Climate Action Program

Emission Pathways & Scenarios
Link with global economy

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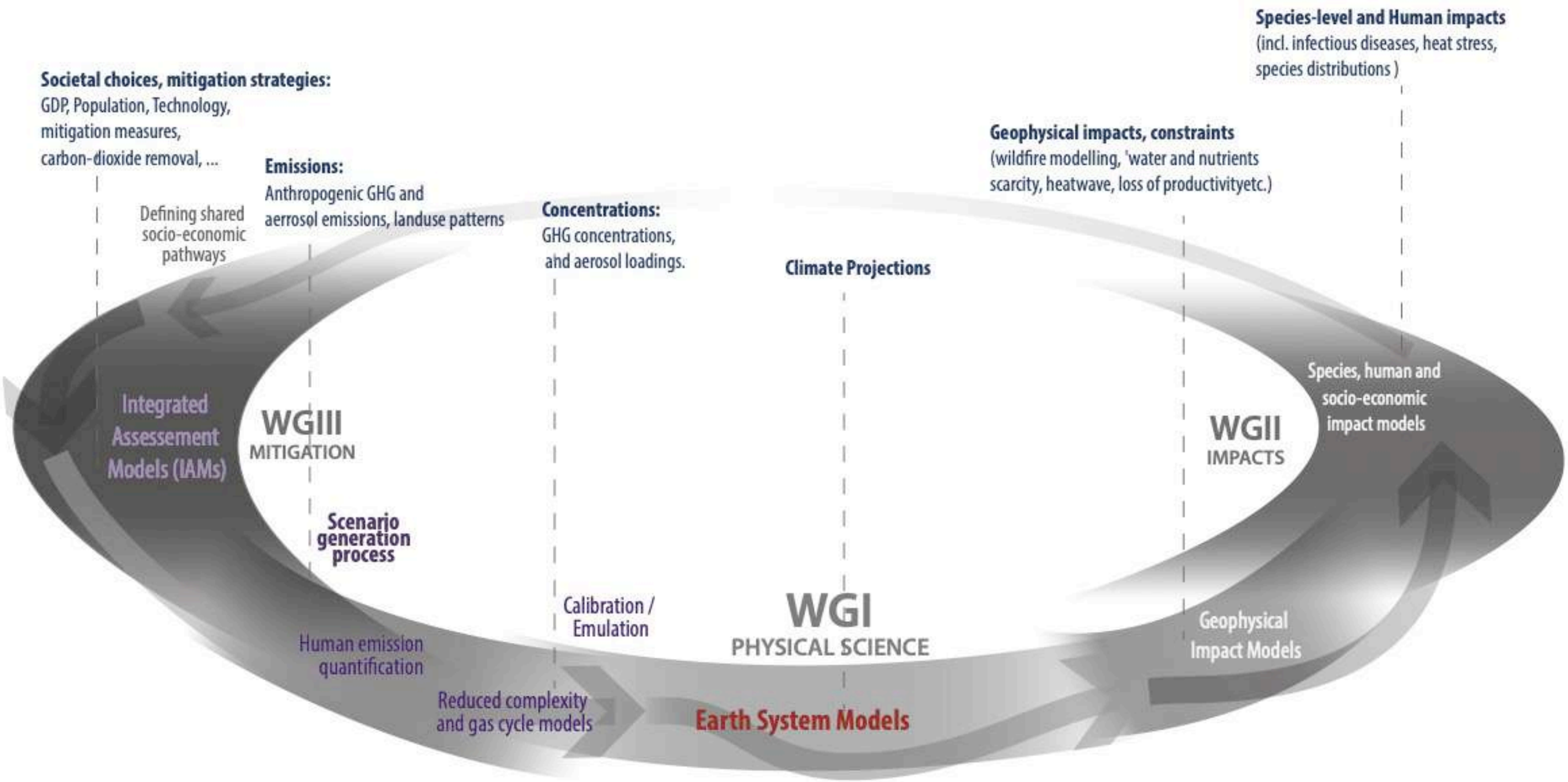
Outline

1. What the scenarios are (and are not) ?
2. Carbon budget: a geophysical tools to inform mitigation pathways
3. Mitigation pathways compatible with 1.5° C and 2° C
4. Sectoral implications of stringent mitigation pathways
5. Translation in Global climate policy
6. National-scale Pathways : cas de la France
7. Outro

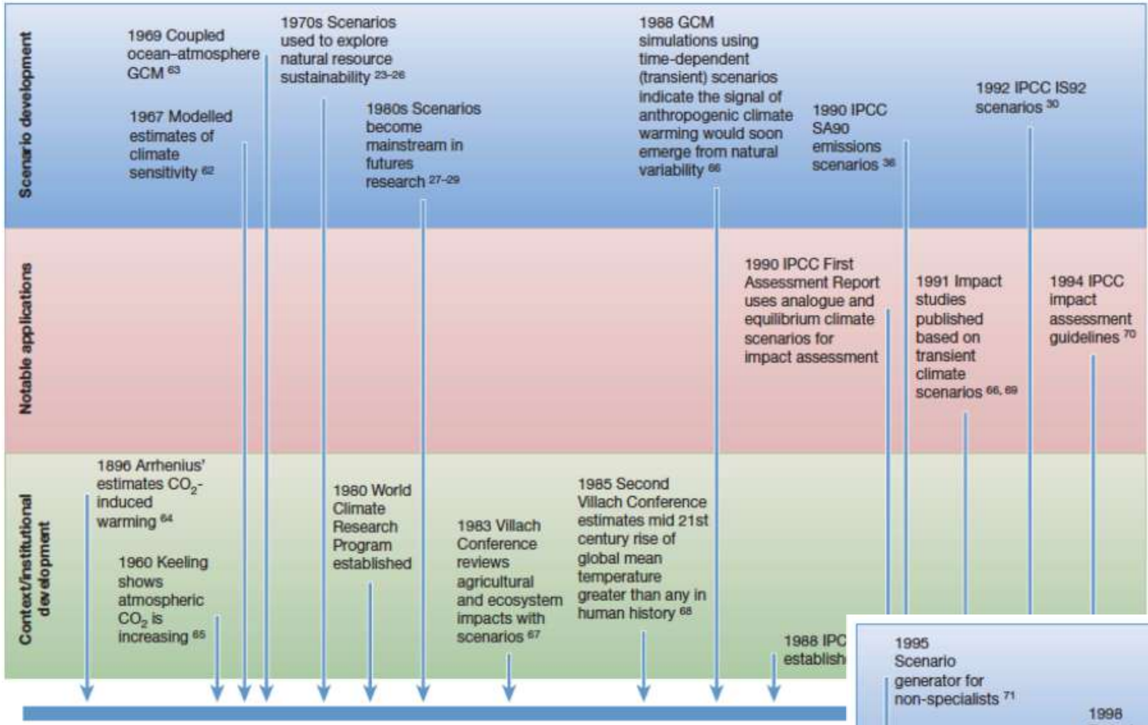
What the scenarios are (and are not) ?

