



# **Climate Crises and District Heating, the Big Picture**

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Baldur Pétursson,  
Manager International Projects and PR  
National Energy Authority, Iceland,  
SDEC Conference Reykjavik, 25.10.2019



# Climate Crises – from policy to implementation

**Sometimes – there is a long way from global climate policy discussions, to sectoral discussions and implementation – within each country**

**How is the link between climate crises and district heating discussions in different countries?**

Is it regarding

- awareness wake-up message?
- engineering, resources, timing, planning, infrastructure?
- economic, management, leadership?
- risk assessment – regarding municipality, city, country, people?

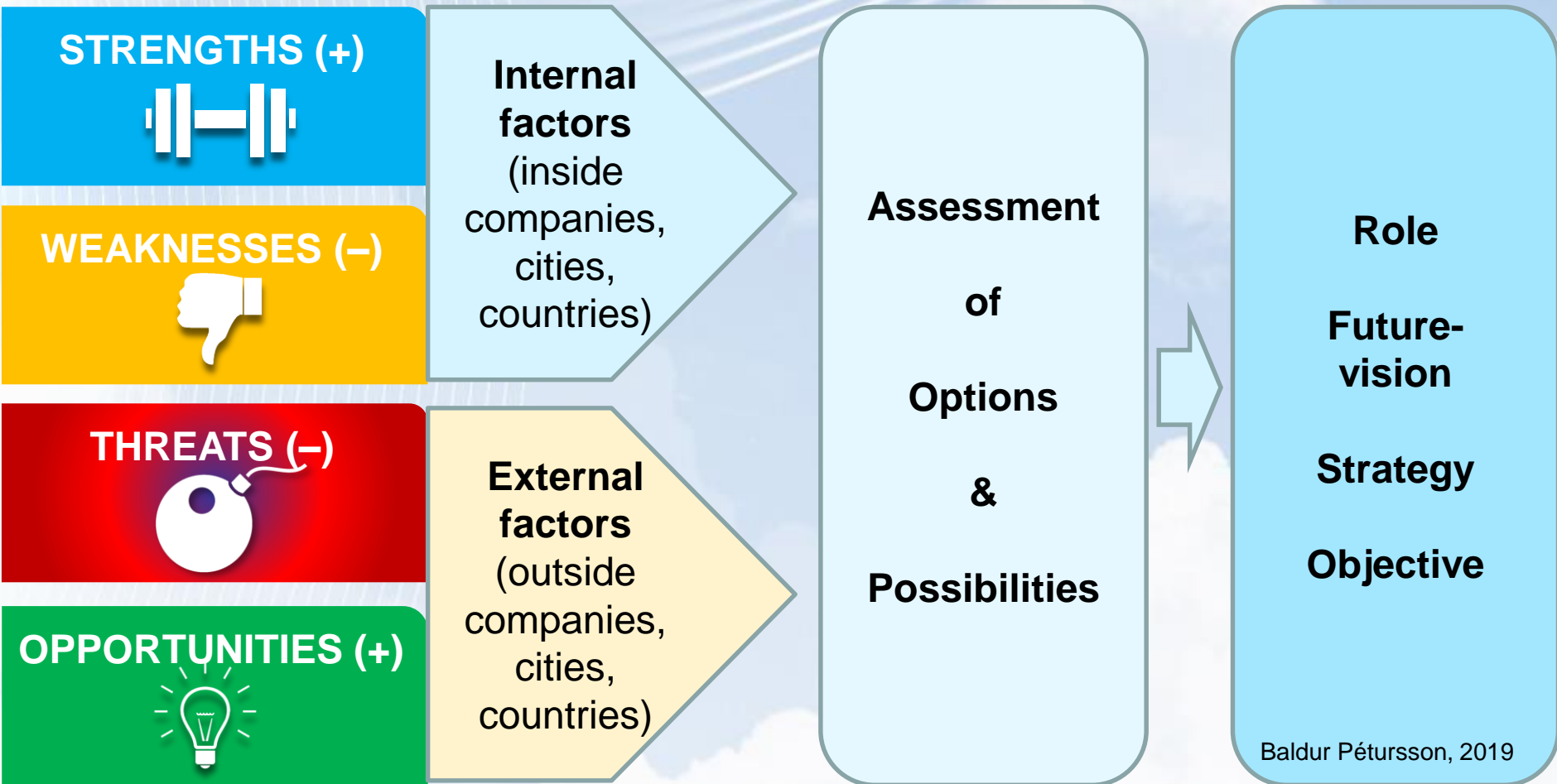
or perhaps all of this and much more,,,,,

# Climate Crises – from policy to implementation

- Climate crises is also,,,,,
- **about future life on earth - and how we can fight the climate crises in increasing competition against time**
- **we must discuss climate crises – much more - also within the district heating sector – to speed up awareness, actions and opportunities – to avoid the enormous consequences of climate crises**
- **therefore climate crises risk factors have to be recognised**
- **and also – the great opportunities by fighting climate crises**

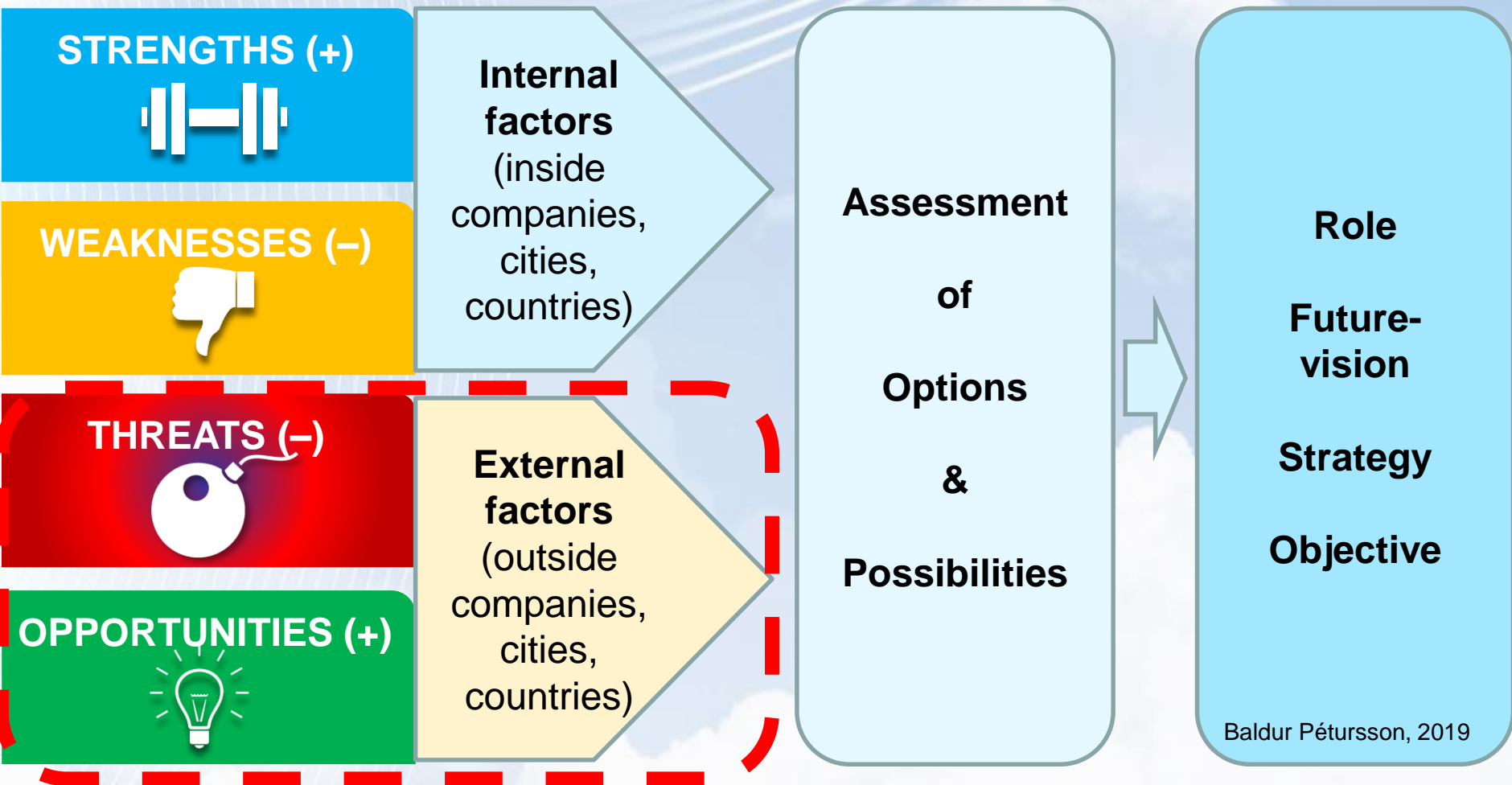
# SWOT – Climate Crises assessments

## Many models of risk assessment and strategy



# SWOT – Climate Crises assessments

## Many models of risk assessment and strategy



# SWOT – Climate Crises assessments

## Many models of risk assessment and strategy

### STRENGTHS (+)



What are the company, city, country - strengths regarding Climate Change?

- 
- 
- 

### WEAKNESSES (-)



What are the company, city, country - weaknesses regarding Climate Change?

- 
- 
- 

### THREATS (-)



What are the external threats regarding Climate Change?

- biggest threats in history of mankind,,,
- competition against time,,,
- lack of awareness raising,,,

### OPPORTUNITIES (+)



What are the external opportunities regarding Climate Change?

- lot of opportunities within, companies, cities and countries,,,
- speeding up awareness, finance, action, cooperation,,,
- much more finance to climate technology,,,

Baldur Pétursson, 2019

# SWOT – Climate Crises assessments

## Many models of risk assessment and strategy

### STRENGTHS (+)



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- much more finance to climate technology,,,

Baldur Pétursson, 2019

# SWOT – Climate Crises assessments

THREATS (-)



**UN**   
environment

## Emissions Gap Report 2018

**Unless NDC ambitions are increased before 2030, exceeding the 1.5°C goal is unavoidable. Now more than ever, unprecedented and urgent action is required by all nations**

IPCC Side Event ♦ COP 24 ♦ 5 December 2018



# SWOT – Climate Crises assessments

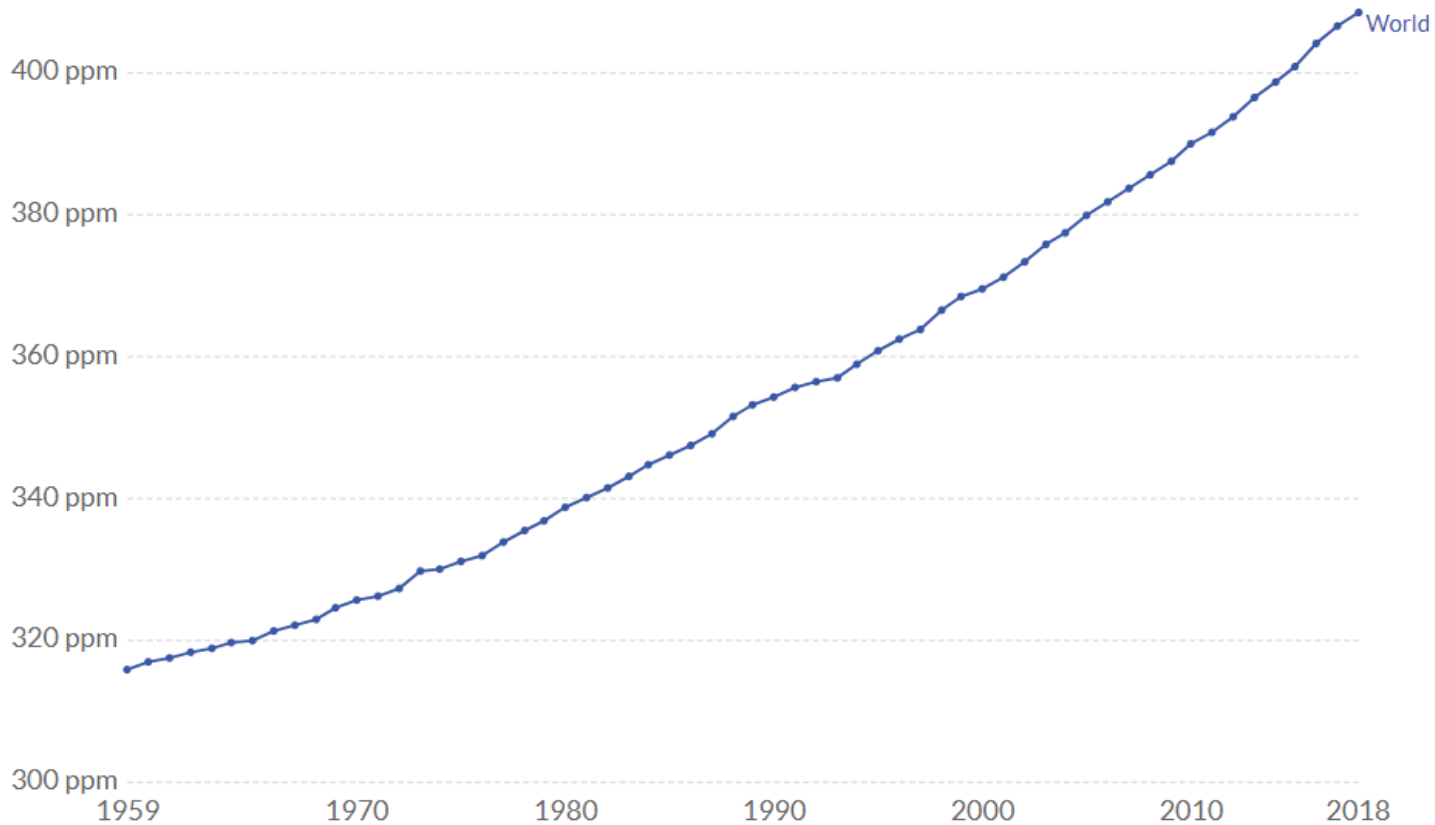
## CO<sub>2</sub> – ppm



### Global CO<sub>2</sub> atmospheric concentration

Global mean annual concentration of carbon dioxide (CO<sub>2</sub>) measured in parts per million (ppm).

Our World  
in Data



Source: NOAA/ESRL (2018)

CC BY



▶ 1959 2018

CHART

DATA

SOURCES



# SWOT – Climate Crises assessments

## CO<sub>2</sub> last 2000 years

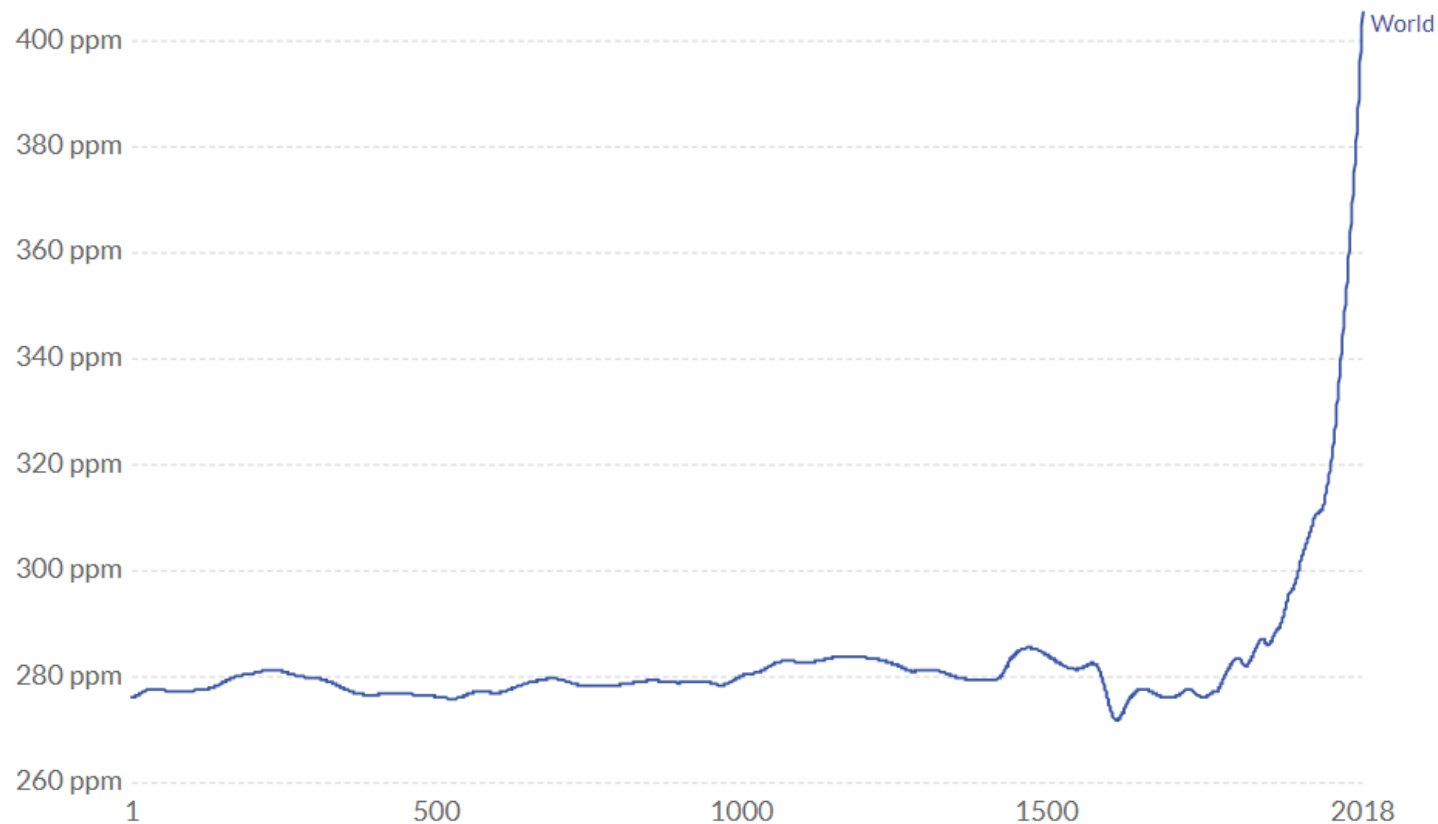
THREATS (-)



### Atmospheric CO<sub>2</sub> concentration

Global average long-term atmospheric concentration of carbon dioxide (CO<sub>2</sub>), measured in parts per million (ppm).

