biomass offers a “bridge” to a clean, renewable energy future.
Bioplastics	1.33 - 2.48 Gt	Most plastics are made from fossil fuels, but bioplastics utilize plants as an alternative source of carbon. They often have lower emissions and sometimes biodegrade.
Building Automation Systems	9.55 - 14.01 Gt	Building automation systems can control heating, cooling, lighting, and appliances in commercial

		buildings. They cut greenhouse gas emissions by enhancing energy efficiency.
Building Retrofitting	(Not quantified, solution is an aggregate of different combinations of other solutions listed)	Retrofits can improve energy efficiency and so reduce greenhouse gas emissions with better insulation and windows, efficient lighting, and advanced heating and cooling systems.
Carpooling	9.06 - 11.07 Gt	When people share rides in passenger vehicles through ride-sharing or similar practices, they can reduce greenhouse gas emissions per traveler.
Clean Cooking	31.38 - 76.34 Gt	Clean cooking can reduce pollution from burning wood or coal in traditional stoves and protect human health.
Coastal Wetland Protection	1.20 - 1.62 Gt	Mangroves, salt marshes, and seagrasses sequester huge amounts of carbon in plants and soil. Protecting them inhibits degradation and safeguards their carbon sinks.
Coastal Wetland Restoration	0.76 - 1.00 Gt	Agriculture, development, and natural disasters have degraded many coastal wetlands. Restoring mangrove forests, salt marshes, and seagrass beds to health revives carbon sequestration.
Composting	1.13 - 1.40 Gt	Composting can range from backyard bins to industrial-scale operations. Regardless, it converts organic waste into soil carbon, averting landfill methane emissions in the process.
Concentrated Solar Power	18.00 - 21.51 Gt	Concentrated solar power uses sunlight as a heat source. Arrays of mirrors concentrate incoming rays onto a receiver to heat fluid, produce steam, and turn turbines.
Conservation Agriculture	12.81 - 8.08 Gt	Conservation agriculture uses cover crops, crop rotation, and minimal tilling to produce annual crops. It protects soil, avoids emissions, and sequesters carbon.
Distributed Energy Storage	(Not quantified, solution is an aggregate of different combinations of other solutions listed)	Standalone batteries and electric vehicles store energy. They can enable 24/7 electricity supply even when the sun isn't shining or the wind isn't blowing.
Distributed Solar Photovoltaics	26.65 - 64.86 Gt	Whether grid-connected or part of stand-alone systems, rooftop solar panels, and other distributed solar photovoltaic systems offer hyper-local, clean electricity generation.
District Heating	6.18 - 9.68 Gt	District systems reduce greenhouse gas emissions by heating multiple buildings with hot water from a central plant.
Dynamic Glass	0.34 - 0.54 Gt	By responding to sunlight and weather, dynamic glass can reduce a building's energy load for

		heating, cooling, and lighting. More effective windows lower emissions.
Efficient Aviation	5.29 - 5.82 Gt	Technologies and practices that can lower airplane emissions include better engines, wingtips, and reducing airplanes' weight.
Efficient Ocean Shipping	6.72 - 9.83 Gt	Huge volumes of goods are shipped across oceans. Fuel-saving ship design, technologies, and practices can trim greenhouse gas emissions.
Efficient Trucks	9.15 - 10.77 Gt	Fuel efficiency is critical to reducing truck emissions. Existing fleets can be retrofitted, while new trucks can be built to be more efficient or fully electric.
Electric Bicycles	1.39 - 1.55 Gt	Battery-powered motors can boost the use of bicycles, reducing greenhouse gas emissions from cars.
Electric Cars	7.66 - 9.76 Gt	Electric cars supplant those powered by gasoline or diesel. They always reduce emissions—dramatically so when powered by renewable electricity.
Electric Trains	1.91 - 3.25 Gt	Electrified tracks allow freight trains to stop burning dirty diesel. When powered by renewables, electric trains can provide nearly emissions-free transport.
Family Planning and Education	68.90 Gt	Rights-based, voluntary family planning and universal, high-quality education are essential human rights. They generate numerous direct benefits for gender equality, improved health and well-being, economic development, and more. Slower global population growth, a cascading outcome of increased family planning and rising education levels, contributes to reduced greenhouse gas emissions.
Farm Irrigation Efficiency	1.13 - 2.07 Gt	Drip and sprinkler irrigation, among other practices and technologies, make farm water use less energy/fuel intensive and conserve significant amounts of freshwater.
Forest Protection	5.55 - 8.83 Gt	In their biomass and soil, forests are powerful carbon storehouses. Protection prevents emissions from deforestation, shields stored carbon, and enables ongoing carbon sequestration.
Geothermal Power	6.15 - 9.17 Gt	Steamy hot water from underground reservoirs is the fuel for geothermal power. It can be piped to the surface to drive turbines that produce electricity without pollution.

Grassland Protection	3.35 - 4.25 Gt	Grasslands hold large stocks of carbon, largely underground. Protecting them shields this carbon and avoids emissions from conversion to agriculture or development.
Green & Cool Roofs	0.53 - 0.99 Gt	Green roofs use soil and vegetation as insulation. Cool roofs reflect sunlight. Both reduce building energy use for heating and/or cooling.
Grid Flexibility	(Not quantified, solution is an aggregate of different combinations of other solutions listed)	Smarter, more flexible electric grids can cut energy losses. They also are critical to mainstreaming renewables, which are more variable than conventional energy sources.
High-Efficiency Heat Pumps	4.04 - 9.05 Gt	Heat pumps extract heat from the air and transfer it—from indoors out for cooling, or from outdoors in for heating. With high efficiency, they can dramatically lower building energy use.
High-Performance Glass	8.82 - 11.34 Gt	High-performance glass improves window insulation and makes building heating and cooling more efficient. By minimizing unnecessary energy use, it curtails emissions.
High-Speed Rail	1.26 - 3.62 Gt	High-speed rail offers an alternative to trips made by car or airplane. It requires special, designated tracks, but can dramatically curtail emissions.
Hybrid Cars	1.61 - 4.71 Gt	A transitional technology, hybrid cars are non-plugin internal combustion engine fuel cars that run on or are supported by electric motors for at least part of the journey. The combination improves fuel economy—more miles on a gallon—and lowers emissions.
Improved Aquaculture	0.50 - 0.78 Gt	Aquaculture is one of the fastest-growing animal food sectors. Because some aquaculture systems are highly energy intensive, ensuring part of the on-site energy consumption is based on renewable resources would reduce greenhouse gas emissions.
Improved Cattle Feed	4.42 - 15.05 Gt	Optimizing cattle feeding strategies can lower the methane emissions produced within the ruminant digestive system. Nutrient-enriched diets of high-quality forages, additives, and supplements aim to improve animal health and productivity.
Improved Fisheries	1.01 - 1.54 Gt	Improved fisheries involves reforming and improving the management of wild-capture fisheries to reduce excess effort, overcapitalization, and overfishing. This can reduce fuel usage and rebuild fish populations, enhancing carbon sequestration.

