Using ECMWF's Forecasts 2022: Visualising Meteorological Data

9th June 2022

INFO DESIGN LAB

Visualising data for impact

A participatory journey from data to storytelling

Angela Morelli InfoDesignLab.com @angelamorelli

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Customize your Visualization
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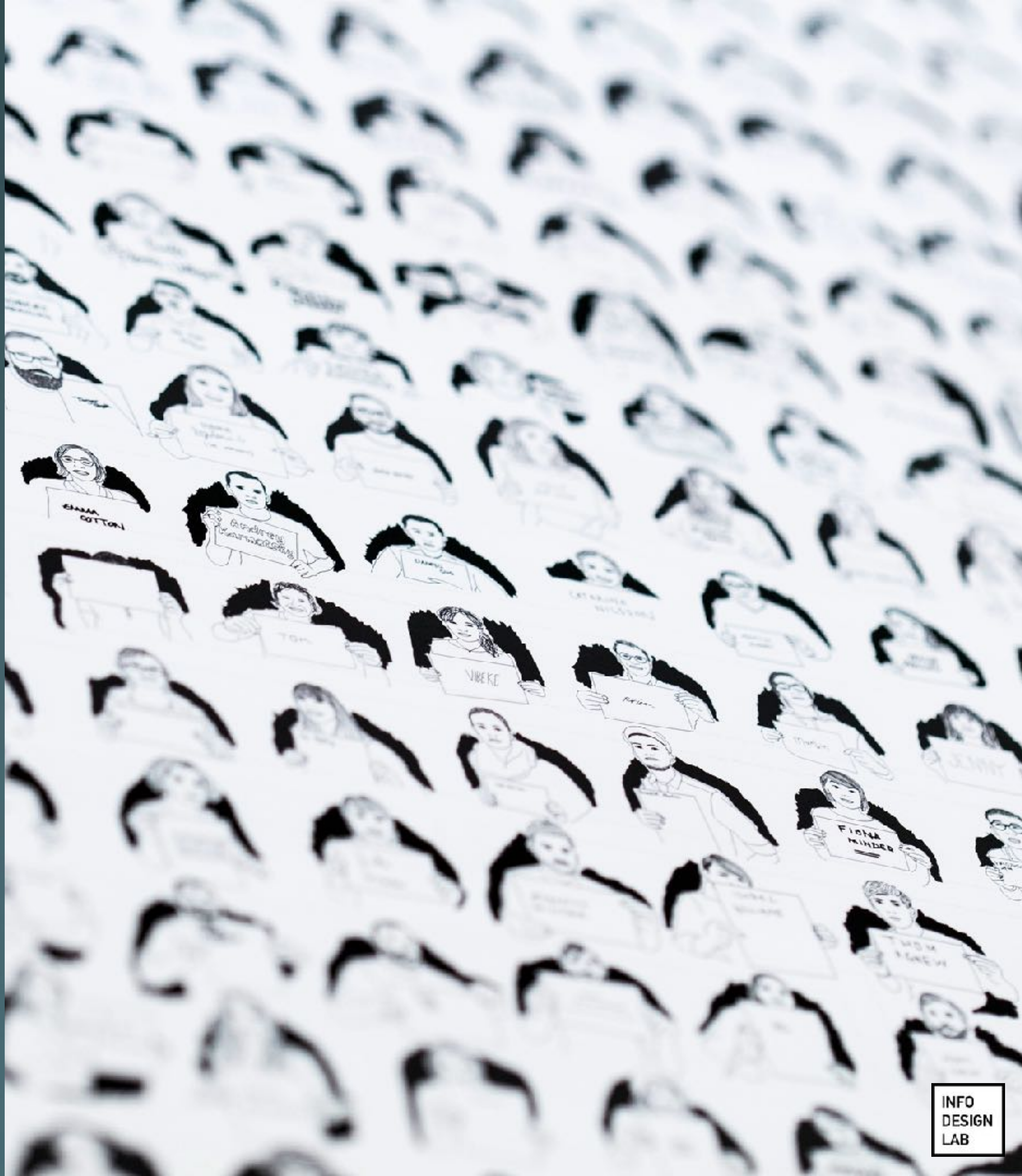

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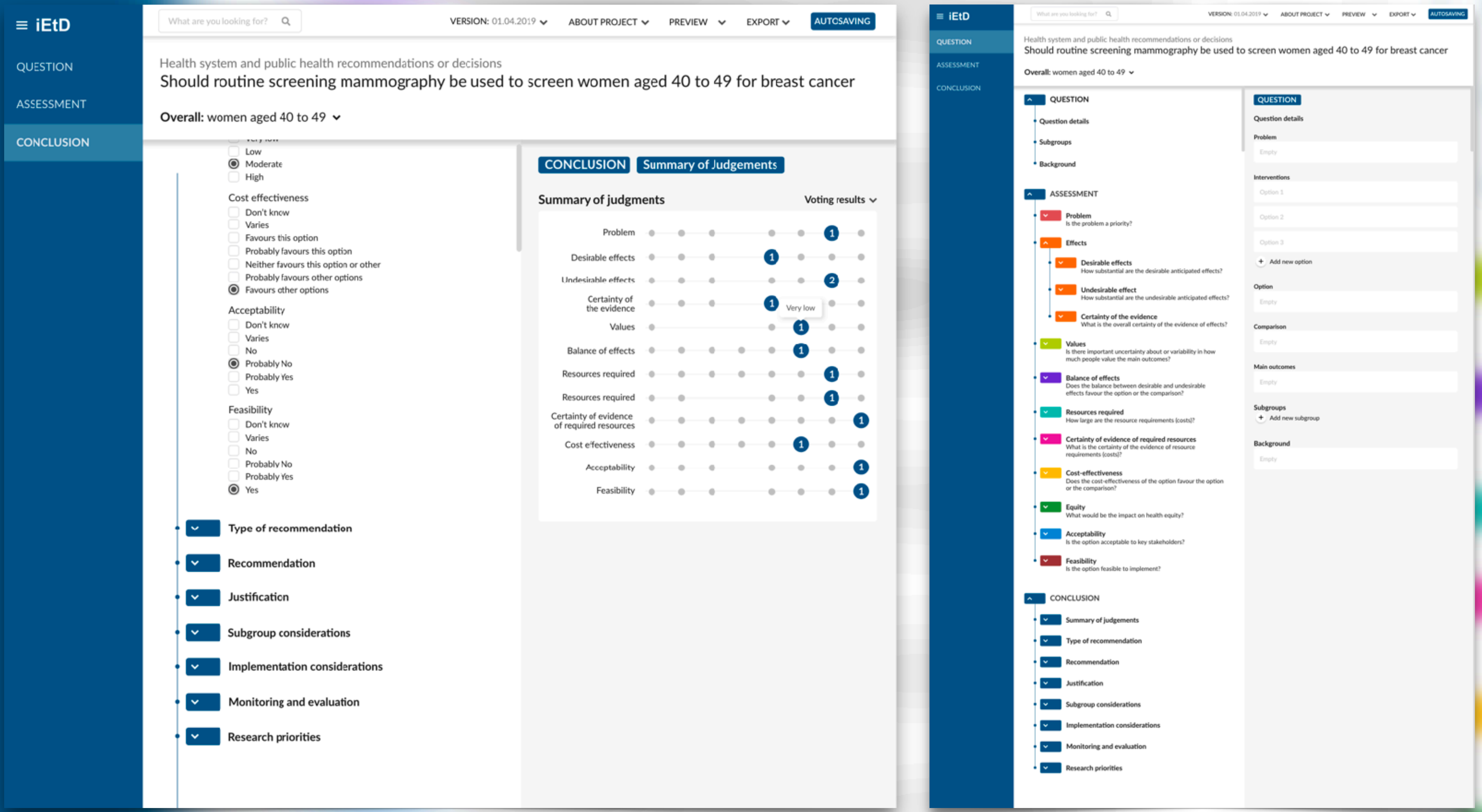
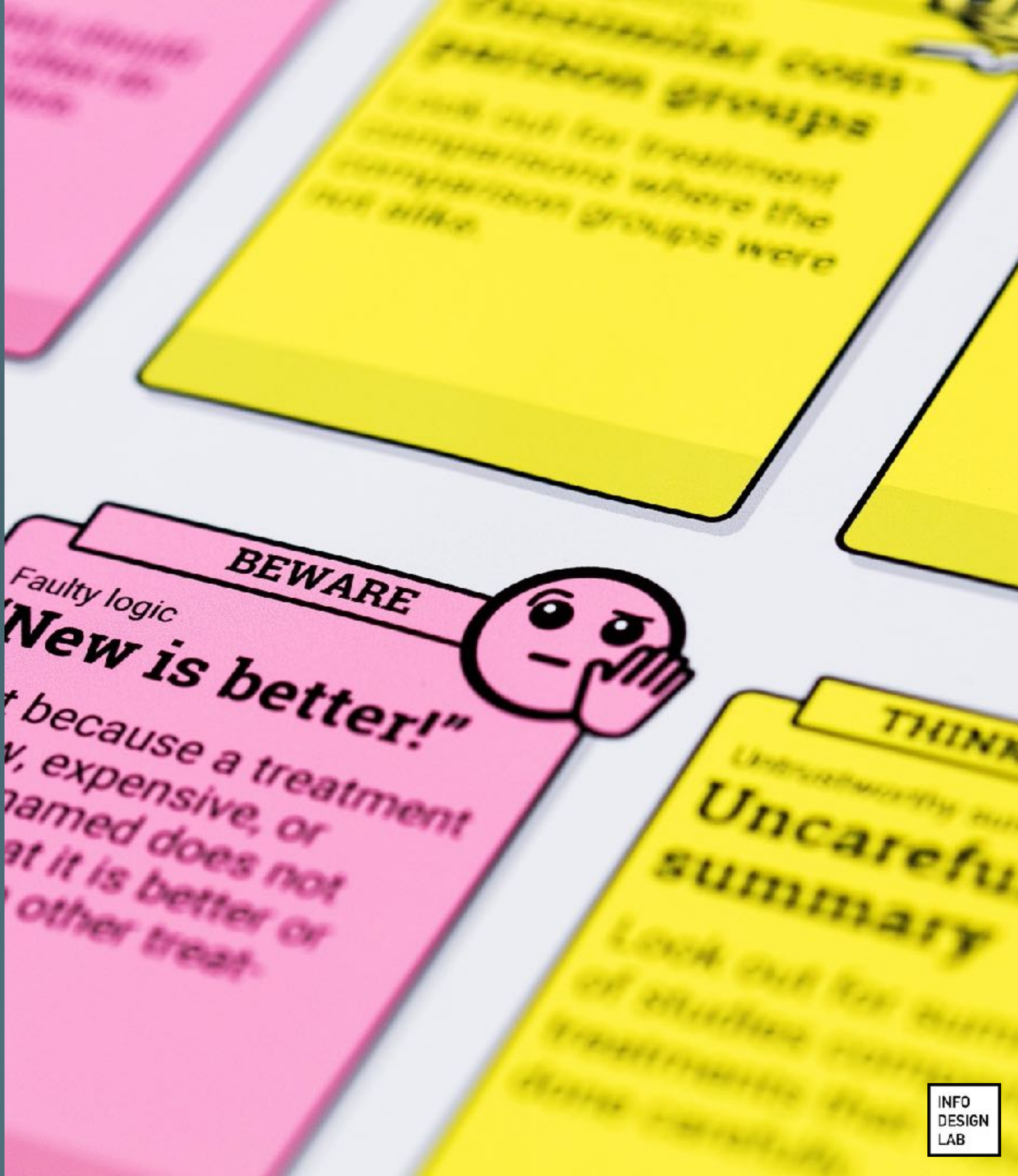


iEtD
QUESTION
ASSESSMENT
CONCLUSION
What are you looking for?
VERSION: 01.04.2019
ABOUT PROJECT
PREVIEW
EXPORT
AUTOSAVING
Health system and public health recommendations or decisions
Should routine screening mammography be used to screen women aged 40 to 49 for breast cancer
Overall: women aged 40 to 49
Low
Moderate
High
Cost effectiveness
Don't know
Varies
Favours this option
Probably favours this option
Neither favours this option or other
Probably favours other options
Favours other options
Acceptability
Don't know
Varies
No
Probably No
Probably Yes
Yes
Feasibility
Don't know
Varies
No
Probably No
Probably Yes
Yes
Type of recommendation
Recommendation
Justification
Subgroup considerations
Implementation considerations
Monitoring and evaluation
Research priorities
CONCLUSION
Summary of Judgements
Summary of judgments
Voting results
Problem
Desirable effects
Undesirable effects
Certainty of the evidence
Very low
Values
Balance of effects
Resources required
Resources required
Certainty of evidence of required resources
Cost effectiveness
Acceptability
Feasibility
QUESTION
Question details
Subgroups
Background
ASSESSMENT
Problem
Is the problem a priority?
Effects
Desirable effects
How substantial are the desirable anticipated effects?
Undesirable effect
How substantial are the undesirable anticipated effects?
Certainty of the evidence
What is the overall certainty of the evidence of effects?
Values
Balance of effects
Resources required
How large are the resource requirements (costs)?
Certainty of evidence of required resources
Cost-effectiveness
Equity
What would be the impact on health equity?
Acceptability
Is the option acceptable to key stakeholders?
Feasibility
Is the option feasible to implement?
CONCLUSION
Summary of judgements
Type of recommendation
Recommendation
Justification
Subgroup considerations
Implementation considerations
Monitoring and evaluation
Research priorities
Problem
Interventions
Option 1
Option 2
Option 3
Add new option
Option
Comparison
Main outcomes
Add new subgroup



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Collaborators would integrate the available knowledge and ensure the right people come together to develop solutions tailored to the problems we really want to solve.
3. IMPLEMENT
Collaborators would implement actions together.
projects.
THE BARRIERS
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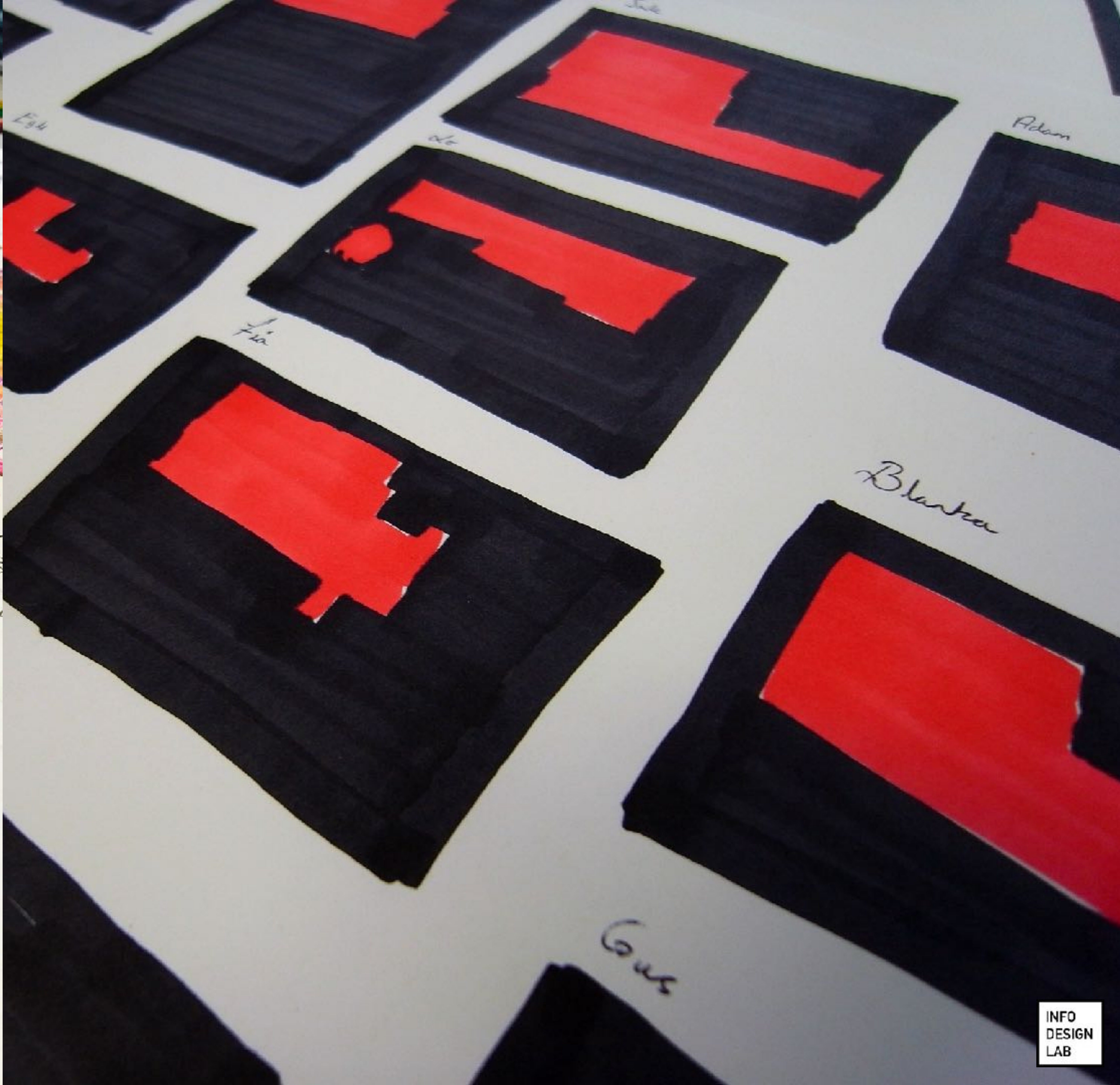

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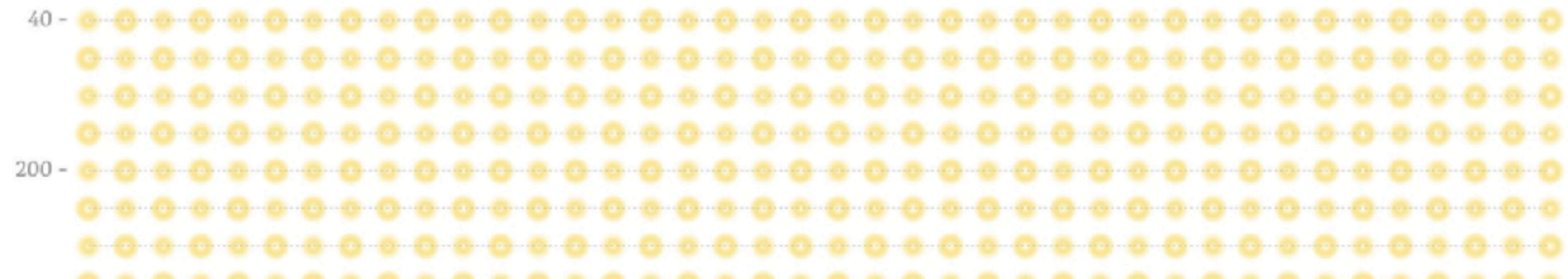
European Monitoring Centre for Drug and Drug Addiction

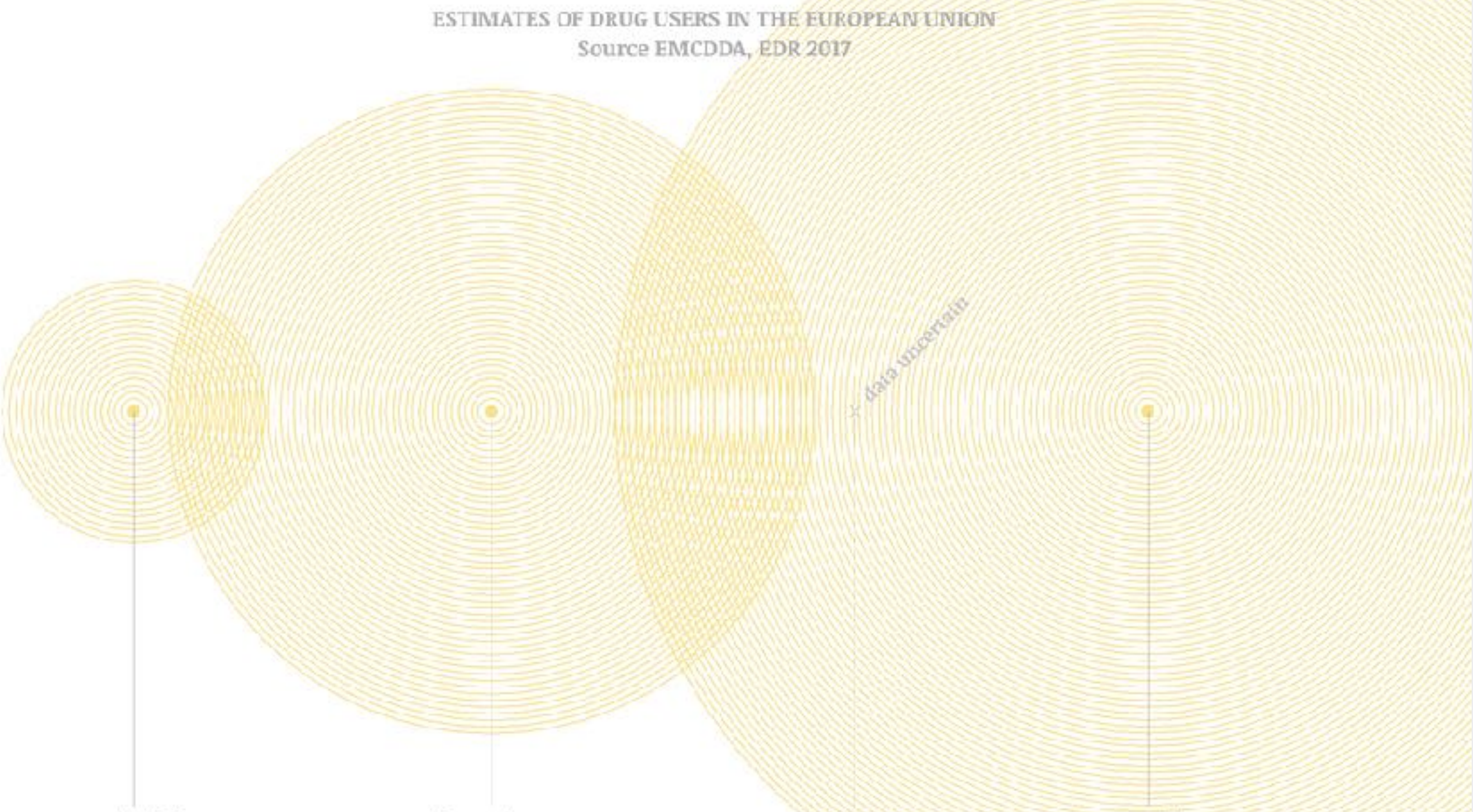
Drug mortality is preventable. Here's how.

In 2015, **8441** people in Europe died because of **overdose of drugs**. They accidentally or intentionally took more than the normal amount or the drug was too potent.



The number of people who die because of drugs is heavily influenced by **the drugs used** and **how these drugs are consumed.**

The European drug market offers a wide range of substances ranging from **Opioids** to **Stimulants**, from **Synthetic drugs** to **Cannabis.**



Opioids
1.3 million users
Opioids are a class of drugs that act as powerful pain relievers. In 2015 in Europe it was estimated that there were 1.3 million high-risk opioid users.

Stimulants
8 million users
Stimulants are a class of drugs that increase alertness, energy and attention. In 2015 in Europe it was estimated that there were almost 8 million recent users of stimulants.

Synthetic drugs
data uncertain
Synthetic drugs are new substances created synthetically in illegal labs. The number of users is uncertain but their availability on the market shows that there is a demand.

Cannabis
22.1 million users
Cannabis is the illicit drug most likely to be used in Europe. In 2014 in Europe it was estimated that there were 23.5 million recent users.

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The world is thirsty because it is hungry.

FAO Food and Agricultural Organization of the United Nations

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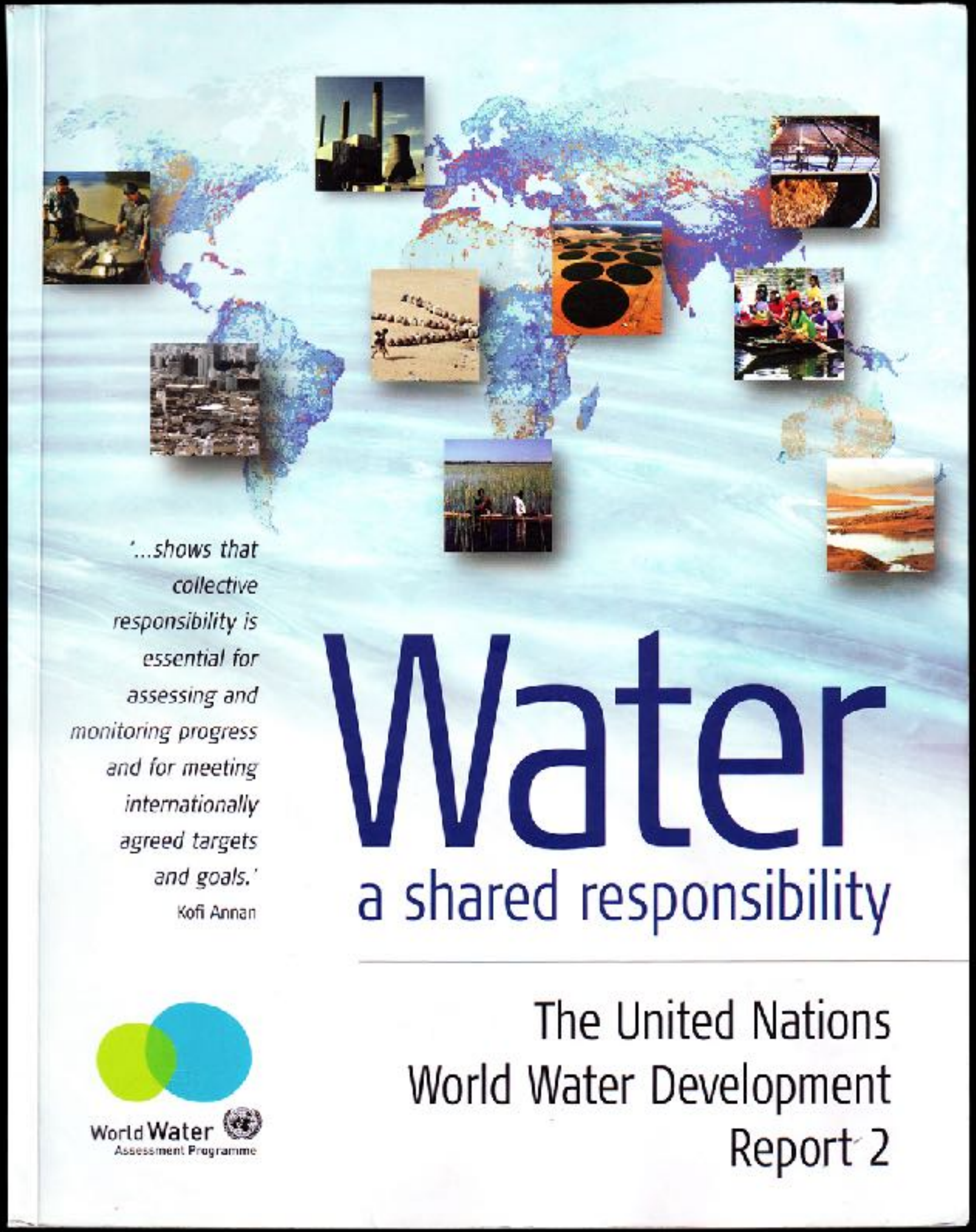
'...shows that
collective
responsibility is
essential for
assessing and
monitoring progress
and for meeting
internationally
agreed targets
and goals.'
Kofi Annan
Water
a shared responsibility
The United Nations
World Water Development
Report 2
World Water
Assessment Programme

Source: Water Footprint Network

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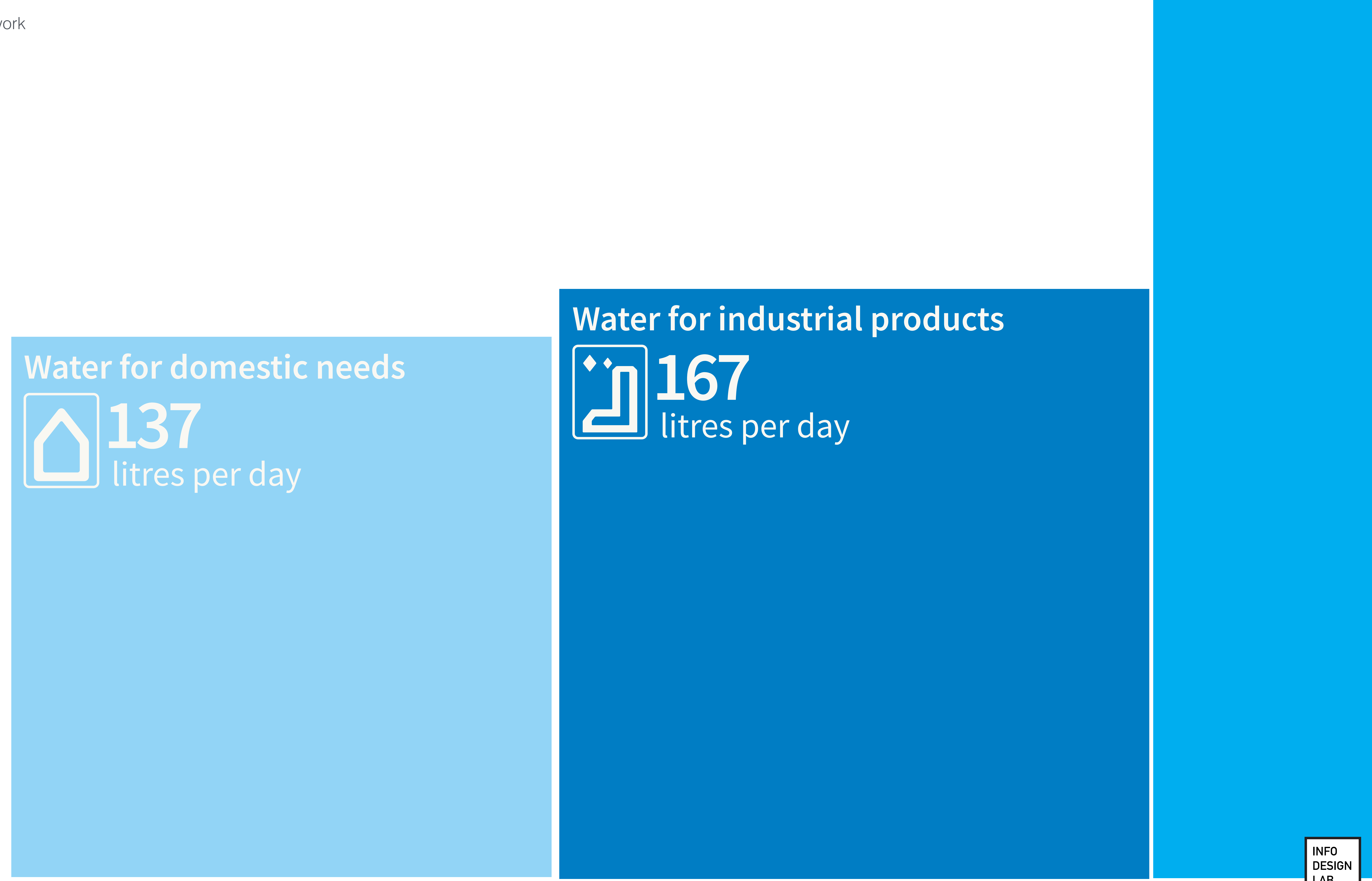
Source: Water Footprint Network



