



The Earth And Us

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Earth - Humankind's Only Home

**“Earth Rise” as captured by Apollo 8 Astronaut,
Major General (Retd.) Bill Anders, December 24th
1968**

**Quote: “We came all this way to explore the
Moon, and the most important thing is that we
discovered the Earth”**

The Story of Borneo – my childhood home (1969-1986) (Earth's 3rd largest island, 2nd oldest rainforest 130-140 million years old)



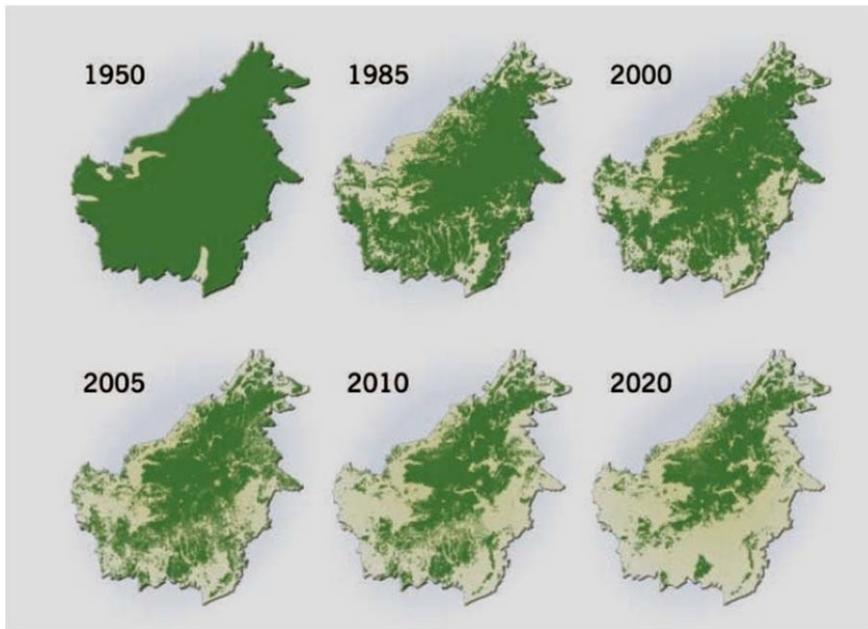
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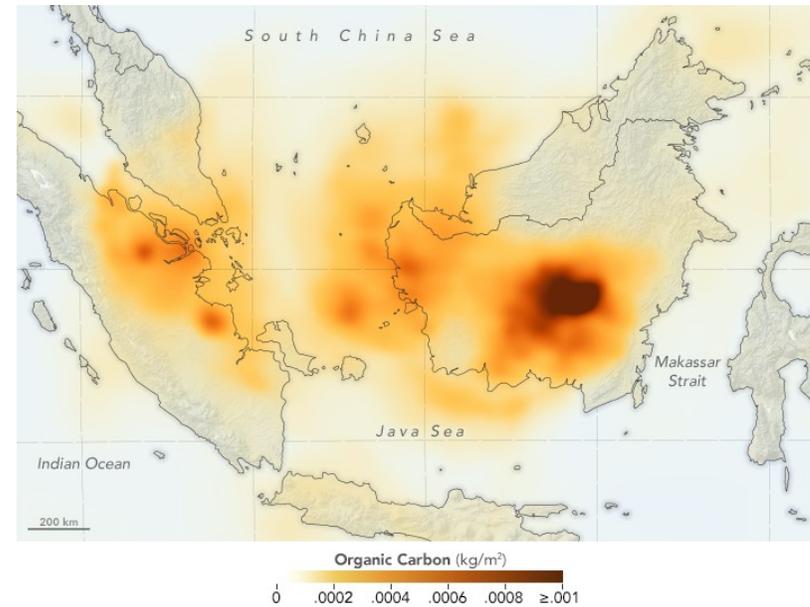
What's happened in the last 50 years ?



The Future Story of Borneo?



Borneo deforestation from 1950-2020



PM2.5 Pollution from fires in 2019 owing to the effects of Industrial Agriculture

Image Credits: Various sources on the Internet

Destruction of a pristine, biodiverse environment in my lifetime



Human Energy Demands: Growing Exponentially!

