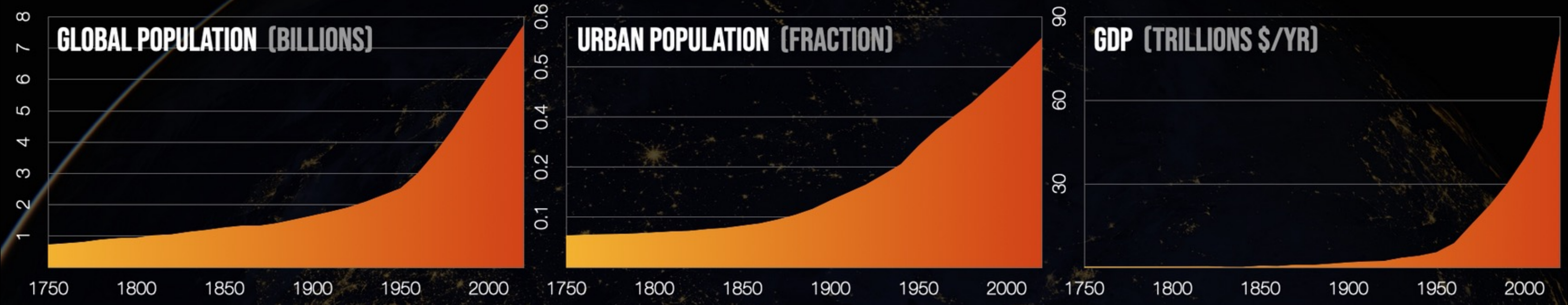
ACHIEVING DRAWDOWN

Solutions to reverse global warming

João Pedro Gouveia, PhD, jplg@fct.unl.pt — @joaopgouveia

Senior Researcher CENSE, Invited Professor NOVA School of Science and Technology, NOVA University of Lisbon

Drawdown Europe Research Association (DERA)