Improved Manure Management	3.34 - 6.09 Gt	Livestock manure produces methane, a potent greenhouse gas. Advanced technologies and practices for managing manure can reduce the adverse climate impact of animal agriculture.
Improved Rice Production	9.85 - 14.43 Gt	Flooded rice paddies produce large quantities of methane. Improved production techniques, including alternate wetting and drying, can reduce methane emissions and sequester carbon.
Indigenous Peoples' Forest Tenure	8.69 -12.51 Gt	Secure land tenure protects Indigenous peoples' rights. With sovereignty, traditional practices can continue—in turn protecting ecosystems and carbon sinks and preventing emissions from deforestation.
Insulation	15.38 - 18.54 Gt	Insulation impedes unwanted airflow in or out of buildings. It reduces emissions by making heating and cooling more energy efficient.
Landfill Methane Capture	3.89 - (-)1.48 Gt	Landfills generate methane as organic waste decomposes. Rather than getting released as emissions, that methane can be captured and used to produce electricity.
LED Lighting	14.45 - 15.69 Gt	LEDs (light-emitting diodes) are the most energy-efficient bulbs available. Unlike older technologies, they transfer most of their energy use into light, rather than waste heat.
Low-Flow Fixtures	0.93 - 1.52 Gt	Cleaning, transporting, and heating water requires energy. More efficient fixtures and appliances can reduce home water use, thereby reducing emissions.
Macroalgae Protection and Restoration	2.61 - 3.78 Gt	Macroalgae forests are among the most productive ecosystems on Earth. Protecting and restoring these habitats could enhance carbon sequestration in the deep sea.
Managed Grazing	13.72 - 20.92 Gt	Managed grazing involves carefully controlling livestock density and timing and intensity of grazing. Compared with conventional pasture practices, it can improve the health of grassland soils, sequestering carbon.
Methane Digesters	6.02 - 7.05 Gt	Industrial-scale anaerobic digesters control decomposition of organic waste and convert methane emissions into biogas, an alternative fuel, and digestate, a nutrient-rich fertilizer.
Methane Leak Management	25.83 - 31.29 Gt	Methane, a potent greenhouse gas, is emitted during the production and transportation of oil and natural gas. Managing methane emissions in this sector can reduce greenhouse gases in the atmosphere.

Micro Wind Turbines	0.09 - 0.11 Gt	Micro wind turbines can generate clean electricity in diverse locations, from urban centers to rural areas, without access to centralized grids.
Microgrids	(Not quantified, solution is an aggregate of different combinations of other solutions listed)	A microgrid is a localized grouping of distributed electricity generation technologies paired with energy storage or backup generation and tools to manage demand.
Multistrata Agroforestry	13.26 - 23.94 Gt	Multistrata agroforestry systems mimic the structure of natural forests. Layered trees and crops achieve high rates of both carbon sequestration and food production.
Net Zero Buildings	(Not quantified, solution is an aggregate of different combinations of other solutions listed)	Buildings with zero net energy consumption employ efficiency measures and onsite renewables to produce as much energy as they use, with low or no emissions.
Nuclear Power	3.17 - 3.64 Gt	Nuclear power is slow to build, expensive, and risky, and it creates radioactive waste. However, it also can avoid emissions produced by generating electricity from fossil fuels.
Nutrient Management	2.77 - 11.48 Gt	Overuse of nitrogen fertilizers—a frequent phenomenon in agriculture—results in the production of nitrous oxide, a potent greenhouse gas. More judicious use of fertilizers can curb these emissions and reduce energy-intensive fertilizer production.
Ocean Power	1.27 - 0.80 Gt	Wave- and tidal-power systems harness natural ocean flows—among the most powerful and constant dynamics on Earth—to generate electricity.
Offshore Wind Turbines	9.89 - 10.22 Gt	Winds over sea are more consistent than those over land. Offshore wind turbines tap into that power to generate utility-scale electricity without emissions.
Onshore Wind Turbines	46.95 - 143.56 Gt	Onshore wind turbines generate electricity at a utility-scale, comparable to power plants. They replace fossil fuels with emissions-free electricity.
Peatland Protection and Rewetting	25.40 - 40.27 Gt	Peatlands hold vast amounts of carbon. Forestry, farming, fire, and fuel extraction release carbon and reduce peatlands' ability to store more. Protection and rewetting can reduce emissions while supporting peatlands' role as carbon sinks.
Perennial Biomass Production	4.00 - 7.04 Gt	Bioenergy relies on biomass—often annual crops such as corn. Perennial plants (e.g., switchgrass, silvergrass, willow, eucalyptus) are a more sustainable source and sequester modest amounts of soil carbon.

