IN THE CONTEXT OF PARIS AGREEMENT

RODOLFO LACY



PHOTO: ALISO Canyon gas leak





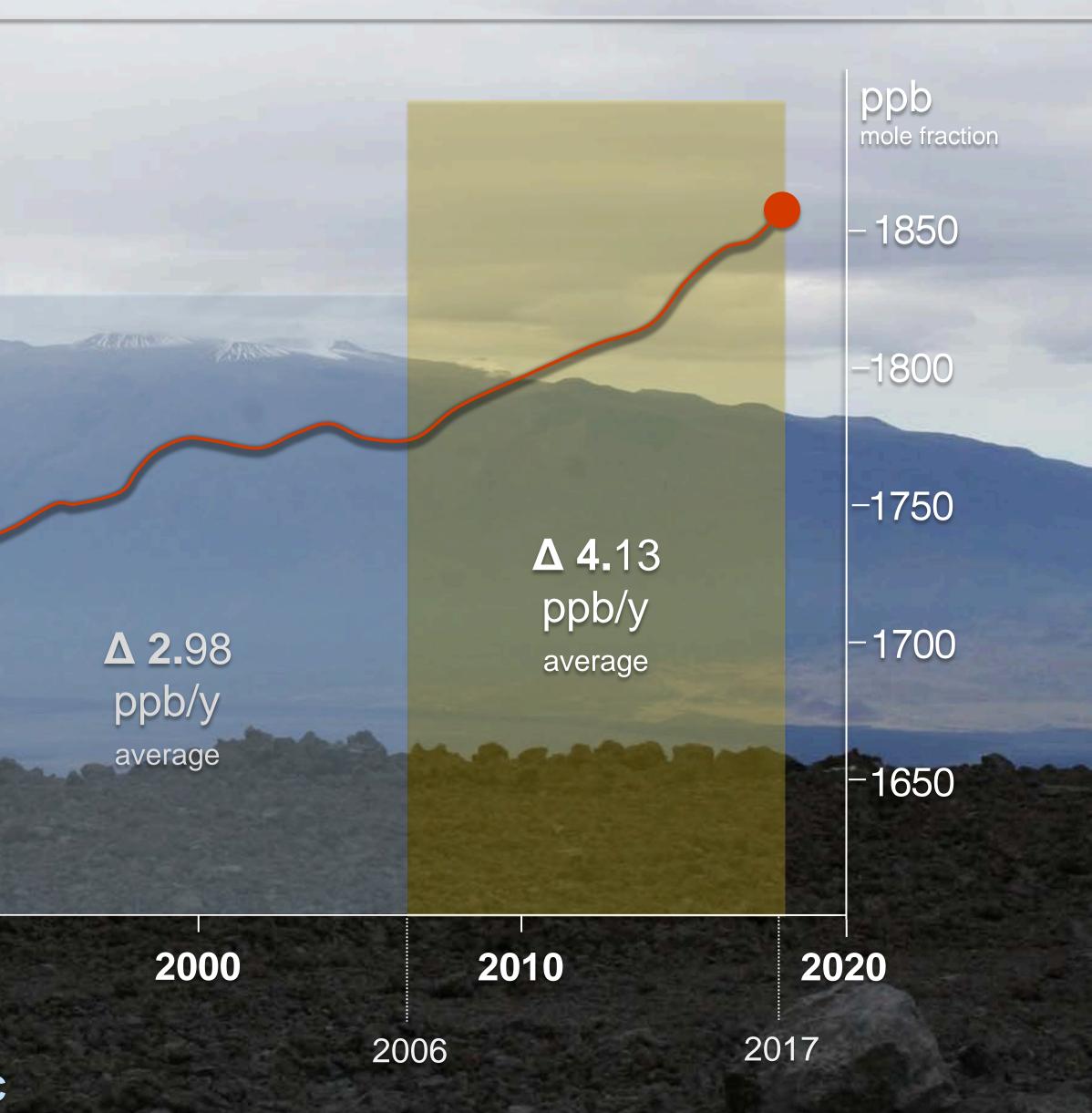
METHANE GLOBAL MONTHLY MEAN

1980

1990

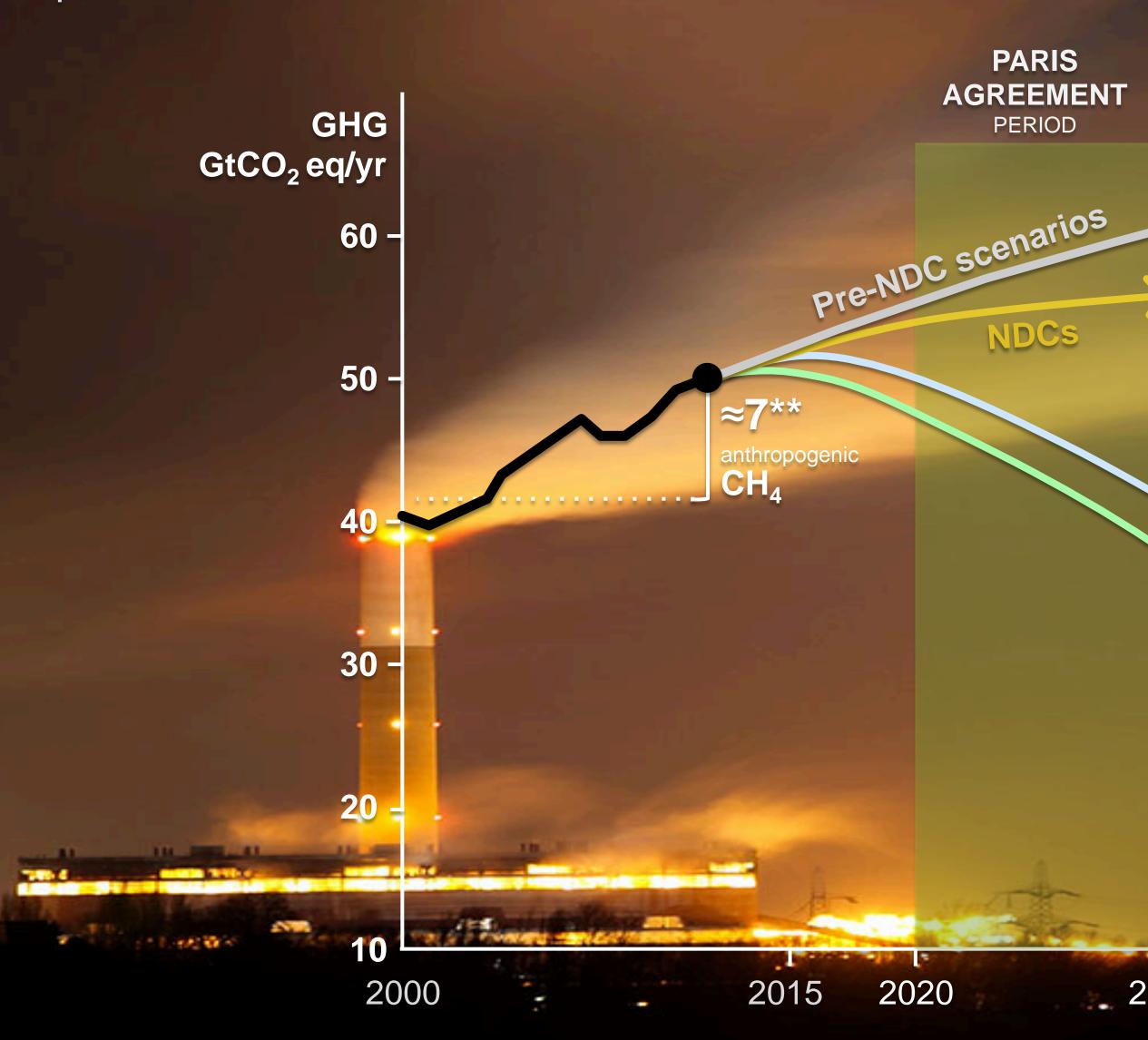
1992 UNFCCC

SOURCE: NOAA, Mauna Loa Observatory





PARIS AGREEMENT AGGREGATE EFFECT OF NDCS

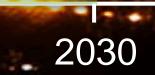


SOURCES: UNFCCC, 2016 *MIT, 2016 **GMI, 2017



Least cost 2 °C scenarios 1 L5 °C

scenarios



-1 °C*

2050

PARIS AGREEMENT

.....



Artista **YANN TOMA** Human Energy Eiffel Antenna

ARTICLE 4

"...Parties shall promote environmental integrity, transparency, accuracy, completeness, comparability, and consistency" in their NDC's





CARBON NEUTRALITY

Parties aim to reach global peaking of GHG emissions as soon as possible... so to achieve a

BALANCE between anthropogenic emissions by sources and removals by sinks and greenhouse gases IN THE SECOND HALF OF THIS CENTURY