Our World  
in Data



Source: Scripps CO<sub>2</sub> Program

CC BY



▶ 1 2018

CHART

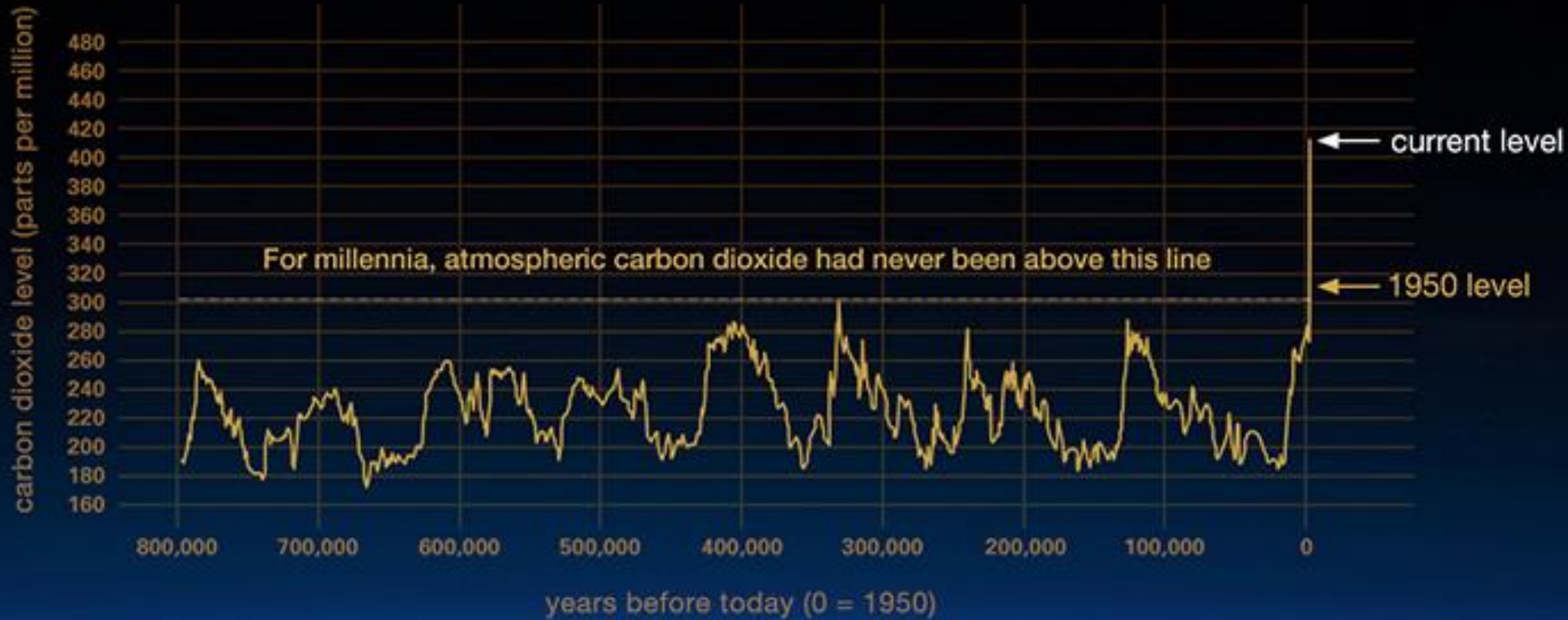
DATA

SOURCES



# SWOT – Climate Crises assessments

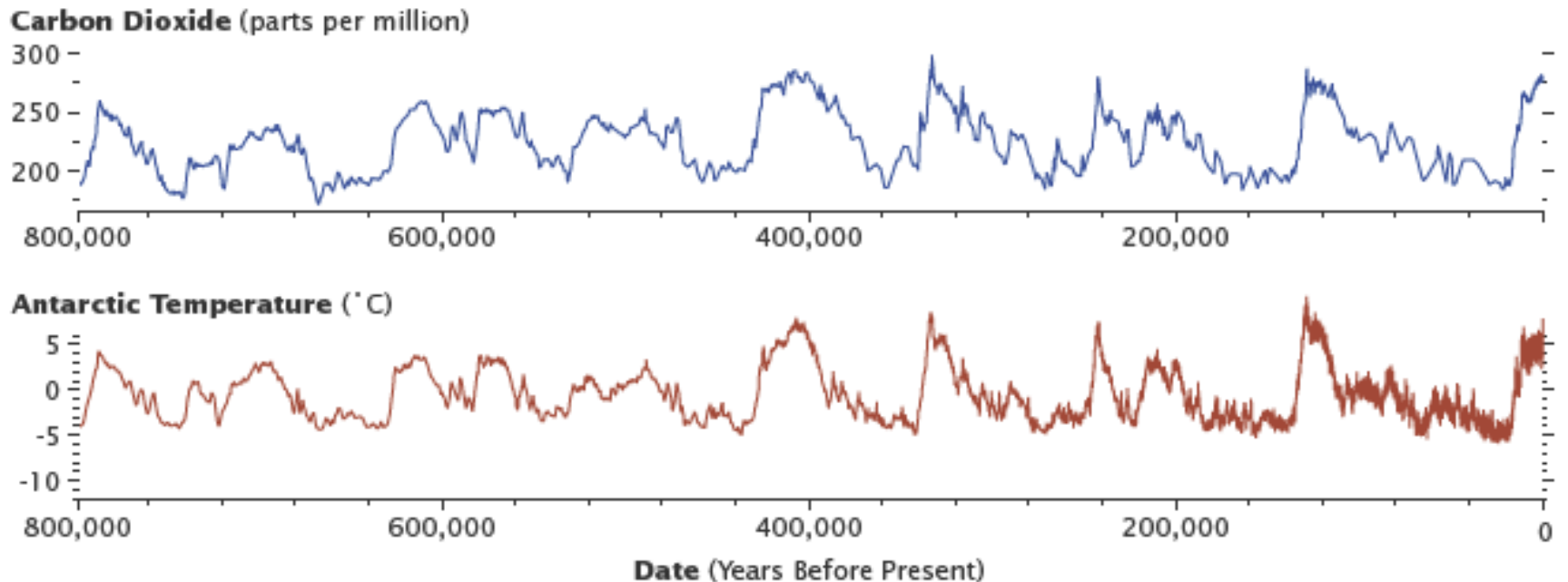
## CO<sub>2</sub> last 800.000 years



NASA

# SWOT – Climate Crises assessments

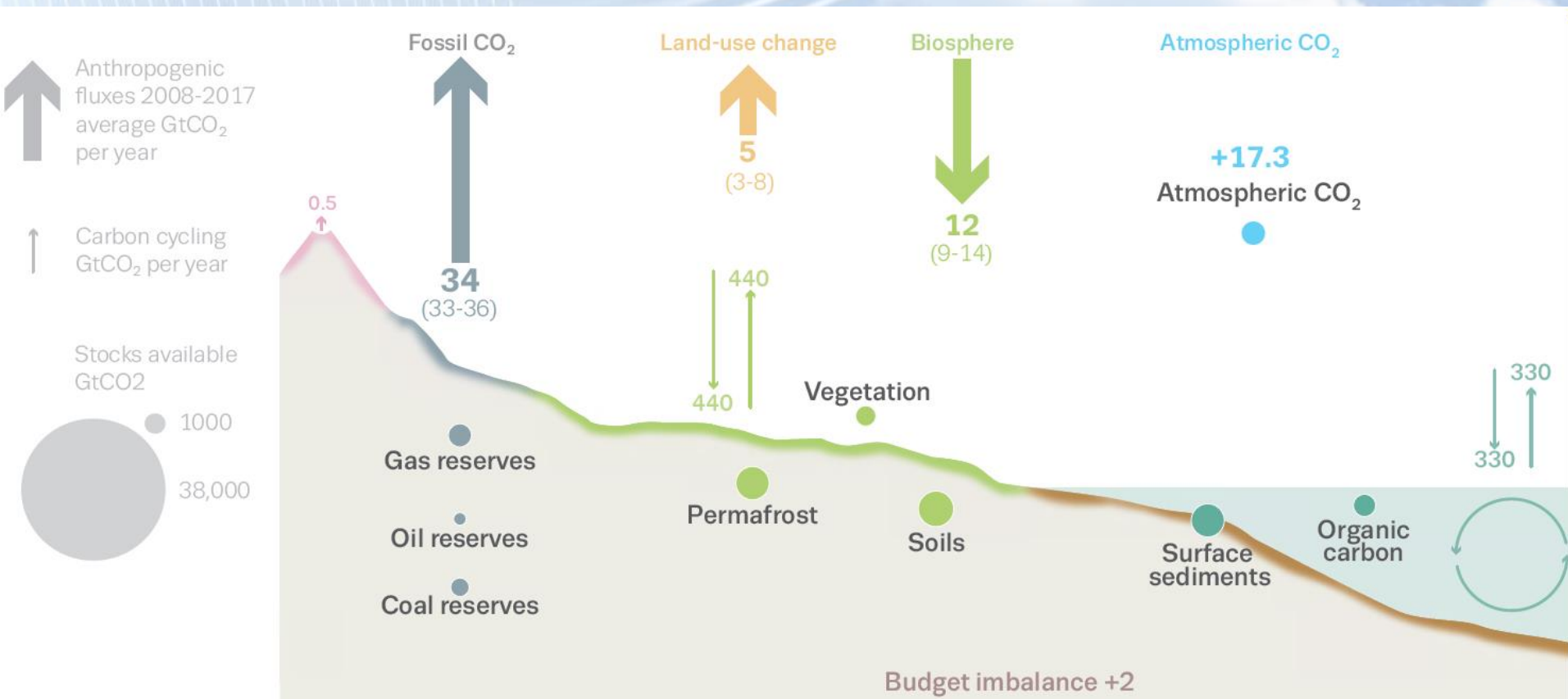
CO<sub>2</sub> last 800.000 years – the temperature has followed



Levels of carbon dioxide in the atmosphere have corresponded closely with temperature over the past 800,000 years. Although the temperature changes were touched off by variations in Earth's orbit the increased global temperatures released CO<sub>2</sub> into the atmosphere, which in turn warmed the Earth. Antarctic ice-core data show the long-term correlation until about 1900. (Graphs by Robert Simmon, using data from [Lüthi et al., 2008](#), and [Jouzel et al., 2007](#).)

# SWOT – Climate Crises assessments

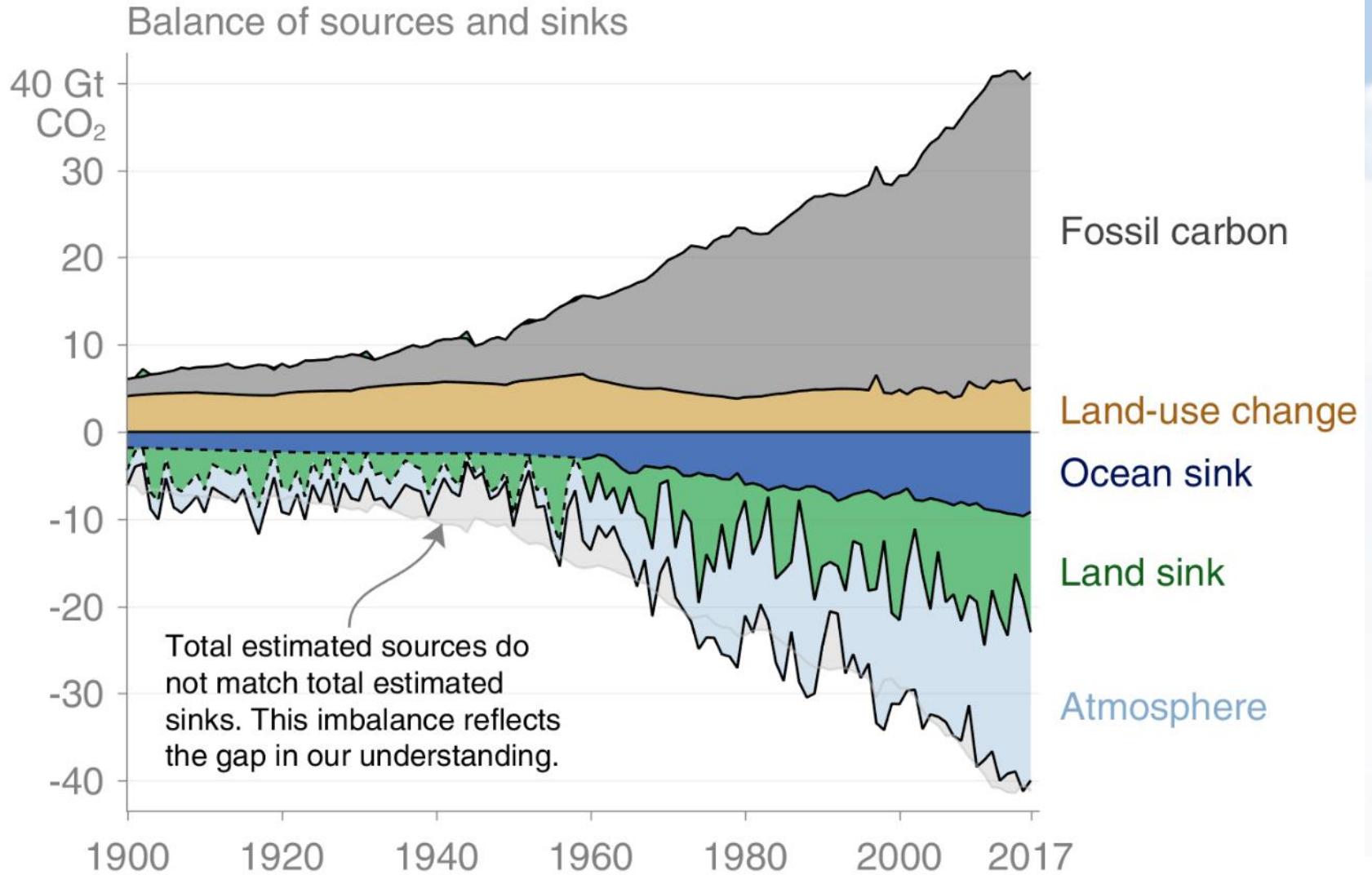
## Alarm of the carbon cycle (global carbon budget)



# SWOT – Climate Crises assessments

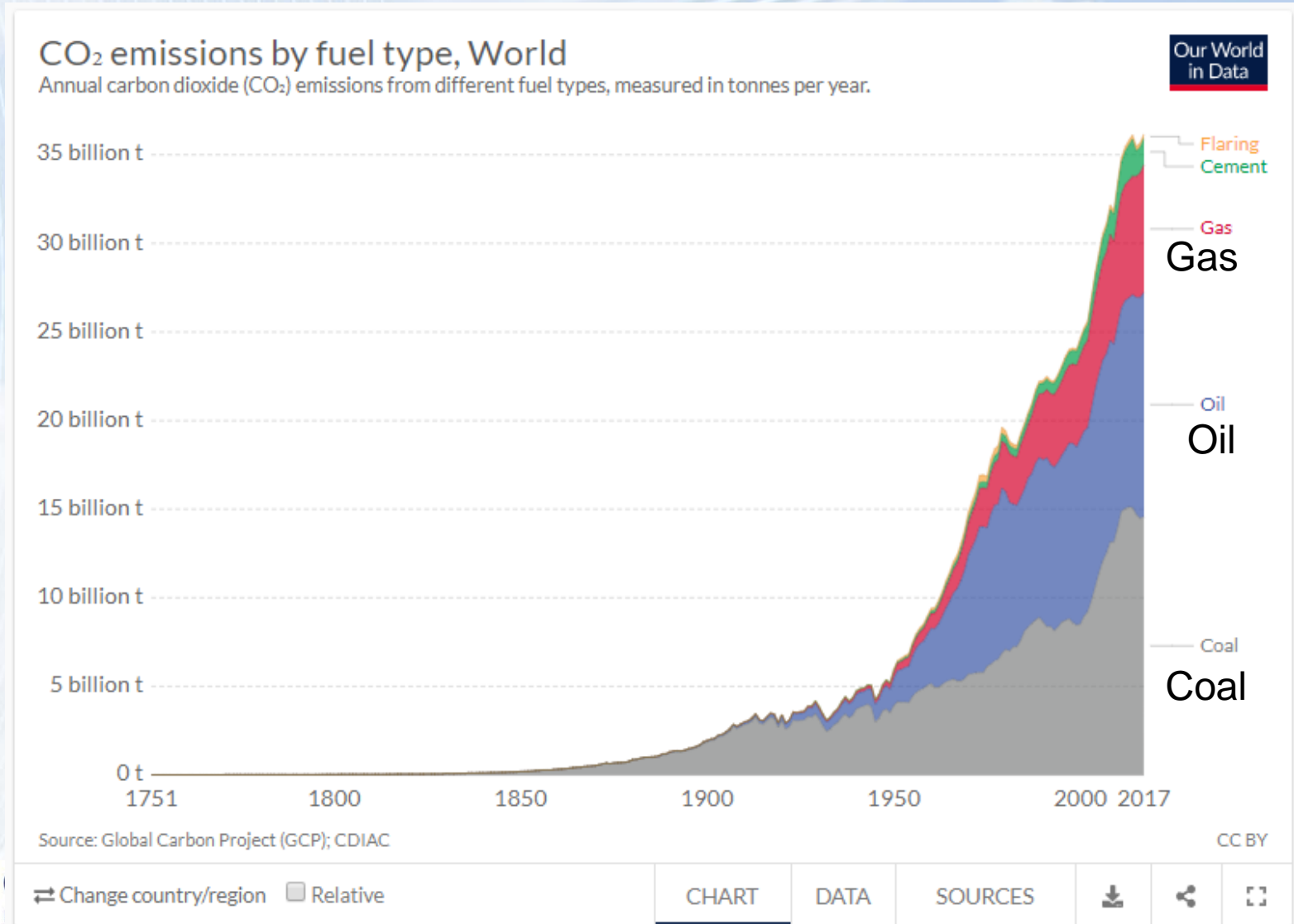
## Alarm of the carbon cycle (global carbon budget)

THREATS (-)



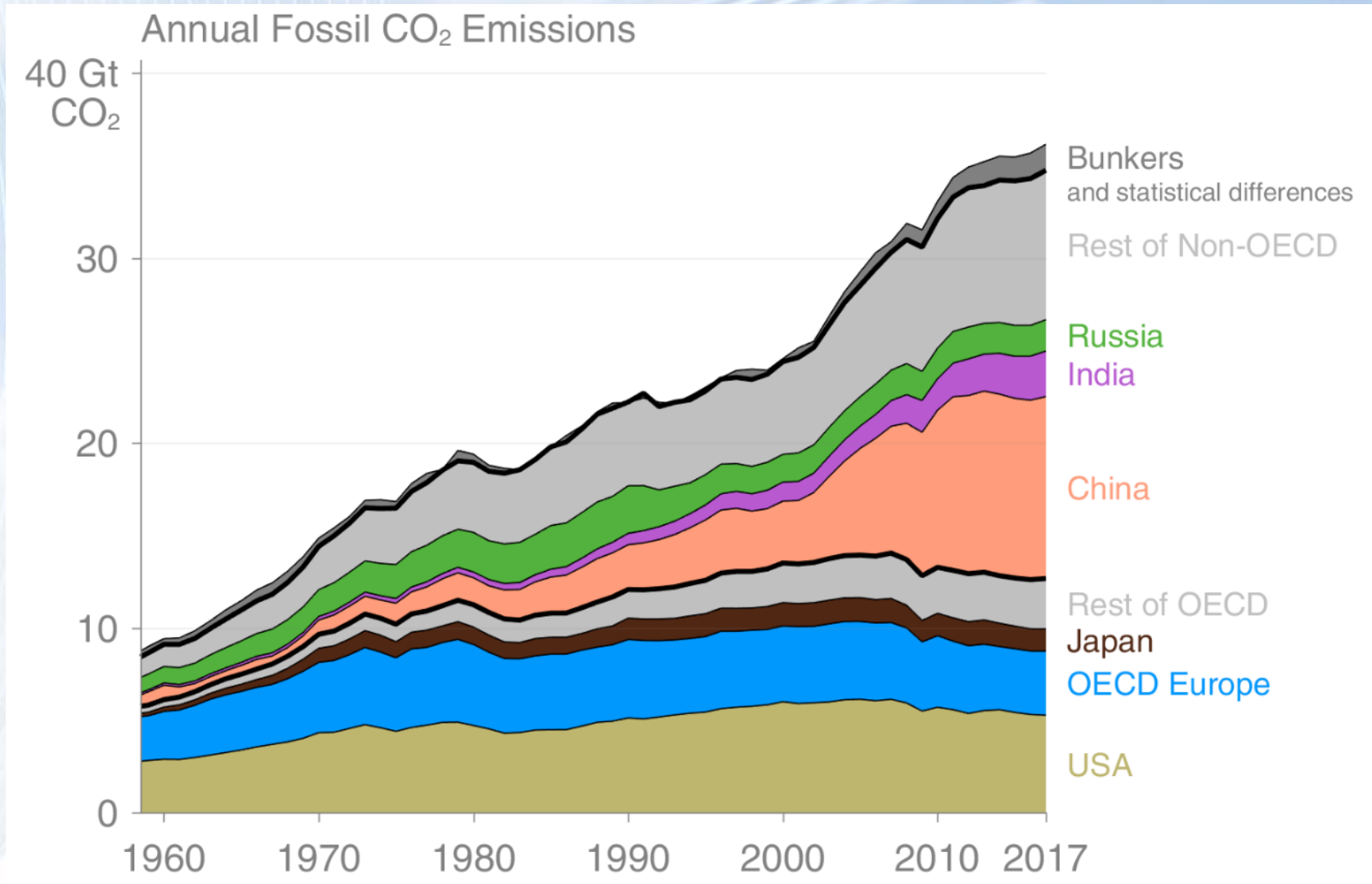
# SWOT – Climate Crises assessments

## CO<sub>2</sub> – from – coal, oil & gas



# SWOT – Climate Crises assessments

## CO<sub>2</sub> – from - countries





# SWOT – Climate Crises assessments

## CO<sub>2</sub> – from – countries %

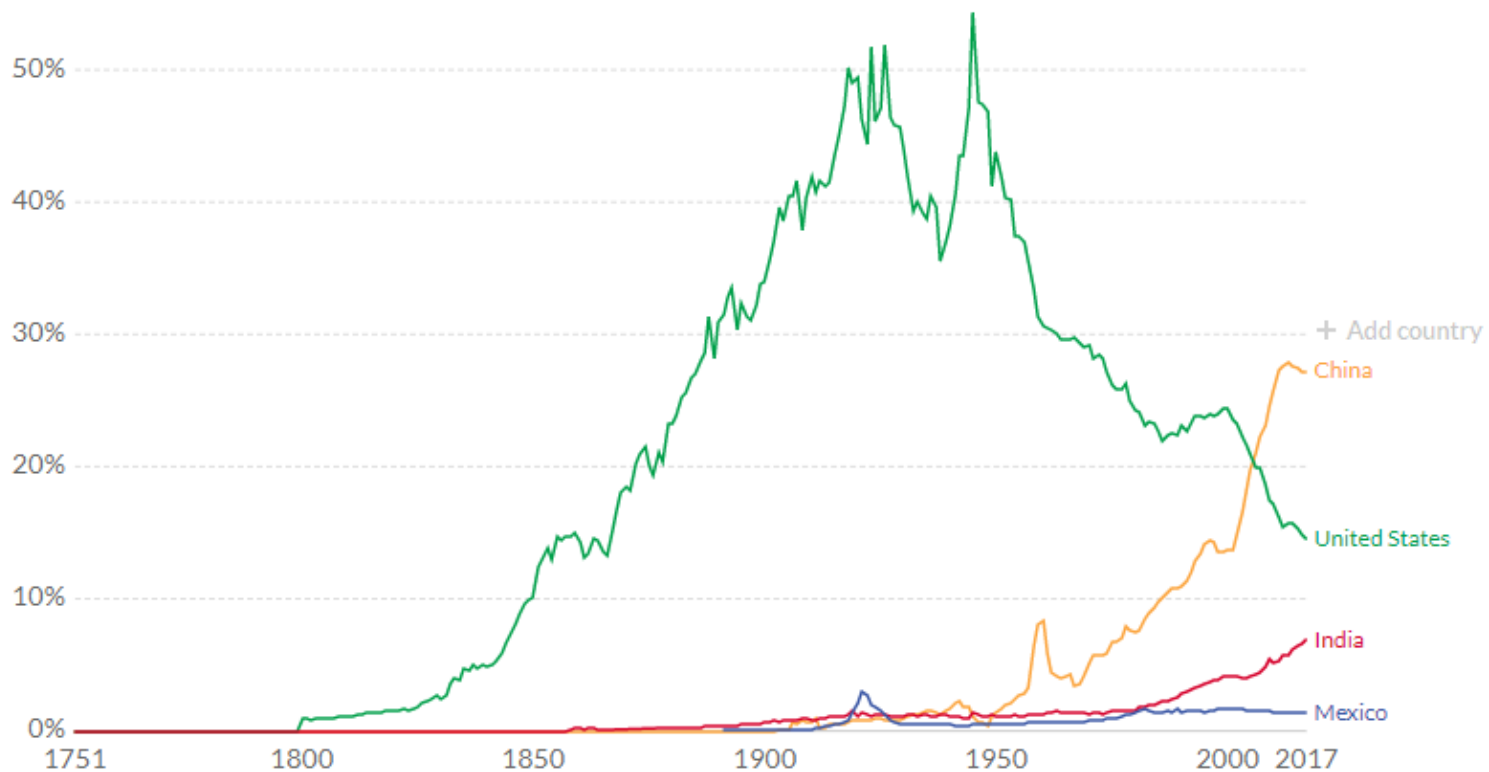
THREATS (-)



### Annual share of global CO<sub>2</sub> emissions

Each country's share of global carbon dioxide (CO<sub>2</sub>) emissions. This is measured as each country's emissions divided by the sum of all countries' emissions in a given year plus international aviation and shipping (known as 'bunkers') and 'statistical differences' in carbon accounts.

