Jacobs Challenging today. Reinventing tomorrow.

Decarbonization Throughout the Value Chain – Perspectives from the Tech Sector

In the kNOW Webinar Series

September 25, 2020

CLIMATE WEEK NYC

About Jacobs

FOCUS AREAS

CUTTING-EDGE MANUFACTURING

MISSION-CRITICAL OUTCOMES

OPERATIONAL ADVANCEMENT

RESILIENT ENVIRONMENTS

SCIENTIFIC DISCOVERY

THRIVING CITIES

BY THE NUMBERS

40+
COUNTRIES

55K+
TALENT FORCE

400
OFFICES

23.8M
METRIC TONNES CO_2 AVOIDED FOR CLIENTS

$2.5B
IN CLIENT SAVINGS

$13B
ANNUAL REVENUE

$22.5B
IN BACKLOG

2020 *Engineering News-Record* Rankings

#1 – Design Firm

#1 – Semiconductors

#1 – Data Centers

#2 – Environmental

Agenda

- Moderator: **Sharon Jean-Baptiste**, Vice President for Growth & Sales at Jacobs
- **Jameson Morrell**, Director of Sustainable Solutions at Jacobs will discuss decarbonization at Jacobs
- **Andy Solberg**, Global Technology Lead, Facility Modelling & Analytics at Jacobs will talk about decarbonization throughout the value chain
- **Joshua Parker**, Assistant General Counsel and Head of Sustainability at **Western Digital** will discuss emissions management in tech manufacturing
- **Sean James**, Director of Energy Research at **Microsoft** will talk about investing and piloting new clean energy technology for datacenters
- **Q&A**

Limiting global warming to 1.5°C above pre-industrial levels will require businesses and industries to look beyond their own direct emissions.

Partnering across value chains in every sector is critical to ensuring lifecycle decarbonization and achieving sustainable outcomes.

Decarbonization at Jacobs

Jameson Morrell, Director of
Sustainable Solutions at Jacobs

Jacobs

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Climate Action Plan

1. 100% renewable energy for our operations in 2020.
2. Net zero carbon for our operations and business travel in 2020.
3. Carbon negative for our operations and business travel by 2030.

Working across the Technology Value Chain

Energy	Materials	Air	Security	Data Center
Power	Components	Land	Operations	Waste
Mining	Hardware	Water	EHS	Remediation
Chemical	Software	Transport	Compliance	Re-use

Our biggest impact, lowering carbon here.

Scope 3

Many value chain companies will likely need to set a Scope 3 target.

Most common categories:

- Purchased Goods and Services; and
- Use of Sold Products.

Source: sciencebasedtargets.org

Our Approach

To decarbonize requires collaboration & engagement inside each organization and across the value chain on multiple levels:

- **Continuous Improvement -** ongoing effort to improve products, services, and processes.
- **Innovation** – developing new capabilities, technologies, & opportunities
- **Ideation** – finding solutions that go beyond business-as-usual
- **Influence** – drawing board, completely shifting the way we do business.

Benefit: positive feedback mechanisms in the value chain.

How do we increase the value of decarbonization?

Account for justice and equity, kind of like a “Scope 4”.

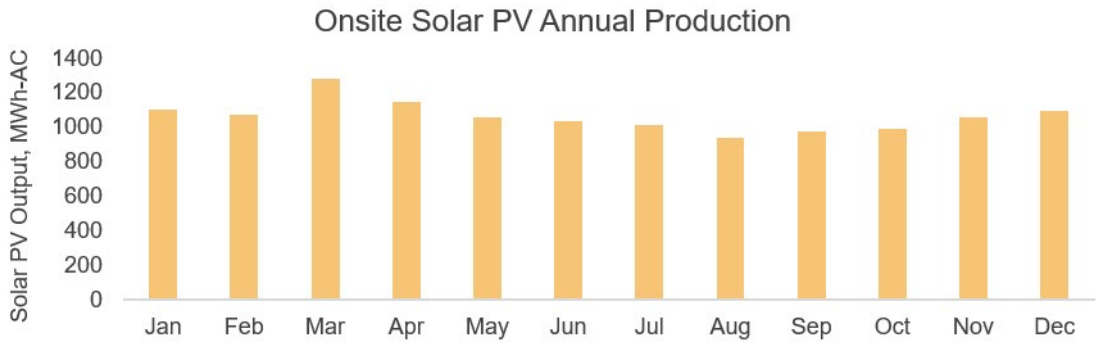
- Deliver advancements in equity and social justice (ESJ)
- Integrate economic evaluation, ESJ, and sustainability to develop to project goals, objectives and a prioritization frameworks for decarbonization projects
- Conduct equity analyses, integrate major site elements, and measure capital investment, all through sustainable and ESJ lenses

Approach Matrix

Scope / Channel	Improvement	Innovation	Ideation	Influence
Suppliers (Scope 3)	Measure Supplier Performance	Track Performance	Reward Performance	Next Generation Products/Suppliers?
Operations (Scope 1)	Resource Efficiency	Bio-fuel, Alternative Chemistry	AI/IoT Optimization	Sustainable Technologies?
Energy Supply (Scope 2)	Renewable Energy	Hydrogen	Integrated Siting	Distributed Energy?
Product Use (Scope 3)	Life-Cycle Analysis	Capture Program	Circular Economy	New Product Sets?
Justice & Equity “Scope 4”	Education/Capacity	Measure Impact	Community-defined Metrics	Local Partnerships?

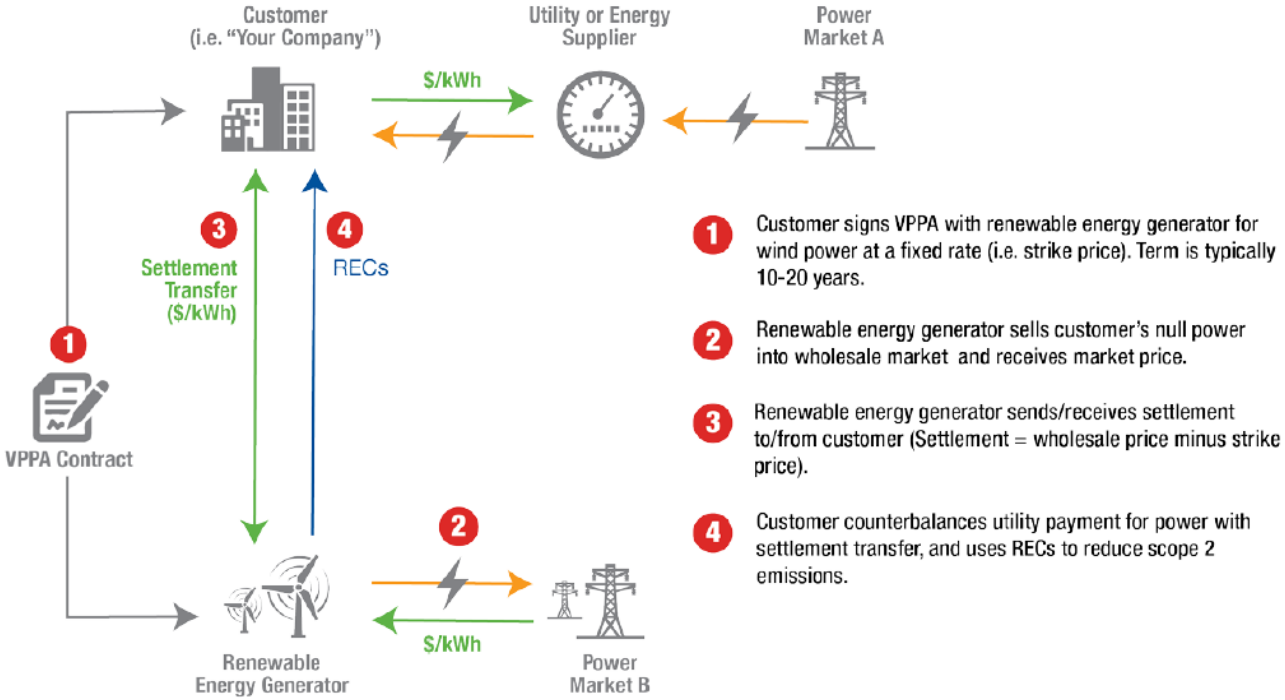
Continuous Improvement: Renewable Energy