Perennial Staple Crops	16.34 - 32.87 Gt	Perennial staple crops provide important foods, such as bananas, avocados, and breadfruit. Compared to annual crops, they have similar yields but higher rates of carbon sequestration.
Plant-Rich Diets	78.33 - 103.11 Gt	Animal agriculture is a significant source of greenhouse gas emissions. Favoring plant-based foods reduces demand, thereby reducing land clearing, fertilizer use, and greenhouse gas emissions.
Public Transit	9.42 - 15.42 Gt	Streetcars, buses, and subways offer alternative, efficient modes of transport. Public transit can keep car use to a minimum and avert greenhouse gases.
Recycled Metals	4.31 - 12.34 Gt	Metals are extracted from nonrenewable ores. Recycled metals capitalize on already extracted materials—making it possible to produce goods more efficiently, reduce the need to extract new resources, and cut down on energy and water use.
Recycled Paper	2.28 - 2.90 Gt	Reprocessing used paper curtails extraction of virgin feedstock and lowers emissions.
Recycled Plastics	0.52 - 1.69 Gt	Recycling plastics requires less energy than producing new materials and relieves demand for fossil-fuel-based raw materials. It also saves landfill space and reduces environmental pollution.
Recycling	10.36 - 11.29 Gt	Producing new products from recovered materials requires fewer raw resources and less energy. That's how recycling household, commercial, and industrial waste can cut emissions.
Reduced Food Waste	88.50 - 102.20 Gt	Roughly one-third of the world's food is never eaten. By reducing loss and waste, we can reduce the need for land and resources used to produce food as well as the greenhouse gases released in the process.
Reduced Plastics	3.76 - 5.40 Gt	Plastic production has grown tremendously over the last century, mainly for short-term use. Reducing the amount of plastic used in nondurable goods can achieve significant reductions in both greenhouse gas emissions and plastic waste.
Refrigerant Management	57.15 Gt	Fluorinated gases, which are widely used as refrigerants, have a potent greenhouse effect. Managing leaks and disposal of these chemicals can avoid emissions in buildings and landfills.
Regenerative Annual Cropping	15.12 - 23.21 Gt	Building on conservation agriculture with additional practices, regenerative annual cropping can include compost application, green manure, and organic production. It reduces emissions, increases soil organic matter, and sequesters carbon.

Seafloor Protection	3.80 - 5.14 Gt	Vast amounts of carbon stored in seafloor sediments risk release by bottom-trawling fishing. Bottom-trawling bans and establishment of Marine Protected Areas can protect this important carbon sink.
Seaweed Farming	2.50 - 4.72 Gt	Seaweed farming is one of the most sustainable types of aquaculture. Expanding seaweed farming enhances carbon sequestration and boosts production of biomass that can be used for biofuel, bioplastic, livestock feed, and human consumption.
Silvopasture	26.58 - 42.31 Gt	Silvopasture integrates trees, pasture, and forage into a single system. Incorporating trees into agriculture improves land health and increases carbon sequestration.
Small Hydropower	1.65 - 3.21 Gt	Small hydropower systems capture the energy of free-flowing water without using a dam. They can replace dirty diesel generators with clean electricity generation.
Smart Thermostats	6.91 - 7.25 Gt	Thermostats regulate space heating and cooling. Smart thermostats use algorithms and sensors to boost energy efficiency and lower emissions.
Solar Hot Water	3.41 - 13.73 Gt	Solar hot water systems use the sun's radiation, rather than fuel or electricity, to heat water. By replacing conventional energy sources with a clean alternative, they reduce emissions.
Sustainable Intensification for Smallholders	0.68 - 1.36 Gt	Sustainable intensification practices such as pest management, crop diversification, and capacity building can increase per-hectare agricultural productivity for smallholders. This in theory reduces the need to clear additional land.
System of Rice Intensification	2.90 - 4.44 Gt	The System of Rice Intensification (SRI) is a holistic approach to sustainable rice cultivation. By minimizing water use and alternating wet and dry conditions, it minimizes methane production and emissions.
Telepresence	2.64 - 4.43 Gt	Telepresence uses software- or hardware-based audiovisual technology to replace business aviation.
Temperate Forest Restoration	19.42 - 27.85 Gt	Almost all temperate forests have been altered in some way—timbered, converted to agriculture, or disrupted by development. Restoring them sequesters carbon in biomass and soil.
Tree Intercropping	15.03 - 24.40 Gt	Growing trees and annual crops together increase biomass, soil organic matter, and carbon sequestration.

Tree Plantations (on Degraded Land)	22.04 - 35.09 Gt	Degraded lands present potential locations for tree plantations. Managed well, they can restore soil, sequester carbon, and produce wood resources in a more sustainable way.
Tropical Forest Restoration	54.45 - 85.14 Gt	Many tropical forests have undergone clearing, fragmentation, degradation, or depletion of biodiversity. Restoring these forests restores their ability to sequester carbon.
Utility-Scale Energy Storage	(Not quantified, solution is an aggregate of different combinations of other solutions listed)	Large-scale energy storage ensures electricity supply can match demand. It enables the shift to variable renewables and curbs emissions from polluting “peaker” plants.
Utility-scale Solar Photovoltaics	40.83 - 111.59 Gt	Solar photovoltaics can be used at utility-scale—with hundreds or thousands of panels—to replace fossil-fuel electricity generation.
Walkable Cities	2.83 - 3.51 Gt	Walkable cities use planning, design, and density to maximize walking and minimize driving. Emissions decrease as pedestrians take the place of cars.
Waste to Energy	6.27 - 5.24 Gt	Waste-to-energy processes burn waste to produce heat and/or electricity. This reduces greenhouse gas emissions but creates health and environmental risks.
Water Distribution Efficiency	0.61 - 0.86 Gt	Pumping water requires enormous amounts of electricity. Addressing leaks in water-distribution networks, especially in cities, can curb water loss, energy use, and emissions.

PROJECT DRAWDOWN

Annex 2

Subset of 28 mitigation solutions with co-benefits for adaptation, poverty alleviation, and human well-being

(Note: The hyperlink in each solution leads to the solution summary on Project Drawdown's website.)

Abandoned Farmland Restoration: Degraded farmland is often abandoned, but it need not be. Restoration can bring these lands back into productivity and sequester carbon in the process.

Biogas for Cooking: Anaerobic digesters process backyard or farmyard organic waste into biogas and digestate fertilizer. Biogas stoves can reduce emissions when replacing biomass or kerosene for cooking.