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Source: Water Foo

r food

496

res per day

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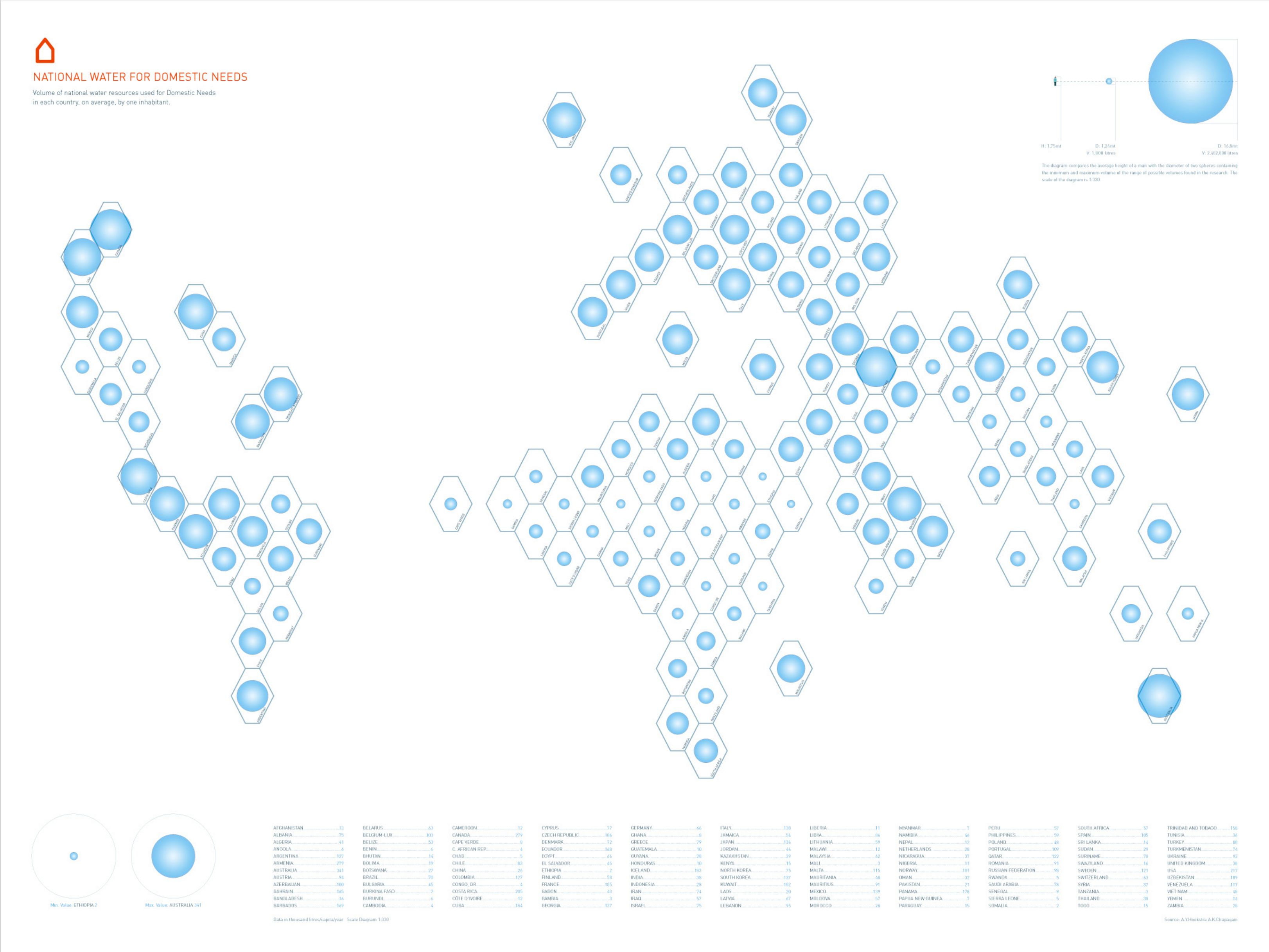
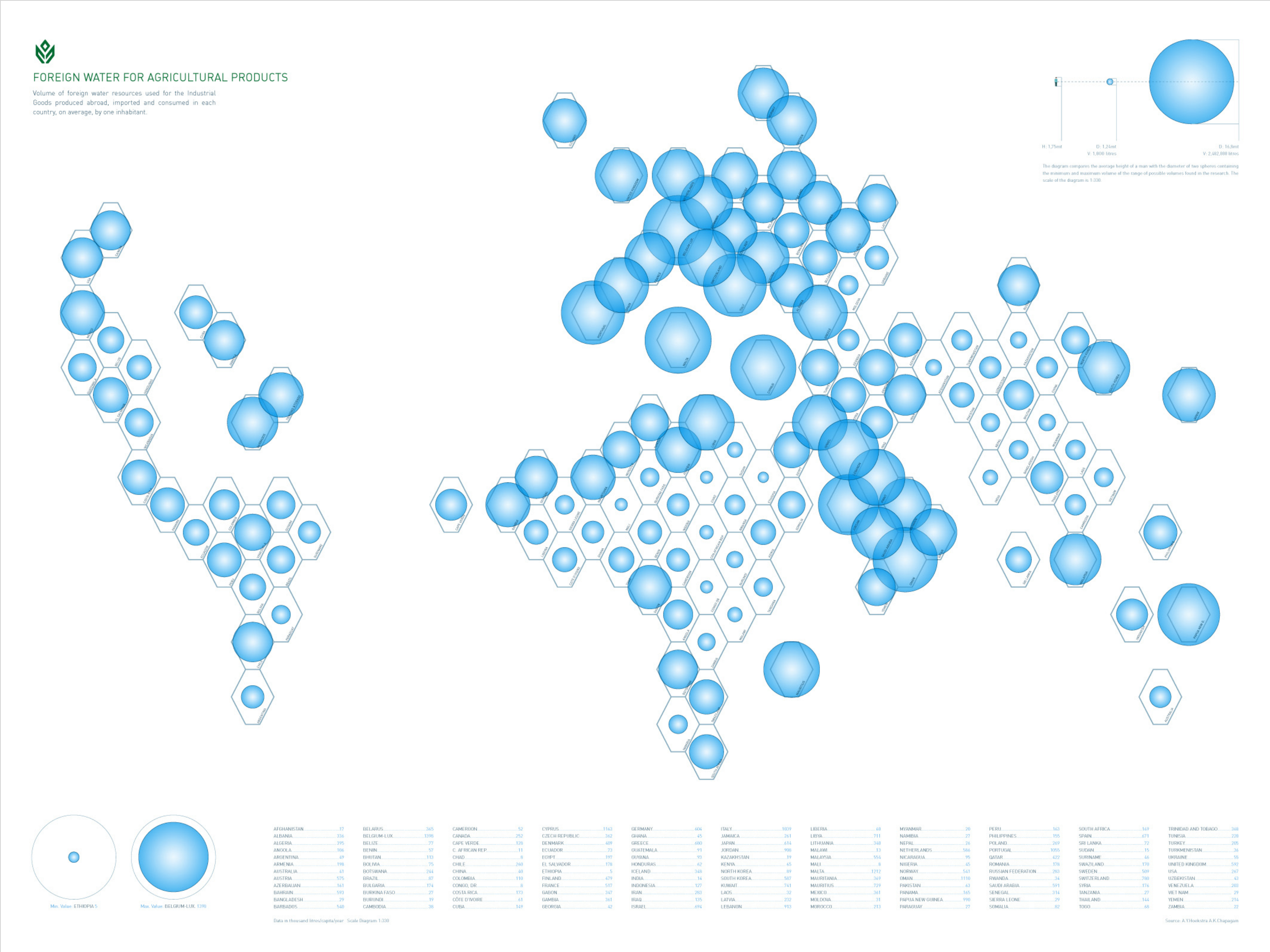
THE WATER CRISIS
Today more than 1 billion people
By 2050, if present water consumption
people, nearly half the world population,
that are chronically short of water.
The basic problem is that the
is fixed: it can be neither
populations grow,
water is
Pollution

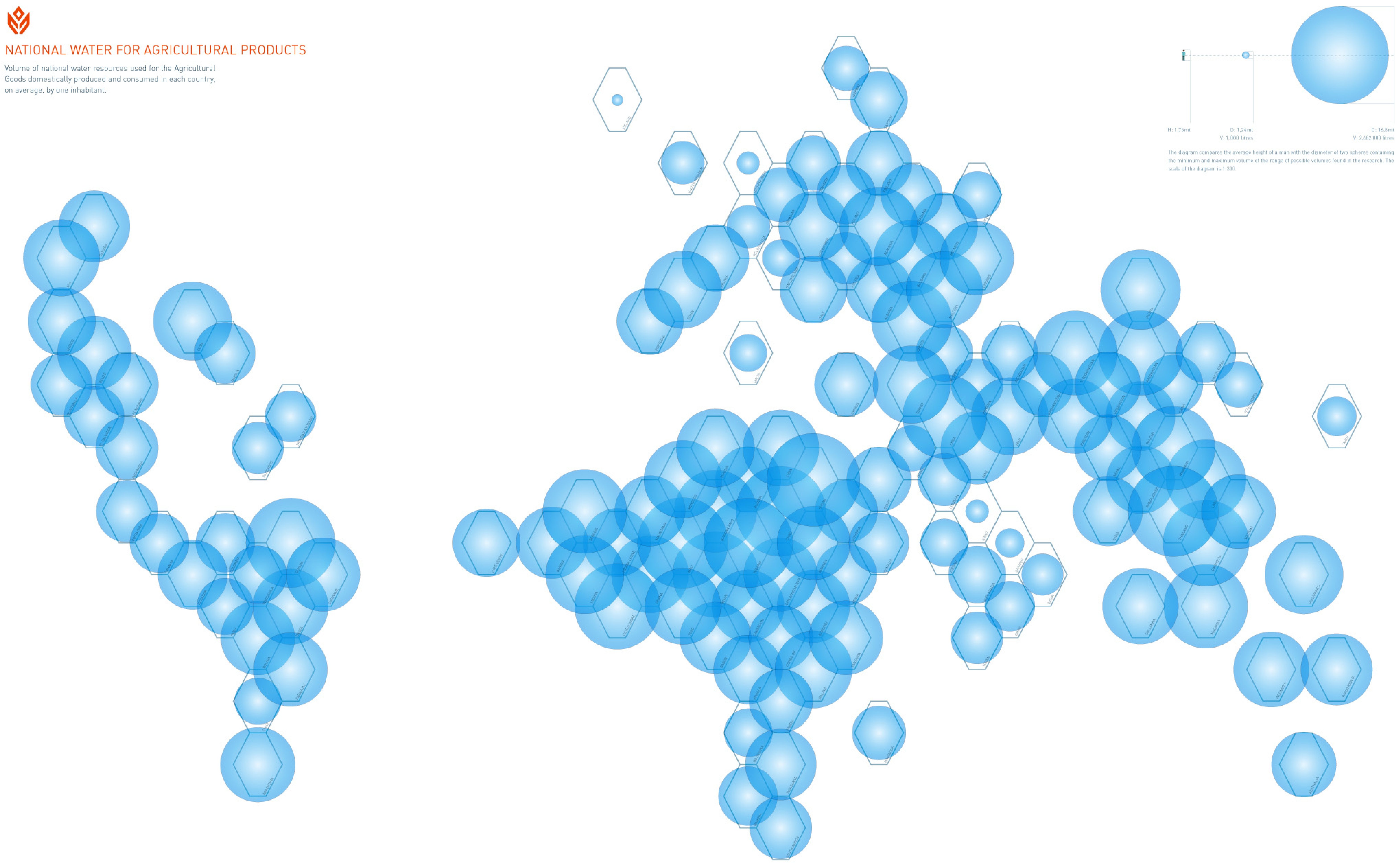

comes from ocean, the remaining 60
evaporation on land is 119,000 km³ a year.
THE UNITED NATIONS WORLD WATER DEVELOPMENT REPORT 2
Streamflow of freshwater to salt water is 42,600 km³ a year.
6 GROUNDWATER FLOW: The groundwater flow is 2,200 km³ a year.
stability in areas of unstable ground, and acts as an overall critical water resource



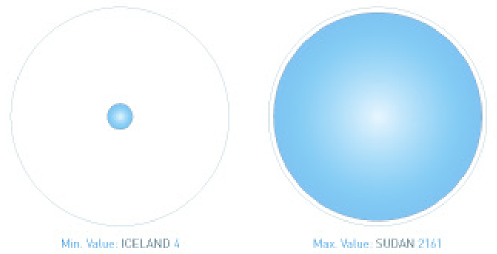


NATIONAL WATER FOR AGRICULTURAL PRODUCTS

Volume of national water resources used for the Agricultural Goods domestically produced and consumed in each country, on average, by one inhabitant.



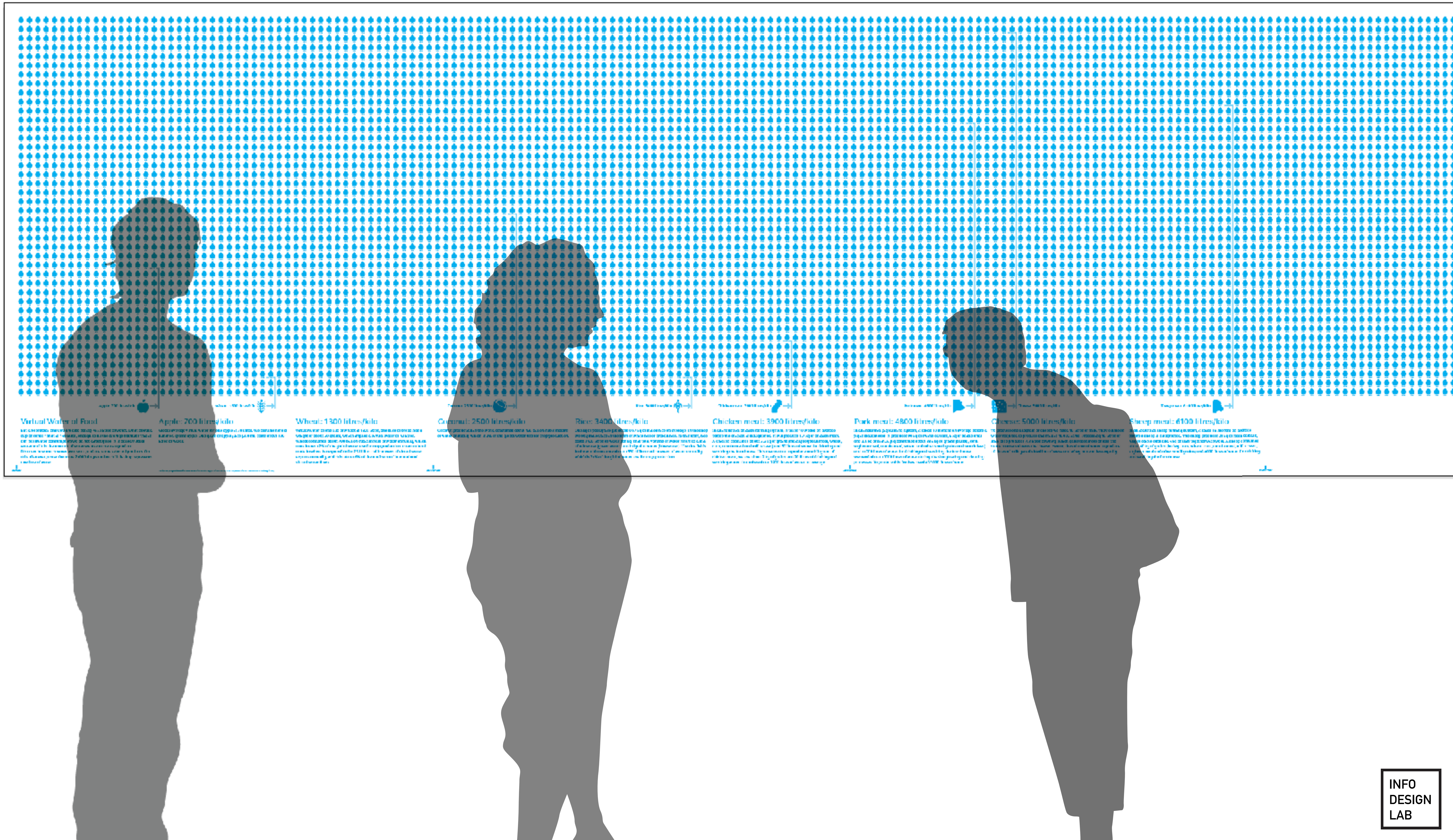
The diagram compares the average height of a man with the diameter of two spheres containing the minimum and maximum volume of the range of possible volumes found in the research. The scale of the diagram is 1:330.



AFGHANISTAN	629	BELARUS	820	CAMEROON	1021	CYPRUS	693	GERMANY	434	ITALY	829	LIBERIA	1294	MYANMAR	1557	PERU	489	SOUTH AFRICA	644	TRINIDAD AND TOBAGO	365
ALBANIA	777	BELGIUM-LUX	215	CANADA	986	CZECH REPUBLIC	934	GHANA	1229	JAMAICA	615	LIBYA	1189	NAMIBIA	555	PHILIPPINES	1308	SPAIN	1251	TUNISIA	1285
ALGERIA	755	BELIZE	1087	CAPE VERDE	835	DENMARK	442	GREECE	1400	JAPAN	165	LITHUANIA	632	NEPAL	806	POLAND	559	SRI LANKA	1185	TURKEY	1257
ANGOLA	878	BENIN	1690	C. AFRICAN REP.	1064	ECUADOR	907	GUATEMALA	621	JORDAN	301	MALAWI	1245	NETHERLANDS	31	PORTUGAL	800	SUDAN	2161	TURKMENISTAN	1619
ARGENTINA	1122	BHUTAN	902	CHAD	1962	EGYPT	722	GUYANA	1925	KAZAKHSTAN	1637	MALAYSIA	1591	NICARAGUA	663	QATAR	196	SURINAME	1082	UKRAINE	1089
ARMENIA	379	BOLIVIA	1095	CHILE	274	EL SALVADOR	593	HONDURAS	673	KENYA	626	MALI	2003	NIGERIA	1917	ROMANIA	1293	SWAZILAND	969	UNITED KINGDOM	218
AUSTRALIA	736	BOTSWANA	304	CHINA	565	ETHIOPIA	664	ICELAND	4	NORTH KOREA	574	MALTA	141	NORWAY	244	RUSSIAN FEDERATION	1380	SWEDEN	507	USA	1192
AUSTRIA	368	BRAZIL	1155	COLOMBIA	551	FINLAND	758	INDIA	907	SOUTH KOREA	264	MAURITANIA	945	OMAN	341	RWANDA	1066	SWITZERLAND	136	UZBEKISTAN	771
AZERBAIJAN	485	BULGARIA	1169	CONGO, DR	719	FRANCE	814	INDONESIA	1153	KUWAIT	33	MAURITIUS	422	PAKISTAN	1119	SAUDI ARABIA	508	SYRIA	1588	VENEZUELA	519
BAHRAIN	64	BURKINA FASO	1491	COSTA RICA	639	GABON	982	IRAN	1243	LAOS	1380	MEXICO	837	PANAMA	555	SENEGAL	1597	TANZANIA	1093	VIET NAM	1091
BANGLADESH	846	BURUNDI	1036	CÔTE D'IVOIRE	1692	GAMBIA	993	IRAQ	1036	LATVIA	293	MOLDOVA	1201	PAPUA NEW GUINEA	994	SIERRA LEONE	858	THAILAND	1987	YEMEN	381
BARBADOS	374	CAMBODIA	1715	CUBA	1315	GEORGIA	505	ISRAEL	264	LEBANON	397	MOROCCO	1264	PARAGUAY	1089	SOMALIA	585	TOGO	1185	ZAMBIA	695

Data in thousand litres/capita/year   Scale Diagram 1:330

Source: A.Y.Hoekstra A.K.Chapagain



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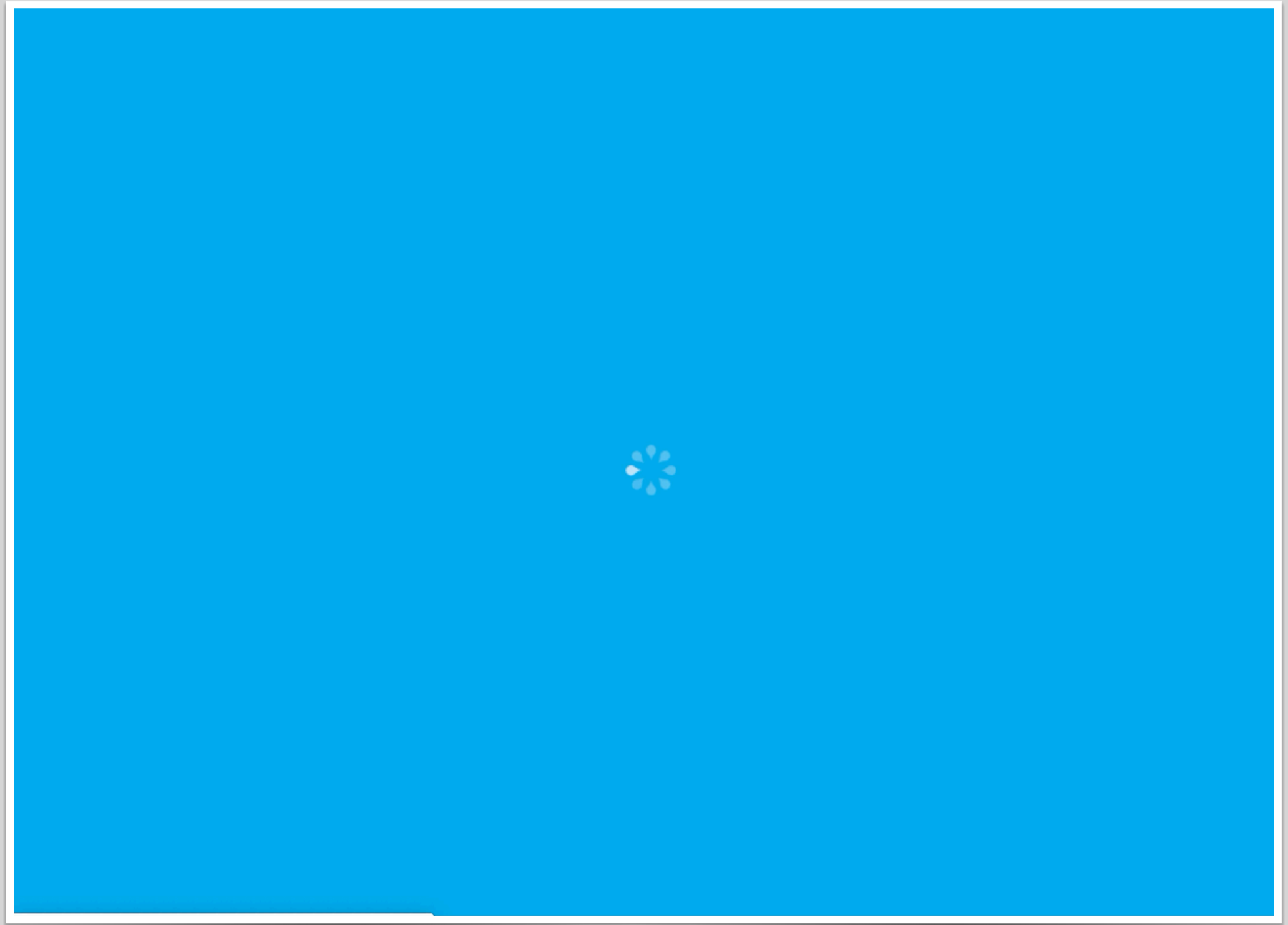

THE WATER WE EAT
www.angelamorelli.com/water

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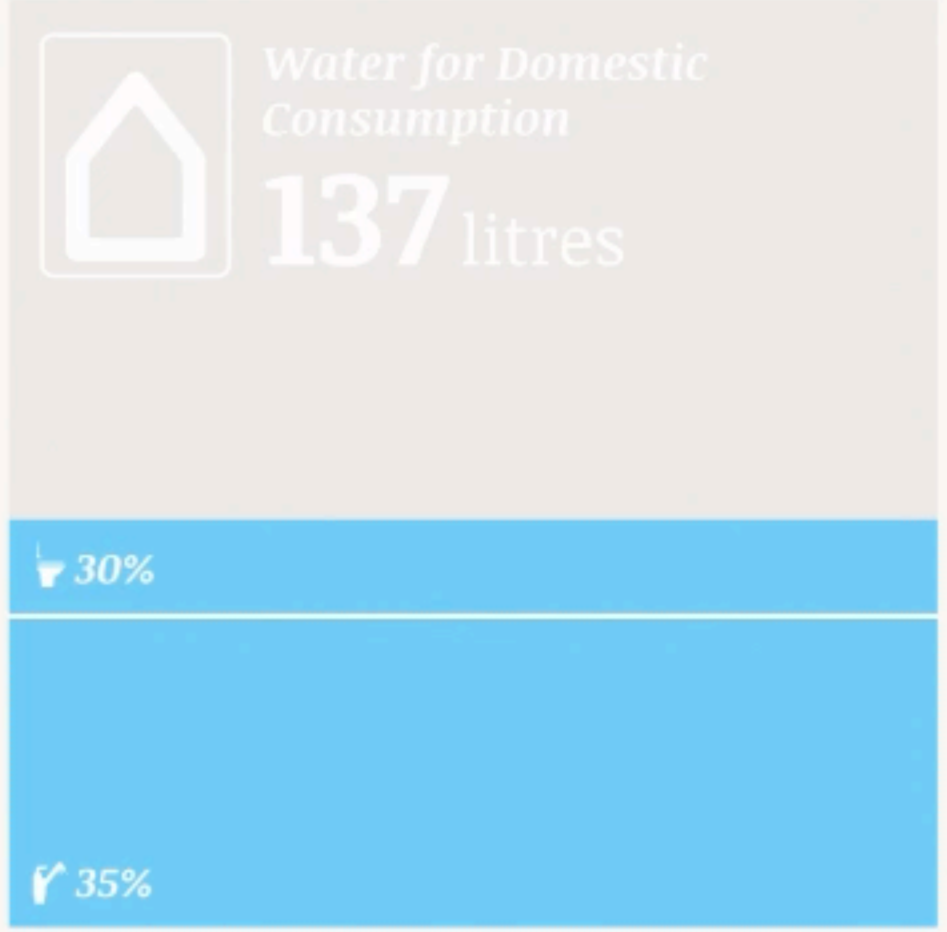
thewaterweeat.com

What if I told you:

you eat 3496 litres of water

Our **domestic consumption** is **137 litres** of water everyday. This is how we manage those **137 litres**

30% Flushing toilet



Can you visualize 15400 litres of water in your head?

The Global Water Footprint of Humanity
With Prof Tony Allan, inventor of the Virtual Water concept

Co-designing data visualizations with the readers and above all with the content experts can really help us meet our audience where they are.

1. The collaboration with the IPCC
2. Designing the co-design process
3. User engagement
4. The tools to support the co-design process

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The collaboration with the IPCC.

01

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INTERGOVERNMENTAL PANEL ON climate change
WMO
UNEP
SUMMARY FOR POLICYMAKERS
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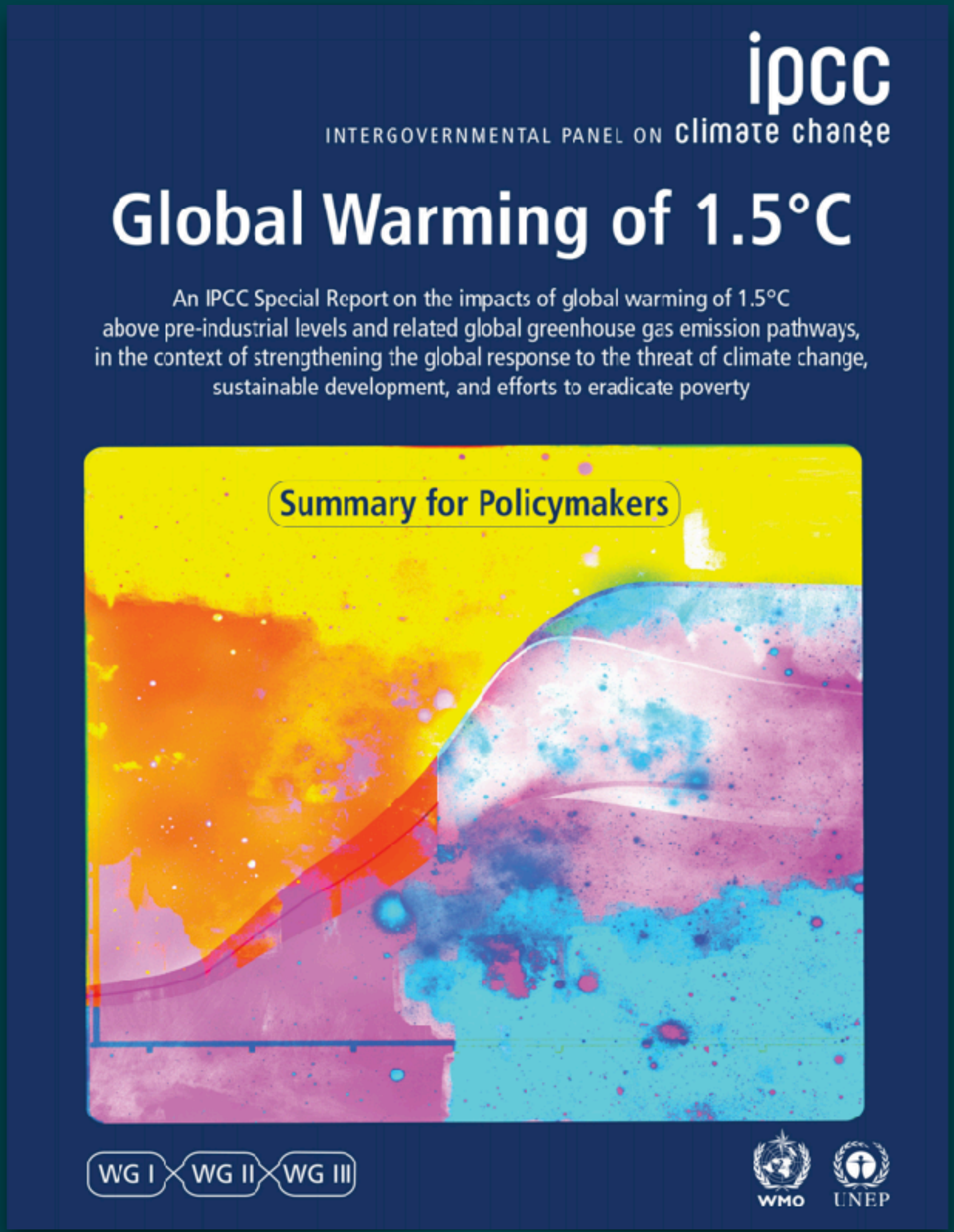