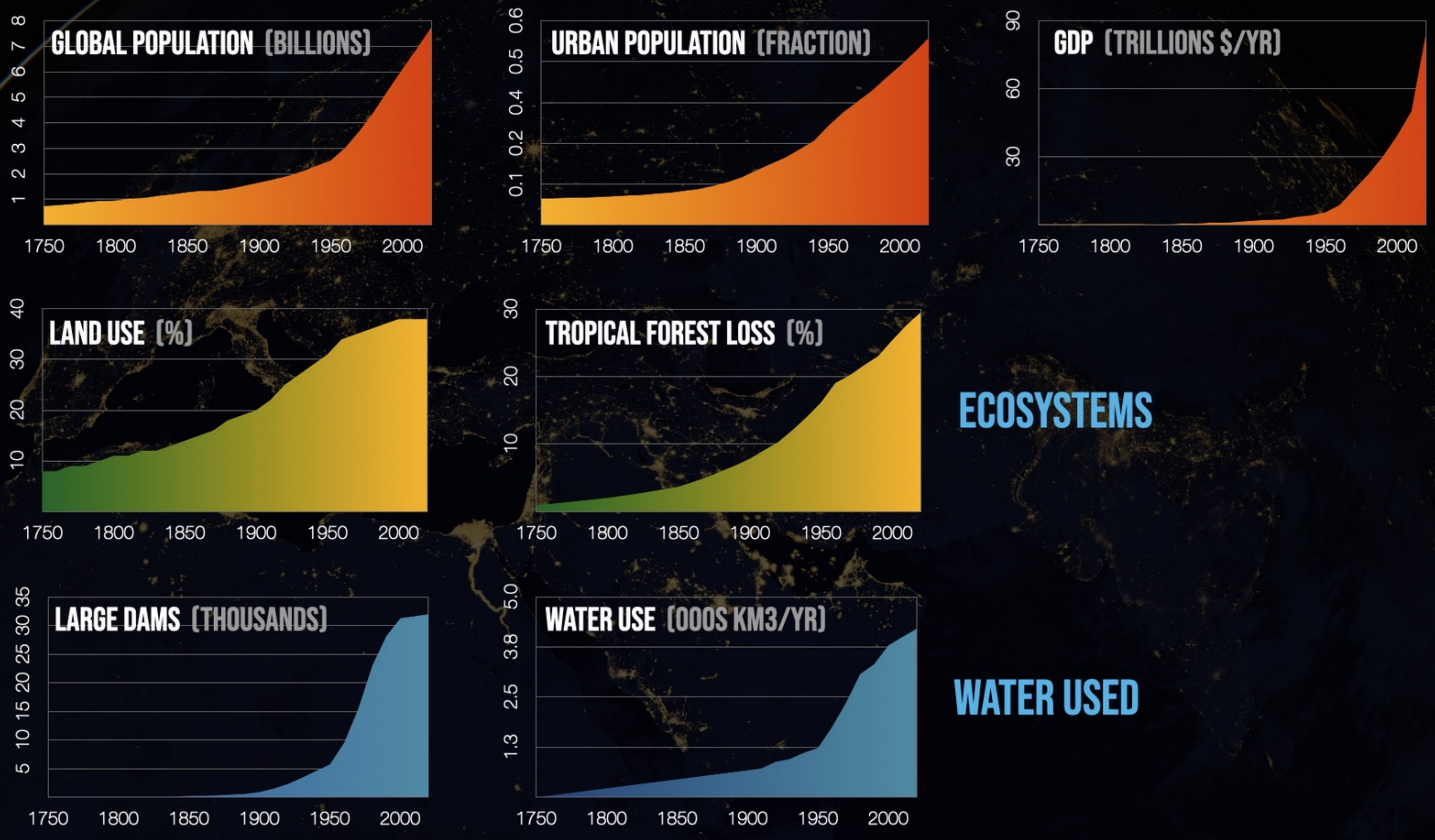
DURING THE LAST 50 YEARS

MORE CHANGES IN THE LAST 50 YEARS THAN THE ENTIRE SUM OF HUMAN HISTORY

PROJECT DRAWDOWN

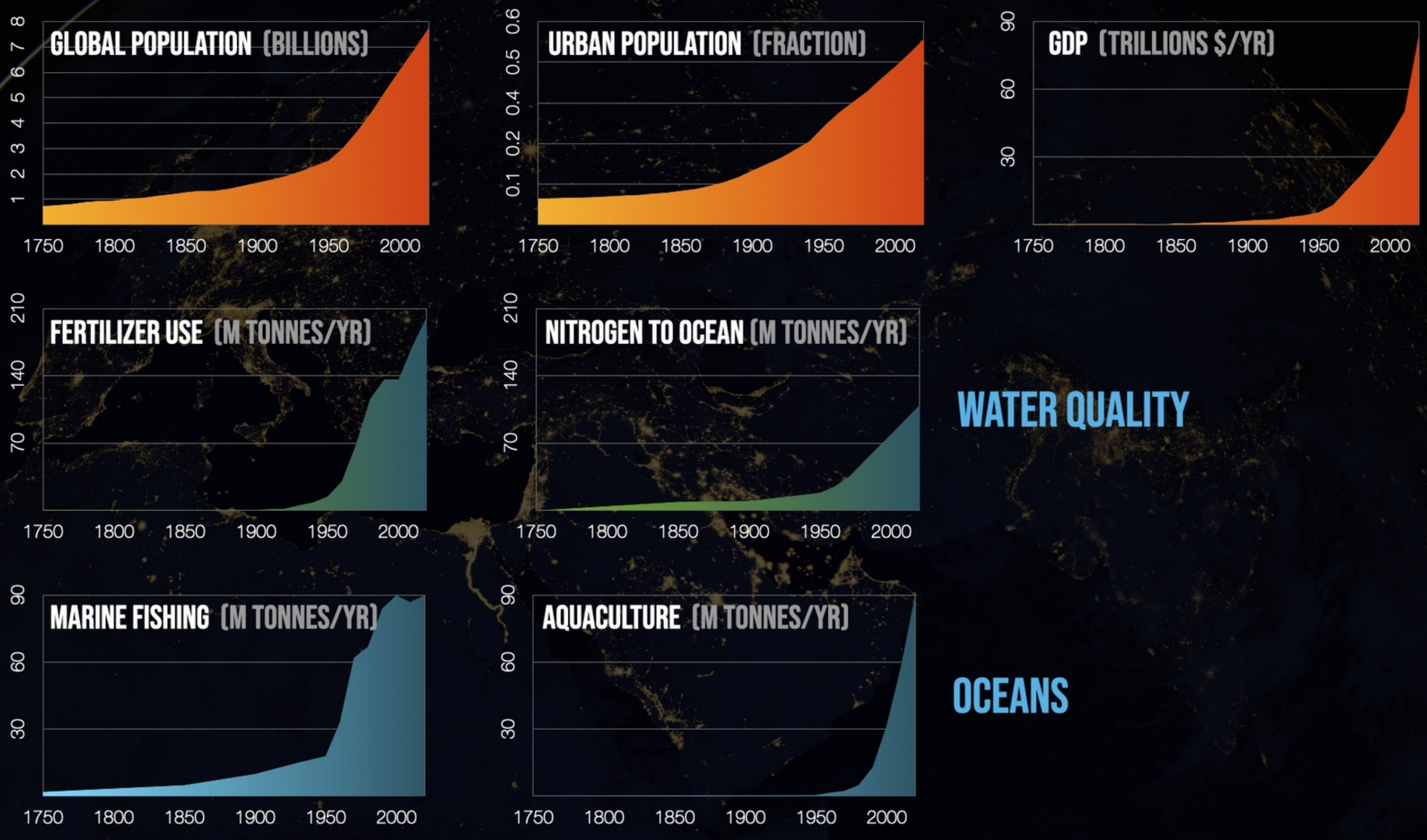
Image: NASA/NOAA

Source: IGBP “Great Acceleration” Report



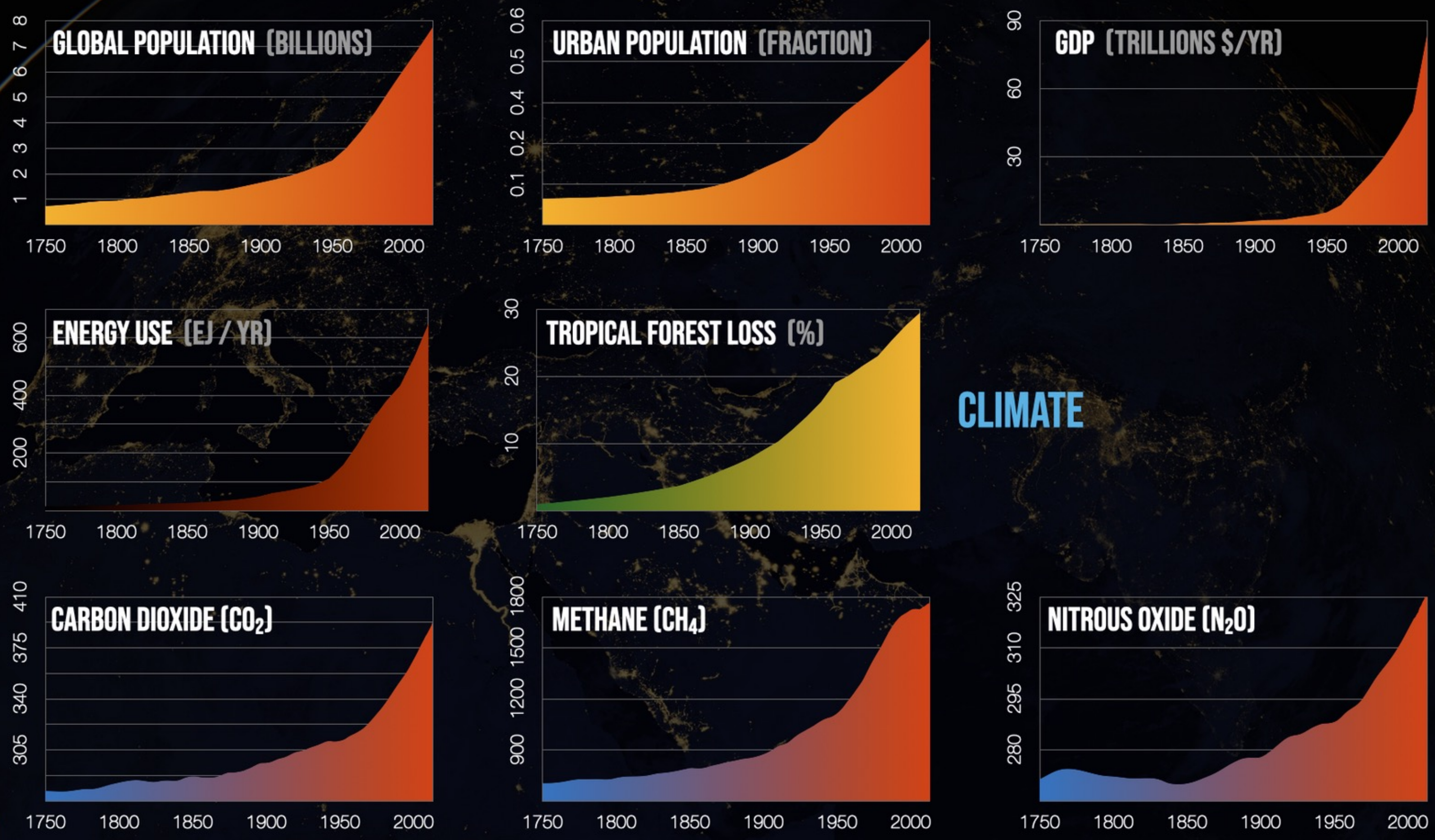
PROJECT DRAWDOWN

Source: IGBP "Great Acceleration" Report



PROJECT DRAWDOWN

Source: FAO & IGBP “Great Acceleration” Report



PROJECT DRAWDOWN

Source: IGBP "Great Acceleration" Report

DISRUPTING ENTIRE PLANET

IMAGE: NASA

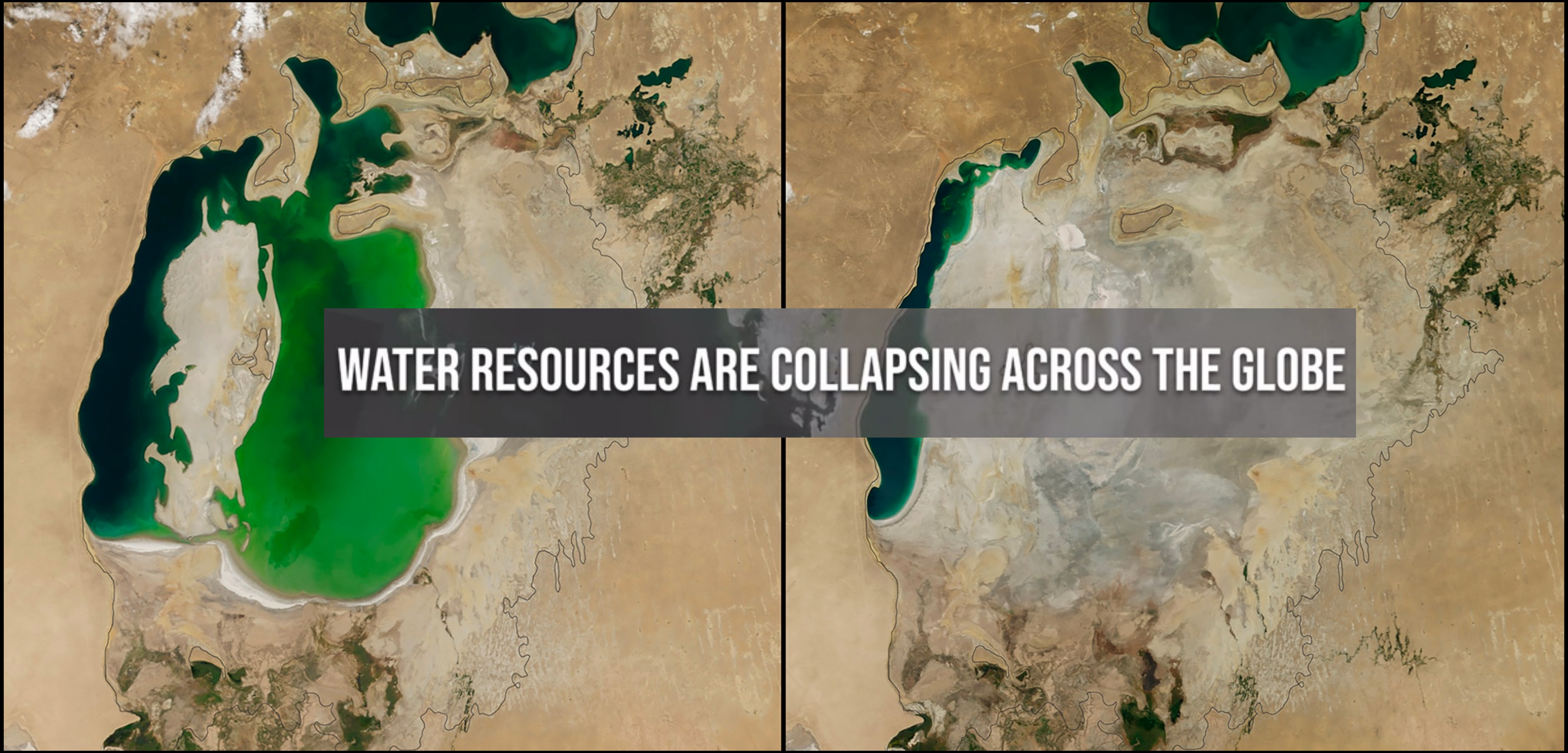
HARM THE MOST VULNERABLE

BURDEN FUTURE GENERATIONS

Baban Rafi deforestation, Niger

January 12, 1976 - February 2, 2007

IMAGES of CHANGE

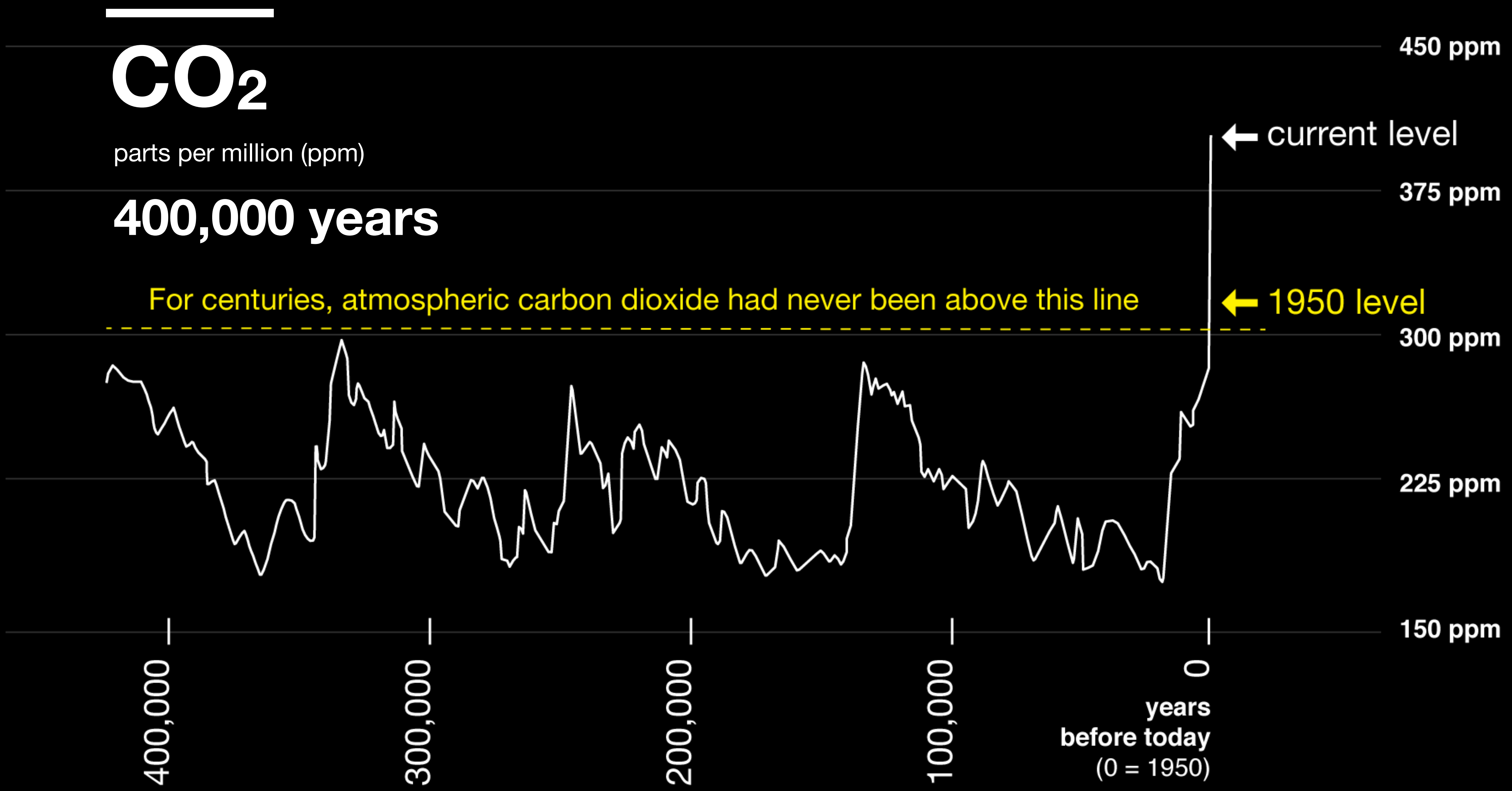


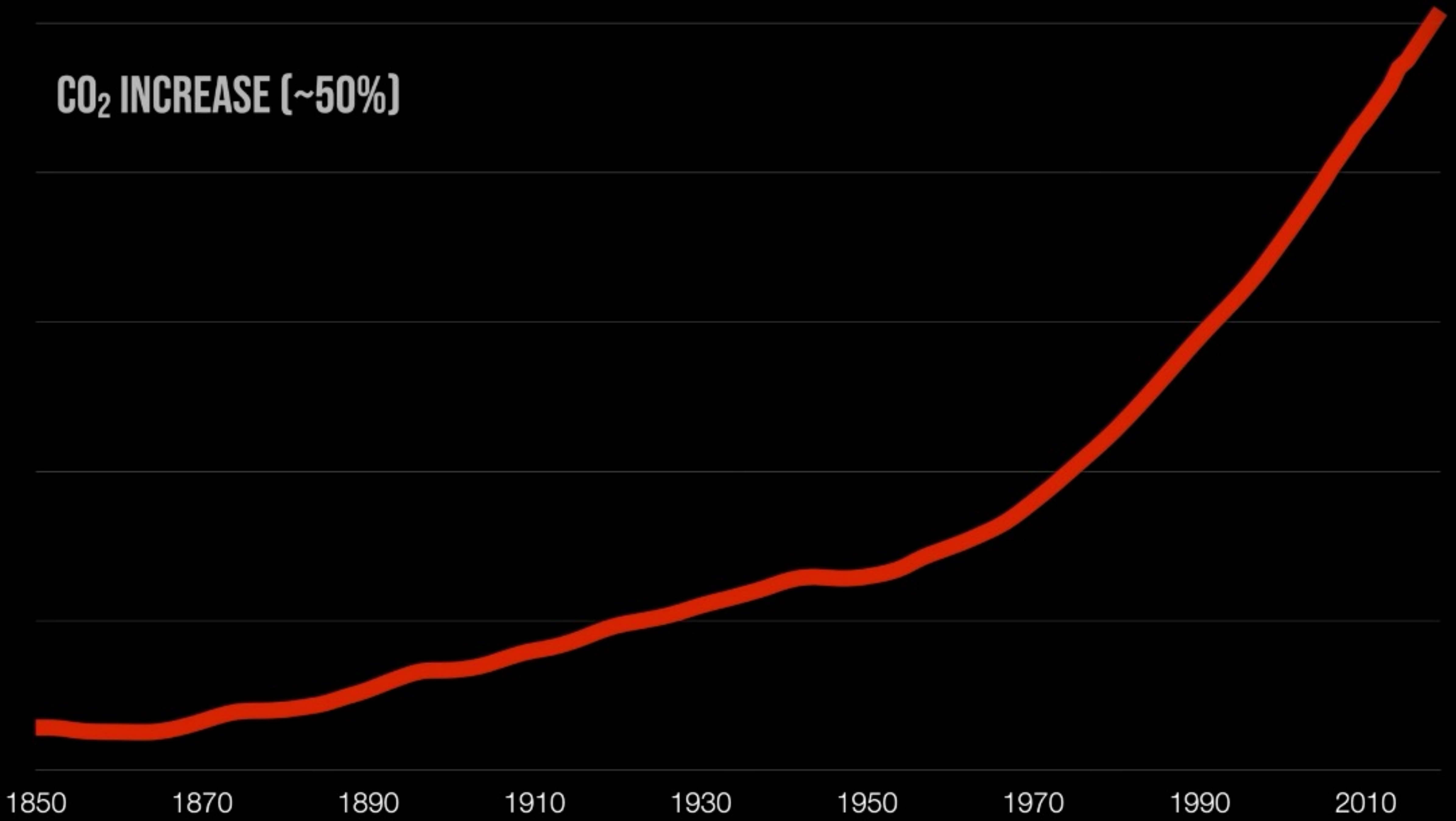
Shrinking Aral Sea, central Asia

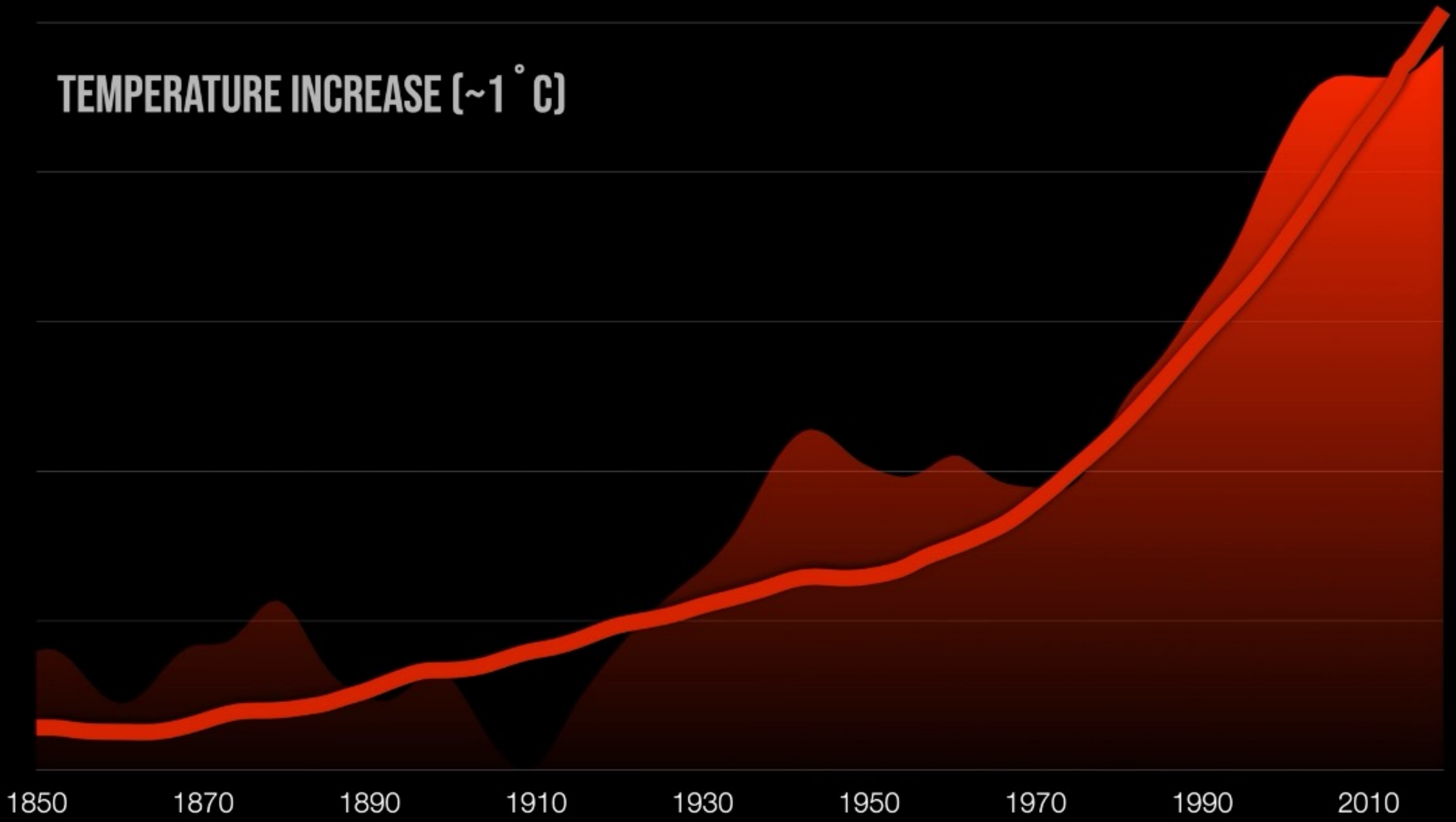
August 25, 2000 - August 19, 2014

IMAGES of CHANGE


CHANGING EARTH'S CLIMATE


CO_2
parts per million (ppm)
400,000 years
For centuries, atmospheric carbon dioxide had never been above this line
current level
1950 level
450 ppm
375 ppm
300 ppm
225 ppm
150 ppm
400,000
300,000
200,000
100,000
0
years
before today
(0 = 1950)


CO_2 INCREASE (~50%)
1850
1870
1890
1910
1930
1950
1970
1990
2010


TEMPERATURE INCREASE (~1˚C)
1850
1870
1890
1910
1930
1950
1970
1990
2010

How do we get the news about global warming?

Global warming could wipe out millions in world's major cities with catastrophic 'THREE METRE sea level rise'

18:44, 18 MAY 2016 | **UPDATED** 19:22, 18 MAY 2016 | **BY** JESSICA HAWORTH , STEPHEN BEECH

London, New York and Hong Kong are among the cities which could be underwater if global warming continues

★ Recommended In UK News

DANGEROUS DOGS

Blyth dog attack: 'Hero' schoolgirl saves seven-year-old from being mauled to death by crazed Staffie

INQUESTS

Wife 'smashed husband's head with frog ornament and kept him mummified in layers of sheeting for 18 years'

INCREDIBLE ESCAPES

Dashcam captures shocking moment huge bridge collapses and falls 60ft next to busy motorway

ISIS

ISIS murder 25 'spies' by tying them together and

ENERGY

THE DAILY CALLER
NEWS FOUNDATION

Noah's ark during a rain and lightning storm. (Credit: Amanda Carden/Shutterstock)

'Potential Apocalypse': NYT Warns Of Global Warming Floods Of Biblical Proportions

MICHAEL BASTASCH

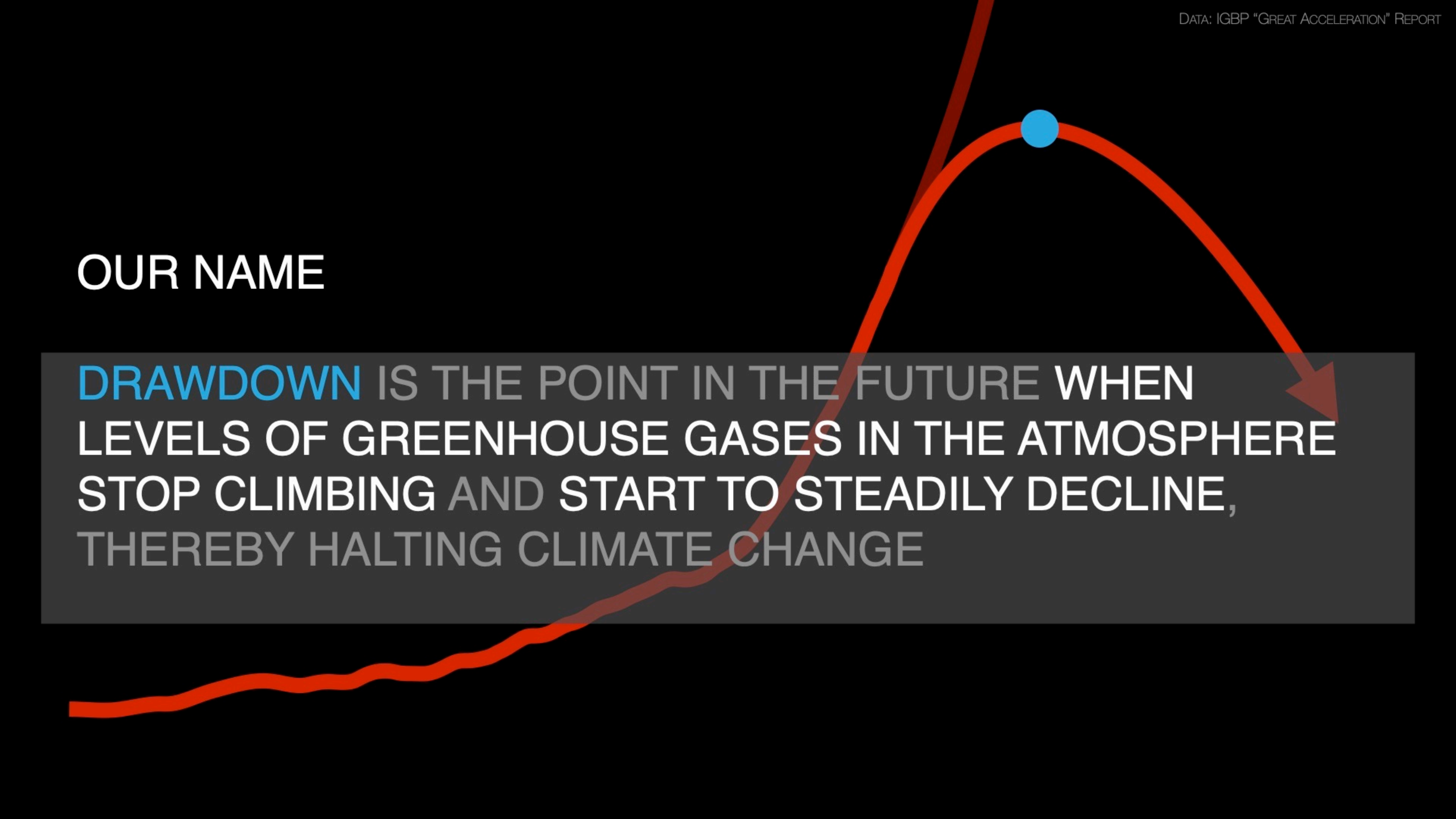
7:08 PM 05/20/2017

The New York Times has taken warnings about global warming to a whole new level, publishing a three-part series suggesting a "potential apocalypse" from melting ice sheets if humans keep pumping carbon dioxide into the atmosphere.

"If that ice sheet were to disintegrate, it could raise the level of the sea by more than 160 feet — a potential apocalypse, depending on exactly how fast it happened," NYT reporter Justin Gillis wrote of what some scientists predict could happen to Antarctica.

PROJECT DRAWDOWN

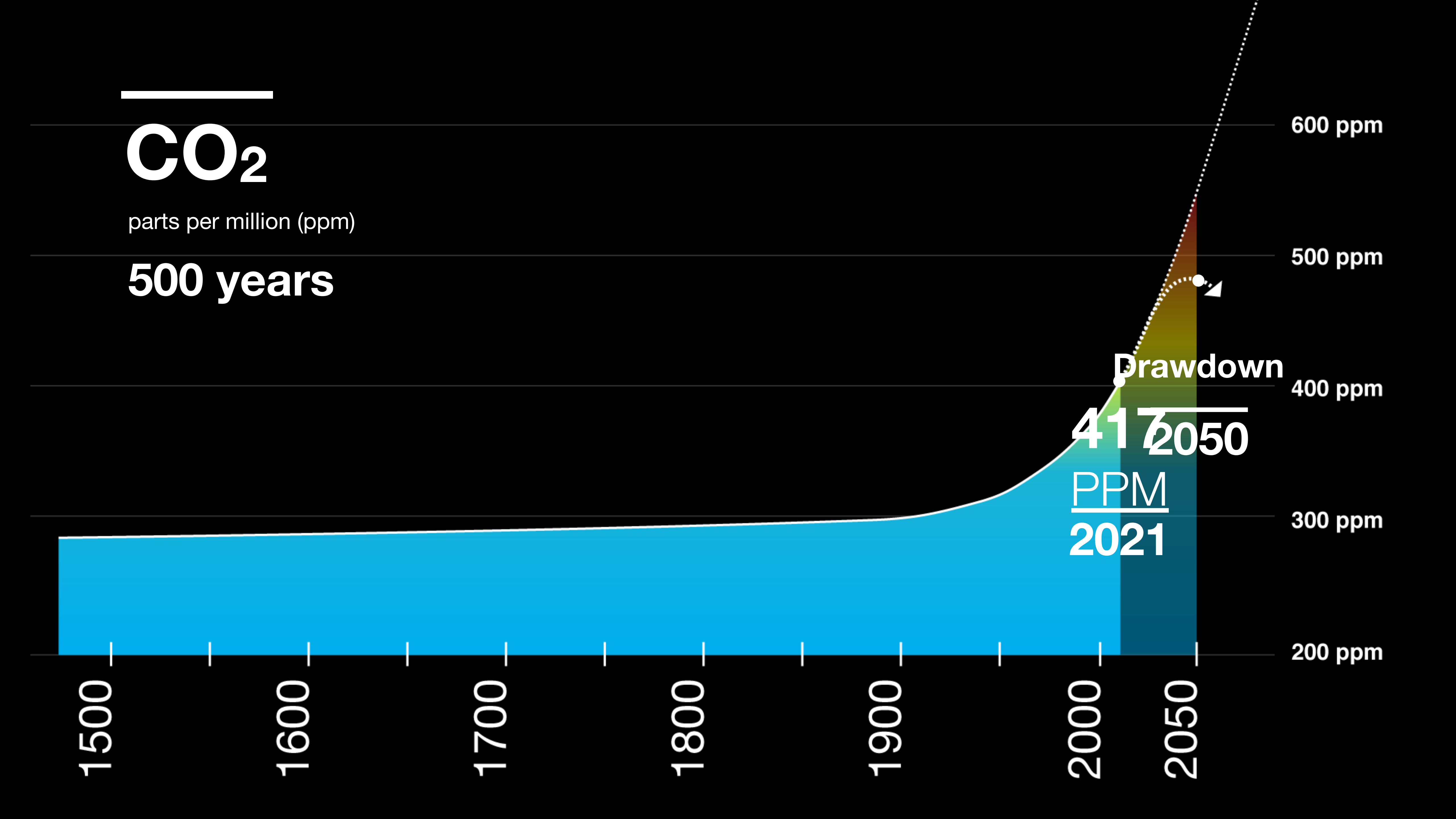
The World's Leading Resource for Climate Solutions


DATA: IGBP "GREAT ACCELERATION" REPORT
OUR NAME
DRAWDOWN IS THE POINT IN THE FUTURE WHEN LEVELS OF GREENHOUSE GASES IN THE ATMOSPHERE STOP CLIMBING AND START TO STEADILY DECLINE, THEREBY HALTING CLIMATE CHANGE