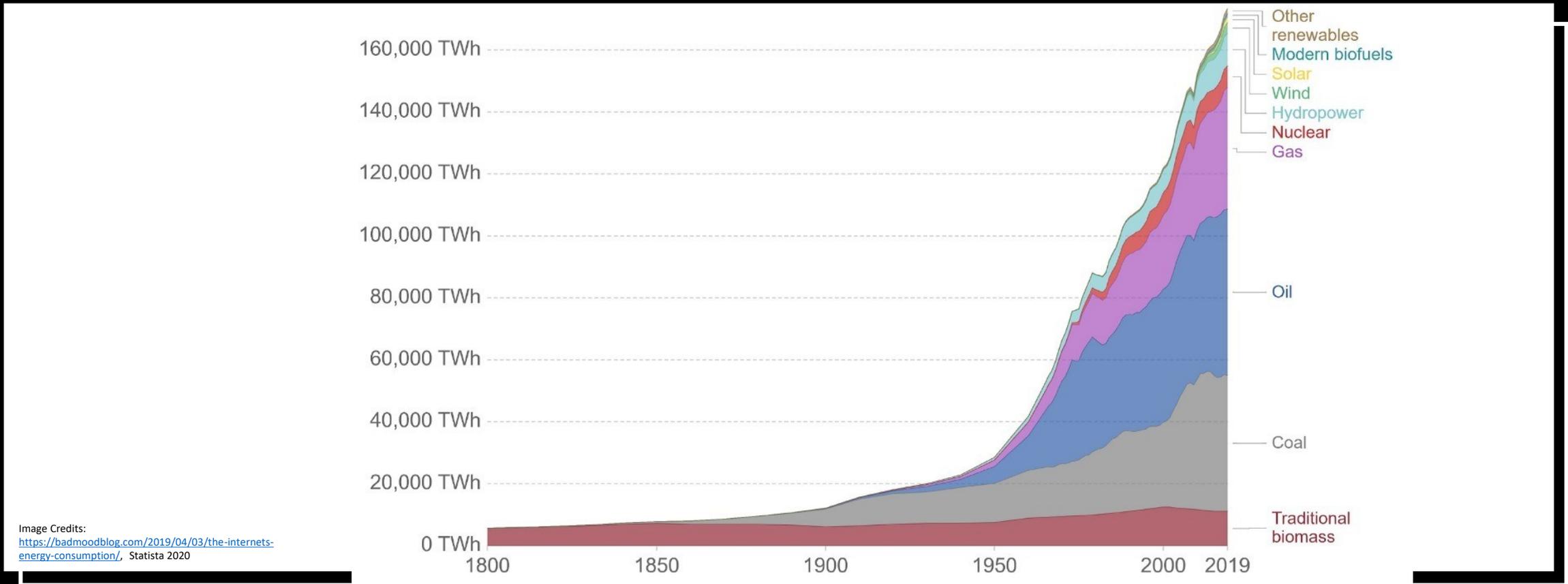
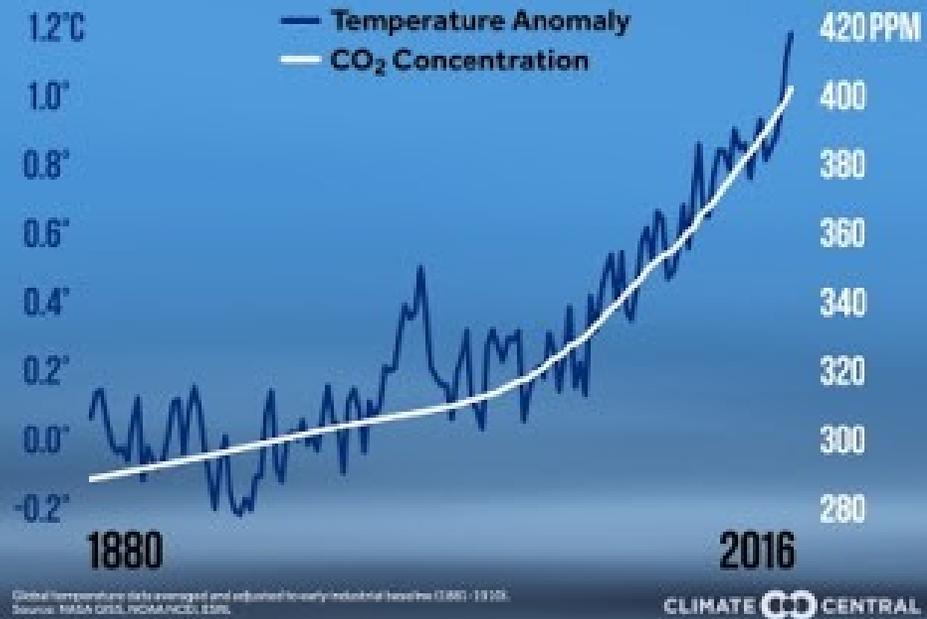


Image Credits:
<https://badmoodblog.com/2019/04/03/the-internets-energy-consumption/>, Statista 2020

Runaway Green House Gas (GHG) Concentrations

Global Temperature and Carbon Dioxide



| GHG | GWP for 100 years |
|------------------|-------------------|
| CO ₂ | 1 |
| CH ₄ | 23 |
| N ₂ O | 296 |
| HFC - 23 | 12 000 |
| HFC - 134a | 1 300 |
| SF ₆ | 22 200 |

Source: IPCC Third Assessment Report (2001).

GWP == Global Warming Potential CH₄ is 23 times more potent than CO₂

HOW CLIMATE CHANGE IMPACTS WEATHER

THE SCIENCE

CHANGES IN THE WATER CYCLE ARE INCREASING THE RISK OF DROUGHTS AND FLOODS.



Higher temperatures mean there is more evaporation from the land and sea into the atmosphere.



As air gets warmer, it can hold more water vapor. This can lead to more intense rainstorms.



Intense rainstorms increase the risk of flooding. Much of the water runs off into rivers and streams, doing little to dampen soil.



This, combined with increased temperatures, increases the risk of drought.