- On-site Potential



Local solar PV capacity factor is 16.7%

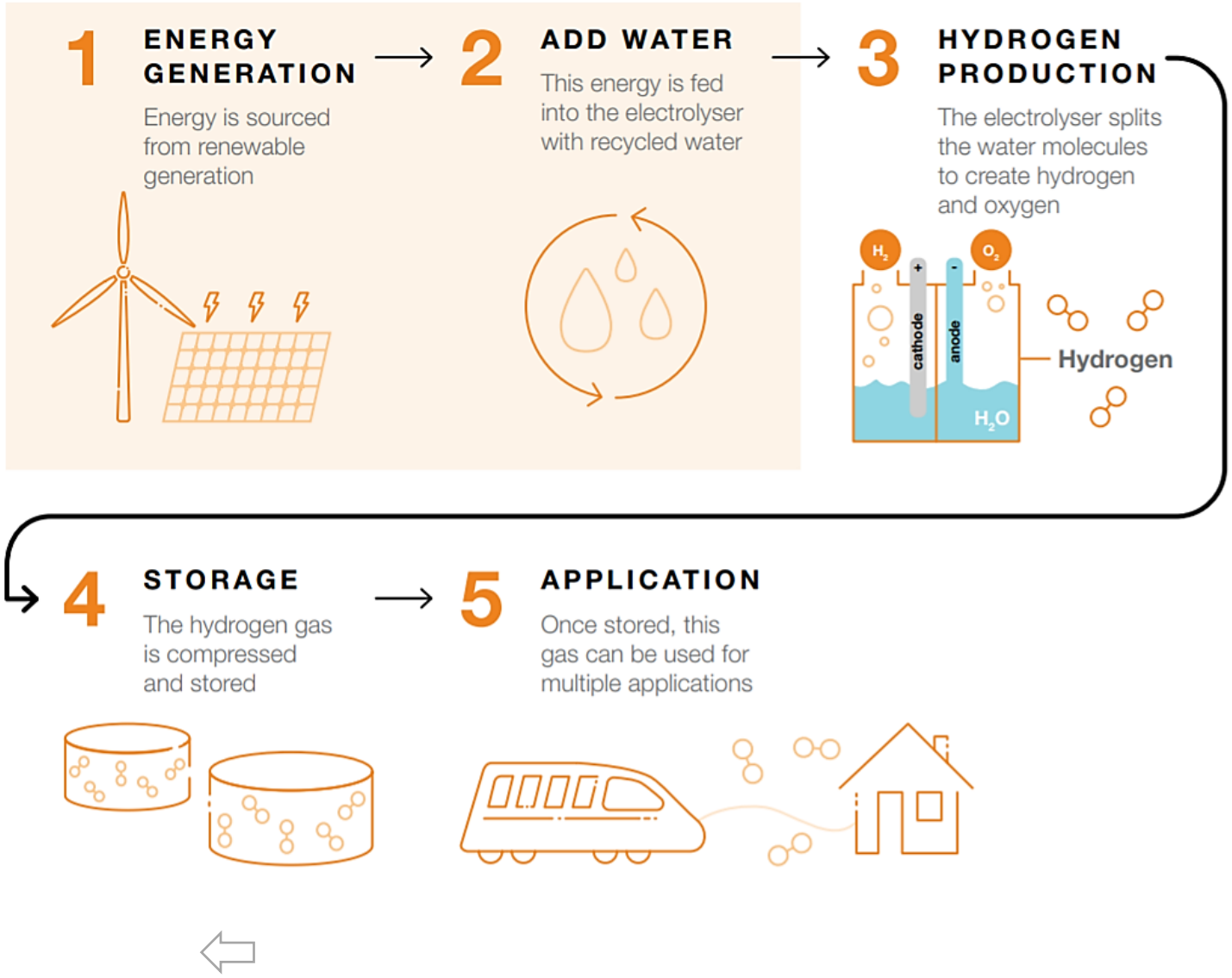
- Off-site Power Purchase Agreement Model



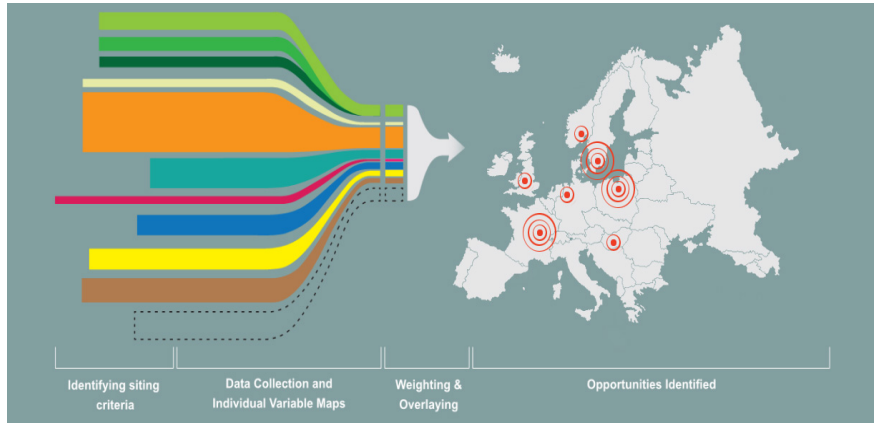
Source: EPA Green Power Partnership

Innovation: Hydrogen

- Regenerative infrastructure and circular economy
- Zero emissions (air and water)
- Integrate energy and water
- Renewable energy with hydrogen
- 24/7 resilient operations
- New revenue streams
- Community building and social values



Ideation: Integrated Site Selection with GIS Risk Management

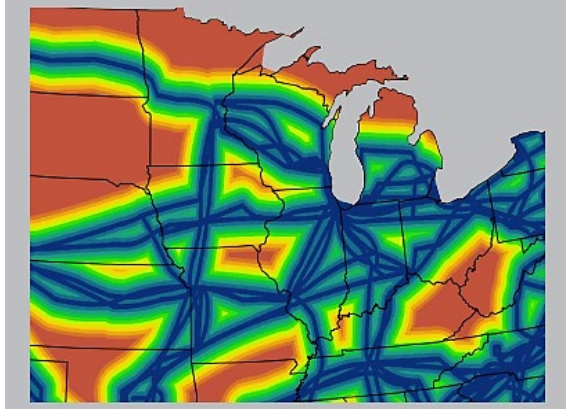


Construction Costs	Network Connectivity
Operating Labor Costs	Road, Rail, Air Transportation Infrastructure
Renewable Energy Resources	Environmental and Regulatory Restrictions
Incentives & Special Enterprise Zones	Weather, Geology, Environmental Factors
Workforce Availability & Qualifications	Risk to Infrastructure
Corporate, Personal, and Property Taxes	Land or Building Costs
Utility Rates	Proximity to Raw Materials & Markets
Logistics and Transportation	Special Environmental Zones, Protected Species

FIBER CONNECTIVITY

Second in importance only to electricity, data centers require access to reliable, redundant, and high capacity fiber connections.

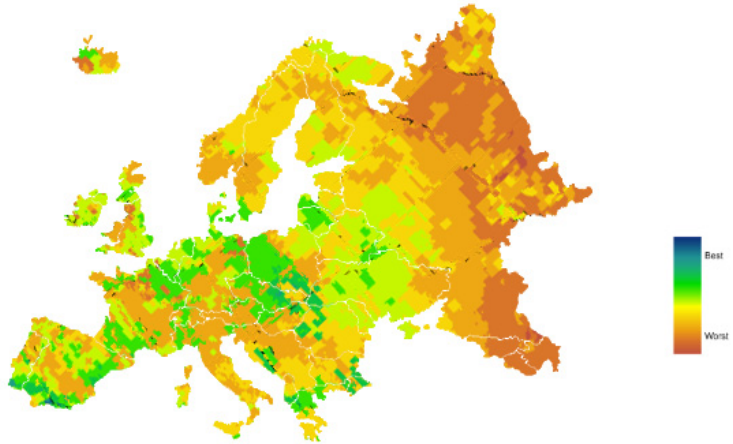
In this map layer, we used data of long haul fiber to show the redundancy of major fiber routes. The map layer to the left shows which areas in the U.S. have access to redundant long haul network resources. Other or more specific network criteria and/or geographic reach are also possible.