Clean Cooking: Improved clean cookstoves can address the pollution from burning wood or biomass in traditional stoves. Using various technologies, they reduce emissions and protect human health.

Coastal Wetland Protection: Mangroves, salt marshes, and seagrasses sequester huge amounts of carbon in plants and soil. Protecting them inhibits degradation and safeguards their carbon sinks.

Coastal Wetland Restoration: Agriculture, development, and natural disasters have degraded many coastal wetlands. Restoring mangrove forests, salt marshes, and seagrass beds to health revives carbon sequestration.

Conservation Agriculture: Conservation agriculture uses cover crops, crop rotation, and minimal tilling in the production of annual crops. It protects soil, avoids emissions, and sequesters carbon.

Distributed Solar Photovoltaics: Whether grid-connected or part of stand-alone systems, rooftop solar panels and other distributed solar photovoltaic systems offer hyper-local, clean electricity generation.

Farm Irrigation Efficiency: Pumping and distributing water is energy-intensive. Drip and sprinkler irrigation, among other practices and technologies, make the use of farm water more precise and efficient.

Forest Protection: In their biomass and soil, forests are powerful carbon storehouses. Protection prevents emissions from deforestation, shields that carbon, and enables ongoing carbon sequestration.

Geothermal Power: Underground reservoirs of steamy hot water are the fuel for geothermal power. The water can be piped to the surface to drive turbines that produce electricity without pollution.

Grassland Protection: Grasslands hold large stocks of carbon, largely underground. Protecting them shields their carbon stores and avoids emissions from conversion to agricultural land or development.

Family Planning and Education: Some initiatives, designed primarily to ensure rights and foster equality, also have cascading benefits to climate change. They include access to high-quality, voluntary reproductive health care and to high-quality, inclusive education, which are fundamental human rights and cornerstones of gender equality.

Improved Rice Production: Flooded rice paddies produce large quantities of methane. Improved production techniques, including alternate wetting and drying, can reduce methane emissions and sequester carbon.

Indigenous People's Forest Tenure: Secure land tenure protects Indigenous peoples' rights. With sovereignty, traditional practices can continue—in turn protecting ecosystems and carbon sinks and preventing emissions from deforestation.

Micro Wind Turbines: Micro wind turbines can generate clean electricity in diverse locations, from urban centers to rural areas, without access to centralized grids.

Microgrids: A microgrid is a localized grouping of distributed electricity generation technologies, paired with energy storage or backup generation and tools to manage demand or "load."

Multistrata Agroforestry: Multistrata agroforestry systems mimic natural forests in structure. Multiple layers of trees and crops achieve high rates of both carbon sequestration and food production.

Nutrient Management: Overuse of nitrogen fertilizers—a frequent phenomenon in agriculture—creates nitrous oxide. More efficient use can curb these emissions and reduce energy-intensive fertilizer production.

Peatland Protection & Rewetting: Forestry, farming, and fuel extraction are among the threats to carbon-rich peatlands. Protection and rewetting can reduce emissions from degradation while supporting peatlands' role as carbon sinks.

Reduced Food Waste: Roughly one-third of the world's food is never eaten, which means the land and resources used and GHGs emitted in producing it were unnecessary. Interventions can reduce loss and waste as food moves from farm to fork, thereby reducing overall demand.

Regenerative Annual Cropping: Building on conservation agriculture with additional practices, regenerative annual cropping can include compost application, green manure, and organic production. It reduces emissions, increases soil organic matter, and sequesters carbon.

Silvopasture: An agroforestry practice, silvopasture integrates trees, pasture, and forage into a single system. Incorporating trees improves land health and significantly increases carbon sequestration.

Small Hydropower: Small hydropower systems capture the energy of free-flowing water without using dams. They can replace dirty diesel generators with clean electricity generation.

Sustainable Intensification for Smallholders: Sustainable intensification practices can increase smallholder yields which, in theory, reduce demand to clear additional land. Practices include intercropping, ecosystem-based pest management, and equal resources for women.

System of Rice Intensification: This is a holistic approach to sustainable rice cultivation. By minimizing water use and alternating wet and dry conditions, it minimizes methane production and emissions.

Temperate Forest Restoration: Almost all temperate forests have been altered in some way—timbered, converted to agriculture, or disrupted by development. Restoring them sequesters carbon in biomass and soil.

Tree Intercropping: Growing trees and annual crops together is a form of agroforestry. Tree intercropping practices vary, but all increase biomass, soil organic matter, and carbon sequestration.

Tropical Forest Restoration: Tropical forests have suffered extensive clearing, fragmentation, degradation, and depletion of biodiversity. Restoring these forests also restores their function as carbon sinks.

PROJECT DRAWDOWN

Annex 3

Climate-Poverty Connections Factsheet (web version available here)

CLIMATE–POVERTY CONNECTIONS:

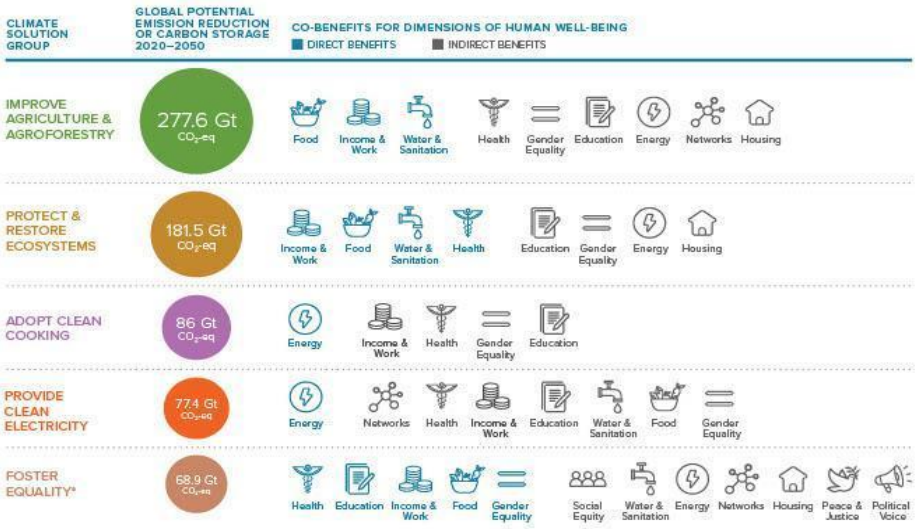
OPPORTUNITIES FOR SYNERGISTIC SOLUTIONS AT THE INTERSECTION OF PLANETARY AND HUMAN WELL-BEING

MARCH 2022

Approaches to address climate change and improve the well-being of people experiencing extreme poverty can and must be complementary. A new report provides decision-makers with concrete evidence of how climate solutions also contribute to meeting development and human well-being (HWB) needs while boosting prosperity for rural communities in sub-Saharan Africa (SSA) and South Asia.