EVAPORATION

PRECIPITATION

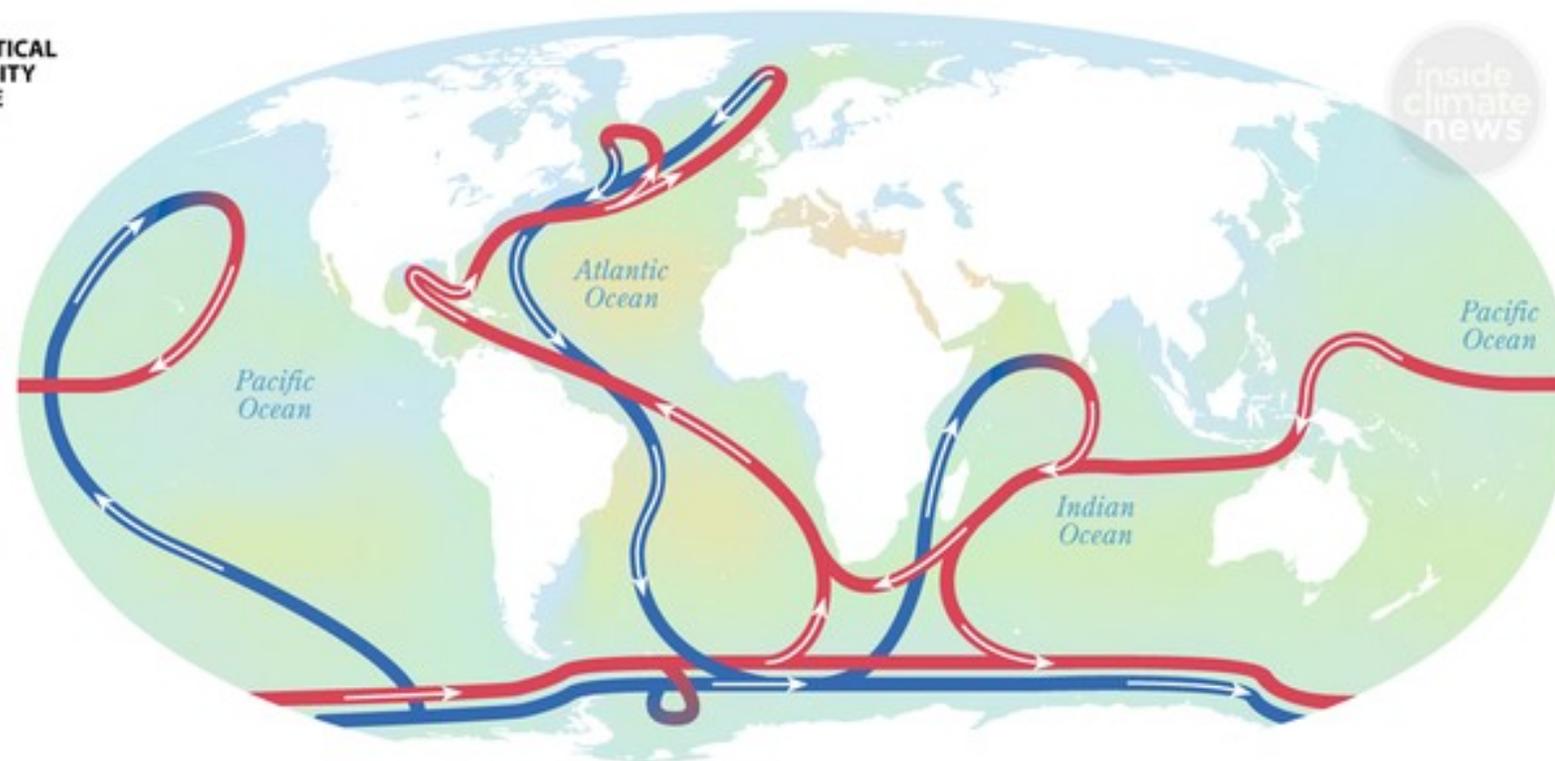


RUNOFF

Thermohaline Circulation: The Great Ocean Conveyor Belt

Currents circulate water through the world's oceans like a giant conveyor belt, carrying heat from the tropics toward the poles and sending colder water back in deep ocean currents. Wind, temperature and salinity help drive them. This simplified map shows the pattern.

PRACTICAL SALINITY SCALE



SOURCE: NASA

PAUL HORN / InsideClimate News

Consequences of Inaction!