Artista **OLAFUR ELIASSON** Artic Ice in Paris PARIS AGREEMENT





METHANE GLOBAL EMISSIONS

600/0

of global methane emissions come from human activities

> Latin America and Canbean

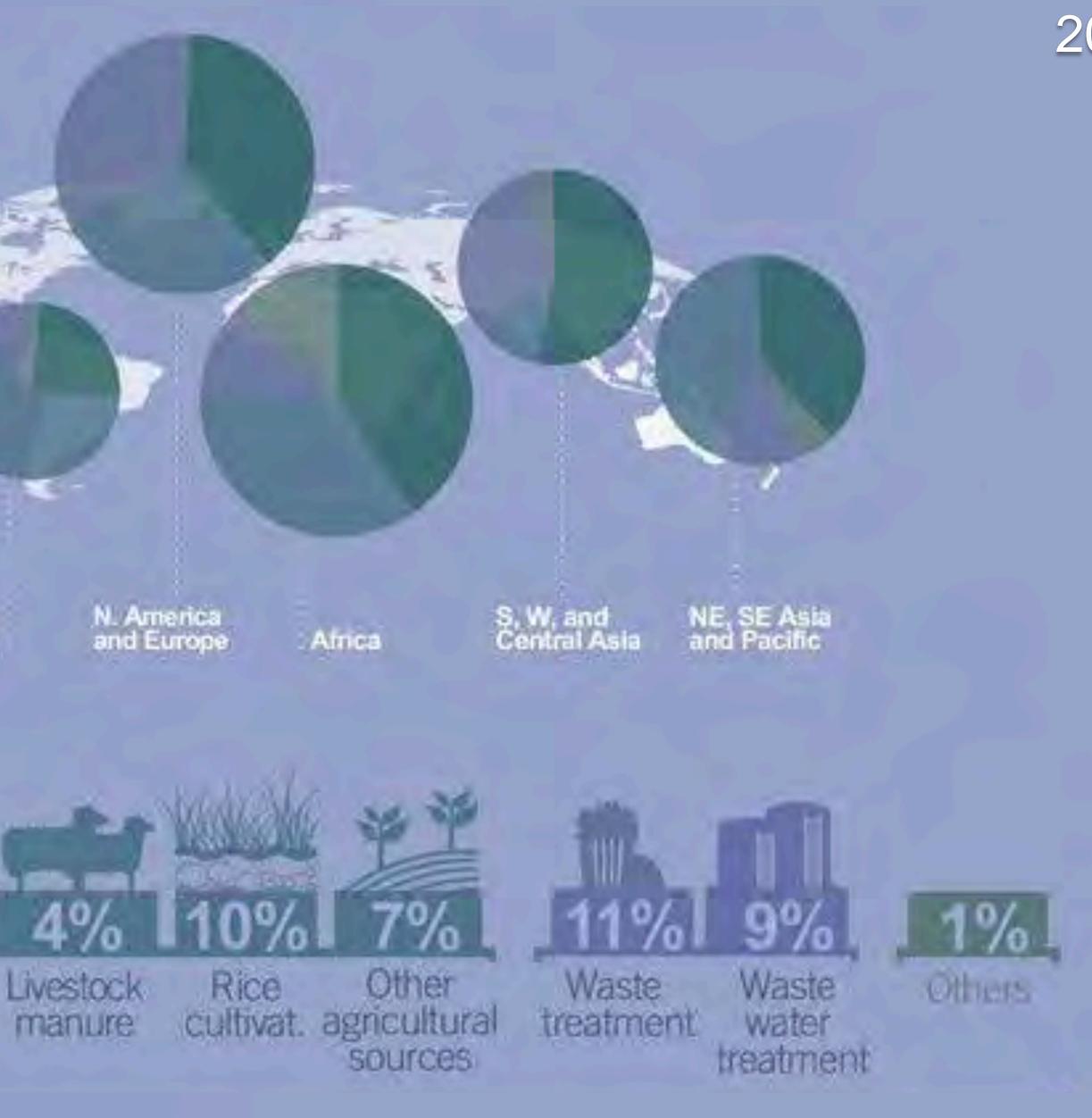


Fossil Fuels

Livestock enteric fermentation

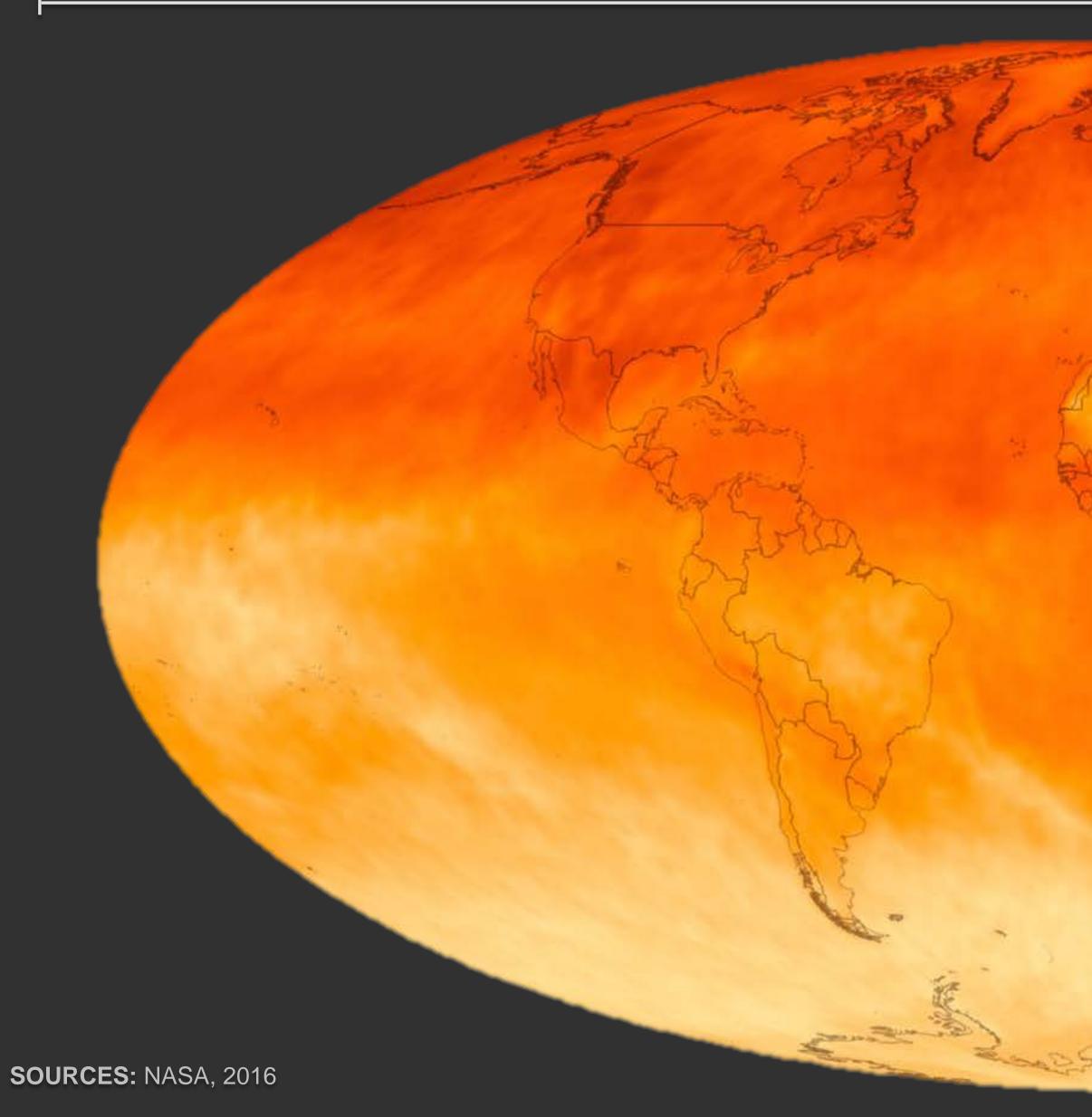
29%

