

Klimaänderung I

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Vorlesung WS 2022/23

LMU München



Knowledge for Tomorrow

Technical information

- <http://www.pa.op.dlr.de/~RobertSausen/vorlesung/index.html>
 - Most recent update on the lecture
 - Slides of the lecture (with some delay)

 - See also LSF <https://lsf.verwaltung.uni-muenchen.de/>

- Contact: robert.sausen@dlr.de

- Further information:
 - www.ipcc.ch
 - www.de-ipcc.de



0. Einleitung



Knowledge for Tomorrow



Bild Zeitung, 3 Februar 2007





Bild INFOS ZU BILDPLUS WETTER 23°C MÜNCHEN EPAPER KONTAKT ZEITUNGSABO BILD SHOP LOGIN

BILDplus NEWS POLITIK GELD UNTERHALTUNG SPORT FUßBALL LIFESTYLE RATGEBER REISE AUTO DIGITAL SPIELE REGIO VIDEO

15.10.2019 - 21:05 Uhr NEWS AKTUELL AUSLAND KLIMAWANDEL: BIS 2100 KÖNNTE SICH DIE ERDE UM SIEBEN GRAD ERWÄRMEN

NEUE MODELLRECHNUNGEN ZUM KLIMAWANDEL

Bis 2100 könnte sich die Erde um sieben Grad erwärmen

Klimaexperte zu BILD: Ergebnisse schränken die Möglichkeiten ein, dem Klimawandel wirksam entgegenzuwirken



Ein Eisberg schwimmt bei Sonnenuntergang auf dem Meer. Mit der Erderwärmung dehnt sich das Meerwasser aus, die Eismassen schmelzen und der Meeresspiegel steigt
Foto: Felipe Dana / dpa

bild.de, 15.10.2019

8. Oktober 2018, 5:09 Uhr Bericht zur Erderwärmung

Weltklimarat hält "nie dagewesene Veränderungen" für nötig



Die Klimaerwärmung kann offenbar noch begrenzt werden. (Foto: REUTERS)

sueddeutsche.de, 8.10.2018



13. August 2021, 15:03 Uhr SZ-Klimakolumne

Trauern ums Klima

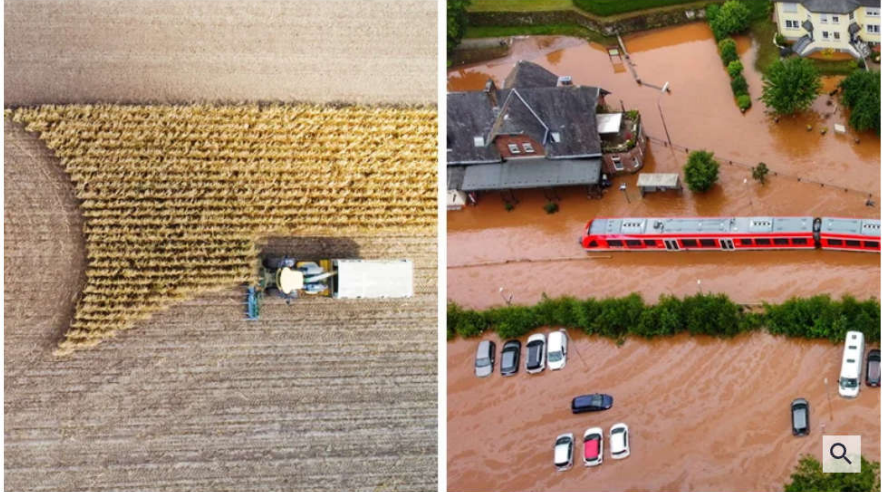


Auch Algerien ist derzeit von Waldbränden betroffen, Feuerwehrleute kämpfen gegen eine Reihe von Feuern im Norden des Landes. (Foto: Fateh Guidoum/dpa)

sueddeutsche.de, 13.08.2021

20. Juli 2021, 15:46 Uhr Flut, Hitze, Erderwärmung

"Klimawandel, das war immer woanders"



Dürren, die die Böden vertrocknen und die Ernten beeinträchtigen, wie etwa 2019 (l.) sind das eine Extrem. Überflutete Straßen, wie zuletzt im rheinland-pfälzischen Kordel (r), das andere. (Foto: dpa)

sueddeutsche.de, 20.07.2021



Gegen die Leugner des anthropogenen Klimawandels 1

Donald Trump
'It'll change back': Trump says climate change not a hoax, but denies lasting impact

The Guardian International edition

Climate scientists have political agendas, US president says in interview with 60 Minutes

Donald Trump has reiterated his doubts about climate change, suggesting that the climate could “change back again,” and that climate scientists are politically motivated.