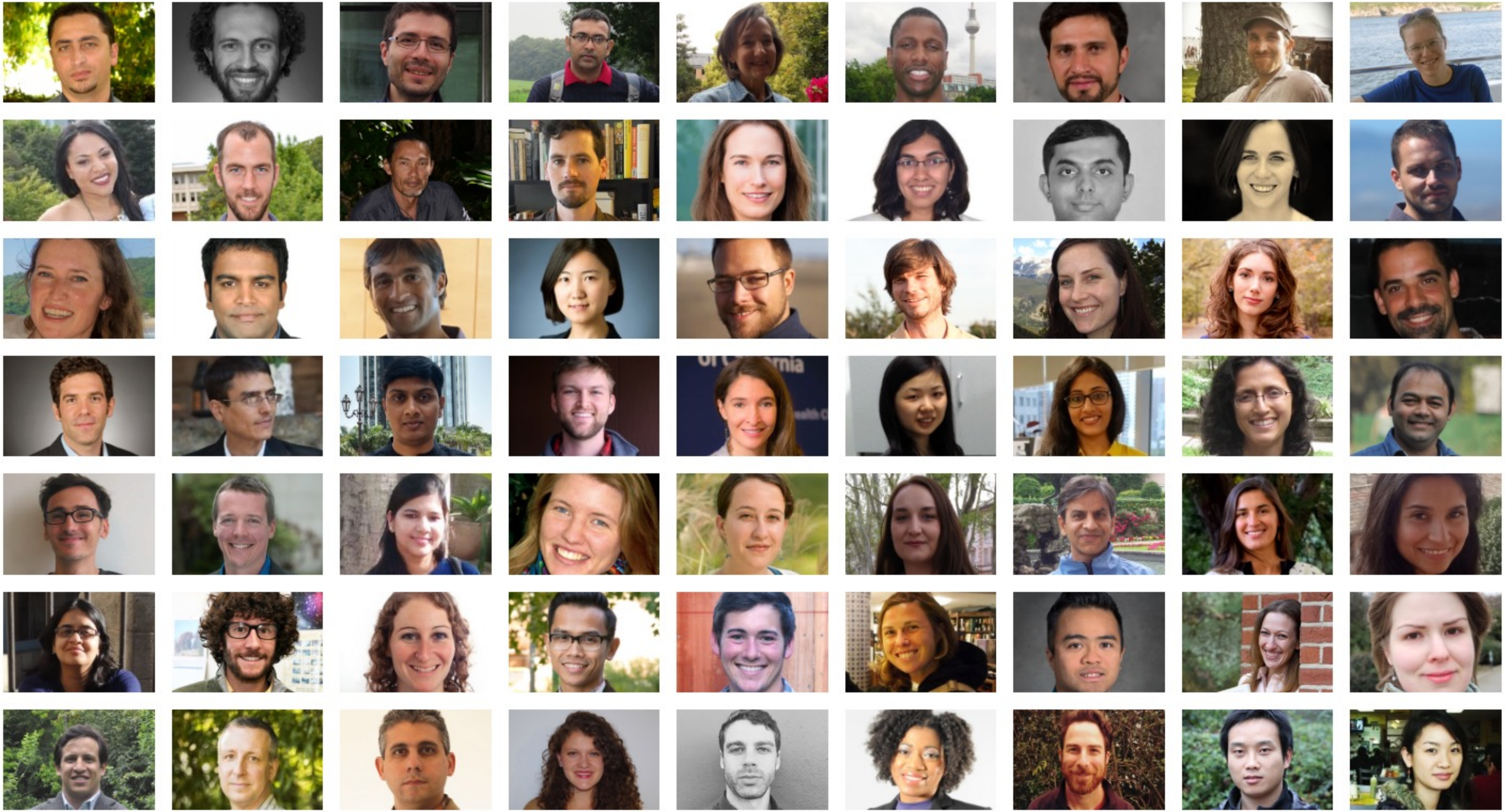
Data: IGBP “Great Acceleration” Report

OUR MISSION

TO HELP THE WORLD STOP GLOBAL WARMING BY ACHIEVING DRAWDOWN — AS QUICKLY, SAFELY, AND EQUITABLY AS POSSIBLE


CO2
parts per million (ppm)
500 years
600 ppm
500 ppm
400 ppm
300 ppm
200 ppm
Drawdown
2050
417
PPM
2021
1500
1600
1700
1800
1900
2000
2050

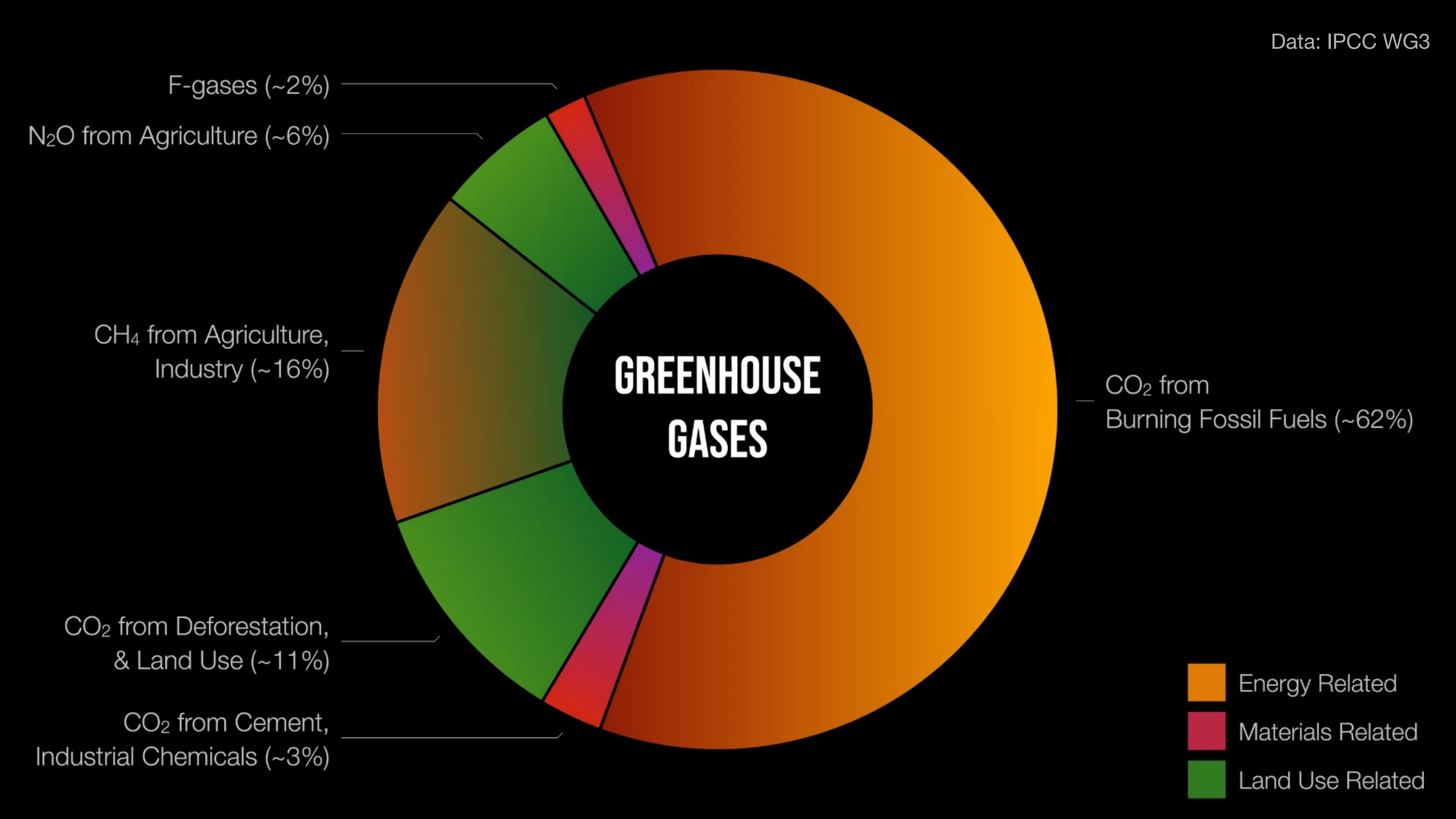
The Coalition




INCREDIBLE CHALLENGE

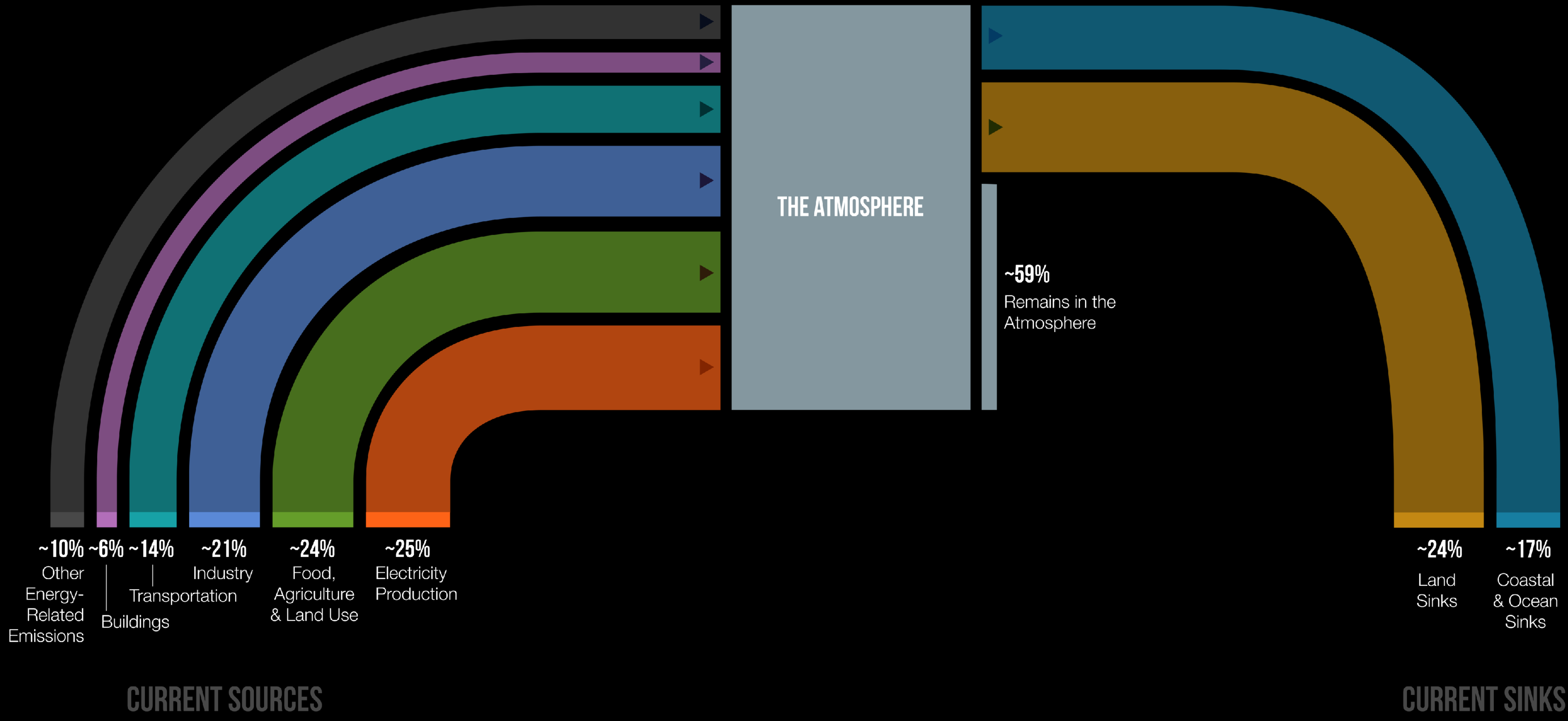
THE PROBLEM


CARBON DIOXIDE (CO2)
410
375
340
305
1750 1800 1850 1900 1950 2000
METHANE (CH4)
1800
1500
1200
900
1750 1800 1850 1900 1950 2000
NITROUS OXIDE (N2O)
325
310
295
280
1750 1800 1850 1900 1950 2000


Data: IPCC WG3
F-gases (~2%)
N_2O from Agriculture (~6%)
CH_4 from Agriculture, Industry (~16%)
GREENHOUSE GASES
CO_2 from Burning Fossil Fuels (~62%)
CO_2 from Deforestation, & Land Use (~11%)
CO_2 from Cement, Industrial Chemicals (~3%)
Energy Related
Materials Related
Land Use Related

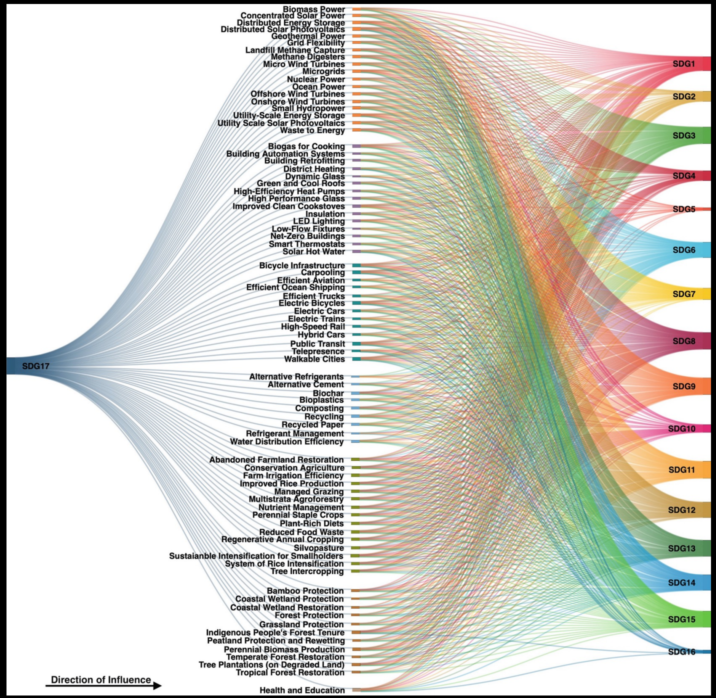
BRINGS SOURCES TO ZERO

MAINTAIN NATURAL SINKS



=

SUSTAINABLE DEVELOPMENT GOALS



Frischmann et al. (2020)


ELECTRICITY
FOOD, AGRICULTURE, AND LAND USE
INDUSTRY
TRANSPORTATION
BUILDINGS
HEALTH AND EDUCATION
LAND SINKS
COASTAL AND OCEAN SINKS
ENGINEERED SINKS