SOURCE: CCAC, 2015





METHANE



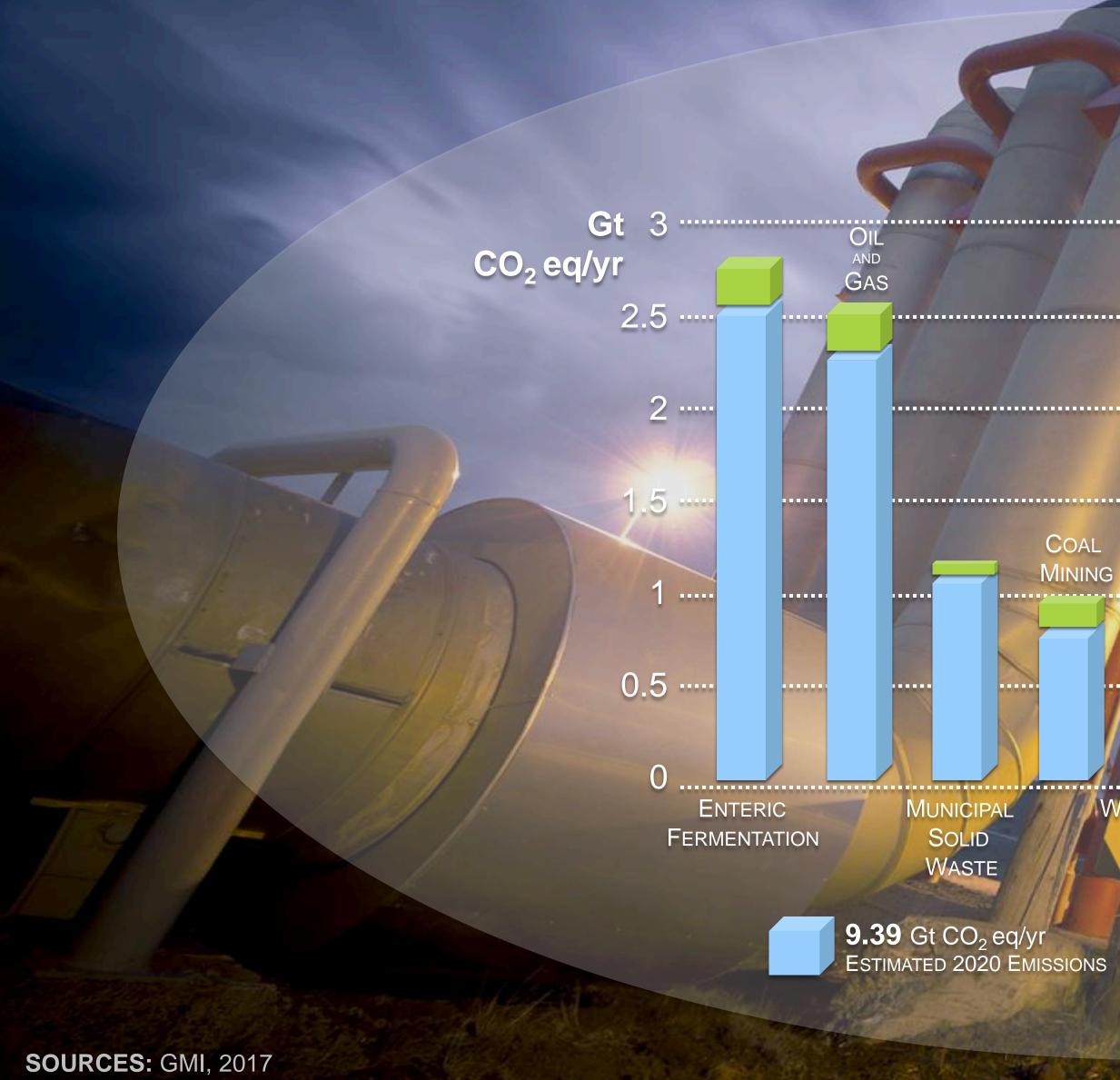
Monthly Average Atmospheric Methane

≤1.7

1.8 ppmv at 400 hPa



METHANE GLOBAL EMISSIONS BY SOURCE





MINING RICE CULTIVATION STATIONARY AND MOBILE BIOMASS WASTEWATER OTHER MANURE AGRICULTURE MANAGEMENT SOIRCES

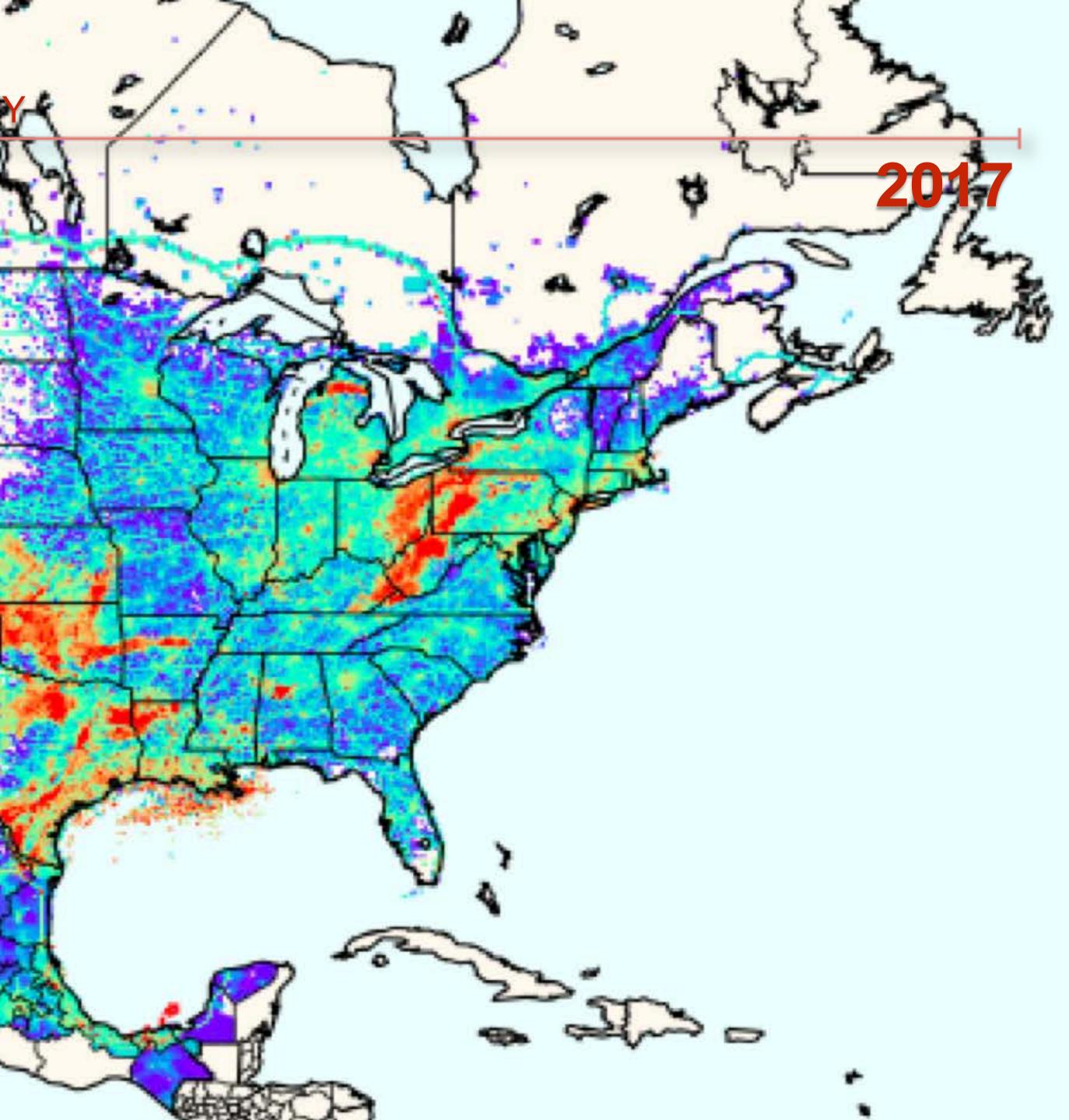