The US president has long questioned man-made global warming. In an **interview** with CBS programme 60 Minutes that aired Sunday night, he said that he no longer believes climate change is a hoax, as he tweeted in 2012.

Don't despair: the climate fight is only over if you think it is
Rebecca Solnit
➔ **Read more**

“I think something’s happening. Something’s changing and it’ll change back again,” he said. “I don’t think it’s a hoax. I think there’s probably a difference. But I don’t know that it’s manmade. I will say this: I don’t want to give trillions and trillions of dollars. I don’t want to lose millions and millions of jobs.”

The White House has previously declined to clarify Trump’s position. He **tweeted** in 2017 during a cold snap that “perhaps we could use a little bit of that good old Global Warming.”

<https://www.theguardian.com/us-news/2018/oct/15/itll-change-back-trump-says-climate-change-not-a-hoax-but-denies-lasting-impact>



Gegen die Leugner des anthropogenen Klimawandels 2

13.1 Klimawandel

Das Spurengas Kohlenstoffdioxid (CO₂) ist kein Schadstoff sondern eine unverzichtbare Voraussetzung für alles Leben.

Die Aussagen des Weltklimarats (IPCC), dass Klimaänderungen vorwiegend menschengemacht seien, sind wissenschaftlich nicht gesichert. Sie basieren allein auf Rechenmodellen, die weder das vergangene noch das aktuelle Klima korrekt beschreiben können. Schon vor der Industrialisierung gab es Warm- und Kaltperioden, die sich nicht durch die zugehörige CO₂-Konzentration der Luft erklären lassen. Mit dem Beitritt zum Pariser Abkommen und dem von der Bundesregierung erlassenen Klimaschutzplan 2050 hat Deutschland sich verpflichtet, für die sogenannte „Dekarbonisierung“ weitgehende Eingriffe in unsere Wirtschaft und Gesellschaft vorzunehmen.

Wir wollen das Projekt der Dekarbonisierung über die „Große Transformation“ beenden und den Klimaschutzplan 2050 der Bundesregierung aufheben.

Das Pariser Klimaabkommen vom 12.12.2015 ist zu kündigen. Deutschland soll aus allen staatlichen und privaten „Klimaschutz“-Organisationen austreten und ihnen jede Unterstützung entziehen.

Dem Klimawandel positiv begegnen

Das Ziel der Bundesregierung, die CO₂-Emissionen faktisch auf null zu senken, führt zu einem radikalen Umbau von Industrie und Gesellschaft ... und bedroht unsere Freiheit in einem immer beängstigenderen Ausmaß. Die AfD lehnt dieses Ziel und den damit verbundenen Gesellschaftsumbau ab.

Begründet wird der radikale Umbau von Industrie und Gesellschaft mit der Behauptung, dass durch eine Dekarbonisierung, also den Verzicht auf die Nutzung von Kohle, Öl und Gas, eine vom Menschen gemachte „Klimakatastrophe“ noch verhindert werden könne. Wir halten diese These und die daraus abgeleiteten Maßnahmen für falsch.

Das Spurengas CO₂ ist als Voraussetzung für alles Leben unverzichtbar. Der Anstieg der Konzentration von CO₂ in der Atmosphäre hat in den letzten Jahrzehnten zu einem Ergrünen der Erde beigetragen.

Niemand streitet die jüngste globale Erwärmung ab. Die AfD bezweifelt aber, dass diese nur negative Folgen hat. Statt einen aussichtslosen Kampf gegen den Wandel des Klimas zu führen, sollten wir uns an die veränderten Bedingungen anpassen, so wie es Pflanzen und Tiere auch tun. Die Menschheitsgeschichte belegt, dass Warmzeiten immer zu einer Blüte des Lebens und der Kulturen führten, während Kaltzeiten mit Not, Hunger und Kriegen verbunden waren. Es ist bis heute nicht nachgewiesen, dass der Mensch, insbesondere die Industrie, für den Wandel des Klimas maßgeblich verantwortlich ist. Die jüngste Erwärmung liegt im Bereich natürlicher Klimaschwankungen, wie wir sie auch aus der vorindustriellen Vergangenheit kennen.