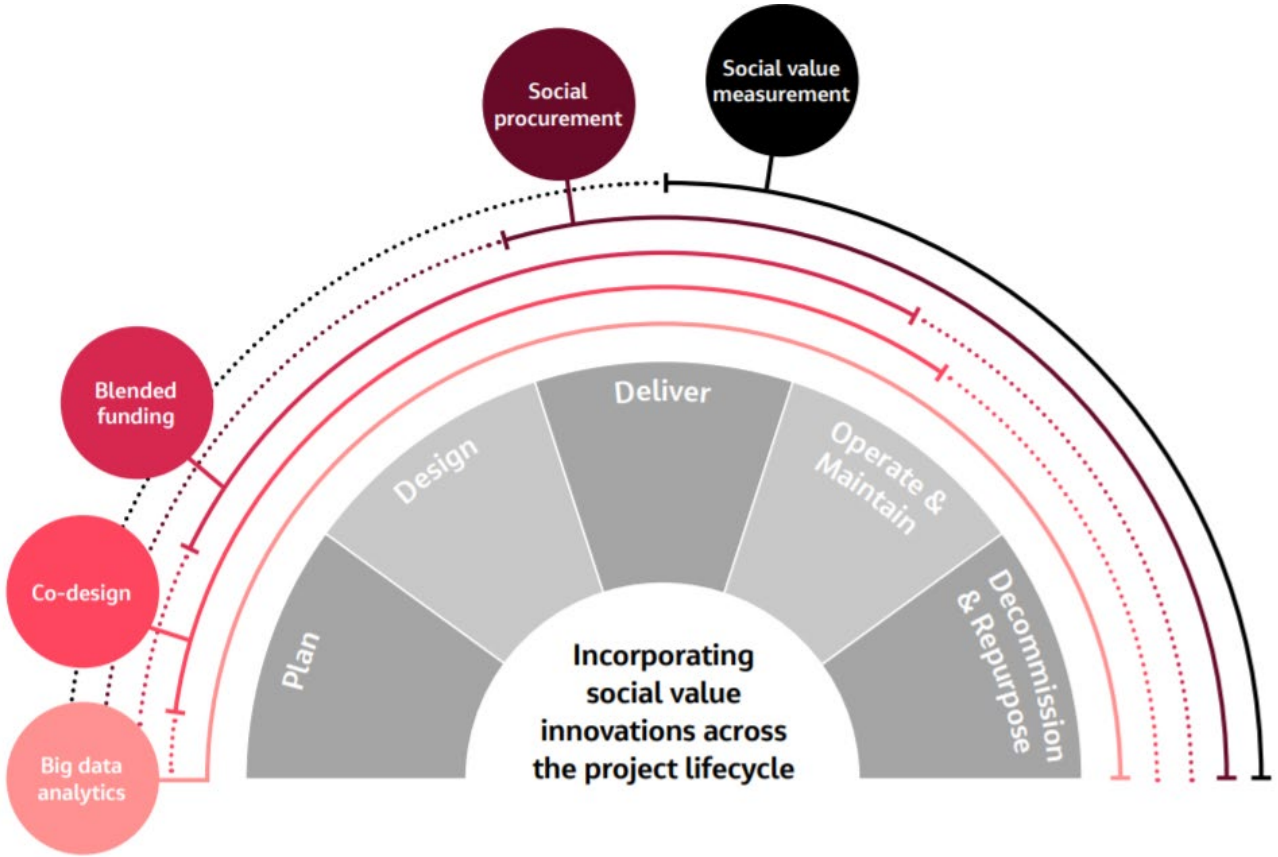
Analysis of the same data (above) shows distance to long haul network capacity in a specific region.

Datacenter Site Selection Criteria	Scenario 1	Scenario 2
Electric Power	2.00	3.00
Rates	0.75	0.75
Reliability	1.00	1.50
Green Power Availability	0.25	0.75
Population Density	0.10	0.10
Fiber Optics	0.90	0.90
Industrial Risks	0.75	1.00
Renewable Resource Potential	0.20	0.20

Scenario 1



Influence: Creating Social Value in Decarbonization Projects



Community wellbeing
Connectedness, cohesion and safety

Equality and equity
Including justice and fairness

Housing
Affordability and choice

Mobility
Accessibility and choice

Work
Security, availability and meaning

Physical and mental health

Access to vital services
Food, water, energy and health

Learn more at simetrica.co.uk

Decarbonization Throughout the Value Chain

Andy Solberg, Global Technology Lead
Facility Modeling & Analytics at Jacobs

Jacobs

Challenging today.
Reinventing tomorrow.

Climate Action - Tech Sector Leadership

"This generation owes it to the next generation to address climate change . . . The time to act is very narrow, and shrinking as we go."
- *Sundar Pichai, CEO of Google and Alphabet*

- Since 2007, carbon neutral for company operations
- Since 2017, 100% renewable energy for global operations
- Immediately eliminate legacy carbon emissions
- Enable 5 GW or carbon-free energy for manufacturing
- By 2030, Operate 24/7 on carbon free energy

"Climate change is real and we all share a responsibility to fight it. We will never waver, because we know that future generations depend on us."
- *Tim Cook, CEO of Apple*

- Since 2014, 100% renewable energy for data centers
- Since 2017, 100% renewable energy for global operations
- By 2030, carbon neutral — from supply chain to the power you use in every device we make.

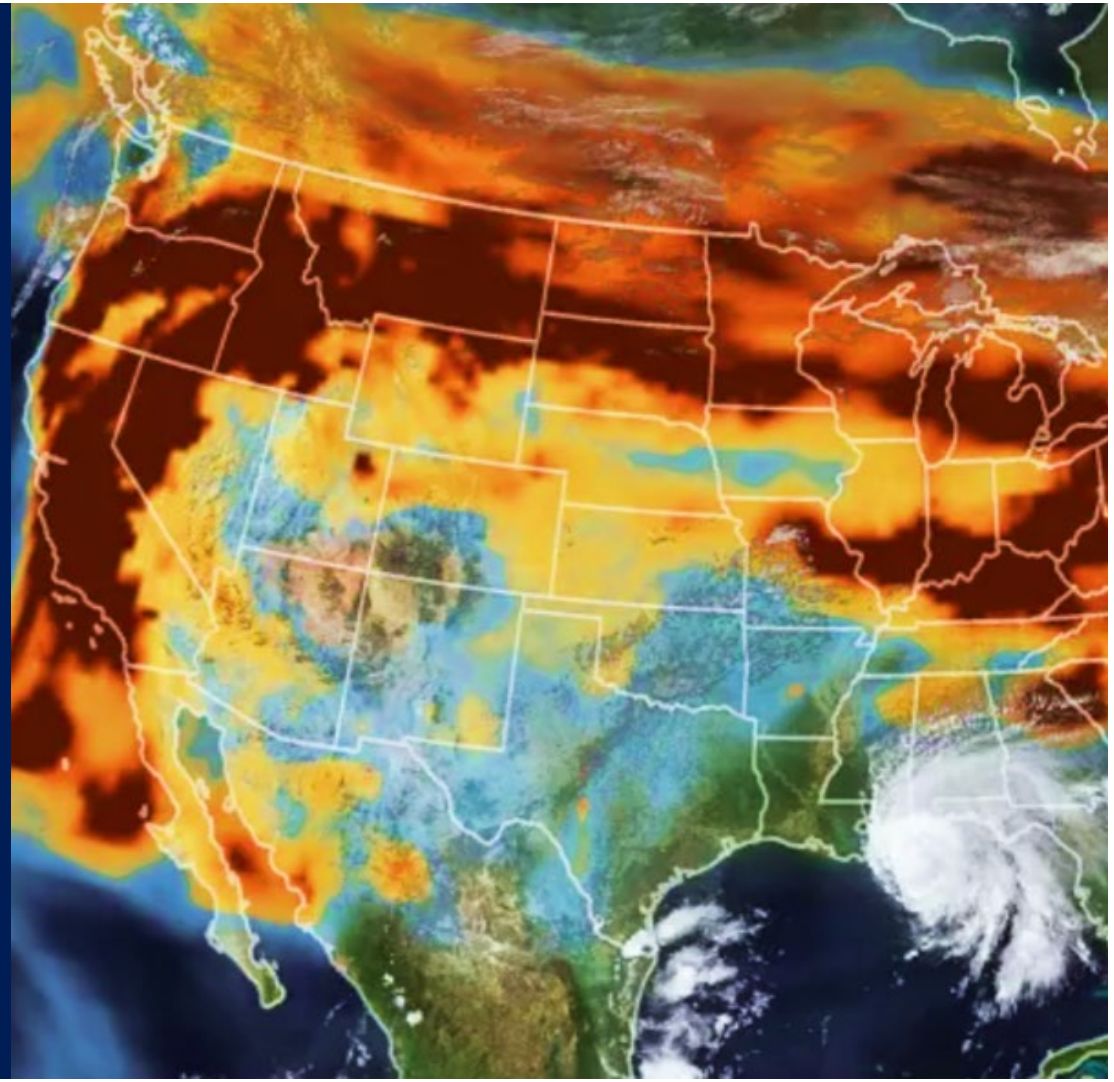
"The world's climate experts agree that the world must take urgent action to bring down emissions. Ultimately, we must reach "net zero" emissions, meaning that humanity must remove as much carbon as it emits each year."
- *Satya Nadella, CEO of Microsoft*