10.22 Gt CO₂ eq/yr PROJECTED ADDED EMISSIONS BY 2030

19



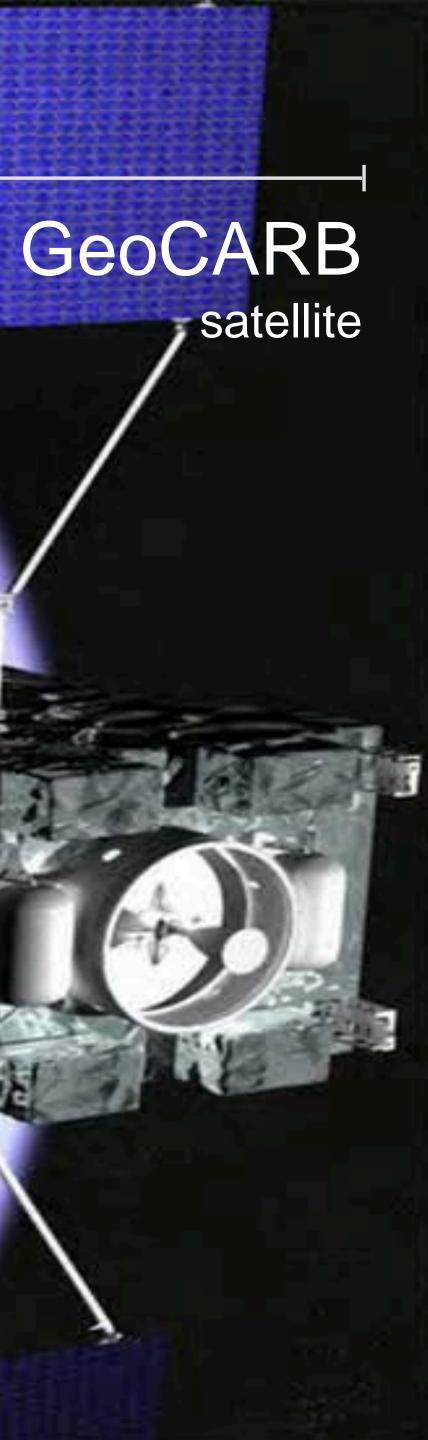
METHANE OIL/GAS EMISSIONS INVENTORY

SOURCE: Sheng *et al.* 2017. A high-resolution (0.1°x0.1°) inventory of methane emissions from Canadian and Mexican oil and gas systems, submitted to Atmos. Environ., 2017.