AfD-Bundestagswahlprogramm_2021

*AfD-Bundestagswahlprogramm_Onlinefassung
April 2017*



Extreme Wetterereignisse in Deutschland

Hagel am 10.06.16 im Großraum München



Flächenbrand bei Esselbach, Franken,
26.07.2018



Schwarze Elster in Brandenburg
August 2018



Hochwasser in Deutschland 1



Hochwasser in Passau
www.sueddeutsche.de, 2. Juni 2013



Hochwasser in Kolbermoor
www.ovb-online.de, 4. Juni 2013

**Sind die Hochwässer von 2013
ein Folge des Klimawandels?**



Hochwasser in Deutschland 2



Hochwasser im Ahrtal 2021
www.rlp.de

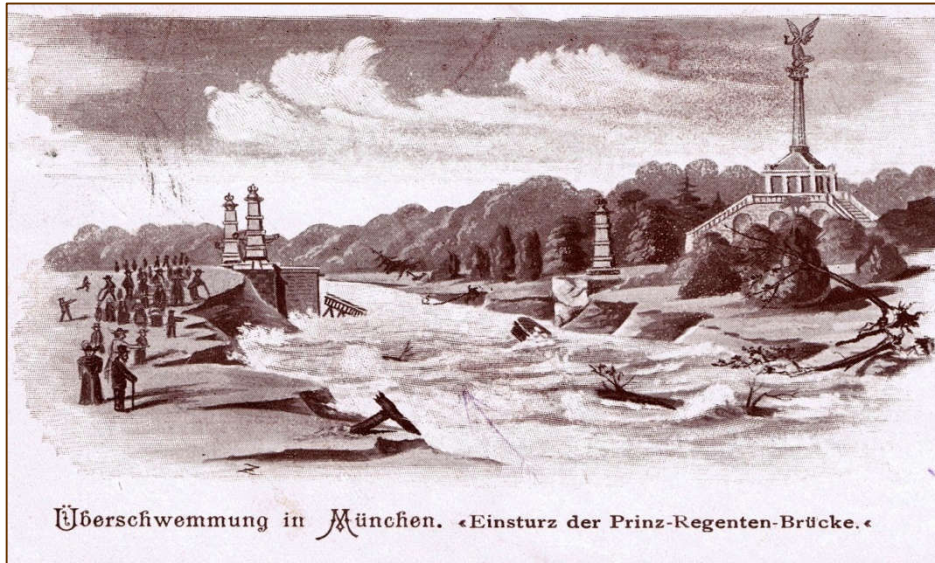


Hochwasser in Erfstadt
faz, 17. Juli 2021

Sind die Hochwässer von 2021
ein Folge des Klimawandels?



Hochwasser in Deutschland 3



Überschwemmung in München. «Einsturz der Prinz-Regenten-Brücke.»

Postkarte zum
Isar-Hochwasser im September 1899
Sammlung M. Deutsch, Erfurt/Göttingen



so genannte “Thüringer Sintflut”
am 29. Mai 1613
Deutsch et al., 2013



An example of climate change: retreat of glaciers in the Alps (1)

Pasterzenzunge at Mount Großglockner, Austria (3798 m)