Project Drawdown maps and models solutions

Principle1

Principle 2

Principle 3

ELECTRICITY

ELECTRICITY

- Shift Production
- Enhance Efficiency
- Improve Electrical System

ONSHORE WIND TURBINES

#6

RANK BY 2050

47.2GT

REDUCED CO2-eq

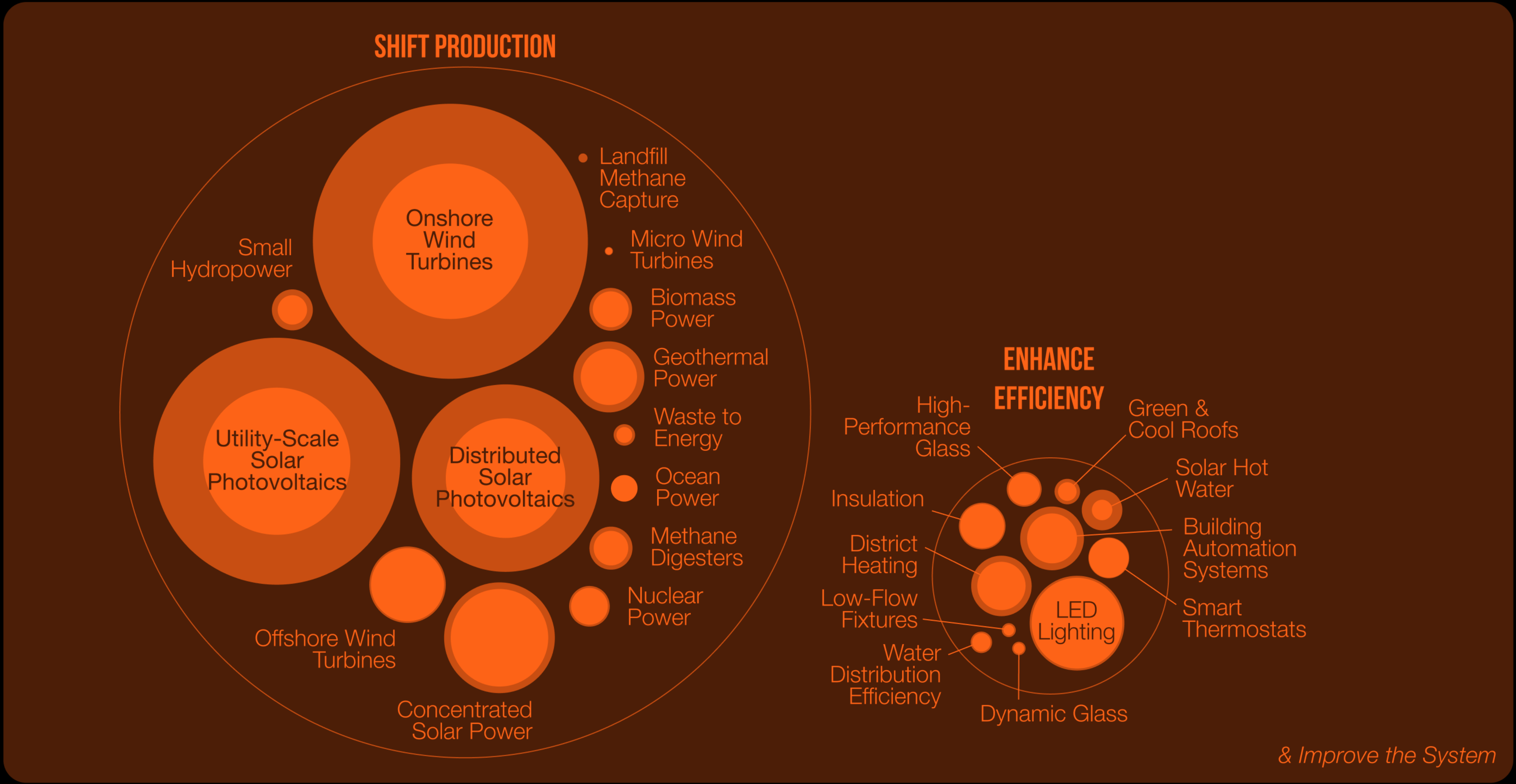

DISTRIBUTED SOLAR PHOTOVOLTAICS
#10
RANK BY 2050
28.0GT
REDUCED CO2-eq


OFFSHORE
WIND TURBINES
#26
RANK BY 2050
10.4GT
REDUCED CO2-eq

WATER DISTRIBUTION EFFICIENCY

#72
RANK BY 2050

0.7 GT
REDUCED CO2



ELECTRICITY

FOOD, AGRICULTURE, AND LAND USE

FOOD, AGRICULTURE, LAND USE

- Address Waste & Diets
- Protect Ecosystems
- Shift Agricultural Practices

REDUCED FOOD WASTE

#1
RANK BY 2050

87.4 GT
REDUCED CO2-eq

PLANT-RICH DIETS

#3

RANK BY 2050

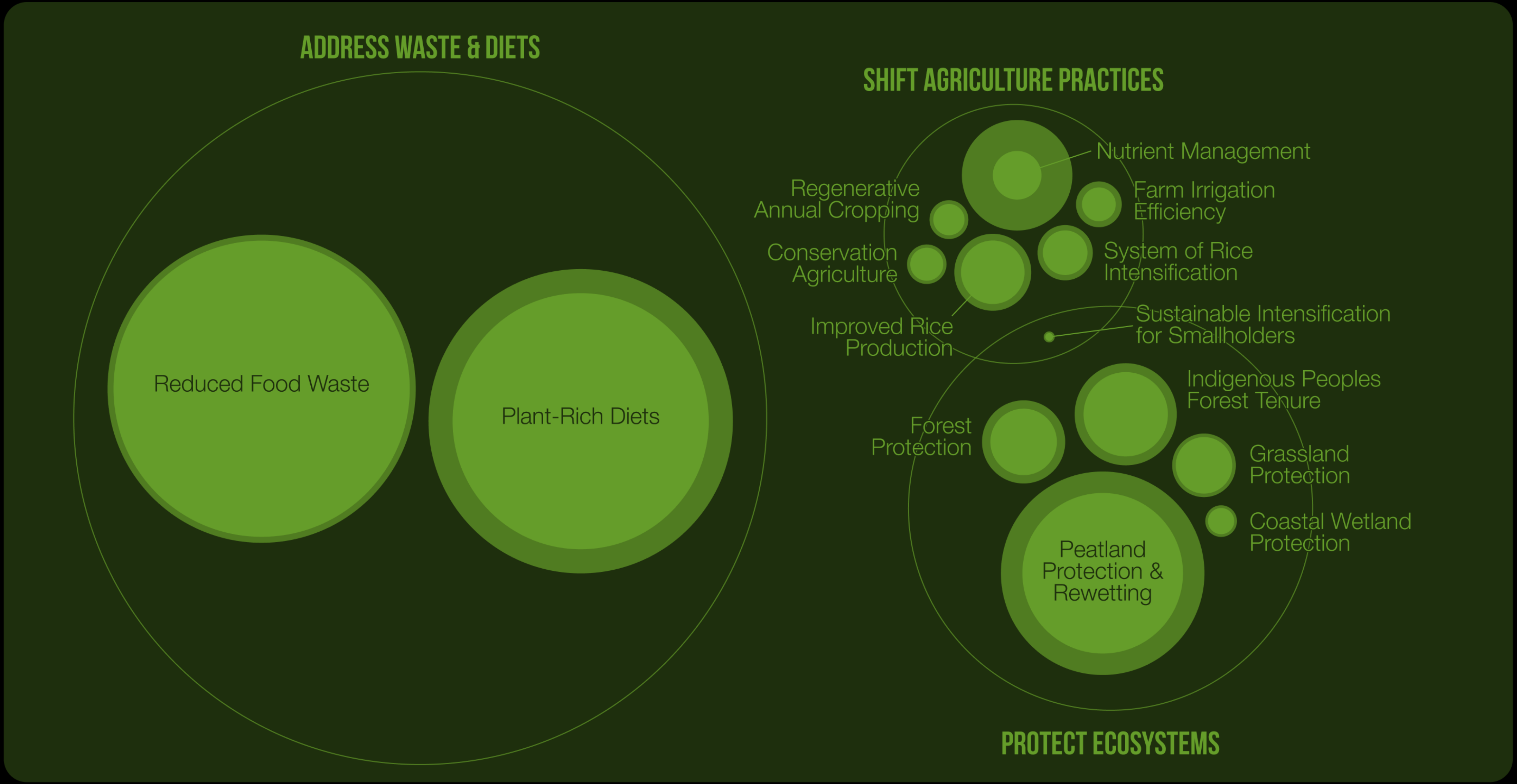
65.0 GT

REDUCED CO_2-eq

IMPROVED RICE PRODUCTION

#29
RANK BY 2050

9.4 GT
REDUCED CO2-eq



FOOD, AGRICULTURE & LAND USE

INDUSTRY

INDUSTRY

- Use Waste
- Address Refrigerants
- Improve Materials

REFRIGERANT MANAGEMENT

#4
RANK BY 2050

57.7 GT
REDUCED CO2-eq

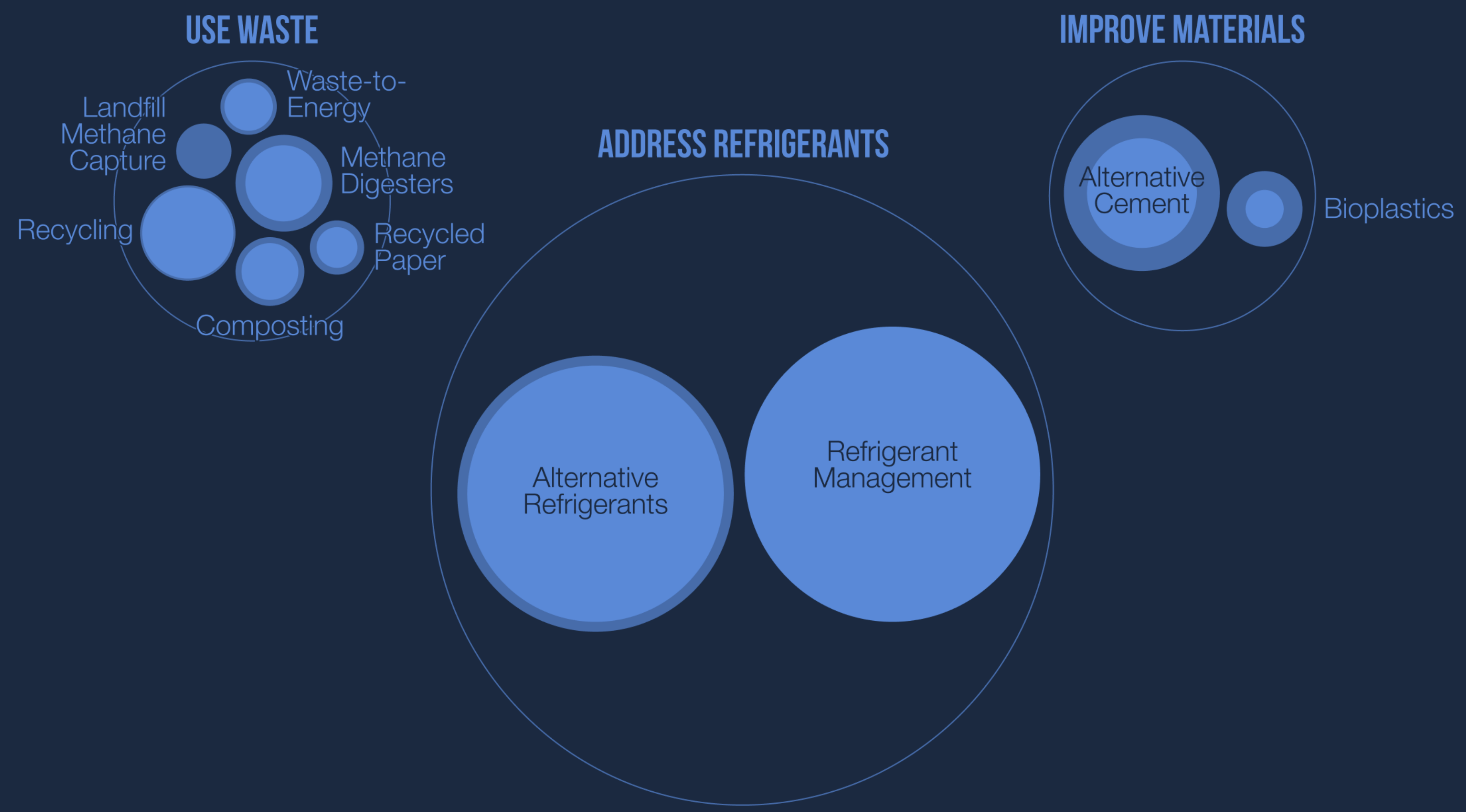

COMPOSTING
#57
RANK BY 2050
2.1 GT
REDUCED CO2


RECYCLED PAPER
#66
RANK BY 2050
1.0 GT
REDUCED CO2-eq

BIOPLASTICS

#69
RANK BY 2050

1.0GT
REDUCED CO2-eq


USE WASTE
Waste-to-Energy
Landfill Methane Capture
Methane Digesters
Recycling
Recycled Paper
Composting
ADDRESS REFRIGERANTS
Alternative Refrigerants
Refrigerant Management
IMPROVE MATERIALS
Alternative Cement
Bioplastics

INDUSTRY

TRANSPORTATION

TRANSPORTATION

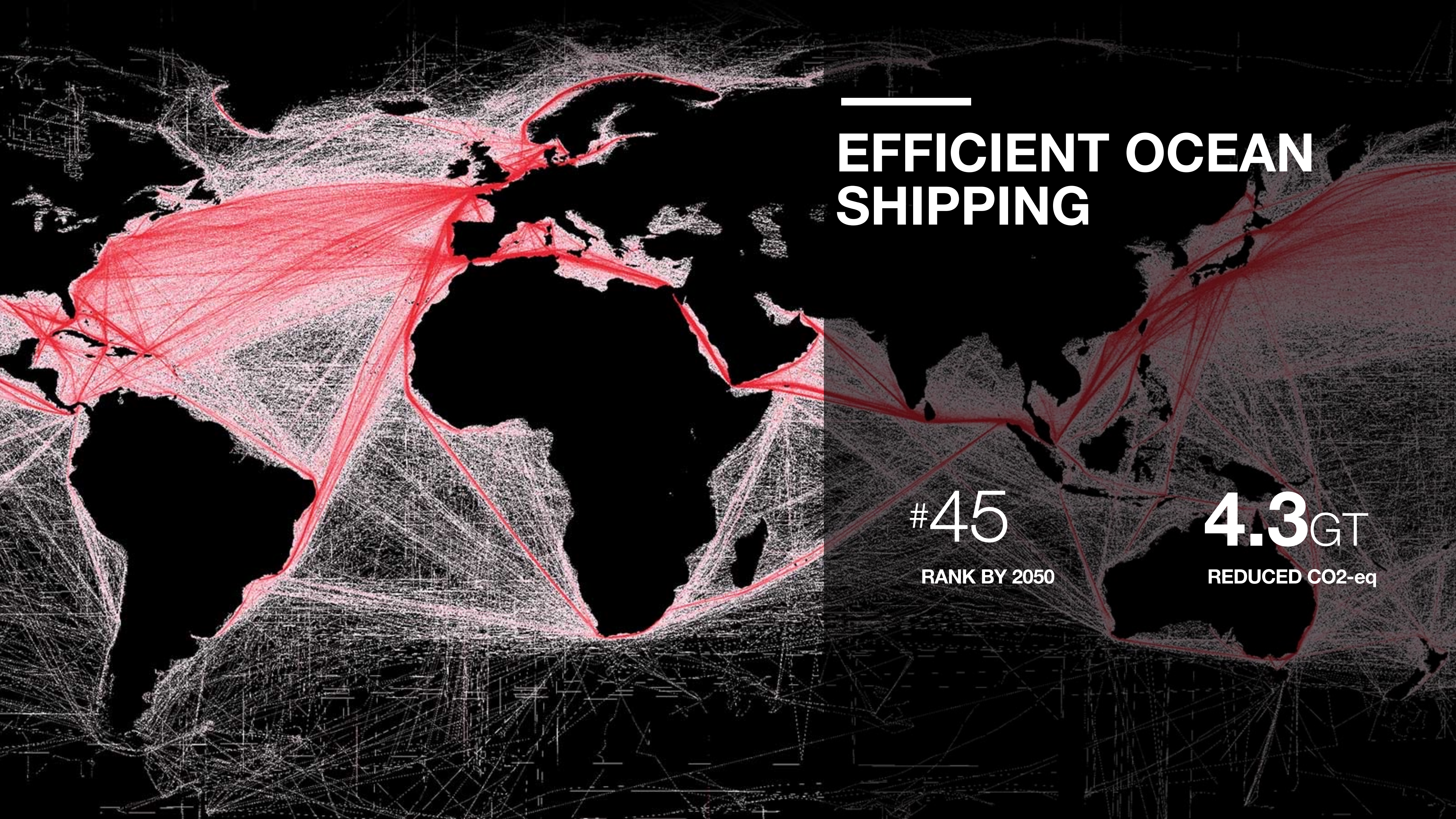
- Shift to Alternatives
- Enhance Efficiency
- Electrify Vehicles


ELECTRIC CARS
#24
RANK BY 2050
11.8 GT
REDUCED CO2-eq

PUBLIC TRANSIT

#35
RANK BY 2050

7.5GT
REDUCED CO2-eq



EFFICIENT OCEAN SHIPPING

#45
RANK BY 2050

4.3GT
REDUCED CO2-eq

BIKE INFRASTRUCTURE

#52
RANK BY 2050

2.5GT
REDUCED CO_2-eq

WALKABLE CITIES

#60
RANK BY 2050

1.4GT
REDUCED CO2-eq

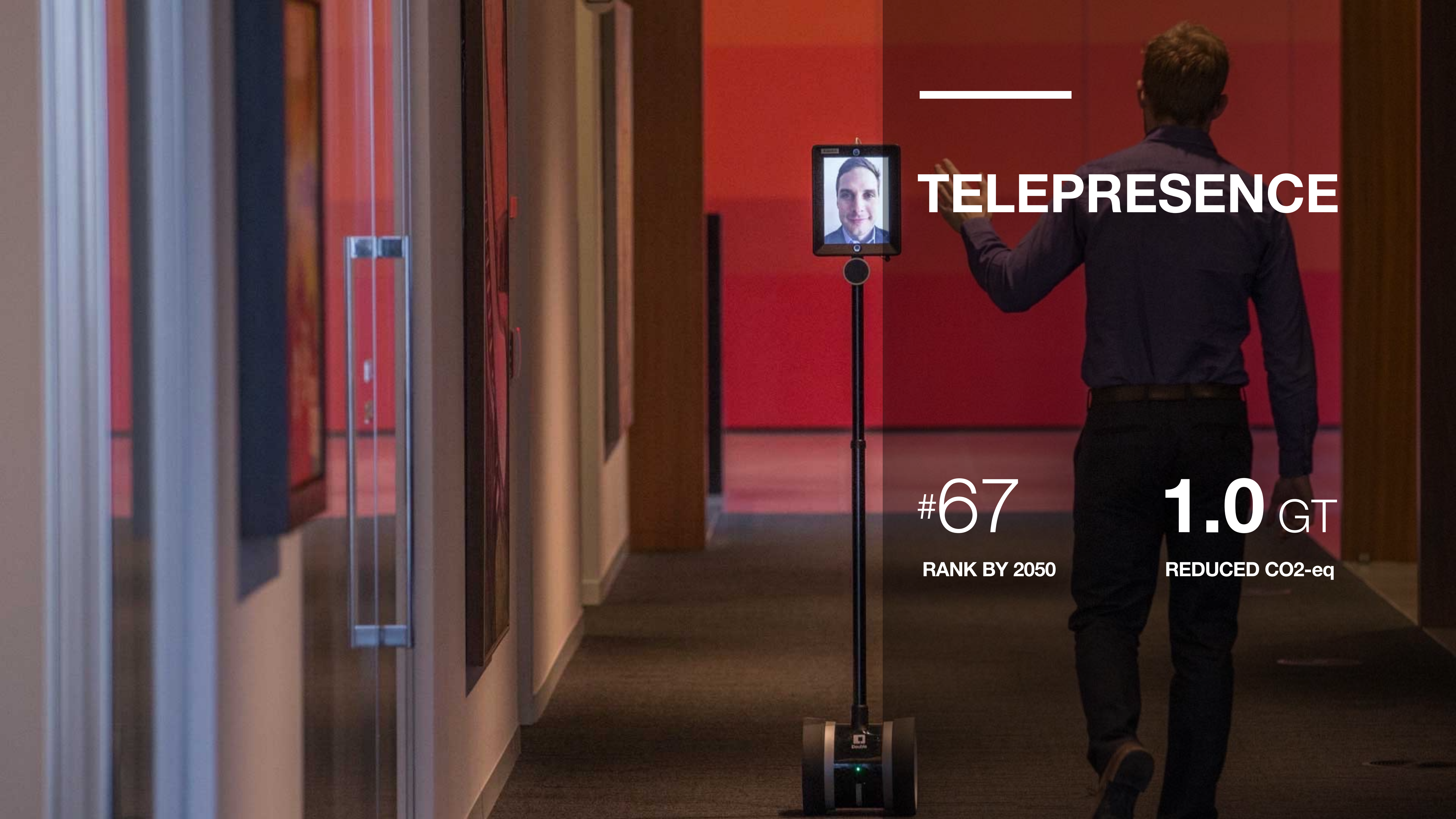
ELECTRIC BICYCLES

#63

RANK BY 2050

1.3GT

REDUCED CO2-eq



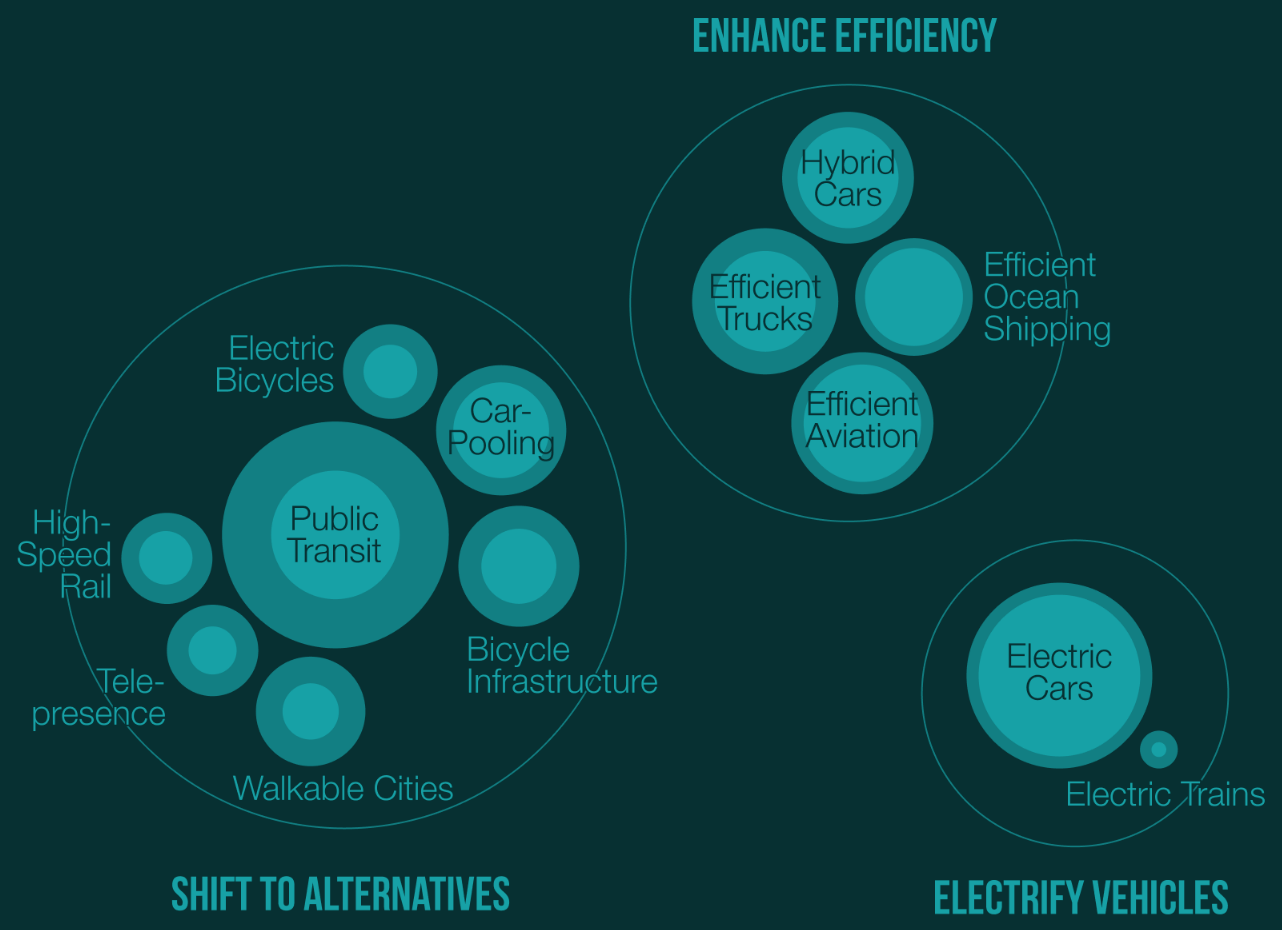
TELEPRESENCE

#67

RANK BY 2050

1.0 GT

REDUCED CO2-eq


ENHANCE EFFICIENCY
Hybrid Cars
Efficient Trucks
Efficient Ocean Shipping
Efficient Aviation
Electric Bicycles
Car-Pooling
Public Transit
High-Speed Rail
Bicycle Infrastructure
Tele-presence
Walkable Cities
SHIFT TO ALTERNATIVES
Electric Cars
Electric Trains
ELECTRIFY VEHICLES