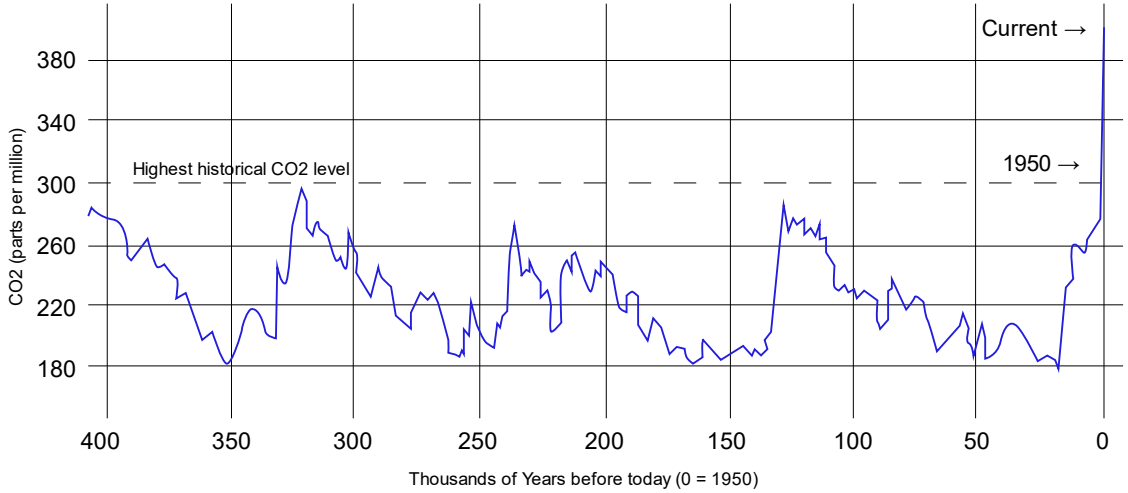
- By 2025, 100% Renewable Energy
- By 2030, carbon negative for company's value chain
- By 2050, removal of historical carbon footprint by 2050

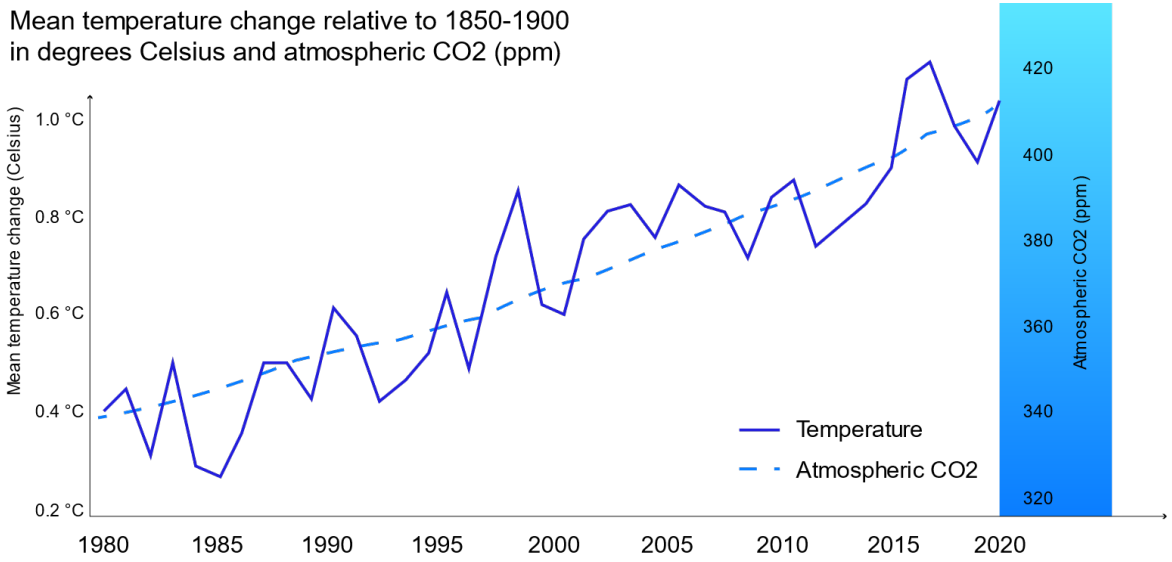
"Climate change is a crisis we will only be able to address if we all work together on a global scale and Facebook is committed to playing its part and helping to inspire real action in our community."
- *Mark Zuckerberg, CEO of Facebook*

- By 2020, net zero GHG emissions for global operations
- By 2030, net zero emissions for company's value chain