Every day it becomes more clear that regions of the world experiencing widespread poverty and food insecurity are also the most vulnerable to climate change. Urgent and timely interventions and policies that address inequalities related to gender, Indigenous communities, and access to resources can significantly reduce vulnerabilities and climate risks.

Climate–Poverty Connections: Opportunities for Synergistic Solutions at the Intersection of Planetary and Human Well-Being, a landmark report from the Drawdown Lift program at Project Drawdown, reveals many ways that proven, readily available, and financially viable climate solutions that mitigate greenhouse gas emissions also contribute to increasing income, generating jobs, improving food security, and fostering gender equality and overall well-being in rural communities in low- and middle- income countries (LMICs).



Project Drawdown's climate solutions offer substantial co-benefits for human well-being dimensions included in the Drawdown Lift Human Well-Being Index, from **Income and Work** (greatest) to **Political Voice** (least). (Gt CO_2-eq is gigatons of carbon dioxide equivalent.) *Note: Family planning and education are not in themselves climate mitigation strategies. Rather, it is the outcome of ***Fostering Equality***, slower population growth, that is a climate solution.

PROJECT DRAWDOWN

Annex 4

Drawdown-Aligned Business Framework (web version available here)

PROJECT DRAWDOWN

Annex 5

Project Drawdown's high-level analysis of National Determined Contributions in eight African Countries: Congo, Ethiopia, Malawi, Niger, Rwanda, Senegal, Tanzania, and Uganda (for fully interactive data sets, please see original web page here)

November 3, 2022

Supercharging National Climate Plans

An analysis of Nationally Determined Contributions in eight African countries

by Drawdown Lift

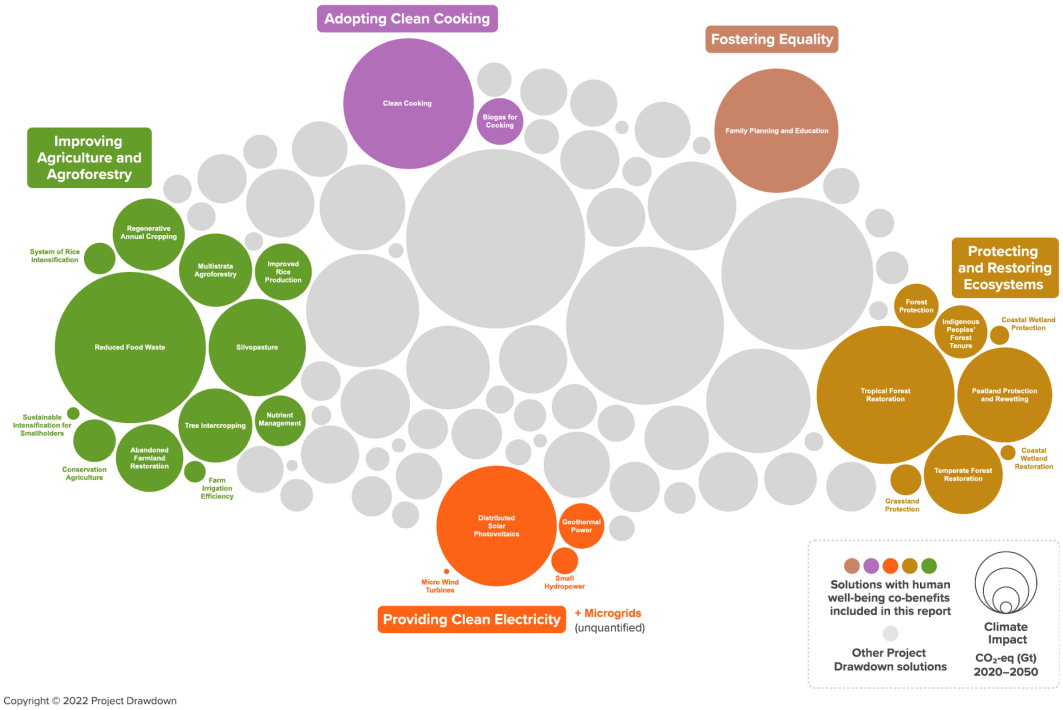
Joerg Boethling | Alamy Stock Photo

PROJECT DRAWDOWN

Climate solutions and efforts to improve the well-being of people experiencing extreme poverty can—and must—be complementary. How can African countries use their Nationally Determined Contributions(link is external) (NDCs) to chart a path forward that not only achieves low-carbon development and builds climate change resilience but also helps lift people out of extreme poverty?

Project Drawdown's landmark 2022 Climate-Poverty Connections report provides compelling evidence that 28 climate solutions (Figure 1) can simultaneously generate substantial human well-being benefits (Figure 2) for rural communities in sub-Saharan Africa and South Asia; 26 of these 28 solutions are applicable for the countries in this analysis.

Figure 1 — Shown in the colored circles are 28 climate mitigation solutions with enormous human well-being co-benefits for rural communities in low-and middle-income countries (the gray circles are Project Drawdown solutions that do not generate significant human well-being benefits for under-resourced rural communities).