about 1900



2000

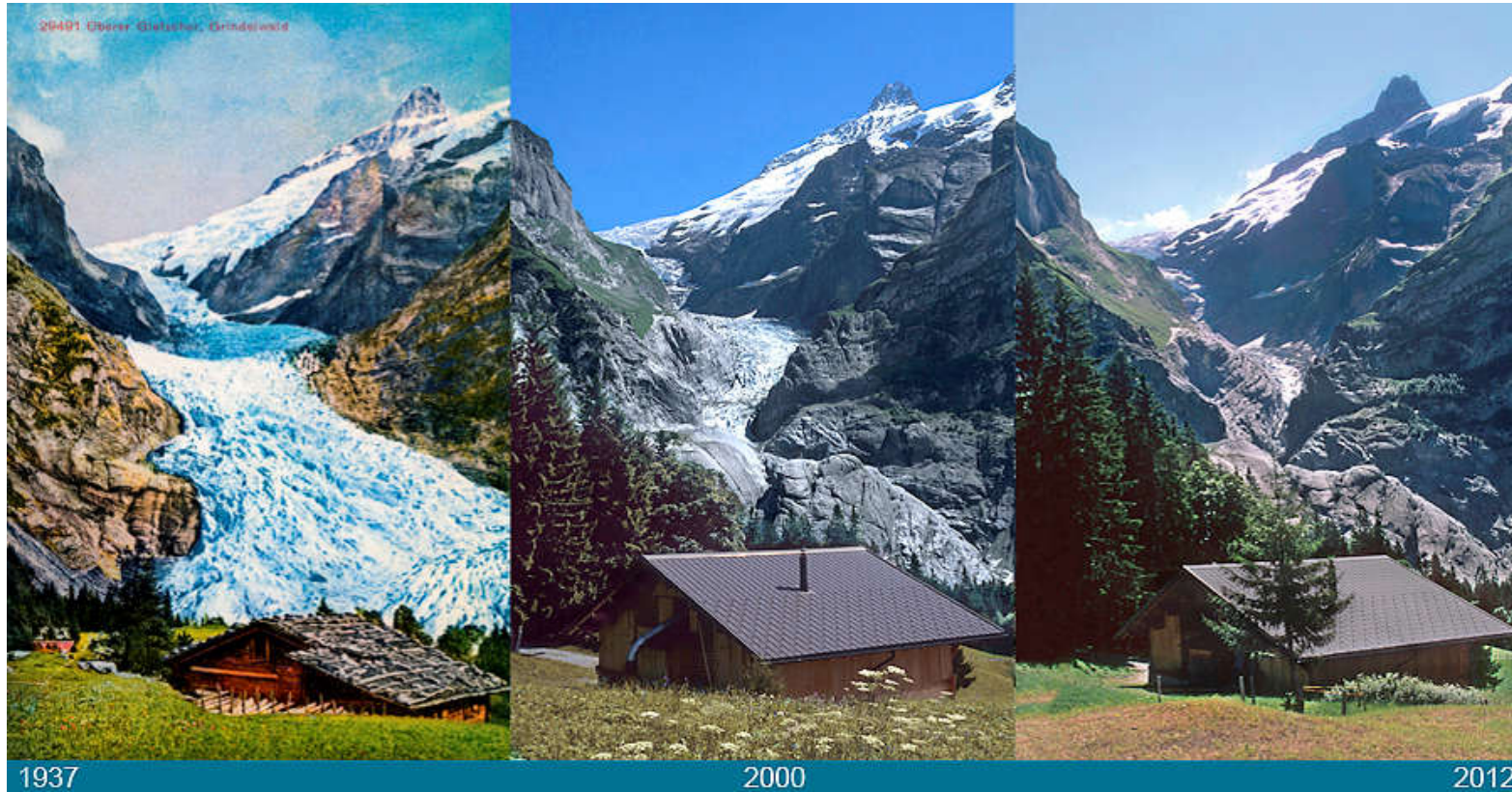


<http://www.gletscherarchiv.de>



An example of climate change: retreat of glaciers in the Alps (2)

Oberer Grindelwaldgletscher, Berner Oberland, Switzerland



<http://www.gletscherarchiv.de>



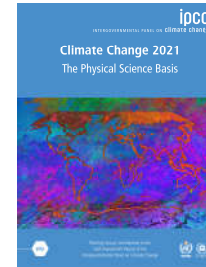
Questions

- Has there been a climate change ?
- What is the impact of man ?
- How will the climate develop in the future ?
- What is necessary to limit climate change?

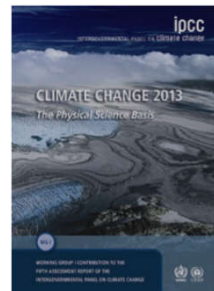


An important source of knowledge: IPCC Assessment Reports

Central results of the recent IPCC Assessment Report
(Sixth Assessment Report "AR6", 2021)



Central results of the recent Fifth IPCC Assessment Report ("AR5", 2013/2014)