Our World  
in Data



Source: Our World in Data based on Global Carbon Project (2018)

OurWorldInData.org/co2-and-other-greenhouse-gas-emissions • CC BY



▶ 1751  2017

CHART

MAP

DATA

SOURCES

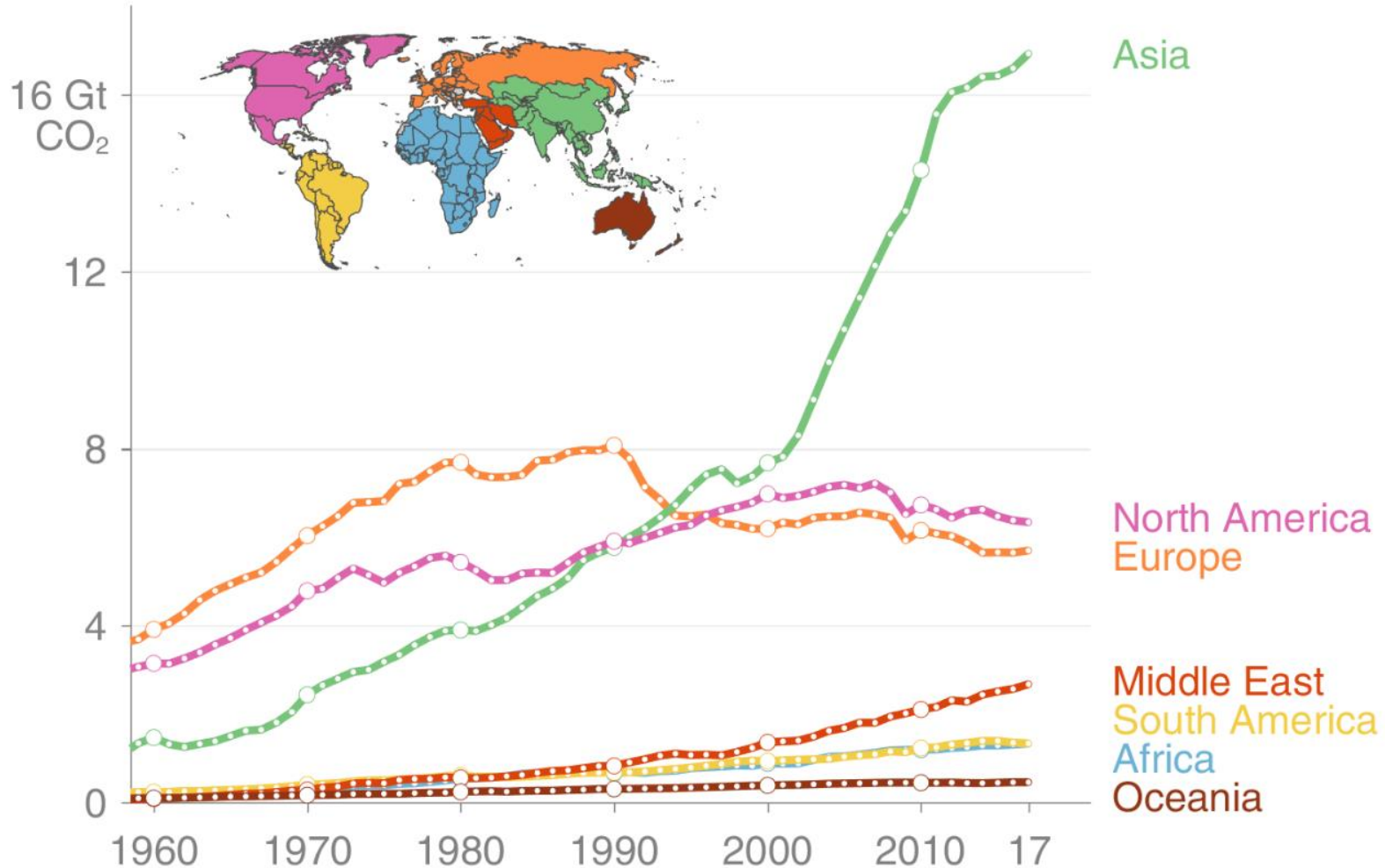


# SWOT – Climate Crises assessments



CO<sub>2</sub> – from – countries %

Fossil CO<sub>2</sub> Emissions by Continent

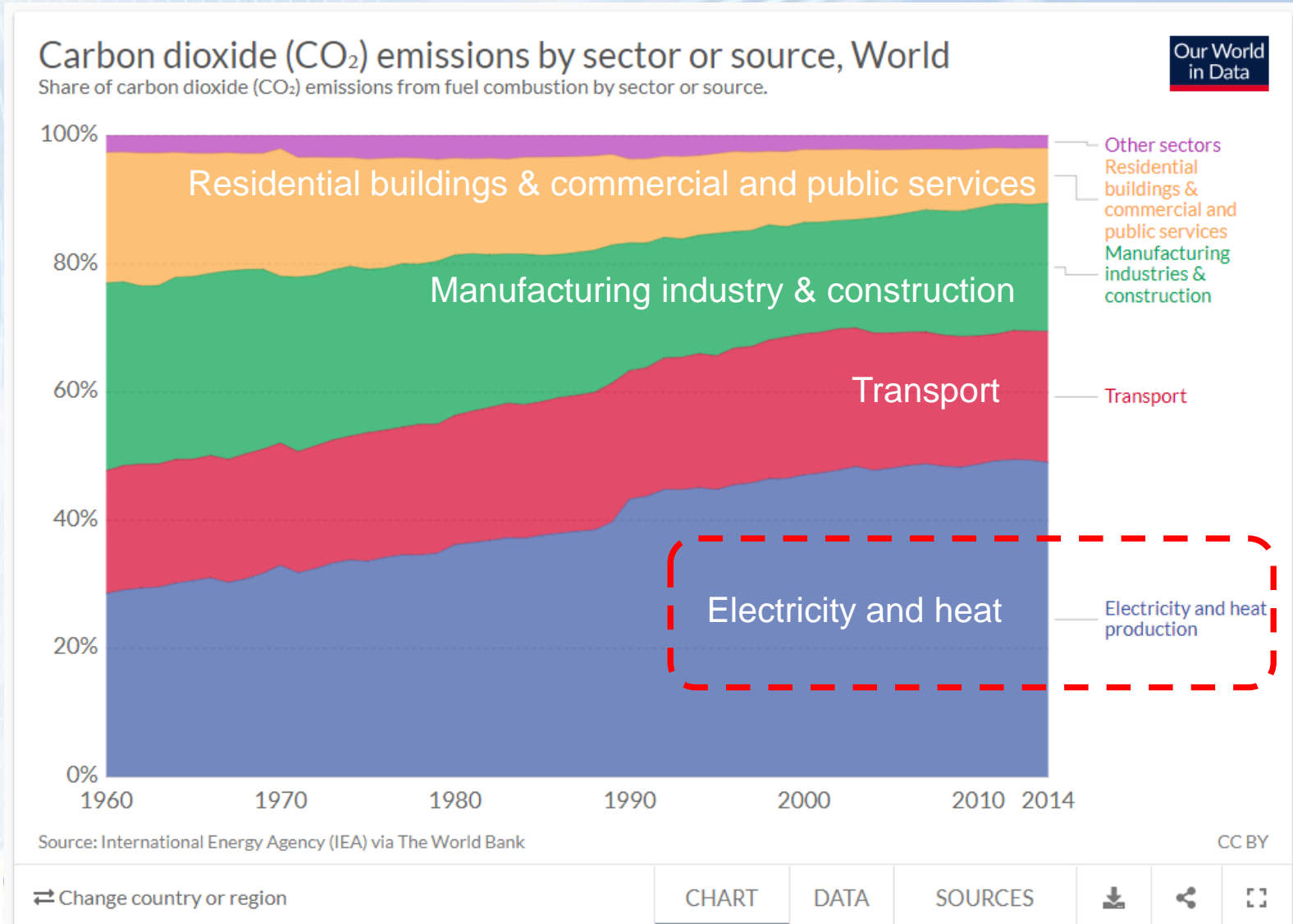


© Global Carbon Project • Data: CDIAC/UNFCCC/BP/USGS



# SWOT – Climate Crises assessments

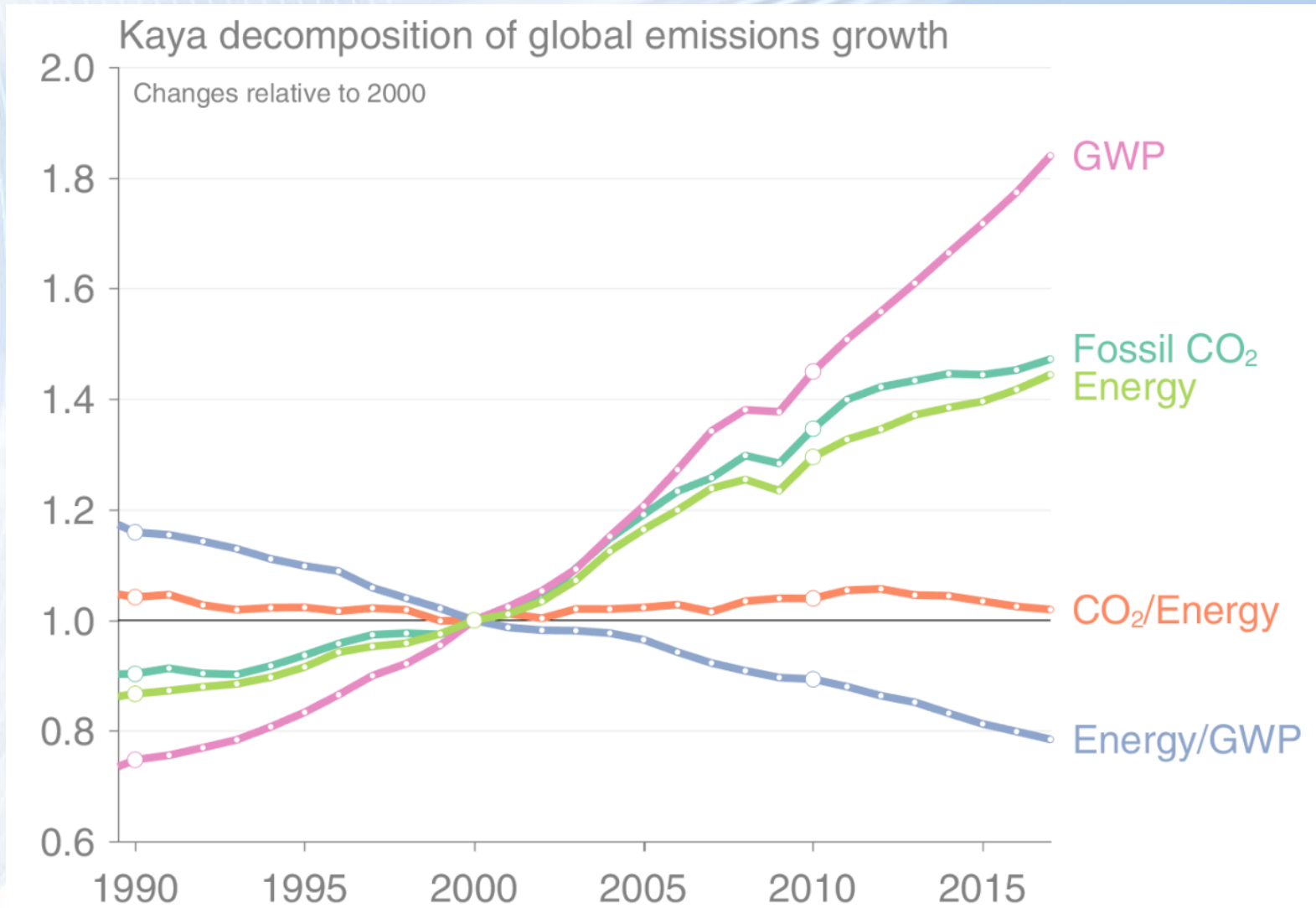
## CO<sub>2</sub> – from - sectors



# SWOT – Climate Crises assessments

## CO<sub>2</sub> – from - sectors

THREATS (-)



# SWOT – Climate Crises assessments

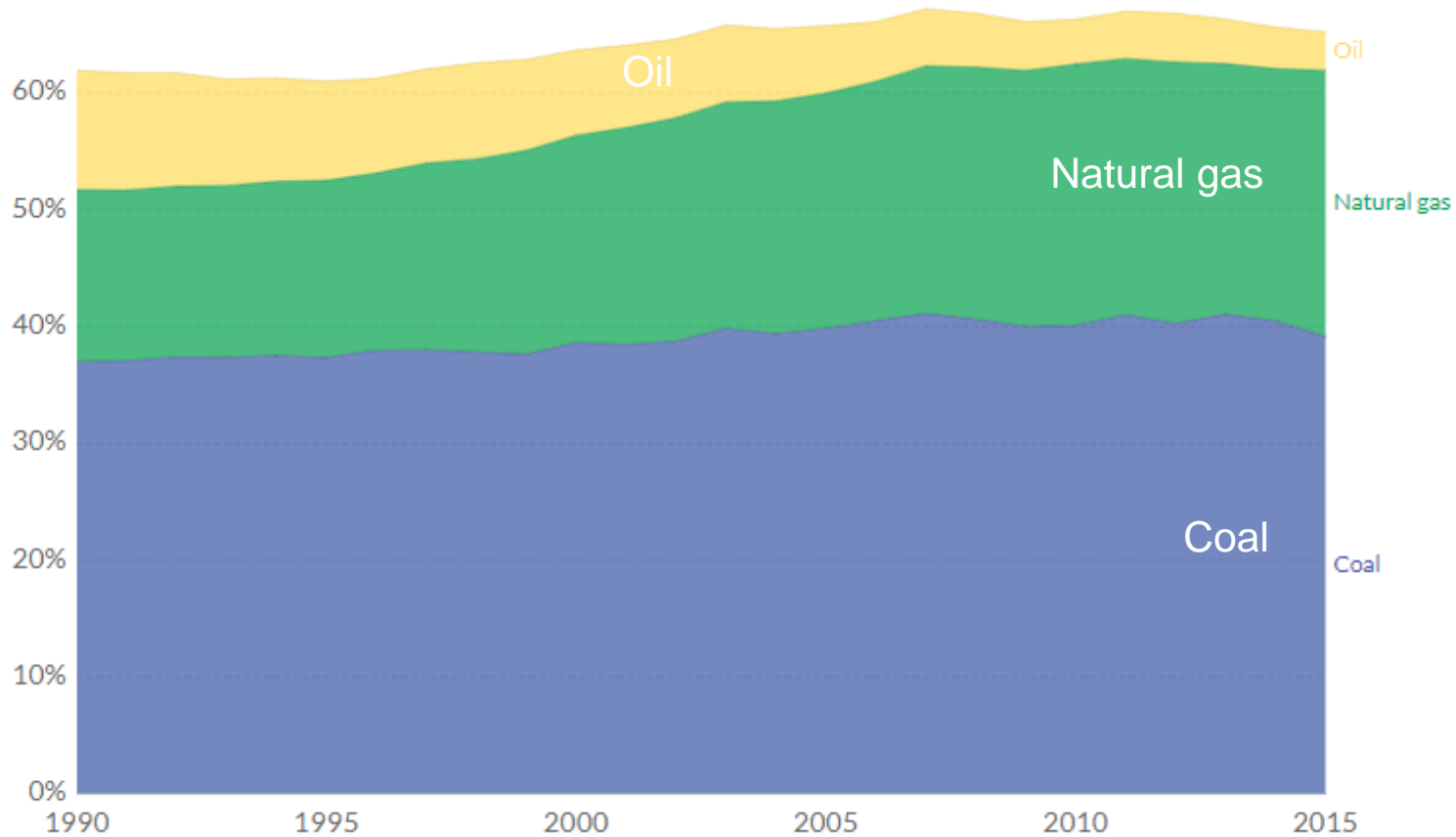
THREATS (-)



## Share of electricity production from fossil fuels, World

The share of total electricity production from coal, oil and natural gas sources.