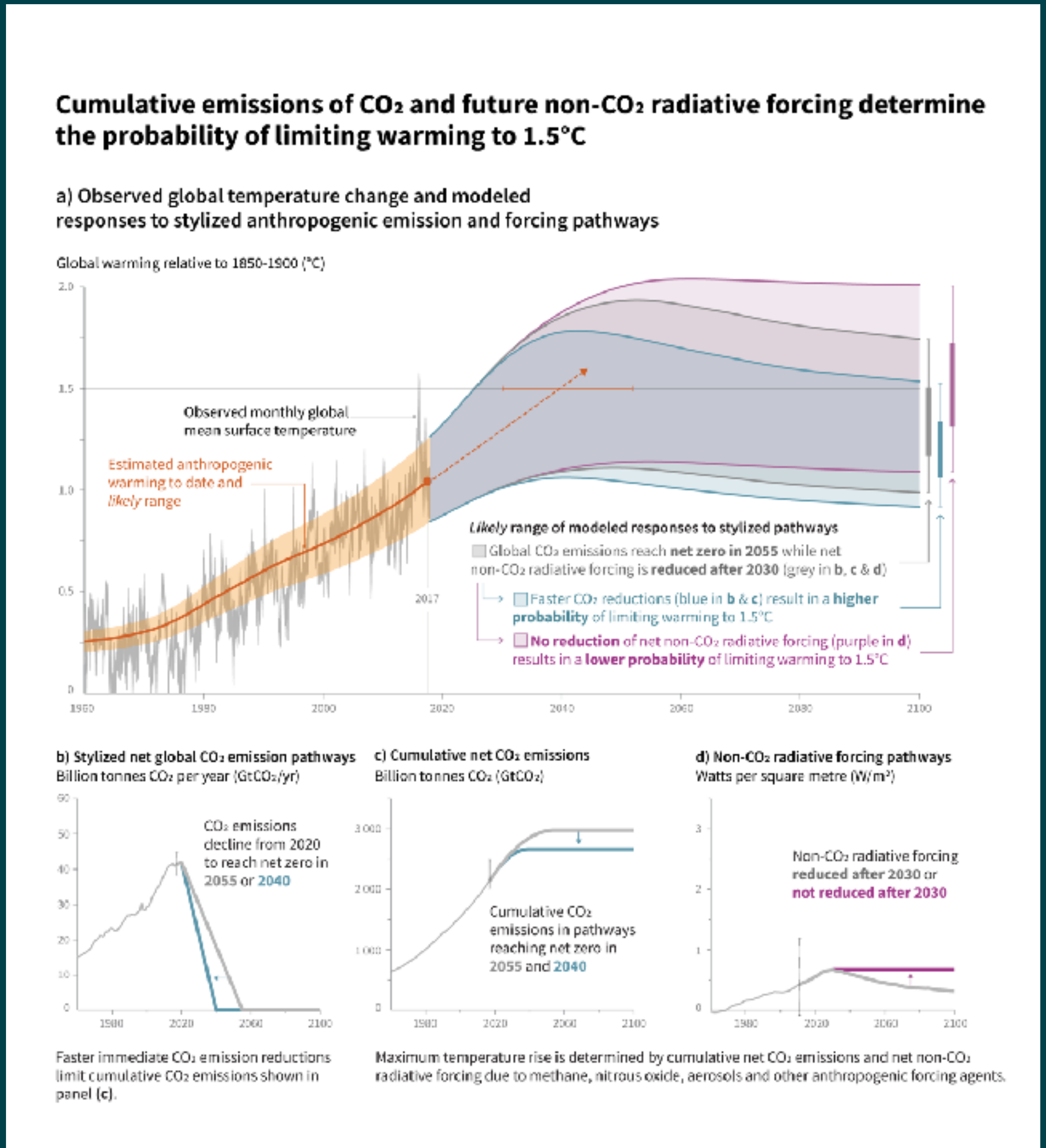

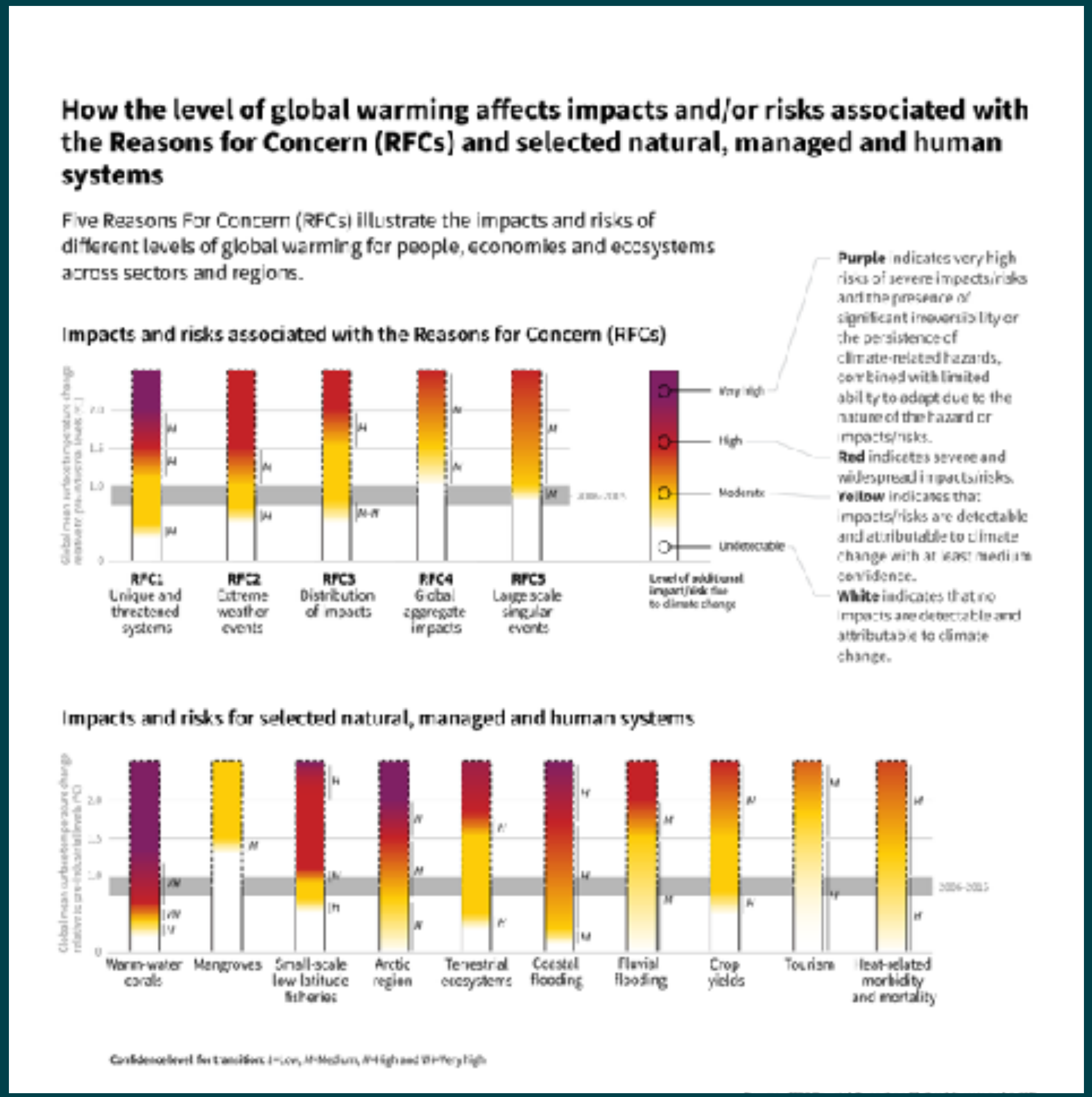

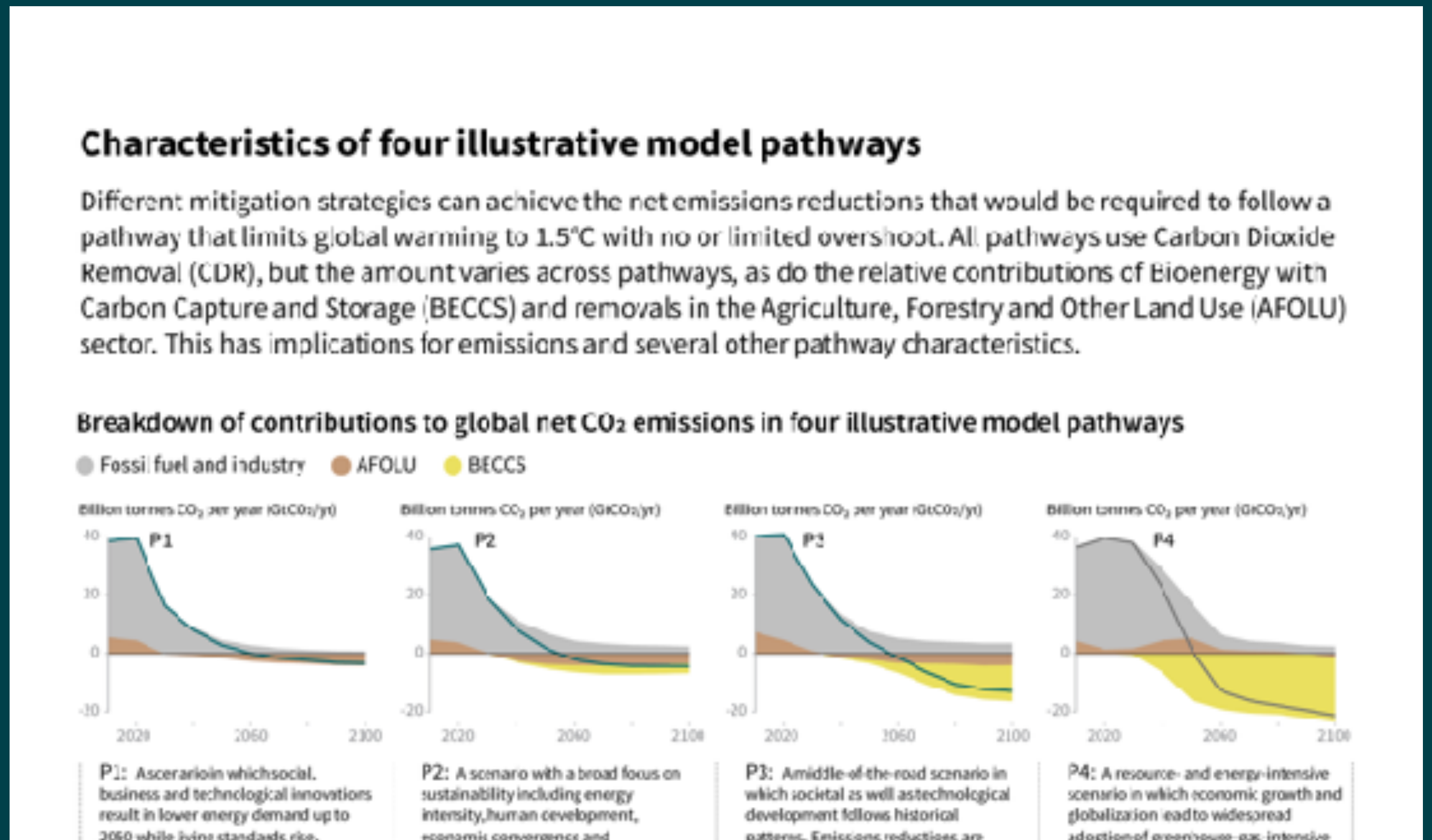

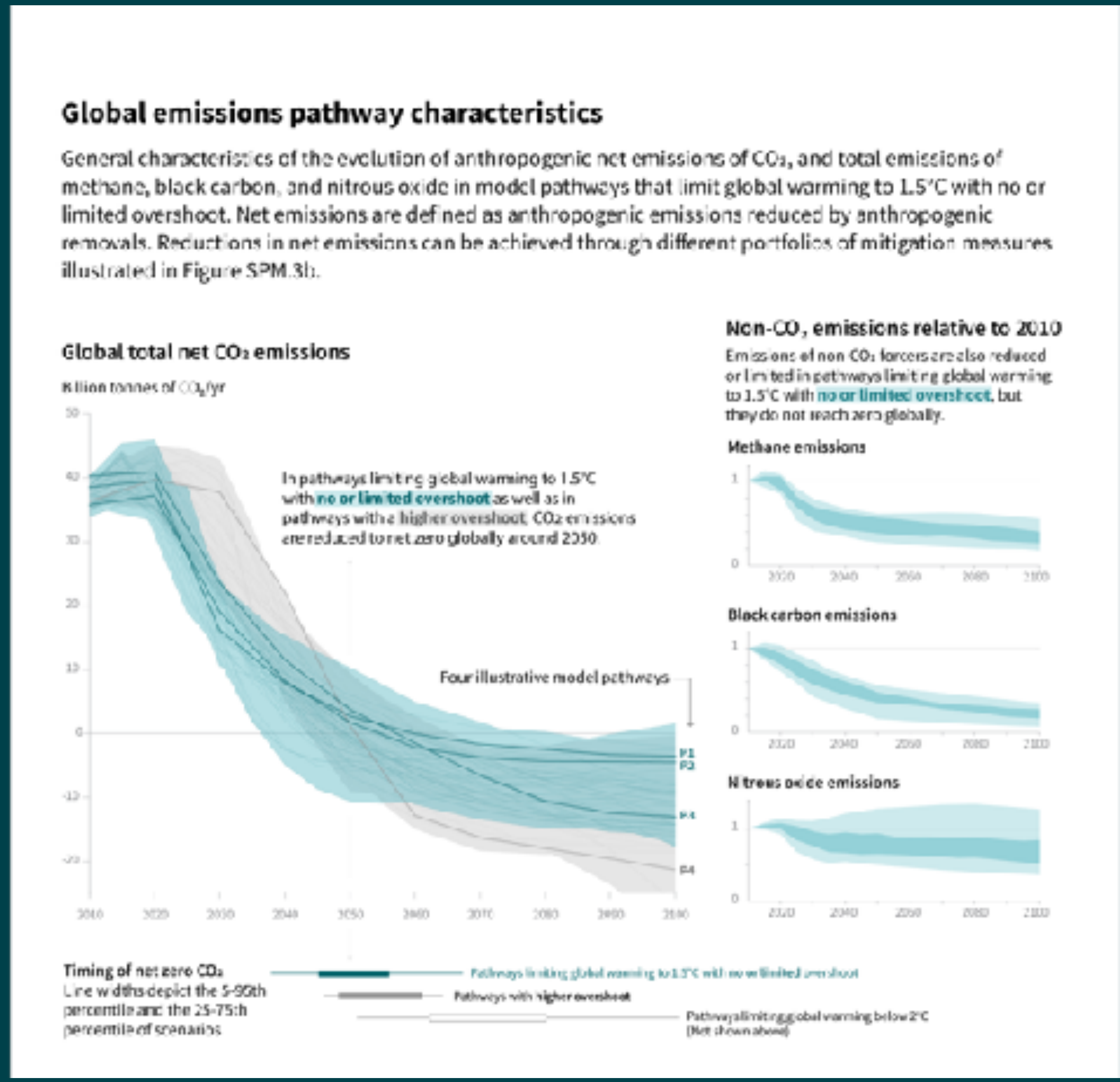

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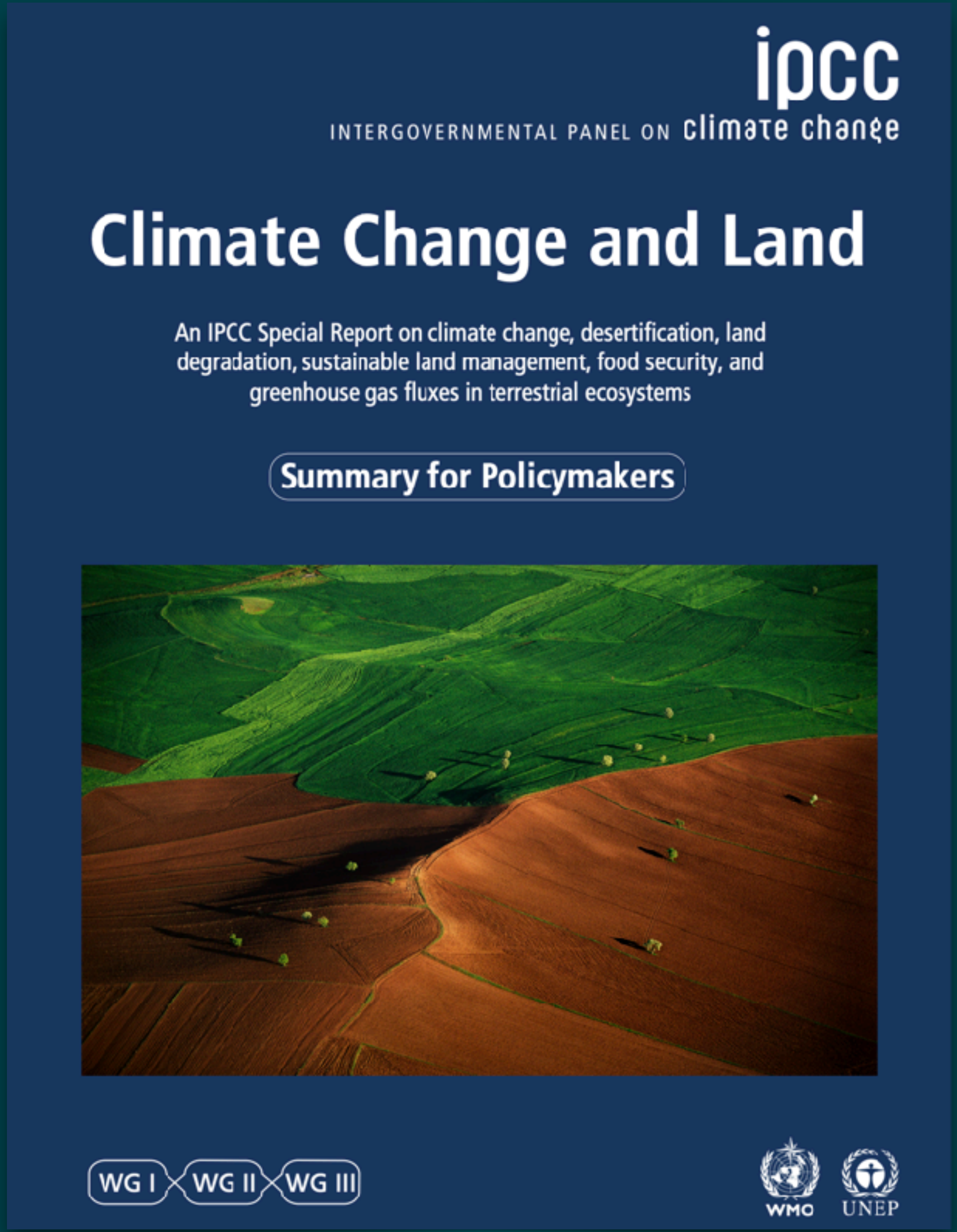
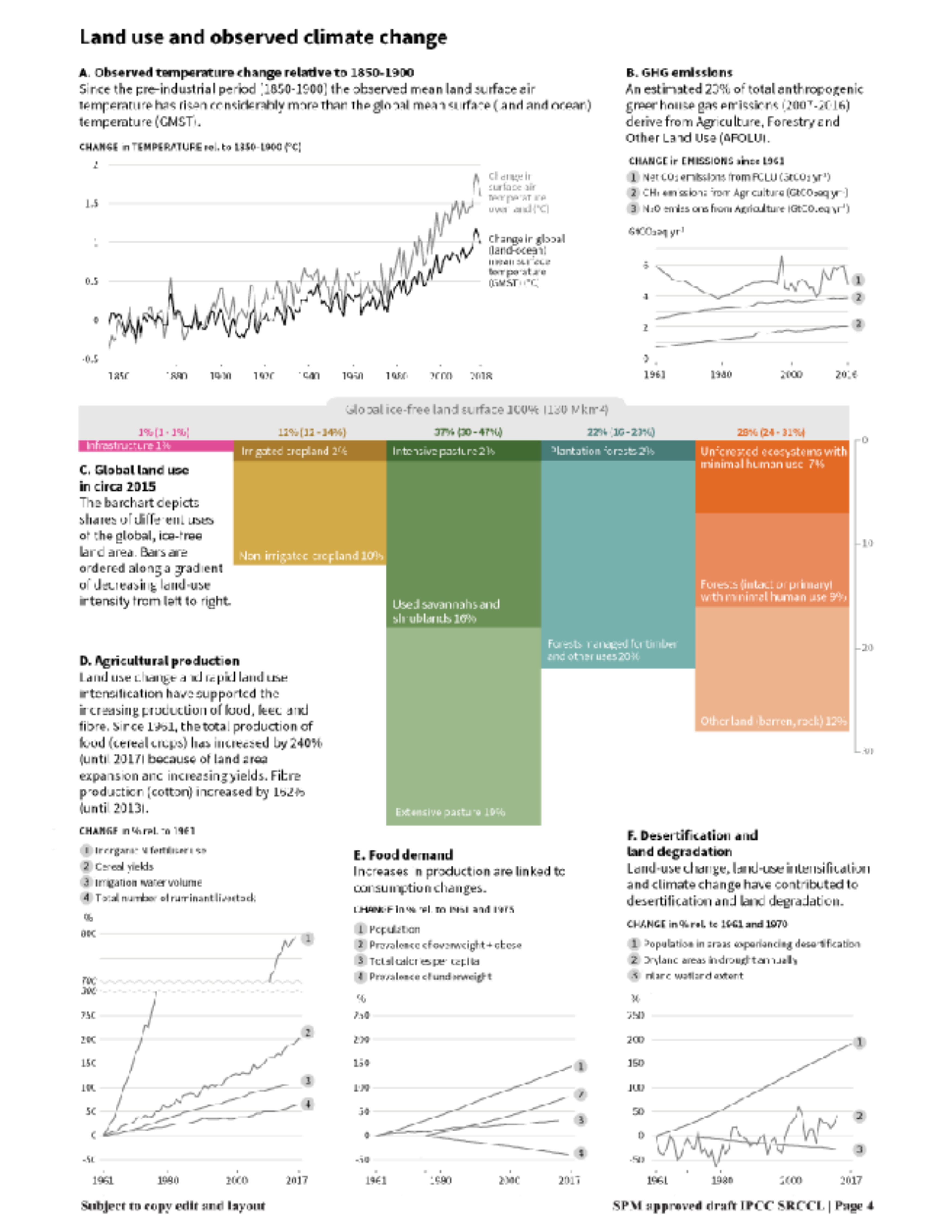




Land use and observed climate change

A. Observed temperature change relative to 1850-1900
Since the pre-industrial period (1850-1900) the observed mean land surface air temperature has risen considerably more than the global mean surface (land and ocean) temperature (GMST).

B. GHG emissions
An estimated 23% of total anthropogenic greenhouse gas emissions (2007-2016) derive from Agriculture, Forestry and Other Land Use (AFOLU).

C. Global land use in circa 2015
The barchart depicts shares of different uses of the global, ice-free land area. Bars are ordered along a gradient of decreasing land-use intensity from left to right.

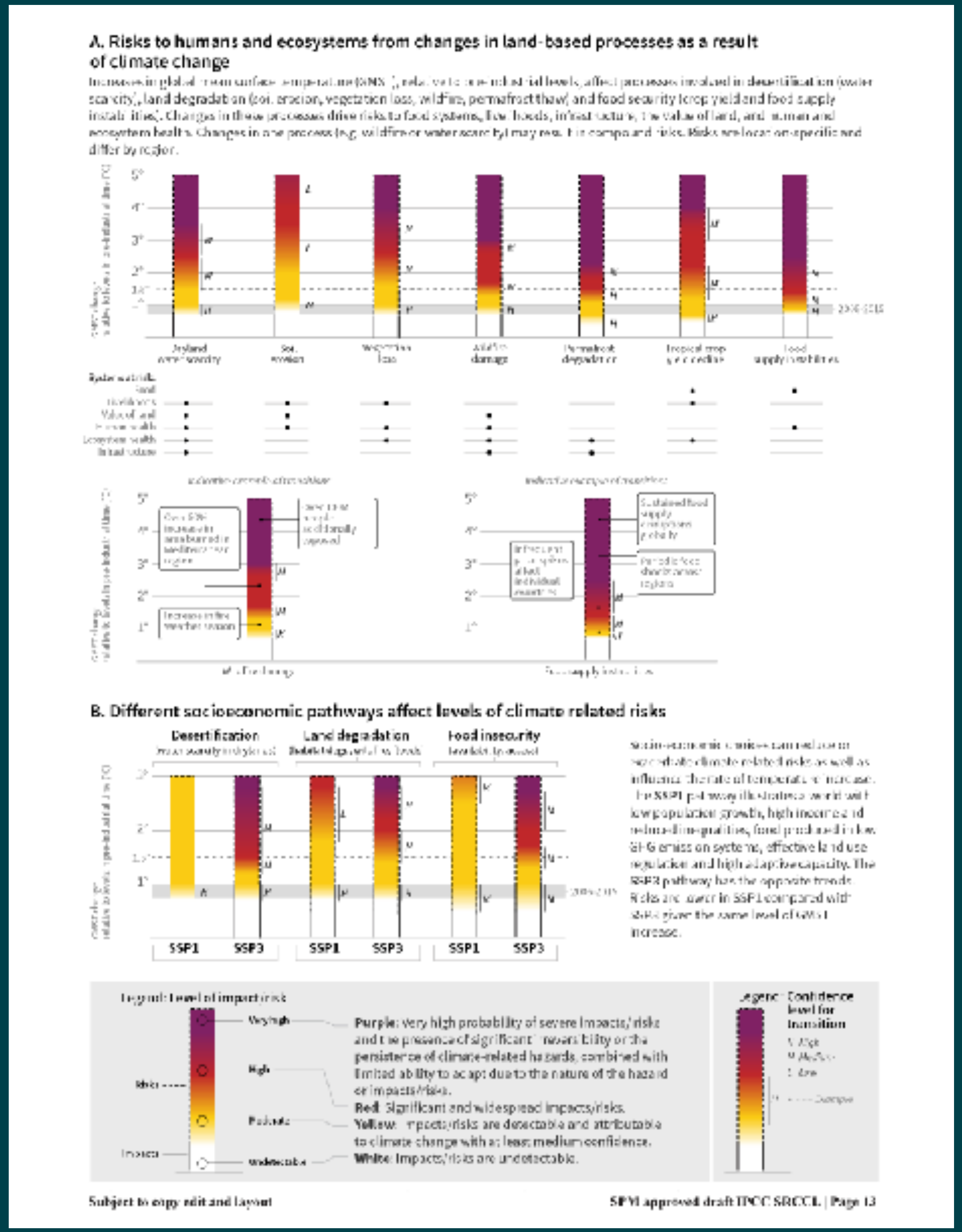
D. Agricultural production
Land use change and rapid land use intensification have supported the increasing production of food, feed and fibre. Since 1961, the total production of food (cereal crops) has increased by 240% (until 2017) because of land area expansion and increasing yields. Fibre production (cotton) increased by 162% (until 2013).

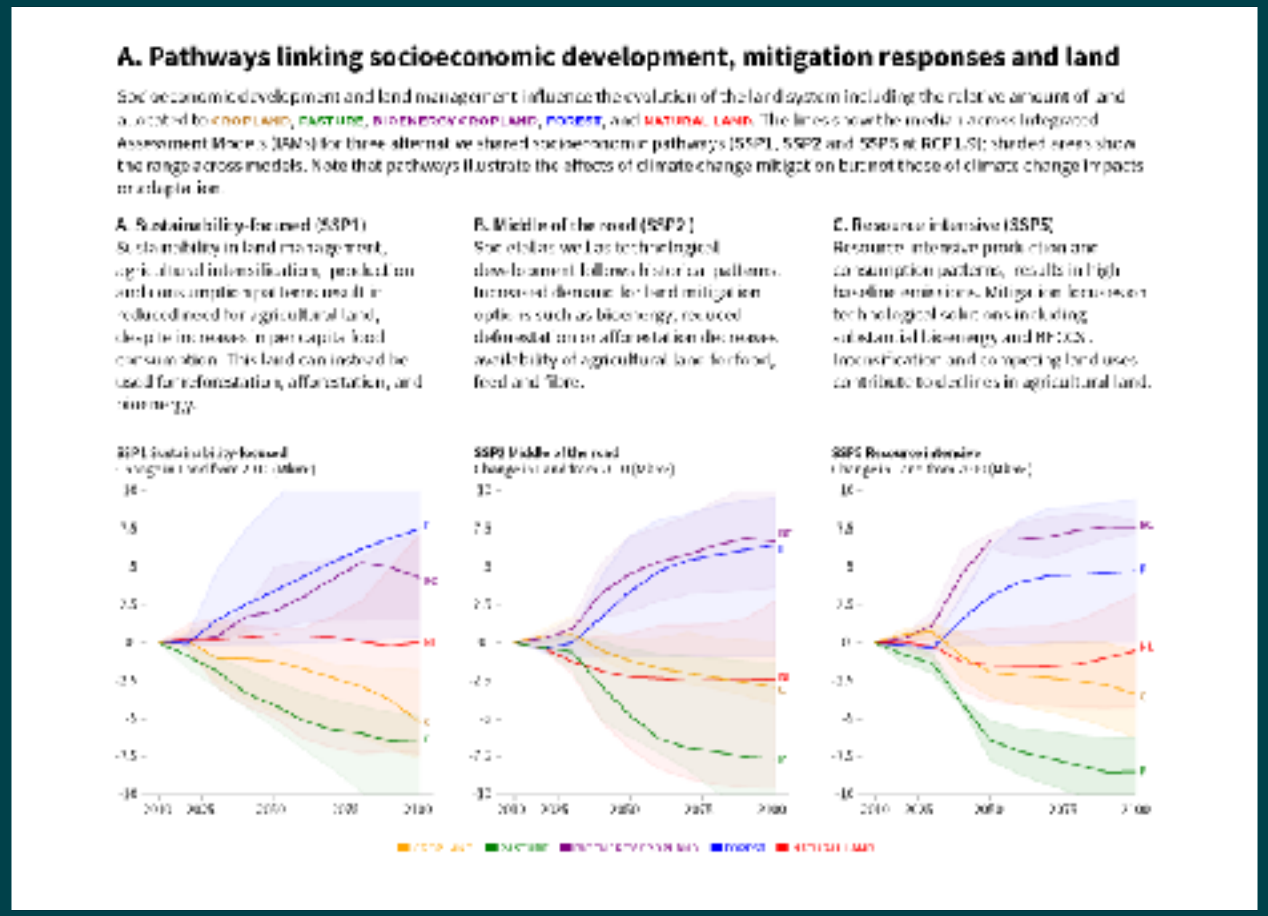
E. Food demand
Increases in production are linked to consumption changes.

F. Desertification and land degradation
Land-use change, land-use intensification and climate change have contributed to desertification and land degradation.

Subject to copy edit and layout

SPM approved draft IPCC SRCCL | Page 4





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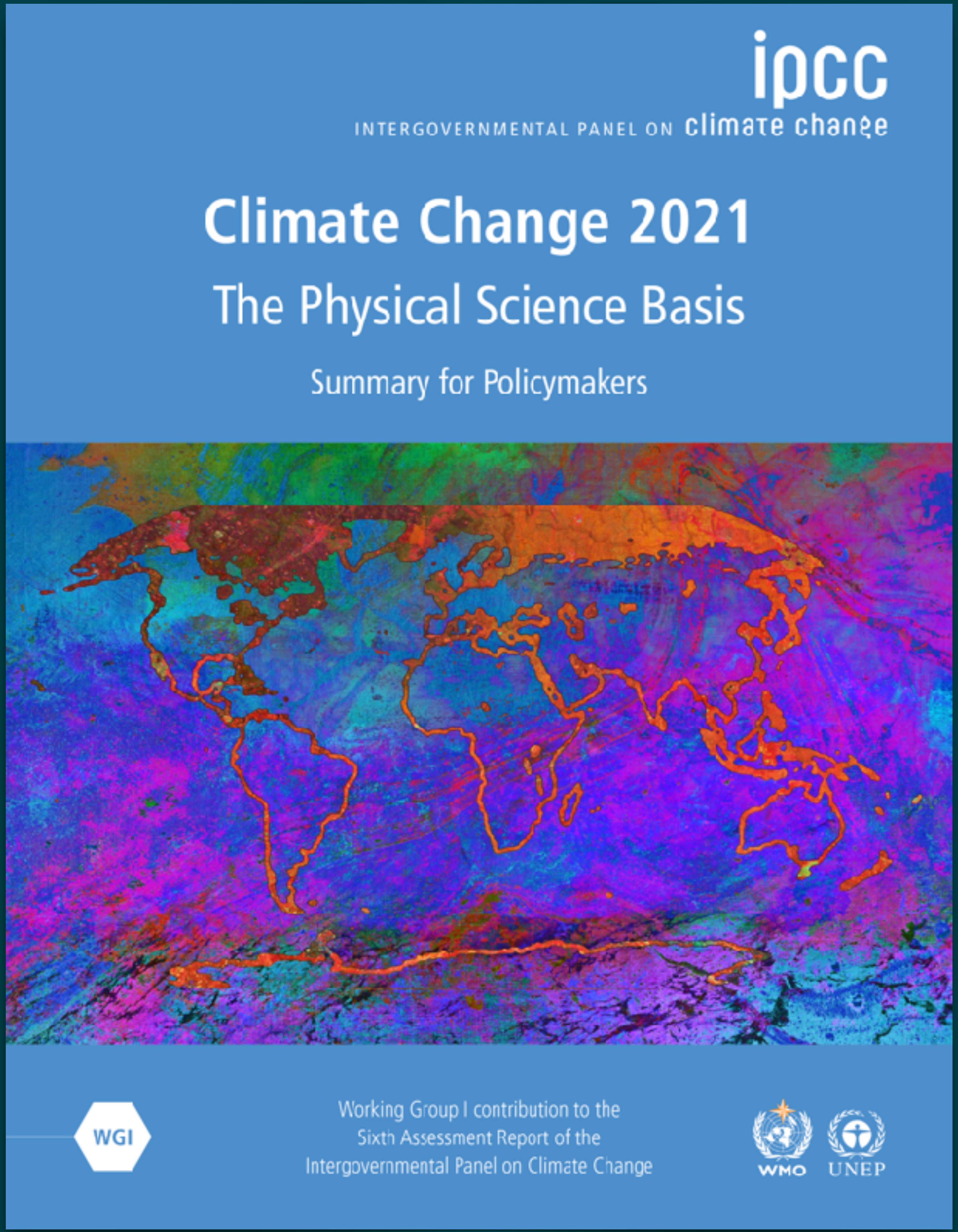

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Climate change is already affecting every inhabited region across the globe with human influence contributing to many observed changes in weather and climate extremes

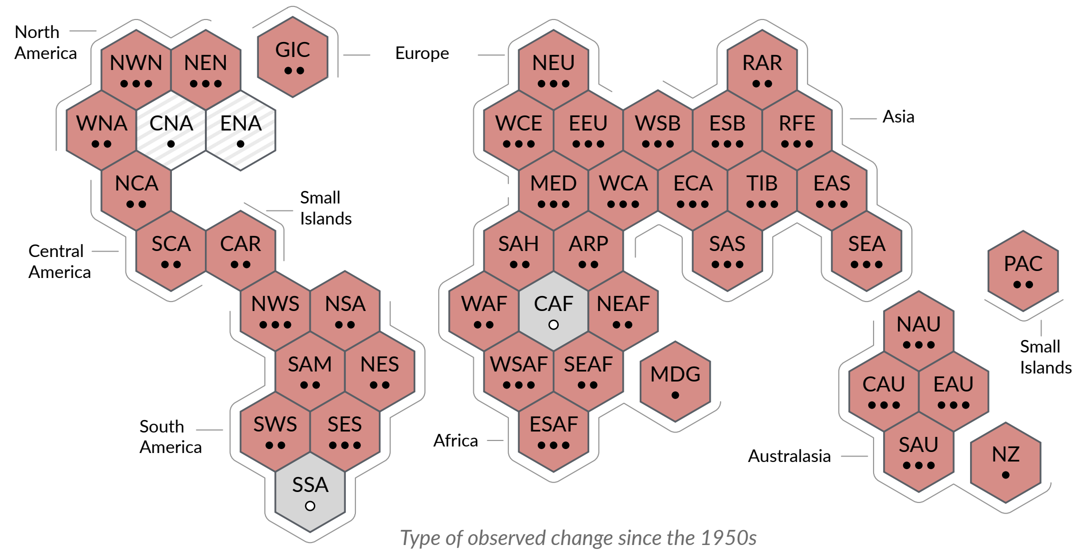
a) Synthesis of assessment of observed change in **hot extremes** and confidence in human contribution to the observed changes in the world's regions

Type of observed change in hot extremes

- Increase (41)
- Decrease (0)
- Low agreement in the type of change (2)
- Limited data and/or literature (2)

Confidence in human contribution to the observed change

- ●●● High
- ●● Medium
- ● Low due to limited agreement
- ○ Low due to limited evidence



Type of observed change since the 1950s

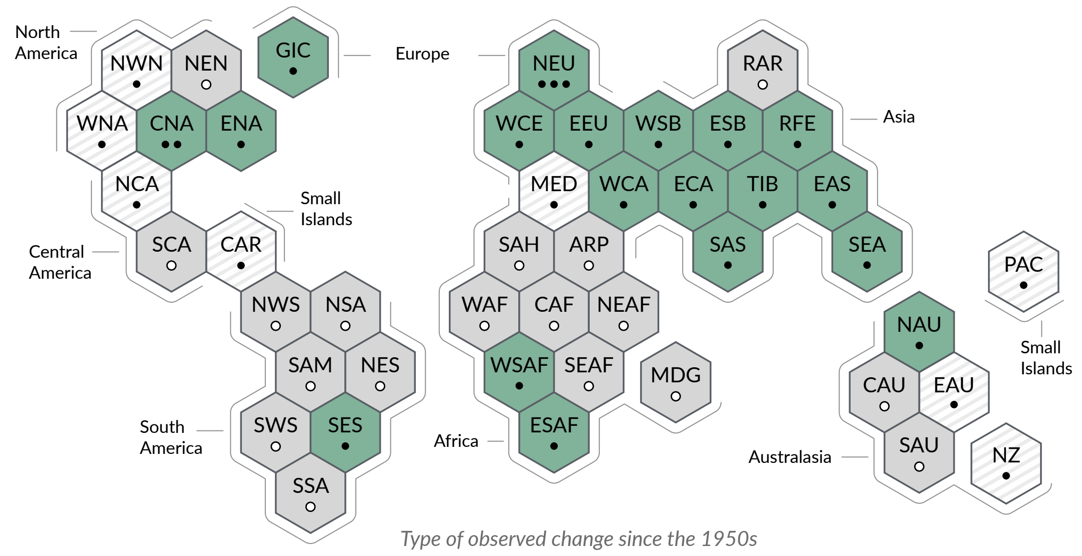
b) Synthesis of assessment of observed change in **heavy precipitation** and confidence in human contribution to the observed changes in the world's regions

Type of observed change in heavy precipitation

- Increase (19)
- Decrease (0)
- Low agreement in the type of change (8)
- Limited data and/or literature (18)

Confidence in human contribution to the observed change

- ●●● High
- ●● Medium
- ● Low due to limited agreement
- ○ Low due to limited evidence



Type of observed change since the 1950s

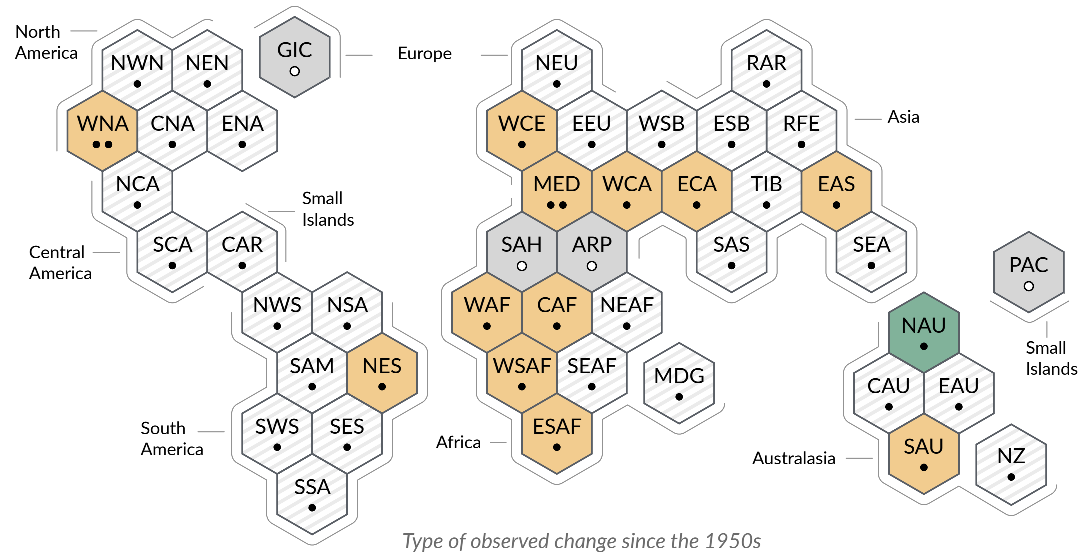
c) Synthesis of assessment of observed change in **agricultural and ecological drought** and confidence in human contribution to the observed changes in the world's regions