Results from the IPCC Special Report (SR15) "Global Warming of 1.5 °C"



www.ipcc.ch
www.de-ipcc.de

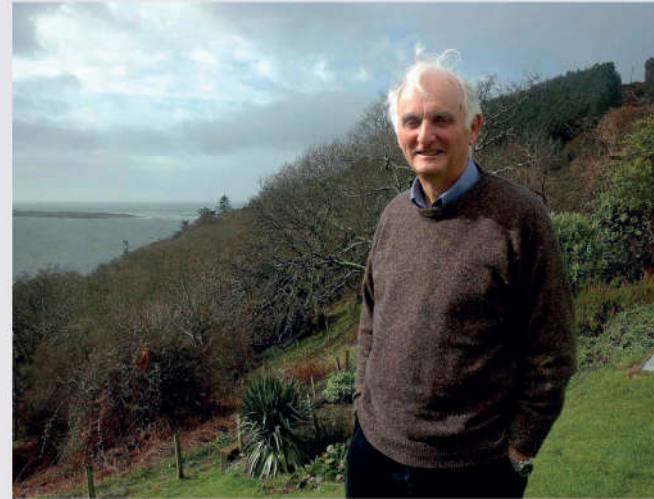


Sir John Houghton

(30 December 1931 – 15 April 2020)

Dedication

Sir John Houghton
(30 December 1931 – 15 April 2020)



The Working Group I Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) *Climate Change 2021: The Physical Science Basis* is dedicated to the memory of Sir John Houghton, who was one of the key figures in the creation of the IPCC in 1988, and served as Chair and Co-Chair of Working Group I for the IPCC's first three assessment reports from 1988 to 2002.

Sir John's work was a major factor in the award of the Nobel Peace Prize to the IPCC in 2007, shared with former U.S. Vice-President Al Gore. He contributed to the development of climate science and building international cooperation based upon climate research. Sir John played a key role in ensuring a robust science-policy interface, used in the IPCC process, but his role in international scientific research extended beyond the IPCC, for instance in contributing to the establishment of the World Climate Research Programme, which he chaired from 1982 to 1984.

Sir John was a brilliant communicator among scientific colleagues, policymakers and the public at large, explaining the fact and threat of climate change with clarity and directness.

IPCC 2021



Sir John Houghton

(30 December 1931 – 15 April 2020)



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What is IPCC (Intergovernmental Panel on Climate Change) 1

The IPCC provides regular assessments of the scientific basis of climate change, its impacts and future risks, and options for adaptation and mitigation.

Created in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP), the objective of the IPCC is to provide governments at all levels with scientific information that they can use to develop climate policies. IPCC reports are also a key input into international climate change negotiations. The IPCC is an organization of governments that are members of the United Nations or WMO. The IPCC currently has 195 members. Thousands of people from all over the world contribute to the work of the IPCC. For the assessment reports, IPCC scientists volunteer their time to assess the thousands of scientific papers published each year to provide a comprehensive summary of what is known about the drivers of climate change, its impacts and future risks, and how adaptation and mitigation can reduce those risks. An open and transparent review by experts and governments around the world is an essential part of the IPCC process, to ensure an objective and complete assessment and to reflect a diverse range of views and expertise. Through its assessments, the IPCC identifies the strength of scientific agreement in different areas and indicates where further research is needed. The IPCC does not conduct its own research.

What is IPCC (Intergovernmental Panel on Climate Change) 2

"IPCC assessments provide a scientific basis for governments at all levels to develop climate related policies, and they underlie negotiations at the UN Climate Conference – the United Nations Framework Convention on Climate Change (UNFCCC). **The assessments are policy-relevant but not policy-prescriptive:** they may present projections of future climate change based on different scenarios and the risks that climate change poses and discuss the implications of response options, **but they do not tell policymakers what actions to take.**"

IPCC, 2013



IPCC was awarded the Nobel Peace Prize in 2007



The Nobel Peace Prize 2007 was awarded to the Intergovernmental Panel on Climate Change (IPCC) and Albert Arnold (Al) Gore Jr.