Our World  
in Data



Source: International Energy Agency (IEA) via The World Bank

CC BY



↔ Change country  Relative

CHART

DATA

SOURCES

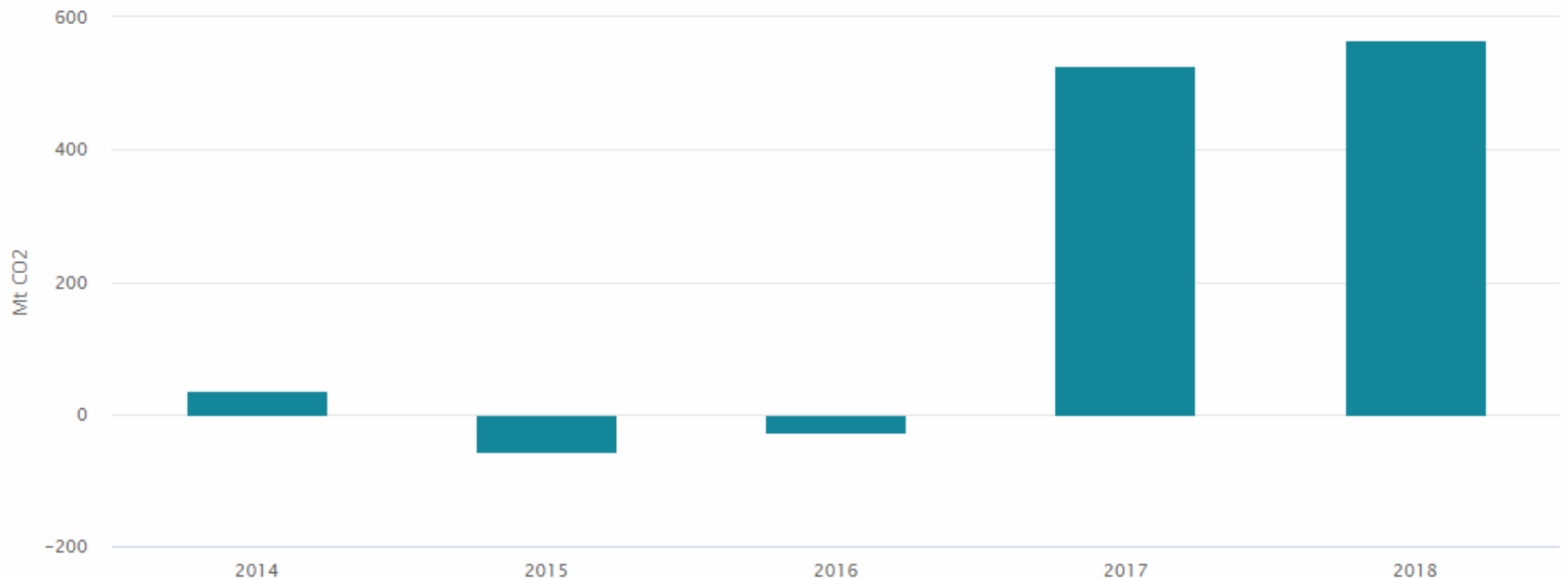


# SWOT – Climate Crises assessments



CO<sub>2</sub> is still increasing a lot

Change in global CO<sub>2</sub> emissions, 2014-18

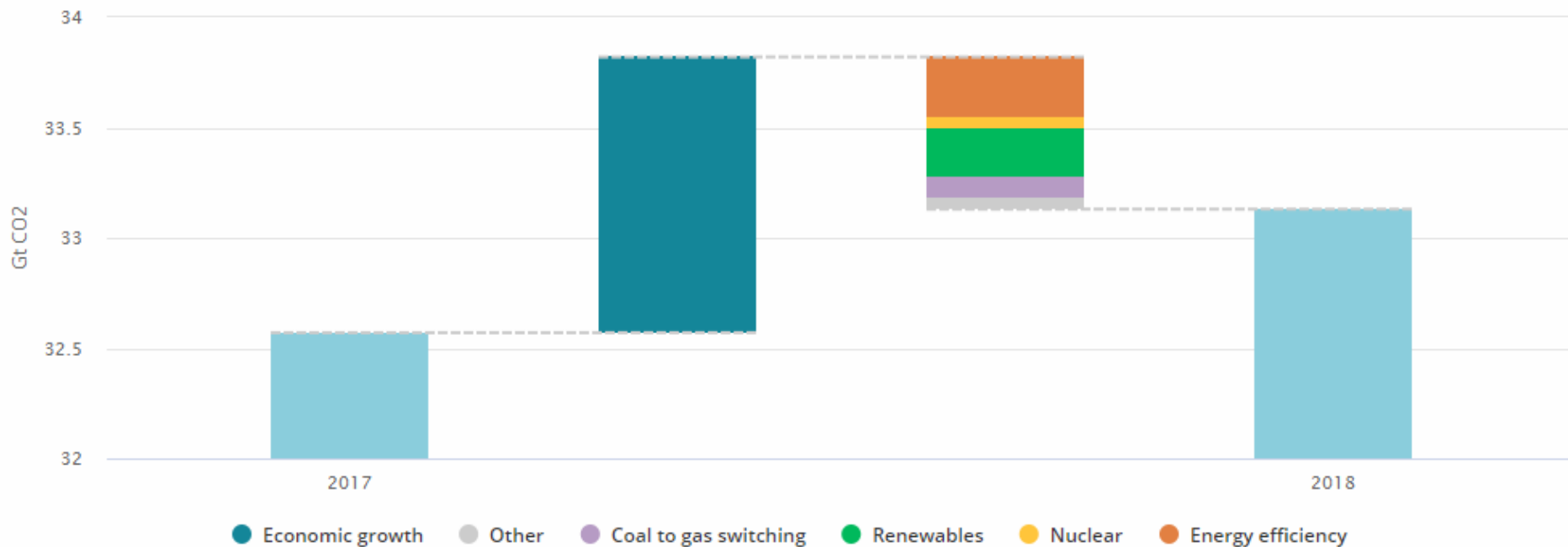


IEA. All rights reserved.

# SWOT – Climate Crises assessments



Change in global energy related CO2 emissions and avoided emissions, 2017-18



IEA. All rights reserved



## Trends in global GHG emissions

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- Global greenhouse gas emissions show no signs of peaking.
- Global CO<sub>2</sub> emissions from energy and industry increased in 2017, following a three-year period of stabilization.
- Total annual greenhouse gases emissions, including from land-use change, reached a record high of 53.5 GtCO<sub>2</sub>e in 2017, an increase of 0.7 GtCO<sub>2</sub>e compared with 2016.
- In contrast, global GHG emissions in 2030 need to be approximately 25 percent and 55 percent lower than in 2017 to put the world on a least-cost pathway to limiting global warming to 2°C and 1.5°C respectively.



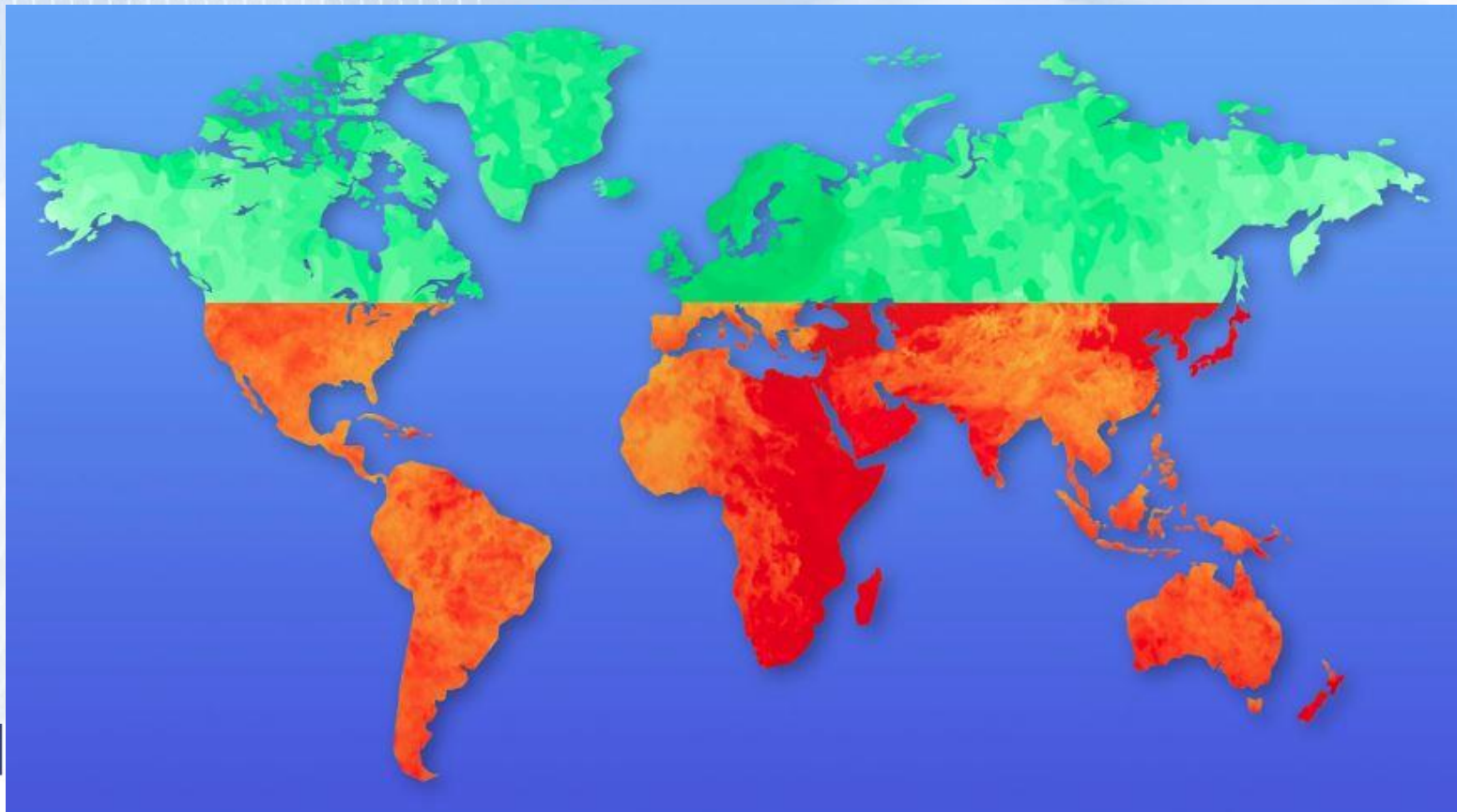
# SWOT – Climate Crises assessments

THREATS (-)



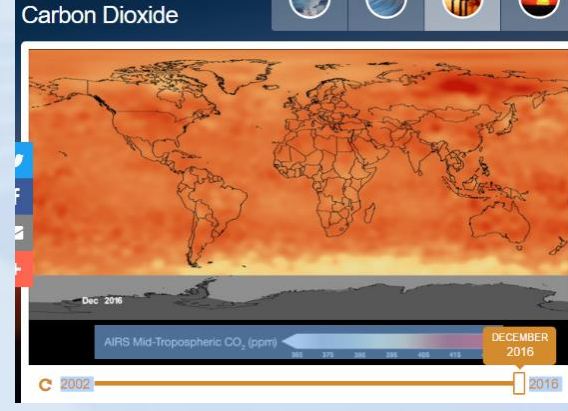
Total annual emissions of CO<sub>2</sub> 2017 is 50,3 GtCO<sub>2</sub>  
that is invisible - but how would it look like if we could see it

Only 50% of the emission are absorbed by plants in the terrestrial and ocean biosphere - therefore we must do much more to reduce CO<sub>2</sub>



# Global Warming

Five-year Global Temperature Anomalies from 1880 – 2015  
1883 - 2100 (NASA)



2002 (ppm 370) > 14 years 14% increase > 2016 (ppm 407)

Once CO<sub>2</sub> is in the air  
it will stay for very  
long time

The future ?



1978 - > 35 years - > 2014

The future ?

# Global Warming

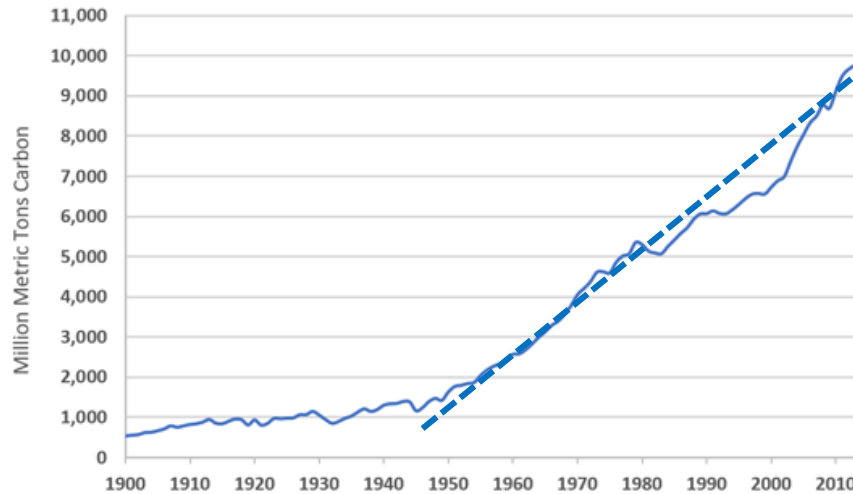
The heat follows global carbon emission

THREATS (-)



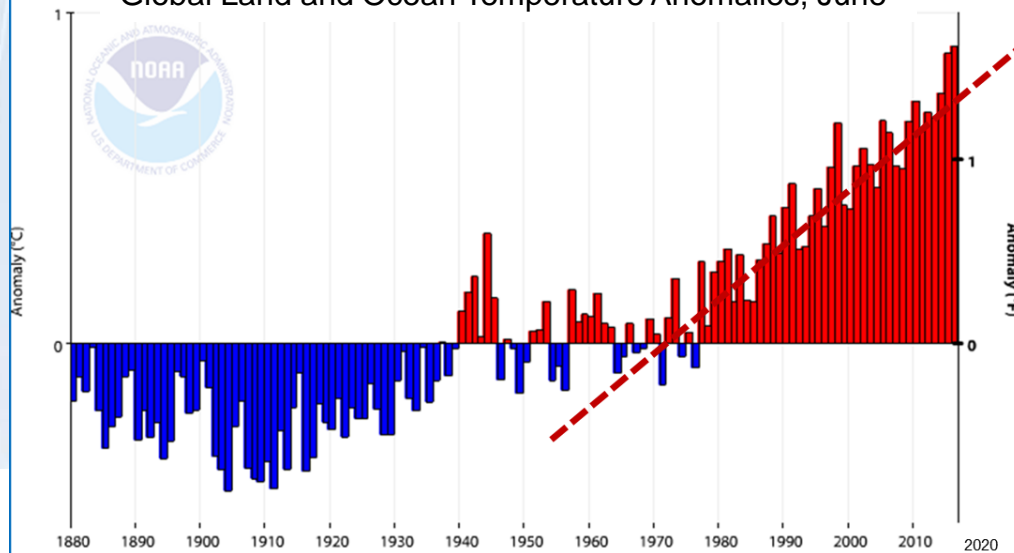
## Trends in Global Emissions

Global Carbon Emissions from Fossil Fuels, 1900-2014



Source: Boden, T.A., Marland, G., and Andres, R.J. (2017). [Global, Regional, and National Fossil-Fuel](#)

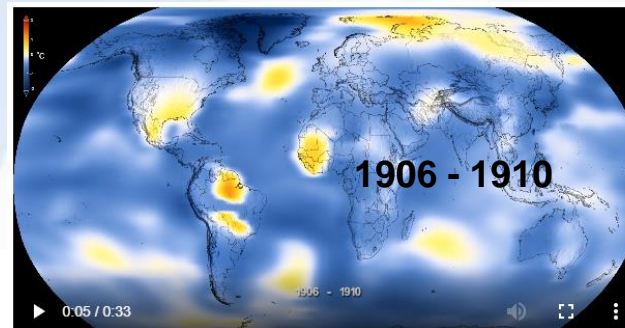
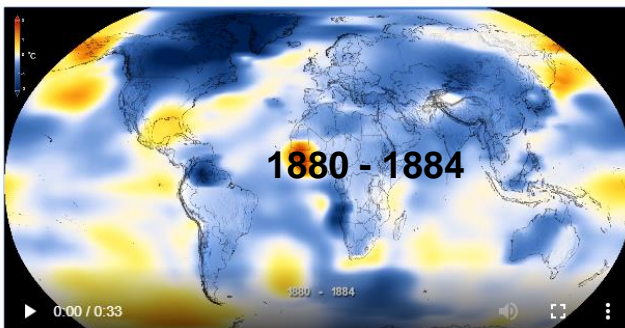
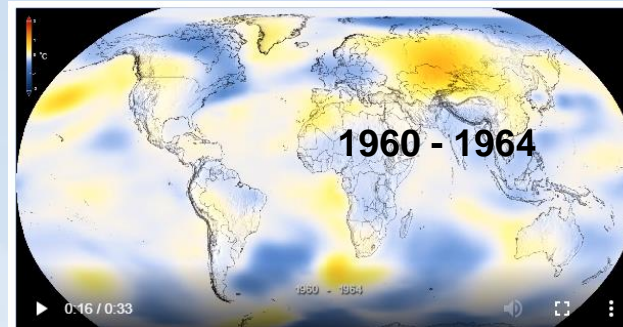
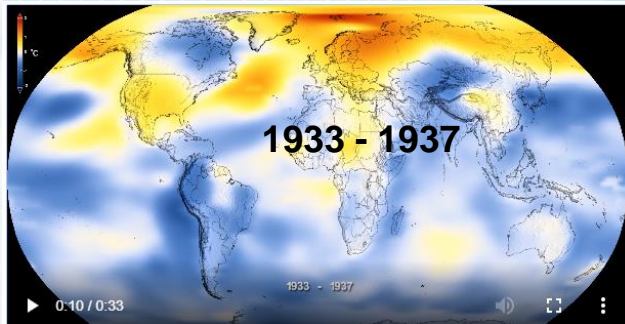
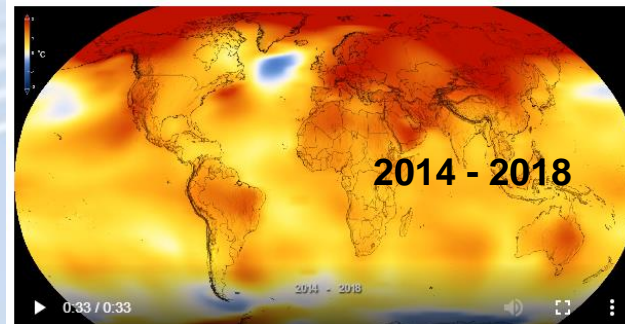
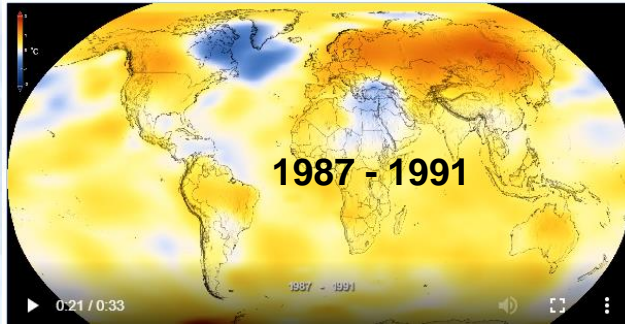
Global Land and Ocean Temperature Anomalies, June



# Global Warming

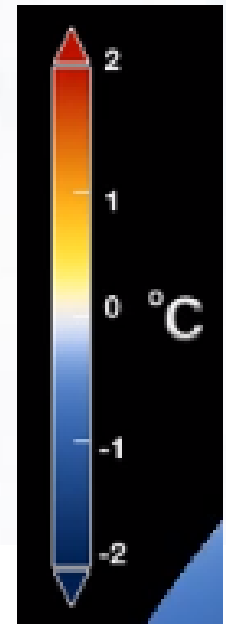
Five-year Global Temperature Anomalies from 1880 – 2018 (NASA)

Average temperature increase in Northern part of earth – is already more than 2°



How will the future look like

➔



# Global Warming

THREATS (-)



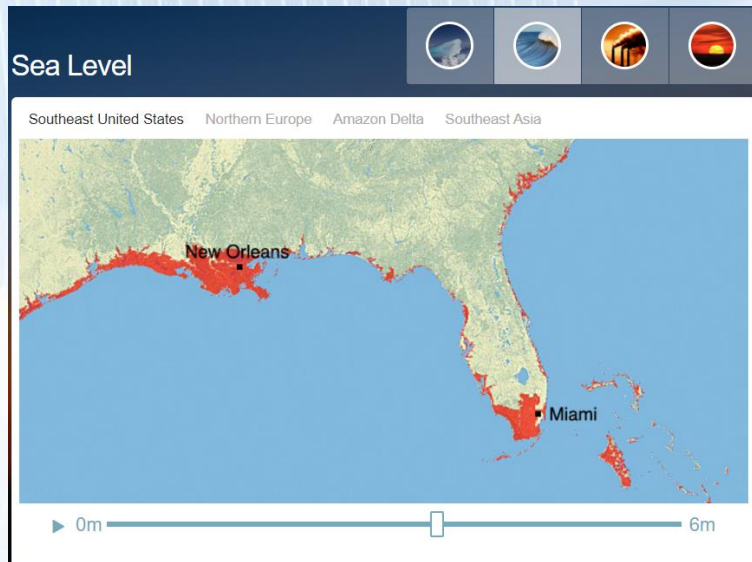
Recent satellite observations have detected a thinning of parts of the Greenland ice sheet at lower elevations.

A partial melting of this ice sheet would cause a 1-meter (3-foot) rise.