Type of observed change in agricultural and ecological drought

- Increase (12)
- Decrease (1)
- Low agreement in the type of change (28)
- Limited data and/or literature (4)

Confidence in human contribution to the observed change

- ●●● High
- ●● Medium
- ● Low due to limited agreement
- ○ Low due to limited evidence

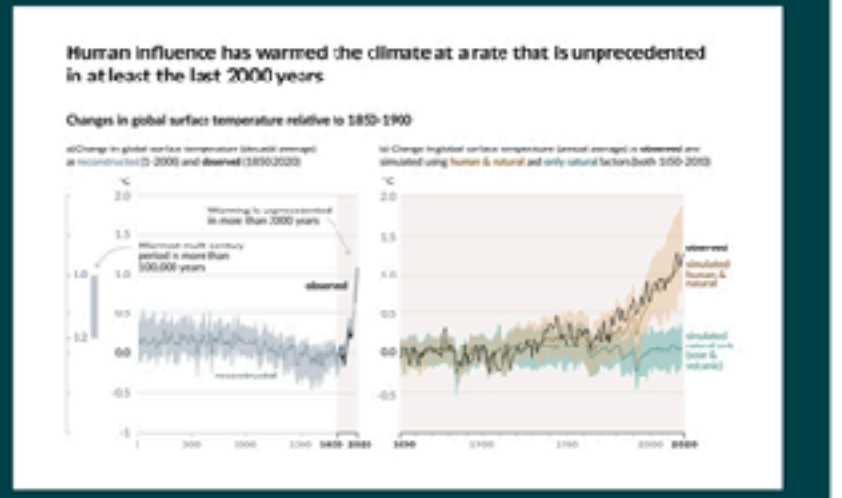


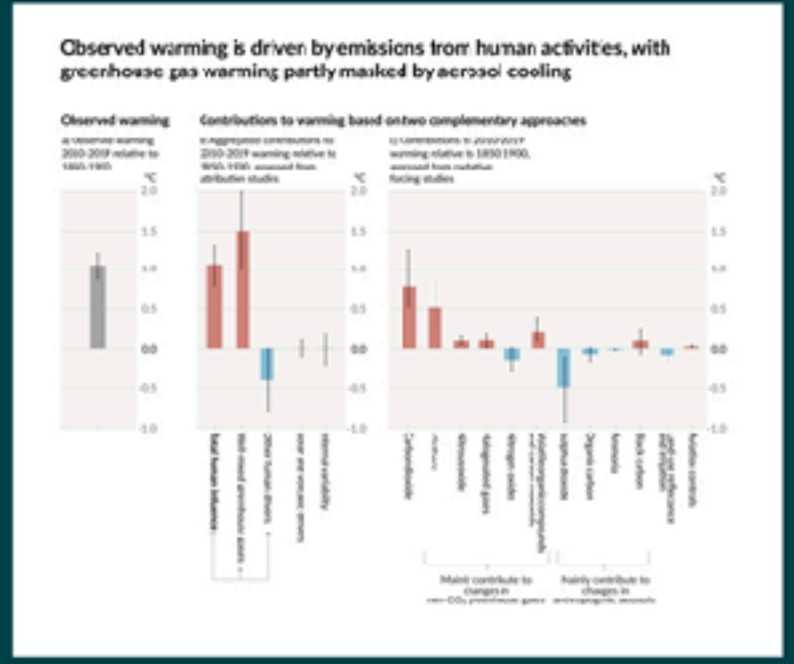
Type of observed change since the 1950s

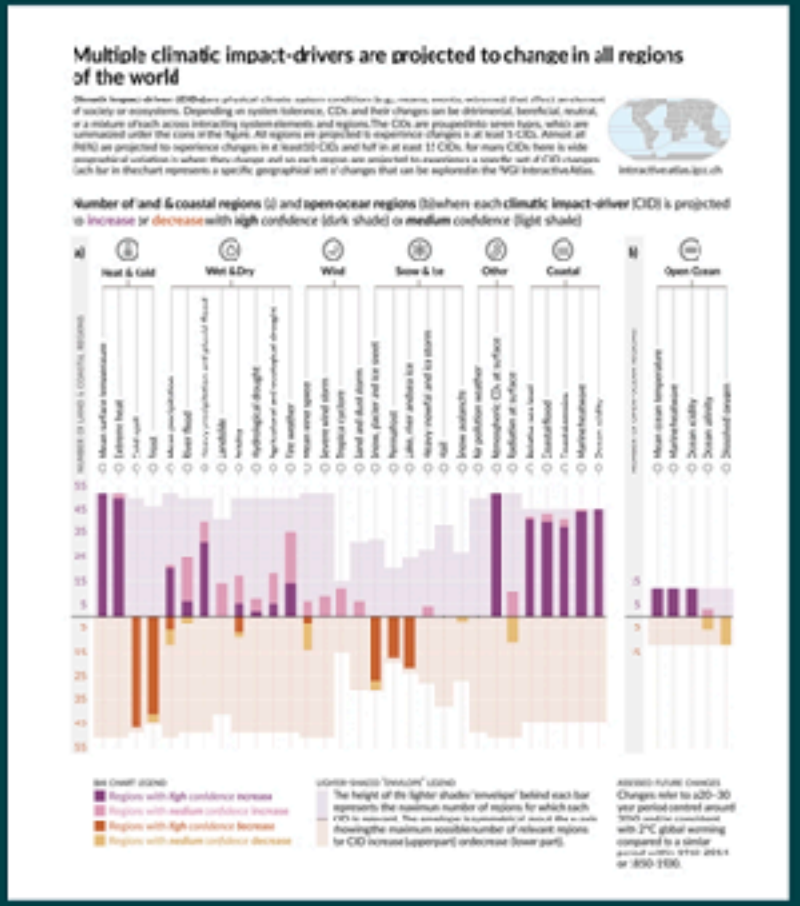
Each hexagon corresponds to one of the IPCC AR6 WGI reference regions

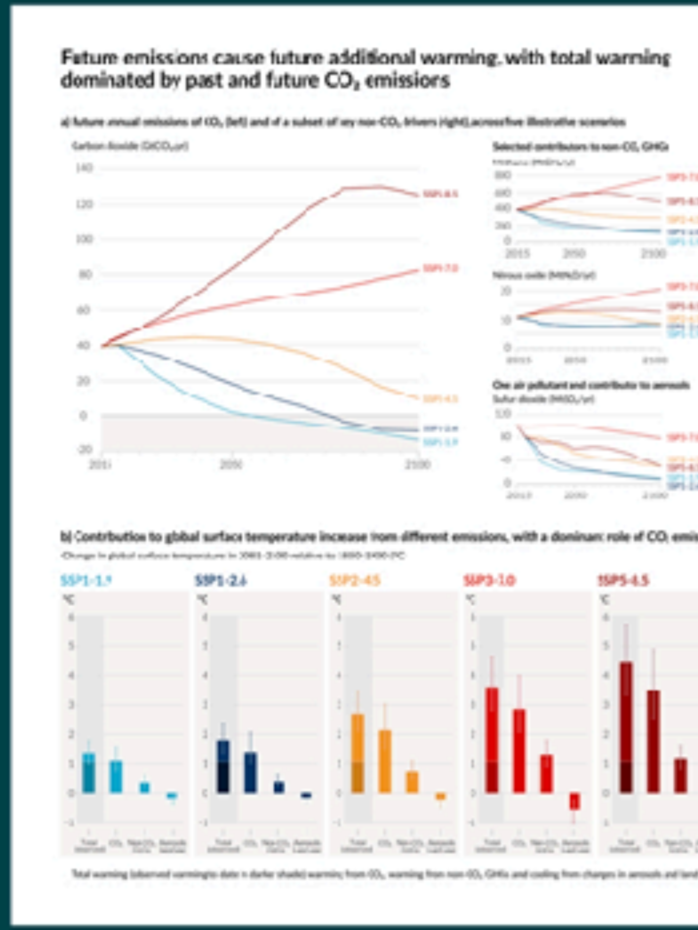
NWN *North-Western North America*

IPCC AR6 WGI reference regions: **North America: NWN** (North-Western North America, **NEN** (North-Eastern North America), **WNA** (Western North America), **CNA** (Central North America), **ENA** (Eastern North America), **Central America: NCA** (Northern Central America), **SCA** (Southern Central America), **CAR** (Caribbean), **South America: NWS** (North-Western South America), **NSA** (Northern South America), **NES** (North-Eastern South America), **SAM** (South American Monsoon), **SWS** (South-Western South America), **SES** (South-Eastern South America), **SSA** (Southern South America), **Europe: GIC** (Greenland/Iceland), **NEU** (Northern Europe), **WCE** (Western and Central Europe), **EEU** (Eastern Europe), **MED** (Mediterranean), **Africa: MED** (Mediterranean), **SAH** (Sahara), **WAF** (Western Africa), **CAF** (Central Africa), **NEAF** (North Eastern Africa), **SEAF** (South Eastern Africa), **WSAF** (West Southern Africa), **ESAF** (East Southern Africa), **MDG** (Madagascar), **Asia: RAR** (Russian Arctic), **WSB** (West Siberia), **ESB** (East Siberia), **RFE** (Russian Far East), **WCA** (West Central Asia), **ECA** (East Central Asia), **TIB** (Tibetan Plateau), **EAS** (East Asia), **ARP** (Arabian Peninsula), **SAS** (South Asia), **SEA** (South East Asia), **Australasia: NAU** (Northern Australia), **CAU** (Central Australia), **EAU** (Eastern Australia), **SAU** (Southern Australia), **NZ** (New Zealand), **Small Islands: CAR** (Caribbean), **PAC** (Pacific Small Islands)

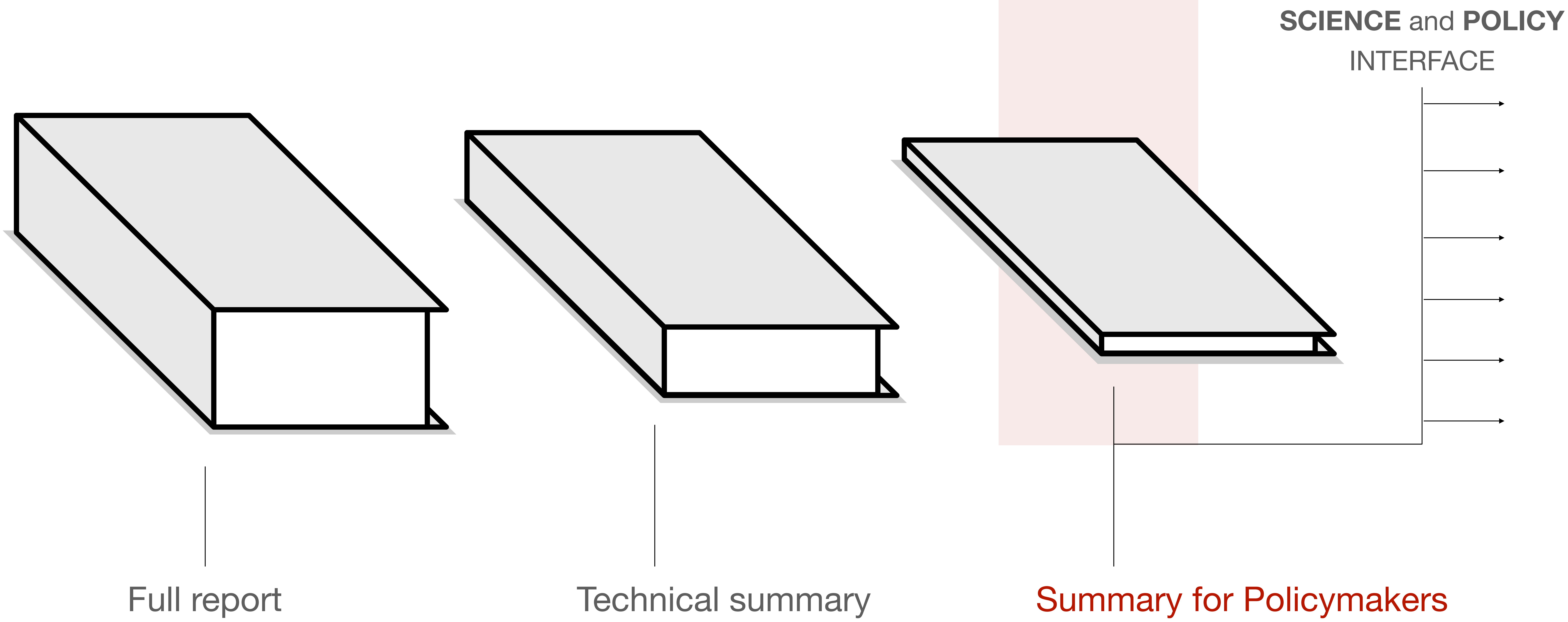


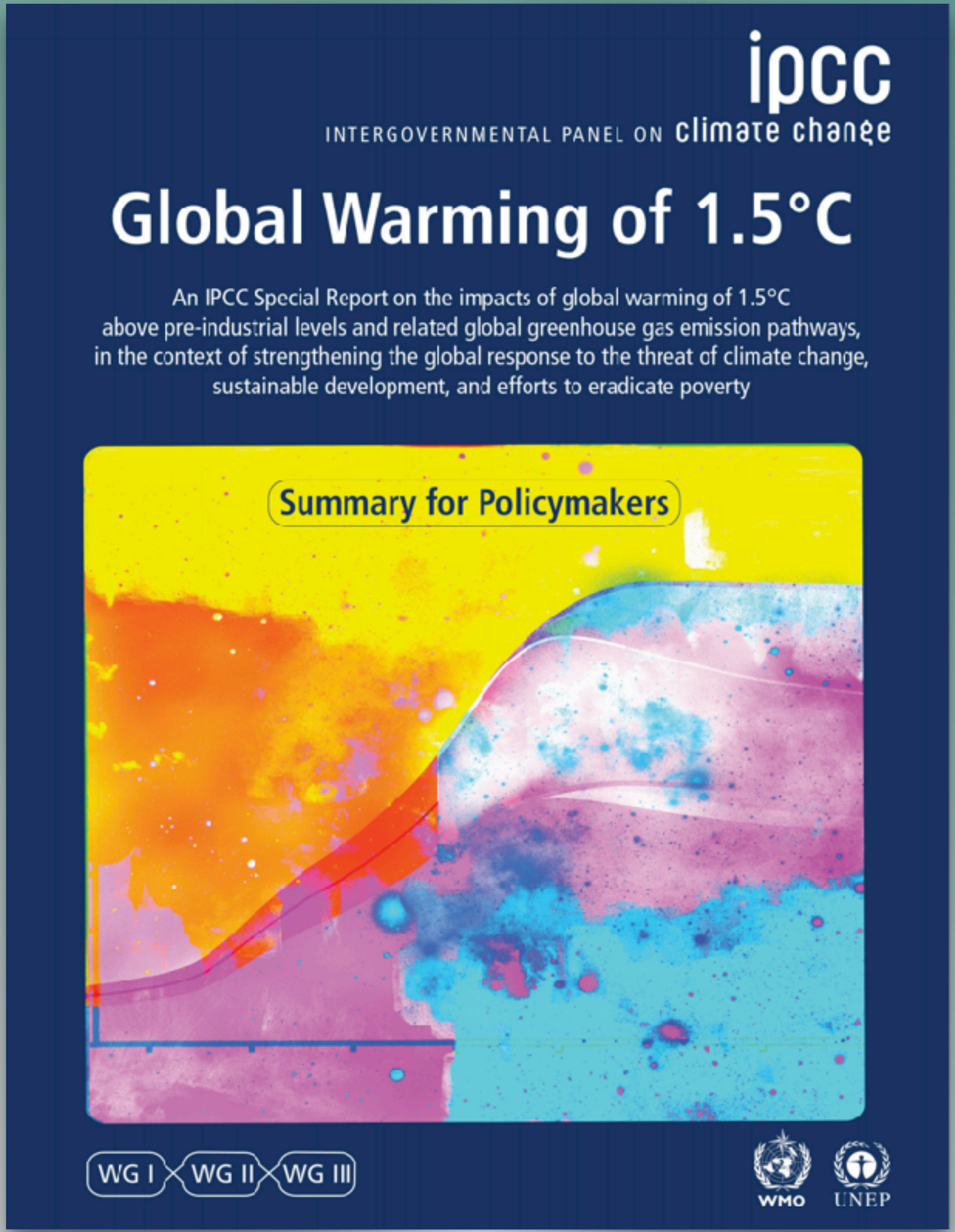






IPCC Special Reports consist of:

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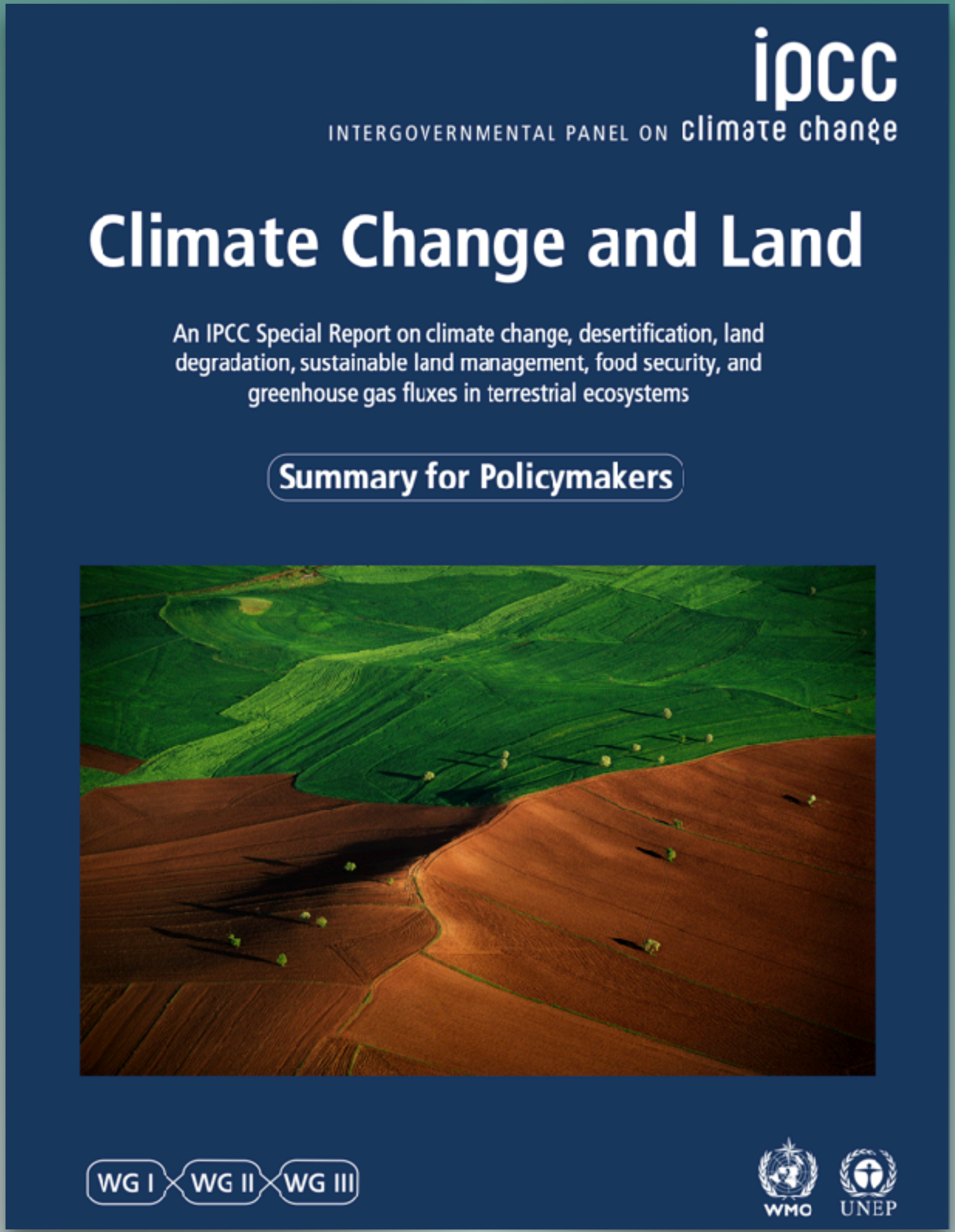
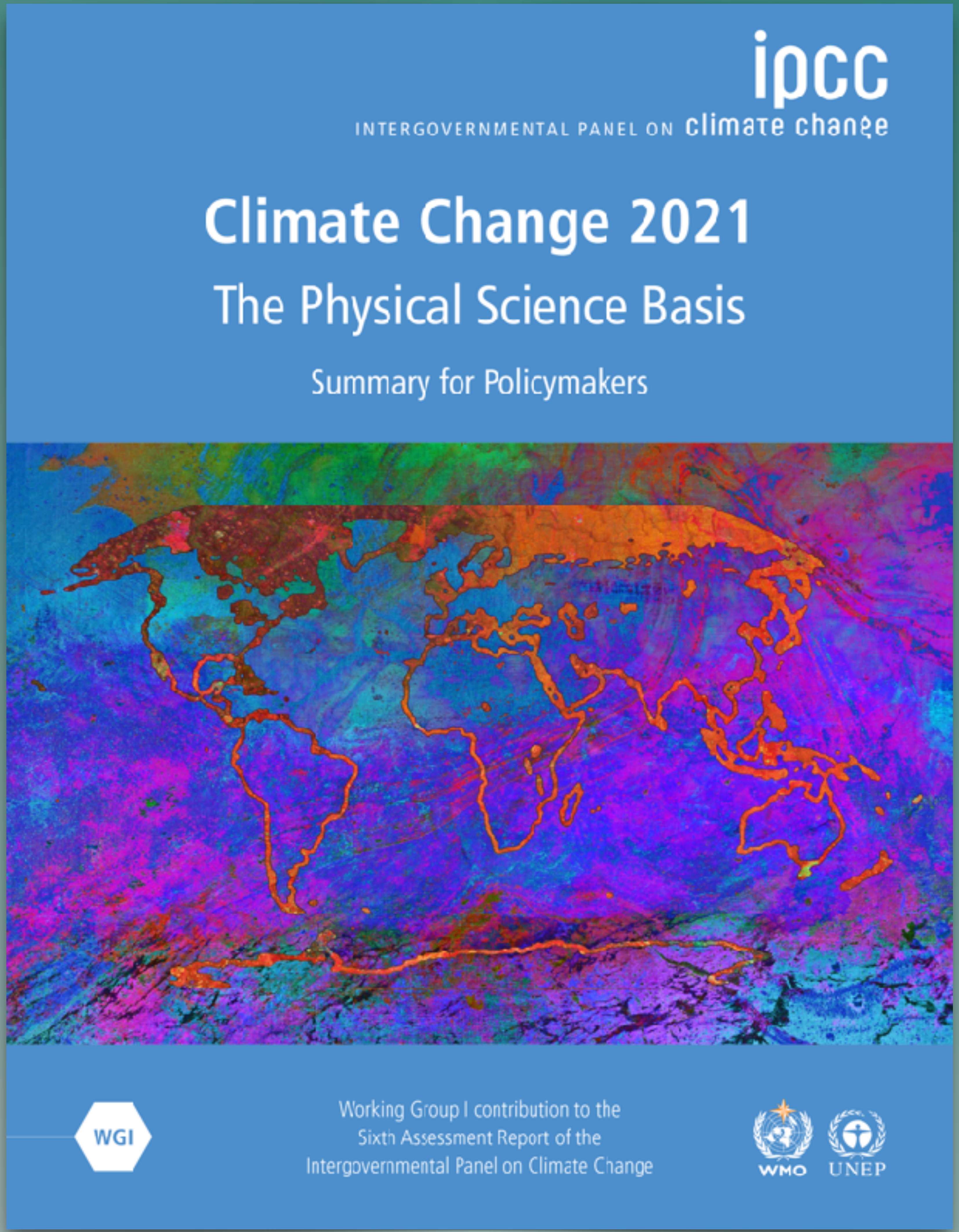
INTERGOVERNMENTAL PANEL ON climate change
Global Warming of 1.5°C
An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty
Summary for Policymakers
WG I WG II WG III
WMO
UNEP


ipcc
INTERGOVERNMENTAL PANEL ON climate change
Climate Change and Land
An IPCC Special Report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems
Summary for Policymakers
WG I WG II WG III
WMO
UNEP


ipcc
INTERGOVERNMENTAL PANEL ON climate change
Climate Change 2021
The Physical Science Basis
Summary for Policymakers
WGI
Working Group I contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change
WMO
UNEP

Anna Pirani
Head of IPCC Technical Support Unit Working Group 1

Lead Author Meeting

Draft submitted and compiled

Review

Review Comments to CLAs


First Lead Author Meeting
INTERNAL DRAFT
Internal Draft submitted and compiled
Internal Review
Review comments to CLAs and team
Second Lead Author Meeting
FIRST DRAFT
First Order Draft submitted and compiled
Expert Review of First Order Draft
Review comments to CLAs and team
Third Lead Author Meeting
SECOND DRAFT
Second Order Draft submitted and compiled
Expert and Government Review of Second Order Draft
Review comments to CLAs and team
Fourth Lead Author Meeting
FINAL DRAFT
Final Order Draft submitted and compiled
Final Government Distribution of Final Order Draft
Review comments to CLAs and team
Pre-approval
Session of IPCC: Approval word by word of SPM

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Mr Hoesung Lee
Chair of the IPCC
Forty-Eighth Session of the IPCC and
First Joint Session of Working Groups I, II and III
ipcc
INTERGOVERNMENTAL PANEL ON
climate change


Saint Kitts and N

SPM Special Report on Climate Change and Land
50th Session of IPCC
August, Geneva, Switzerland 2019

SPM Special Report on Global Warming 1.5 °C
48th Session of IPCC
October, Incheon, South Korea 2018

Designing the co-design process.

02

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Leadership

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User engagement.

03

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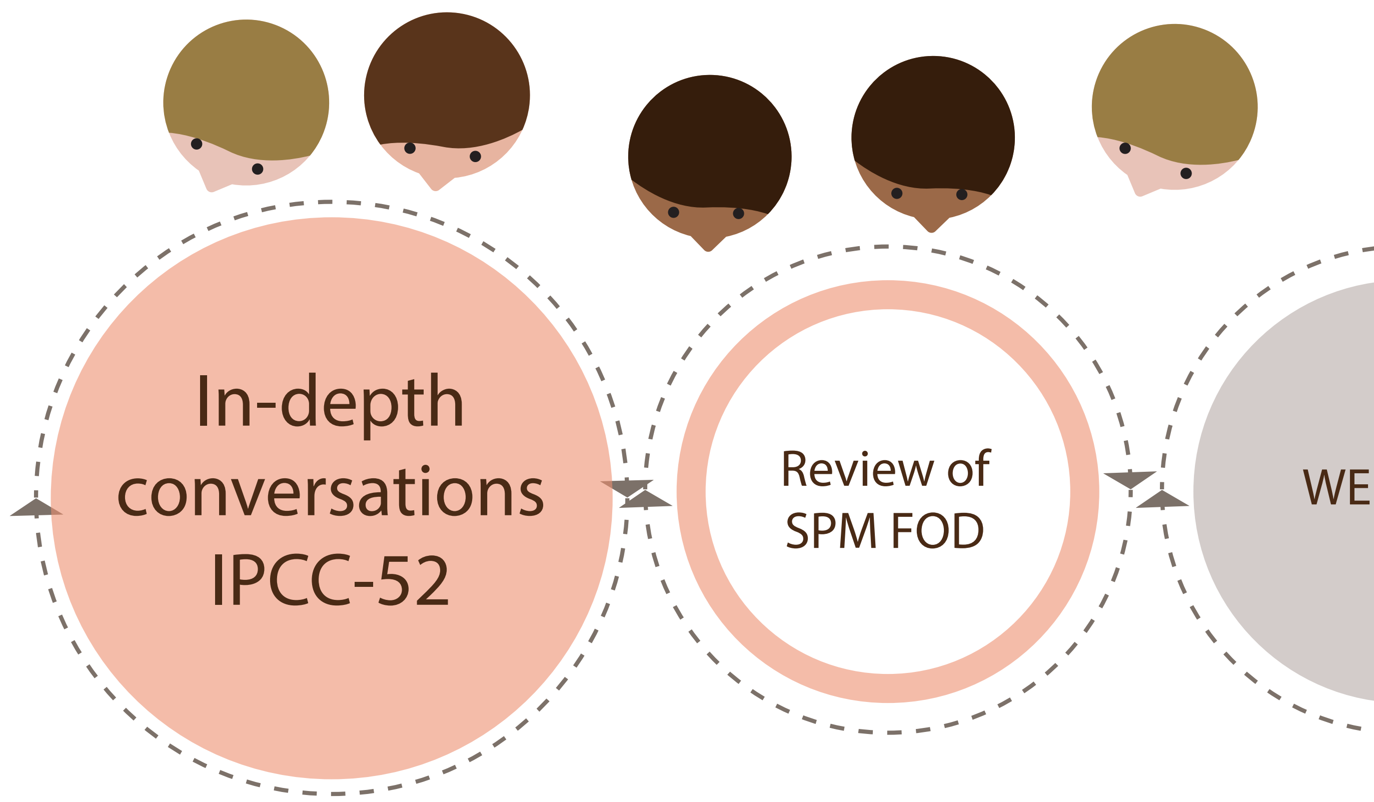
“It is exceptionally hard to inspire change in someone when you don't know anything about them.”

OLIVIA VAGELOS | IDEO

In-depth conversations

WEB



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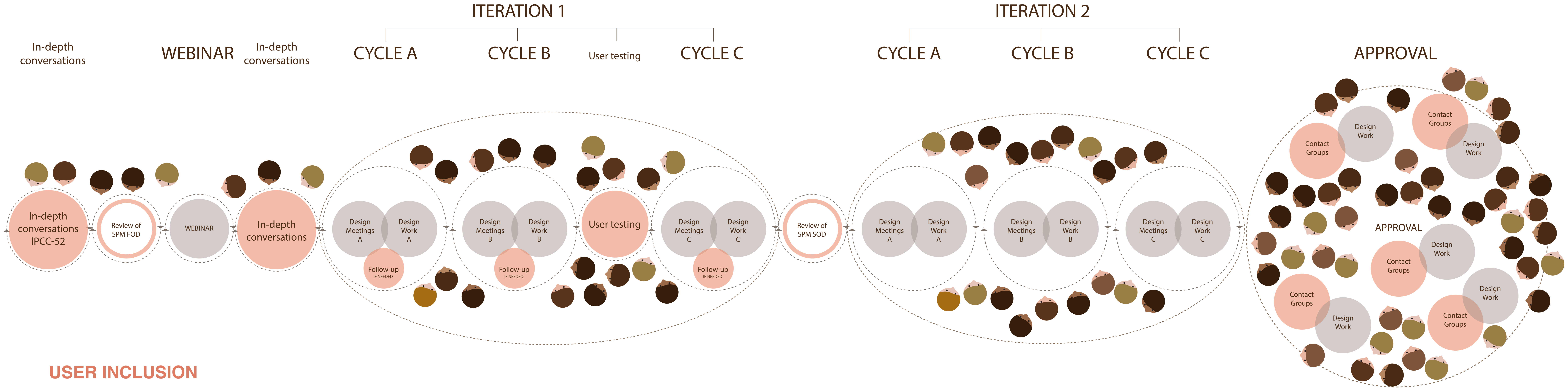

USER INCLUSION

1. In-depth conversations to check the needs of the expressed target group

2. Follow-up conversations for quick reality checks during the design iterations (if needed)

3. User testing to measure if the co-designed SPM figures fulfil the intent

4. Review comments on the SPM figures

5. Contact groups during approval

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User-testing session of draft figures for policy-makers
Performed with the Tyndall team

The tools to support the process.