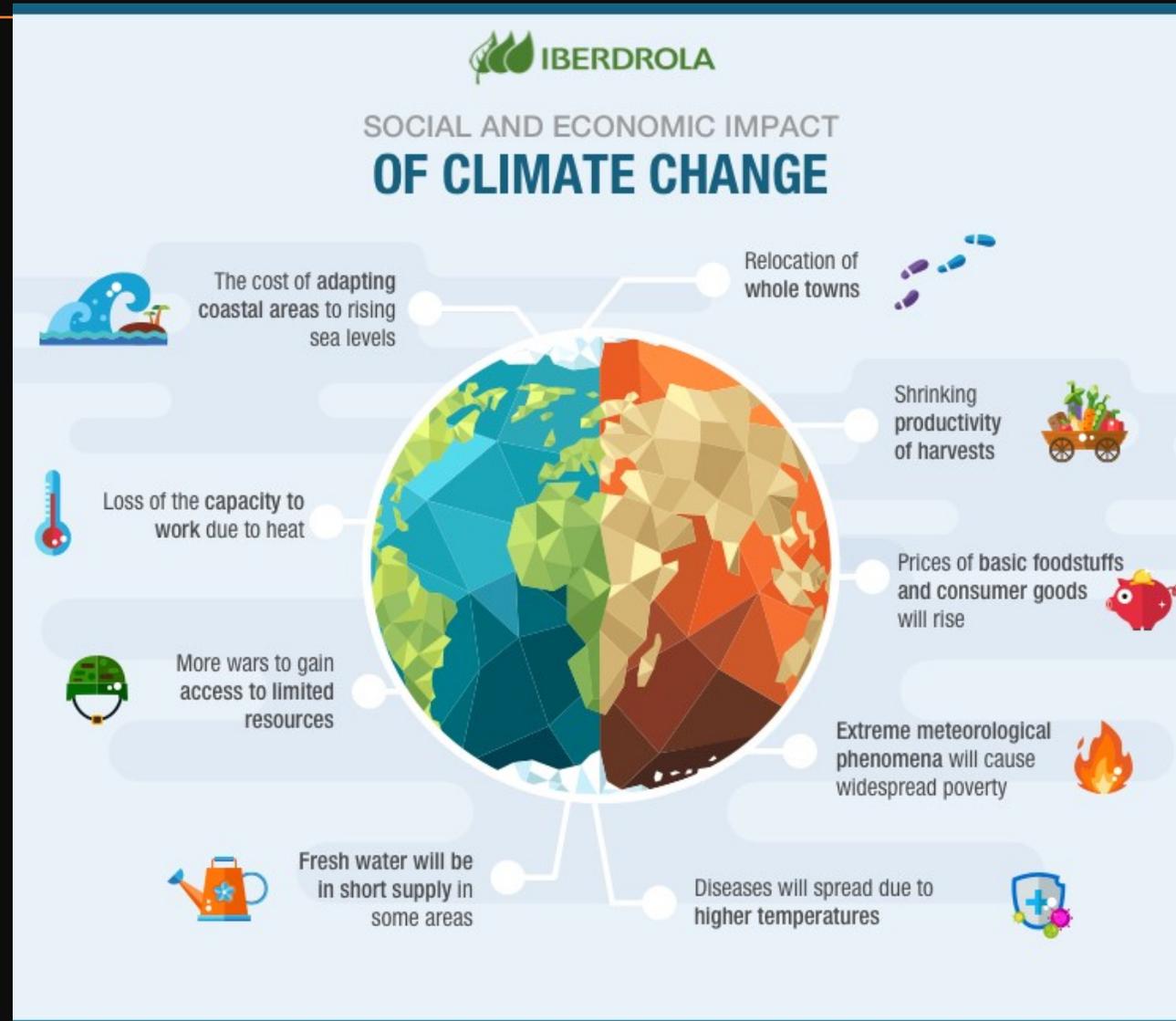


Image Credits: Iberdrola



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Image credit: imageBROKER/Alamy Stock
Photo



Location: Global



Proportion of species losing >50% of their climatic range

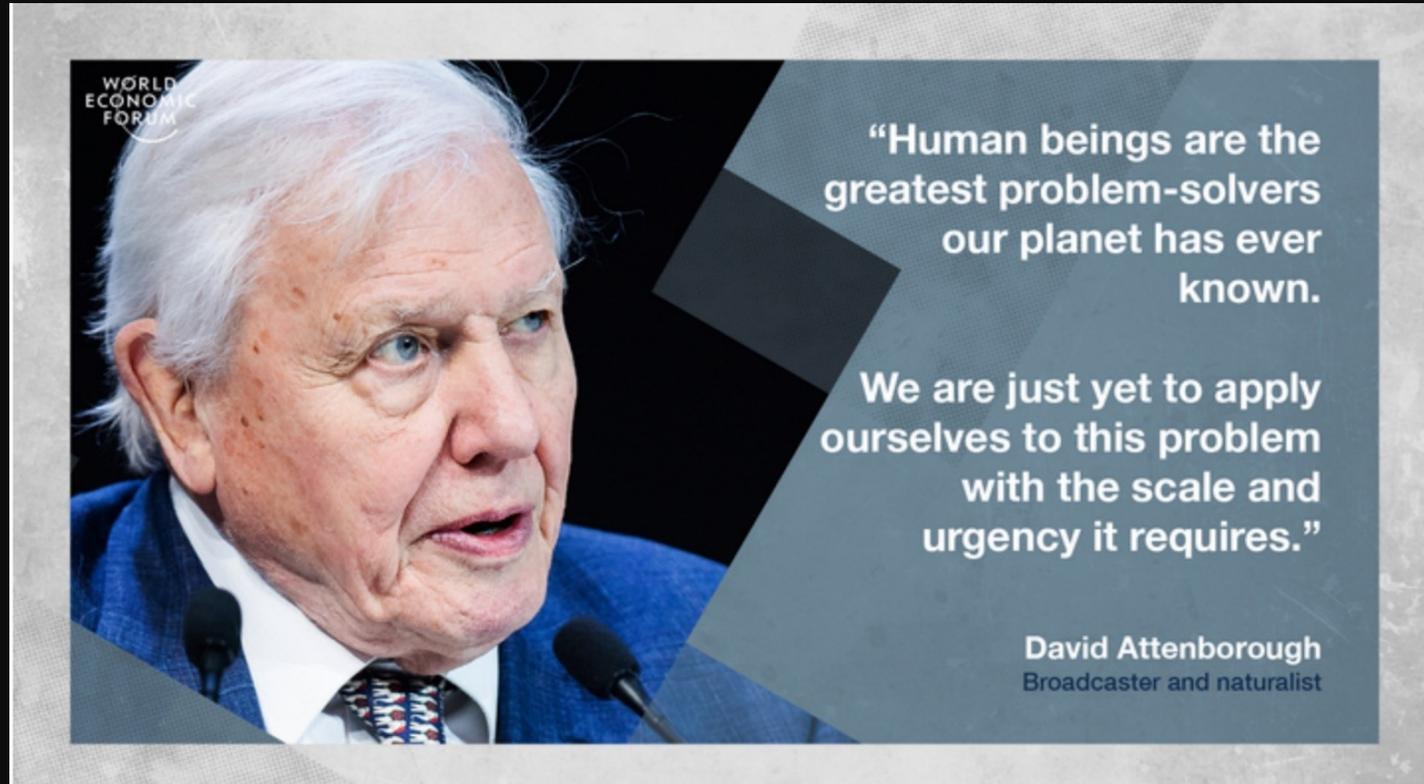
| | 1.5C | 2C | 4.5C |
|---|------------|------------|-------------|
| <i>Invertebrates</i> | 6% (1-18) | 18% (6-35) | 68% (52-80) |
| <i>Vertebrates</i> | 4% (2-9) | 8% (4-16) | 44% (31-59) |
| <i>Plants</i> | 8% (4-15) | 16% (9-28) | 67% (50-80) |
| <i>Insects</i> | 6% (1-18) | 18% (6-35) | 67% (52-79) |
| <i>Mammals</i> | 4% (2-7) | 8% (4-14) | 41% (29-57) |
| <i>Birds</i> | 2% (1-6) | 6% (3-13) | 40% (28-54) |
| <i>Butterflies & moths</i> | 4% (0-14) | 10% (2-29) | 58% (40-74) |
| <i>Dragonflies & damselflies</i> | 1% (0-2) | 2% (1-6) | 21% (11-42) |
| Average warming across drylands | ▲ 2.4-3.0C | ▲ 3.2-4.0C | |
| Average warming across humid lands | ▲ 1.8-2.0C | ▲ 2.4-2.6C | |