Why - The Climate Crisis

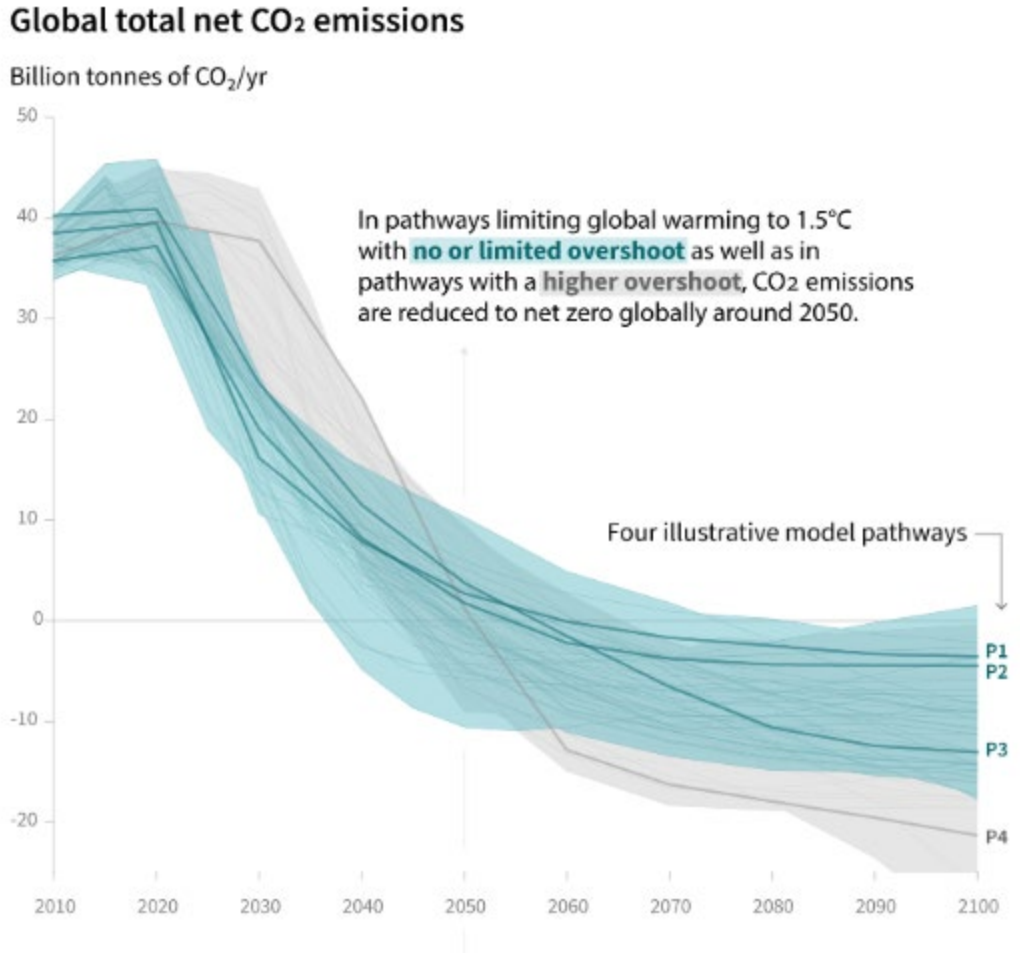


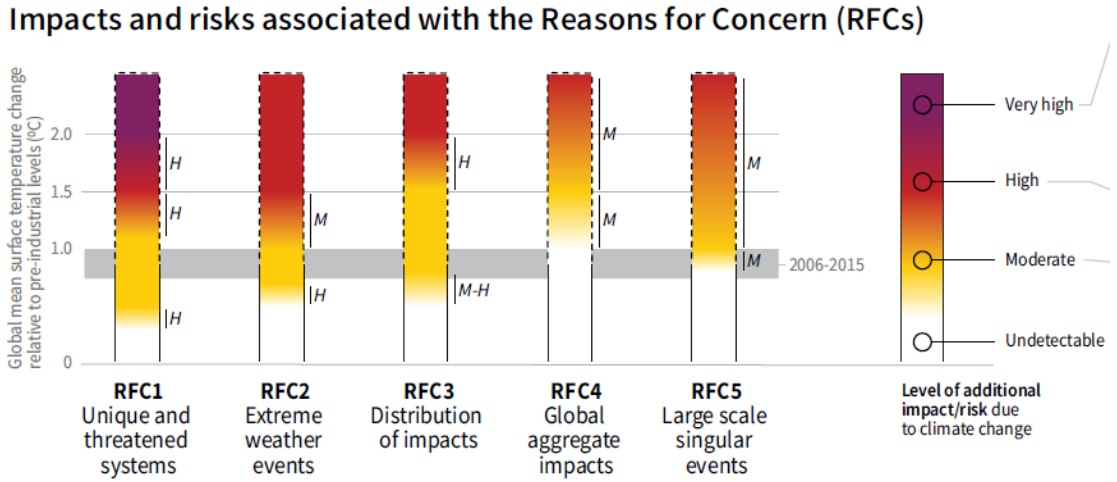




Source: NOAA – National Climate Data Center

When- Timing of Net Zero CO_2



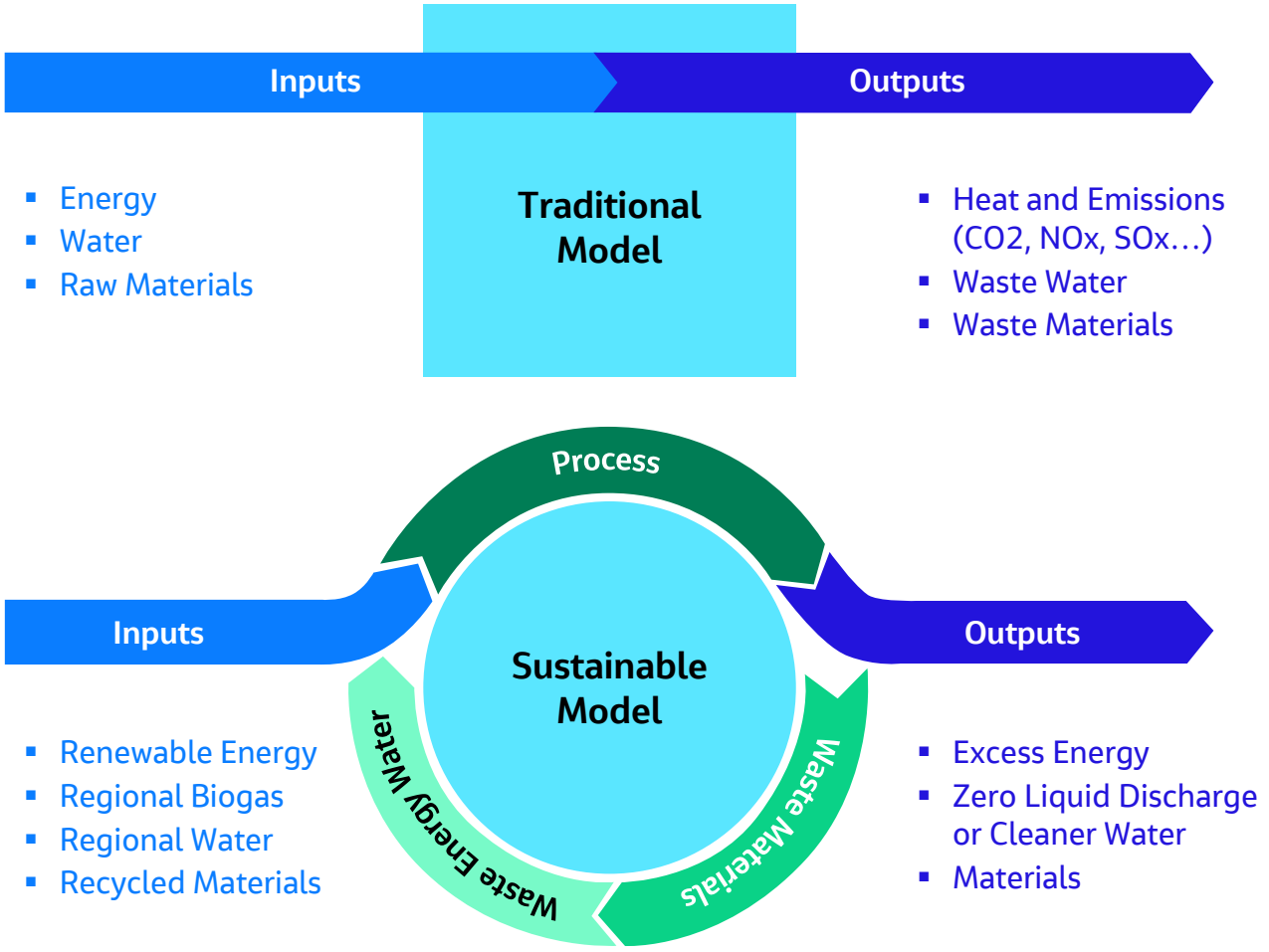


Source: Intergovernmental Panel on Climate Change (IPCC) Summary for Policymakers