Interconnection between IPCC working groups

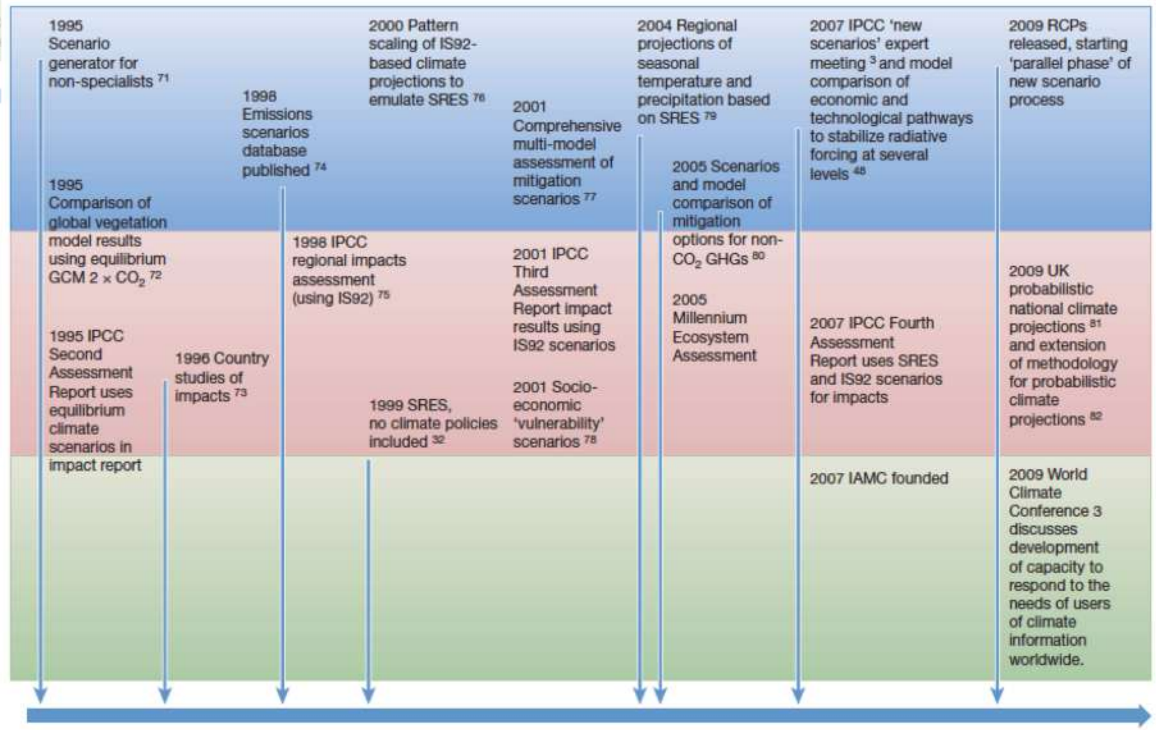


IAMs= policy models
ESMs= climate/geophysical models

Emission Pathways — a long story

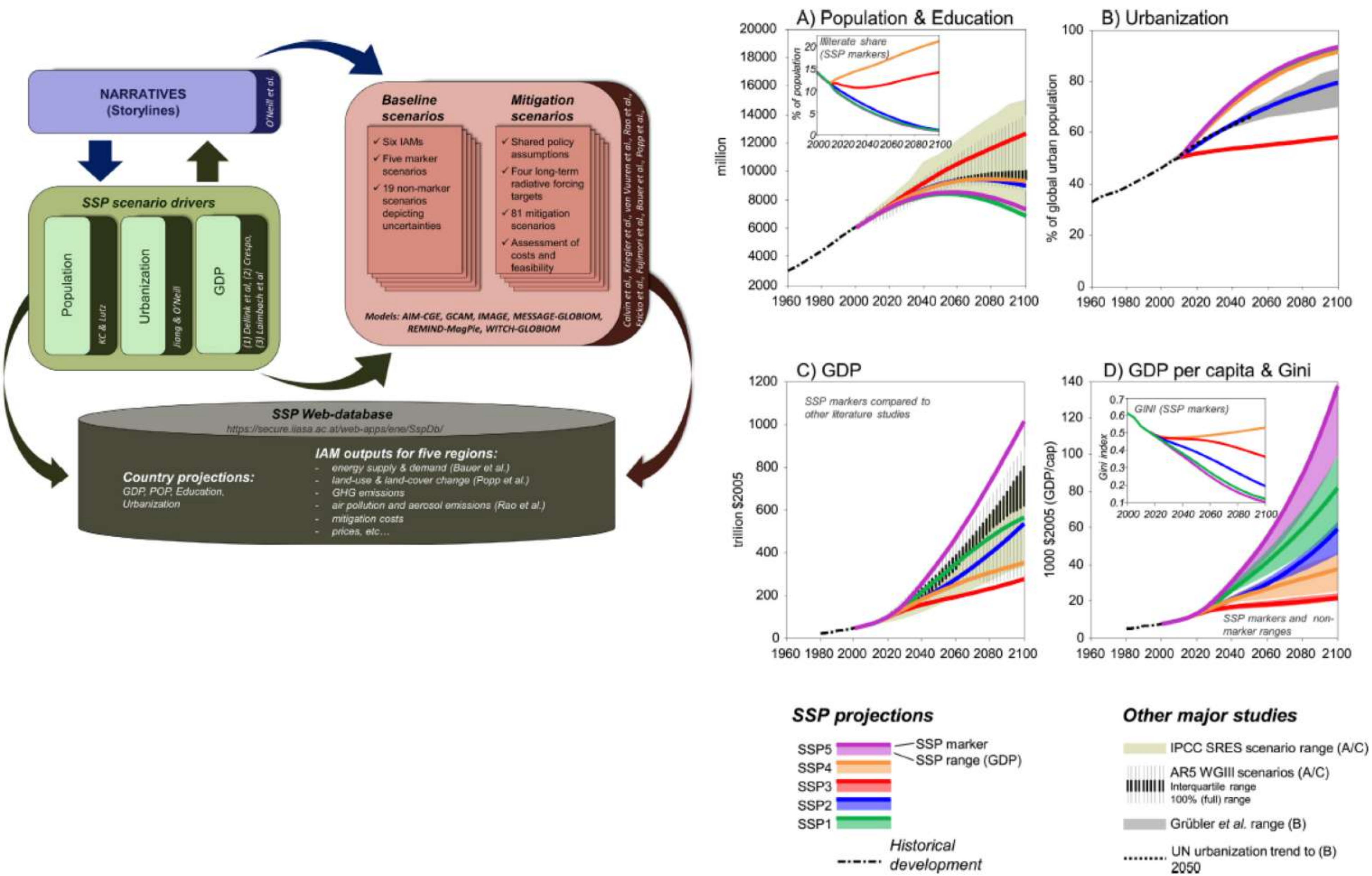


SA90: idealized/CO2 scenarios 1990 => 1992
IS92: comprehensive CO2 scenarios 1992=>2004
SRES comprehensive multigas scenarios 2004=>2009
RCP comprehensive multigas scenarios 2009=>2014



Moss et al. (2010)

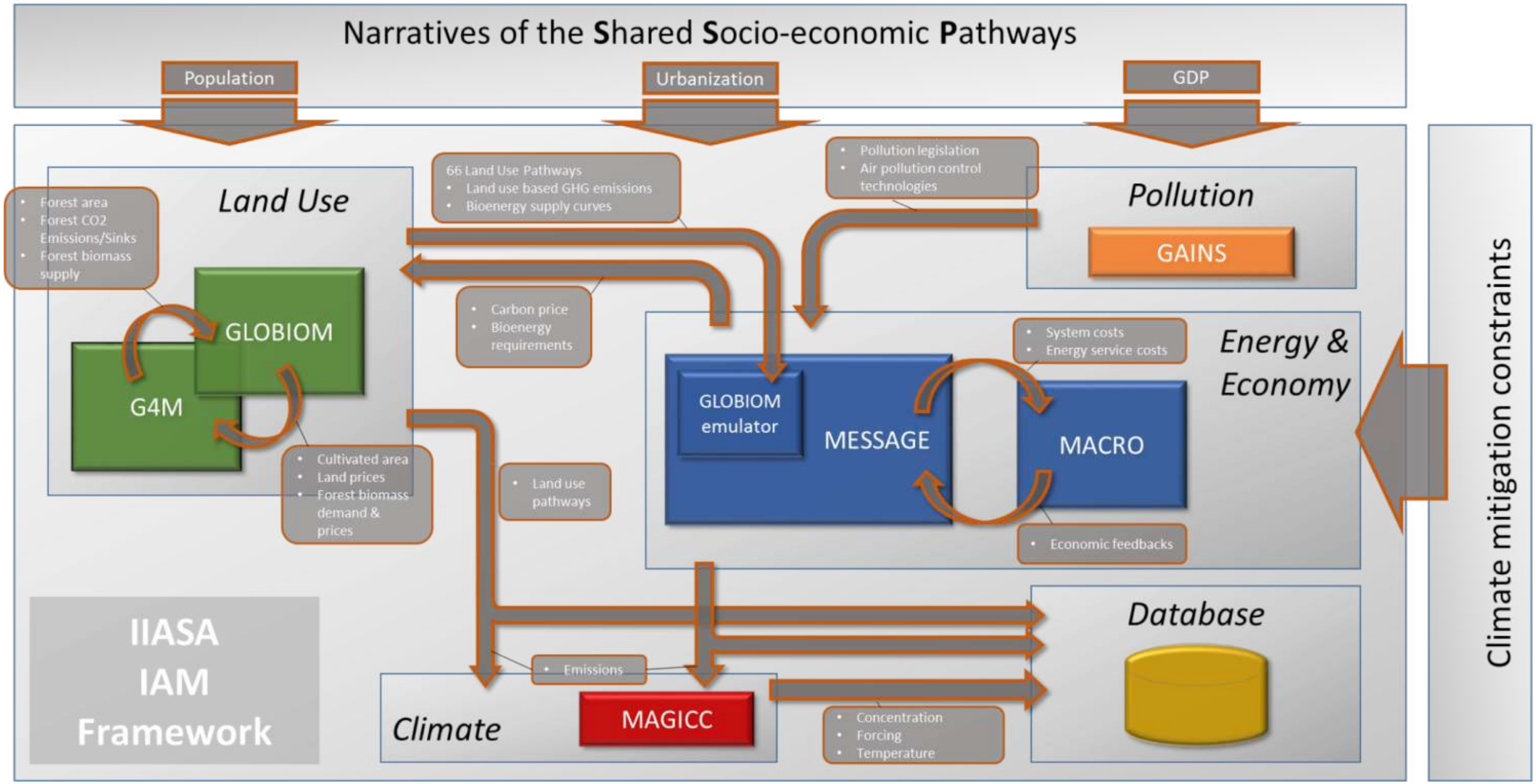
Emission Pathways — Narratives framework



Riahi et al. (2017)

What are Integrated Assessment Models? (IAMs)

IPCC SR15 Glossary:
Integrated assessment model (IAM) Integrated assessment models (IAMs) integrate knowledge from two or more domains into a single framework.



Friko et al. (2016)

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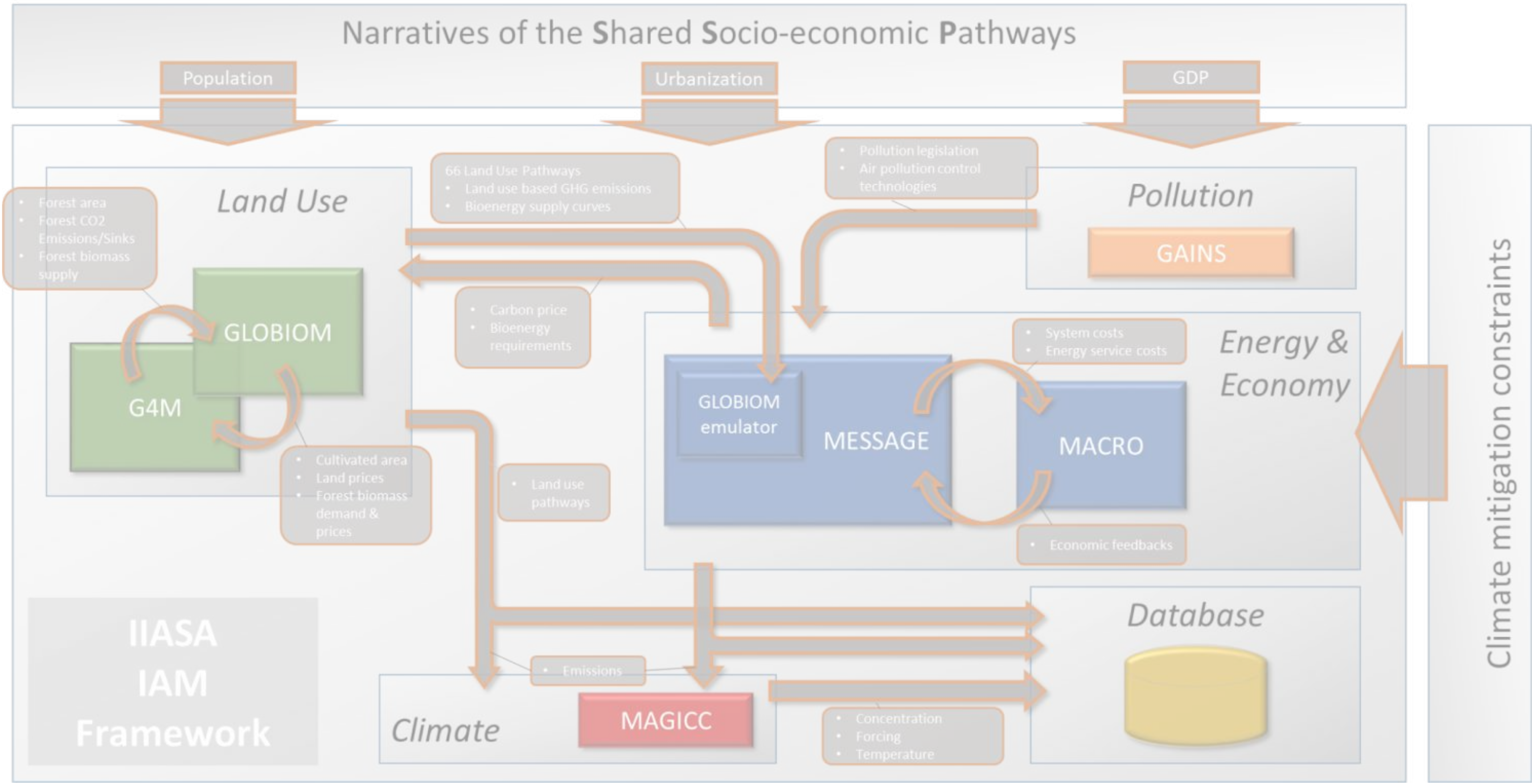