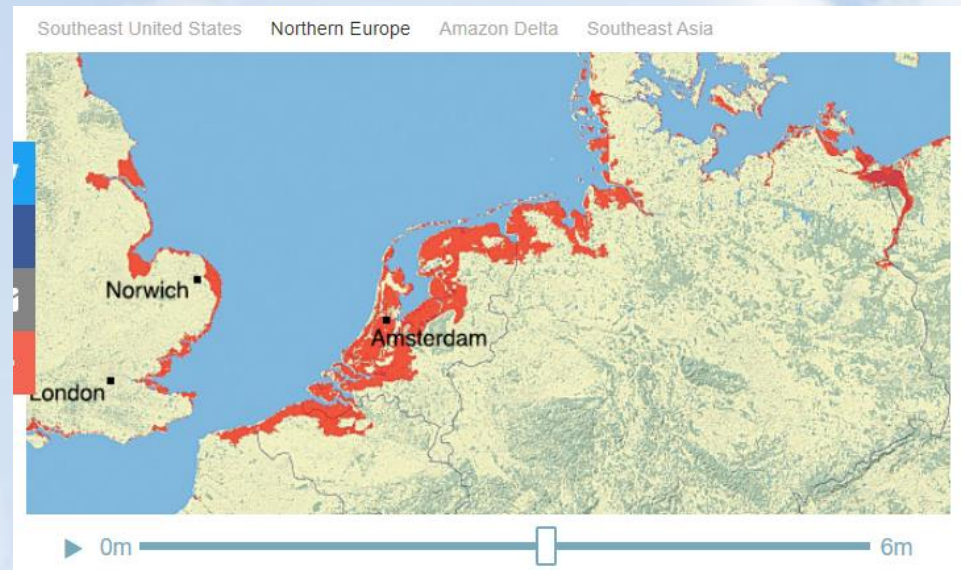
**If melted completely, the Greenland ice sheet contains enough water to raise sea level by 5-7 meters (16-23 feet).**

This visualization shows the effect on coastal regions for each meter of sea level rise, up to 6 meters (19.7 feet).

Land that would be covered in water is shaded red.



3 meter rise



3 meter rise

<https://climate.nasa.gov/interactives/climate-time-machine>

# Global Warming

## More and more weather extremes



Floods in Germany June 2013,  
damage 3 billion € - insurance claims



Floods in Paris 2016



Long Islands, New York "Frankenstorm"  
Hurricane Sandy 2012



Philippines 2013

# Global Warming

## More and more weather extremes



### Wow — Watch Hurricane Irma Turn The Streets Of Miami Into An Overflowing River

9/10/2017 3:57 PM ET | Filed under: [Twitter](#) • [Health](#) • [Scary!](#) • [Instagram](#) • [Viral: News](#) • [Gotta Have Faith](#)



Hurricane Irma, streets in central Miami 2017



Interstate 45 in Houston after Hurricane Harvey. REUTERS/Richard Carson

Hurricane Harvey, Houston 2017



# Global Warming

## More and more weather extremes



Storm in Poland August 2017, 30.000 square km – broken trees and destroyed forest





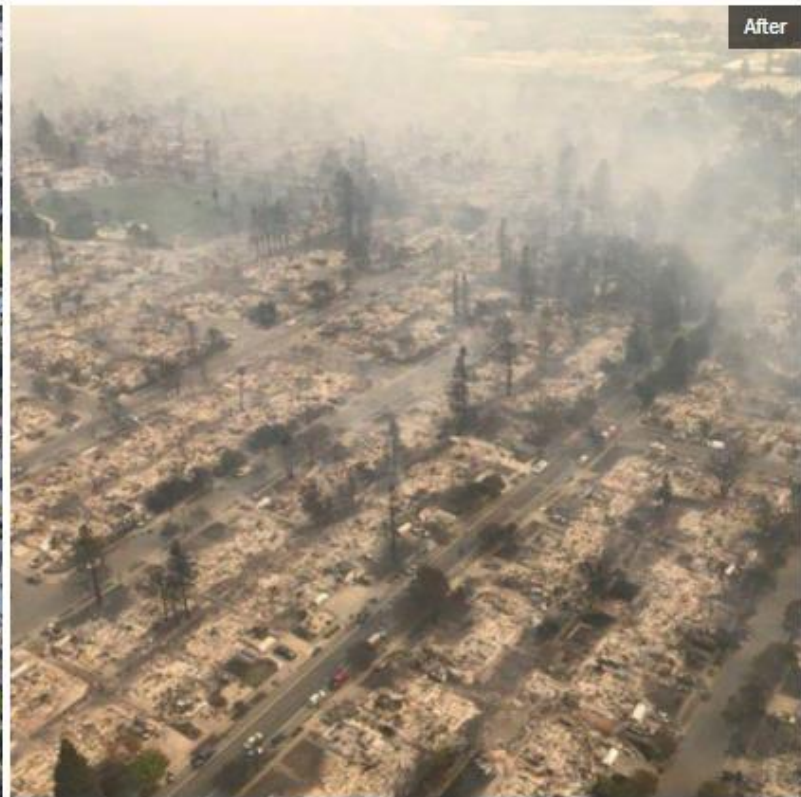
# Global Warming

More and more weather extremes



## Before and After Photos: Fires Tear Through California's Wine Country

UPDATED 5 PM ET, OCT. 11, 2017



Fires destroyed an area of the Coffey Park neighborhood in Santa Rosa, Calif. Before: Google Earth; After: California Highway Patrol, via Reuters



**NATIONAL ENERGY AUTHORITY**  
National Energy Authority

Santa Rose, California 2017

# Global Warming

More and more weather extremes

THREATS (-)



## Portuguese children to crowdfund European climate change case

Group from region hit by deadly forest fires to sue 47 countries alleging failure to tackle climate change threatens their right to life



The fires in Leiria this summer killed more than 60 people. Photograph: Paulo Cunha/EPA

Portuguese schoolchildren from the area struck by the country's worst forest fires are seeking crowdfunding to sue 47 European countries, alleging that the states' failure to tackle climate change threatens their right to life.

# Global Warming

## More and more weather extremes



California had nation's worst fire season in 2018

SHARE THIS - f t e

U.S. NEWS

## California had nation's worst fire season in 2018

Last year's fire season was "the worst in recorded history" for the state, one official said.



**California fires: Emergency declared state-wide**

8 hours ago

Facebook Messenger Twitter Email Share

California wildfires



**Global Warming**  
 More and more  
 weather extremes



With wildfires occurring across the globe, here are some of the techniques used to stop the

Mynd: AP - FR34727 AP

Californian Governor Gavin Newsom has declared a state-wide emergency as wildfires, whipped up by fierce winds, continue to sweep through the area.

California Oct. 2019  
 Emergency declared state-wide

Some 180,000 people have been ordered to leave homes, with roads around Santa Rosa north of San Francisco packed with cars as people tried to flee.

# Global Warming

## More and more weather extremes



Business Insider Nordic

Í gær klukkan 18:28 · 🌐

The East Japan Railway Company said 10 trains with a total of 120 carriages were damaged, which accounts for a third of the total fleet, according to NHK.



BUSINESSINSIDER.COM

**Japan's Typhoon Hagibis wrecked its fleet of bullet trains worth \$300 million**

October 2019



# SWOT – Climate Crises assessments

THREATS (-)



# SWOT – Climate Crises assessments

THREATS (-)



WORLD  
ECONOMIC  
FORUM

It's melting **twice as fast**  
as usual this summer...



50 km



05

Source: National Snow and Ice Data Center

Footage: Nasa, YouTube

# SWOT – Climate Crises assessments

THREATS (-)



WORLD  
ECONOMIC  
FORUM



With **wildfires** across **Alaska**  
and **Siberia**

05

Footage: Courtesy Police Benevolent Association Of New York State

Even the Arctic  
is burning



# SWOT – Climate Crises assessments

OPPORTUNITIES (+)



United Nations  
NDC Global Outlook  
Report 2019

# SWOT – Climate Crises assessments

OPPORTUNITIES (+)



**“ I want to hear about how we are going to stop the increase in emissions by 2020, and dramatically reduce emissions to reach net-zero emissions by mid-century.**



UN Secretary General António Guterres wants countries to come to the Climate Action Summit with concrete plans to combat climate change, which he calls “the defining issue of our time”.

UN Secretary General  
António Guterres

# SWOT – Climate Crises assessments

OPPORTUNITIES (+)



**Overall, this report finds many reasons for optimism, but much work remains. It's clear that *business as usual* simply isn't good enough anymore. We must do more – much more – in areas related to mitigation, adaptation, and the finance to support all of this work. And we must do it quickly.**



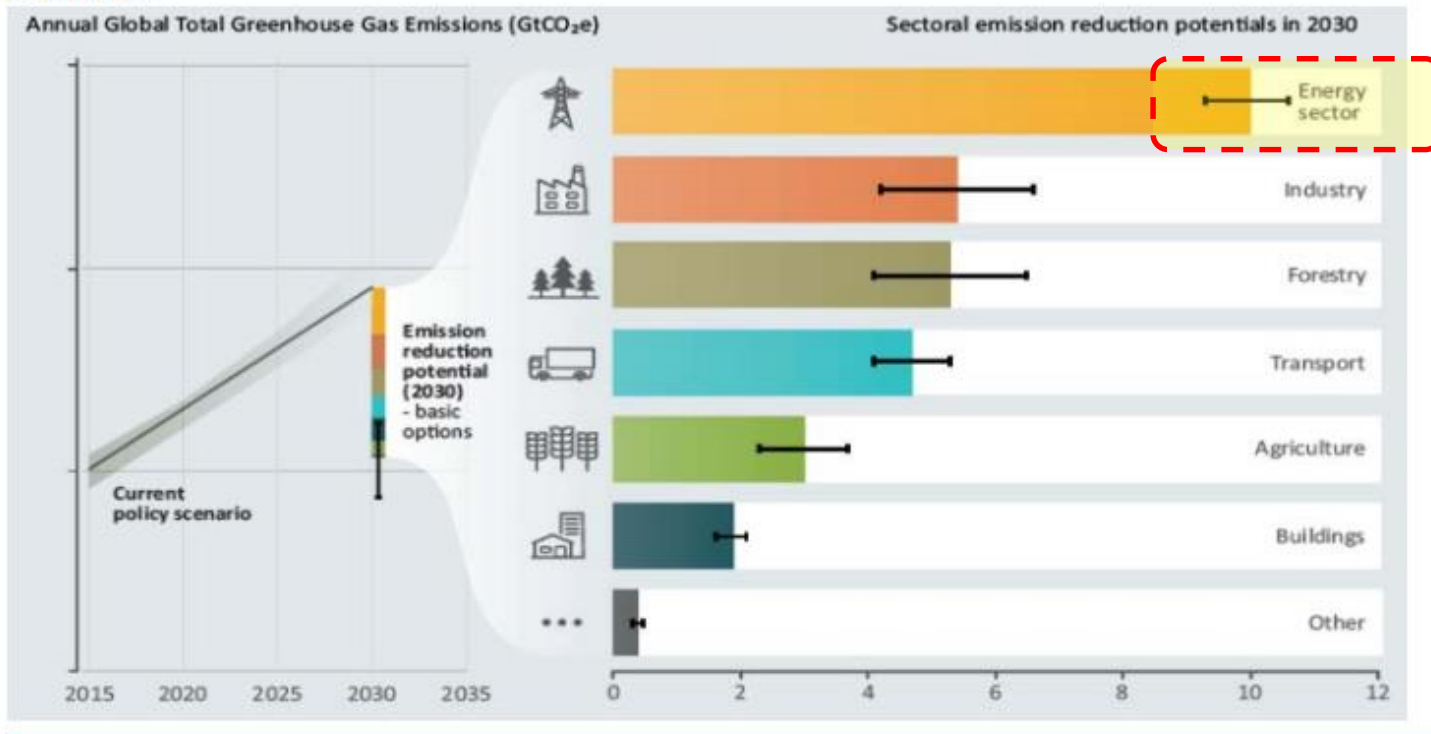
UN Secretary General  
António Guterres

# SWOT – Climate Crises assessments



## Sectoral emission reduction potentials in 2030

The emissions reduction potential in six key sectors, at cost <US\$100/tCO<sub>2</sub>e, is sufficient to close the emissions gap in 2030 - if implemented immediately and at scale. Most actions would have other environmental, social and economic benefits.



# SWOT – Climate Crises assessments

## Warnings from the banking sector

OPPORTUNITIES (+)



### Firms ignoring climate crisis will go bankrupt

says Mark Carney, Bank of England governor warns of financial collapse linked to climate emergency

**Companies and industries that are not moving towards zero-carbon emissions will be punished by investors and go bankrupt**, the governor of the [Bank of England](#) has warned.

[Mark Carney](#) also told the Guardian it was possible that the global transition needed to tackle the climate crisis could result in an abrupt financial collapse. He said the longer action to reverse emissions was delayed, the more the risk of collapse would grow.

The Bank of England has [said up to \\$20tn \(£16tn\) of assets](#) could be wiped out if the climate emergency is not addressed effectively. **But Carney also said great fortunes could be made by those working to end greenhouse gas emissions with a big potential upside for the UK economy i**



# SWOT – Climate Crises assessments

## Warnings from global banks – risk assessment

OPPORTUNITIES (+)



- Although the timing, scope and magnitude of the consequences of global warming remain uncertain, the potential risks are significant
- Climate change could reshape the earth
- Cities will be on the frontlines of climate adaptation
- Urban adaptation could drive one of the largest infrastructure build-outs in history
- Given the scale of the task, urban adaptation will likely need to draw on innovative sources of financing
- Adaptation may raise questions of fairness.

Goldman Sachs  
GLOBAL MARKETS INSTITUTE  
September 2019

# TAKING THE HEAT

Making cities resilient to climate change

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The Goldman Sachs Group, Inc.

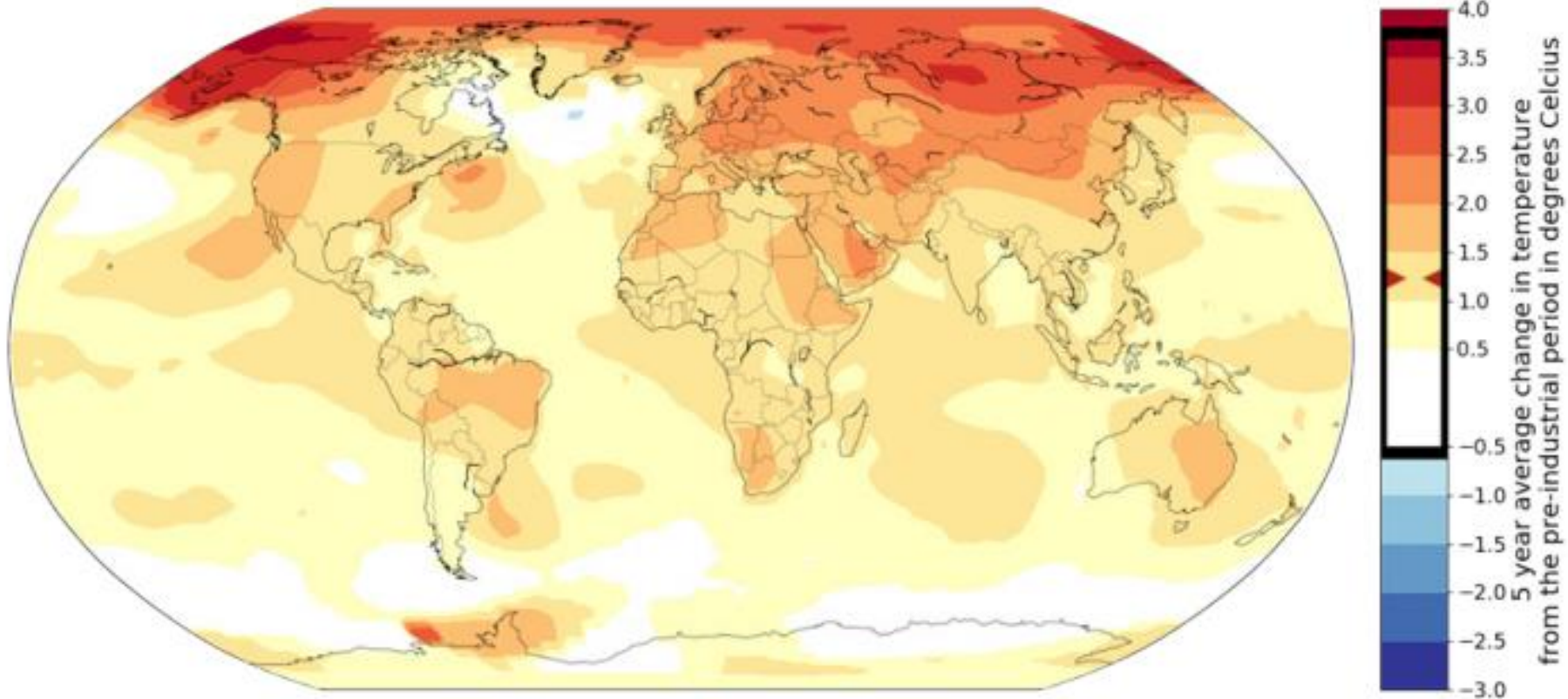
# SWOT – Climate Crises assessments

## Warnings from global banks



**Change in global mean surface temperatures, 2005-2019**  
**Average change in temperatures measured against the pre-industrial period**

2015-2019



# SWOT – Climate Crises assessments

Warnings from global banks

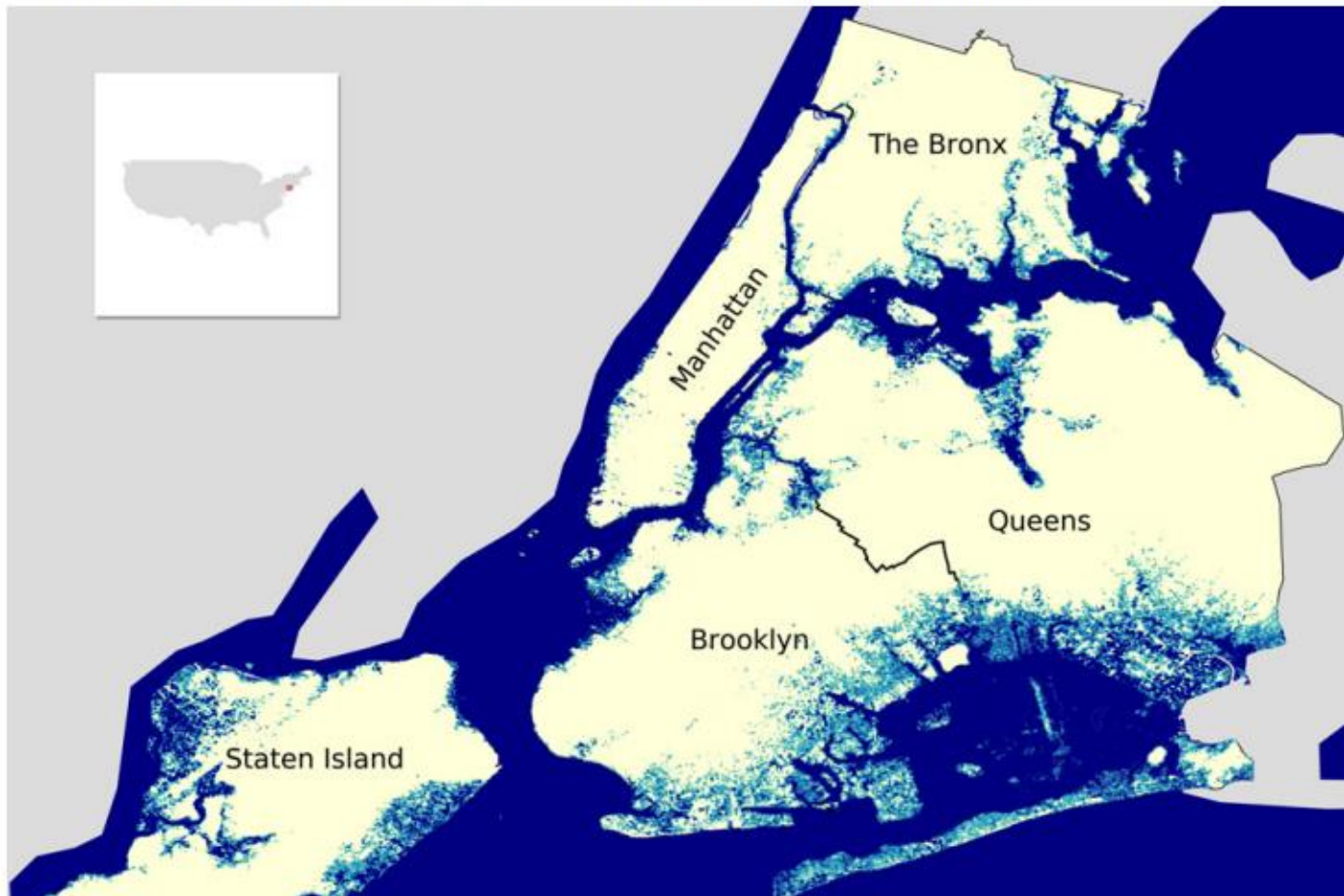


New York, Tokyo, Lagos,, etc. at risk of flooding

Goldman Sachs

Global Markets Institute

Exhibit 8: Rising sea levels and storm surges put parts of New York City, Tokyo and Lagos at risk of flooding