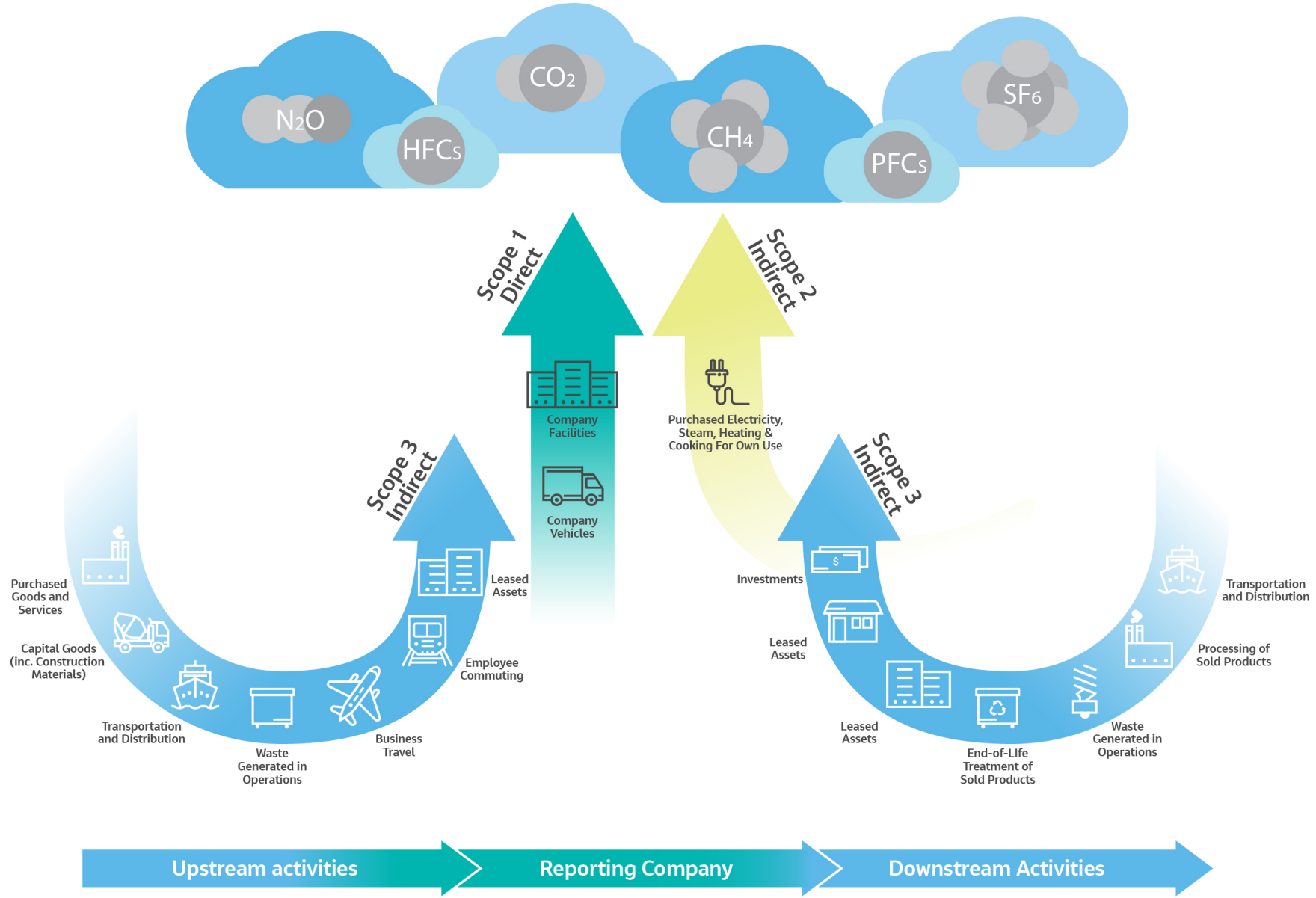
Sustainability, Circularity, and Carbon Neutrality

The common thread of **Sustainability** is a transparent balance of resource use at various scales including personal, corporate, community, regional and country levels. Inputs must equal outputs for system to be sustainable.

In the case of Carbon Neutrality, or net zero carbon, carbon dioxide emissions are balanced with carbon removal.



GHG Emissions – Language of Carbon Neutrality



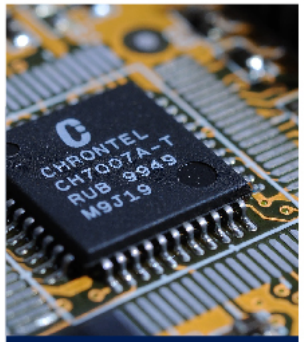
Electronics Value Chain

Scope 3 | *Scope 1 and 2* | *Scope 3*

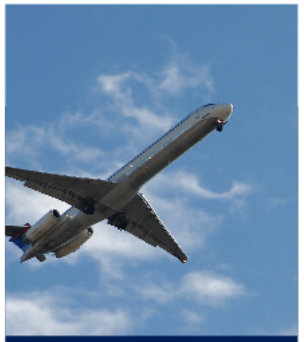
UPSTREAM ACTIVITIES | **COMPANY OPERATIONS** | **DOWNSTREAM ACTIVITIES**

INPUTS: ENERGY, WATER, MATERIALS, LABOR

Extraction



Manufacturing & Assembly



Transport

USE

Disposal

End-of-life

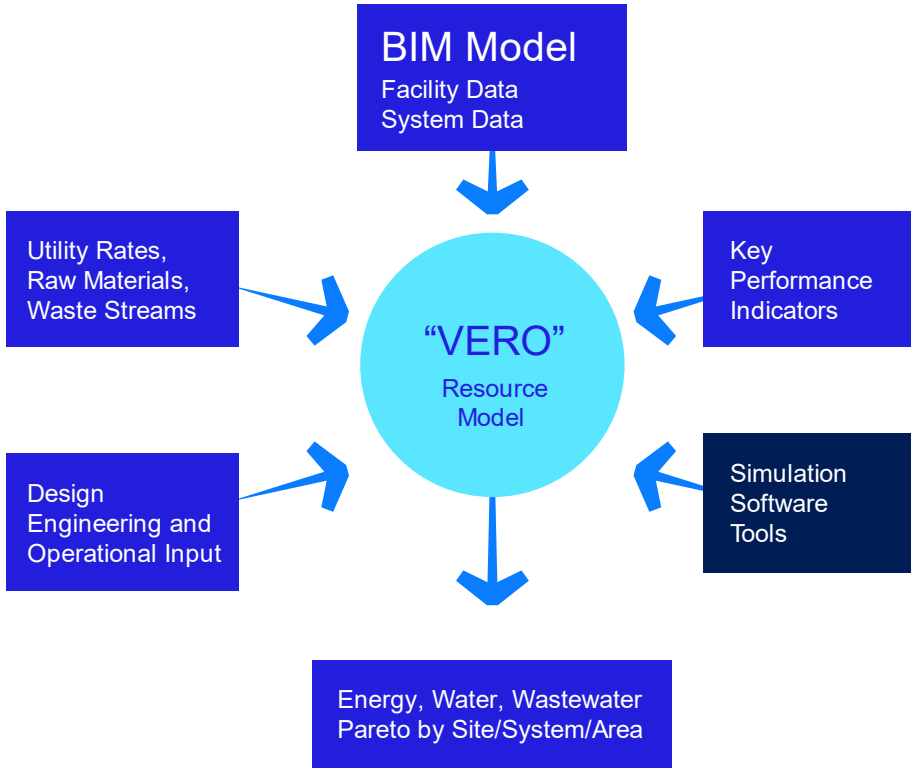
Mining, manufacturing, assembly and packaging account for **85% to 95%** of a smart phone's annual carbon footprint.

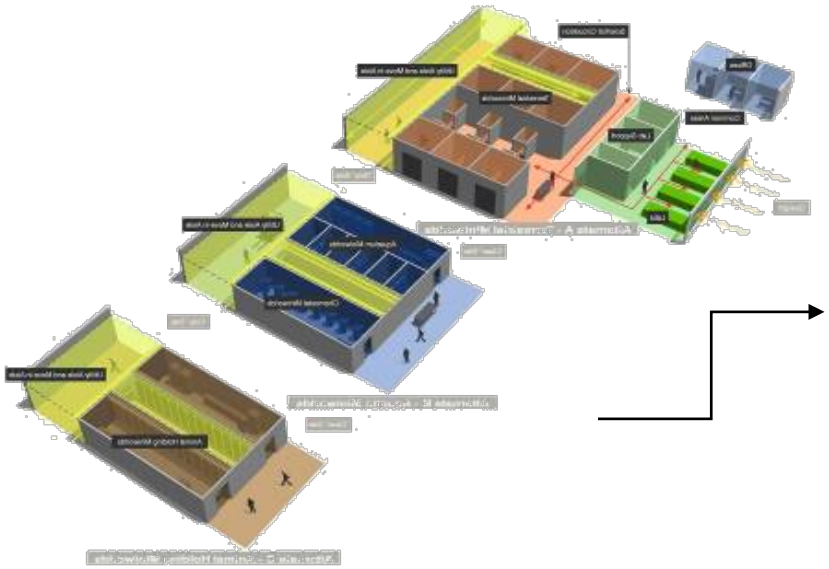
Telecom infrastructure, data centers, and charging are about 2/3rd of ICT emissions.