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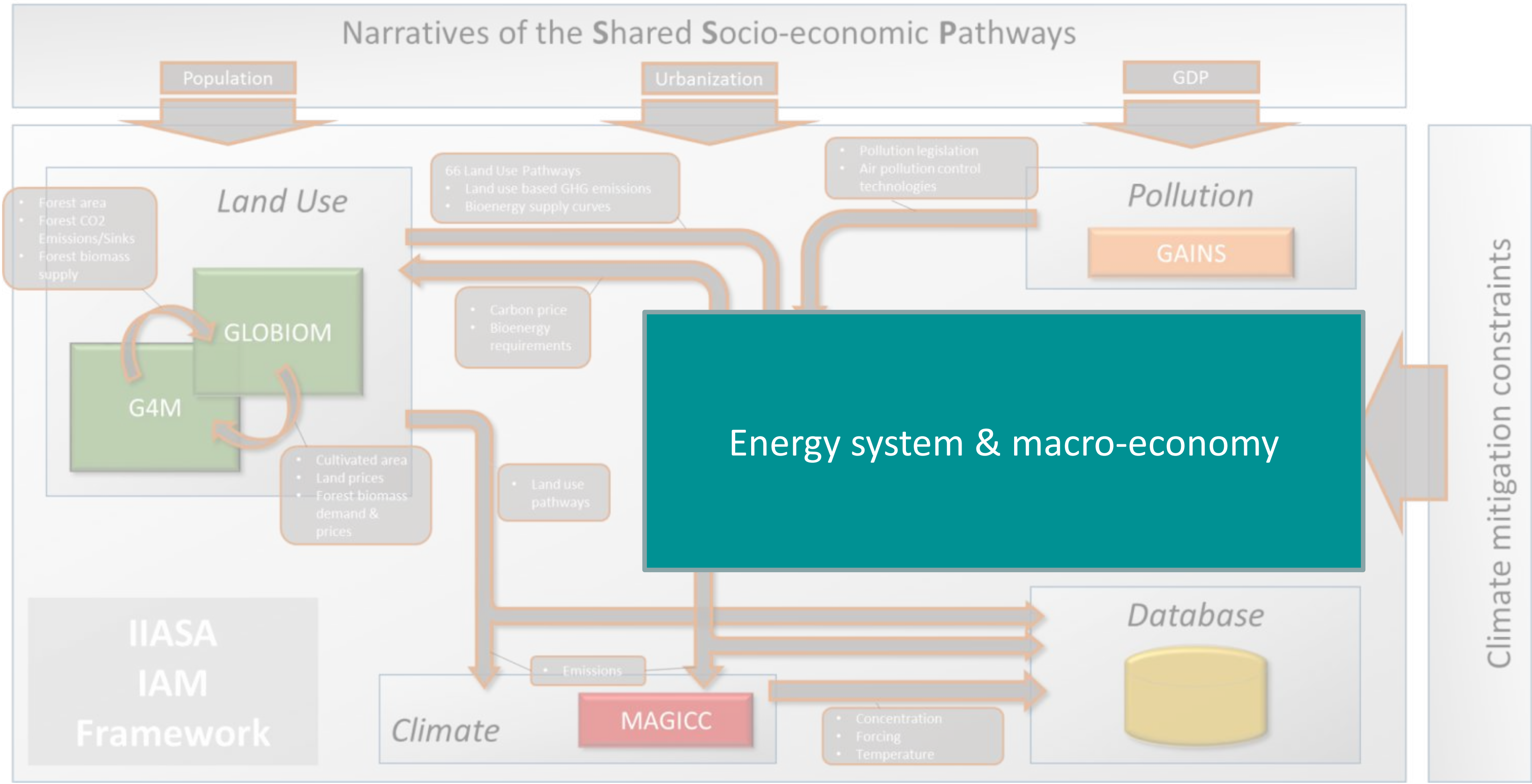

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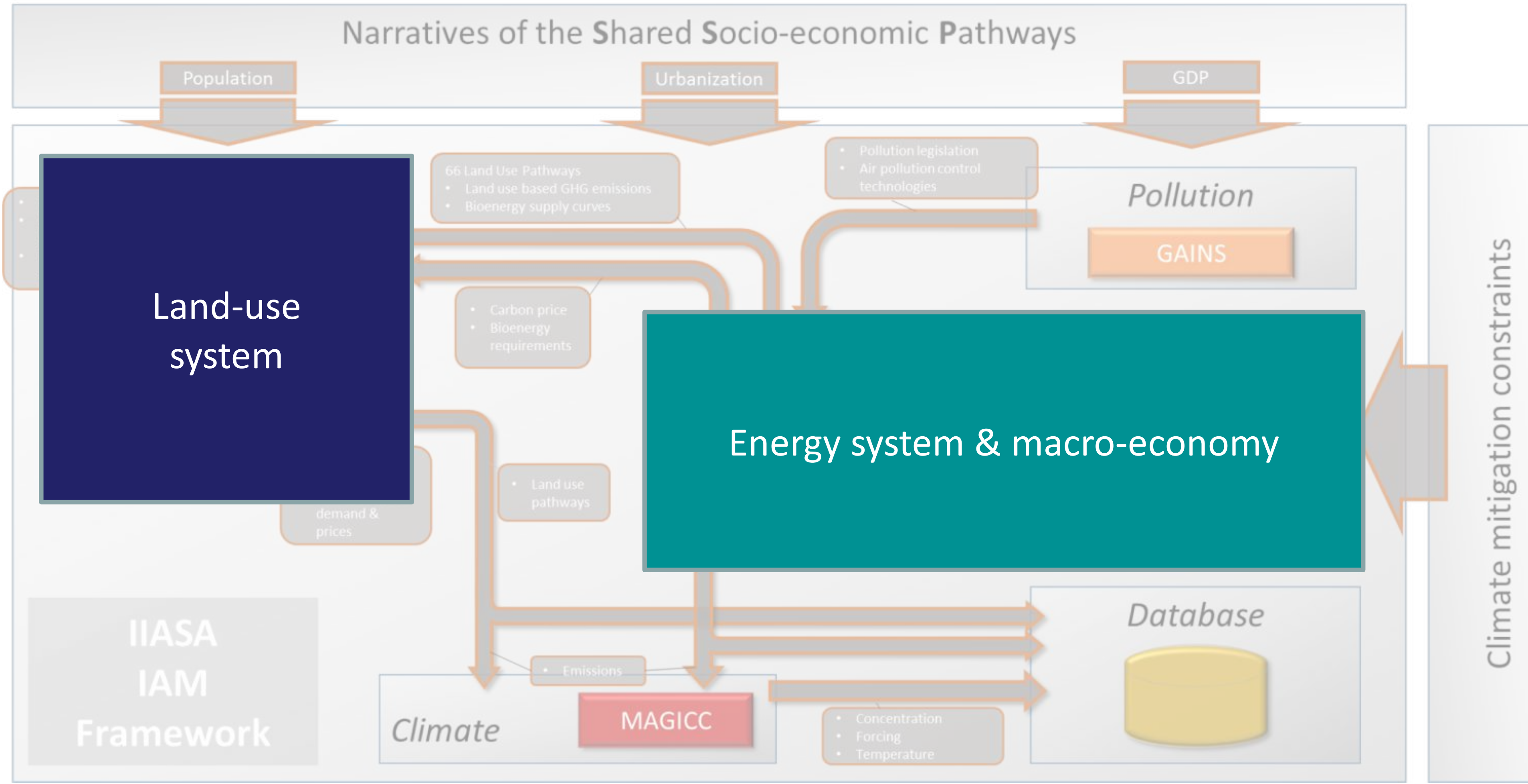