04

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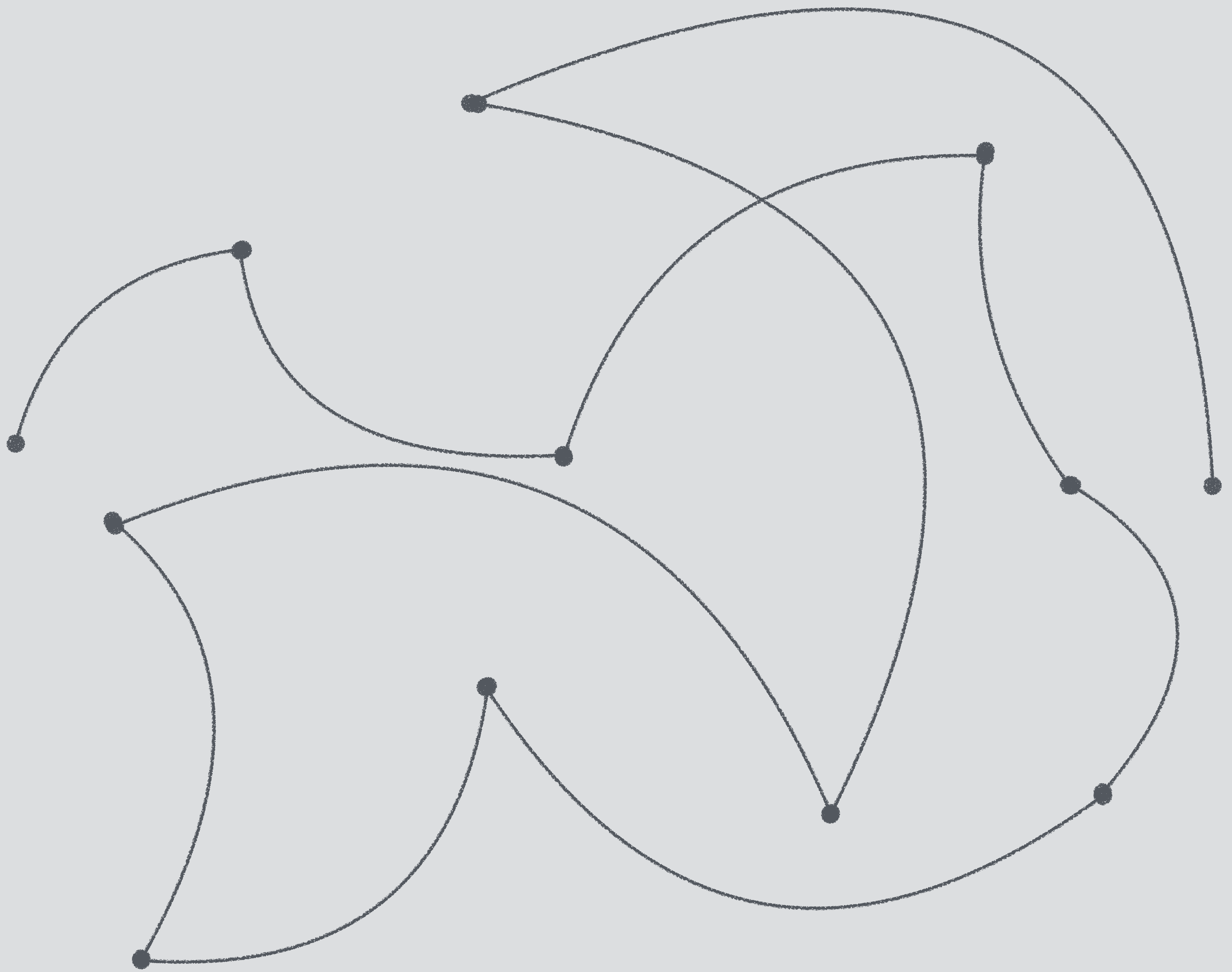

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INFORMATION VISUALIZATION

THE INTENT

of a data visualization

INFODESIGNLAB.COM

INFORMATION VISUALIZATION

THE VISUAL

narrative

INFODESIGNLAB.COM

The intent

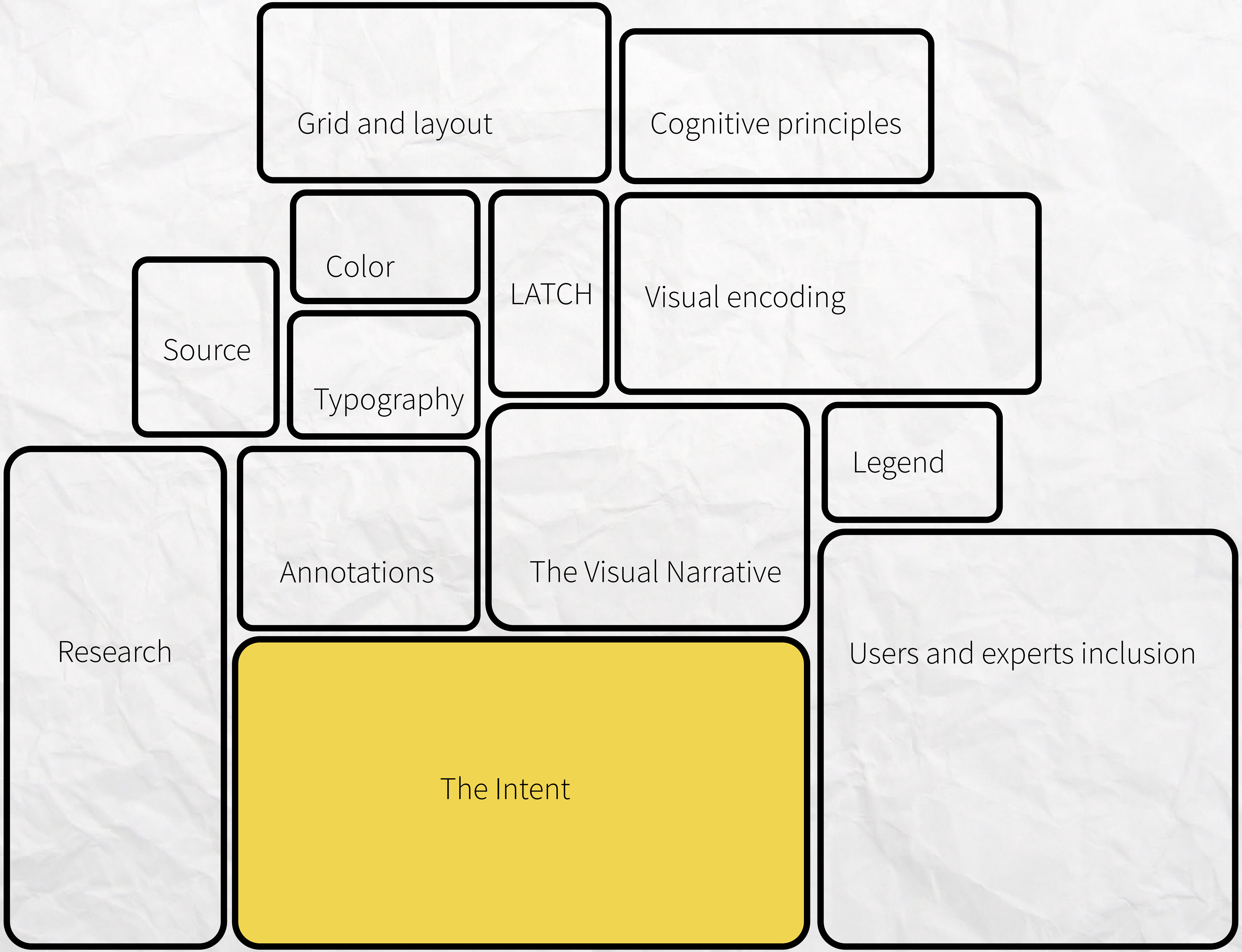
The **goal** that the visualization aims to achieve.

The intent

The **goal** that the visualization aims to achieve.

Ask yourself: Why am I **creating** this chart? What is the **one thing** I want people to remember? What do I want people to do with that information?

You should always be able to write a good **headline** that describes in one short sentence what you want people to remember, the pattern you want to convey.



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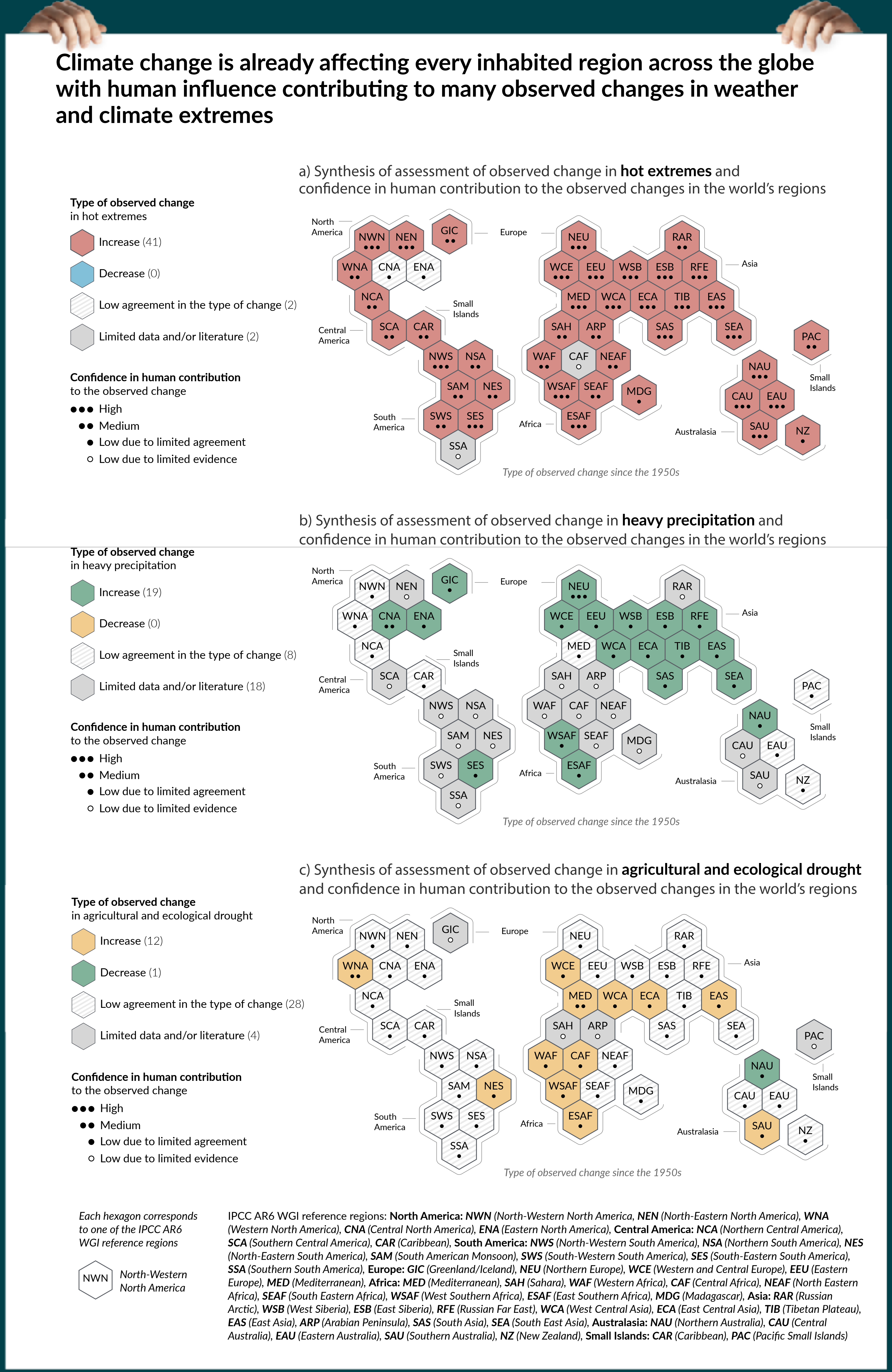
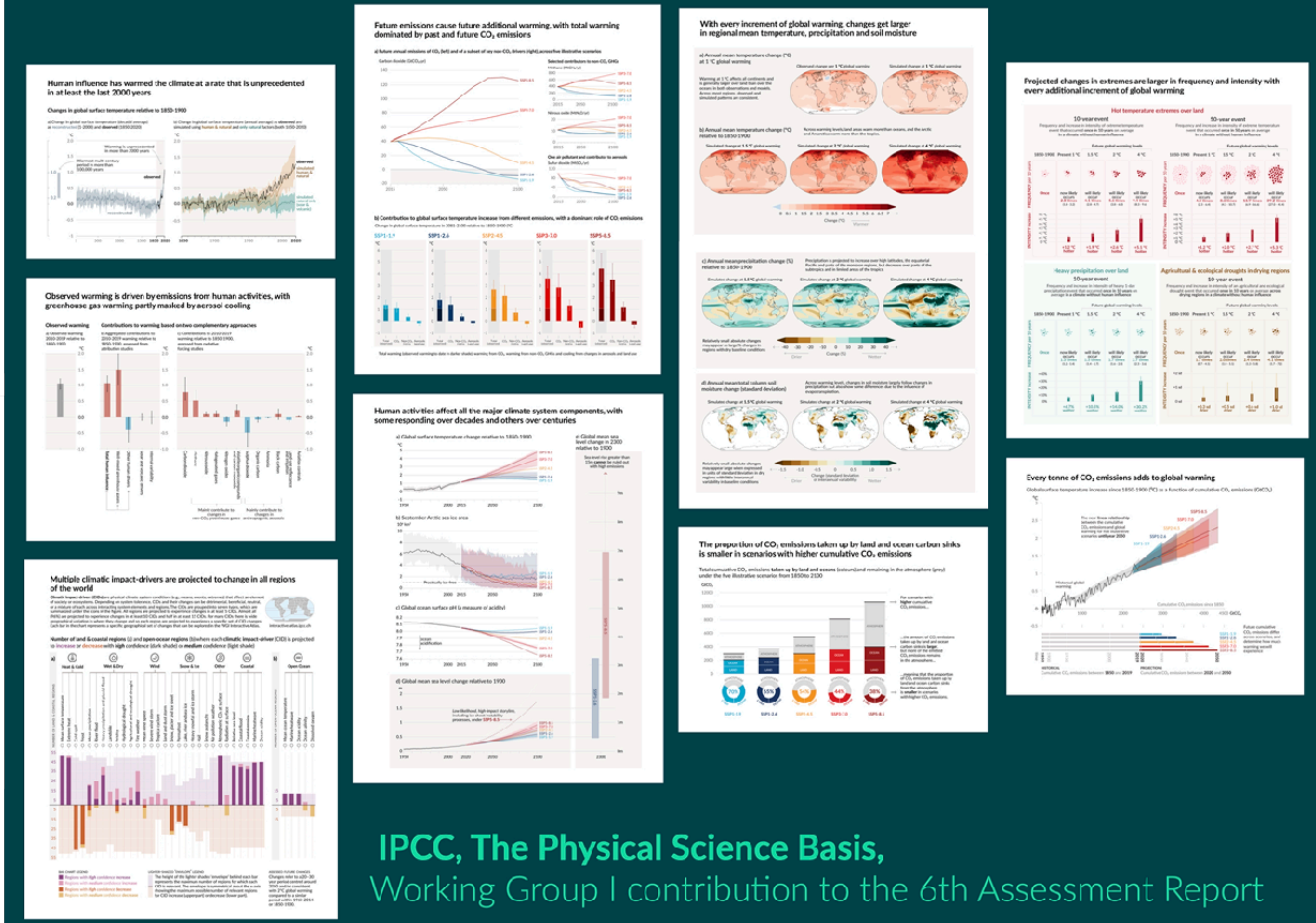




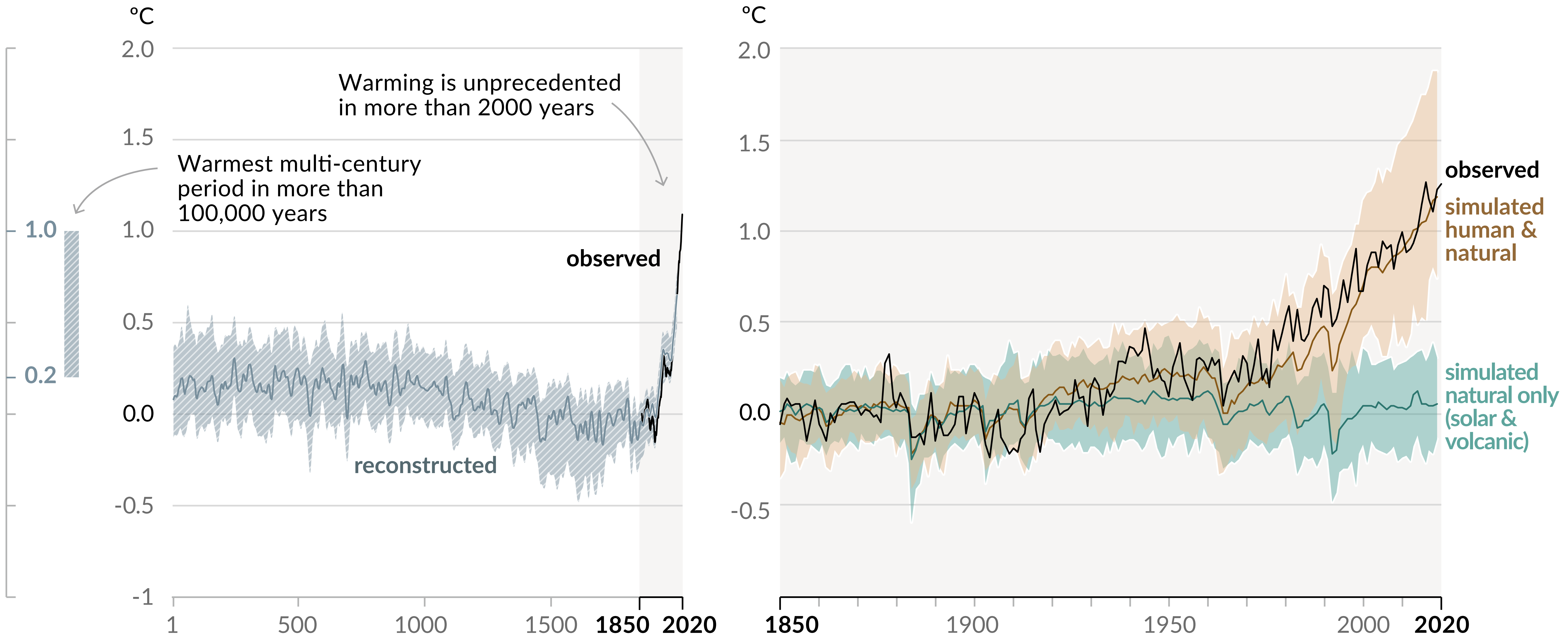
IPCC, The Physical Science Basis,
Working Group I contribution to the 6th Assessment Report

Human influence has warmed the climate at a rate that is unprecedented in at least the last 2000 years

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)



Visual: SPM.1

Human influence has warmed the climate at a rate that is **unprecedented** in at least the last 2000 years

SOURCE: The Physical Science Basis, IPCC
Working Group I contribution to the 6th Assessment Report

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GIGAMAP / VERSION 8
Evolution of figures
NOVEMBER-2020

the intents' family tree

DESIGN MEETINGS 1A.1
6 Section meetings
Section A
Section B
Box SPM.2 Fig 1
Section C
Section D
Box SPM.3 Fig 1

DESIGN MEETINGS 1A.2
4 Cluster meetings
Cluster 1: SPM.1, 2, 3, 4
Cluster 2: SPM.6, Box3 Fig
Cluster 3: SPM.7,Box2 Fig, SPM.10
Cluster 4: SPM.5, 8, 9

10 suggested intents

- INTENTS as a result of the cluster meetings

WRITESHOP

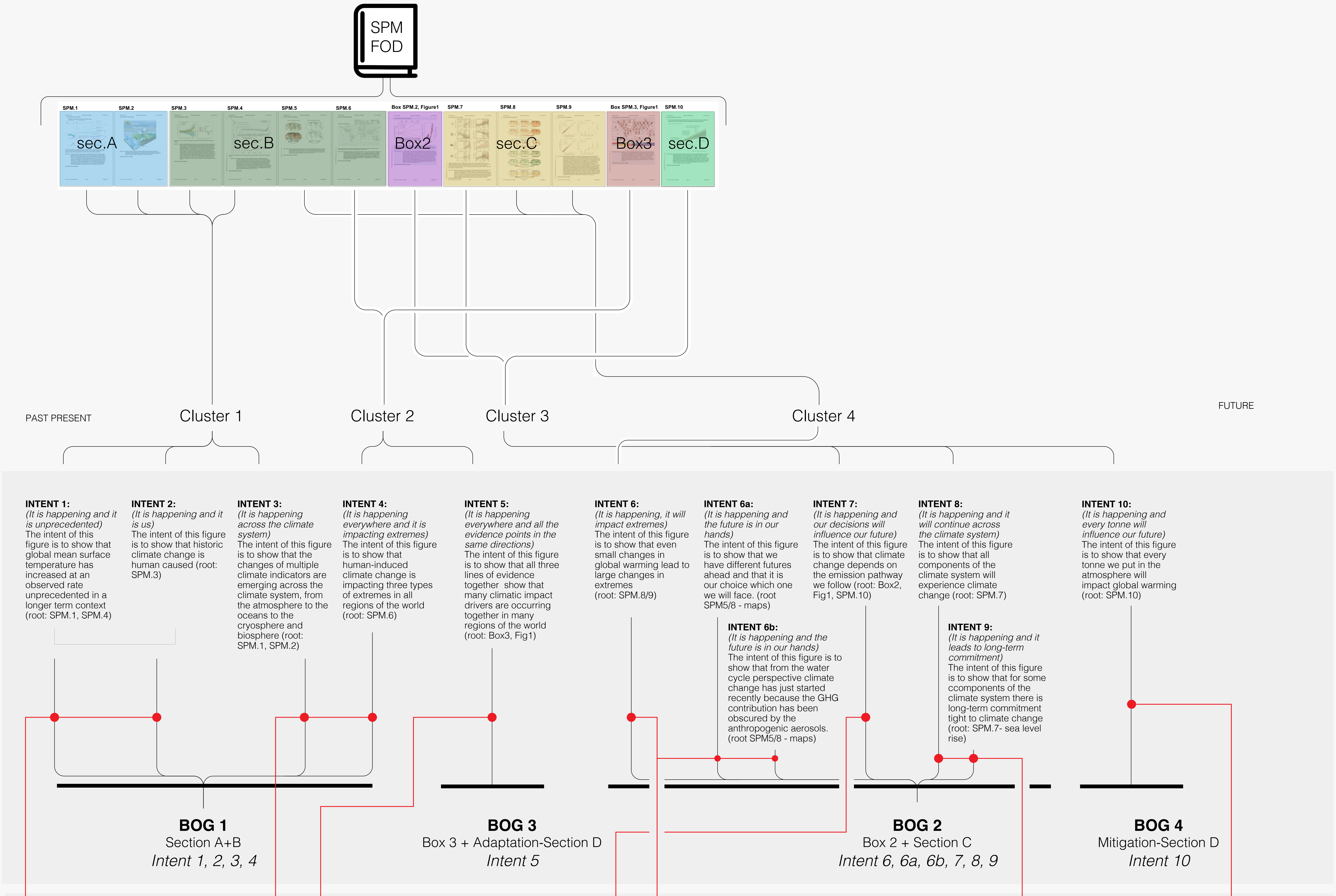
- **DAY 1:** revising SPM structure

The10 INTENTS discussed in the design-cluster meetings might have to be re-shuffled in line with the evolution of the SPM narrative

- **DAY 2:** how TS underpins SPM

- **DAY 3:** SPM narrative HS and visual intents

8 INTENTS



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SPM Special Report on Climate Change and Land
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August, Geneva, Switzerland 2019

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October, Incheon, South Korea 2018

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The visual narrative

It is **what** we show (and **how** it looks) in order to fulfil that intent.

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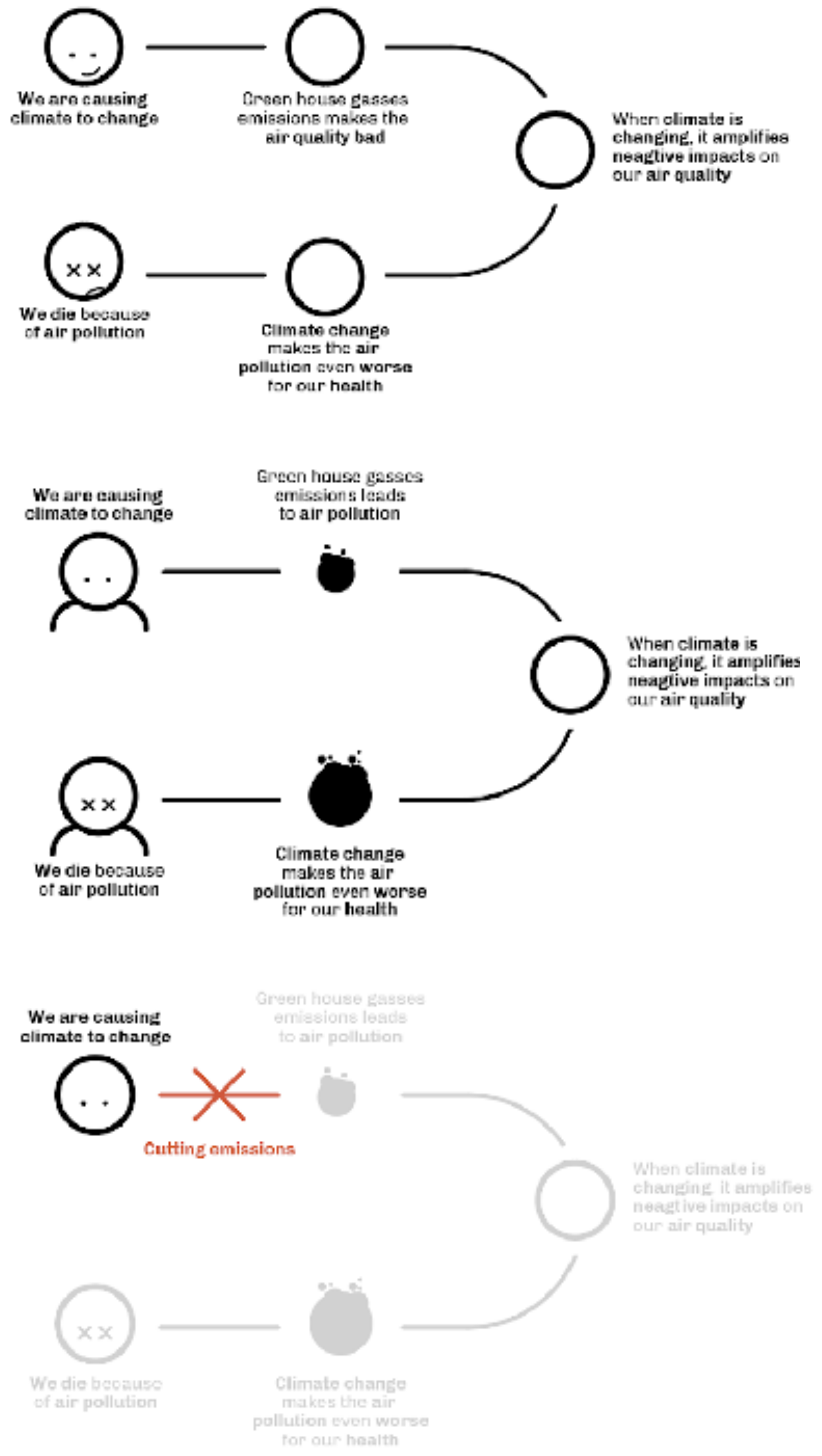
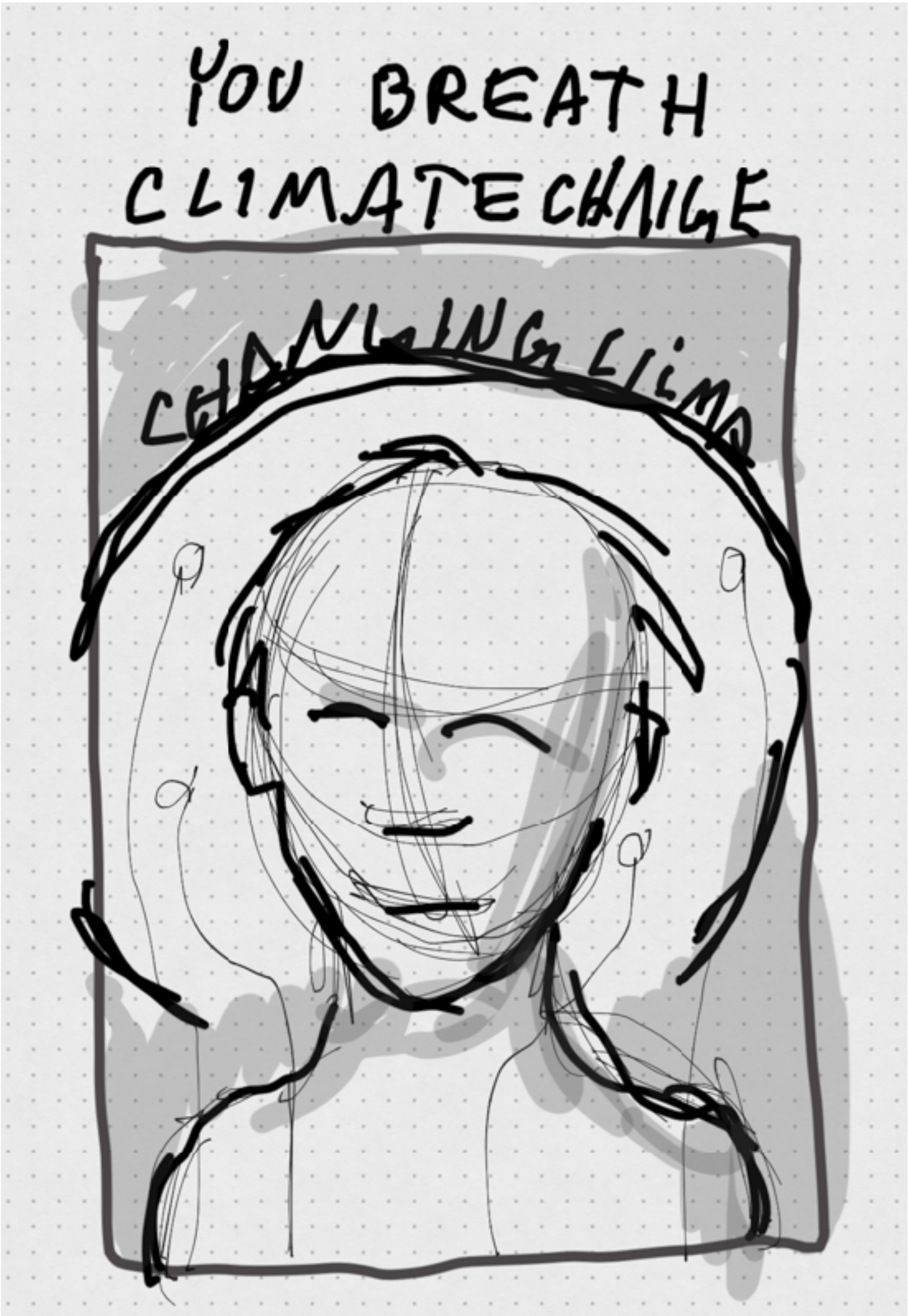
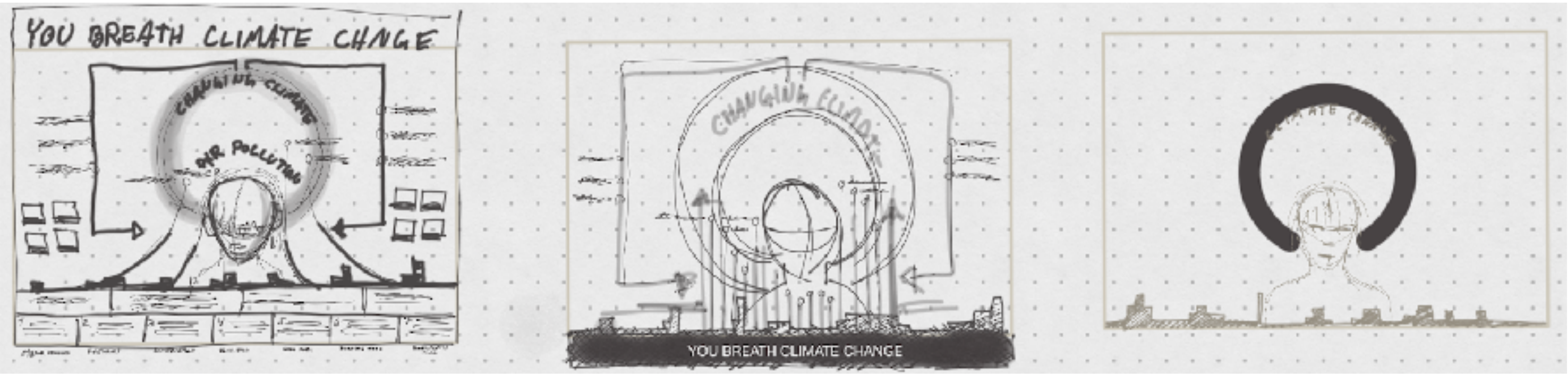
The visual narrative

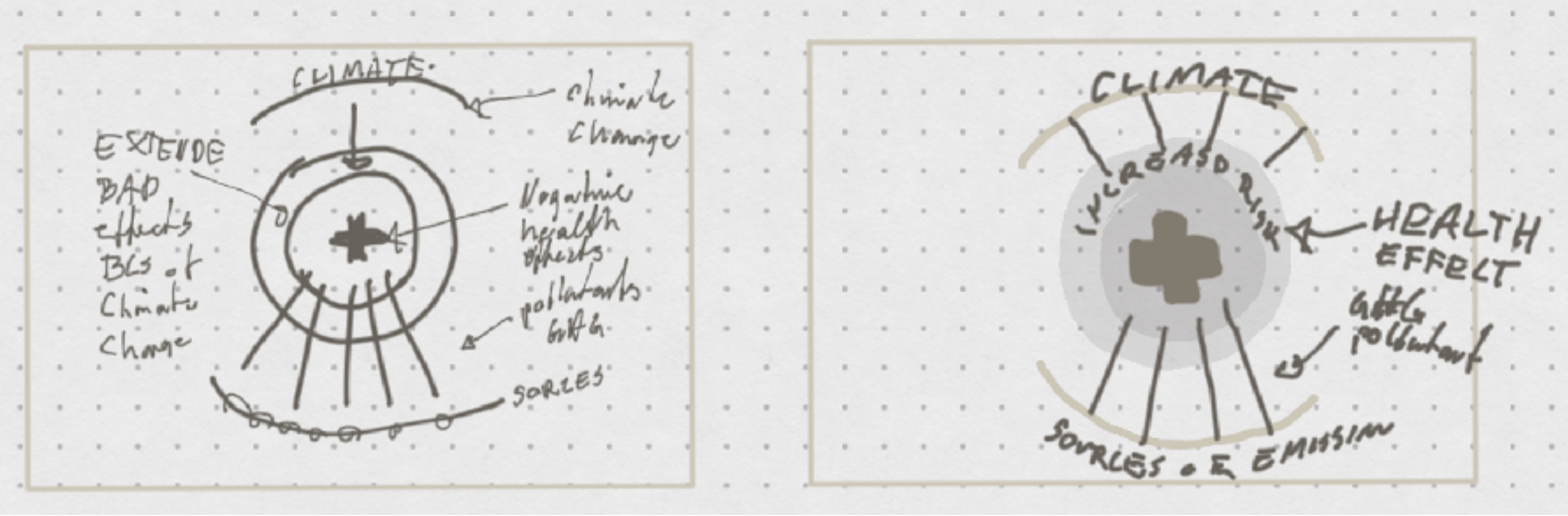
It is **what** we show (and **how** it looks) in order to fulfil that intent.