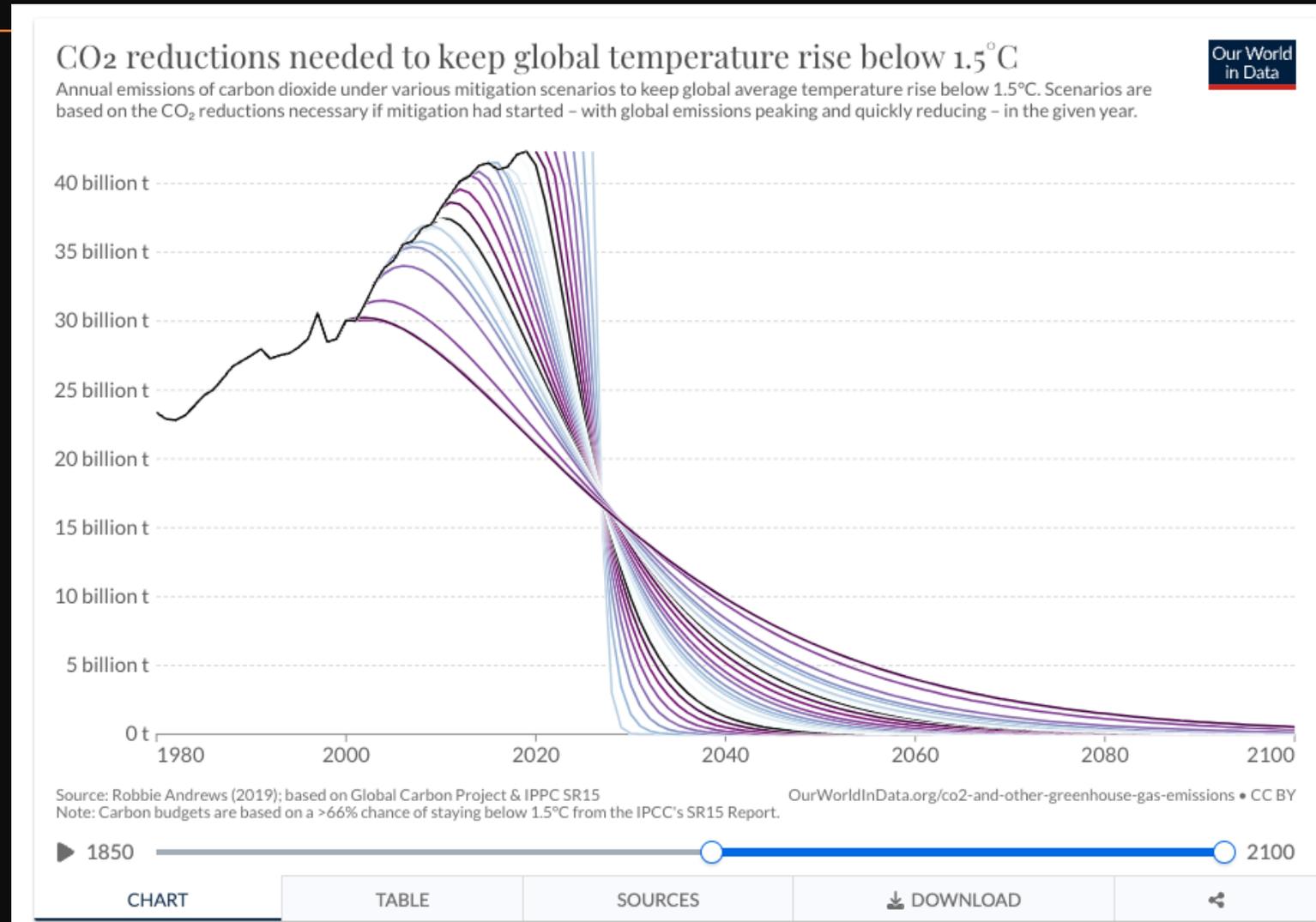
How Do We Restore & Preserve Earth?

Humanity To Respect, and Live In Harmony with Nature



There are multiple paths out of this Human Induced Crisis!

Solution: Reduce GHG Concentrations via Emissions Reduction – Involves Changes to Our Economy, Lifestyles, Technology ...