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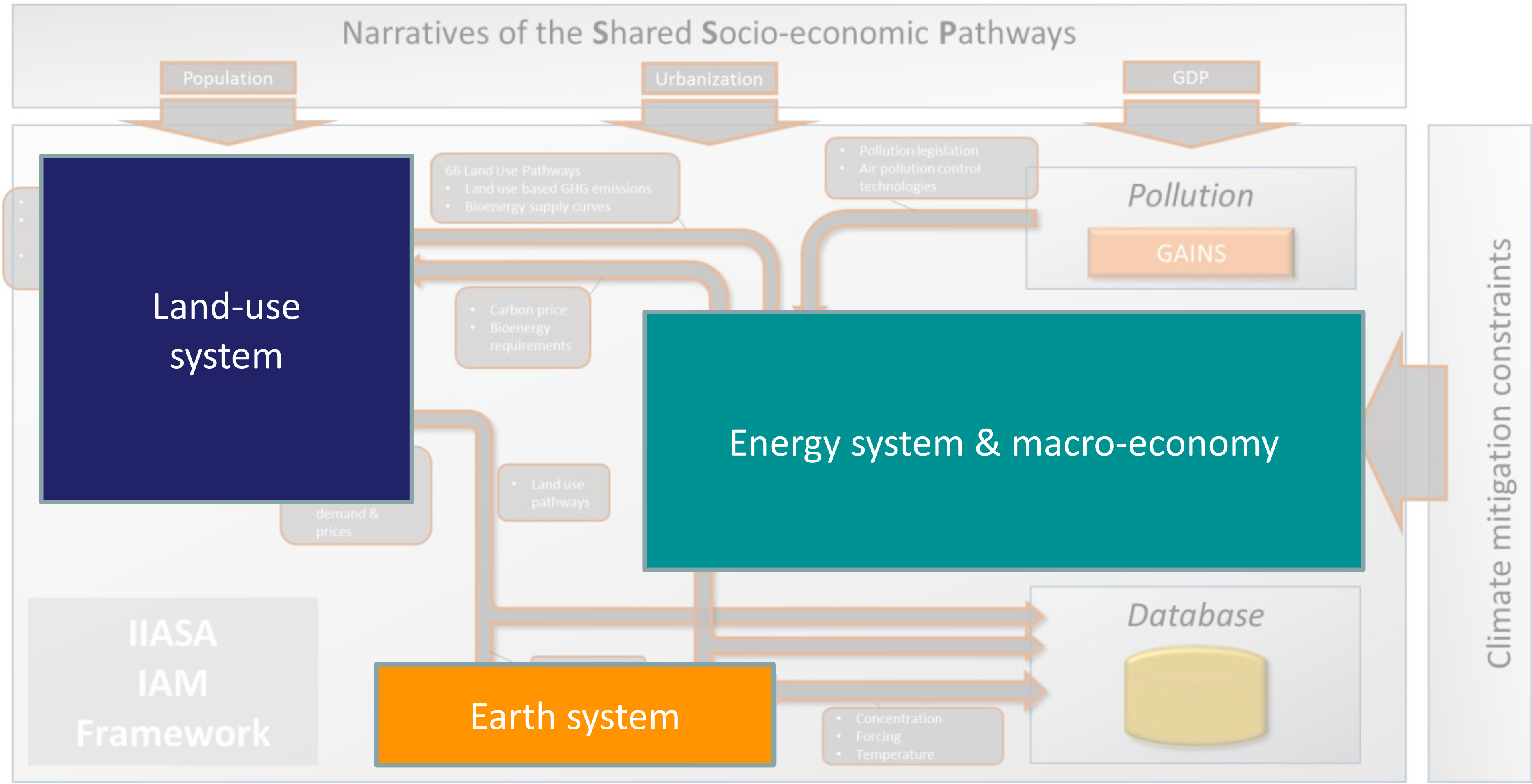

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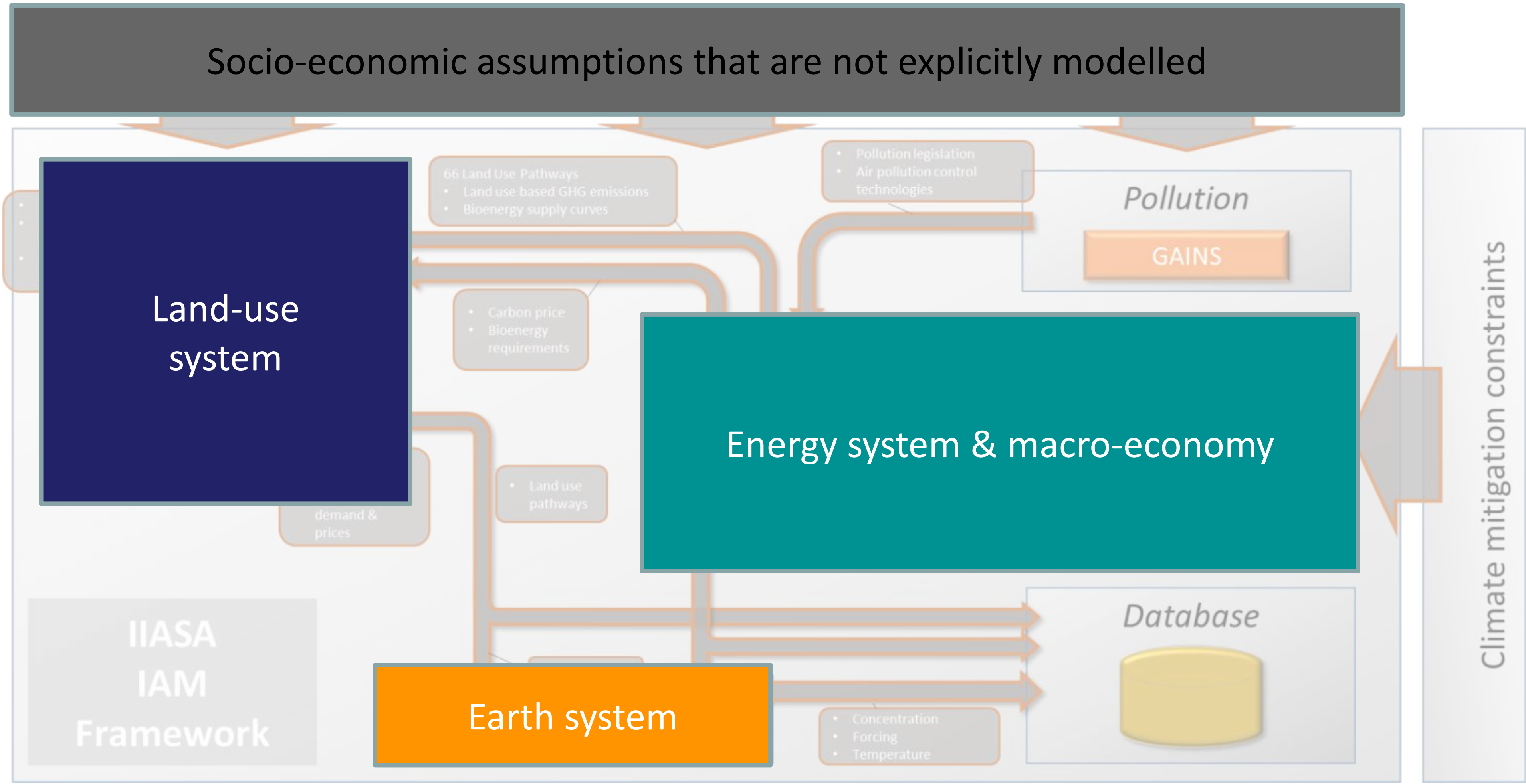
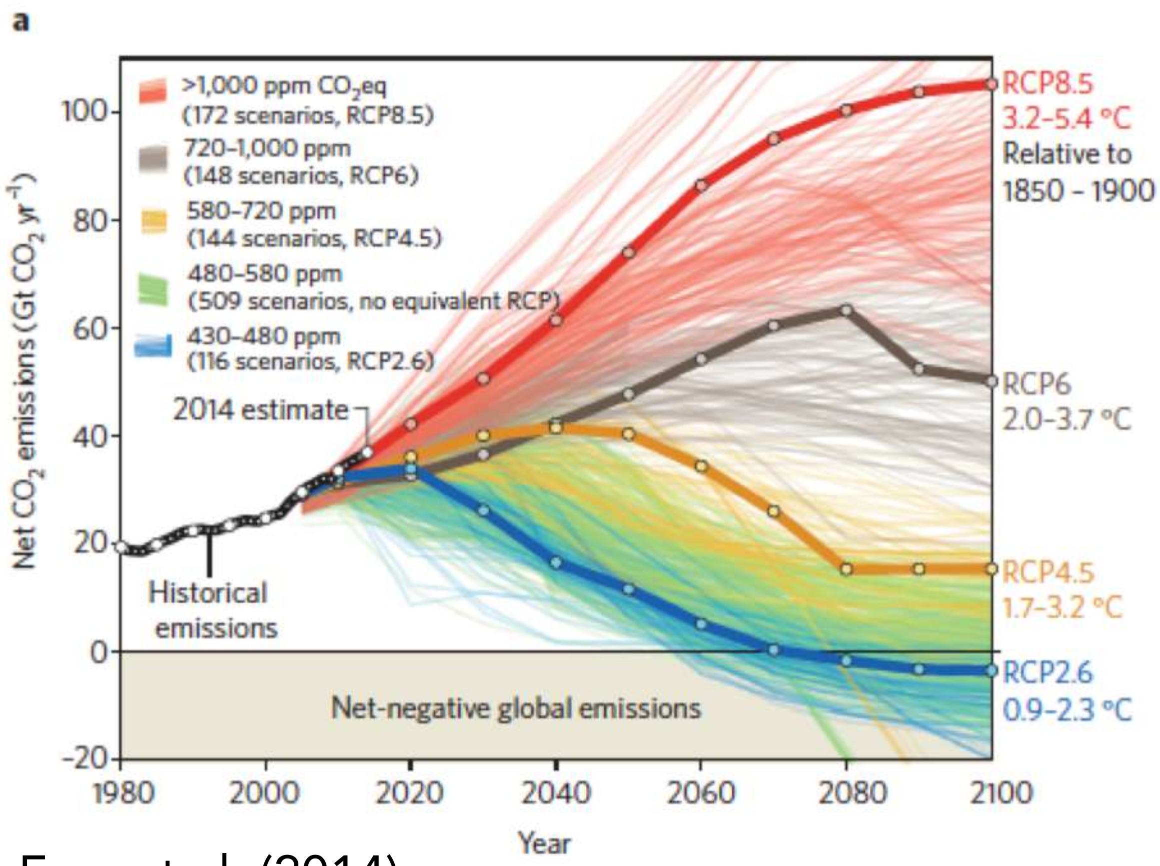


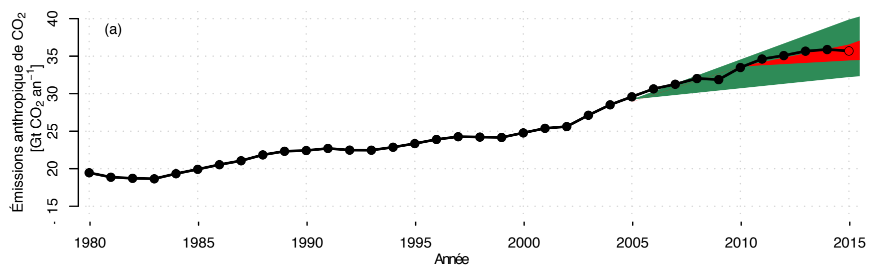
Friko et al. (2016)