# SWOT – Climate Crises assessments

## Warnings from next generation

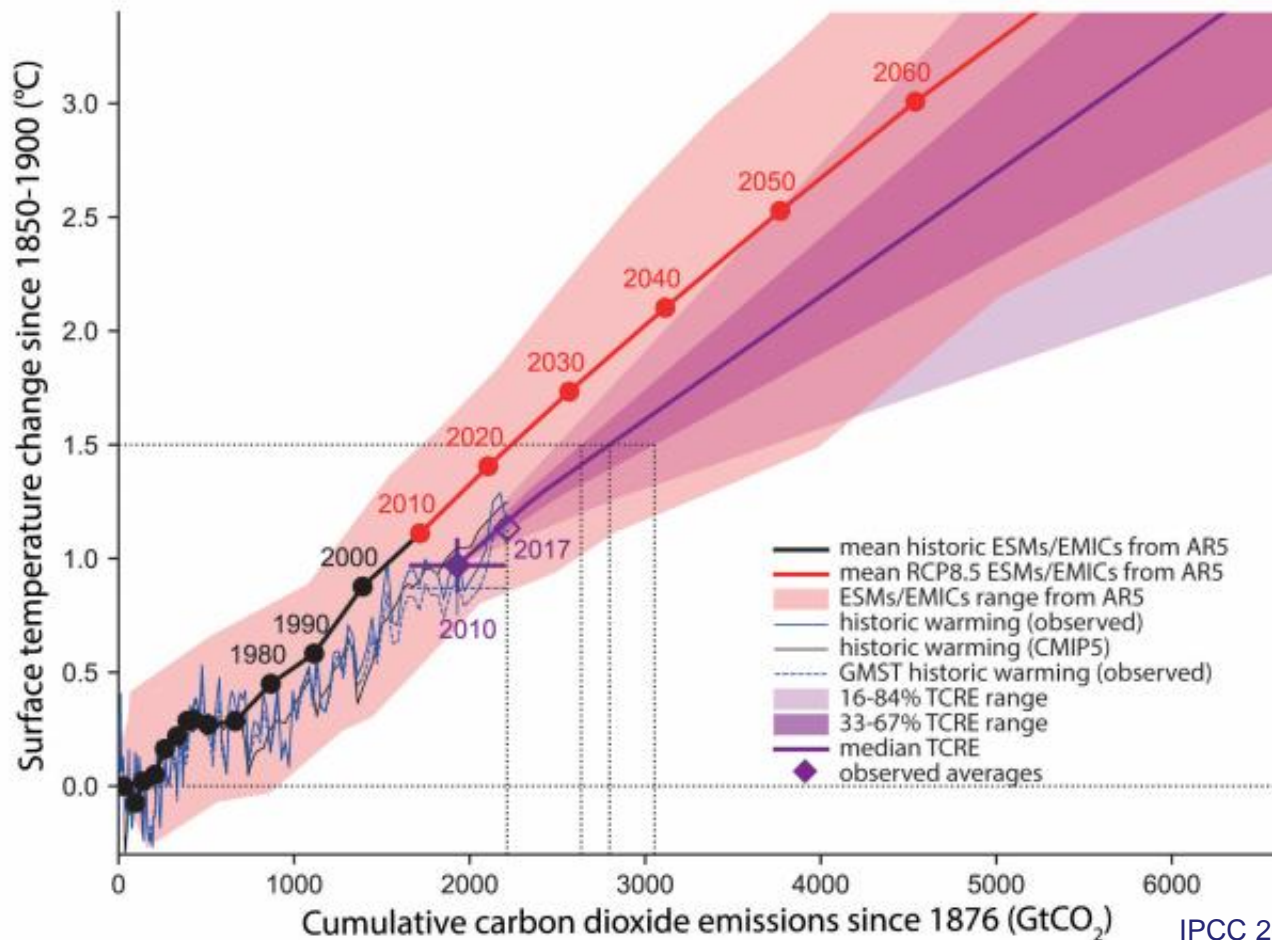
OPPORTUNITIES (+)



# SWOT – Climate Crises assessments



We need to do much more to reduce CO<sub>2</sub> to be able to stay below 1,5° C increase, as there is only 420 GtCO<sub>2</sub> left for the 1,5° C limit, which take only 12 years to finish, without no change



# SWOT – Climate Crises assessments



We need to do much more to be able to reduce CO<sub>2</sub> to be able to stay below 1,5<sup>0</sup> C increase, as there is only 420 GtCO<sub>2</sub> left for the 1,5<sup>0</sup> C limit, which take only 12 years to finish, without no change

Additional Warming since 2006–2015 [°C] <sup>(1)</sup>	Approximate Warming since 1850–1900 [°C] <sup>(1)</sup>	Remaining Carbon Budget (Excluding Additional Earth System Feedbacks <sup>*(5)</sup> ) [GtCO <sub>2</sub> from 1.1.2018] <sup>*(2)</sup>		
		Percentiles of TCRE <sup>*(3)</sup>		
		33rd	50th	67th
0.3		290	160	80
0.4		530	350	230
0.5		770	530	380
0.53	~1.5°C	840	580	420

As this chart from the IPCC shows, there is a remaining carbon budget of about 420 GtCO<sub>2</sub> for a two-thirds 66% chance of limiting warming to 1.5°C, and 580 GtCO<sub>2</sub> for a 50% chance.



# SWOT – Climate Crises assessments

OPPORTUNITIES (+)



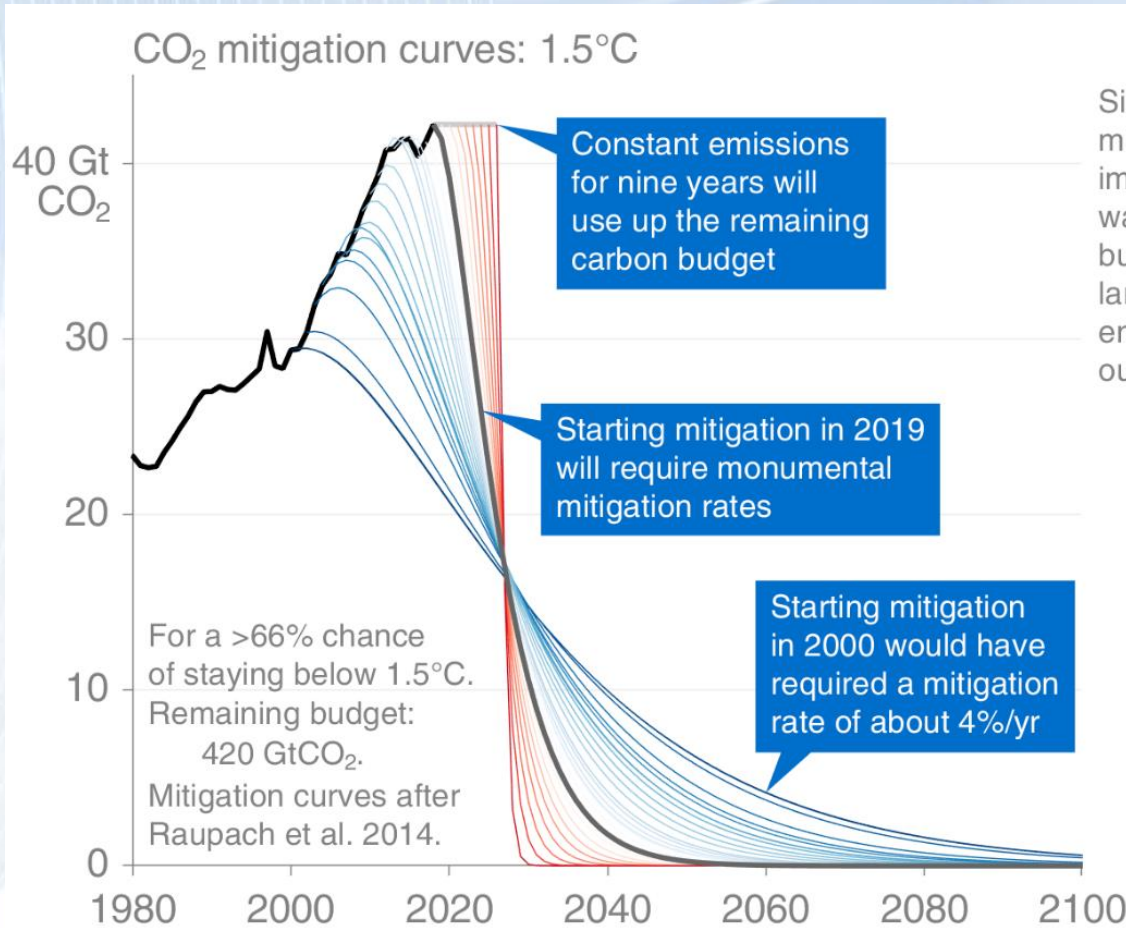
We have 12 years to limit climate change catastrophe, warns UN

Reaching 1.5°C requires a monumental global effort for a 66% chance

— almost a wartime effort —

with extremely steep reductions each year including shutdown of fossil fuel assets

(IPCC and Dr Helena Wright)



Since such steep mitigation is impossible, the only way to achieve this budget is with very large "negative" emissions: pulling CO<sub>2</sub> out of the atmosphere.

As this chart from the IPCC shows, there is a remaining carbon budget of about 420 GtCO<sub>2</sub> for a two-thirds (66%) chance of limiting warming to 1.5°C, and 580 GtCO<sub>2</sub> for a 50% chance.



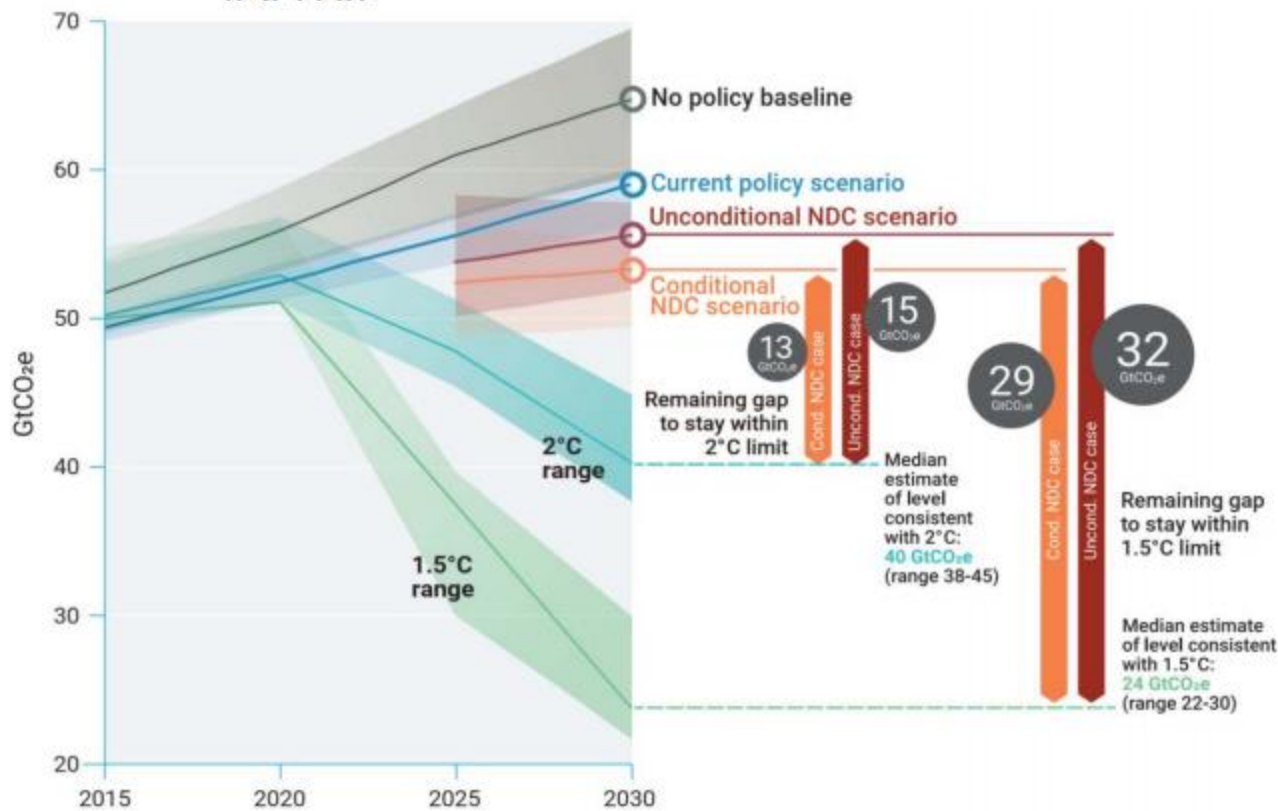
# SWOT – Climate Crises assessments



We need to do much more - to be able to stay below 1,5<sup>0</sup> C increase

## NDC contributions and the emissions gap

Annual global total greenhouse gas emissions



# SWOT – Climate Crises assessments

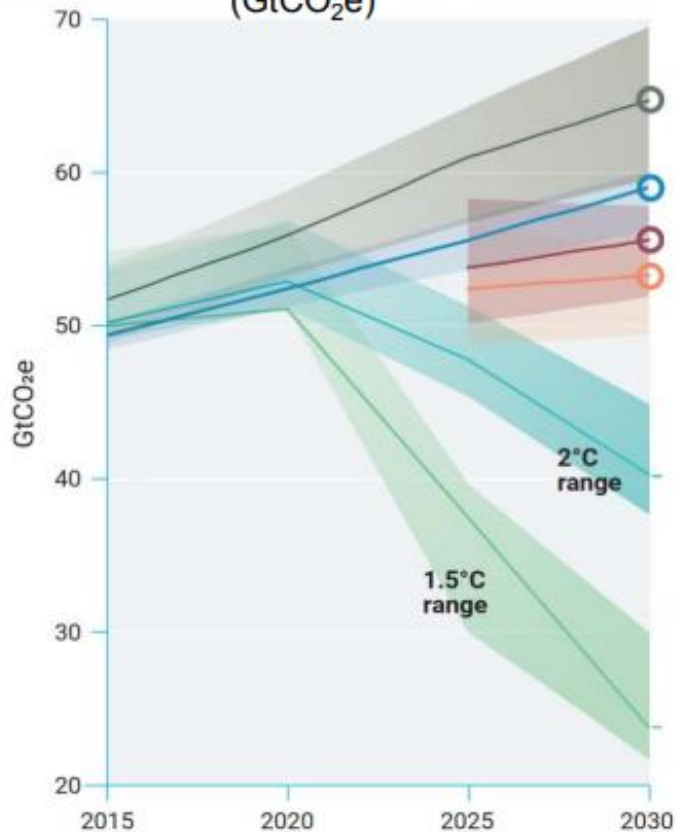
OPPORTUNITIES (+)



We need to do much more - to be able to stay below 1,5<sup>0</sup> C increase

## NDC contributions and the emissions gap

Annual global total greenhouse gas emissions  
(GtCO<sub>2</sub>e)



NDCs represent a first start to initiate the required transition, but are far from consistent with the well below 2°C / 1.5°C

temperature goals. Full implementation of unconditional NDCs is consistent with staying below a 3.2°C temperature increase by 2100. Additional implementation of conditional NDCs lowers this by about 0.2°C.

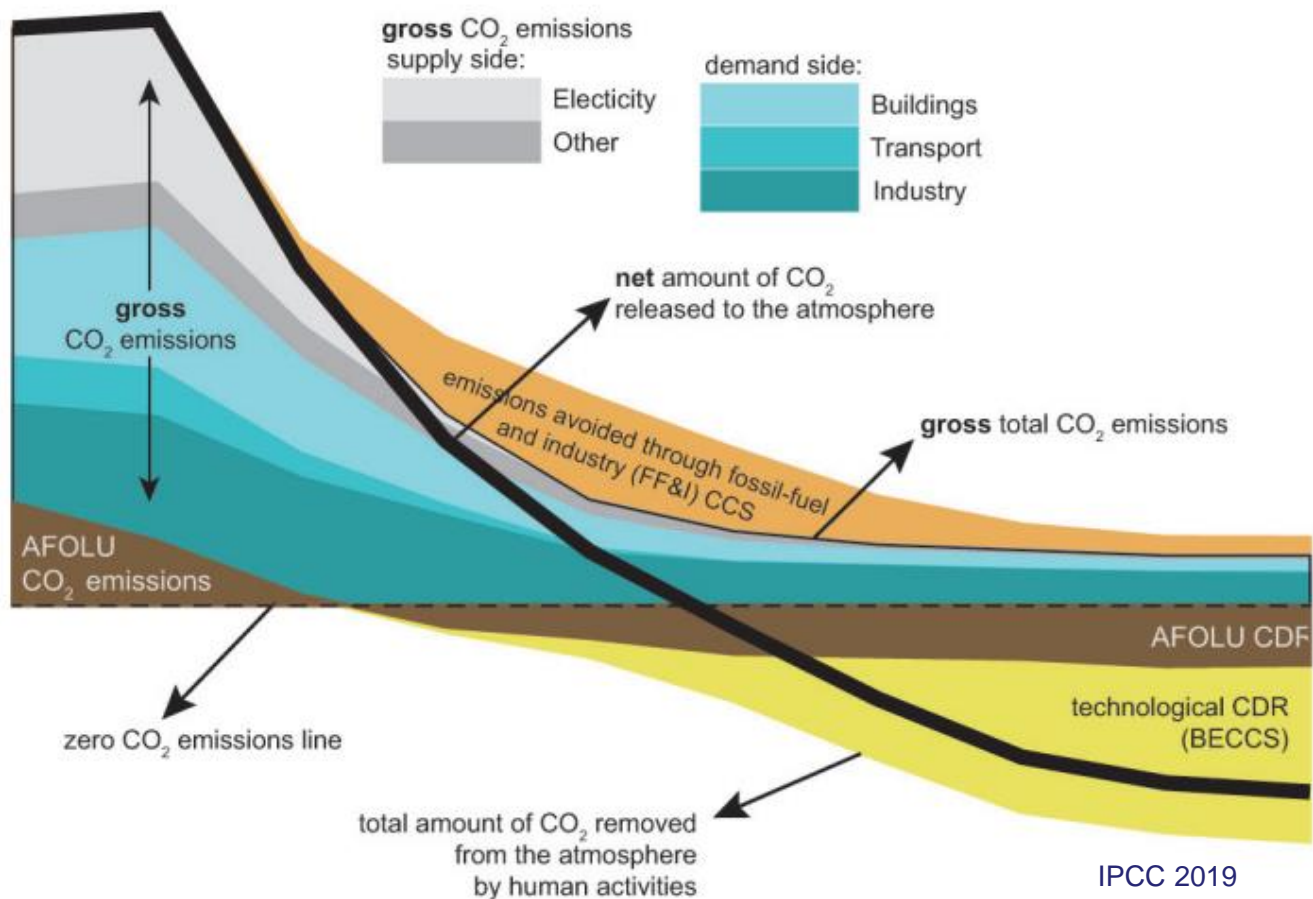
Unless NDC ambitions are increased before 2030, exceeding the 1.5°C goal is unavoidable. Now more than ever, unprecedented and urgent action is required by all nations.