TRACKING METHANE IN THE CARBON CYCLE

Credits: NASA/Lockheed Martin/University of Oklahoma



ACCURATE METHANE MEASUREMENTS

April 11,2018 **ENVIRONMENTAL DEFENSE FUND** announced plans to develop and launch a new satellite purpose-built to identify and measure methane emissions from human-made sources worldwide

thaneSAT

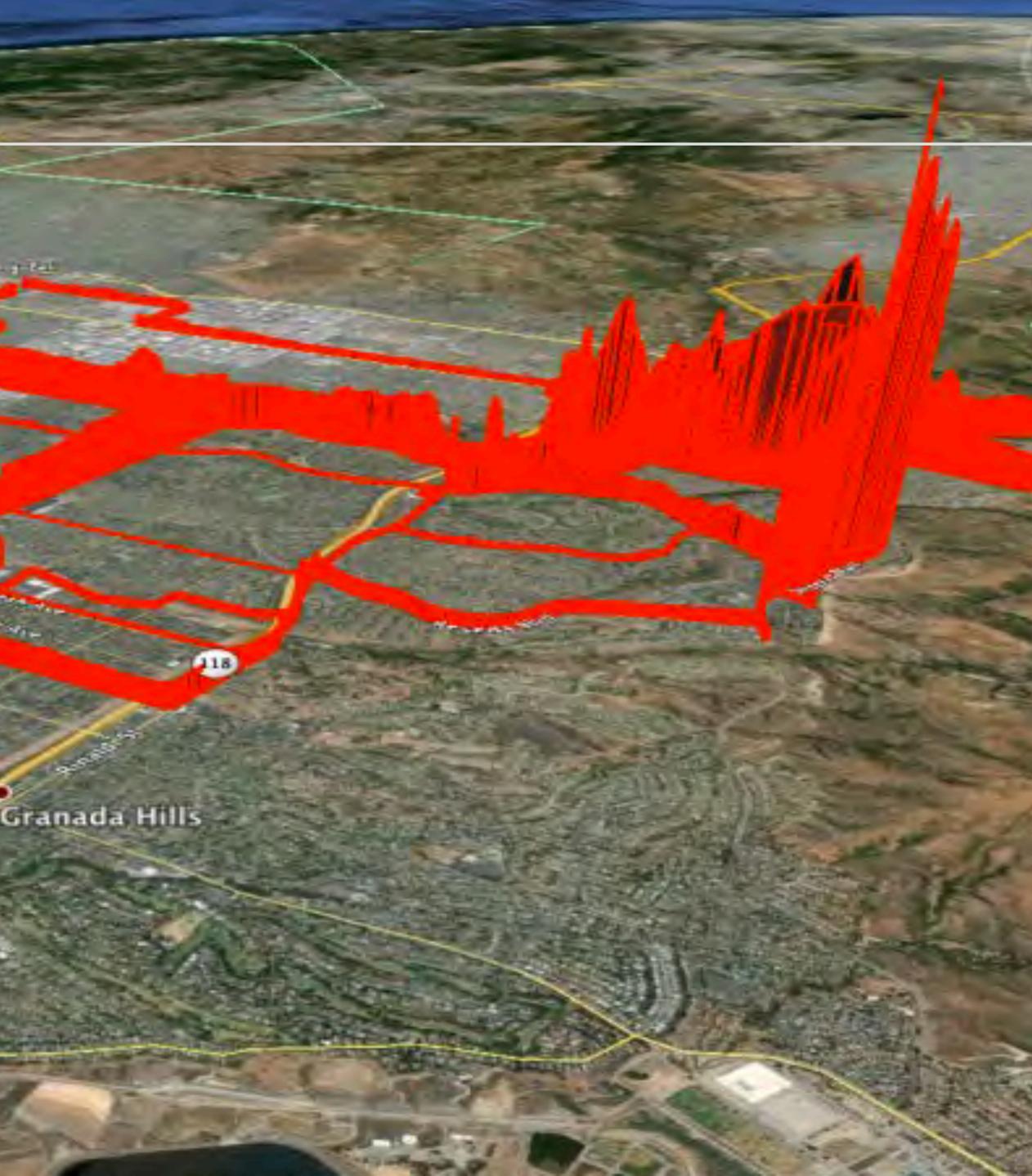


ALISO CANYON LEAK

New measuring instruments and modelling tools are under development for the visualization of methane

Ronald Reaujankway







OIL & GAS SYSTEMS

Upgraded technologies or equipment that reduce or eliminate equipment venting or fugitive emissions

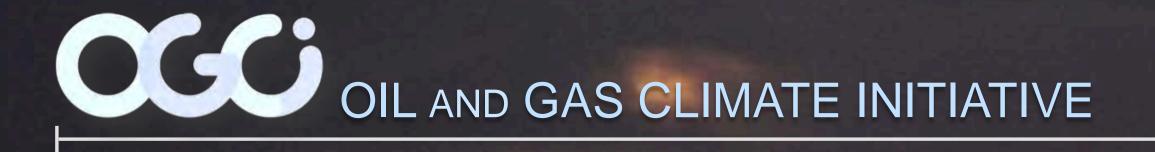
Enhanced management practices that take advantage of improved measurement or emission reduction technology