Technological Reinvention Needed across our Industrial Economy

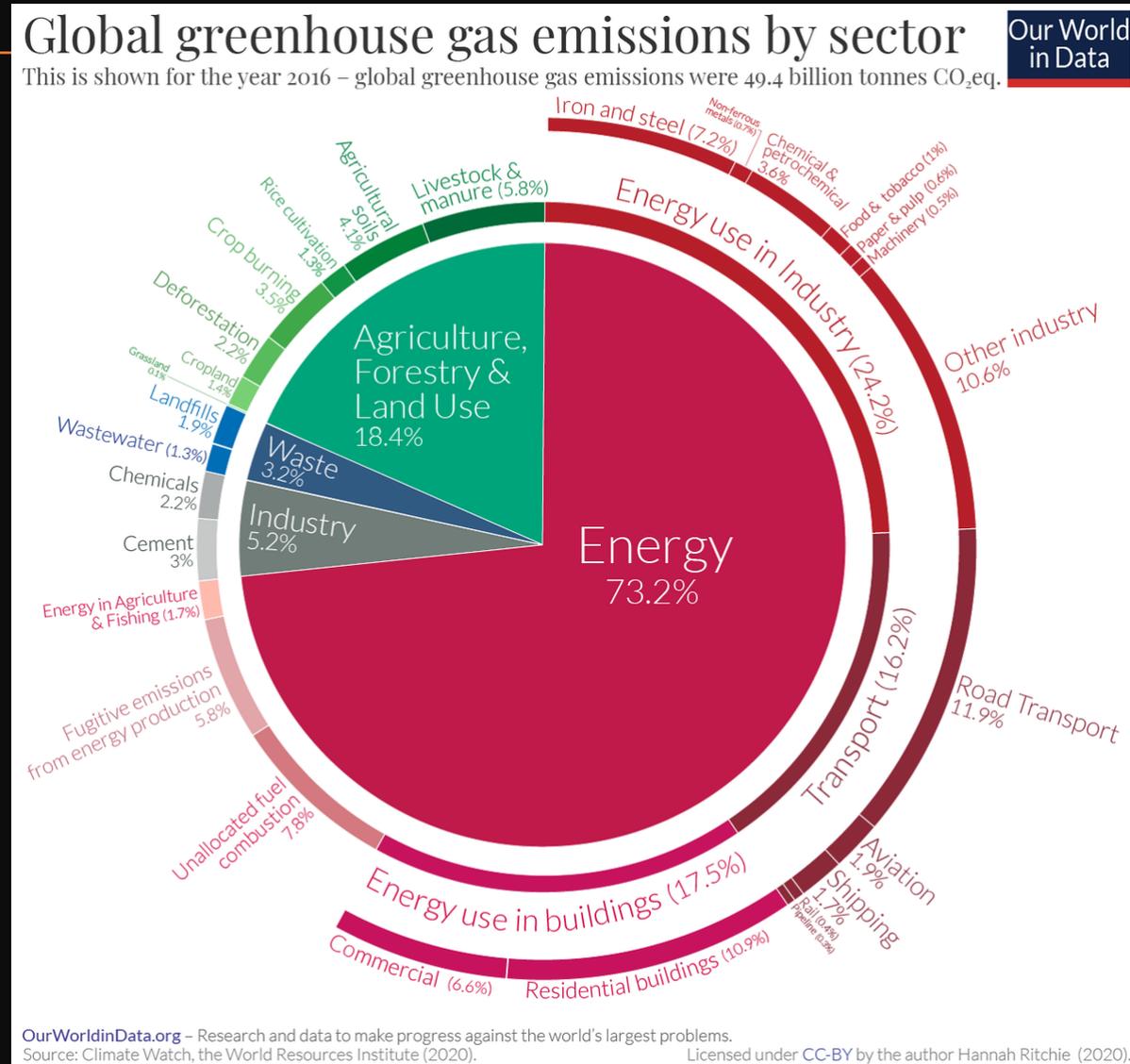


Image Credits: Various sources on the internet

Climate
Technology
Opportunities
Require Skills
That Span
Engineering,
Physical
Sciences, Social
Sciences

| <u>Category</u> | <u>Focus Area</u> |
|---|--|
| Renewable/Alternate Energy | Solar Power Grids |
| | Wind Power Grids |
| | Li-Ion Batteries |
| | Al-Air Batteries |
| | Modernized Lead-Acid Batteries |
| | Tidal Power |
| | Geothermal Power |
| | Reuse of Depleted Oil & Gas Wells/Shafts |
| | Gravity based Power Grids |
| | BioGas / BioMass Sustainable Fuels |
| | Hydrogen Fuel Cells |
| | Green Hydrogen Manufacturing |
| | Blue Hydrogen Manufacturing |
| | Battery Storage Grids |
| | Nuclear Fusion |
| | Dynamic Energy Pricing & Grid Selection |
| | Integrated Power Grids |
| | |
| | |
| Traditional Energy - Emissions Reduction, Energy Efficiency | Fugitive Emissions – Oil & Gas Flaring & Wells (CH4) |
| | CCS – Carbon Capture and Storage |
| | Lead-Acid Batteries Lifecycle improvements |
| | Hydroelectric Power Management |
| | HVAC Efficiency |
| | Energy Efficiency in ICT |
| | Heat, Vibration, Noise Reduction |
| | |
| | |
| | |
| Mobility, Transportation, Logistics | Fixed Battery: - 2W & 3W Electric Vehicles & Stations - Electric Buses & Stations - Electric Cars & Stations |
| | Battery Swapped: - 2W & 3W Electric Vehicles & Stations - Electric Buses & Stations - Electric Cars & Stations - Light & Heavy Electric Trucks - Electric Tractors - Mining Electric Super Heavy Trucks - Electric Heavy Equipment (Excavators, Drills etc) |

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| | |
|---|--|
| | Hydrogen Powered: - Aviation - Shipping - Trucking - Cars Grid Railed Corridors: - Heavy Fixed Battery Trucks - Freight Trains Mobility reinvented as Mobile Energy Platform Hybrid Mobility Fleets |
| Industrial Emissions | Scope 1 Fugitive Emissions (CH ₄ , CO, CO ₂ , NO _x , VOC), Effluents, Pollutants - Oil & Gas - Steel - Cement - Mining - Chemicals - Plastics Predictive Maintenance Scope 3 Effluents and Pollution Scope 2 Equipment Efficiency, Anomaly Detection |
| Regenerative Agriculture, Soil Management | Soil Health Monitoring Soil Regeneration - Technology (Micronutrients) - Biological (Permaculture, Multi-cropping/grazing) Hydroponics Synthetic Simulated Soil Low Water/Arid Agriculture |
| Circular Economy | Materials Reuse Tracing & Tracking – Scope 3 reporting and actions Wastage Tracking Food Excess Reuse – Scalable Composting Minerals Extraction and Reuse Product Packaging, Reuse and Recycling Biodegradable materials |
| Buildings | Materials – minimize fugitive emissions Design – efficient HVAC, lighting Materials – heat retention (winter) Design – Bio & Agrospace Reusable 3D/4D printed buildings |