Country-led prioritization of these climate solutions could be transformational in achieving national-level Paris Agreement(link is external) commitments as well as the 2030 Sustainable

Development Goals(link is external) (SDGs)—especially for goals related to income and work, food, health, education, gender equality, and energy.

Figure 2 — The 12 socioeconomic dimensions of the Donut Economics framework served as a model for the human well-being dimensions used in Drawdown Lift's Climate-Poverty Connections report, which align with the 2030 Sustainable Development Goals.

Our approach

Drawdown Lift did a high-level analysis of the recently updated NDCs (link is external) of eight African countries (Congo, Ethiopia, Malawi, Niger, Rwanda, Senegal, Tanzania, and Uganda) that are highly vulnerable to climate change (Figure 3) to understand the extent to which their national climate plans 1) recognize broader socio-economic development goals *and* 2) include climate solutions that contribute to mitigation, adaptation, and human well-being.

First, we explored whether the NDCs acknowledge that climate actions can contribute to poverty alleviation and improve the well-being of rural communities. To identify the extent of countries' inclusion of development objectives in their NDCs, we looked for keywords focusing on *poverty, vulnerability, rural livelihoods, rural communities,* and *well-being*.

Next, we examined whether climate solutions with clear human well-being benefits were included in the NDCs (refer to Figure 1). In order to compare similar solutions mentioned in the NDCs, we reassigned a consistent name to such solutions. For example, strategies such as 'improving charcoal production,' 'improving cooking efficiency,' and 'improved cookstoves' were all considered as *Clean Cooking*—the relevant Project Drawdown solution. Meanwhile, within a given NDC, we combined similar solutions. For example, both 'forest protection and health enhancement' and 'reforestation and restoration' in Ethiopia's NDC were considered *Forest Protection*.

We then identified opportunities to add or refine climate actions—drawing from solutions that were included in the Climate-Poverty Connections report but that were largely omitted from the NDCs—in future NDC iterations that would both contribute to climate goals (for mitigation and adaptation) and meet development objectives.

Figure 3 — The eight countries included in Project Drawdown's pilot analysis have recently updated their NDCs and also experience high climate vulnerability, while representing different socioeconomic, geographic, and ecological regions in Africa. Data sources include the World Bank (population(link is external), rural population(link is external), extreme poverty(link is external), and rural access to electricity(link is external)) and ND-GAIN (climate vulnerability(link is external)).

[Figure 3 available online here]

Opportunity #1: Enhance the recognition of human well-being dimensions in NDC climate strategies

The good news? Climate strategies outlined in the eight NDCs broadly align with boosting high-level human well-being. All countries' NDCs acknowledge poverty as a major issue, and most of the NDCs explicitly emphasize the need for climate strategies to contribute to improving human well-being (Figure 4). For example, Congo's NDC states that "measures taken to address climate change should be closely coordinated with social and economic development in order to avoid adverse impacts," while Rwanda's NDC states that "climate solutions should also address key issues such as poverty."

Further, all countries' NDCs acknowledge the importance of gender mainstreaming, following the general trend of improvement(link is external) from original NDCs, which largely omitted gender considerations. Of particular note, Uganda's NDC also highlights the importance of climate education as a tool for improving climate resilience—a consideration that is unfortunately still lacking in most NDCs globally.(link is external)

Figure 4 — Alignment between climate and human well-being strategies for the eight countries included in Drawdown Lift's analysis.

[Figure 4 available online here]

Although gender inclusion, rural populations' well-being, and poverty alleviation were common features of the NDCs, only three countries (Congo, Malawi, and Rwanda; see Figure

4) explicitly called out *how* the climate solutions included in the NDCs can benefit one or more of the 12 dimensions of human well-being (Figure 2). For example, Congo's NDC noted that *Forest Protection* and *Tropical Forest Restoration* climate solutions also benefit several SDGs, such as SDG 1 (poverty), SDG 2 (food), SDG 5 (gender), and SDG 8 (work). However, in some cases the NDCs that listed specific well-being co-benefits of climate strategies could have been more comprehensive in enumerating the co-benefits. For example, while Rwanda included food, income and work, and energy well-being co-benefits for its 'solar pumps' climate strategy (referred to as *Farm Irrigation Efficiency* in Project Drawdown's report), the country could have also recognized that solar pumps can improve access to clean water.