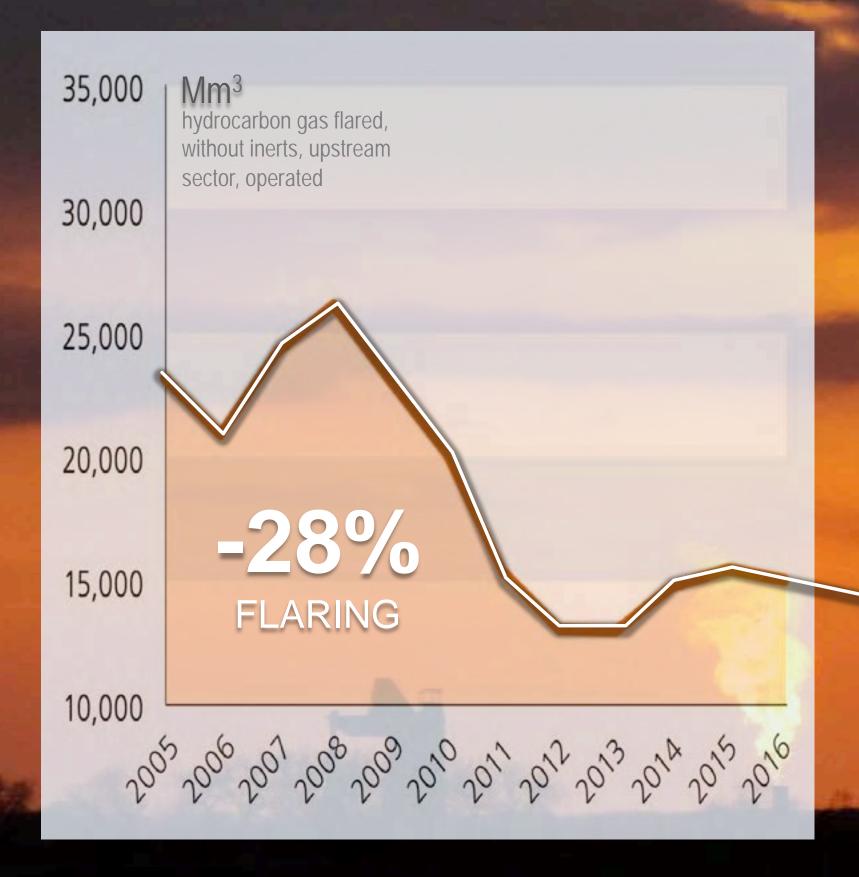
PHOTO: Holbury, New Forest, UK by Mark Baker



MITIGATION **OPPORTUNITIES**







ZERO METHANE EMISSIONS GOAL FROM THE GAS VALUE CHAIN



MUNICIPAL SOLID WASTE

Extraction using a series of wells and a vacuum system, which directs the collected gas to a point to be combusted in a flare or utilized for energy