Climate Technology Opportunities Require Skills That Span Engineering, Physical Sciences, Social Sciences

| | |
|--|--|
| Early Warning/Disaster Management | Extreme Weather Alerting – Heat, Storms, Floods |
| | Portable Renewable Power |
| | Dynamic Multi-Grid Management |
| | Automated Planning and What-Ifs |
| | Mass Evacuation Logistics |
| | Insurance, <u>Reinsurance</u> and dynamic pricing |
| | |
| Climate Adaptation | New Age Cooling – Efficiency in High Wet Bulb conditions |
| | Mass Migration Logistics & Support |
| | Dynamic Agricultural Techniques/Practises |
| | Regenerating Damaged/Destroyed <u>EcoSystems</u> |
| | |
| Remote Sensing/Geospatial Applications | Real-time Fugitive Emissions Isolation, <u>Pin-Pointing</u> |
| | Land Vegetative Health Tracking |
| | Ocean Nutrient and Ecology Health Tracking |
| | |
| Carbon Fintech | Climate Tech financing <u>e.g.</u> Energy as a service |
| | Dynamic Energy Pricing |
| | Carbon Audits, Carbon Offsets |
| | Carbon Tracking |
| | ESG Reporting |
| Water, Sewage Management | Arid Agriculture |
| | Low Energy footprint water, <u>nutrients</u> and sewage management |
| | Biological sewage management and reuse |
| | |
| Ocean Management | Ocean based Agriculture |
| | |
| | |



Educate Ourselves to Produce and Consume Responsibly & Sustainably

Ways to reduce your CO₂ emissions

Annual reduction in tonnes CO₂-equivalent (tCO₂e)



Image Credits: Various sources on the Internet

Source: Seth Wynes; Kimberly A Nicholas | Environmental Research Letters, Volume 12, Number 7

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Educate Ourselves On Equitable Access, Diversity, Human & Environmental Rights



FINANCIAL RESOURCES

Women are granted fewer and smaller loans than men

Women in forestry, fishing and agriculture receive just **7%** of total agriculture investment



LAND & WATER

In developing countries **10% - 20%** of all land holders are women

Farms managed by female-headed households are between half to **2/3** the size of farms run by male-headed households



PRODUCTIVE RESOURCES

Women make up **43%** of the agriculture workforce in developing countries

If women had equal access to productive resources as men, they could increase yields on their farms by as much as **20% - 30%**



ACCESS TO DECISION-MAKING FORAS

Women hold **14%** of management positions in the agricultural sector

At the UN Climate Change Summits between 2000-2010, only **30%** of registered country delegates were women



KNOWLEDGE AND TECHNOLOGY

2/3 of the world's illiterate adults are women

One study showed that women's education contributes to **43%** reduction in child malnutrition



SERVICES & MARKET

Agriculture extension services are accessible to only **5%** of women that make up the agriculture workforce in developing countries

Energy services in West Africa have:

- reduced women's daily work by **2-4** hours
- increased women's incomes
- improved education and school enrolment