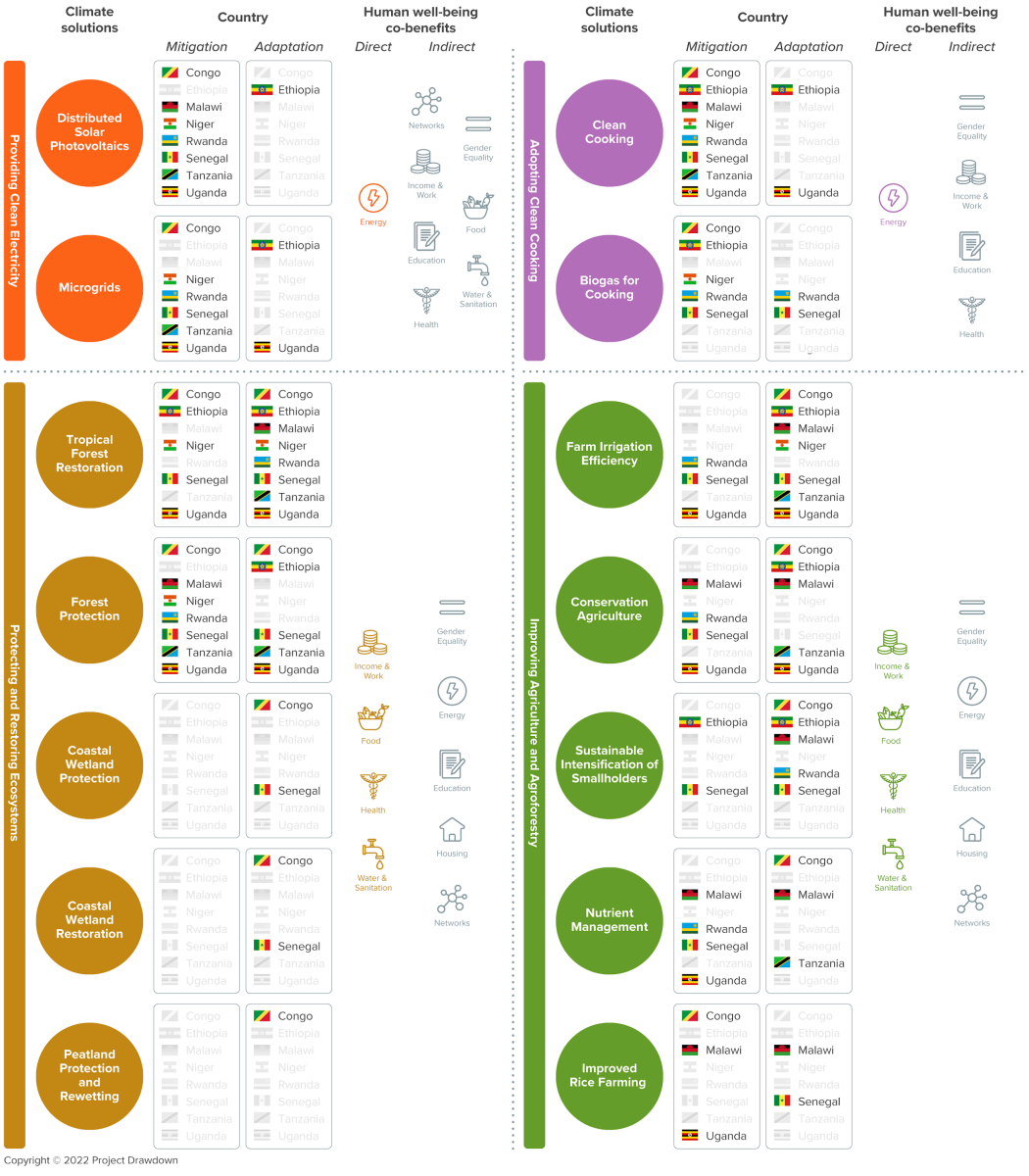
Opportunity #2: Emphasize climate solutions that boost human well-being

Clean Cooking, *Biogas for Cooking*, *Distributed Solar Photovoltaics*, *Sustainable Intensification for Smallholders*, *Microgrids*, *Forest Protection*, and *Tropical Forest Restoration* were the most frequently cited climate strategies that also contribute to the human well-being of rural populations in the eight NDCs (Figure 5). Other frequently included climate strategies with clear human well-being benefits were *Farm Irrigation Efficiency*, *Conservation Agriculture*, *Nutrient Management*, and *Improved Rice Production*.

In addition, Congo and Senegal—two out of the three coastal countries in the analysis—included powerful solutions like *Coastal Wetland Protection* and mangrove-focused *Coastal Wetland Restoration* in their NDCs. Meanwhile, *Peatland Protection and Rewetting* is applicable only to Congo, which included that solution as part of *Forest Protection*.

Generally speaking, we found that the inclusion of 14 of the climate solutions identified in the Climate-Poverty Connections report in the majority of the NDCs analyzed indicates significant potential for the national climate plans—if funded and implemented—to contribute to advancing human well-being.

Figure 5 — The eight NDCs examined in this analysis frequently included 14 climate solutions with substantial human well-being co-benefits (or that were specifically relevant for a given country). The countries that included such solutions are highlighted in black, and the solutions mentioned here were included either as part of mitigation strategies, adaptation strategies, or—for some countries—as both mitigation and adaptation strategies.



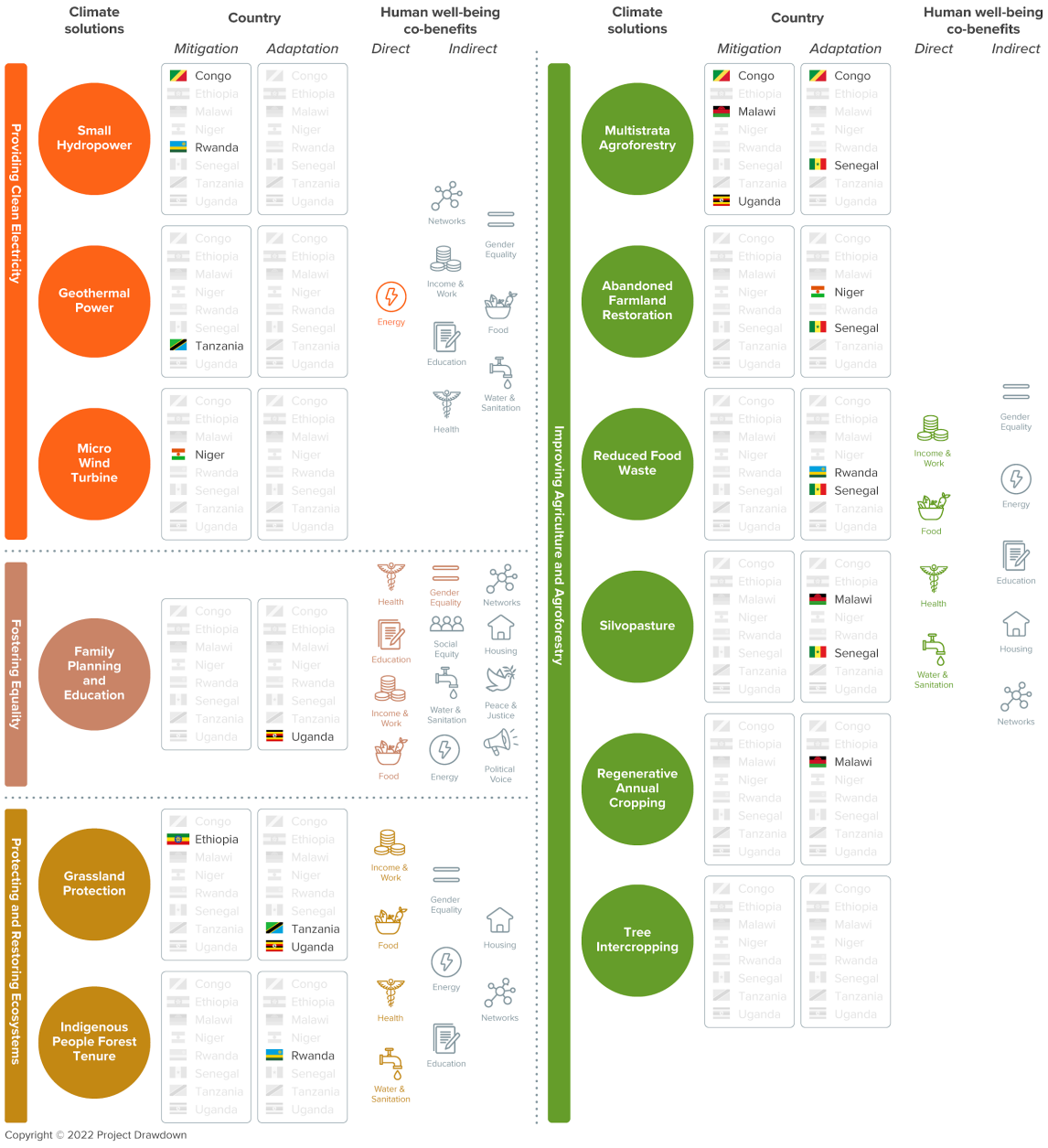
However, several of the impactful climate solutions identified in the Climate-Poverty Connections report that feature well-documented co-benefits for income and work, food security, water and sanitation, and health that are relevant to these eight countries—such as *Small Hydropower*, *Micro Wind Turbines*, *Geothermal Power*, *Indigenous Peoples' Forest Tenure*, *Grassland Protection*, *Reduced Food Waste*, *Abandoned Farmland Restoration*, *Multistrata Agroforestry*, *Silvopasture*, *Regenerative Annual Cropping*, *Tree Intercropping*,