# SWOT – Climate Crises assessments



We need to do much more to be able to reduce CO<sub>2</sub> to be able to stay below 1,5<sup>0</sup> C increase, as there is only 420 GtCO<sub>2</sub> left for the 1,5<sup>0</sup> C limit, which take only 12 years to finish, without no change

## LEGEND: EMISSION CONTRIBUTIONS



# SWOT – Climate Crises assessments

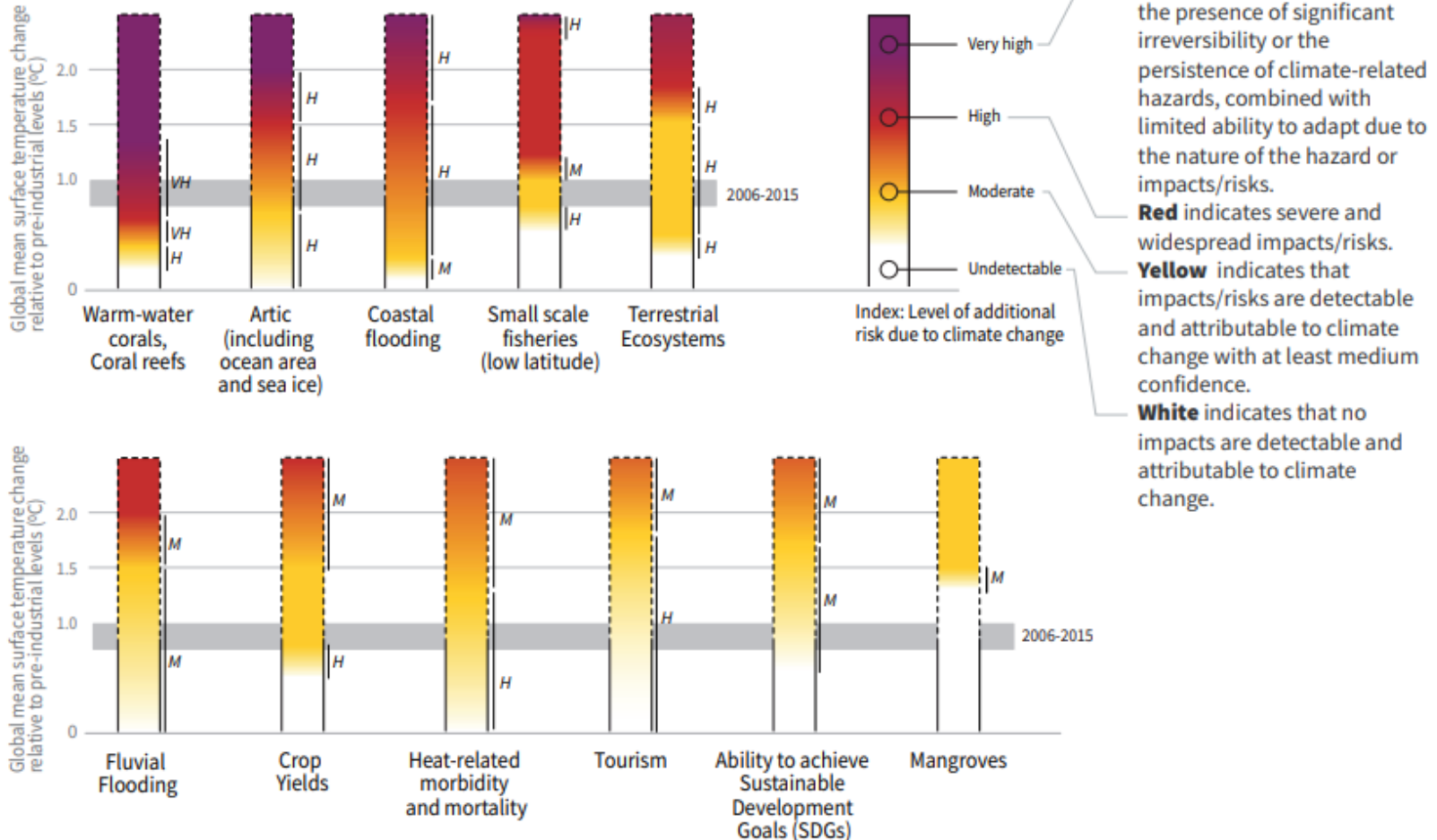
THREATS (-)



## Key risk factors – related to Climate Crises

### Risks and/or impacts for specific natural, managed and human systems

The key elements are presented here as a function of the risk level assessed between 1.5°C and 2°C.





# SWOT – Climate Crises assessments

THREATS (-)



## Climate change

This article is more than 1 year old

### We have 12 years to limit climate change catastrophe, warns UN

Urgent changes needed to cut risk of extreme heat, drought, floods and poverty, says IPCC

Overwhelmed by climate change? Here's what you can do



Jonathan Watts *Global environment editor*

@jonathanwatts

Mon 8 Oct 2018 07.23 BST



32,145



▲ A firefighter battles a fire in California. The world is currently 1C warmer than preindustrial levels. Photograph: Ringo HW Chiu/AP

The world's leading climate scientists have warned there is only a dozen years for global warming to be kept to a maximum of 1.5C, beyond which even half a degree will significantly worsen the risks of drought, floods, extreme heat and poverty for hundreds of millions of people.

# SWOT – Climate Crises assessments

THREATS (-)



## Rising seas will erase more cities by 2050, new research shows

*A paper published Tuesday developed a more accurate way of calculating land elevation based on satellite readings, a way of estimating the effects of sea level rise, and found that the previous numbers were far too optimistic.*

New York Times | Oct 30, 2019, 09.29 AM IST



A+

BCCL



*The new projections suggest that much of Mumbai, India's financial capital and one of the largest cities in the world, is at risk of being wiped out.*

Rising seas could affect three times more people by 2050 than previously thought, according to new research, threatening to all but erase some of the world's great coastal cities.

The authors of a paper published Tuesday developed a more accurate way of calculating land elevation based on satellite readings, a standard way of estimating the effects of sea level rise over large areas, and found that the previous numbers were far too optimistic. The new research shows that some 150 million people are now living on

land that will be below the high-tide line by midcentury.



# SWOT – Climate Crises assessments

## Global banks are going green

OPPORTUNITIES (+)



**130 banks worth \$47 trillion adopt new UN-backed climate policies to shift their loan books away from fossil fuels**



Matthew Green, Reuters Sep 23, 2019, 3:35 AM



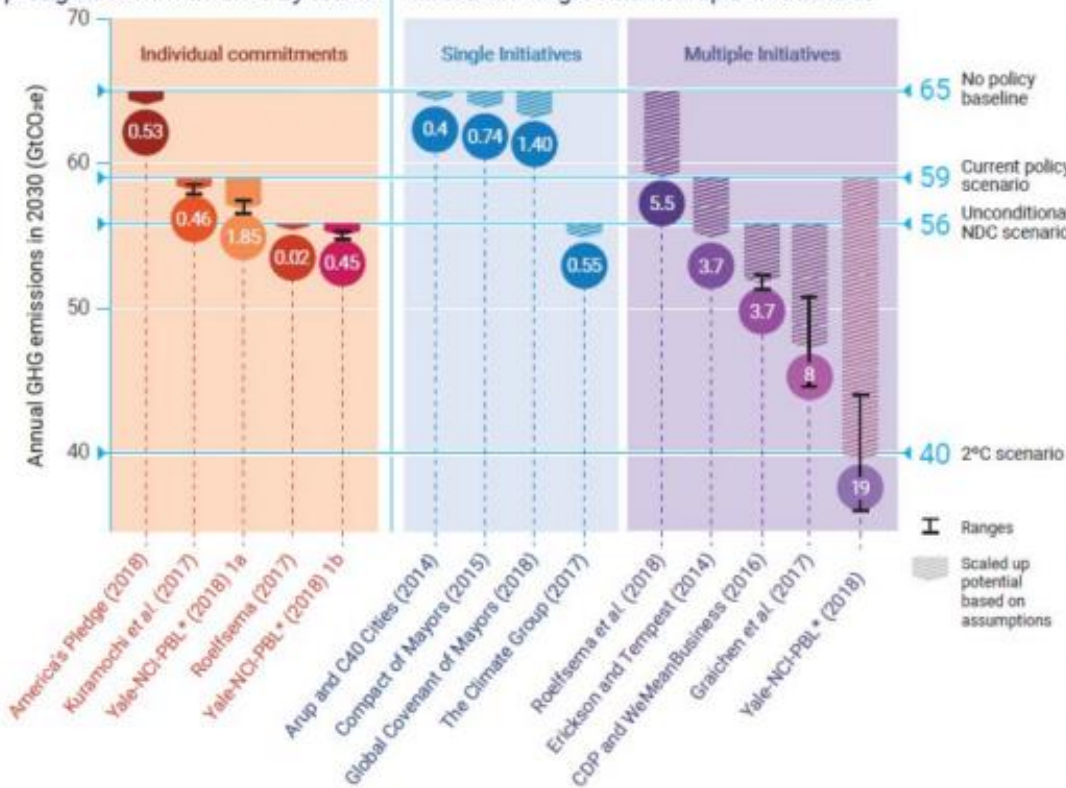
# SWOT – Climate Crises assessments



## The role of non-state and subnational actors

Emission reduction potential of pledged commitments by NSAs.

Scaled up potential emission reductions based on single and multiple initiatives.



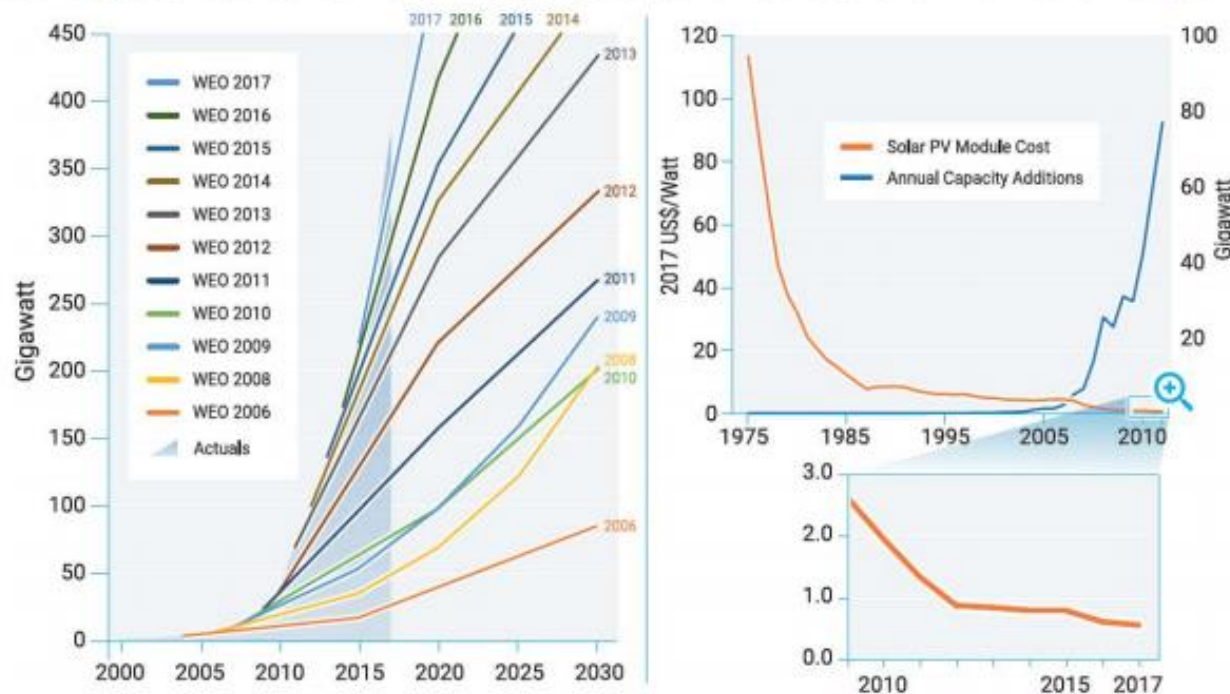
Non-state and subnational actors play an important role in delivering national pledges.

Emission reduction potential from non-state and subnational action could be significant, allowing countries to raise ambition, but the impact of pledged commitments are limited and poorly documented.

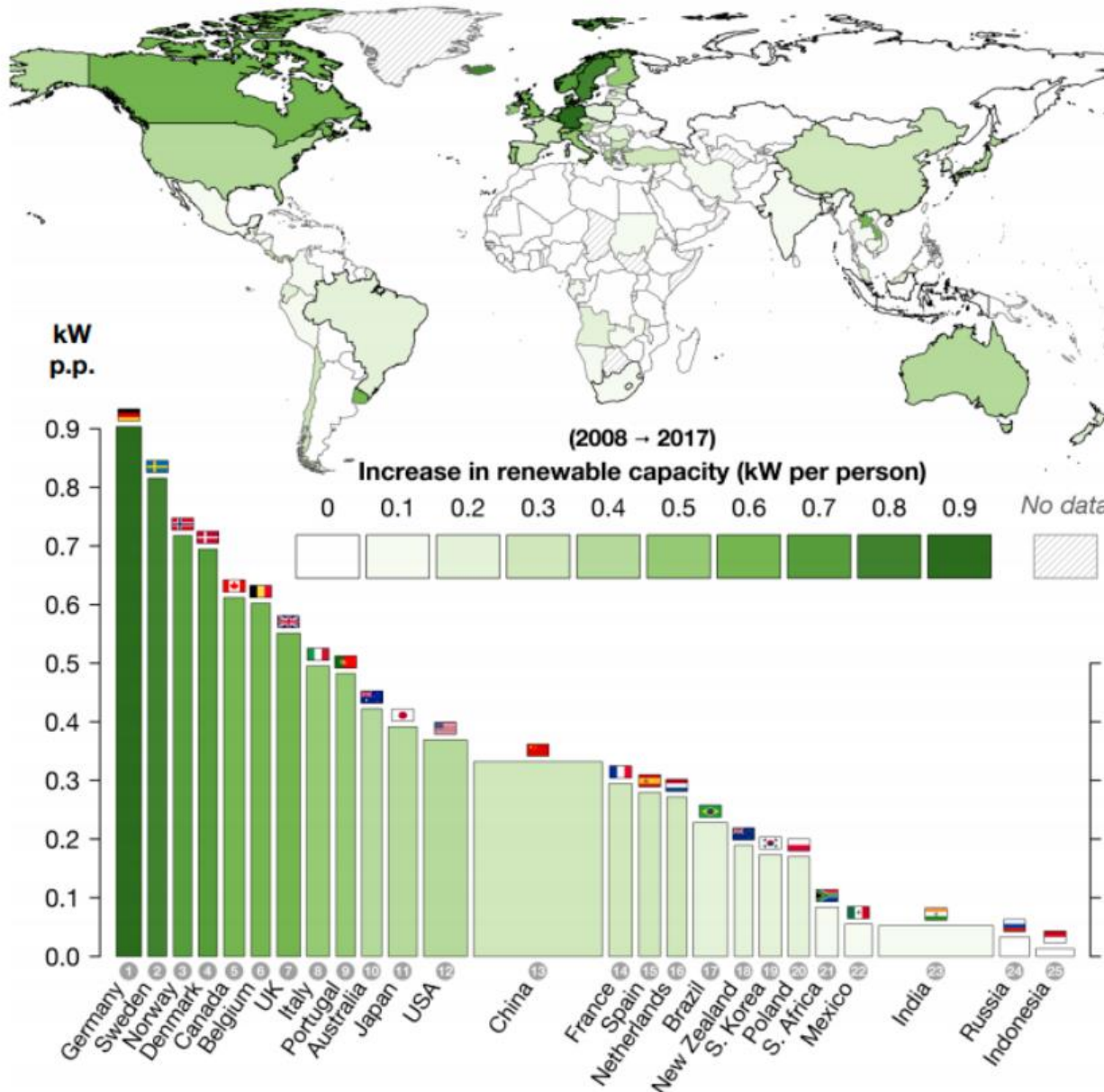


## Accelerating innovation is a key component in bridging the gap

Combining innovation in the use of existing technologies and in behaviour with the promotion of investment in new technologies and market creation has the potential to transform societies and reduce their GHG emissions.



# SWOT – Climate Crises assessments



# SWOT – Climate Crises assessments

OPPORTUNITIES (+)



Kenya has built **Africa's largest wind farm**

Source: Reuters



# SWOT – Climate Crises assessments



**BBC NEWS**

BBC.COM



**Scotland's largest offshore wind farm opened**



# SWOT – Climate Crises assessments



NYTIMES.COM

**New York Awards Offshore Wind Contracts in Bid to Reduce Emissions**



# SWOT – Climate Crises assessments

OPPORTUNITIES (+)



## The world's largest solar power project begins running in UAE

Will the small petrol state soon be solar powered?

SCOTTY HENDRICKS 05 July, 2019

1,7 Gigawatt



# SWOT – Climate Crises assessments

OPPORTUNITIES (+)



What is CarbFix?

CarbFix is the industrial process to capture CO<sub>2</sub> and other sour gases from emission sources and permanently store it as rock in the subsurface. The process can furthermore be applied in relation to direct capture of CO<sub>2</sub> from air. In the current CarbFix2 project, supported by The European Union, we are demonstrating how this secure, cost-effective and environmentally benign method to reduce atmospheric CO<sub>2</sub> levels can be applied world-wide.



Angela Merkel at Hellisheidi

# SWOT – Climate Crises assessments

OPPORTUNITIES (+)



BUSINESSINSIDER.COM

**Scotland is now generating so much wind energy, it could power two Scotlands**



## NEW PERSPECTIVES

For the last decade, the Council has been systematically tracking leadership perceptions, policy performance outcomes, and new energy developments. Four significant new perspectives have emerged.

<https://www.worldenergy.org/energy-for-sustainable-prosperity-and-people>

- + **Enabling consumer-centric services**
- + **A growing acceptance of the Energy Trilemma**
- + **Avoiding climate crisis means a diverse energy mix**
- + **Fragmented leadership is the biggest risk**

## TEN AREAS FOR ACTION

We aim to make use of all flow pathways to secure clean energy liquidity on a global and local basis. We have identified 10 new opportunities in energy for sustainable prosperity and people.

<https://www.worldenergy.org/energy-for-sustainable-prosperity-and-people>

- + **Adopt a whole energy system leadership stance**
- + **Adopt a healthy mix of technologies**
- + **Accelerate trade in clean molecules**
- + **Enable energy infrastructure action planning**
- + **Enable new market designs**

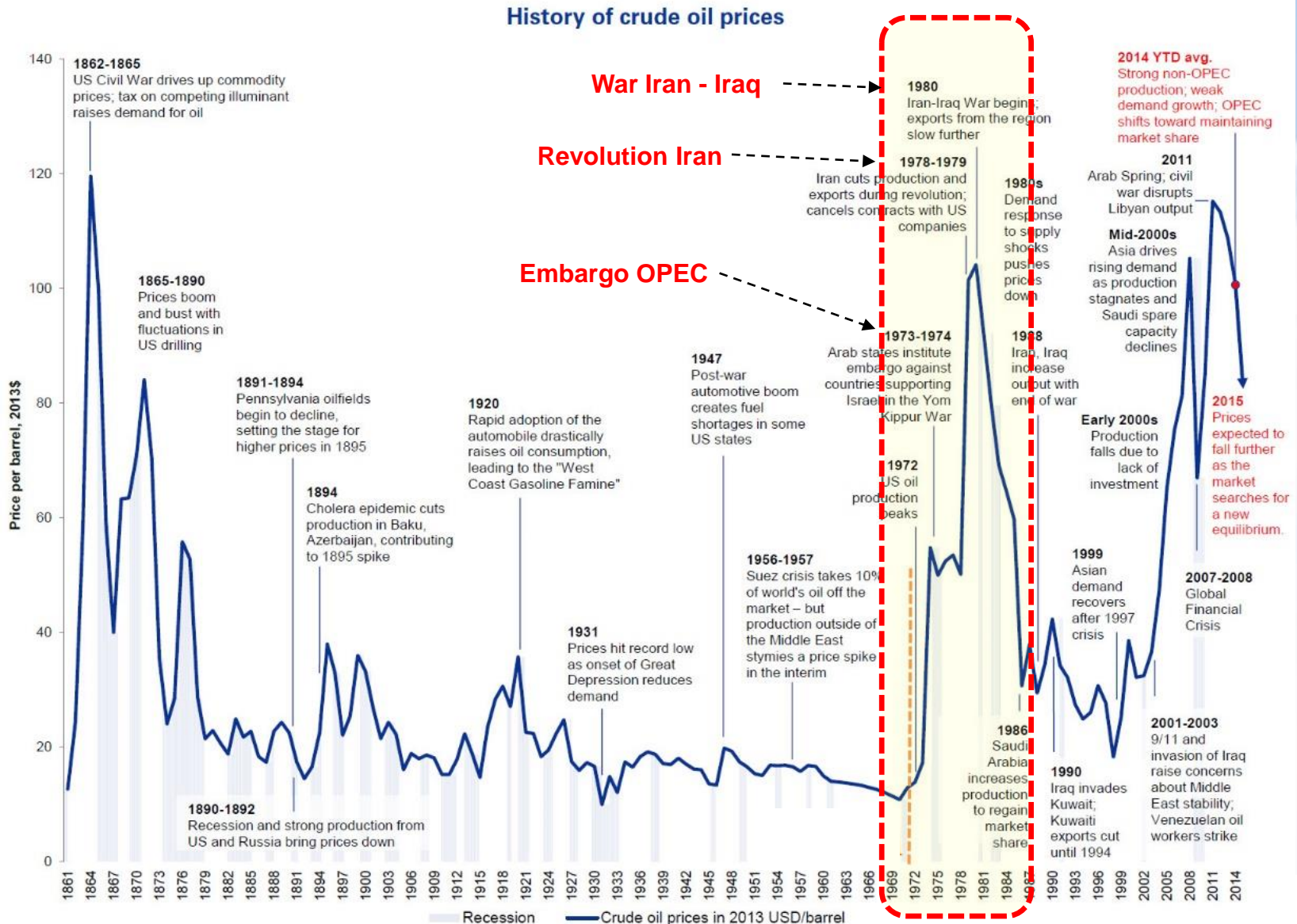
## TEN AREAS FOR ACTION

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<https://www.worldenergy.org/energy-for-sustainable-prosperity-and-people>

- + **Promote international dialogue on useful access**
- + **Provide networked security for dynamic resilience**
- + **Strengthen sector coupling to decarbonise**
- + **Develop a new economics of energy transition**
- + **Close the skills and capabilities gaps**