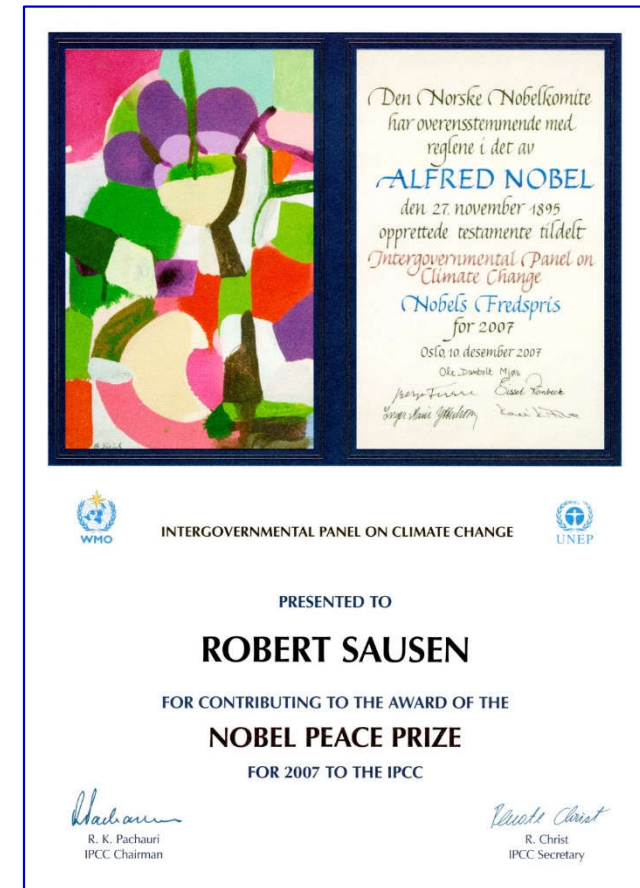
"for their efforts to build up and disseminate greater knowledge about man-made climate change, and to lay the foundations for the measures that are needed to counteract such change"



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The Nobel Prize in Physics 2021 has been awarded to Syukuro Manabe, Klaus Hasselmann and Giorgio Parisi

Syukuro Manabe Facts



Ill. Niklas Elmehed © Nobel Prize Outreach

Syukuro Manabe
The Nobel Prize in Physics 2021

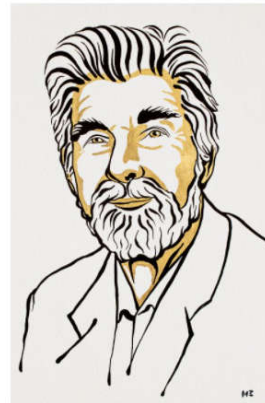
Born: 21 September 1931, Shingu, Ehime Prefecture, Japan

Affiliation at the time of the award: Princeton University,
Princeton, NJ, USA

Prize motivation: "for the physical modelling of Earth's
climate, quantifying variability and reliably predicting global
warming."

Prize share: 1/4

Klaus Hasselmann Facts



Ill. Niklas Elmehed © Nobel Prize Outreach

Klaus Hasselmann
The Nobel Prize in Physics 2021

Born: 25 October 1931, Hamburg, Germany

Affiliation at the time of the award: Max Planck Institute for
Meteorology, Hamburg, Germany

Prize motivation: "for the physical modelling of Earth's
climate, quantifying variability and reliably predicting global
warming."