and *Family Planning and Education*—were featured sparingly in the NDCs (see Figure 6; two of the 28 solutions, *Temperate Forest Restoration* and *System of Rice Intensification*, are not applicable in the eight countries). Featuring more of these double-duty climate solutions in the NDCs would result in stronger synergies for simultaneously meeting both climate and development goals in the eight countries.

In terms of greenhouse gas (GHG) emissions reduction and potential well-being benefits, the biggest available opportunity is for the countries to add *Reduced Food Waste* (which includes post-harvest food loss) (Figure 6) to their NDCs. Food waste accounts for 8-10 percent of global annual GHG emissions. In Africa, unintentional post-harvest food loss due to inadequate storage and poor food distribution networks stands at 14 percent(link is external). Including *Reduced Food Waste* as a climate strategy will not only help reduce emissions but will also contribute to strengthening food security (and improving health) in the eight countries.

Family Planning and Education generates substantial human well-being benefits for health, education, income and work, food, and gender equality for individuals and families. In addition, one long-term outcome of rights-based voluntary family planning and education—slower population growth—translates to lower emissions over time at a global level (Figure 6).

Figure 6 — The eight NDCs examined in Project Drawdown's analysis frequently omitted 12 climate solutions with notable human well-being co-benefits. The countries that included these solutions are highlighted in black. These solutions were included either as part of mitigation strategies, adaptation strategies, or—for some countries—as both mitigation and adaptation strategies.



Opportunity #3: Recognize the mitigation potential of agriculture and agroforestry climate solutions

Agriculture, Forestry, and Other Land Use (AFOLU) climate actions were primarily included as adaptation strategies in the eight NDCs (Figure 5). Yet several of these currently available solutions such as *Nutrient Management*, *Farm Irrigation Efficiency*, *Silvopasture*, and *Coastal Wetland Protection* are also powerful mitigation solutions. As such, including them as mitigation-adaptation dual solutions can be advantageous to meet Paris Agreement goals. Climate solutions focused on either improving agriculture and agroforestry or protecting and restoring ecosystems contribute directly to boosting food, income and work, and water and sanitation, while also contributing indirectly to improving human well-being dimensions around health, gender equality, education, energy, networks, and housing.

Although Africa contributes a scant three percent to global emissions, AFOLU is a large contributor(link is external) to GHG emissions from the continent. Acknowledging the mitigation potential of AFOLU solutions could make achieving the Paris Agreement goals more manageable and cost-effective in comparison to expensive and futuristic solutions.

Opportunity #4: Prioritize renewables for climate, energy, and human well-being goals

All of the eight NDCs include renewable energy solutions such as *Distributed Solar Photovoltaics* and *Microgrids* (Figure 5), highlighting deliberate efforts to use climate actions to address the widespread energy poverty in these countries. However, additional climate solutions such as *Geothermal Power*, *Small Hydropower*, *and Micro Wind Turbines* (Figure 6) were largely omitted from the NDCs. While Ethiopia, Malawi, Rwanda, Tanzania, and Uganda all have high geothermal potential, only Tanzania included *Geothermal Power* as a potential climate solution in its NDC.

Decentralized renewable energy solutions have reached parity with(link is external)—or are even cheaper than—large-grid electricity. Addressing multidimensional energy poverty by serving rural communities through a wide variety of renewably-powered decentralized micro-grids or off-grid electricity would be impactful from both a climate and human well-being perspective.

The path forward: Opportunities to increase synergies between climate actions and development goals in NDCs

Our pilot analysis reveals several opportunities in the NDCs examined here to enhance synergies between climate and development goals. As countries revise their NDCs in the

years ahead (and tap into available resources from the NDC Partnership(link is external) and others to advance their NDCs(link is external)), they can further highlight well-being benefits as part of their climate actions; intentionally incorporate the powerful suite of double-duty solutions identified in the Climate-Poverty Connections report; recognize AFOLU solutions as dual mitigation and adaptation solutions; prioritize essential human rights; and diversify renewable energy solutions in rural areas. These actions could better support rural communities in African countries that are most vulnerable to climate change and advance much-needed socioeconomic development and climate adaptation priorities while also charting low-carbon pathways to development.