EQUAL ACCESS TO RESOURCES AND POWER

for



FOOD SECURITY

AVAILABILITY | STABILITY | UTILIZATION | ACCESS

in the face of

CLIMATE CHANGE

ADAPTATION | MITIGATION

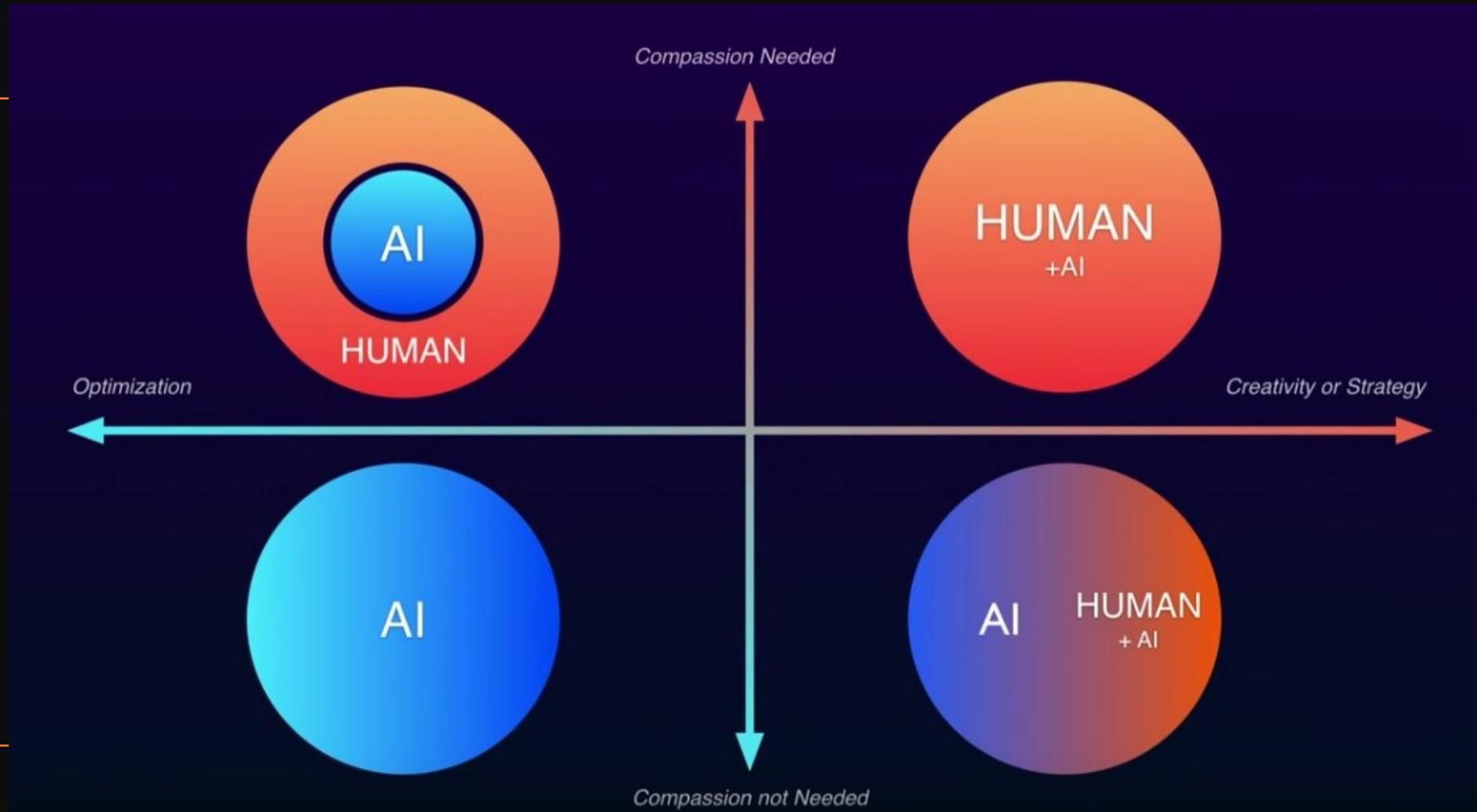


www.fao.org/climatechange/micca/gender
www.fao.org/gender

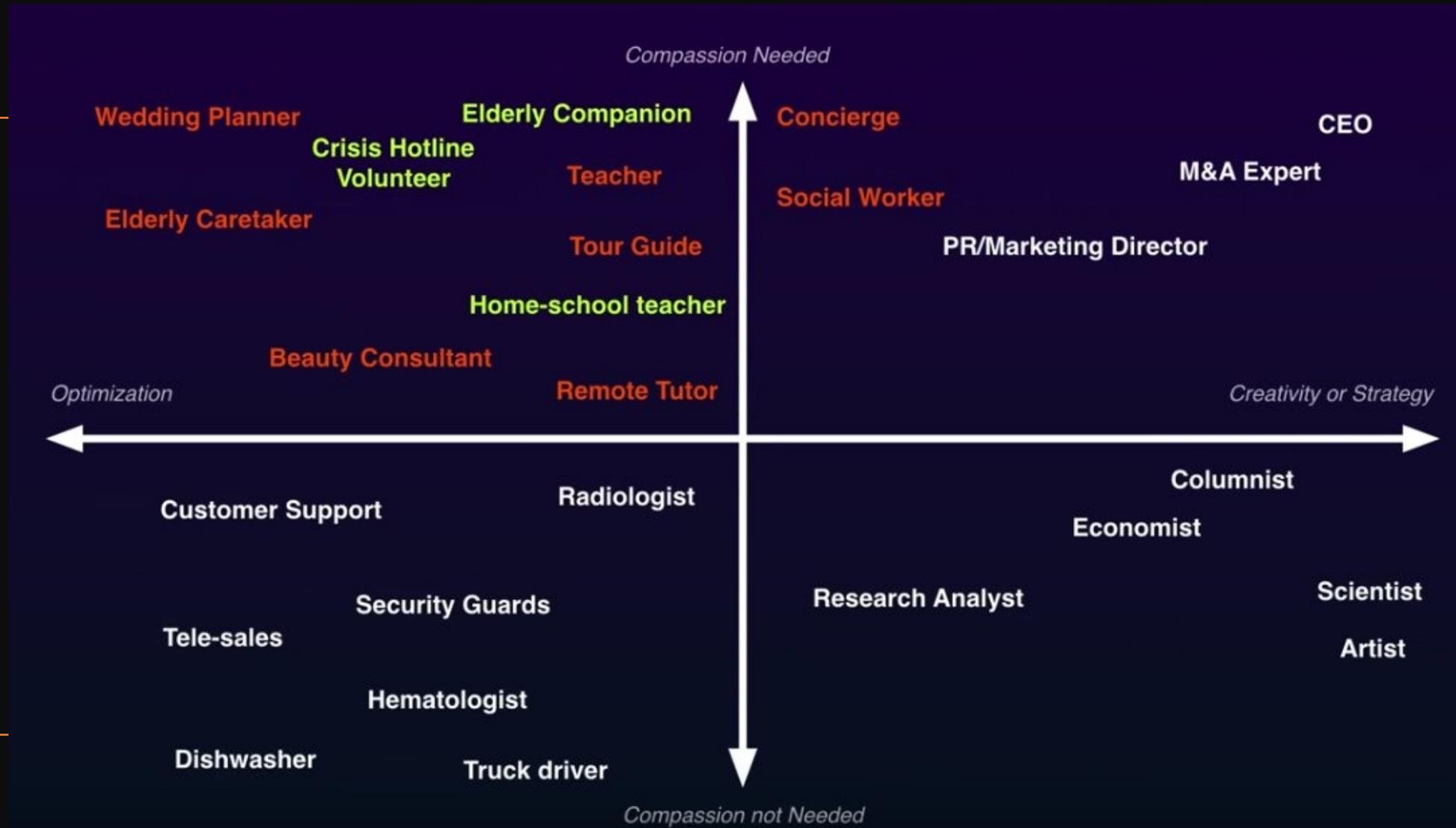
Leverage Your
Education At Home
and Your
Community



AI == Augmented Intelligence for an Ethical Human Society



“Compassionate” AI – Frees Humans from Routine, “Optimized” Work





Human Ethos Must Be Built On Ethics, Compassion
Education is key to nurturing this!

IEEE Code of Ethics

(<https://www.ieee.org/about/corporate/governance/p7-8.html>)

1. to hold paramount the safety, health, and welfare of the public, to strive to comply with ethical design and sustainable development practices, to protect the privacy of others, and to disclose promptly factors that might endanger the public or the environment;



THANK YOU !