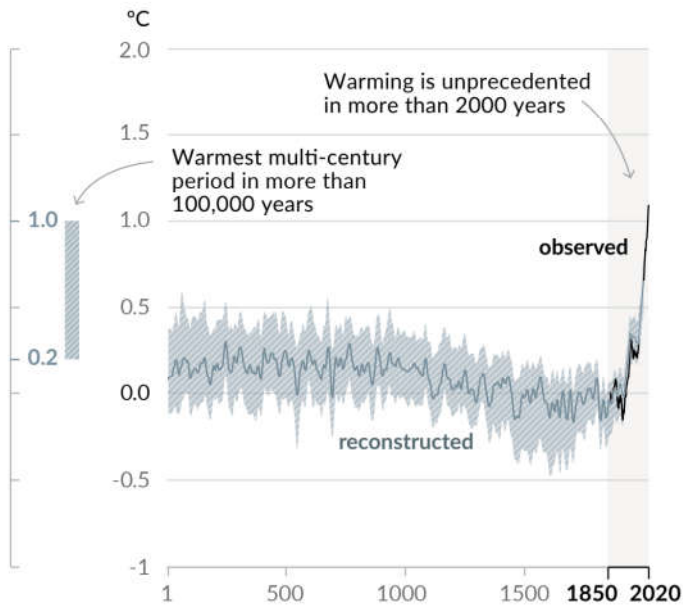
Prize share: 1/4



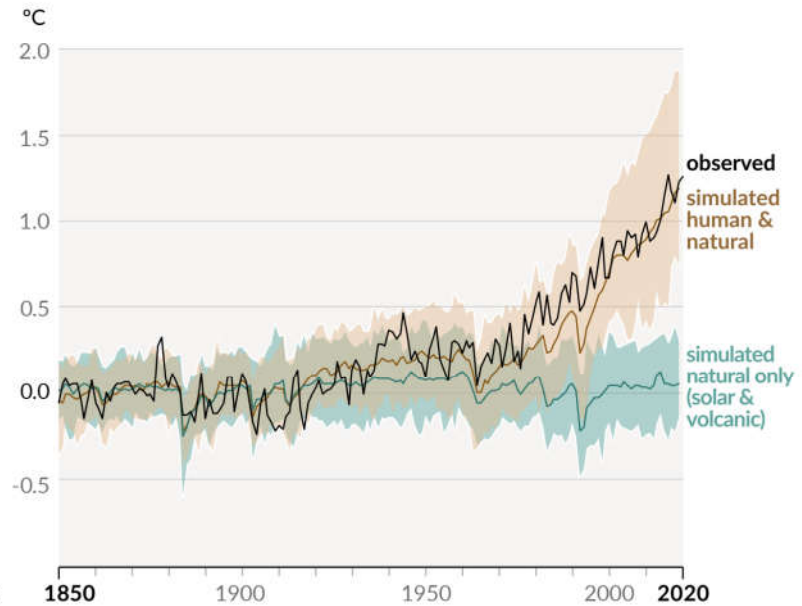
An appetizer

Changes in global surface temperature relative to 1850-1900

a) Change in global surface temperature (decadal average) as **reconstructed** (1-2000) and **observed** (1850-2020)



b) Change in global surface temperature (annual average) as **observed** and simulated using **human & natural** and **only natural** factors (both 1850-2020)



Contents of IPCC AR 6 2021

Working Group I: the Physical Science Basis

Contents		
Front Matter	Foreword	v
	Preface	vii
	Dedication	xiii
SPM	Summary for Policymakers	1
TS	Technical Summary	35
Chapters	Chapter 1 Framing, Context, and Methods	147
	Chapter 2 Changing State of the Climate System	287
	Chapter 3 Human Influence on the Climate System	423
	Chapter 4 Future Global Climate: Scenario-based Projections and Near-term Information	553
	Chapter 5 Global Carbon and Other Biogeochemical Cycles and Feedbacks	673
	Chapter 6 Short-lived Climate Forcers	817
	Chapter 7 The Earth's Energy Budget, Climate Feedbacks and Climate Sensitivity	923
	Chapter 8 Water Cycle Changes	1055
	Chapter 9 Ocean, Cryosphere and Sea Level Change	1211
	Chapter 10 Linking Global to Regional Climate Change	1363
	Chapter 11 Weather and Climate Extreme Events in a Changing Climate	1513
	Chapter 12 Climate Change Information for Regional Impact and for Risk Assessment	1767
	Atlas	1927
Annexes	Annex I Observational Products	2061
	Annex II Models	2087
	Annex III Tables of Historical and Projected Well-mixed Greenhouse Gas Mixing Ratios and Effective Radiative Forcing of All Climate Forcers	2139
	Annex IV Modes of Variability	2153
	Annex V Monsoons	2193
	Annex VI Climatic Impact-driven and Extreme Indices	2205
	Annex VII Glossary	2215
	Annex VIII Acronyms	2257
	Annex IX Contributors to the IPCC WGI Sixth Assessment Report	2267
	Annex X Expert Reviewers of the IPCC Sixth Assessment Report	2287
	Index	2339

IPCC 2021



Front Matter

Foreword

Preface

Dedication

SPM

Summary for Policymakers

TS

Technical Summary

Chapters

Chapter 1 Framing, Context, and Methods

Chapter 2 Changing State of the Climate System



Chapters

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Chapter 11	Weather and Climate Extreme Events in a Changing Climate
Chapter 12	Climate Change Information for Regional Impact and for Risk Assessment
Atlas <i>IPCC 2021</i>



Annexes

Atlas
Annex I	Observational Products
Annex II	Models
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Annex V	Monsoons
Annex VI	Climatic Impact-driver and Extreme Indices
Annex VII	Glossary
Annex VIII	Acronyms
Annex IX	Contributors to the IPCC WGI Sixth Assessment Report
Annex X	Expert Reviewers of the IPCC Sixth Assessment Report
Index



Chapter 1: Framing, context, methods



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