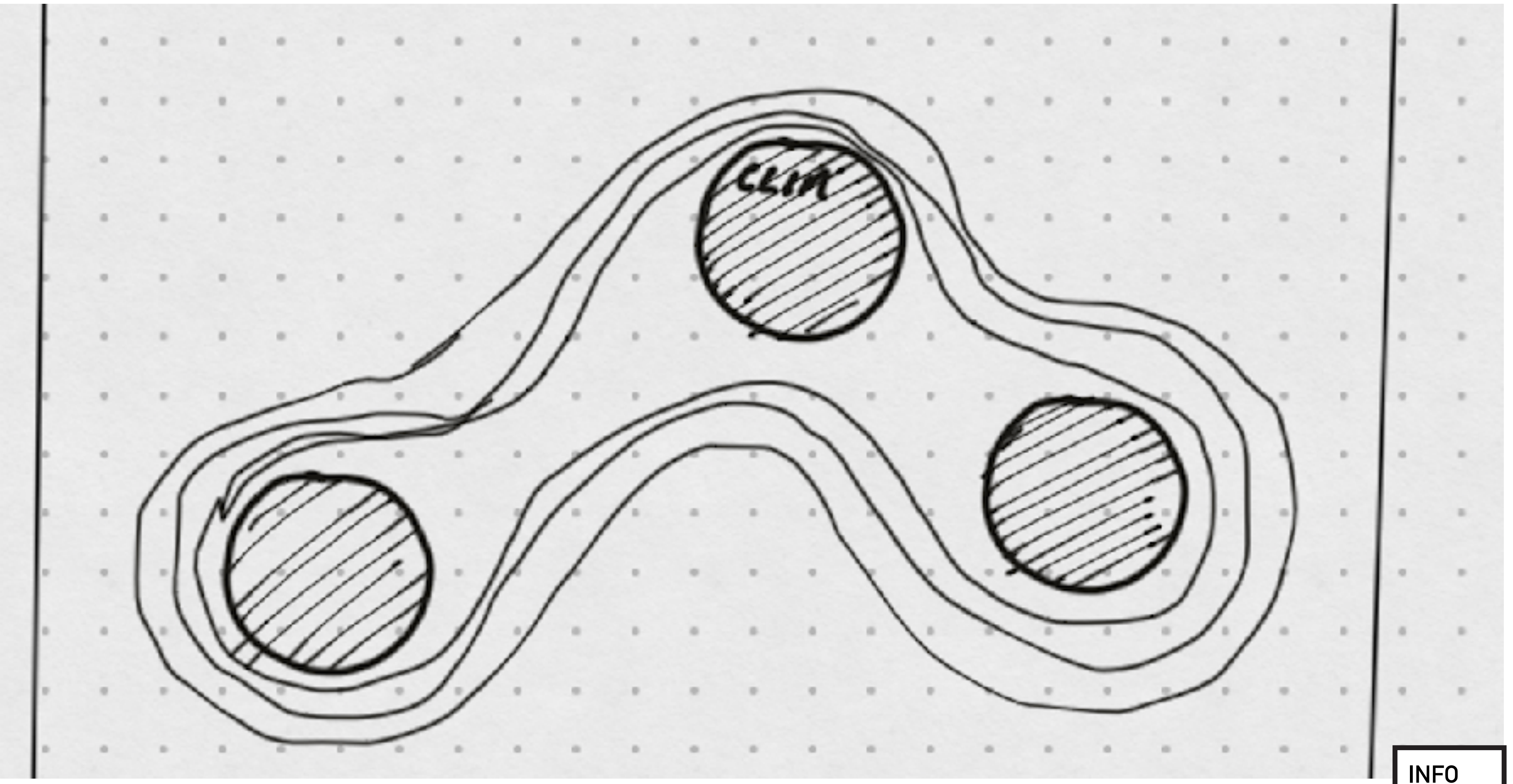
How do I keep the promise described in the **title**? What type of **chart** do I need? What data? What type of **organisation**? How do I use color, typography, space, annotations to fulfil the intent?











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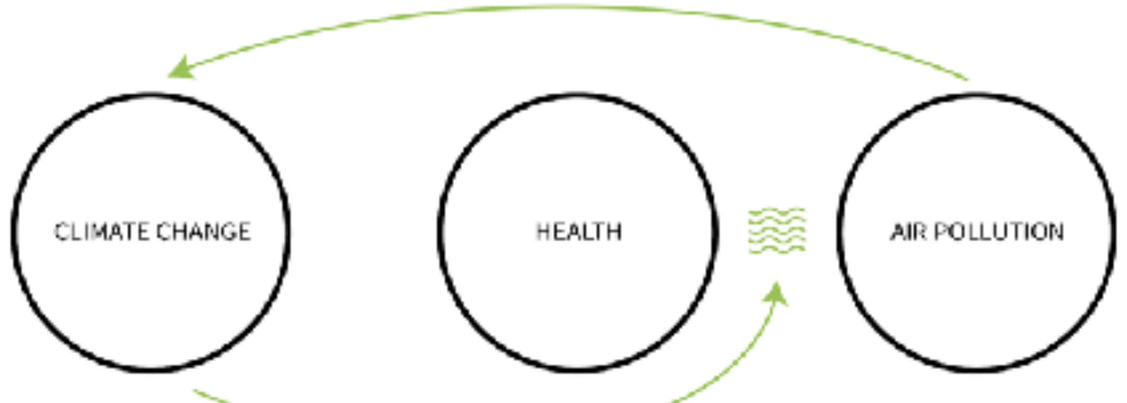
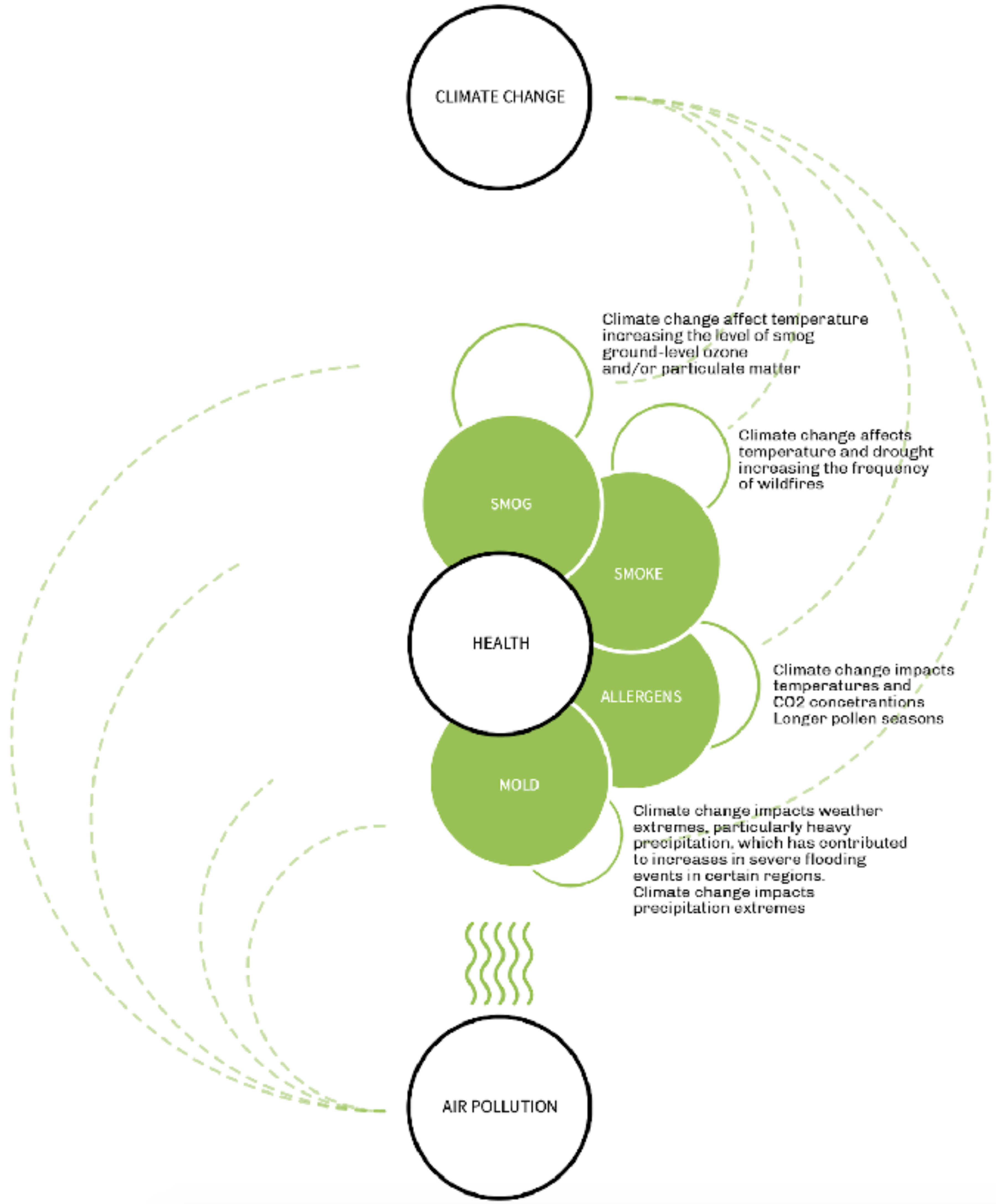
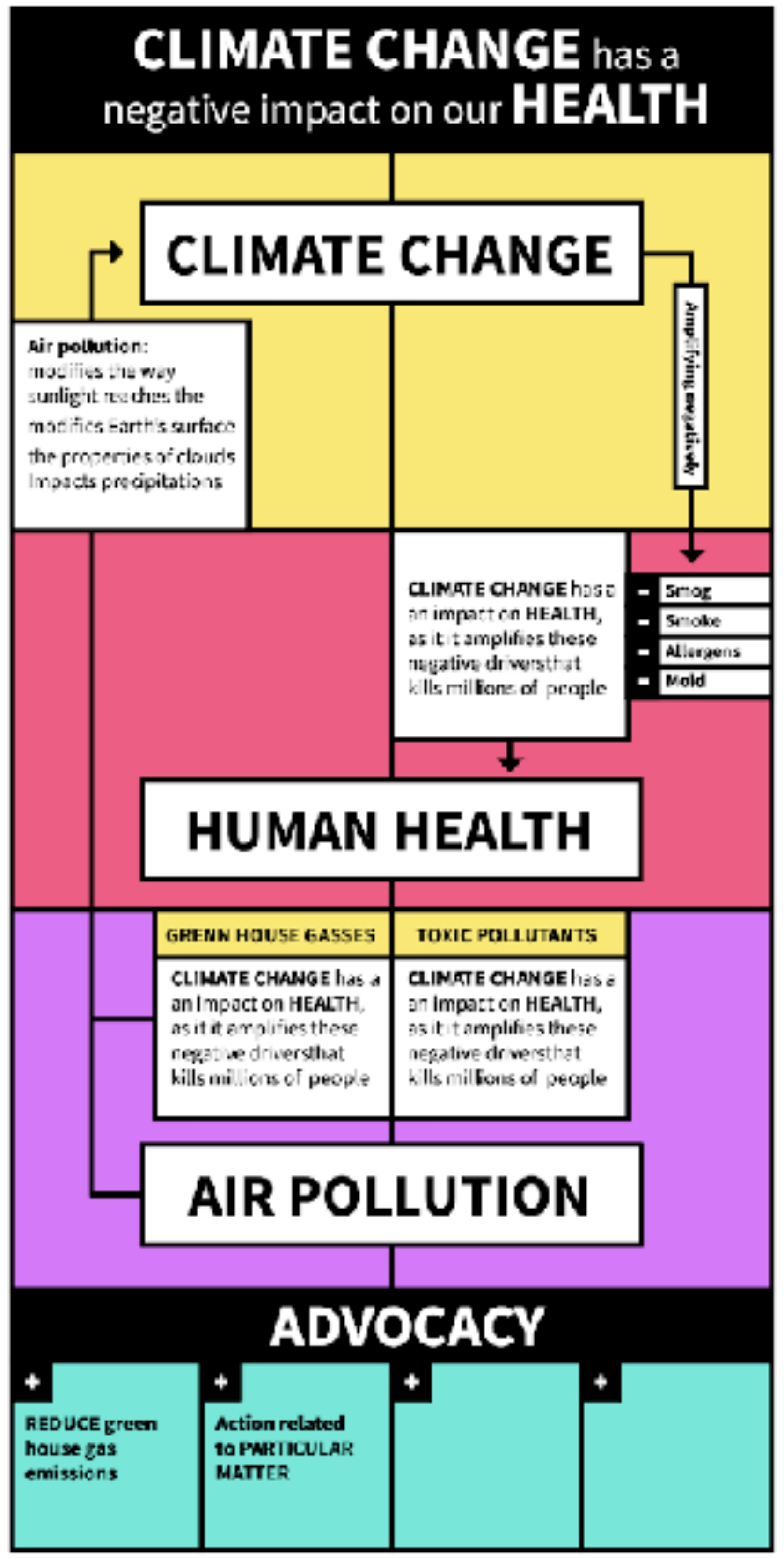
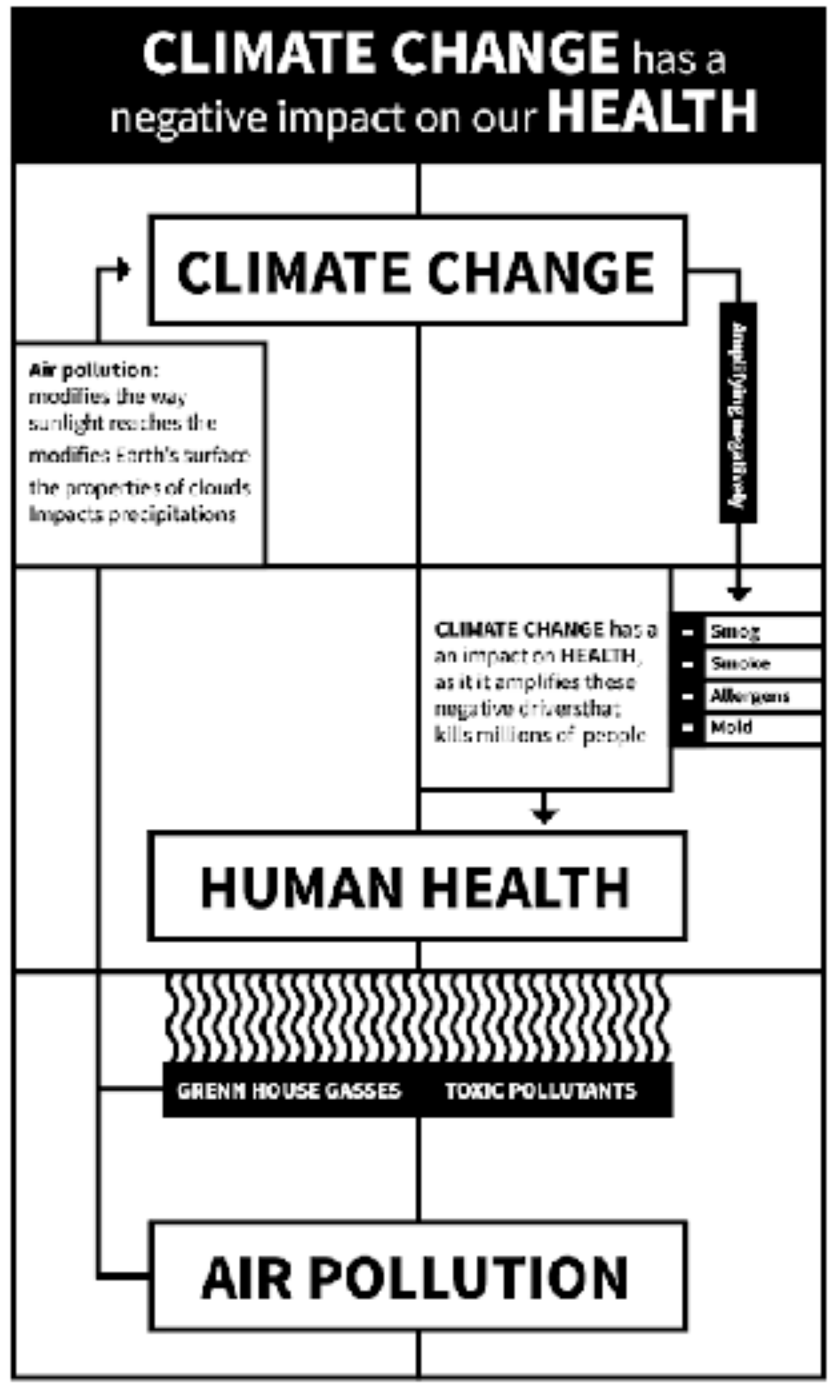
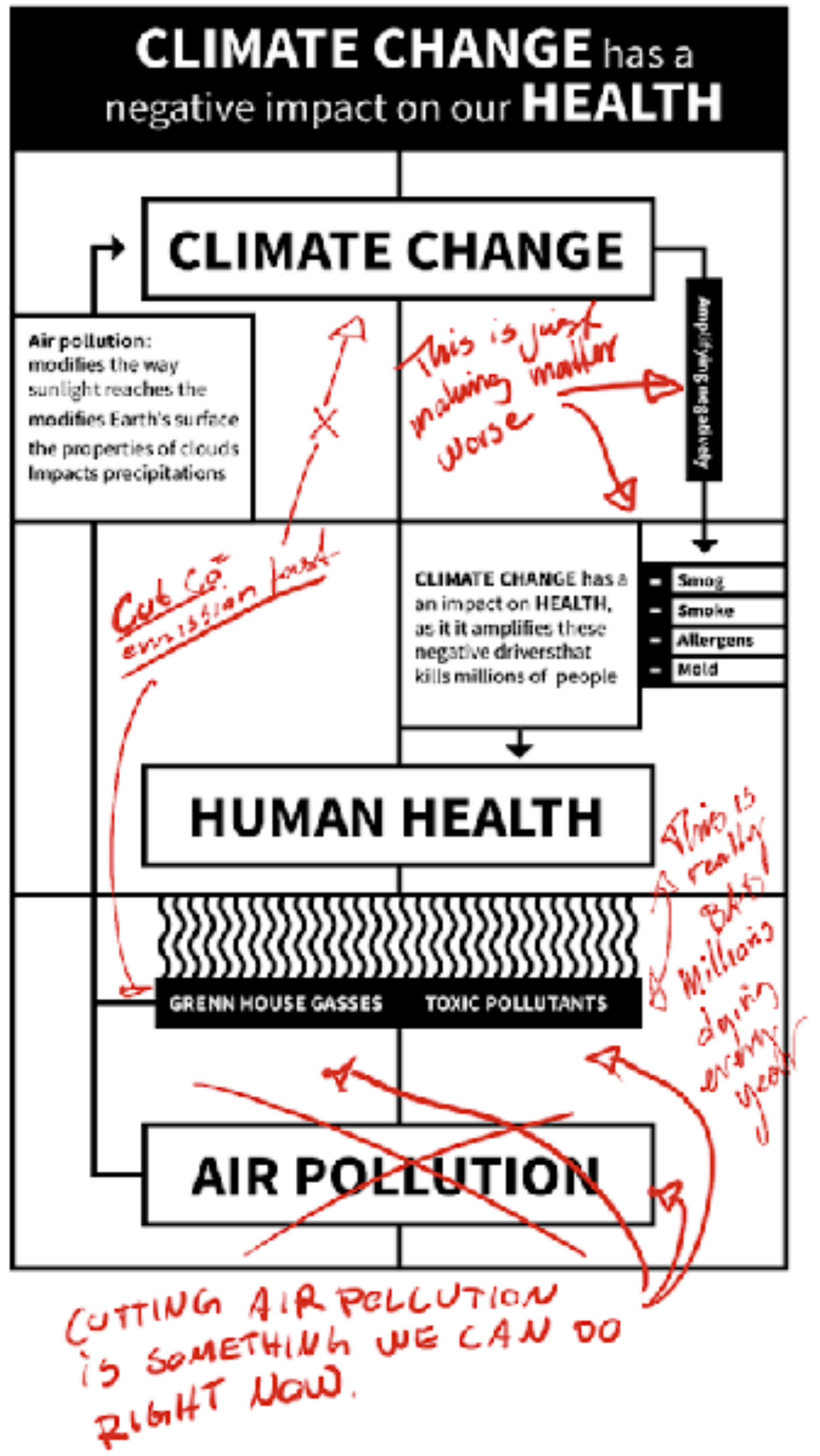


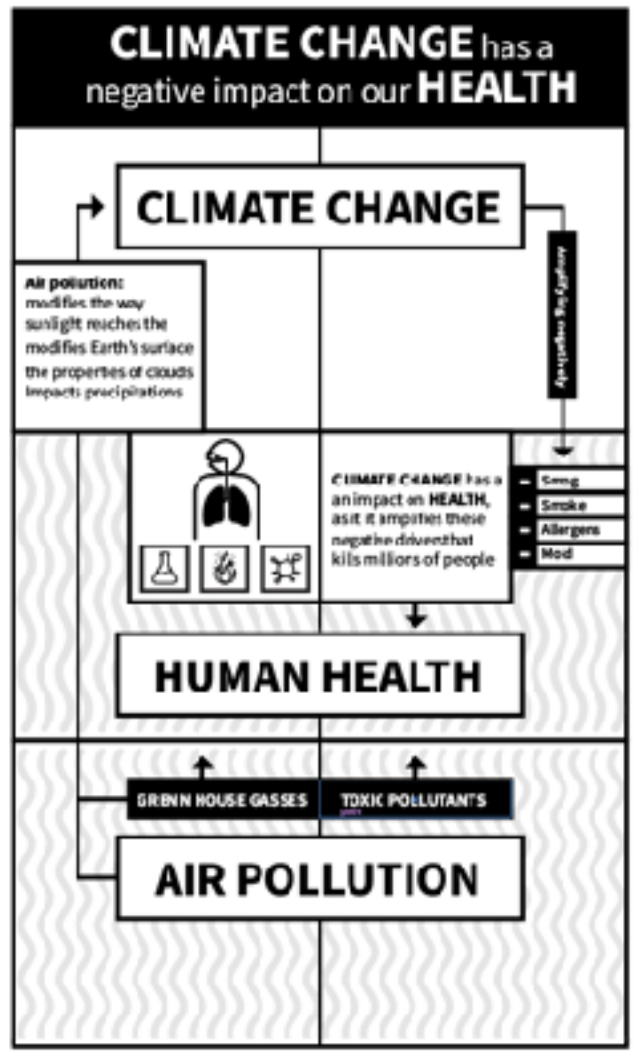
CLIMATE CHANGE is amplifying the bad effects AIR POLLUTION has on our HEALTH

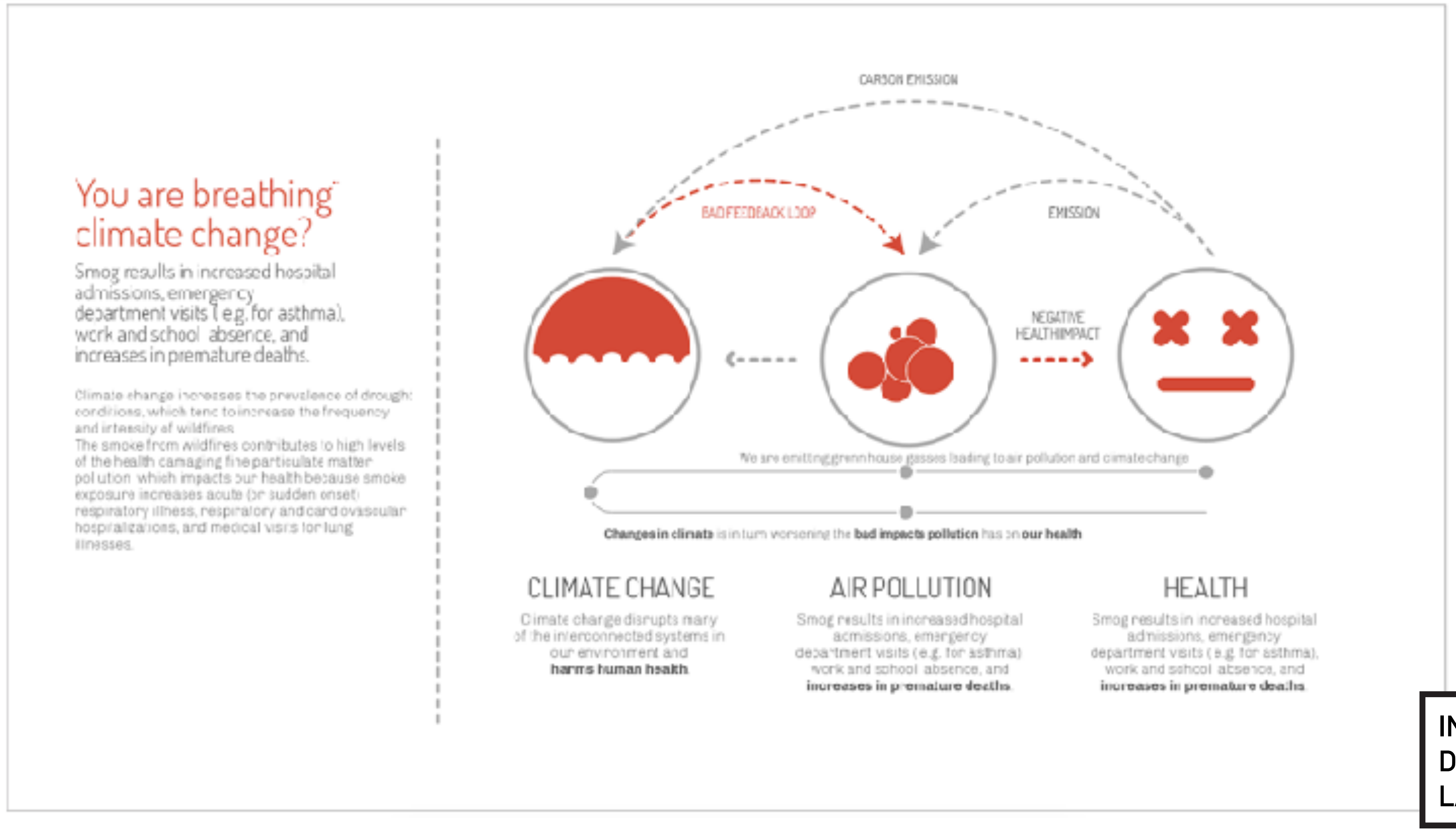












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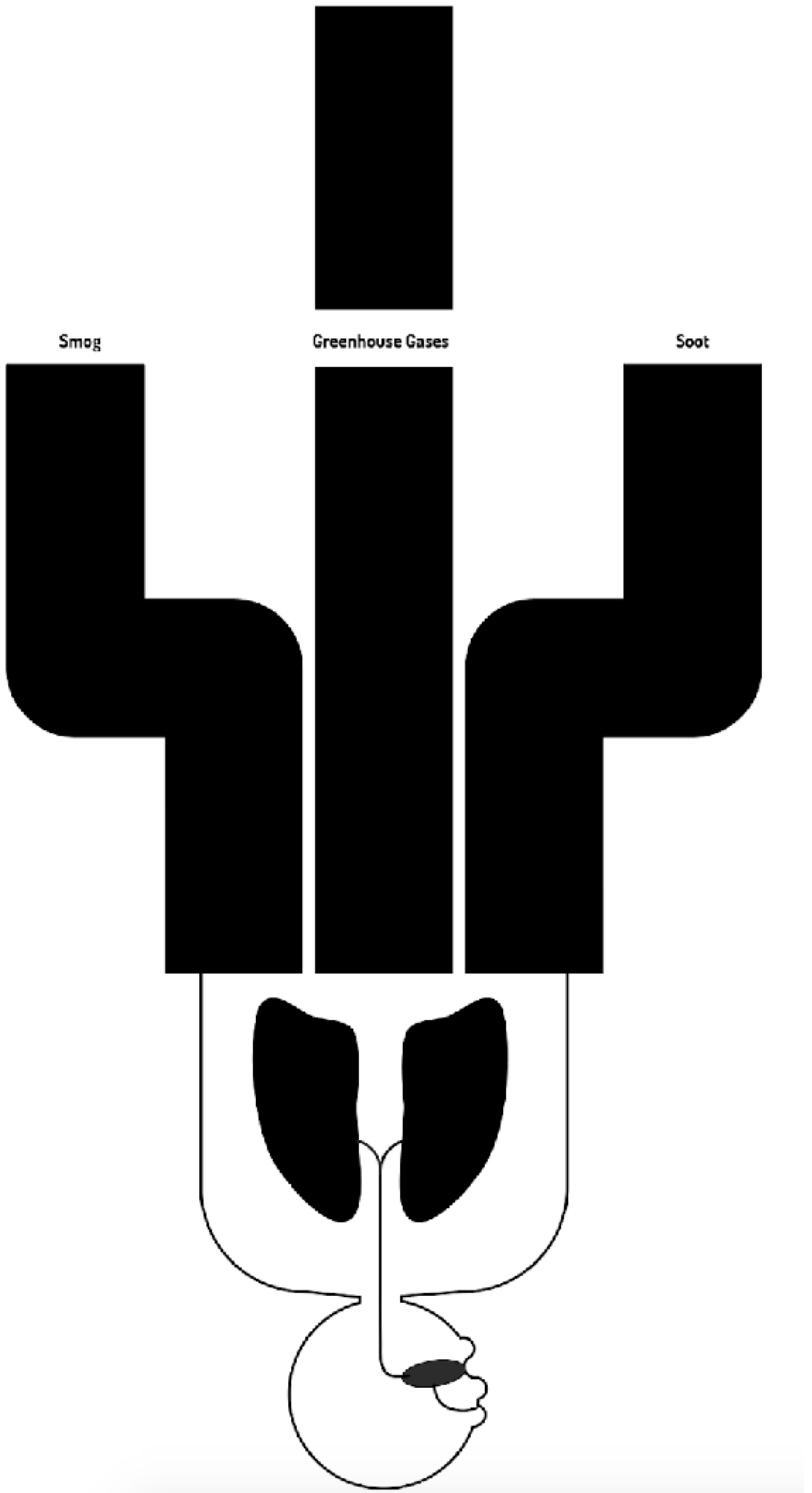