Let’s have a quick look at the scenario database



Fuss et al. (2014)

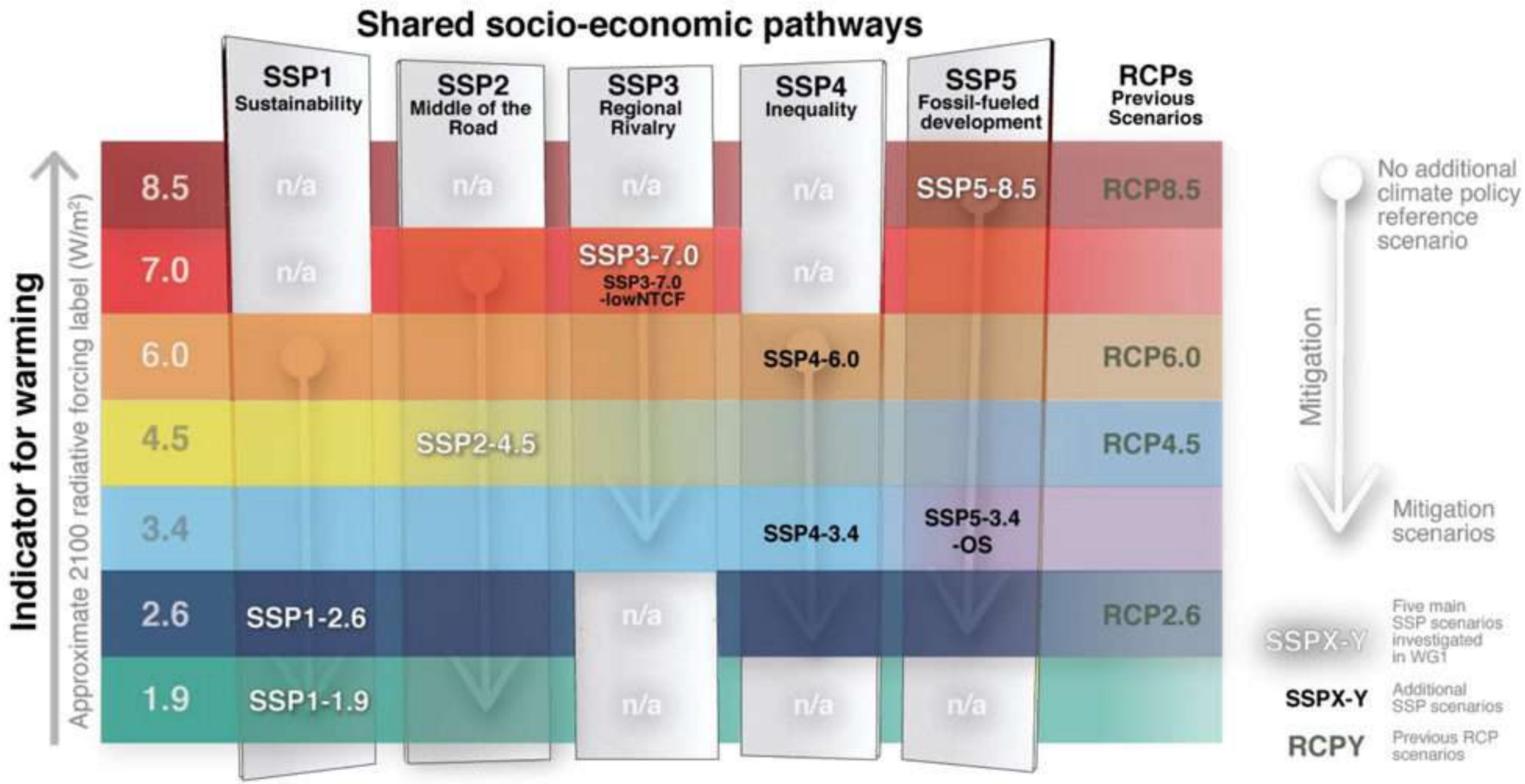
More than 1000 emissions pathways
Bold lines are archetypes pathways
See assessed temperature range on the right (from 0.9° C to 5.4° C from the preindustrial level)



How SRES (green) and RCP (red) emission pathways compare with past historical emissions
⇒ mid-term fit is rather good!

Séférian et al. (2016)

The SSP approach



The SSP approach allows a comprehensive mapping of the future narratives. It shows that:

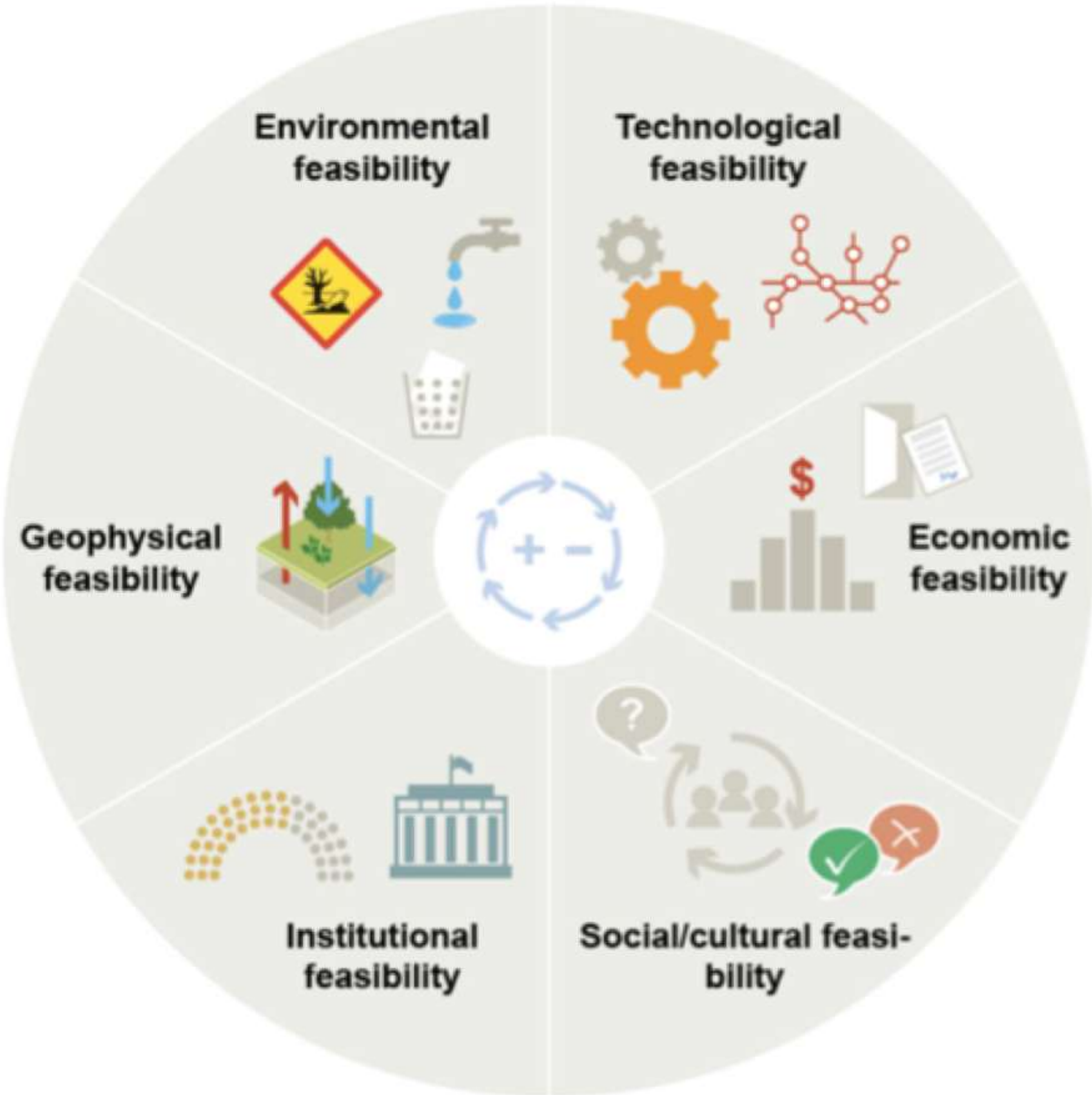
⇒ A given climate target can be reached under several pathways (SSP1 and SSP5 for instance)

⇒ Some pathways have a smaller set of solutions that others

IPCC AR6 WGI (2021)