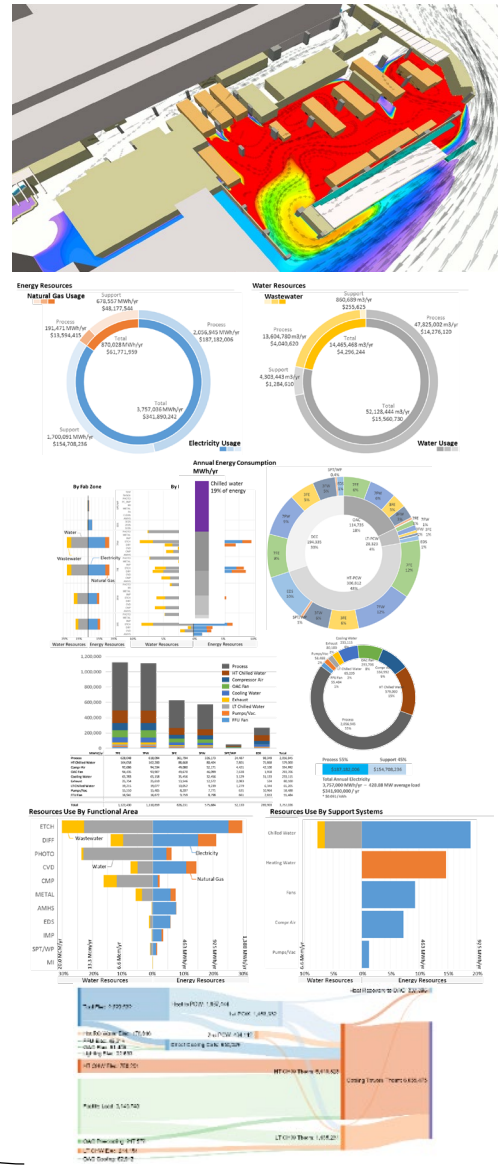
Average life span of a smart phone is **2 years.**

Less than 1% of smart phones are recycled.

Measure, Model, Monitor…Improve



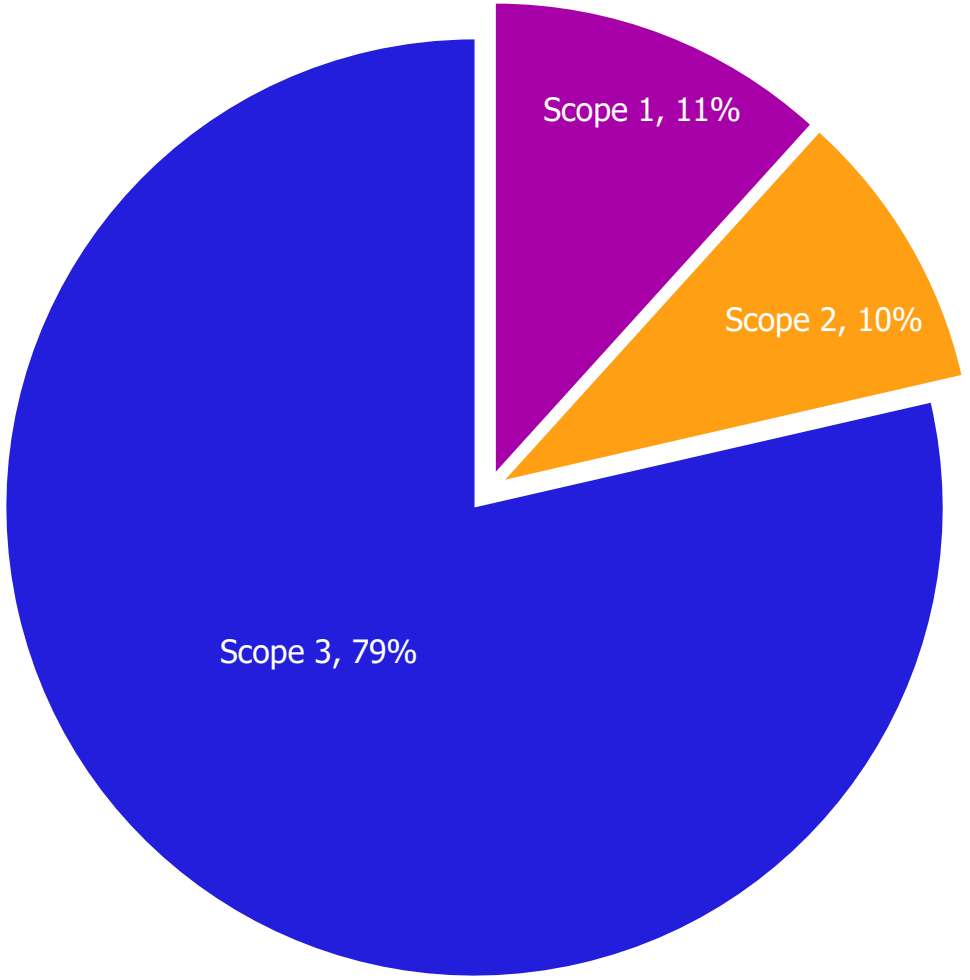




BIM Model = Facility Digital Twin
VERO Model = Performance Digital Twin

Scope 3 (Supply Chain)

- Scope 3 is often the largest source of emissions
- Focusing on Scope 1 and 2 emissions could exclude significant emission sources
- From WRI corporate inventories completed, scope 3 emission account for 79% of a company's total emission on average



Moving Forward Together

© Daniel Biber, Germany, Shortlist, Professional, Natural World & Wildlife, 2018 Sony World Photography Awards

Western Digital®

No Small Task: Emissions Management in Tech Manufacturing

September 2020

Josh Parker
Sr. Director, Corporate Sustainability

Forward-looking Statements

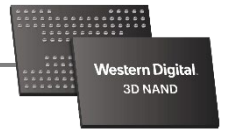
Safe Harbor | Disclaimers

This presentation contains forward-looking statements that involve risks and uncertainties, including, but not limited to, statements regarding our sustainability initiatives, product and technology portfolio and data growth and its drivers. Forward-looking statements should not be read as a guarantee of future performance or results, and will not necessarily be accurate indications of the times at, or by, which such performance or results will be achieved, if at all. Forward-looking statements are subject to risks and uncertainties that could cause actual performance or results to differ materially from those expressed in or suggested by the forward-looking statements.

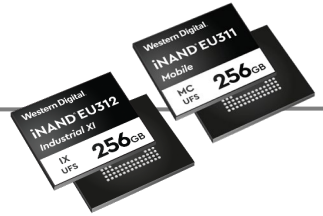
Key risks and uncertainties include future responses to and effects of the COVID-19 pandemic; volatility in global economic conditions; business conditions and growth in the storage ecosystem; impact of restructuring activities and cost saving initiatives; impact of competitive products and pricing; market acceptance and cost of commodity materials and specialized product components; actions by competitors; unexpected advances in competing technologies; our development and introduction of products based on new technologies and expansion into new data storage markets; risks associated with acquisitions, divestitures, mergers and joint ventures; difficulties or delays in manufacturing; and the outcome of legal proceedings. More information about the risks and uncertainties that could affect our business are listed in our filings with the Securities and Exchange Commission (the "SEC") and available on the SEC's website at www.sec.gov, including our most recently filed periodic report, to which your attention is directed. We do not undertake any obligation to publicly update or revise any forward-looking statement, whether as a result of new information, future developments or otherwise, except as required by law.