# The Oil Crises

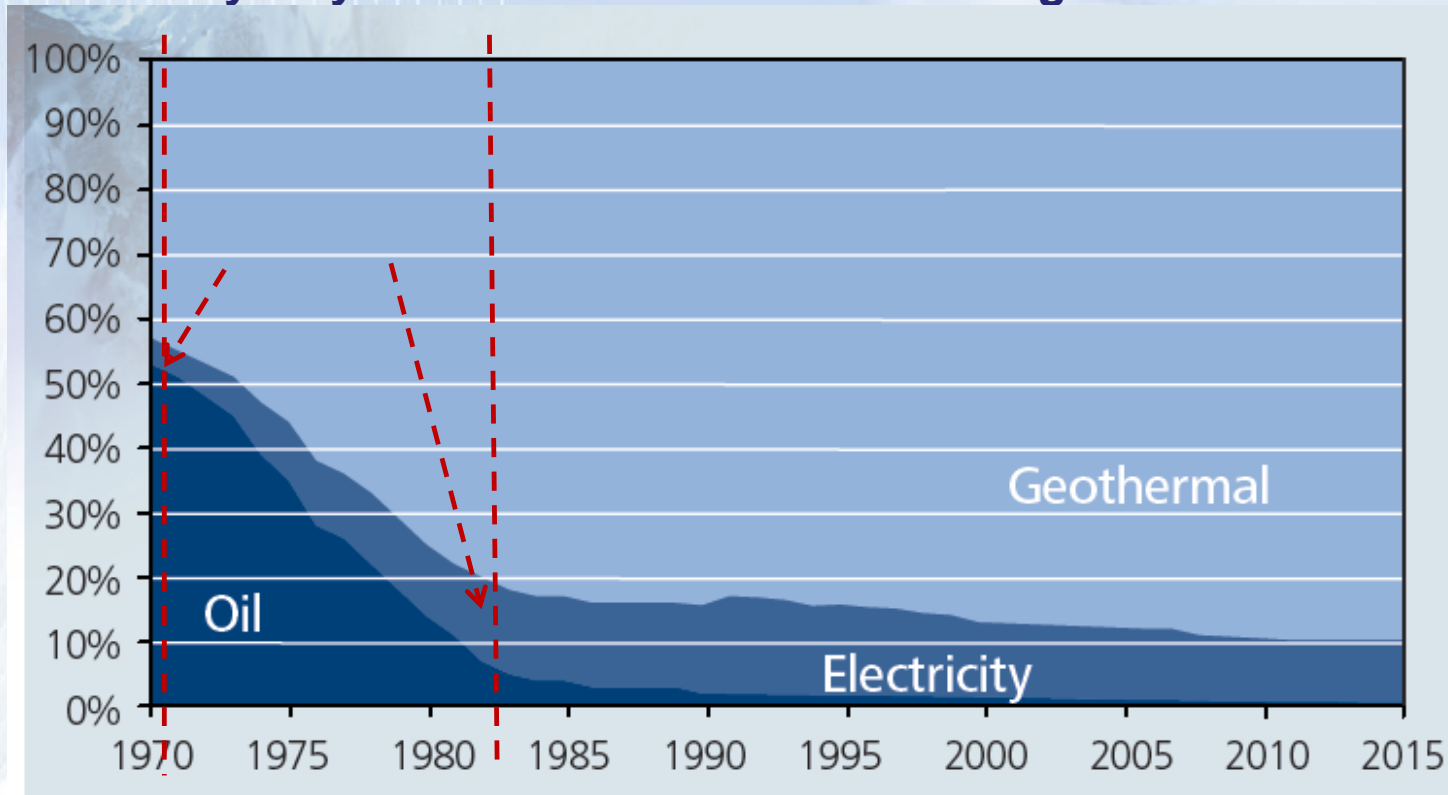




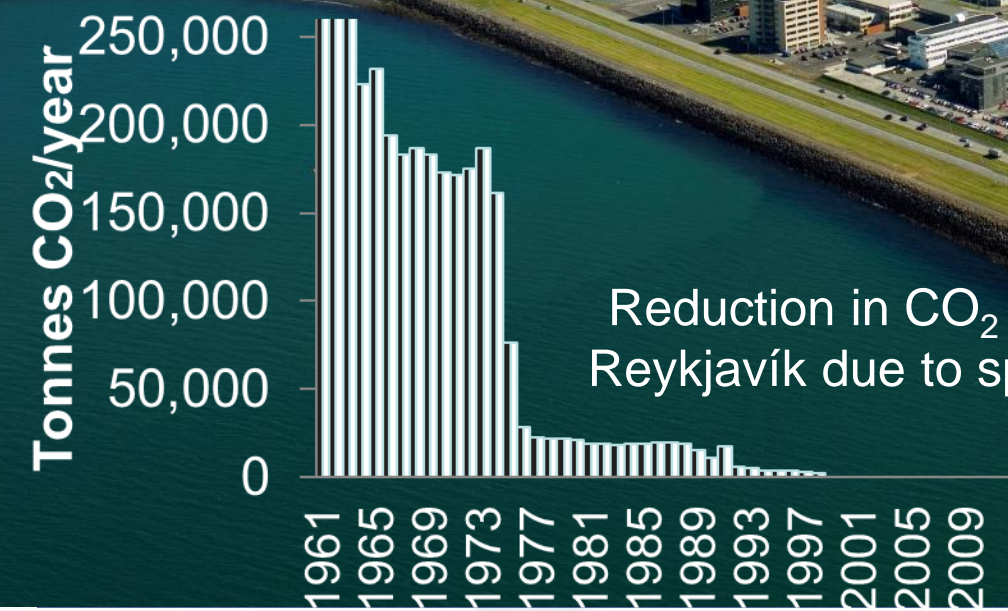
# Expansion of GeoDH

## Space Heating by Source 1970–2013

- Biggest steps in GeoDH were taken during the oil & war crises 1970 – 1982
- External conditions – raised the need of evaluation and GeoDH Planning
- Policy goals to increase geothermal – both national and within main cities
- It took only **12** years to increase GeoDH from **40% to 80%** of total space heating
- It took only **12** years to decrease oil for heating from **50% to 5%** in 12 years



# Reykjavik – one of the biggest District Heating network in the World – Renewable Energy mitigates Global Warming



# Environmental Benefits of Geothermal Utilisation

Reykjavík 1933



Source: Reykjavík Energy

Reykjavík today



# Renewable Energy - mitigate Global Warming

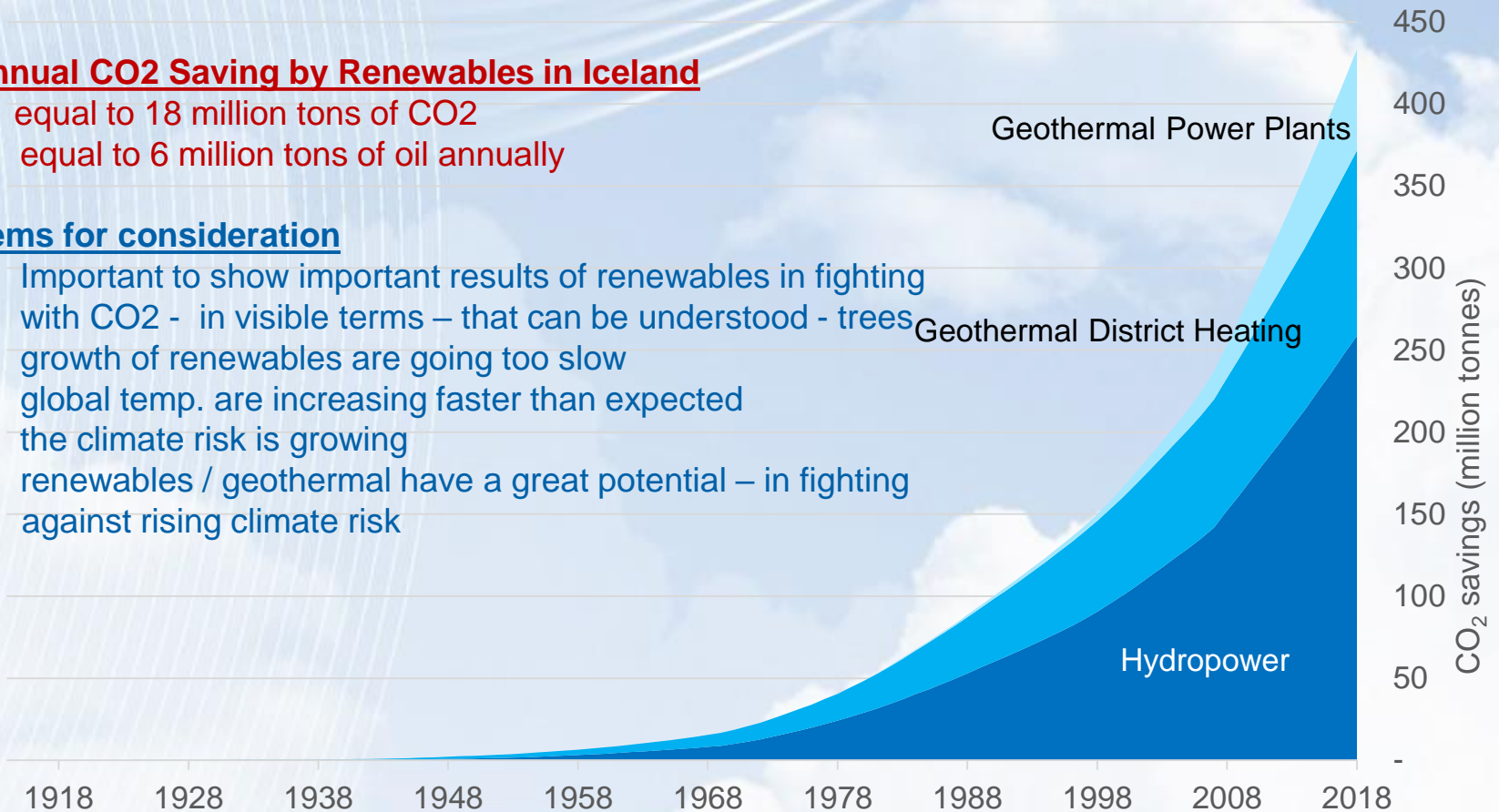
Accumulative CO2 savings using renewables instead of oil

## Annual CO2 Saving by Renewables in Iceland

- equal to 18 million tons of CO2
- equal to 6 million tons of oil annually

## Items for consideration

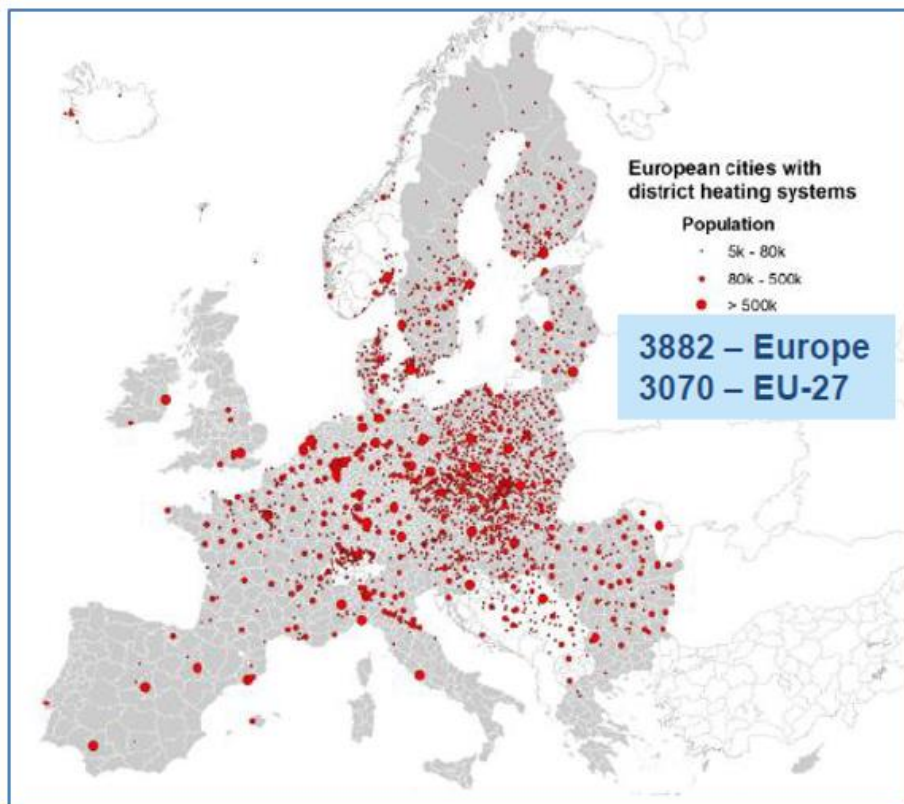
- Important to show important results of renewables in fighting with CO2 - in visible terms – that can be understood - trees
- growth of renewables are going too slow
- global temp. are increasing faster than expected
- the climate risk is growing
- renewables / geothermal have a great potential – in fighting against rising climate risk



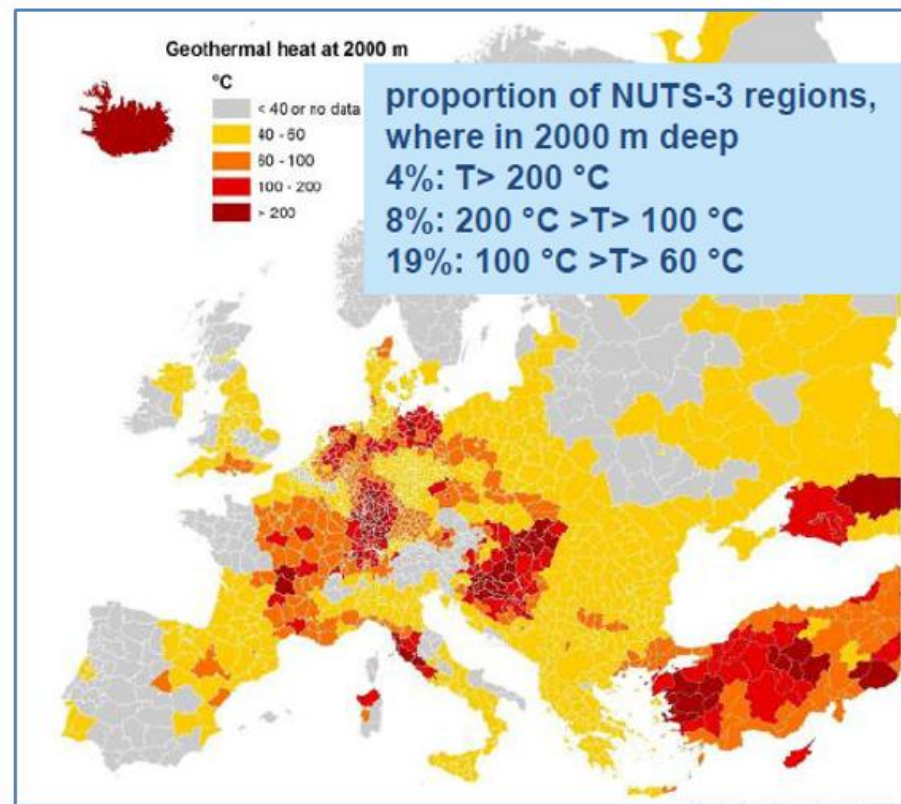
Orkustofnun Data Repository: OS-2019-T011-01

# Geothermal District Heating Options and Possibilities in Europe

## *Geothermal cities in Europe with district heating systems*



## *Geothermal heat at 2000 meters*



# Global Warming

## Ban Ki-moon: There is no plan B, because we have no planet B

• INNLENT | 20:08 | 08. OKTÓBER 2016

Líkar þetta 2



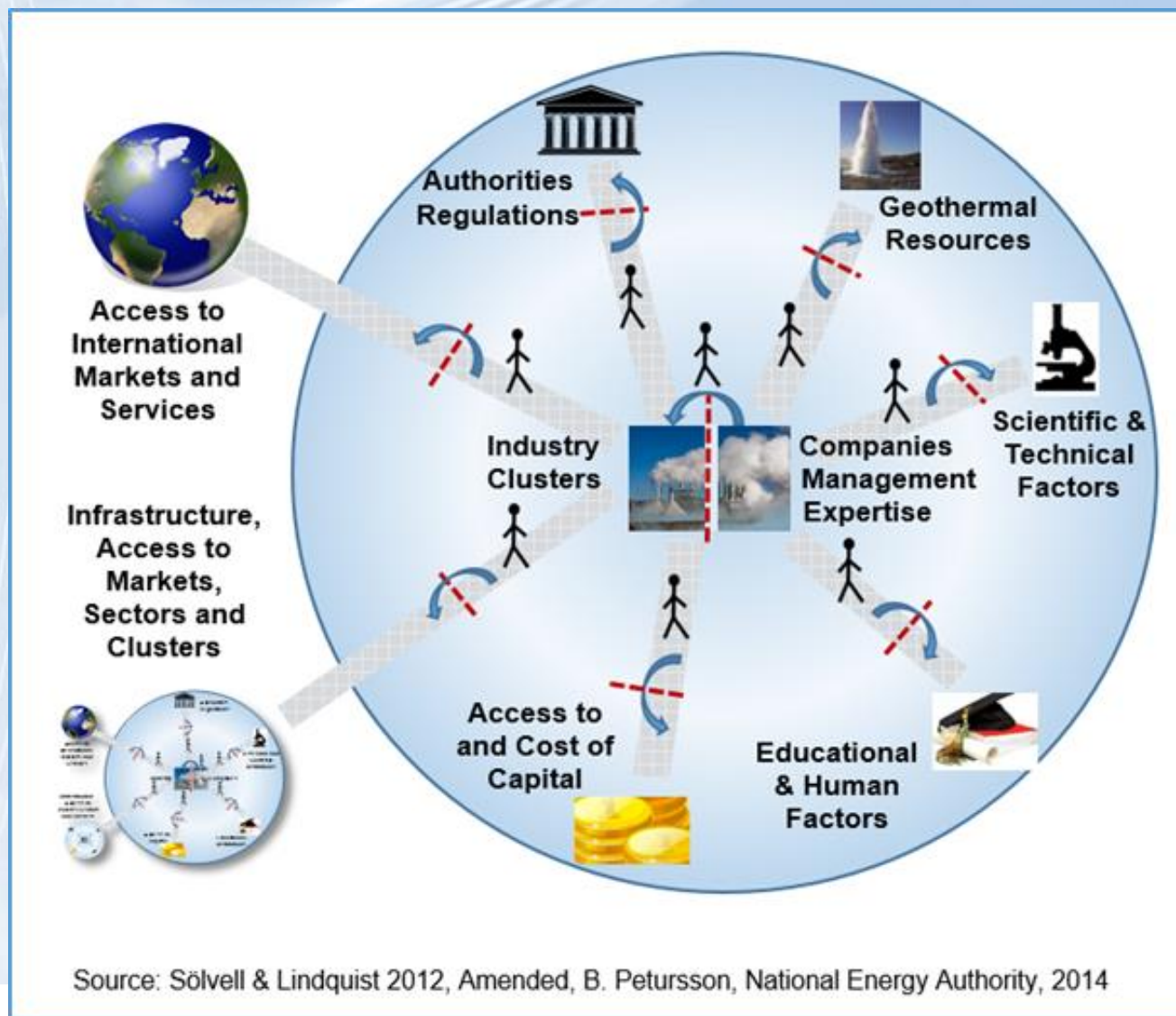
# Competitiveness of the Geothermal Sector

Success of Geothermal District Heating is based on 8 Key Factors

## 8 Key Elements of Success in the Geothermal Sector and District Heating

1. Authorities and regulation,
2. Geothermal resources,
3. Scientific & technical factors,
4. Education & human factors,
5. Access to capital,
6. Infrastructure and access to markets, sectors and other clusters,
7. Access to international markets and services,
8. The company, management, expertise & industry, clusters assessment

In cooperation with international and domestic experts, on geothermal resources, finance, legal, management and other expertise.



# Some lessons from Iceland

## Geothermal Options, Opportunities and Benefits

The geothermal heat generation has several advantages, such as:

1. Economic opportunity and savings.
2. Improvement of energy security.
3. Reducing greenhouse gas emissions.
4. Harnessing local resources.
5. Improve and simplify financial support.
6. Reducing dependency on fossil fuels for energy use.
7. Improving industrial and economic activity.
8. Develop low carbon and geothermal technology industry, and create employment opportunities.
9. Local payback in exchange for local support for geothermal drilling.
10. Improving quality of life based on economic and environmental / climate benefits.



# Renewable Energy - is a Powerful Tool to Fight Against Global Warming



**Thank You**