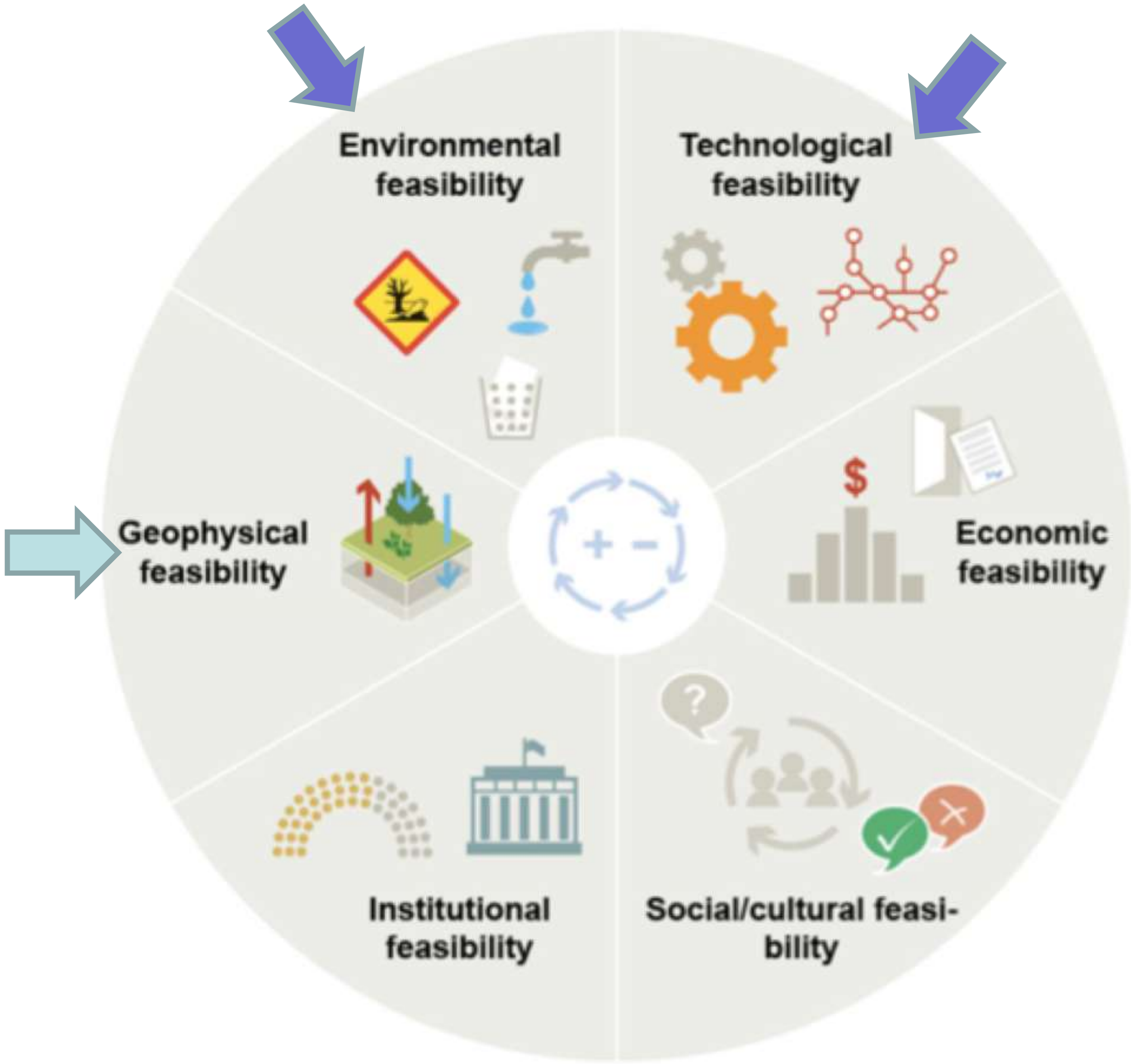
Carbon budgets: a geophysical tool to inform mitigation pathways

How defining feasibility ?



IPCC SR15 (2018)

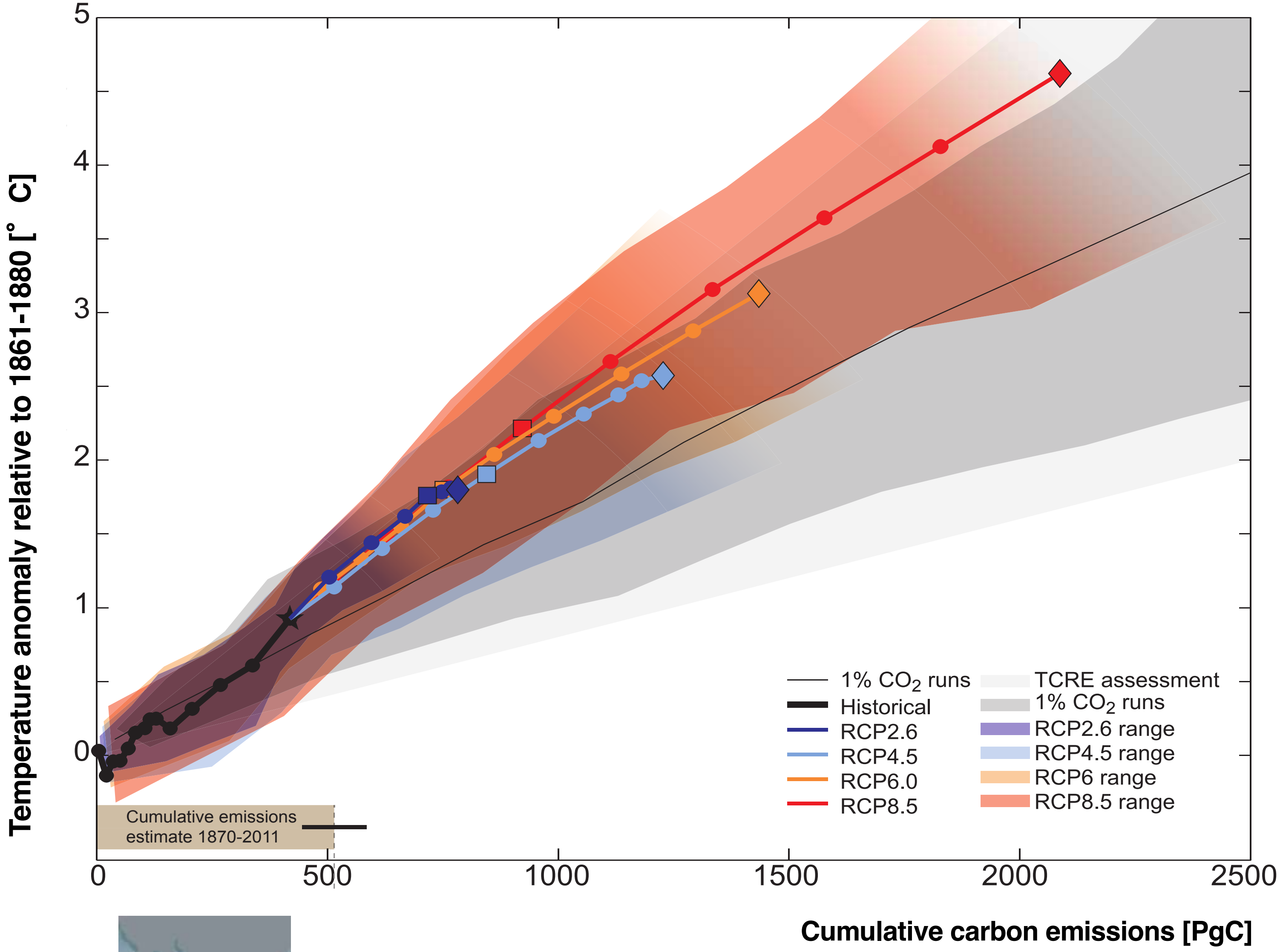
How defining feasibility ?



IPCC SR15 (2018)

The transient climate response to cumulative CO_2 emissions: an emerging properties

Warming



Total emissions

IPCC 2013, Simplified version of Figure 1 TFE.8

The transient climate response to cumulative CO_2 emissions: an emerging properties of ESMs

Drivers of this near-linear relationship (MacDougall & Friedlingstein 2015):

(1) the diminishing radiative forcing from CO_2 per unit mass is compensated by the diminishing ability of the ocean to take up heat and carbon.

(2) This relationship is maintained as long as the ocean carbon uptake remains the dominant driver of the change in atmospheric CO_2

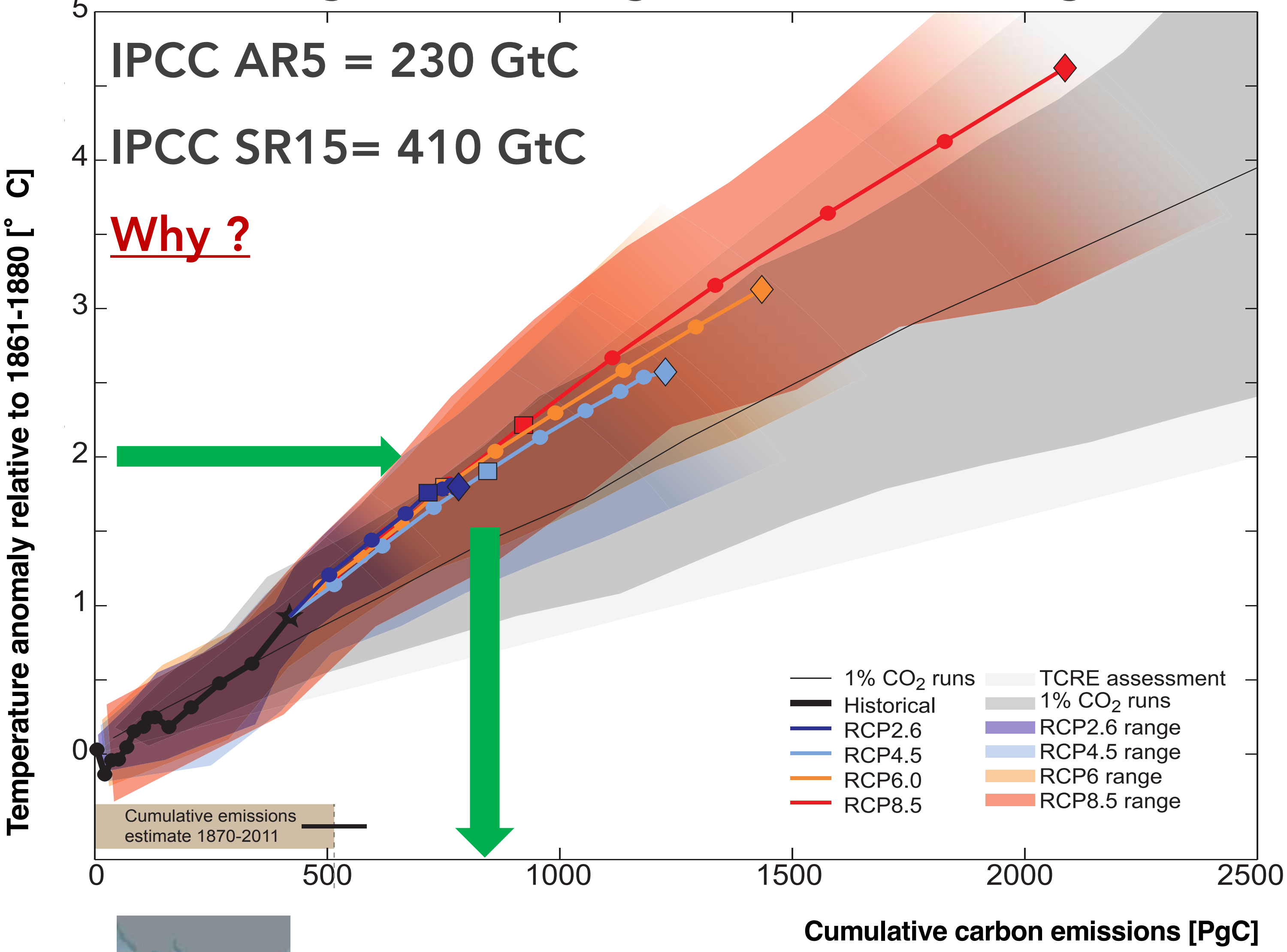
(3) Climate-carbon cycle feedbacks play a smaller role except when CO_2 emissions decline