TRANSPORT

BUILDINGS

BUILDINGS

- Shift to Alternatives
- Enhance Efficiency
- Address Refrigerants


INSULATION
#16
RANK BY 2050
17.0GT
REDUCED CO2-eq

IMPROVED CLEAN COOKSTOVES

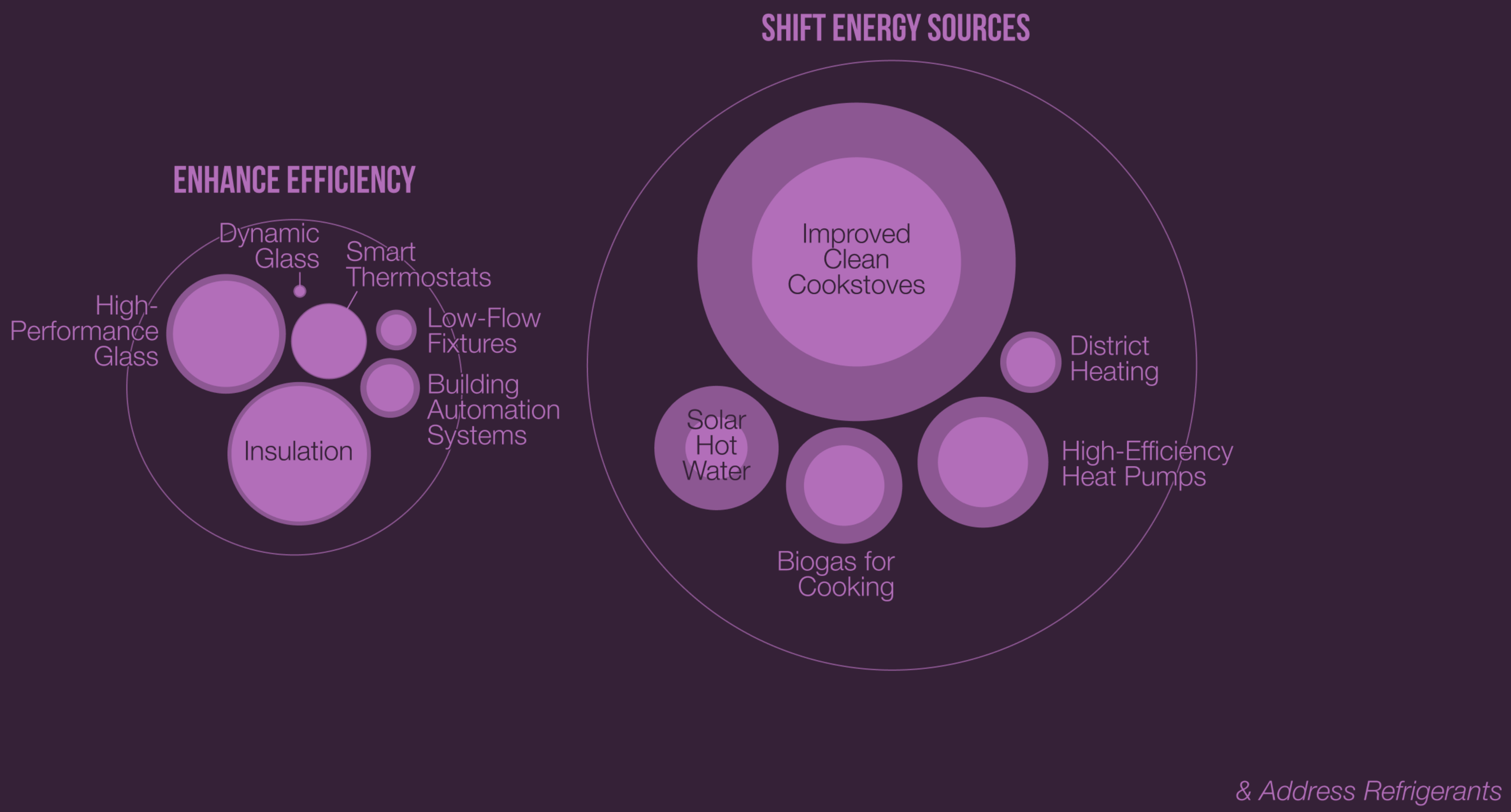
#9
RANK BY 2050

31.3 GT
REDUCED CO2-eq

LOW-FLOW FIXTURES

#70
RANK BY 2050

0.9 GT
REDUCED CO_2-eq



SHIFT ENERGY SOURCES
ENHANCE EFFICIENCY
Dynamic Glass
Smart Thermostats
High-Performance Glass
Low-Flow Fixtures
Building Automation Systems
Insulation
Improved Clean Cookstoves
District Heating
Solar Hot Water
High-Efficiency Heat Pumps
Biogas for Cooking
& Address Refrigerants

BUILDINGS

LAND SINKS

LAND-BASED SINKS

- Shift Agricultural Practices
- Protect and Restore Ecosystems
- Use Degraded Land
- Address Waste and Diets

TROPICAL FOREST RESTORATION

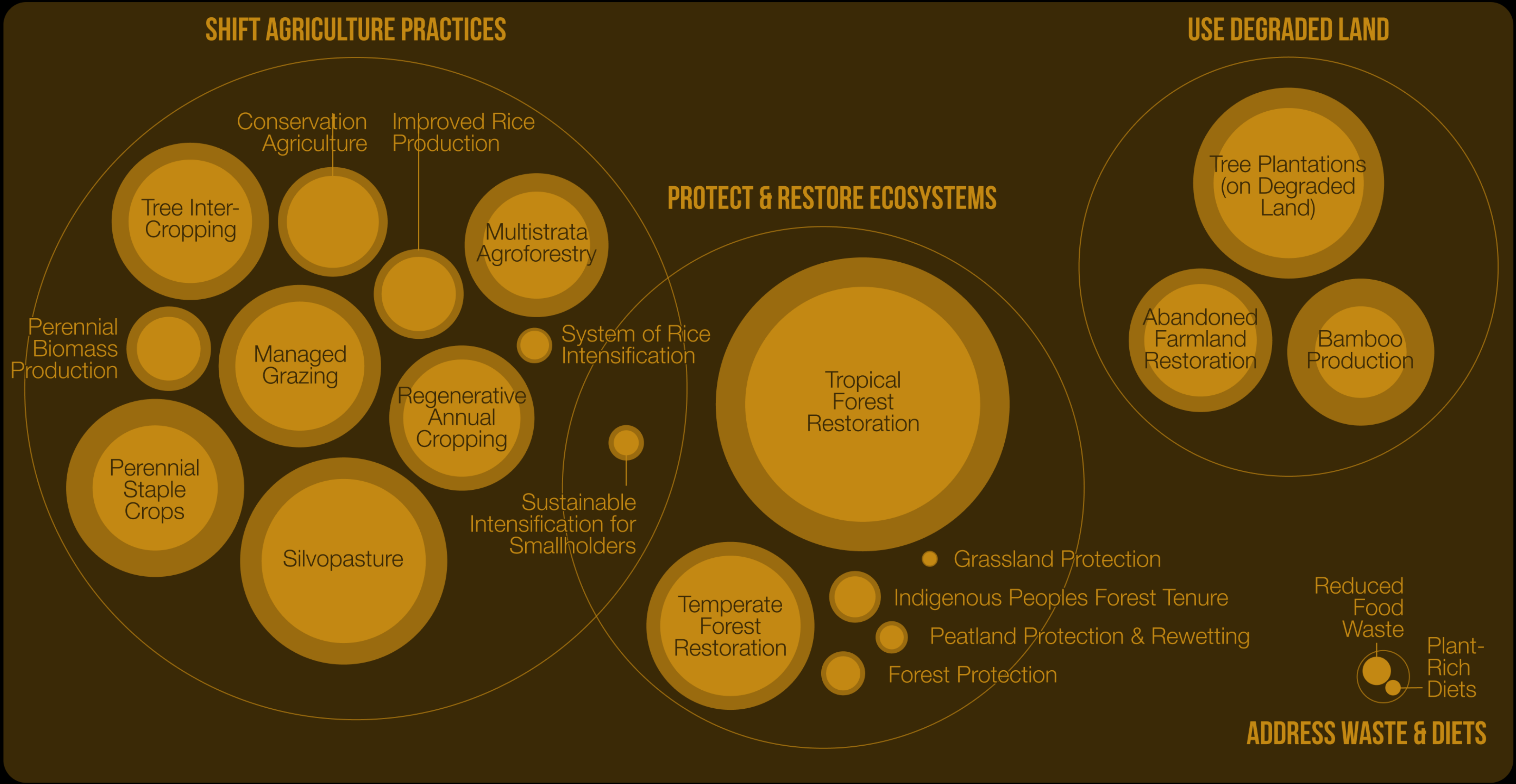
#5
RANK BY 2050

54.4 GT
REDUCED CO2-eq


TEMPERATE FOREST RESTORATION
#14
RANK BY 2050
19.4 GT
REDUCED CO2


MANAGED
GRAZING
#17
RANK BY 2050
16.4 GT
REDUCED CO2-eq


FOREST PROTECTION
#41
RANK BY 2050
5.5 GT
REDUCED CO2-eq


SHIFT AGRICULTURE PRACTICES
Conservation Agriculture
Improved Rice Production
Tree Inter-Cropping
Multistrata Agroforestry
Perennial Biomass Production
Managed Grazing
System of Rice Intensification
Regenerative Annual Cropping
Perennial Staple Crops
Silvopasture
Sustainable Intensification for Smallholders
PROTECT & RESTORE ECOSYSTEMS
Tropical Forest Restoration
Grassland Protection
Indigenous Peoples Forest Tenure
Temperate Forest Restoration
Peatland Protection & Rewetting
Forest Protection
USE DEGRADED LAND
Tree Plantations (on Degraded Land)
Abandoned Farmland Restoration
Bamboo Production
Reduced Food Waste
Plant-Rich Diets
ADDRESS WASTE & DIETS