MITIGATION OPPORTUNITIES

CIRCULAR ECONOMY

Farming & Collection¹

Biological Materials

Biochemical Feedstock

Soil Restoration

Siosphere

Biogas

Cascades

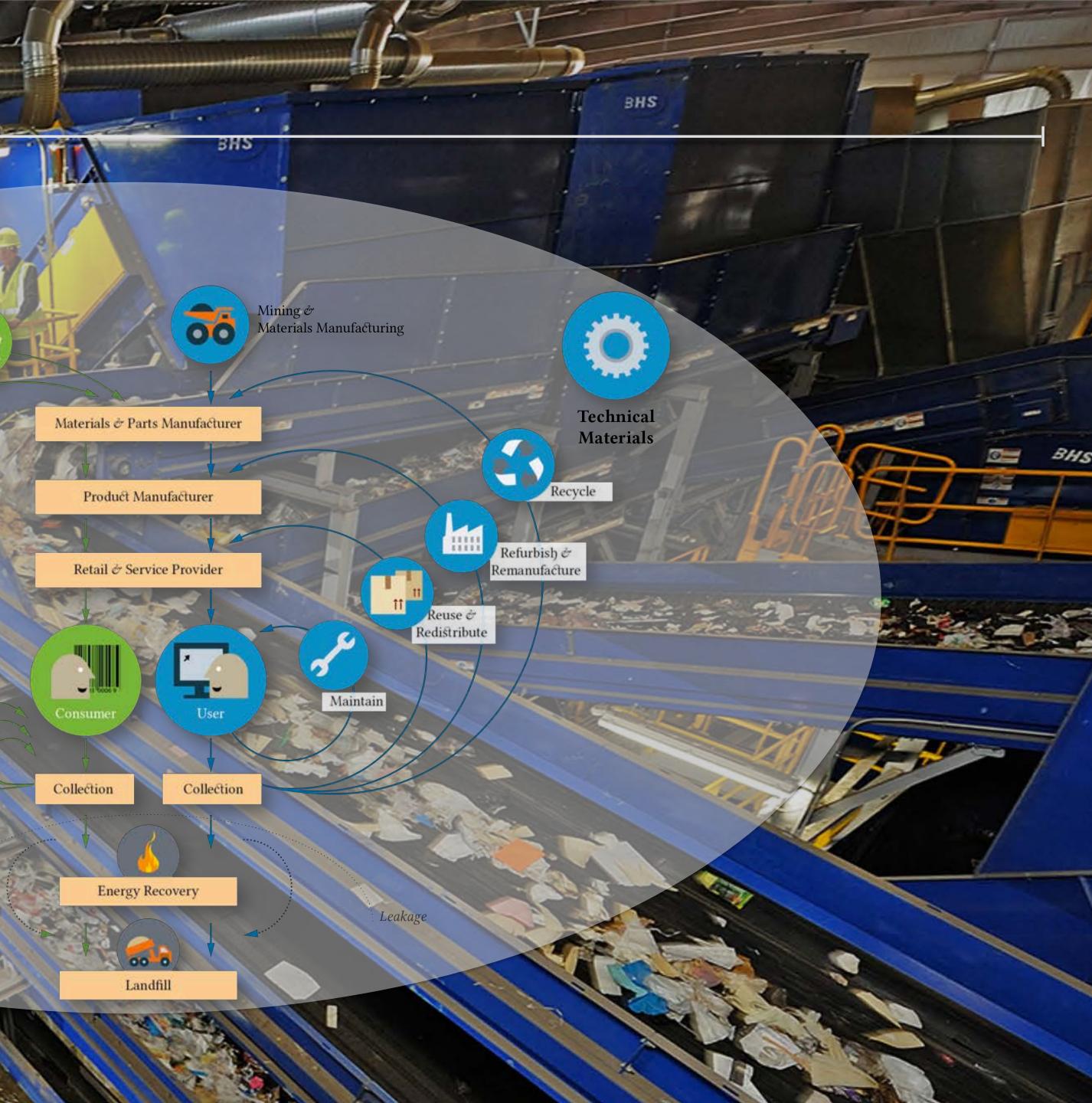
Anaerobic Digestion

.....

Extraction of

Extraction of Biochemical Feedstock²

SOURCE: ELLEN MACARTHUR FOUNDATION



WASTEWATER

Anaerobic sludge digestion

Biogas capture systems at existing open air anaerobic lagoons Aerobic treatment facilities or cov-ered lagoons



MITIGATION OPPORTUNITIES



AGRICULTURE MANURE MANAGMENT

Anaerobic lagoons collection and transmition of biogas to be use in engines or motors

Digesters that compost or "digest" organic waste in the absence of oxygen, thereby generating methane for collection and use



MITIGATION **OPPORTUNITIES**



COAL MINES

Degasification, where holes are drilled and the methane is captured (not vented) in conjunction with mining operations

Ventilation air methane abatement, where low concentrations of methane are oxidized to generate heat for process use and/or electricity generation



OPPORTUNITIES

NDCs IMPLEMENTATION

The Wolrd Bank and International Monetary Fund initiative on

ICIN/

CARBON PRICING LEADERSHIP COALITION



VOLUNTARY COOPERATIVE APPROACHES

Artist Tomás Saraceno AEROCENE PARIS AGREEMENT

The use of

Internationally Transferred Mitigation Outcomes shall promote sustainable development, environmental integrity and transparency





ICAO CARBON OFFSETTING AND REDUCTION SCHEME FOR INTERNATIONAL AVIATION

First ever global deal to curb international emissions

90% of international operations will be covered by the **CRSIA** in 2021

PARIS AGREEMENT





CORSIA CARBON OFFSETTING AND REDUCTION SCHEME FOR INTERNATIONAL AVIATION

Million tonnes of CO2

Pre 2020 commitment: Δ1.5% EE/y

PARIS AGREEMENT period

2019-2020 average, applying MRV rules C RSIA 376 MtCO₂ per year offset demand

2030

2020

2005

2010

PARIS AGREEMENT

Technology Operations Infrastructure

BIOFUELS and additional newgeneration technologies

-50%

2050



- CAP

2040



OFFSETS prices*

63.4 MtCO₂e transacted in the voluntary carbon markets, the average price paid for offsets was

RENEWABLES	\$
FORESTRY AND LAND USE	\$
METHANE	\$
EFFICIENCY AND FUEL SWITCHING	\$
HOUSEHOLD DEVICE	\$
TRANSPORTATION	\$
GASES	\$
OTHER	\$

SOURCE: EcosystemMarketplace Unlocking Potential. State of The Voluntary Carbon Markets 2017.

USdlls/tCO₂e

And services

P



2017 CARBON MARKET PRICES

South Korea USA California/Quebec New Zeland Swiss Ghina Beijing EU





WIN-WIN SOLUTIONS

Mitigation potential at **ZEROCOST** is 940 MMtCO₂e, there arenearly 1,900 MMtCO₂e from cero to \$60/MtCO₂e

PHOTO: Llandfill in Livingston County,



100 BILLIONS 2020-2030 every year



PARIS AGREEMENT

GREEN CLIMATE FUND

50% MITIGATION 50% ADAPTATION



12 COMMITMENTS

5. Zero emissions target Towards Carbon Neutrality...16 countries, more than 32 cities 9. Actions of Central Banks and Businesses Greening the Financial System **10. International Mobilization of Development Banks** ✓ >30 public banks aligned **11. Commitment by Sovereign Fund** ✓ 6 institutions w/\$15T in assets **12. Mobilizing Institutional Investors**

Climate Action 100+ ...225 institutional investors w/\$26T in assets \$1B Energy Breakthrough Coalition







OP23-FIJI

CLIMATE CHANGE CONFERENCE







2

Oa Dialogue "...to build trust and advance knowledge through empathy and understanding"



Artist **PEDRO MAZORATI** Parc Mont Souris