$\Rightarrow$ **Ocean Heat and Carbon uptake are the main players of the Transient Climate response to cumulative emissions (TCRE)**

An introduction to the carbon budget concept

Remaining carbon budget for **2ºC** warming from 2018 (50%)

Warming



Total emissions

IPCC 2013, Simplified version of Figure 1 TFE.8

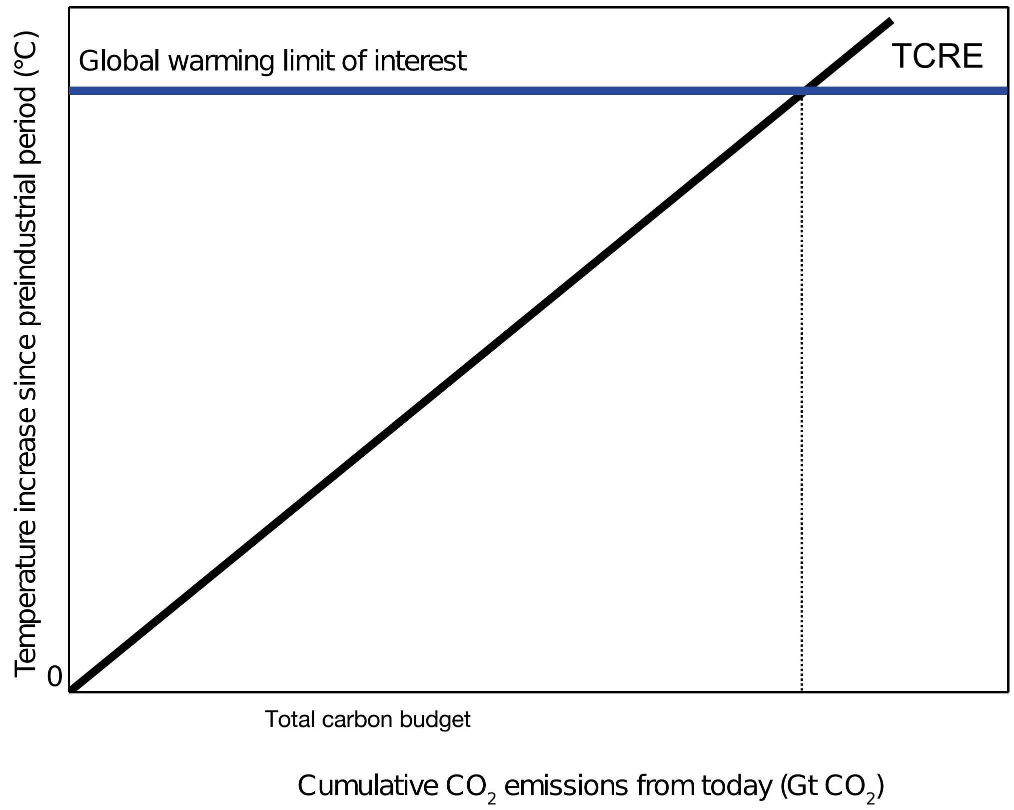
A new framework to determine carbon budgets

Remaining budget

1.5 ºC

$$B_{lim} = \; T_{lim}$$

1.5 ºC



Rogelj et al. 2019

A new framework to determine carbon budgets

Remaining budget

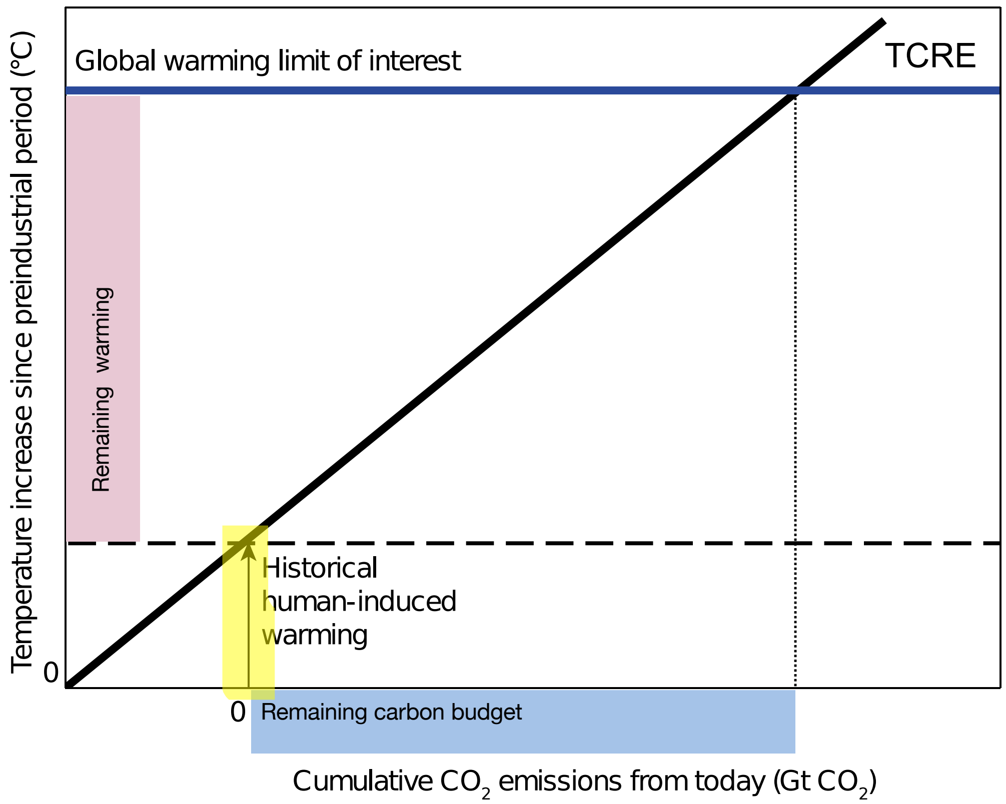
1.5 ºC

$$B_{lim} = \frac{T_{lim} - T_{hist}}{}$$

Historical warming

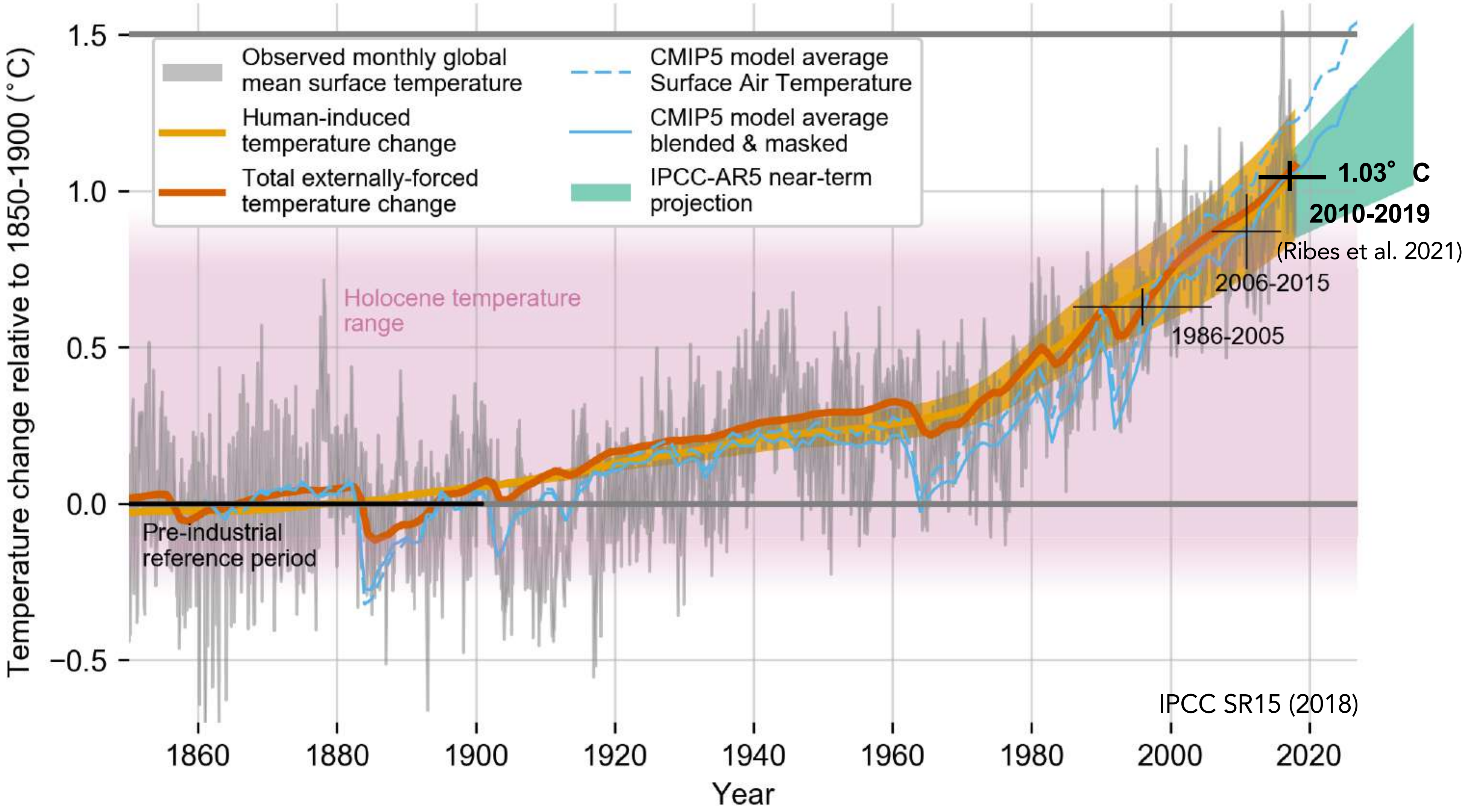
- Uncertainty in the observed wa measurement (± 43%)