Western Digital at a Glance: Breadth and Depth

Solutions to capture, preserve, access and transform data

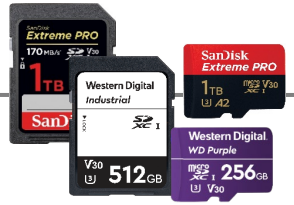


NAND Components



Embedded Flash Devices

NVMe-oF™ * Bridge ASIC



Cards

USB

Portable Storage

Capacity Enterprise HDD

Client SSD

Client+ HDD

Network Attached Storage & Personal Cloud

Direct-Attached Storage

Enterprise SSD

Memory Extension Drive

JBOD & JBOF

Storage Servers

NVMe-oF Bridge Adapter

OpenFlex™ NVMe-over-Fabric Storage

*NVMe-oF = NVMe over fabric

Western Digital's Global Presence

~65K employees worldwide

MANUFACTURING OPERATIONS

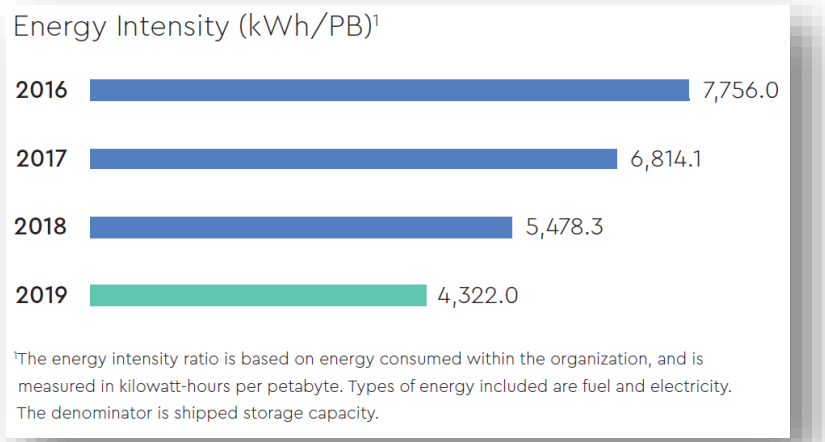
★ **San Jose, CA, USA** ***(Global HQ)***

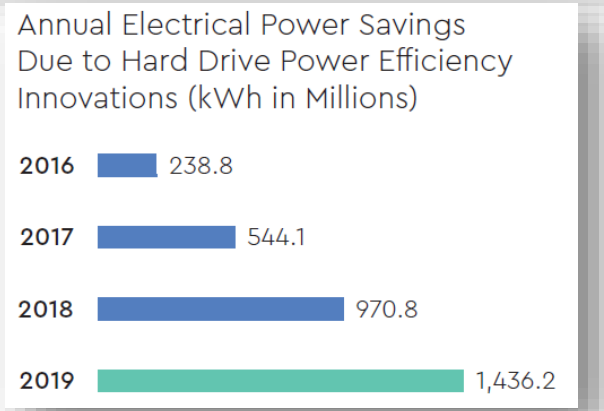
São Paulo, **Brazil**
Shanghai, **China**
Shenzhen, **China**
Yokkaichi, **Japan**
Kitakami, **Japan**
Johor, **Malaysia**
Penang, **Malaysia**
Sarawak, **Malaysia**
Laguna, **Philippines**
BangPa-In, **Thailand**
Navanakorn, **Thailand**
Prachinburi, **Thailand**
Fremont, CA, **USA**

Emissions Profile of an ICT Manufacturer

While we improve efficiency through innovation, the need for storage grows exponentially

Progress in efficiency:





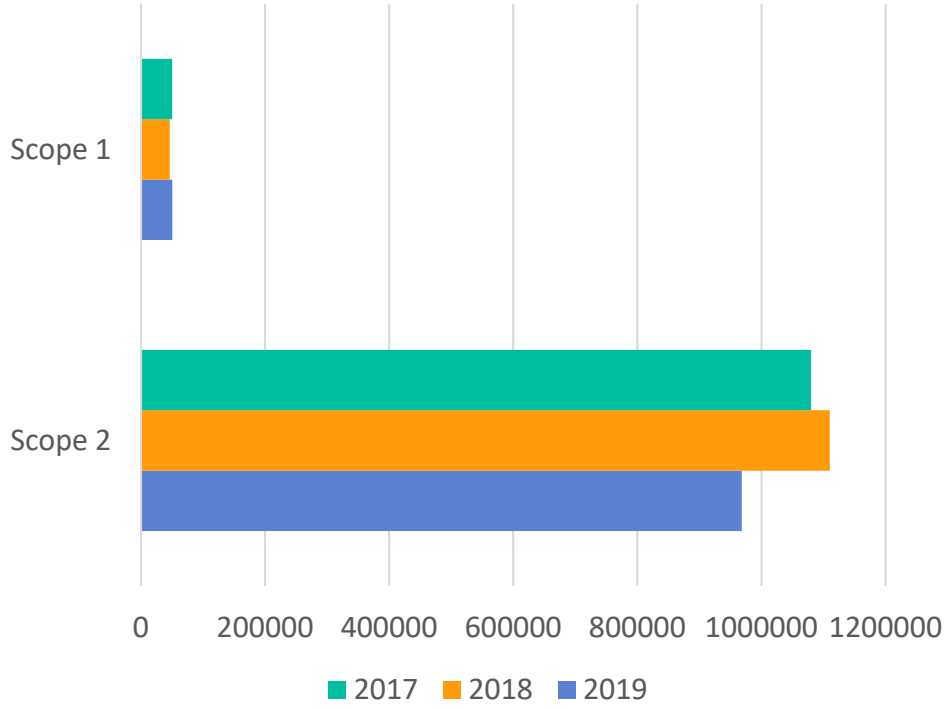
But challenges due to growth:

Sources: IDC Global DataSphere Forecast, 2019-2023: Consumer Dependence on the Enterprise Widening, January 2019, DOC #US44615319. Applied Materials, SEMICON West, AI Design Forum, July 2019. Numbers approximate.

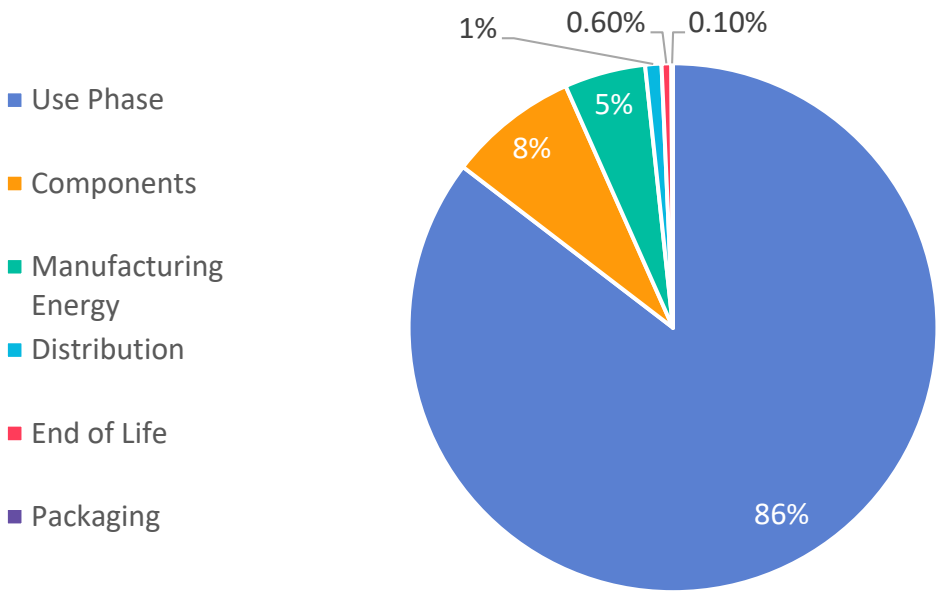
Emissions Profile of an ICT Manufacturer

Emissions progress impacted by manufacturing location, customer decarbonization

Western Digital Emissions (CO2 e-ton)



Representative Industry Product (Enterprise HDD)



- Energy usage dominates Scope 1 + 2 emissions
- But energy usage is concentrated where manufacturing occurs

- Scope 3 emissions appear likely to dominate
- Curbing use-phase emissions will require coordination with customers

The Path Forward

Most significant progress will depend on joint action

- Coordinated push for renewable energy options in common manufacturing locations
  - Broad demand can lead to infrastructure investments
- Collaborative approach to track and reduce emissions throughout the value chain, upstream and downstream
  - Standardization of GHG targets and disclosure through:
    - Disclosure: CDP, TCFD, etc.
    - Substantive rules: Science-Based Targets, etc.
    - Industry practices: Responsible Business Alliance, etc.
  - Positive pressure from customers can be beneficial, as long as realistic
- Common understanding of trends
  - Regulation
  - Consumer/customer expectations
  - Grid greening

Clean Energy Technology for Data Centers

Sean James, Director of Energy
Microsoft

Microsoft

Thank you!

Questions & Answers

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CLIMATE WEEK NYC