LAND SINKS

COASTAL AND OCEAN SINKS

COASTAL WETLAND RESTORATION

#71
RANK BY 2050

0.8 GT
REDUCED CO2-eq

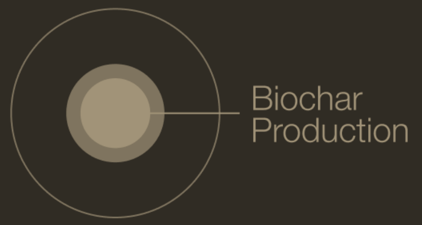
PROTECT & RESTORE ECOSYSTEMS

COASTAL & OCEAN SINKS

ENGINEERED SINKS


BIOCHAR PRODUCTION
#41
RANK BY 2050
2.2 GT
REDUCED CO2-eq

REMOVE & STORE CARBON



ENGINEERED SINKS

HEALTH AND EDUCATION

HEALTH & EDUCATION

#2

RANK BY 2050

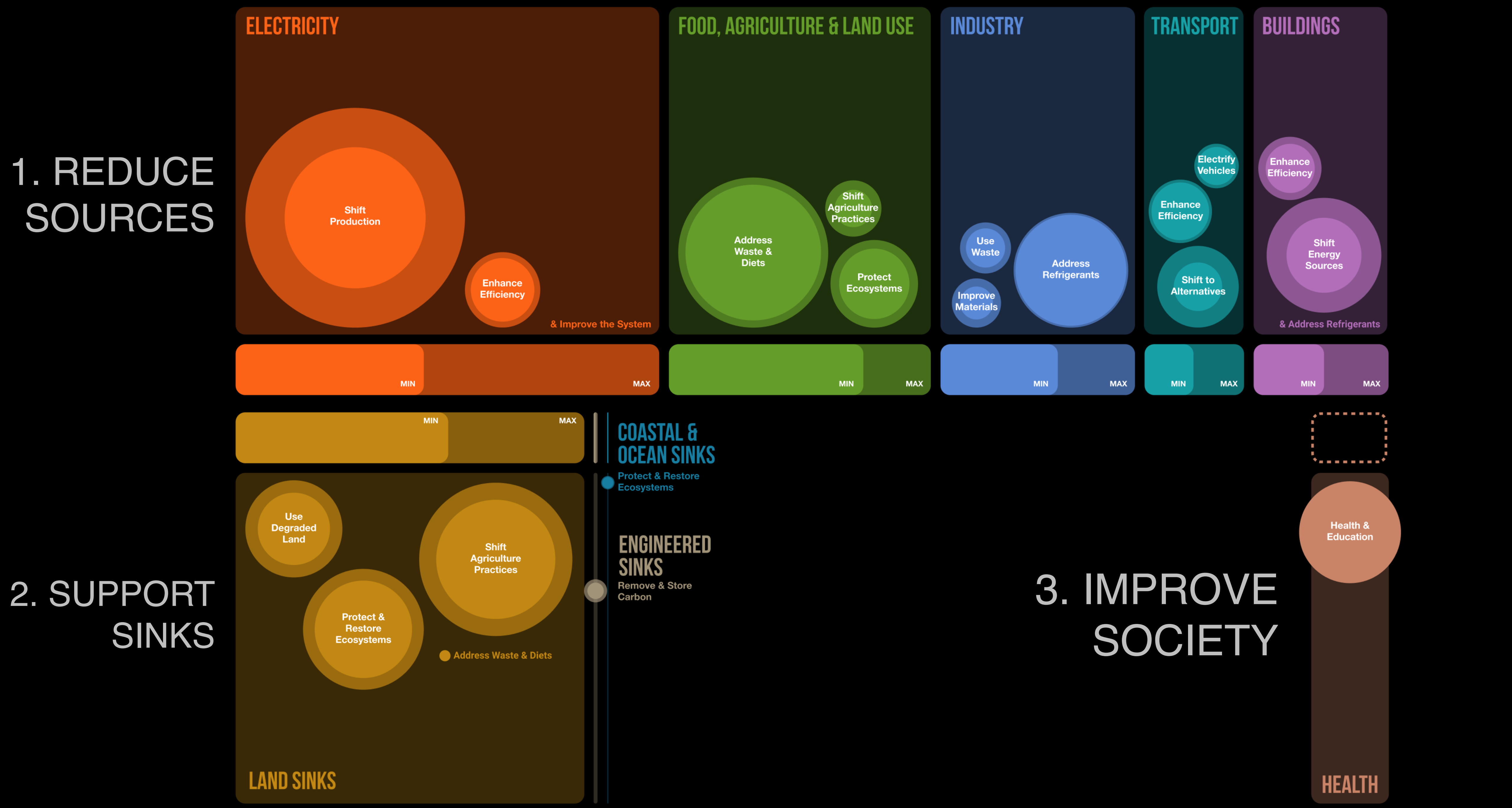
85.4 GT

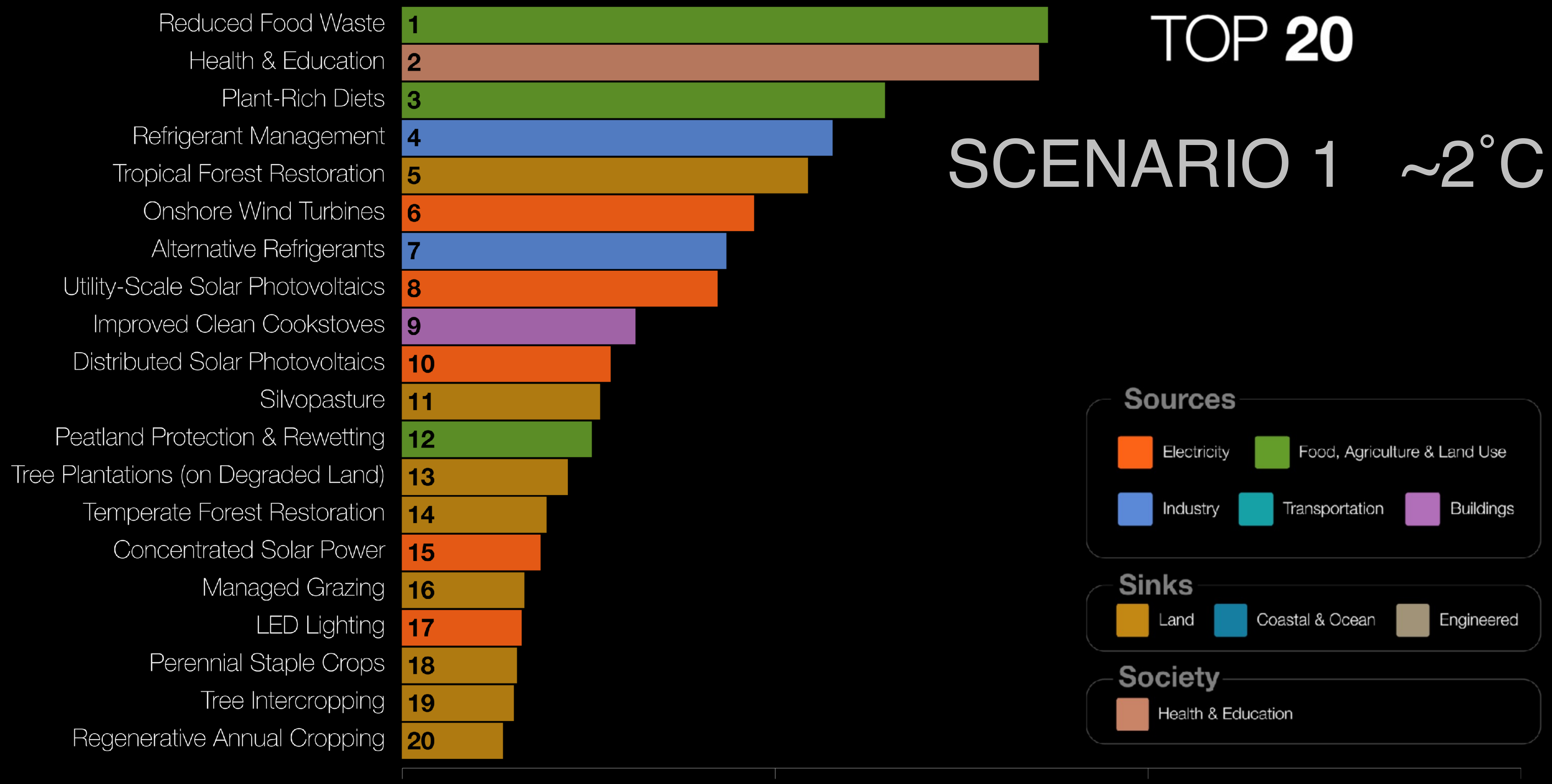
REDUCED CO2-eq

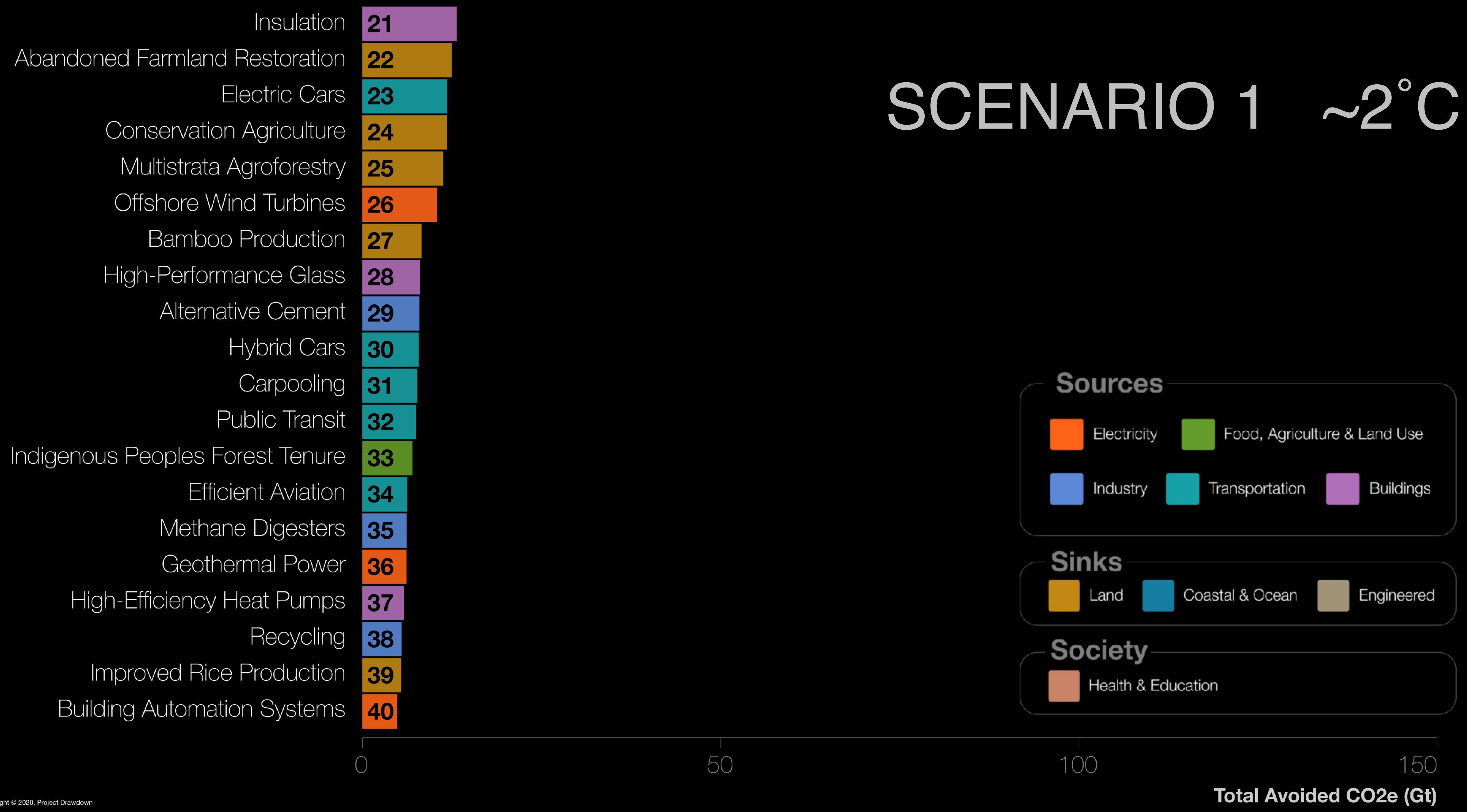
HEALTH & EDUCATION

SOCIETY

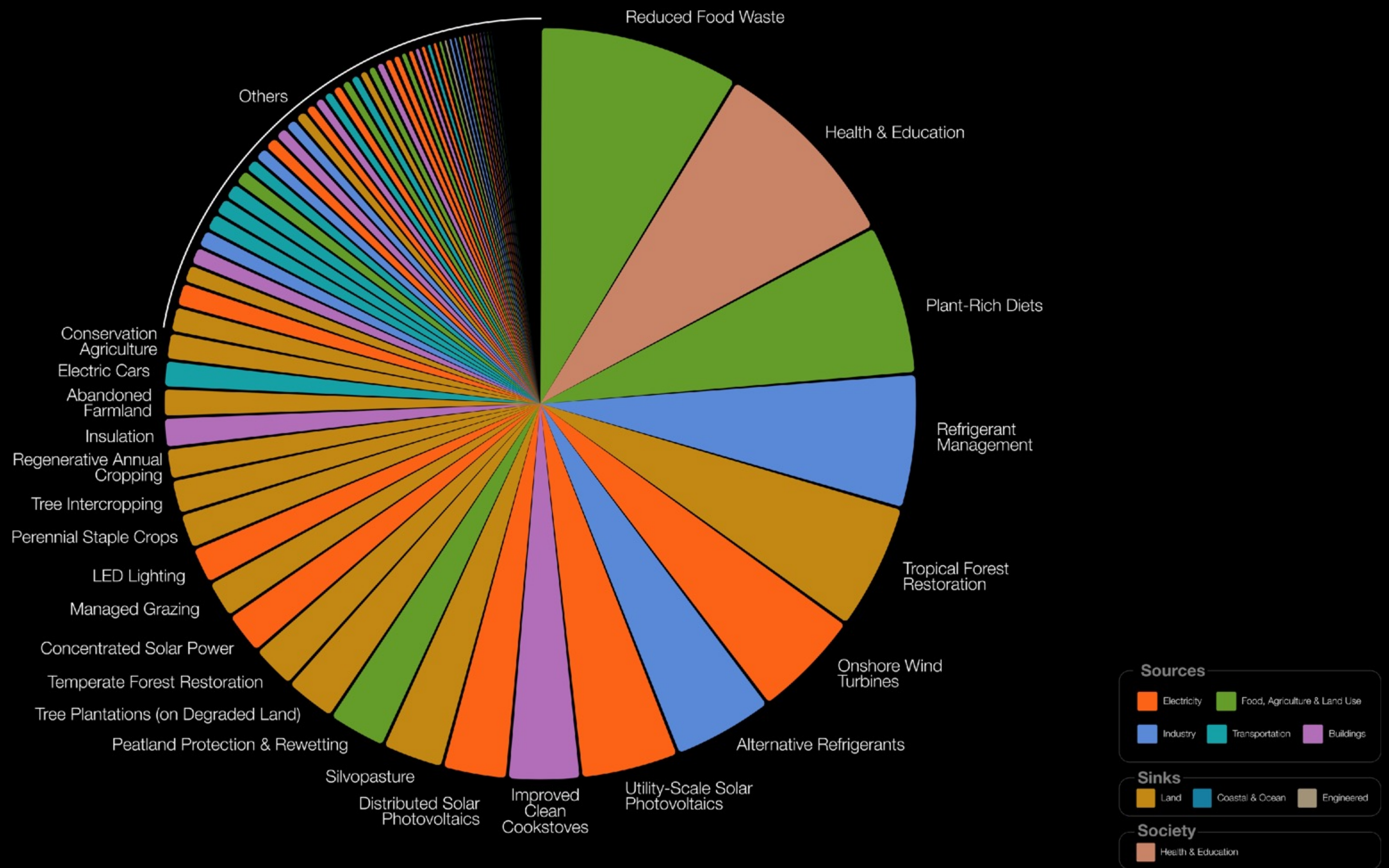

PUTTING IT TOGETHER
REACHING DRAWDOWN


1. REDUCE SOURCES
ELECTRICITY
Shift Production
Enhance Efficiency
& Improve the System
FOOD, AGRICULTURE & LAND USE
Address Waste & Diets
Shift Agriculture Practices
Protect Ecosystems
INDUSTRY
Use Waste
Improve Materials
Address Refrigerants
TRANSPORT
Electrify Vehicles
Enhance Efficiency
Shift to Alternatives
BUILDINGS
Enhance Efficiency
Shift Energy Sources
& Address Refrigerants
MIN
MAX
2. SUPPORT SINKS
LAND SINKS
Use Degraded Land
Shift Agriculture Practices
Protect & Restore Ecosystems
Address Waste & Diets
COASTAL & OCEAN SINKS
Protect & Restore Ecosystems
ENGINEERED SINKS
Remove & Store Carbon
3. IMPROVE SOCIETY
Health & Education
HEALTH


TOP 20
SCENARIO 1 ~2˚C
Reduced Food Waste 1
Health & Education 2
Plant-Rich Diets 3
Refrigerant Management 4
Tropical Forest Restoration 5
Onshore Wind Turbines 6
Alternative Refrigerants 7
Utility-Scale Solar Photovoltaics 8
Improved Clean Cookstoves 9
Distributed Solar Photovoltaics 10
Silvopasture 11
Peatland Protection & Rewetting 12
Tree Plantations (on Degraded Land) 13
Temperate Forest Restoration 14
Concentrated Solar Power 15
Managed Grazing 16
LED Lighting 17
Perennial Staple Crops 18
Tree Intercropping 19
Regenerative Annual Cropping 20
0
50
100
150
Total Avoided CO2e (Gt)
Sources
Electricity
Food, Agriculture & Land Use
Industry
Transportation
Buildings
Sinks
Land
Coastal & Ocean
Engineered
Society
Health & Education



SCENARIO 1 ~2˚C
Insulation 21
Abandoned Farmland Restoration 22
Electric Cars 23
Conservation Agriculture 24
Multistrata Agroforestry 25
Offshore Wind Turbines 26
Bamboo Production 27
High-Performance Glass 28
Alternative Cement 29
Hybrid Cars 30
Carpooling 31
Public Transit 32
Indigenous Peoples Forest Tenure 33
Efficient Aviation 34
Methane Digesters 35
Geothermal Power 36
High-Efficiency Heat Pumps 37
Recycling 38
Improved Rice Production 39
Building Automation Systems 40
Sources
Electricity
Food, Agriculture & Land Use
Industry
Transportation
Buildings
Sinks
Land
Coastal & Ocean
Engineered
Society
Health & Education
0
50
100
150
Total Avoided CO2e (Gt)



Reduced Food Waste
Health & Education
Plant-Rich Diets
Refrigerant Management
Tropical Forest Restoration
Onshore Wind Turbines
Alternative Refrigerants
Utility-Scale Solar Photovoltaics
Improved Clean Cookstoves
Distributed Solar Photovoltaics
Silvopasture
Peatland Protection & Rewetting
Tree Plantations (on Degraded Land)
Temperate Forest Restoration
Concentrated Solar Power
Managed Grazing
LED Lighting
Perennial Staple Crops
Tree Intercropping
Regenerative Annual Cropping
Insulation
Abandoned Farmland
Electric Cars
Conservation Agriculture
Others
Sources
Electricity
Food, Agriculture & Land Use
Industry
Transportation
Buildings
Sinks
Land
Coastal & Ocean
Engineered
Society
Health & Education

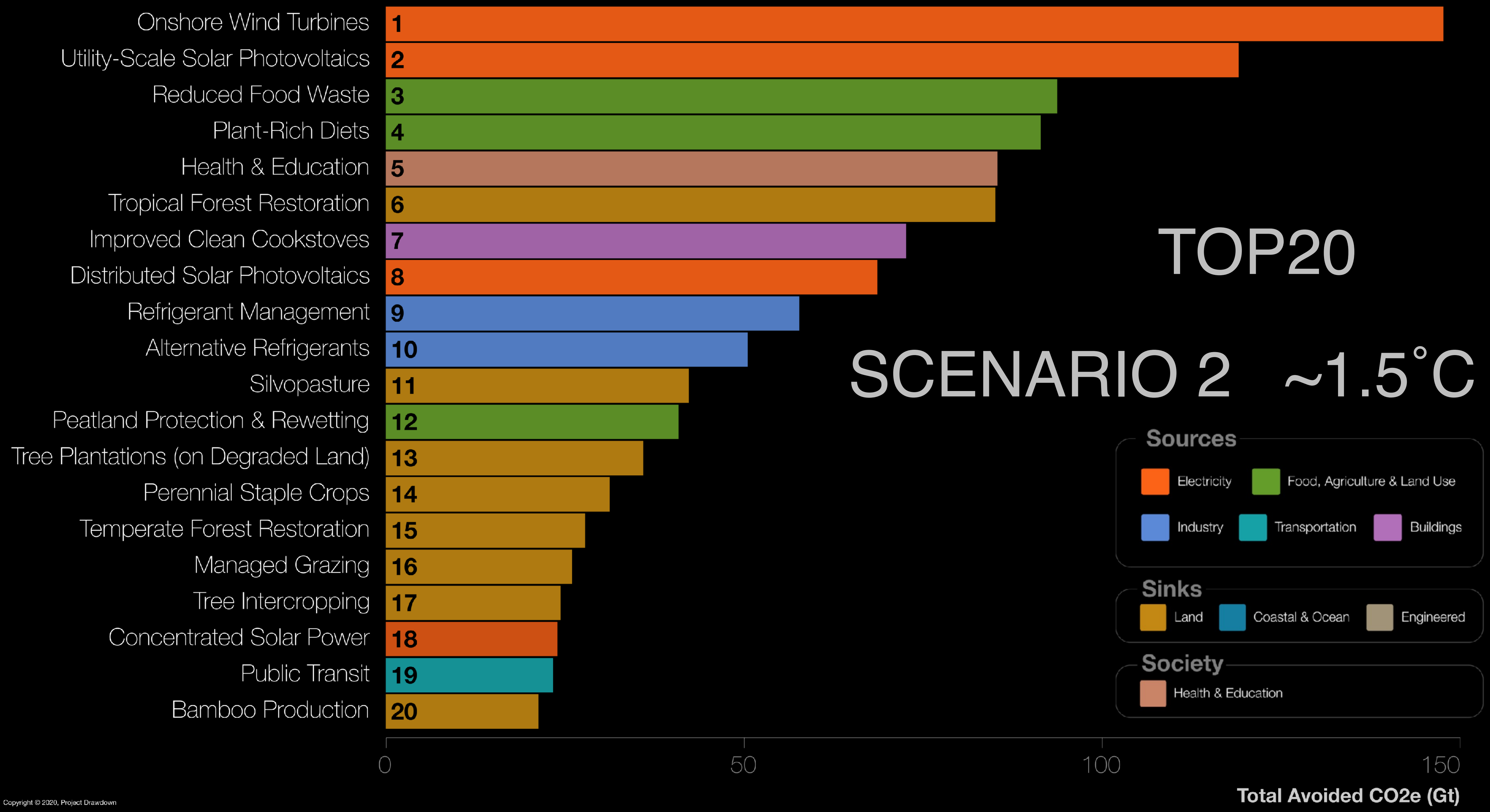
PREVENTS 993.8 GT-CO_2

INITIAL COSTS $22.5 TRILLION
TOTAL SAVINGS $95.1 TRILLION

4.2X RETURN ON INVESTMENT

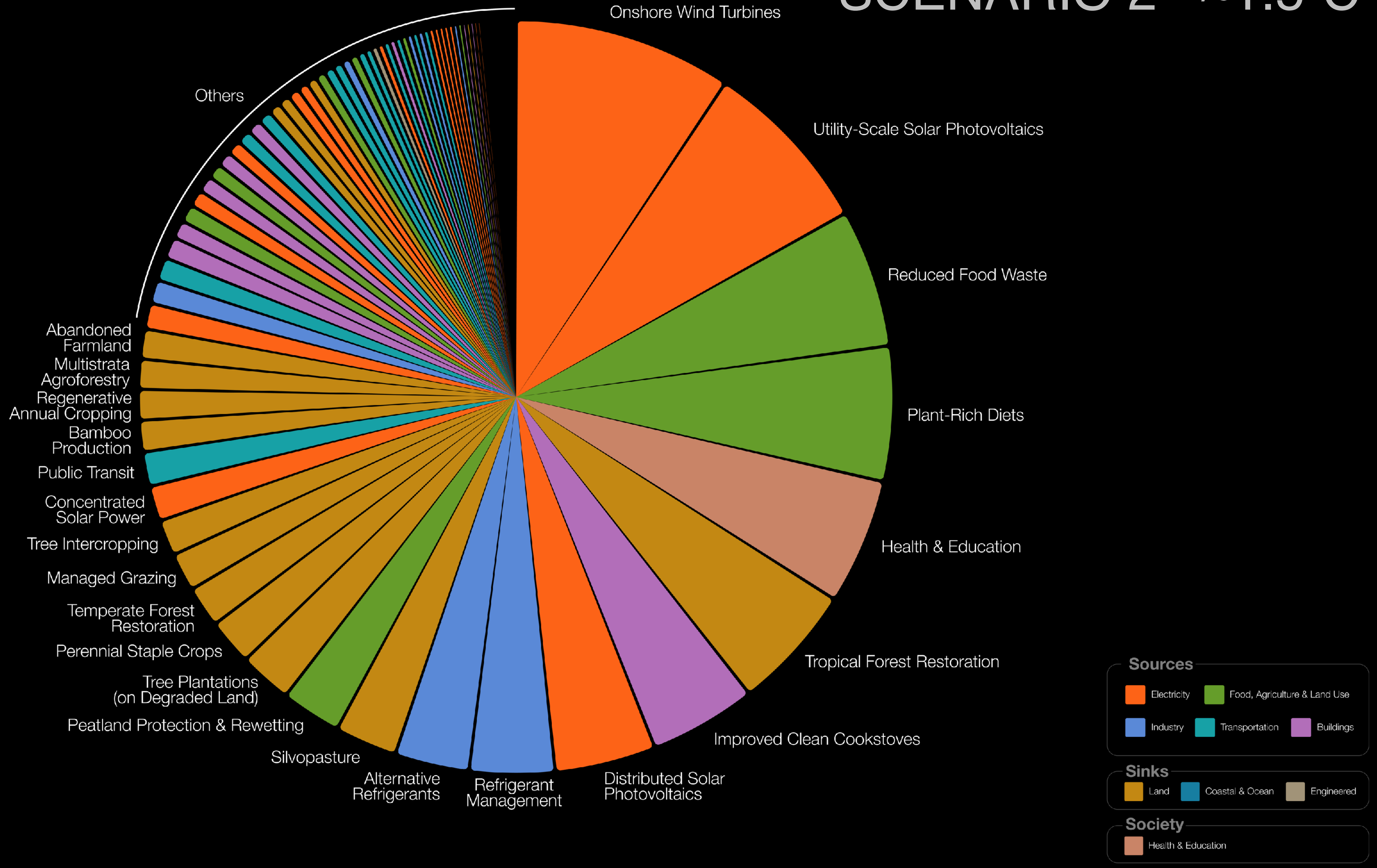
Is **Drawdown** possible by 2050?

Only when we **challenge systems**



Onshore Wind Turbines
Utility-Scale Solar Photovoltaics
Reduced Food Waste
Plant-Rich Diets
Health & Education
Tropical Forest Restoration
Improved Clean Cookstoves
Distributed Solar Photovoltaics
Refrigerant Management
Alternative Refrigerants
Silvopasture
Peatland Protection & Rewetting
Tree Plantations (on Degraded Land)
Perennial Staple Crops
Temperate Forest Restoration
Managed Grazing
Tree Intercropping
Concentrated Solar Power
Public Transit
Bamboo Production
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
TOP20
SCENARIO 2 ~1.5˚C
Sources
Electricity
Food, Agriculture & Land Use
Industry
Transportation
Buildings
Sinks
Land
Coastal & Ocean
Engineered
Society
Health & Education
0
50
100
150
Total Avoided CO2e (Gt)