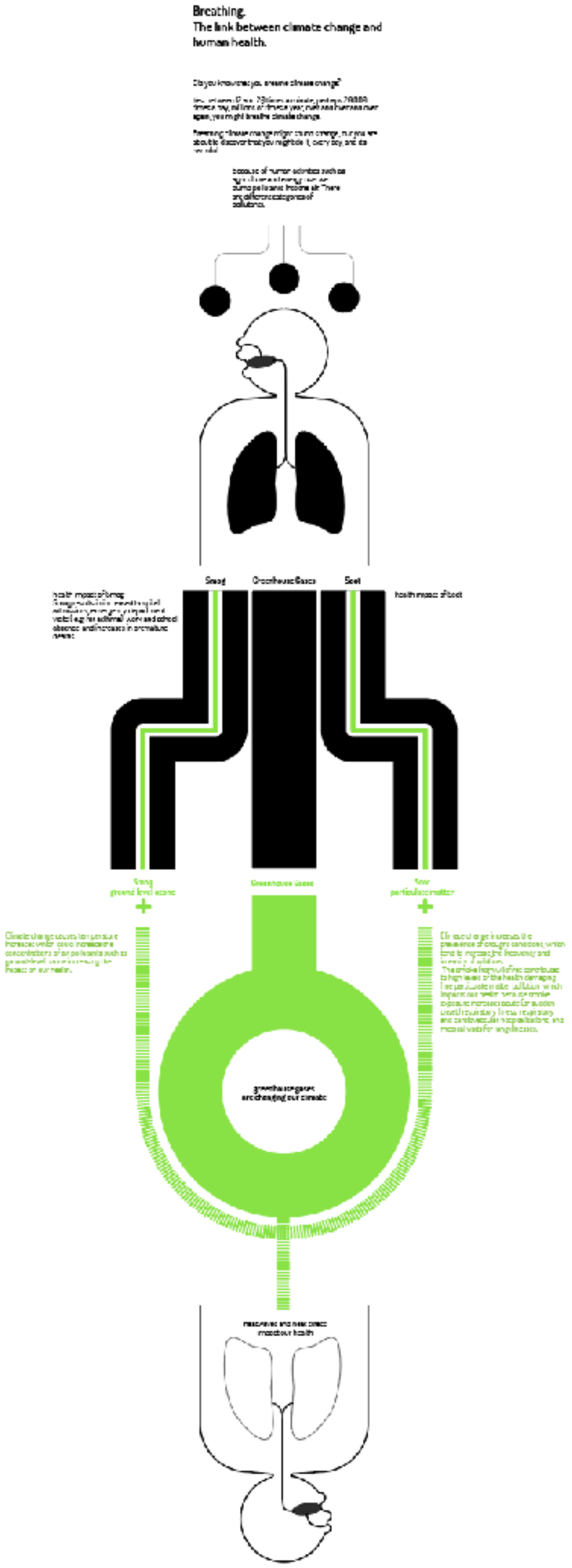

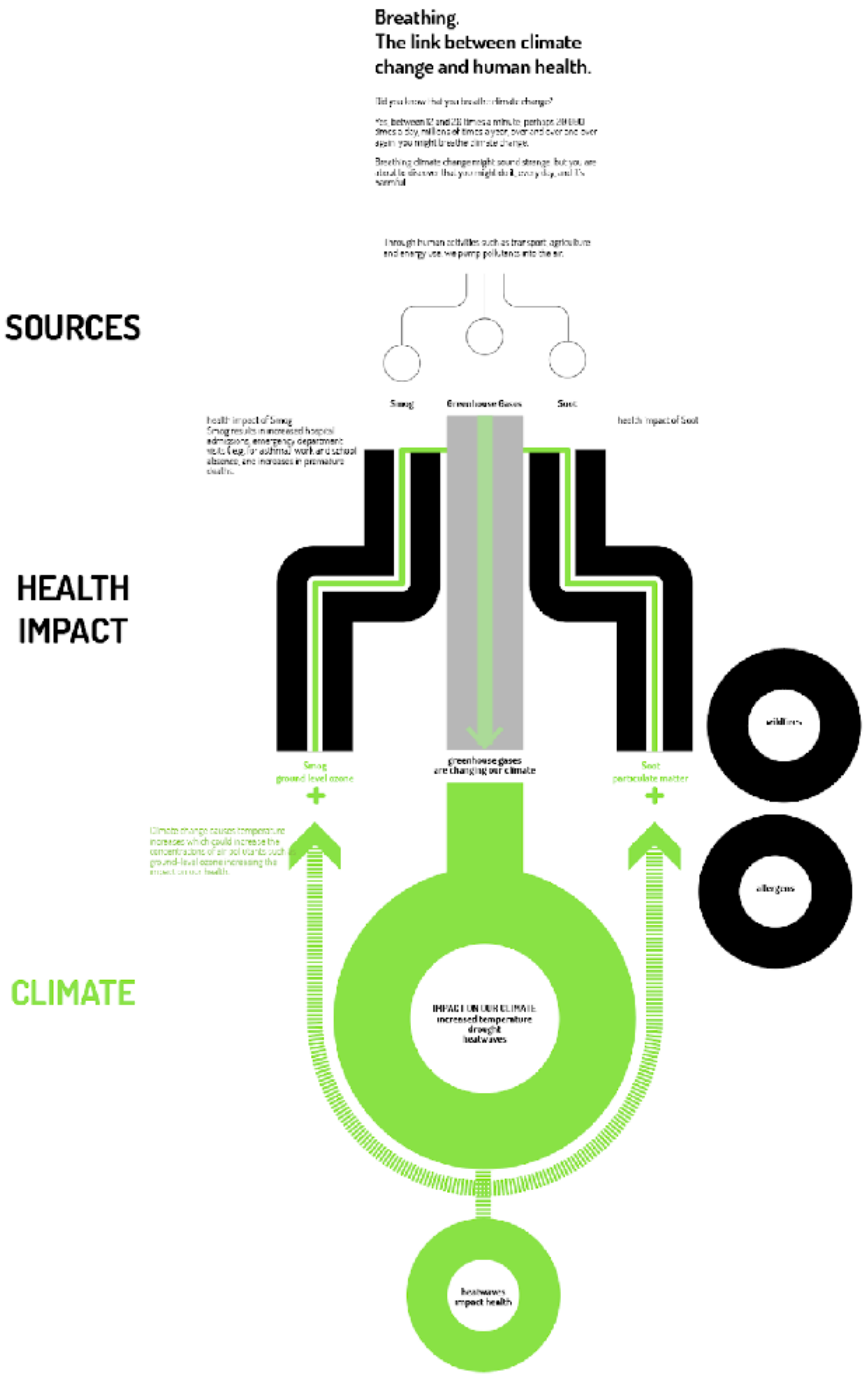

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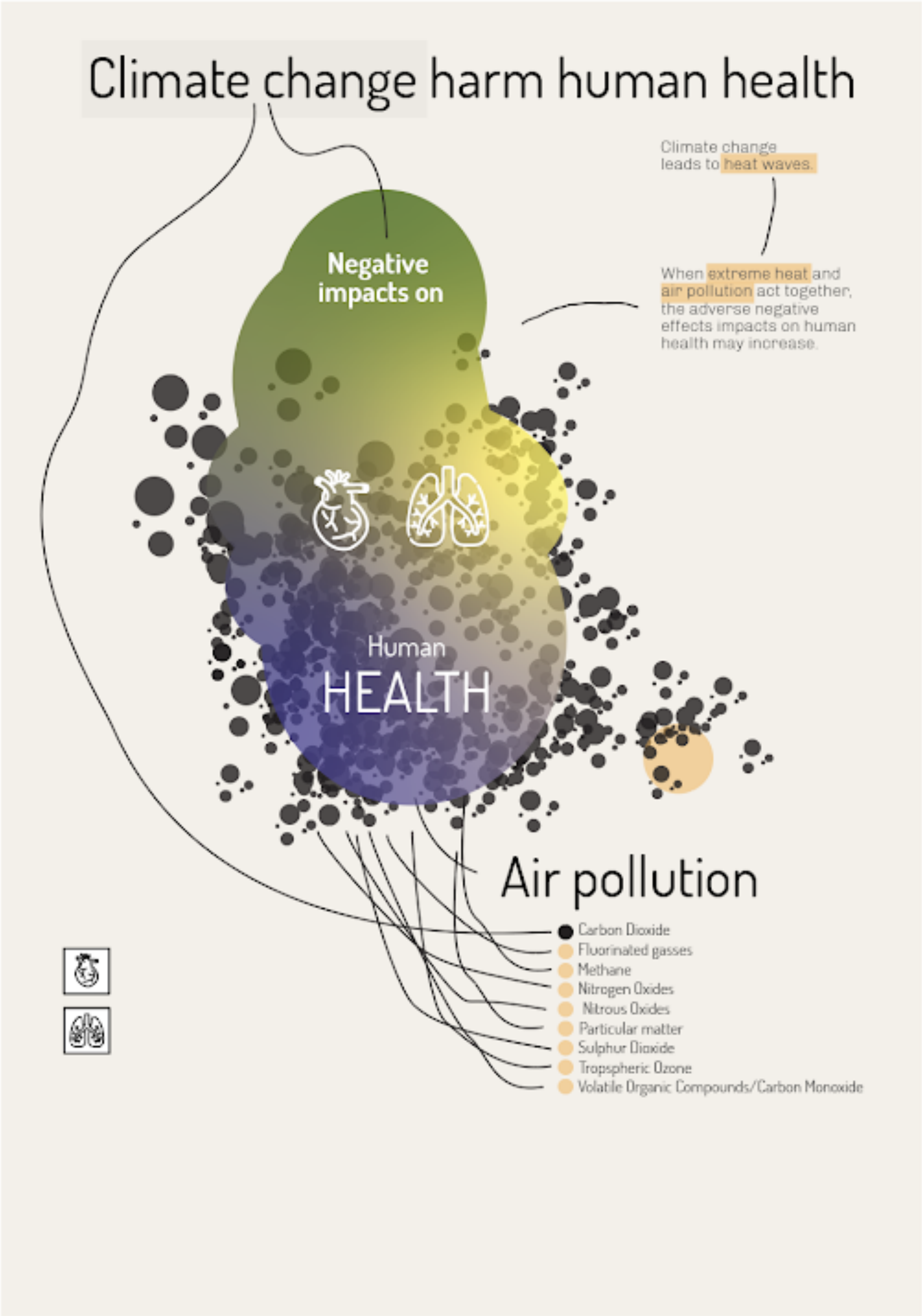

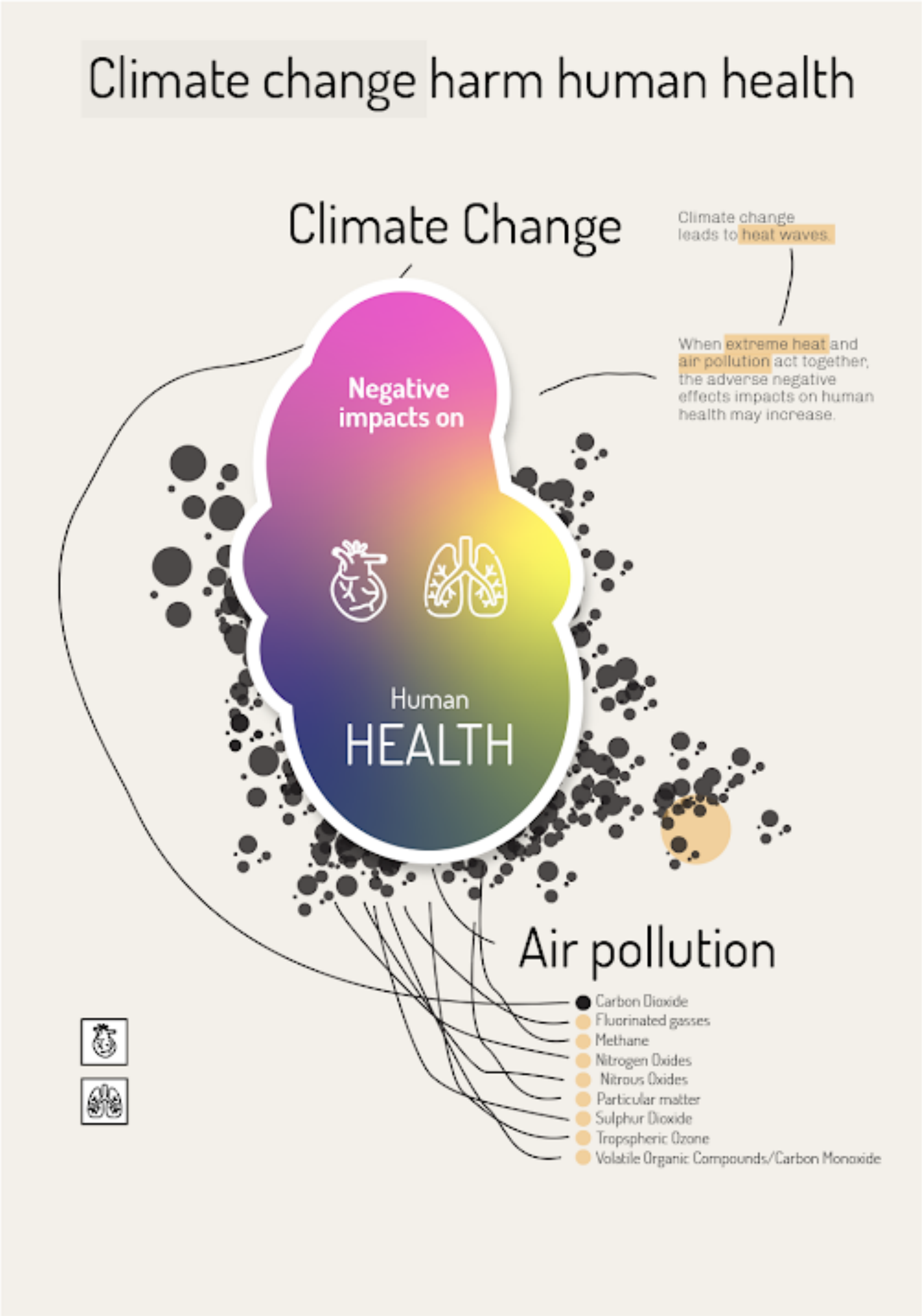

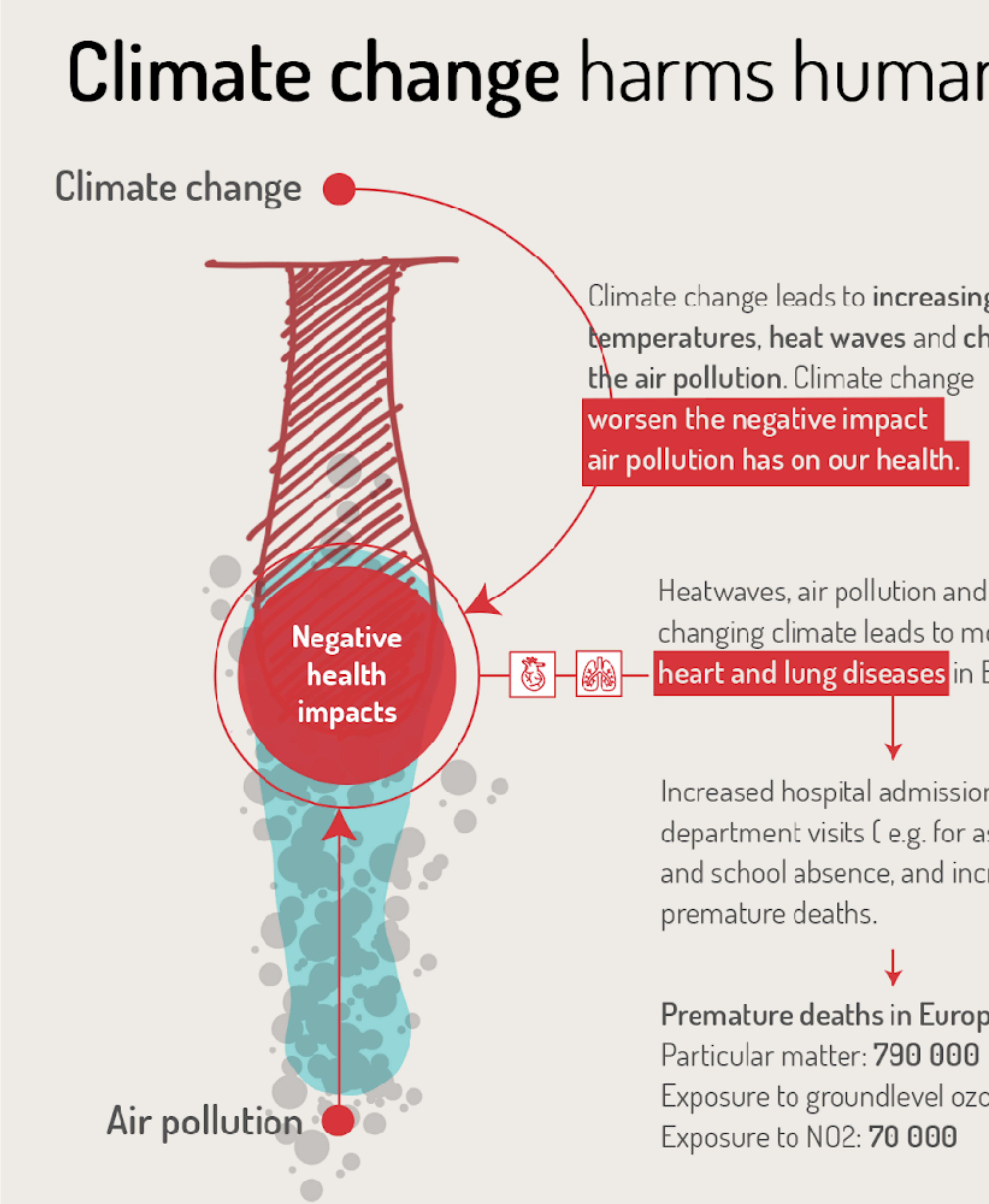

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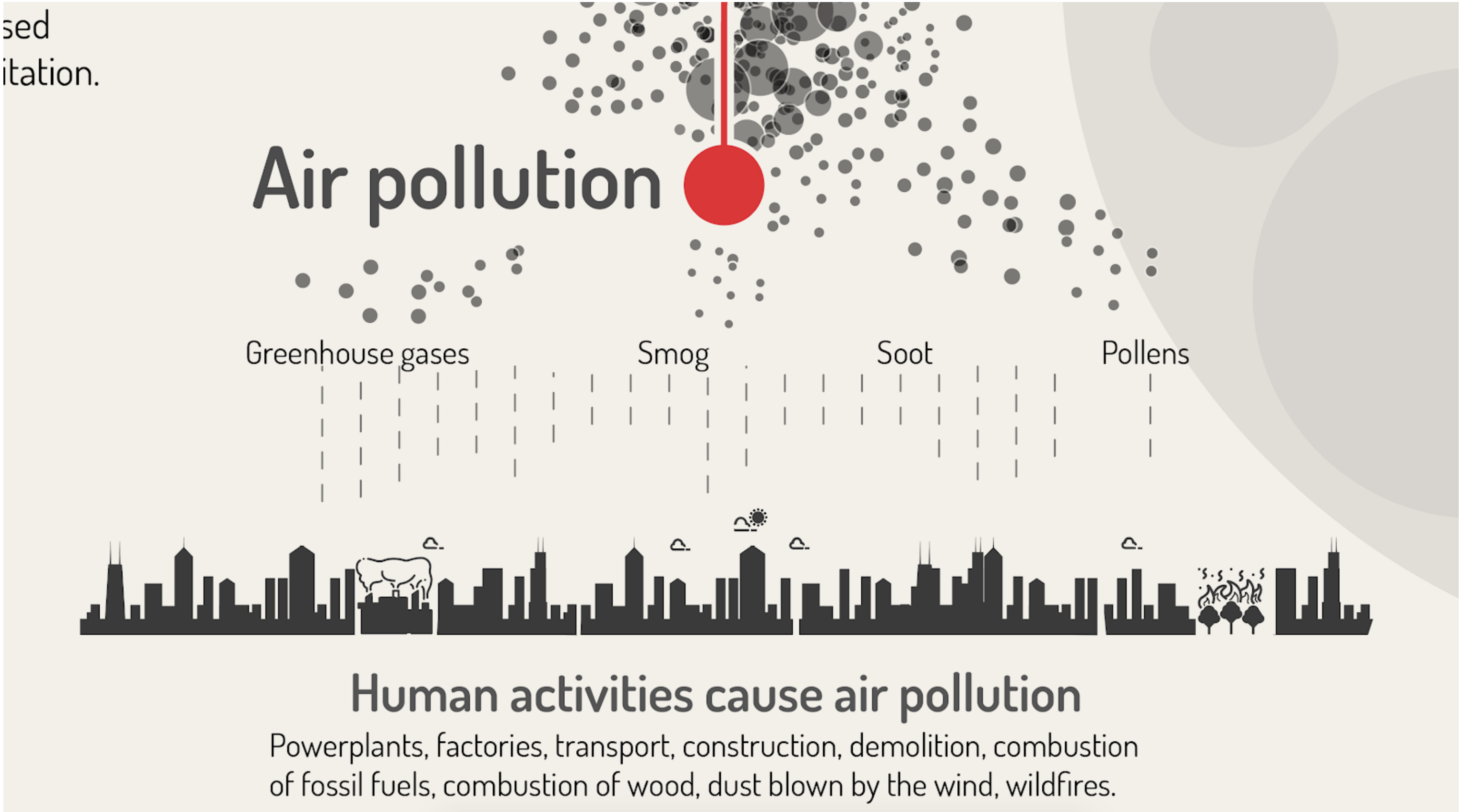
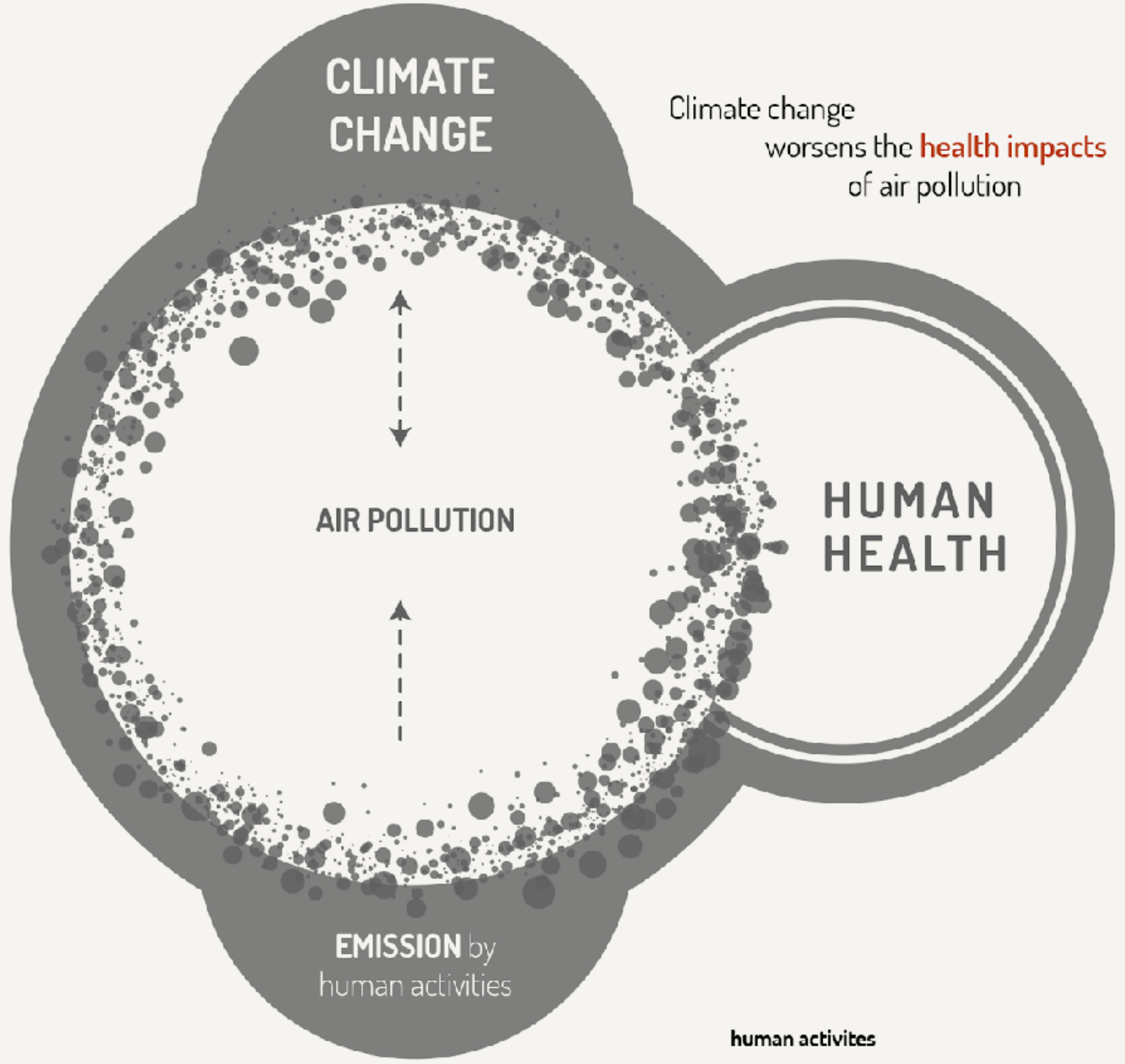
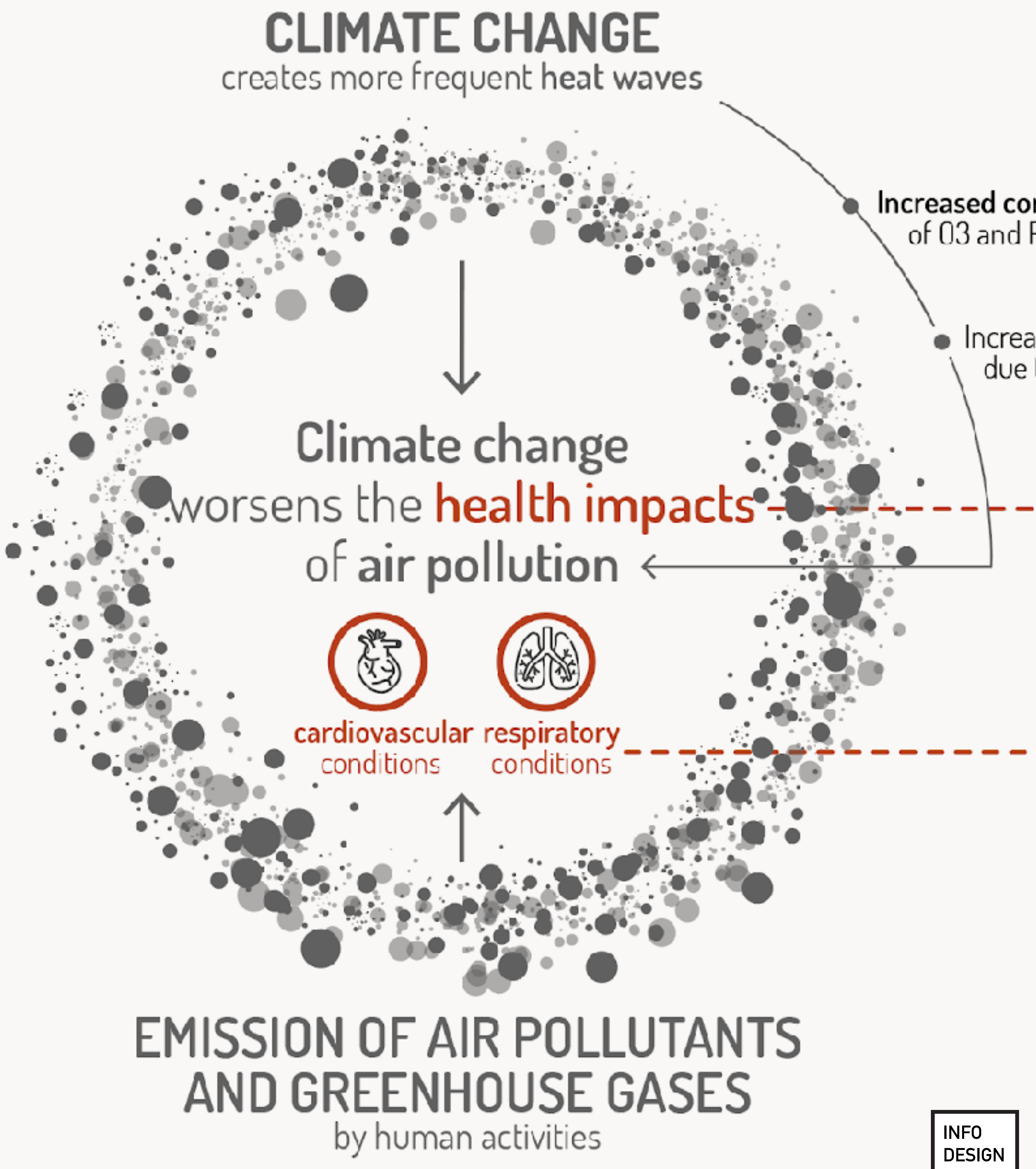


INFO DESIGN LAB

We breathe climate change, and it is harming us.



We breathe climate change, a



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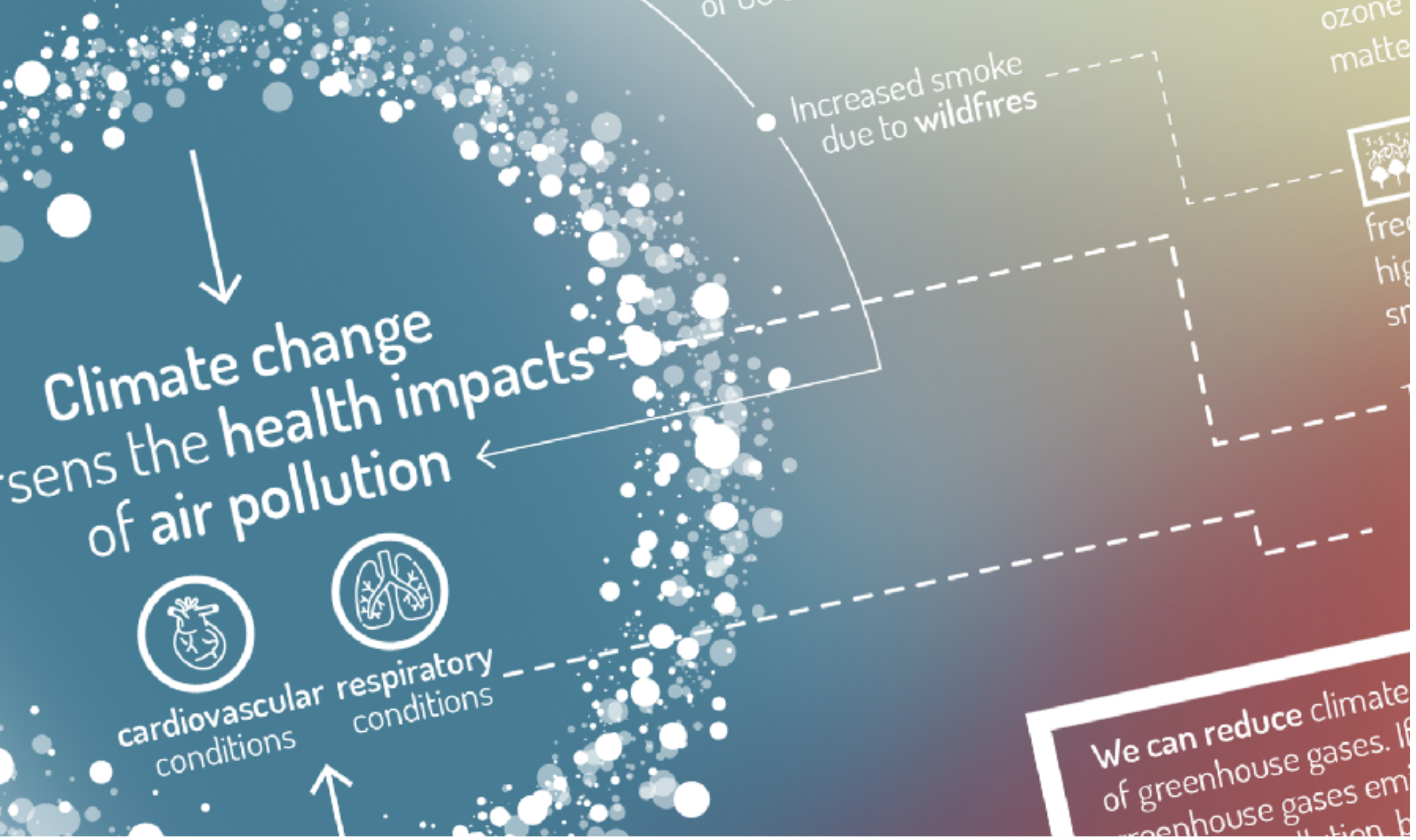