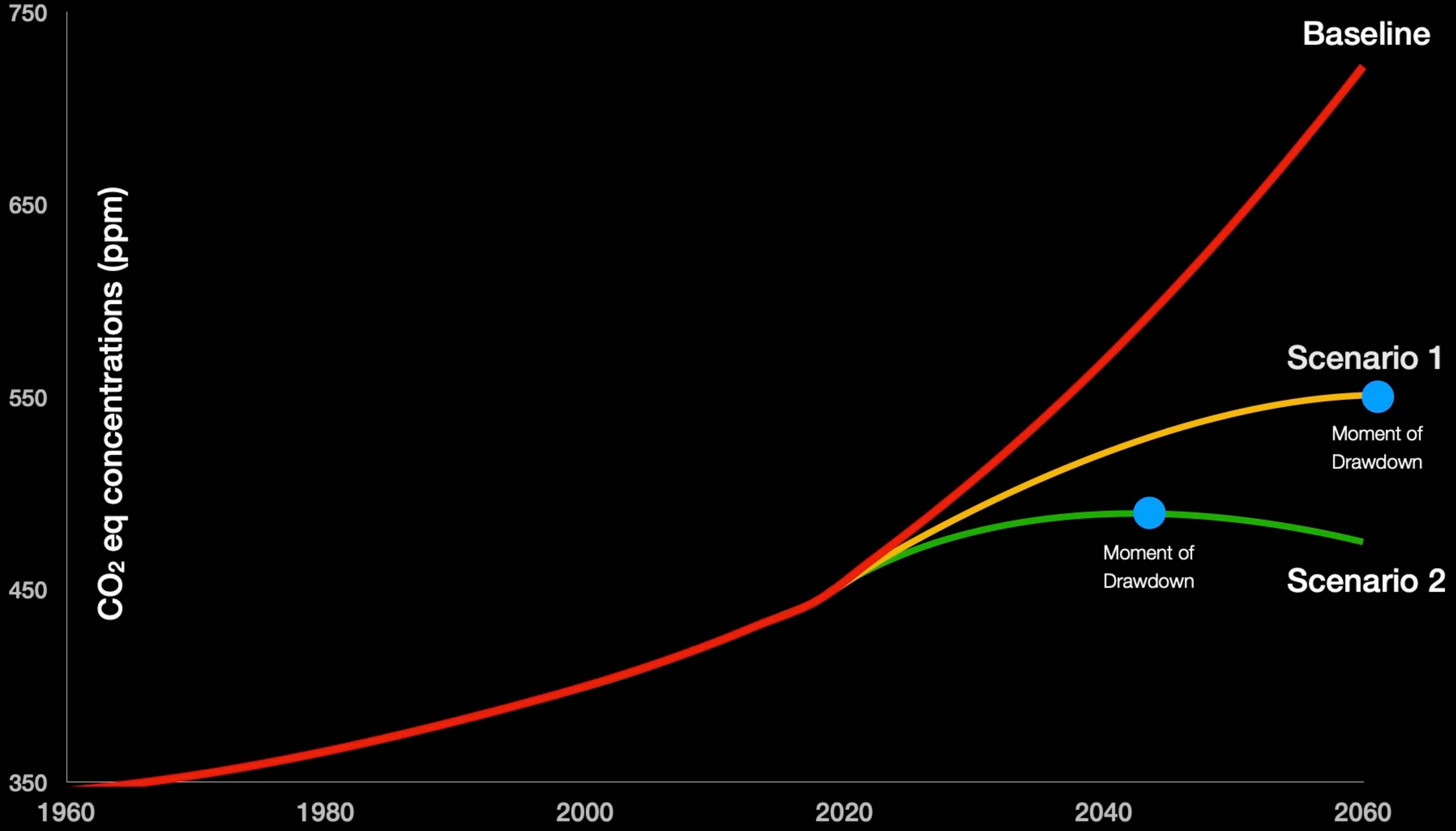
SCENARIO 2 ~1.5˚C



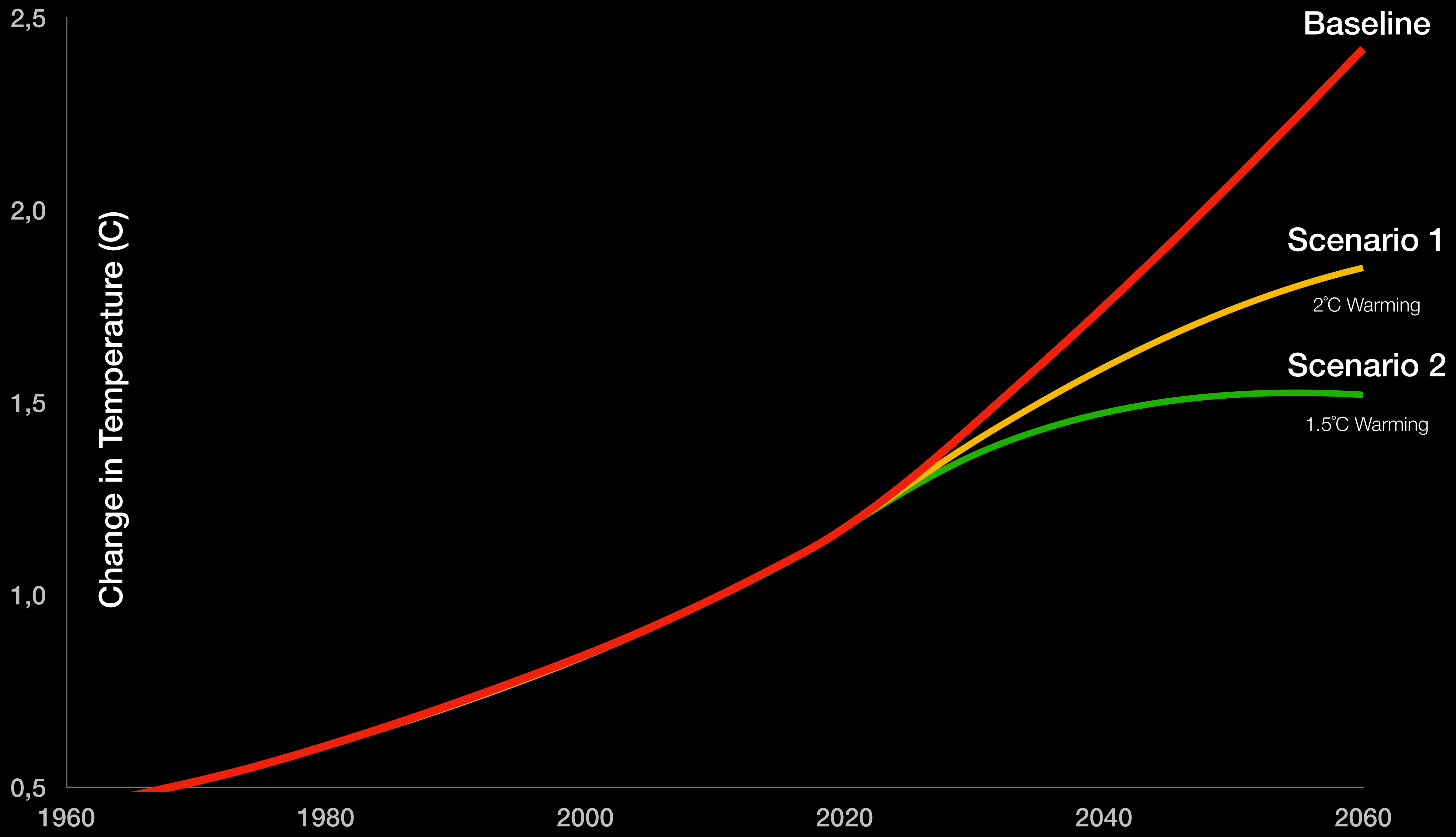
PREVENTS 1,580.4 GT-CO_2

INITIAL COSTS $28.4 TRILLION
TOTAL SAVINGS $145.5 TRILLION

5.1X RETURN ON INVESTMENT



750
650
550
450
350
CO_2 eq concentrations (ppm)
1960
1980
2000
2020
2040
2060
Baseline
Scenario 1
Moment of Drawdown
Moment of Drawdown
Scenario 2



Baseline
Scenario 1
2°C Warming
Scenario 2
1.5°C Warming
Change in Temperature (C)
2,5
2,0
1,5
1,0
0,5
1960
1980
2000
2020
2040
2060

WE HAVE **ENOUGH SOLUTIONS**

TO DO THE JOB

WE CAN REACH DRAWDOWN BY MIDCENTURY IF WE SCALE SOLUTIONS ALREADY IN HAND, TODAY

MORE SOLUTIONS ARE NEEDED, BUT THE TOOLS WE NEED ARE IN HAND

NOW IS BETTER THAN NEW

MARINE PERMACULTURE


BUILDING
WITH WOOD


A COW WALKS
ONTO A BEACH

ENERGY
ROOFTOP SOLAR

RANKING AND RESULTS BY 2050 **#10**

24.6 GIGATONS REDUCED CO2	$453.1 BILLION NET COST	$3.46 TRILLION NET SAVINGS

The year was 1884, when the first solar array appeared on a rooftop in New York City. Experimentalist Charles Fritts installed it after discovering that a thin layer of selenium on a metal plate could produce a current of electricity when exposed to light. How light could turn on lights, he and his solar-pioneering contemporaries did not know, for the mechanics were not understood until the early twentieth century when, among other breakthroughs, Albert Einstein published his revolutionary work on what are now called photons. Though the scientific establishment of Fritts's day believed power generation depended on heat, Fritts was convinced that "photoelectric" modules would wind up competing with coal-fired power plants. The first such plant had been brought online by Thomas Edison just two years earlier, also in New York City.

Today, solar is replacing electricity generated from coal as well as from natural gas. It is replacing kerosene lamps and diesel generators in places where people lack access to the power grid, true for more than a billion people around the world. While society grapples with electricity's pollution in some places and its absence in others, the mysterious waves and particles of the sun's light continuously strike the surface of the planet with an energy more than ten thousand times the world's total use. Small-scale photovoltaic systems, typically sited on rooftops, are playing a significant role in harnessing that light, the most abundant resource on earth. When photons strike the thin wafers of silicon crystal within a vacuum-sealed solar panel, they knock electrons loose and produce an electrical circuit. These subatomic particles are the only moving parts in a solar panel, which requires no fuel.

While solar photovoltaics (PV) provide less than 2 percent of the world's electricity at present, PV has seen exponential growth over the past decade. In 2015 distributed systems of less than 100 kilowatts accounted for roughly 30 percent of solar PV capacity installed worldwide. In Germany, one of the world's solar leaders, the majority of photovoltaic capacity is on rooftops, which don 1.5 million systems. In Bangladesh, population 157 million, more than 3.6 million home solar systems have been installed. Fully 16 percent of Australian homes have them. Transforming a square meter of rooftop into a miniature power station is proving irresistible.

An Uros mother and her two daughters live on one of the 42 floating islands made of totora reeds on Lake Titicaca. Their delight upon receiving their first solar panel is infectious. Installed at an elevation of 12,507 feet, the panel will replace kerosene and provide electricity to her family for the first time. As high tech as solar may be, it is a perfect cultural match: The Uru People know themselves as Lupihaques, Sons of the Sun.

Roof modules are spreading around the world because of their affordability. Solar PV has benefited from a virtuous cycle of falling costs, driven by incentives to accelerate its development and implementation, economies of scale in manufacturing, advances in panel technology, and innovative approaches for end-user financing—such as the third-party ownership arrangements that have helped mainstream solar in the United States. As demand has grown and production has risen to meet it, prices have dropped; as prices have dropped, demand has grown further. A PV manufacturing boom in China has helped unleash a torrent of inexpensive panels around the world. But hard costs are only one side of the expense equation. The soft costs of financing, acquisition, permitting, and installation can be half the cost of a rooftop system and have not seen the same dip as panels themselves. That is part of the reason rooftop solar is more expensive than its utility-scale kin. Nonetheless, small-scale PV already generates electricity more cheaply than it can be brought from the grid in some parts of the United States, in many small island states, and in countries including Australia, Denmark, Germany, Italy, and Spain.

The advantages of rooftop solar extend far beyond price. While the production of PV panels, like any manufacturing process, involves emissions, they generate electricity without emitting greenhouse gases or air pollution—with the infinite resource of sunlight as their sole input. When placed on a grid-connected roof, they produce energy at the site of consumption, avoiding the inevitable losses of grid transmission. They can help utilities meet broader demand by feeding unused electricity into the grid, especially in summer, when solar is humming and electricity needs run high. This "net metering" arrangement, selling excess electricity back to the grid, can make solar panels financially feasible for homeowners, offsetting the electricity they buy at night or when the sun is not shining.

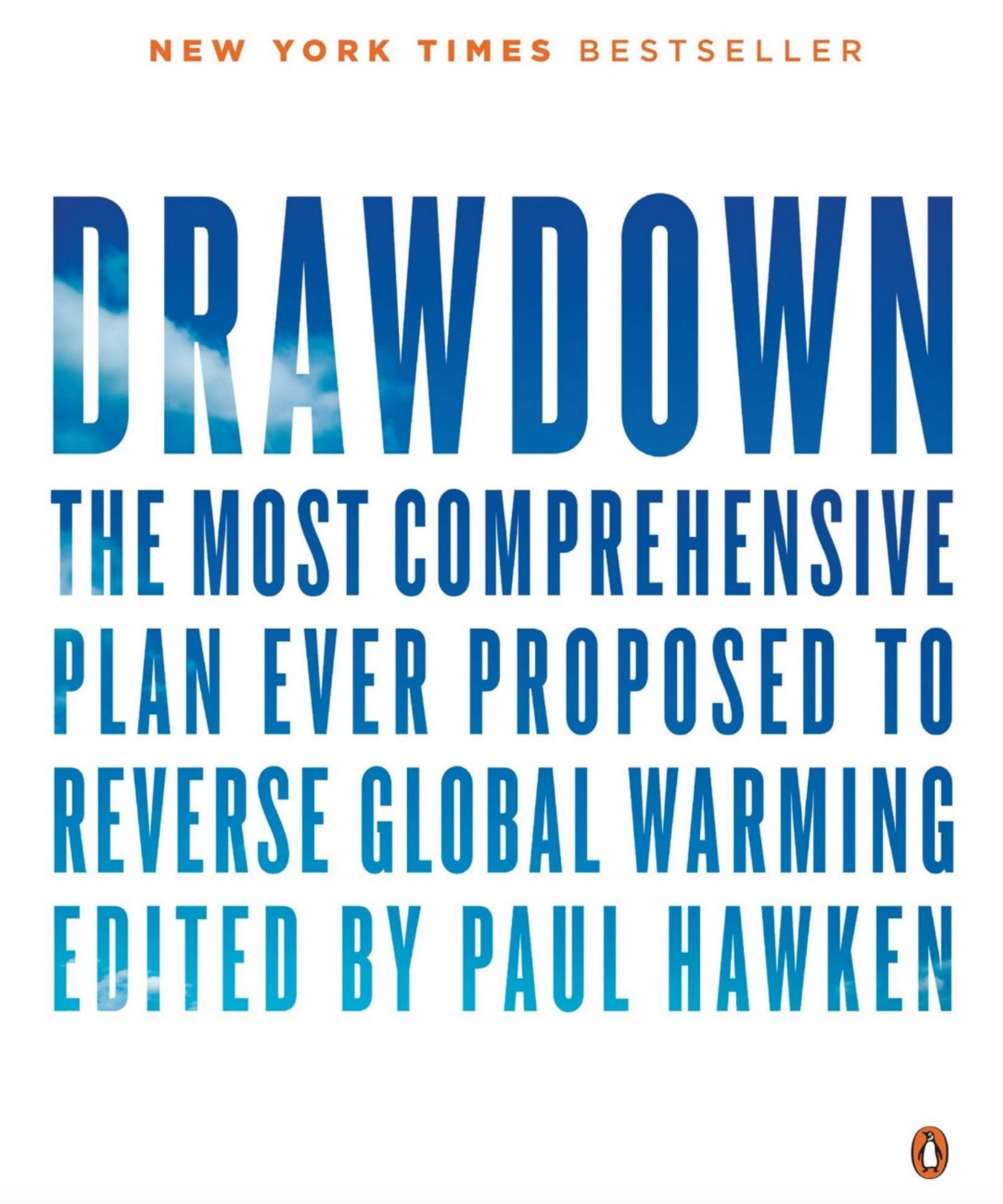
Numerous studies show that the financial benefit of rooftop PV runs both ways. By having it as part of an energy-generation portfolio, utilities can avoid the capital costs of additional coal or gas plants, for which their customers would otherwise have to pay, and broader society is spared the environmental and public health impacts. Added PV supply at times of highest electricity demand can also curb the use of expensive and polluting peak generators. Some utilities reject this proposition and posit contradictory claims of rooftop PV being a "free rider," as they aim to block the rise of distributed solar and its impact on their revenue and profitability. Others accept its inevitability and are trying to shift their business models accordingly. For all involved, the need for a grid "commons" continues, so utilities, regulators, and stakeholders of all stripes are evolving approaches to cover that cost.

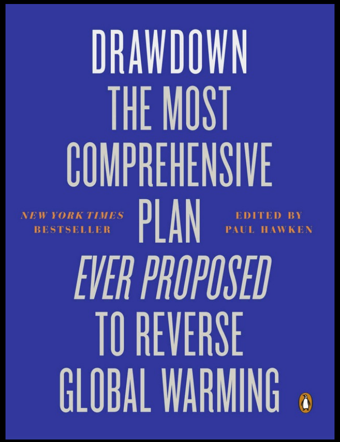
The first solar array installed by Charles Fritts in 1884 in New York City. Fritts built the first solar panels in 1881, reporting that the current was "continuous, constant and of considerable force not only by exposure to sunlight but also to dim, diffused daylight, and even to lamplight."

Off the grid, rooftop panels can bring electricity to rural parts of low-income countries. Just as mobile phones leapfrogged installation of landlines and made communication more democratic, solar systems eliminate the need for large-scale, centralized power grids. High-income countries dominated investment in distributed solar until 2014, but now countries such as Chile, China, India, and South Africa have joined in. It means rooftop PV is accelerating access to affordable, clean electricity and thereby becoming a powerful tool for eliminating poverty. It is also creating jobs and energizing local economies. In Bangladesh alone, those 3.6 million home solar systems have generated 115,000 direct jobs and 50,000 more downstream.

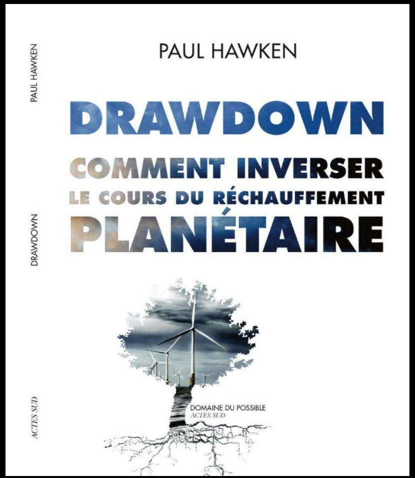
Since the late nineteenth century, human beings in many places have relied on centralized plants that burn fossil fuels and send electricity out to a system of cables, towers, and poles. As households adopt rooftop solar (increasingly accompanied and enabled by distributed energy storage), they transform generation and its ownership, shifting away from utility monopolies and making power production their own. As electric vehicles also spread, "gassing up" can be done at home, supplanting oil companies. With producer and user as one, energy gets democratized. Charles Fritts had this vision in the 1880s, as he looked out over the roofscape of New York City. Today, that vision is increasingly coming to fruition.

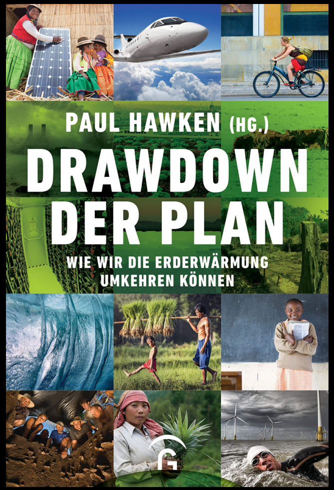
IMPACT: *Our analysis assumes rooftop solar PV can grow from .4 percent of electricity generation globally to 7 percent by 2050. That growth can avoid 24.6 gigatons of emissions. We assume an implementation cost of $1,883 per kilowatt, dropping to $627 per kilowatt by 2050. Over three decades, the technology could save $3.4 trillion in home energy costs.*

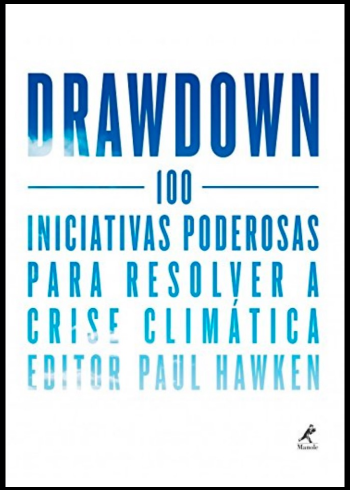

NEW YORK TIMES BESTSELLER
DRAWDOWN
THE MOST COMPREHENSIVE PLAN EVER PROPOSED TO REVERSE GLOBAL WARMING
EDITED BY PAUL HAWKEN

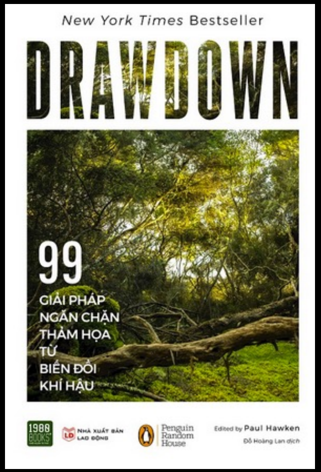

DRAWDOWN
THE MOST COMPREHENSIVE PLAN EVER PROPOSED TO REVERSE GLOBAL WARMING
NEW YORK TIMES BESTSELLER
EDITED BY PAUL HAWKEN

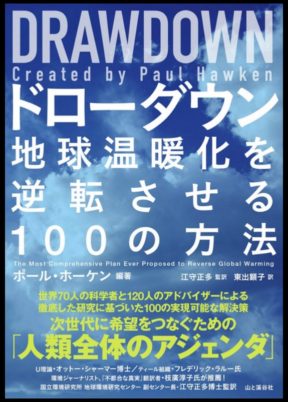

反轉
地球暖化
100招
DRAWDOWN
中文世界第一本對抗全球暖化全方位指南
減少碳排放從你我開始做起


PAUL HAWKEN
DRAWDOWN
COMMENT INVERSER
LE COURS DU RÉCHAUFFEMENT
PLANÉTAIRE
DOMAINE DU POSSIBLE
ACTES SUD


PAUL HAWKEN (HG.)
DRAWDOWN
DER PLAN
WIE WIR DIE ERDERWÄRMUNG
UMKEHREN KÖNNEN


DRAWDOWN
100
INICIATIVAS PODEROSAS
PARA RESOLVER A
CRISE CLIMÁTICA
EDITOR PAUL HAWKEN
Manole


New York Times Bestseller
DRAWDOWN
99
GIẢI PHÁP
NGĂN CHẶN
THẢM HỌA
TỪ
BIẾN ĐỔI
KHÍ HẬU
Edited by Paul Hawken

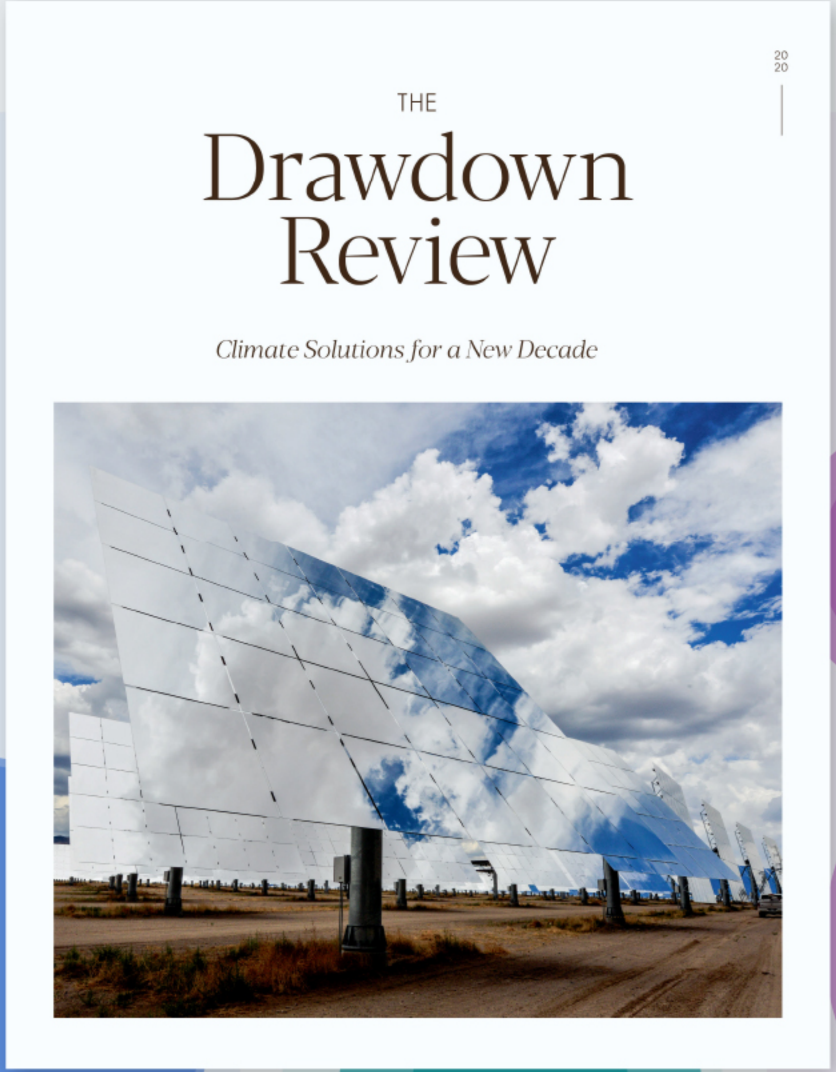

DRAWDOWN
Created by Paul Hawken
ドローダウン
地球温暖化を
逆転させる
100の方法
ポール・ホーケン 編著
世界70人の科学者と120人のアドバイザーによる
徹底した研究に基づいた100の実現可能な解決策
次世代に希望をつなぐための
「人類全体のアジェンダ」

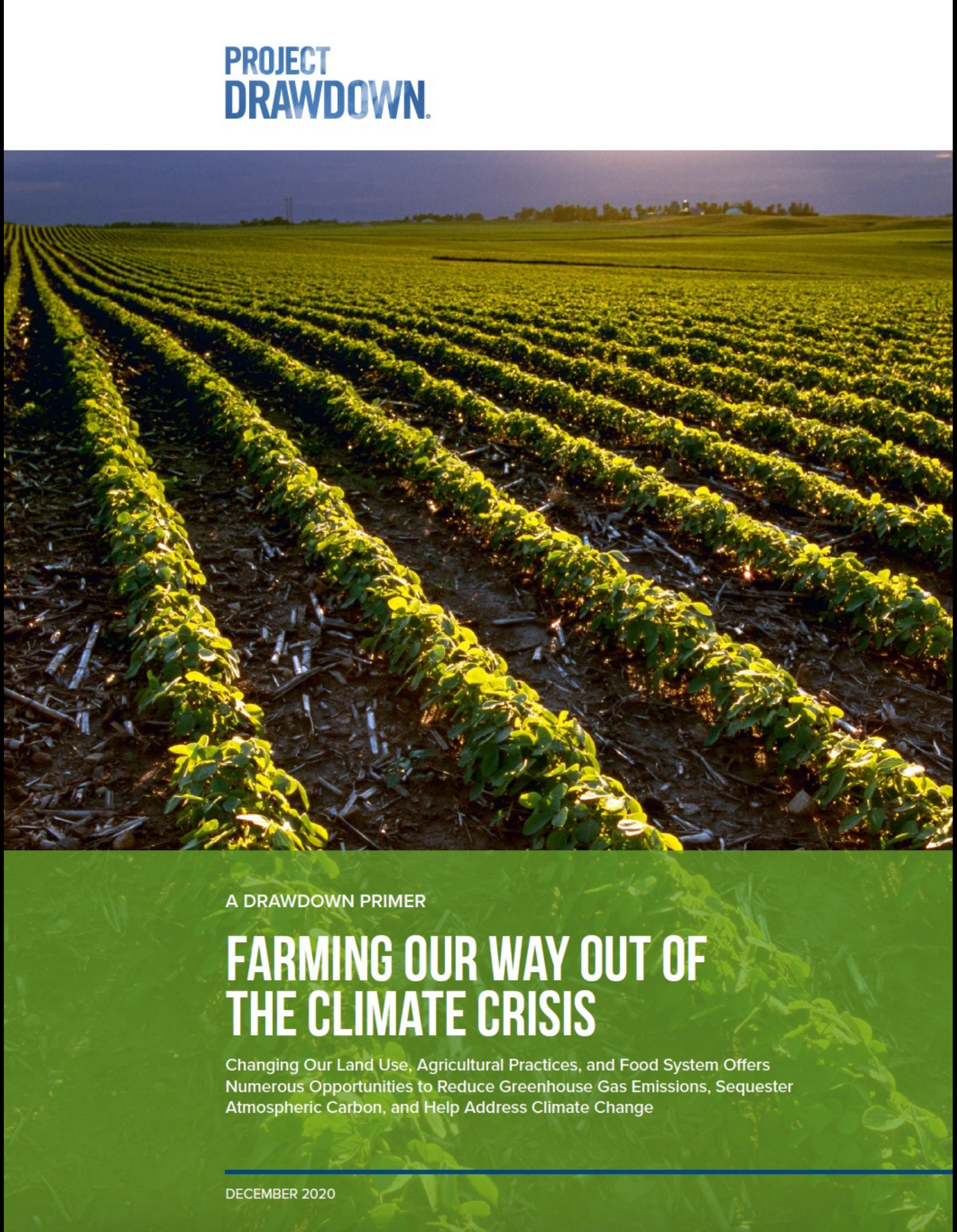

WERELDWIJD SUCCES, NEW YORK TIMES BESTSELLER
DRAWDOWN
HET MEEST
VEELOMVATTENDE PLAN
OOIT
OM KLIMAATONTWRICHTING
TE KEREN
SAMENGESTELD DOOR PAUL HAWKEN
ACT NOW


PAUL HAWKEN
VISSZAFORDÍTHATÓ
100 HATÉKONY
MEGOLDÁS
A KLÍMAKATASZTRÓFA
MEGÁLLÍTÁSÁHOZ

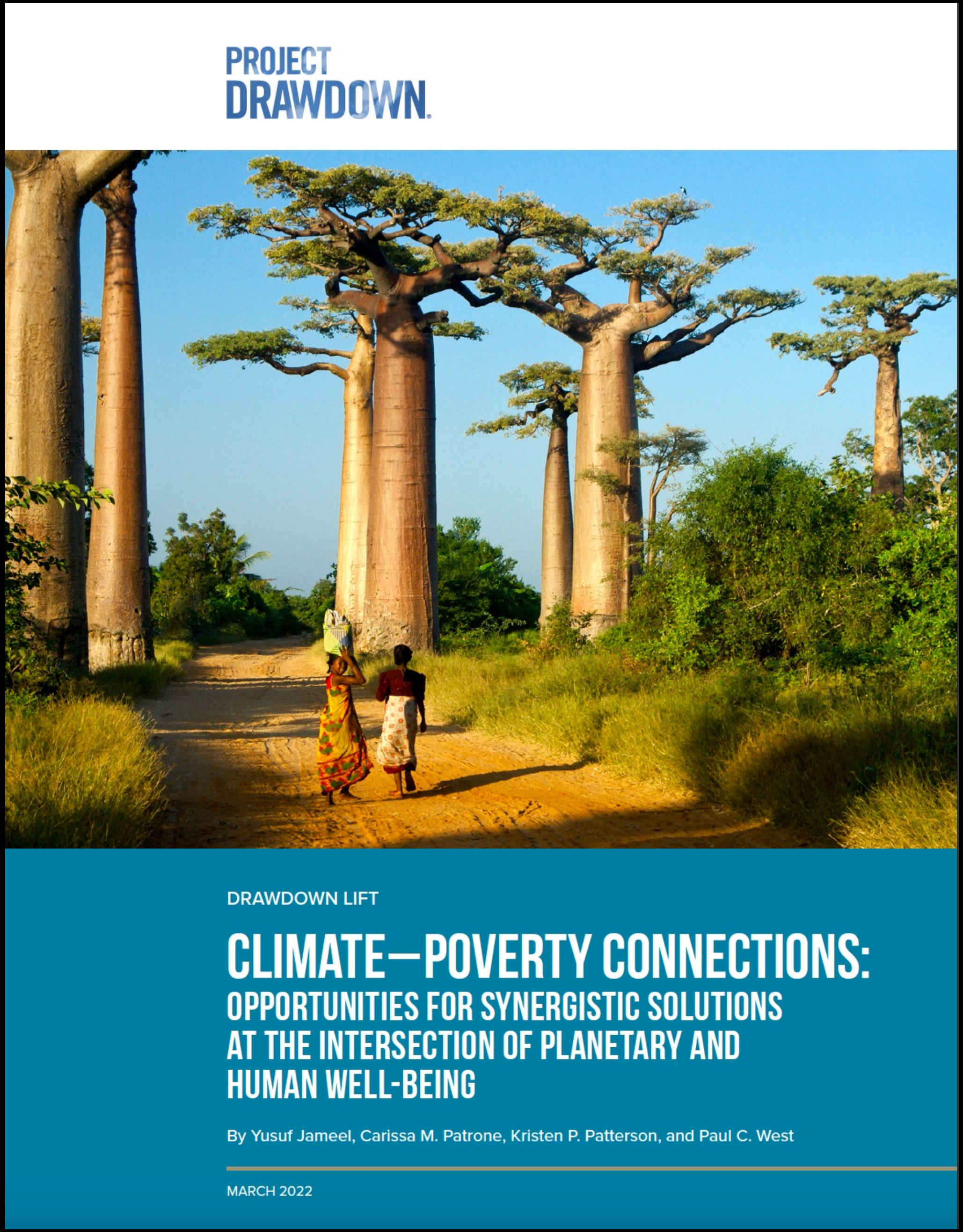
DRAWDOWN 2020

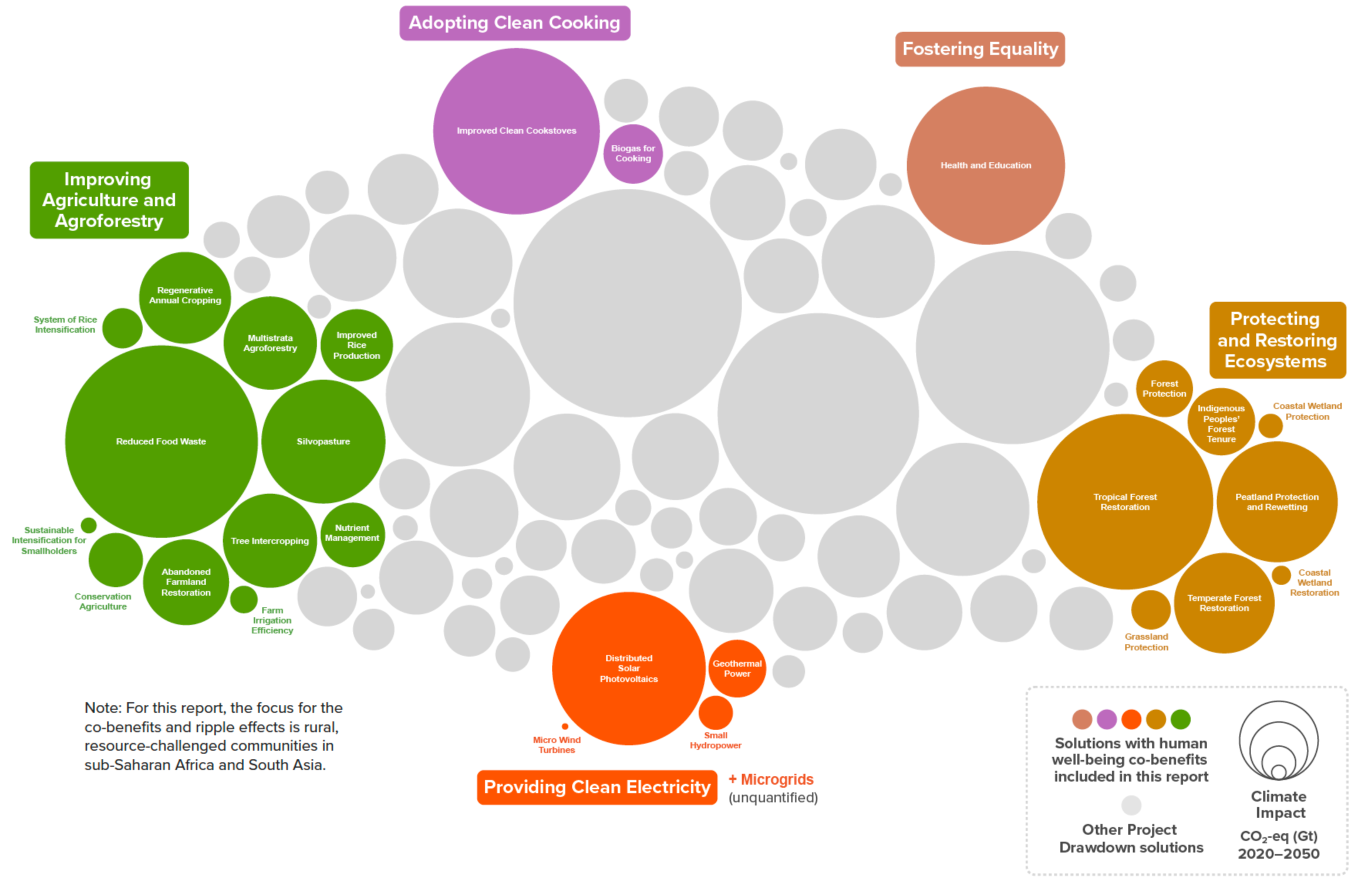
THE LATEST
CLIMATE SOLUTIONS
RESEARCH +
INSIGHTS





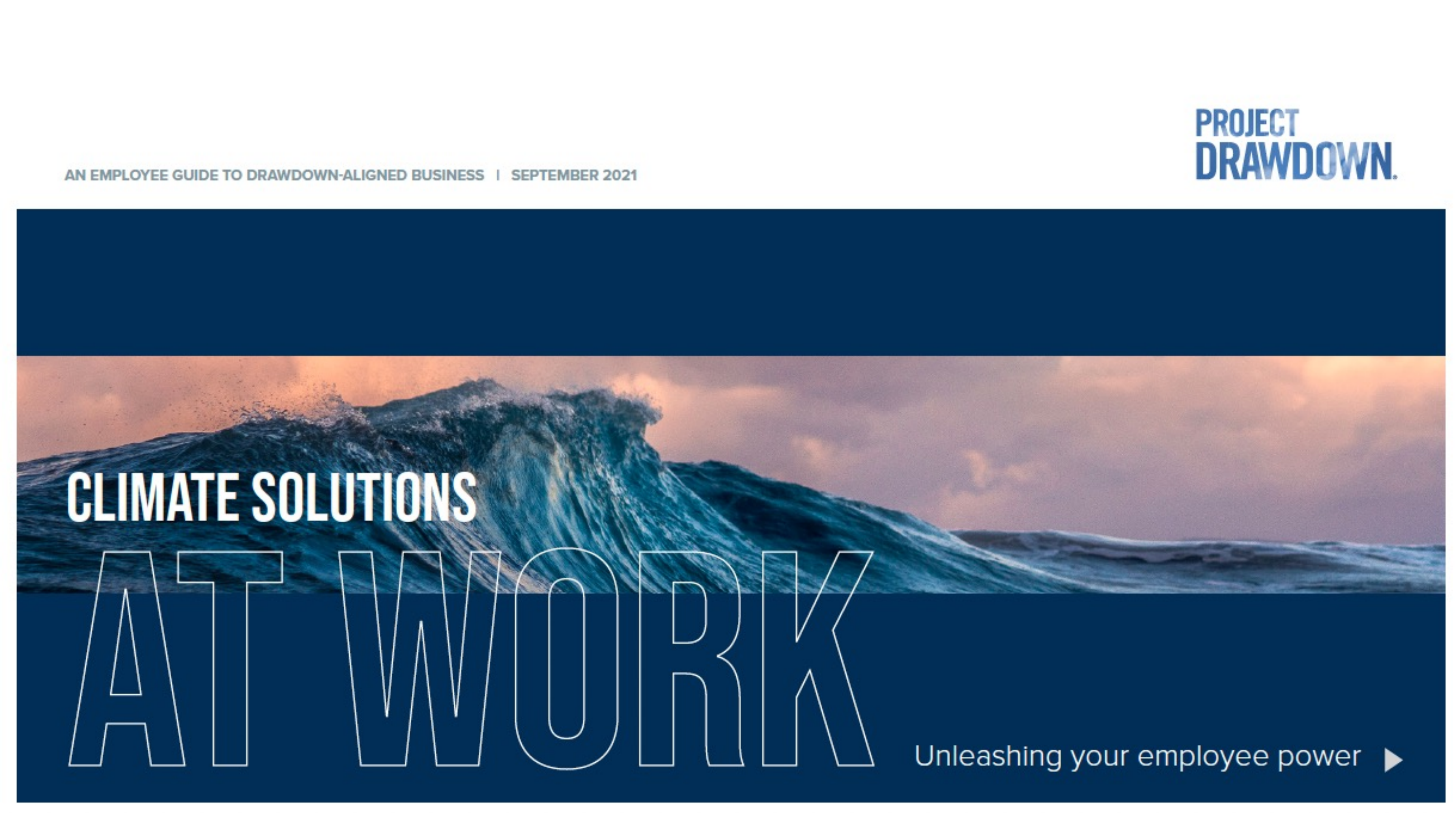
“Farming Our Way Out of the Climate Crisis” details and quantifies the planet-healing potential of land use, agricultural practices, and food systems.





Of the 80-plus solutions in the Project Drawdown framework, 28 have clear well-being co-benefits for rural populations in LMICs. See Project Drawdown for in-depth information and technical reports for each solution.

“Every job is a Climate job”



THE DRAWDOWN-ALIGNED BUSINESS FRAMEWORK

This framework highlights key leverage points and climate actions that all businesses must tap to help the world achieve drawdown quickly, safely, and equitably.

To be drawdown-aligned, companies must apply their social, political, financial, and employee power to scaling climate solutions we have in-hand today.

EMISSIONS REDUCTIONS

- Accelerate goals, include interim targets, and phase out use of offsets
- Use carbon removal technology as a last resort and only for unavoidable emissions
- Address supply chain and historical emissions
- Institutionalize emissions reduction efforts
- Embed climate justice

CLIMATE DISCLOSURES

- Publicly disclose climate-related risk and support mandatory disclosure standards

STAKEHOLDER ENGAGEMENT AND COLLABORATION

- Engage employees on climate action
- Create pathways for every job to be a climate job
- Ensure the board is climate-competent
- Engage and support local communities

CLIMATE POLICY ADVOCACY

- Use influence to advocate for climate policy at all levels of government
- Align political contributions
- Focus lobbying dollars on just climate solutions
- Push trade associations to align

PRODUCTS, PARTNERSHIPS, AND PROCUREMENT

- Ensure products and partnerships don't serve bad climate actors
- Require suppliers to adopt science-based emissions reductions targets
- Prioritize circularity and low carbon materials

BUSINESS MODEL TRANSFORMATION

- Embed climate considerations into every part of the business
- Focus business model on scaling climate solutions, phase out parts of the business that are incompatible

INVESTMENTS AND FINANCING

- Offer employees climate-friendly retirement plans and investment opportunities
- Push banks and asset managers to align investments with the Paris Agreement
- Pressure insurance companies to stop underwriting and investing in carbon-intensive projects

LONG-TERM THINKING

- Value long-term thinking over short-term profit and prioritize building a just climate future for all

WE ARE THE RE-GENERATION !


ACHIEVING

DRAWDOWN

João Pedro Gouveia, PhD, jplg@fct.unl.pt — @joaopgouveia

Senior Researcher CENSE, Invited Professor NOVA School of Science and Technology, NOVA University of Lisbon