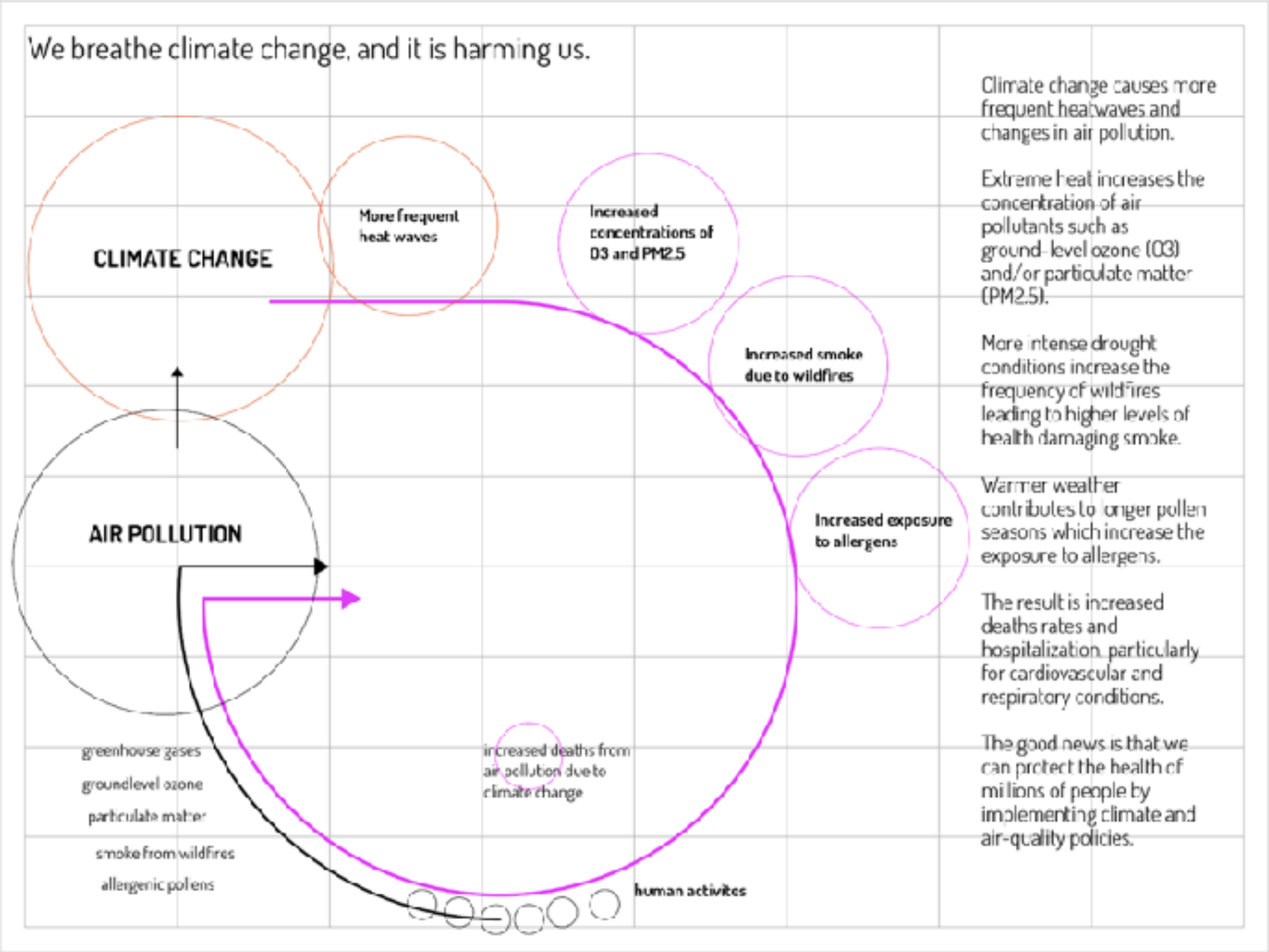

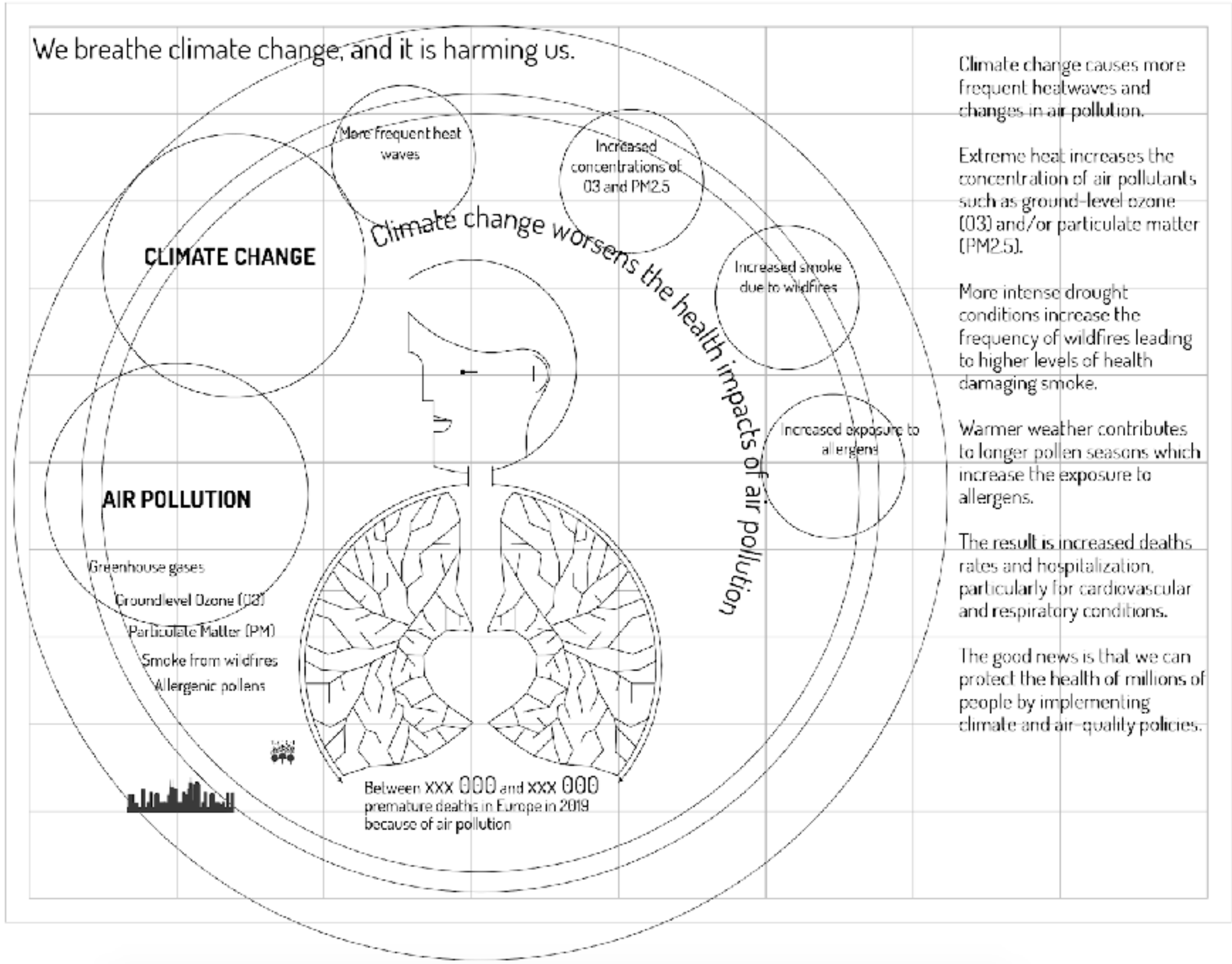

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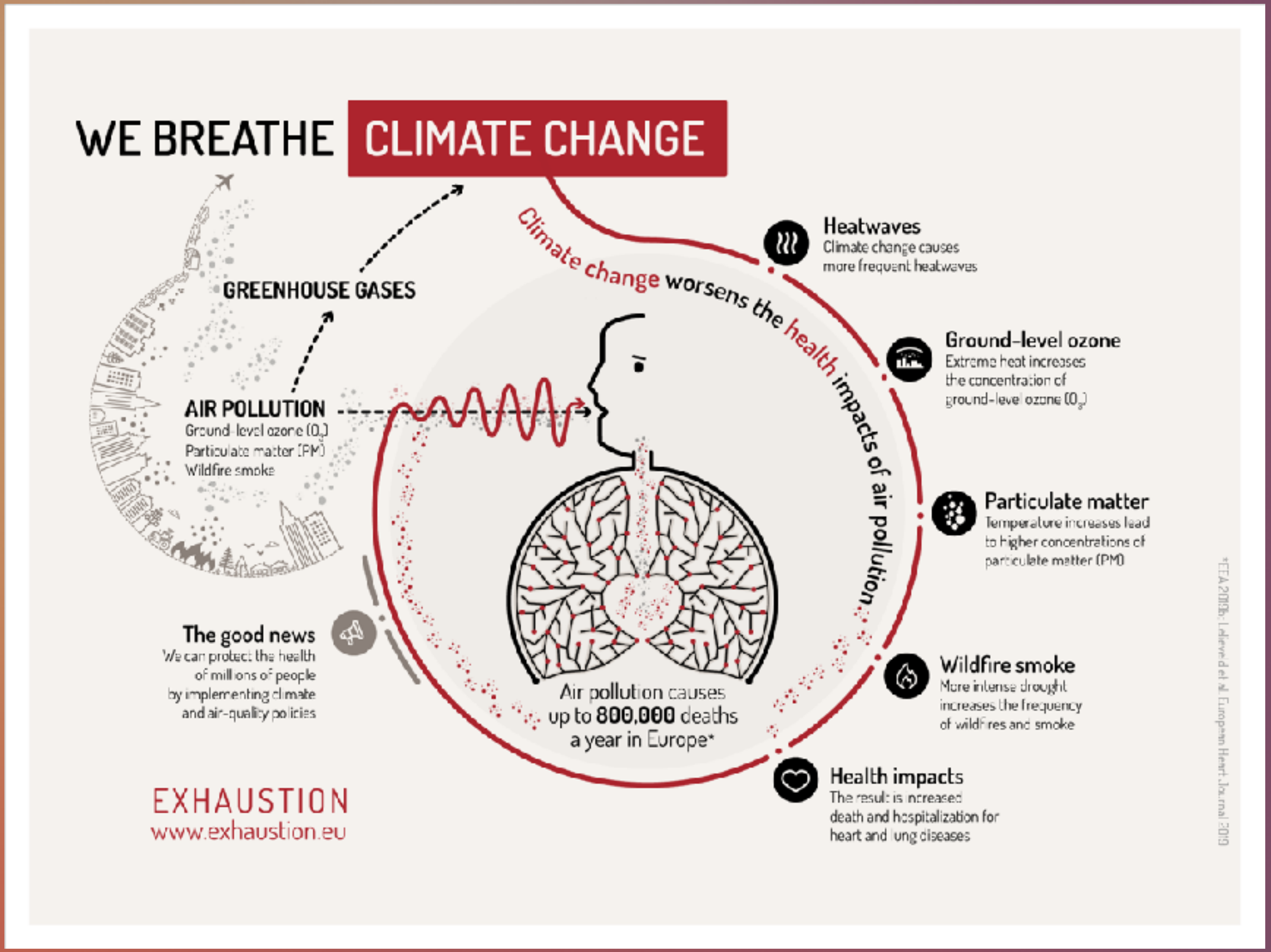

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The narrative arc

It is the journey we offer to our readers.

The narrative arc

It is the journey we offer to our readers.

Imagine being on a stage to **present** your (future) figure. Describe the intent, the core pattern and what the figure shows to a lay audience, in order to empower them to communicate the same message using the same figure.

On data: Email exchange with Malte, Sebastian, Chris

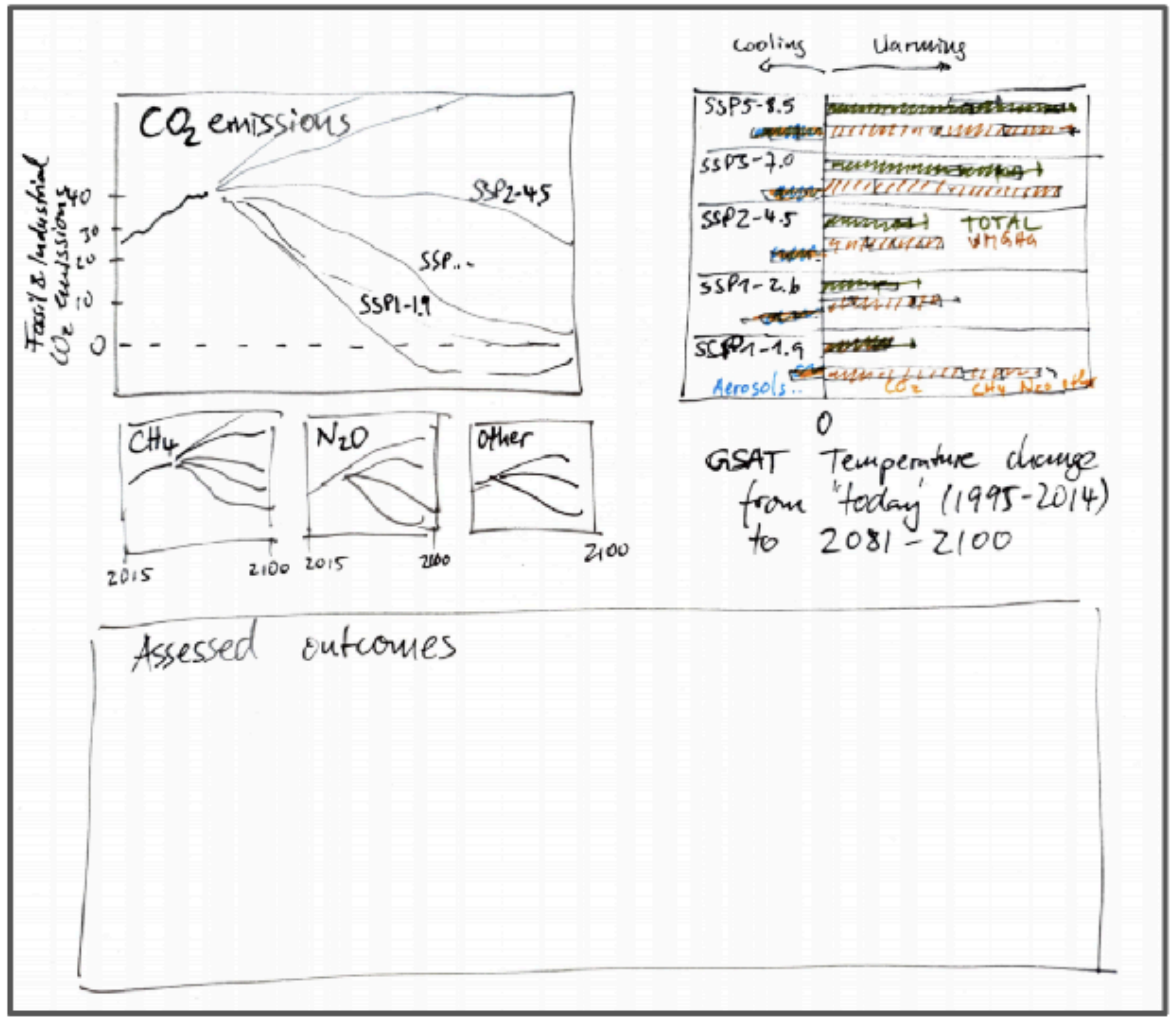
Malte:
Thanks. Promising figure. A few points:

a) Yes, we are happy to provide the emulator data for the figure.

b) On the assessed future temperature implications per forcing driver, that would need to be discussed also with Chapter 7, where the assessment of the "holistic emulators" is done in Box 7.1 and also the individual forcing contributions. I guess once we have the finalised FaIR and MAGICC versions (which are then both calibrated to the latest Chapter 4 total tas projections), it would then be good to use those for that part of the figure with an agreed methodology. I hence also copy in Piers.

c) On the Assessed temperature outcomes. One specifically important point I think are the 1.5 crossings and whether that could be shown for both the peak temperatures and first crossings "from below to above" as well as the other way around, i.e. "from above to below" as otherwise policymakers will immediately infer that the 1.5C target is lost, whereas they overlook that many scenarios come back by 2100 to just below 1.5C in the median. That is more for @Sebastian and Chapter 4, but in terms of the messaging of the overall IPCC report, that is a crucial bit, I feel.

d) Just to understand what exact data you need. Is it something along the sketched PDF? I.e. do you want bar graphs for the induced temperatures "by emission driver", say stacking the median contributions of CO2, CH4 and N2O + OTHER on top of each other with a total warming uncertainty bar... same for the net cooling species (could also be CH4, for SSP1-1.9 where concentrations fall from today to 2100), and then a total total bar for each of the SSP scenarios?



Wireframe

This figure illustrates how **future emissions** influence future global warming, or in other words, **that our actions influence our future**.

Key distinguishing factor between scenarios are their emissions
Tagline: Our actions do influence our future.

Highlight the dominant role of CO2 and also the role of non-CO2
Tagline: CO2 is the elephant in the room

Temperature evolution and timing of **crossing** temperature levels depends on the emission scenario.
Tagline: Our decisions determine the level of climate change

PRESENTER'S NOTES

Wirefram

Scenario i

Co

No
CO

Assessed

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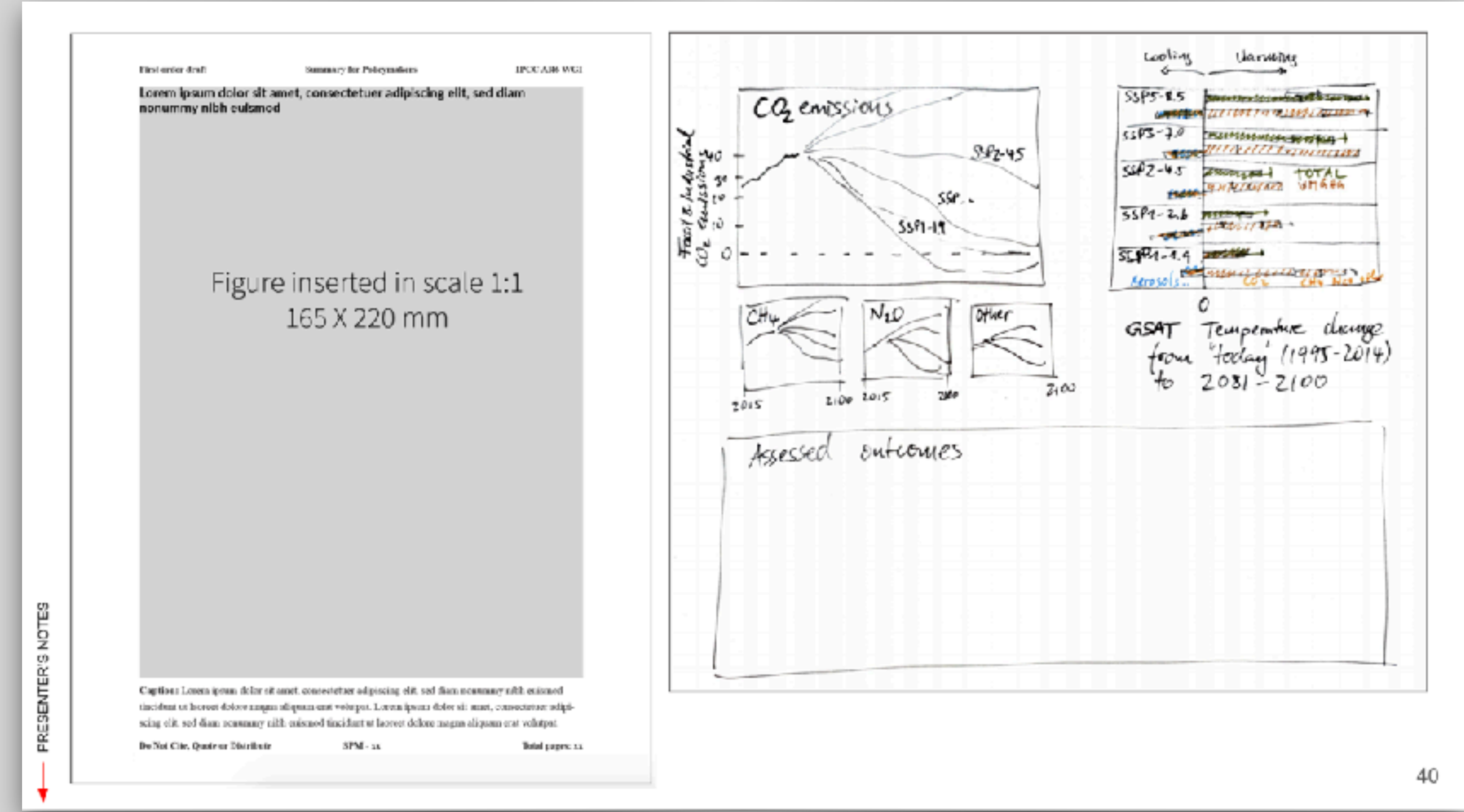

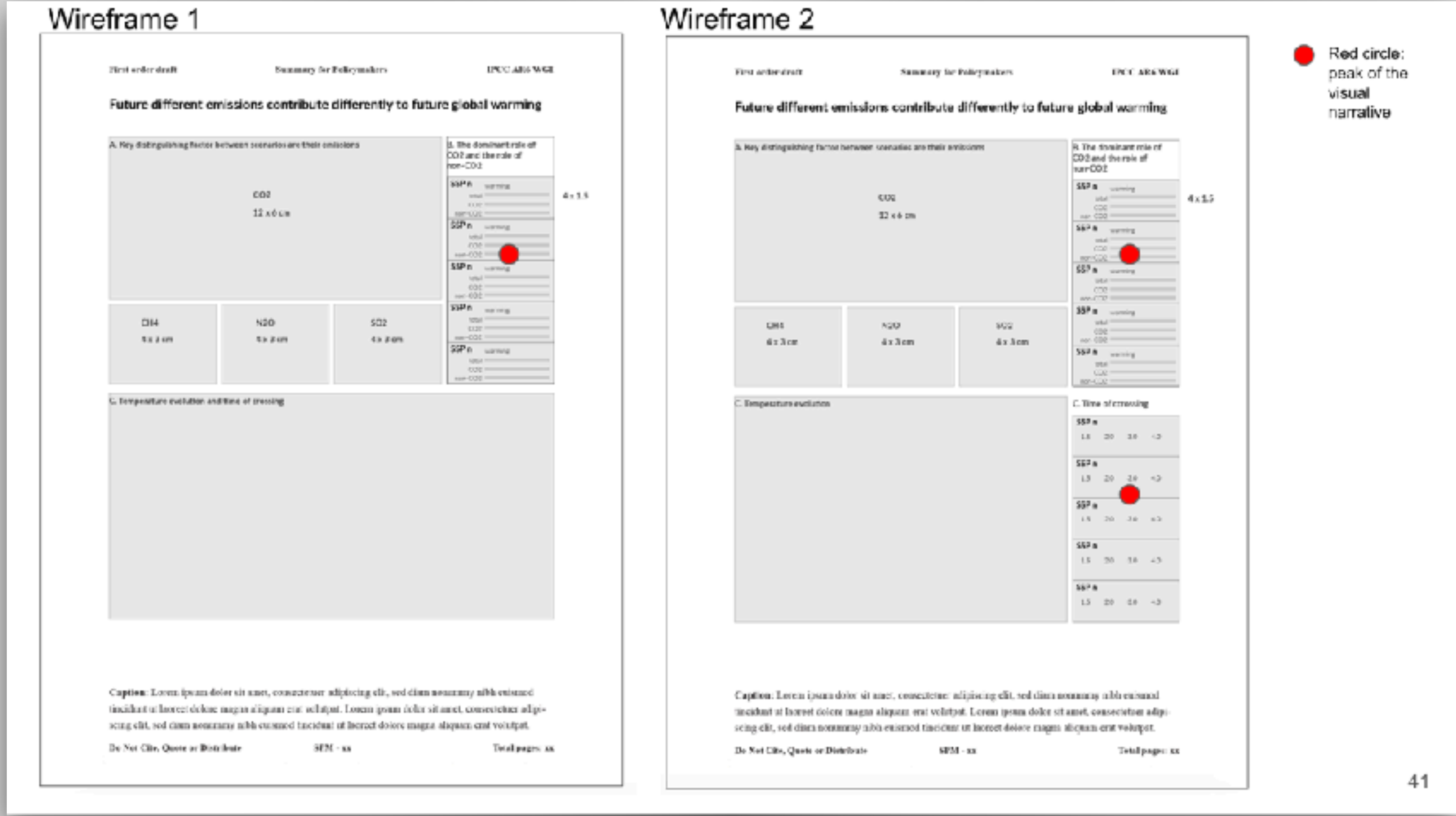

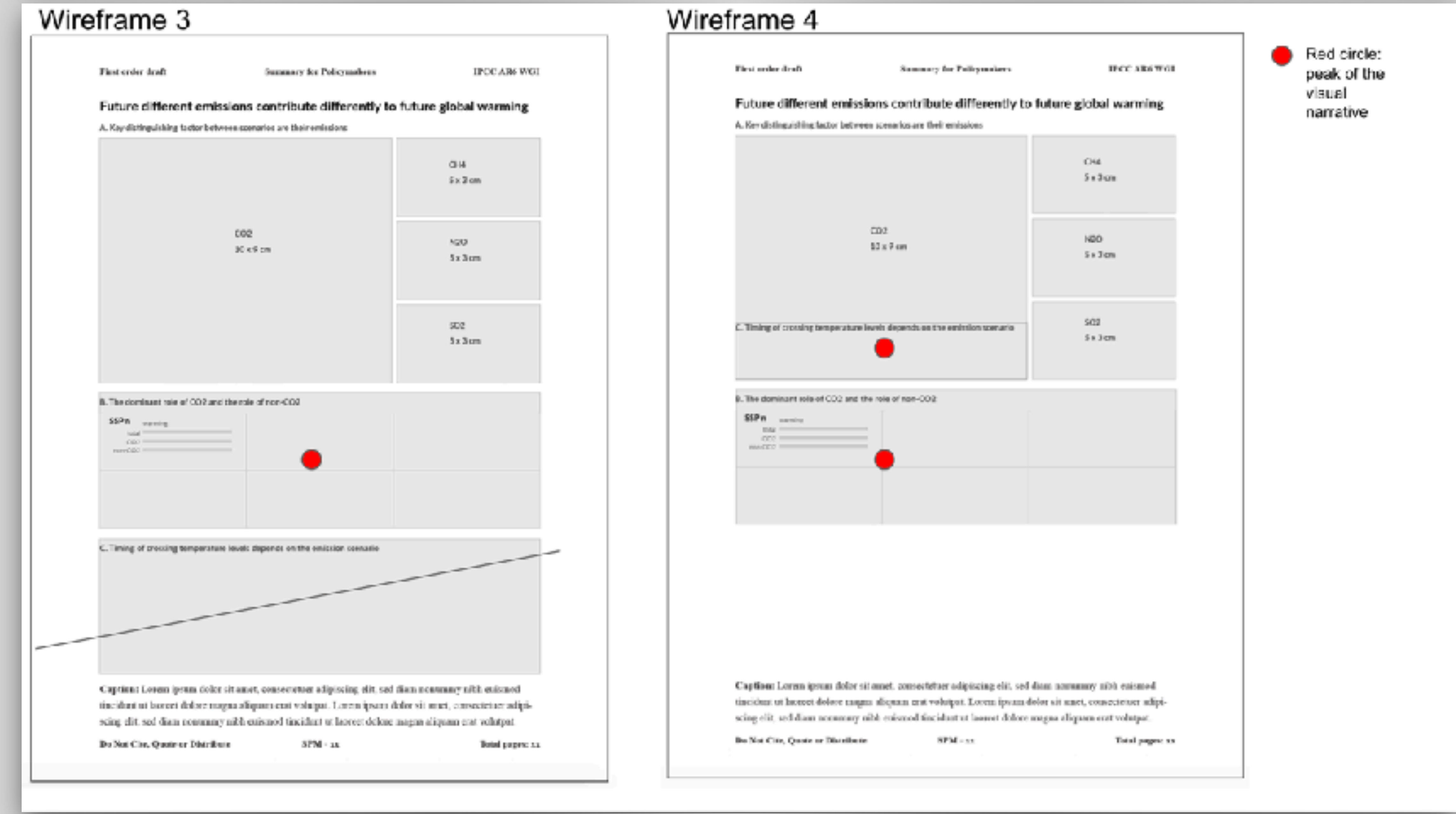

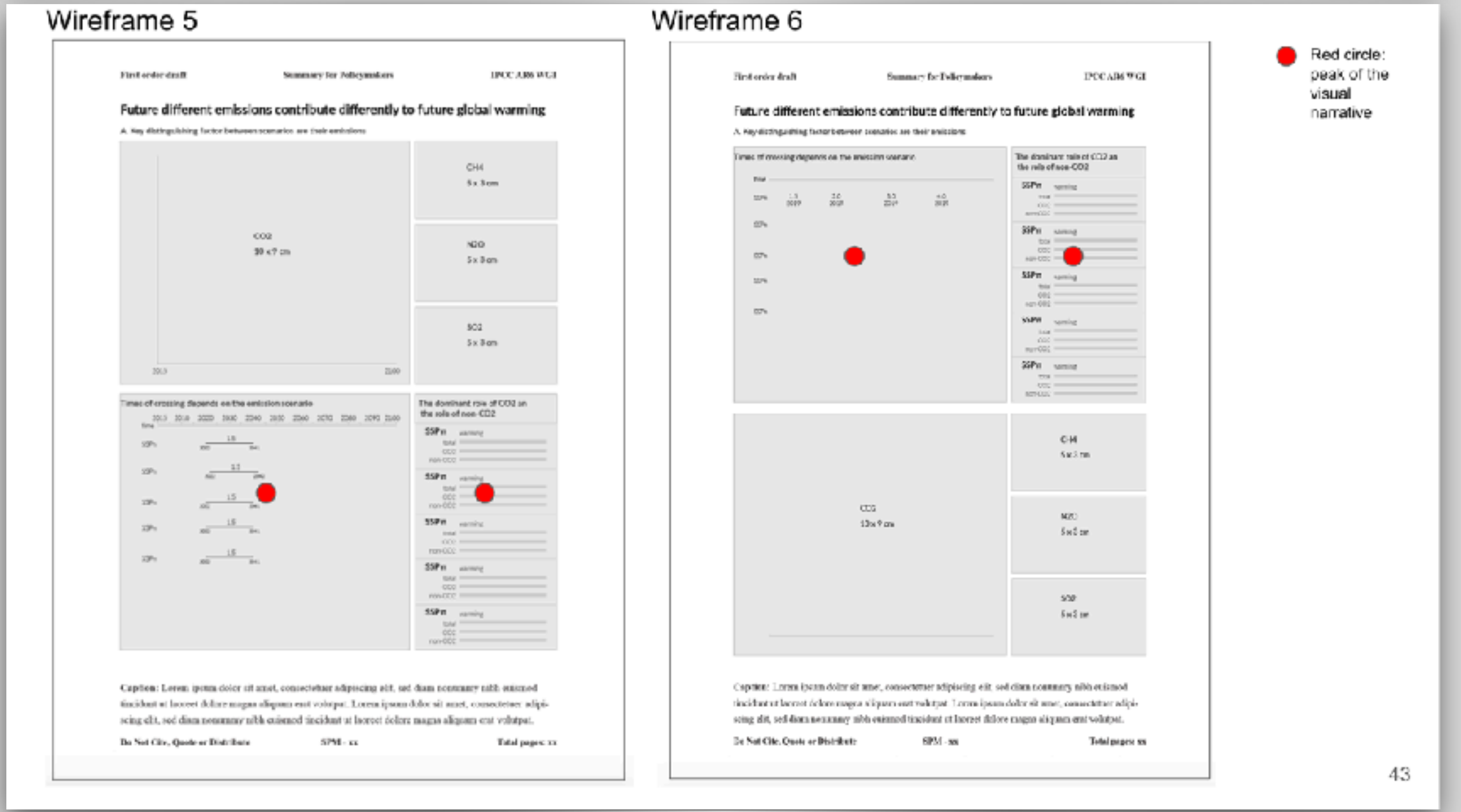

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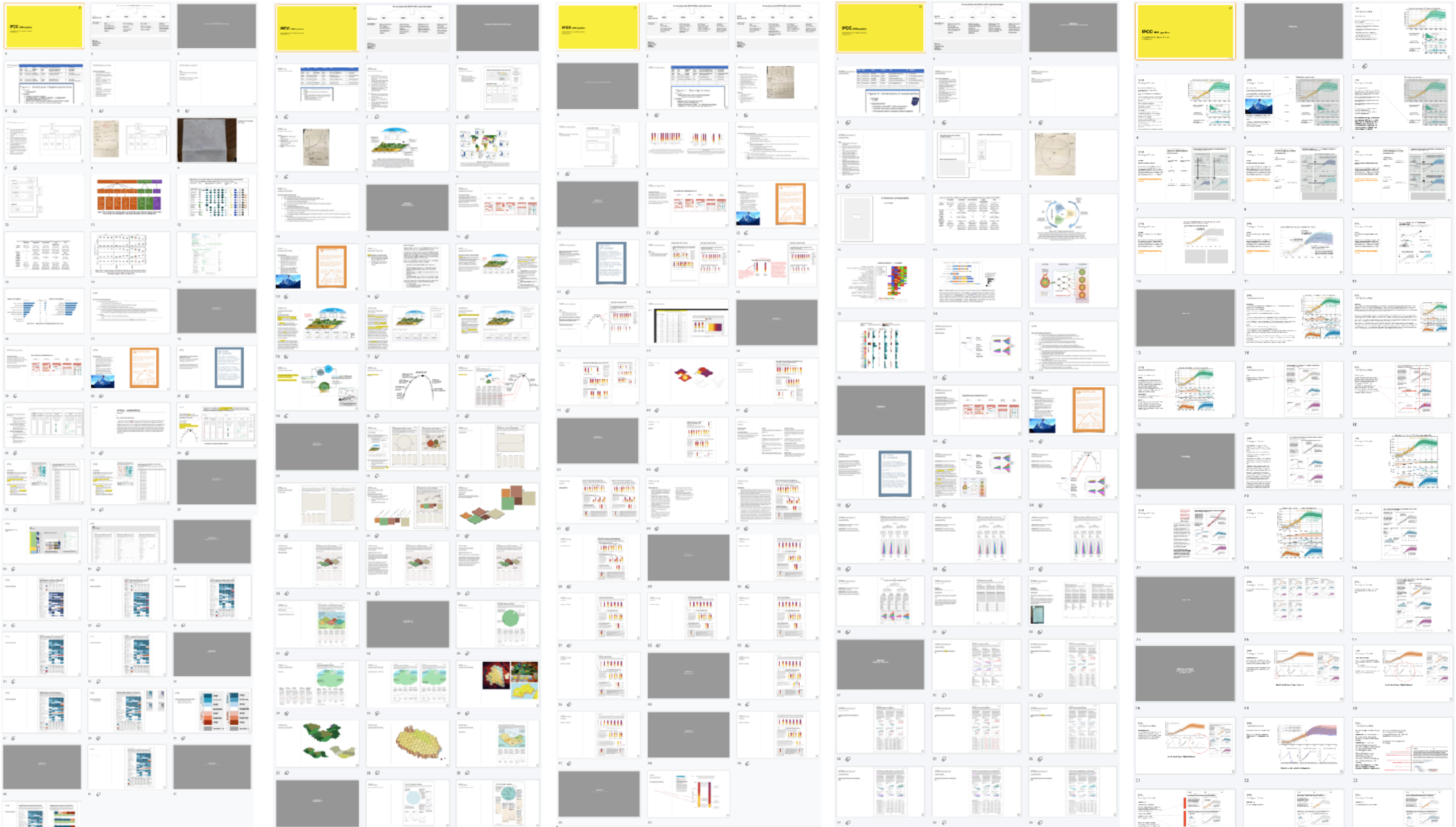
The slide books

Recording the history of everything we work on.



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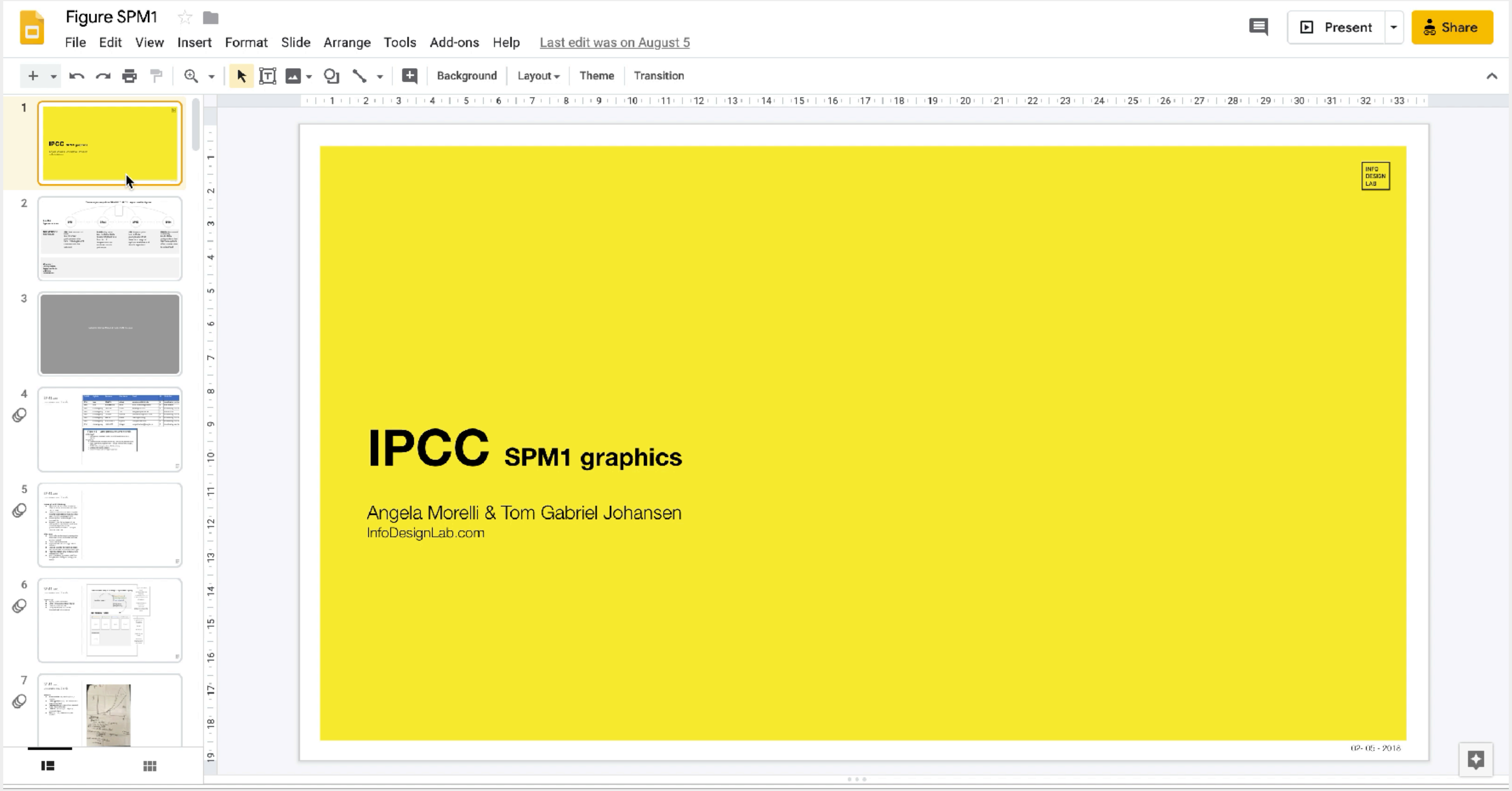

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Present 1 °C
Once
now likely
occurs
4.8 times
(2.3 - 6.4)
will likely
occur
8.6 times
(4.3 - 10.7)
will likely
occur
13.9 times
(6.9 - 16.4)
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WARNER BROS
STUDIO TOUR
LONDON
THE MAKING OF
Harry Potter
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'No story lives unless
someone wants to listen.'
– J.K. Rowling

Using ECMWF's Forecasts 2022: Visualising Meteorological Data

9th June 2022

Angela Morelli **InfoDesignLab.com** **@angelamorelli**

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