1.5 ºC



Rogelj et al. 2019

Historical human-induced warming



⇒ Paris agreement and carbon budget concept make the use of human-induced warming

⇒ Detection and Attribution methods helps to decompose the human-induced warming from the total externally-forced warming

⇒ +1.15° C ±0.15° C in 2020 (from Ribes et al. 2020)

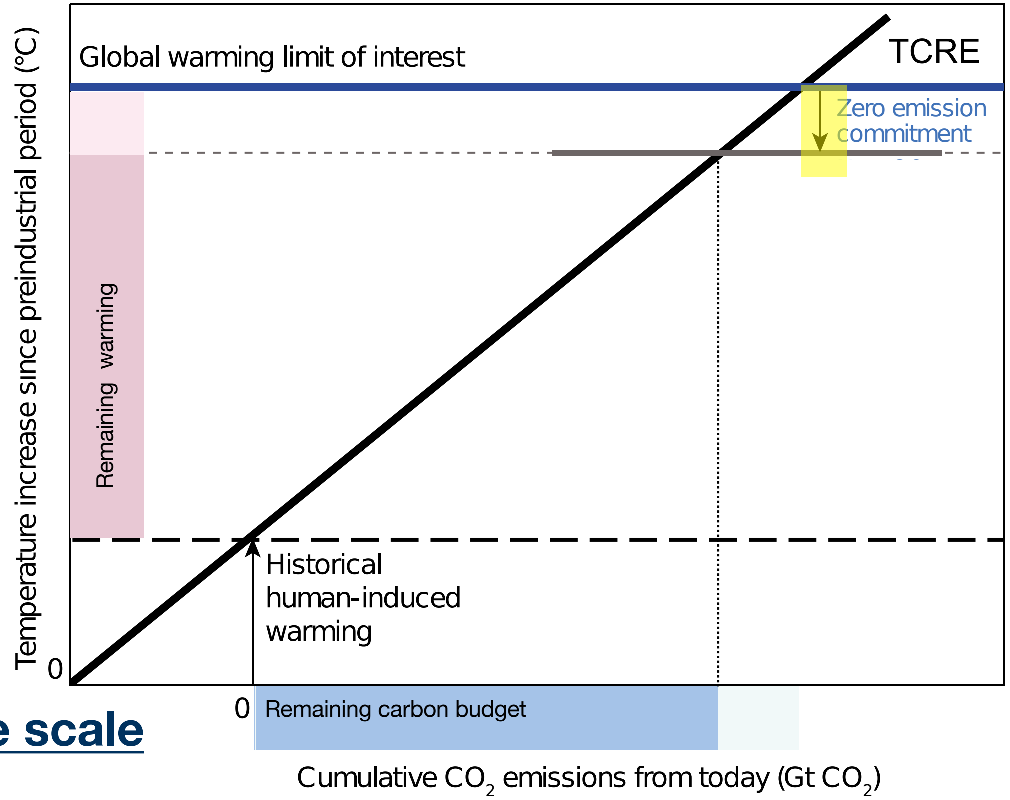
A new framework to determine carbon budgets

Remaining budget

1.5 °C

$$B_{lim} = \quad T_{lim} - T_{hist} - T_{ZEC}$$

1.5 °C



Zero Emission Committed warming

- Often assumed to be negligible
- **knowledge gap at multi-decadal time scale**

How much warming can we expect once emissions are stopped or reach a net-zero level?

(Jones *at al*. 2019; MacDougall *et al*. 2019)

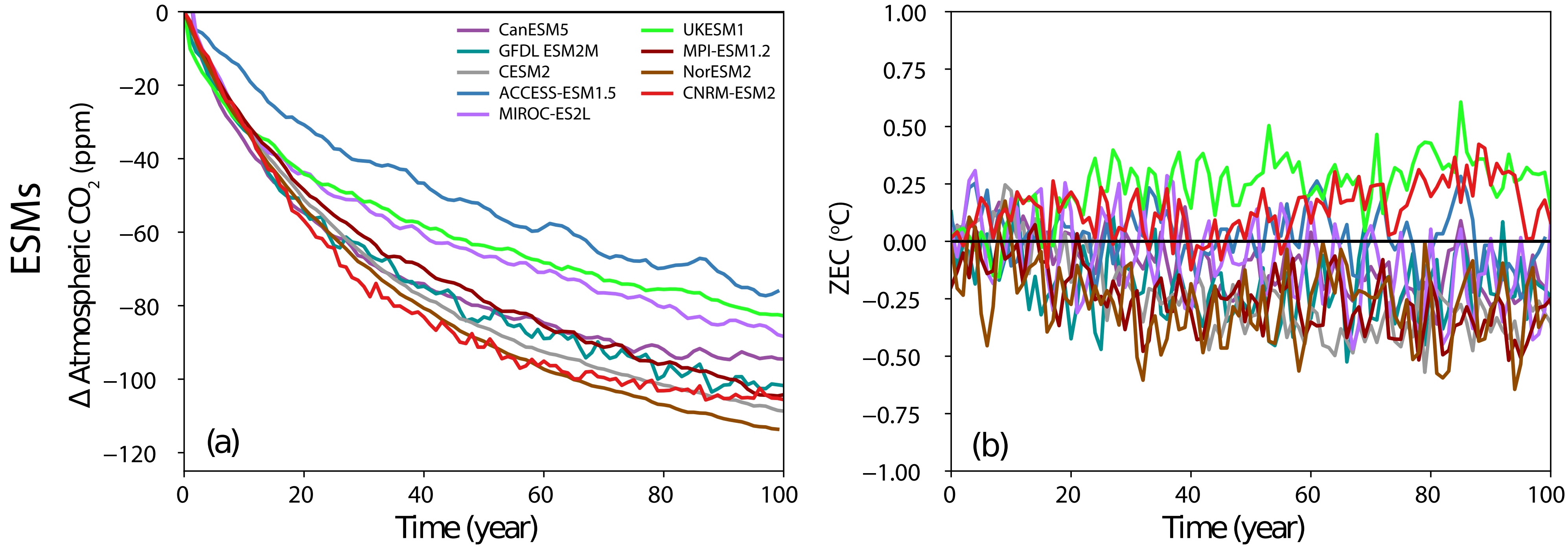
Rogelj et al. 2019

Zero emission committment

⇒Characterize the response of the Earth system to emission cessation

The Zero Emissions Commitment Model Intercomparison Project (ZECMIP) contribution to C4MIP: quantifying committed climate changes following zero carbon emissions

Chris D. Jones[1], Thomas L. Frölicher[2,3], Charles Koven[4], Andrew H. MacDougall[5], H. Damon Matthews[6], Kirsten Zickfeld[7], Joeri Rogelj[8,9], Katarzyna B. Tokarska[10,11], Nathan P. Gillett[12], Tatiana Ilyina[13], Malte Meinshausen[14,15], Nadine Mengis[7,16], Roland Séférian[17], Michael Eby[18], and Friedrich A. Burger[2,3]



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ΔT_{ZEC} for a carbon budget compatible with 2° C (3670 $GtCO_2$)

models	**GFDL-ESM2M**	**UKESM1**	**CNRM-ESM2-1**
ΔT_{ZEC}	-0.05 °C	+0.5 °C	+0.25°C
Change in Carbon budget (TCRE=0.4°C per 1000 $GtCO_2$)	+ 125 $GtCO_2$	- 1250 $GtCO_2$	-625 $GtCO_2$

A new framework to determine carbon budgets

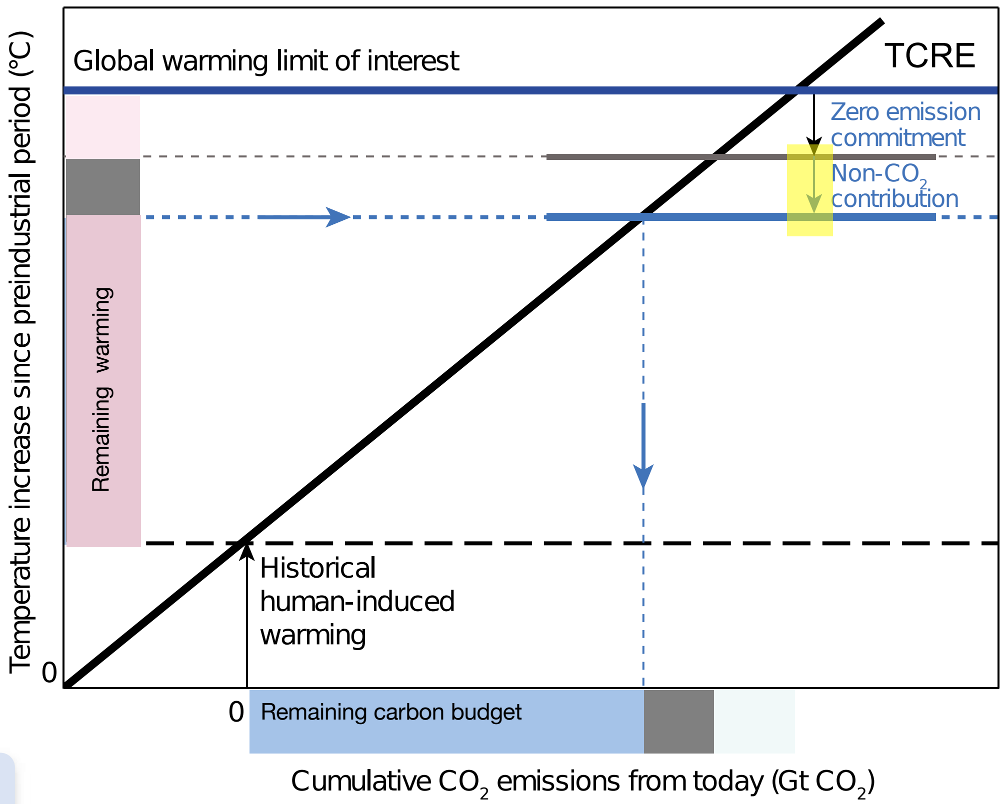
Remaining budget **1.5 °C**

1.5 °C

$$B_{lim} = \frac{T_{lim} - T_{hist} - T_{ZEC} - T_{non_{CO_2}}}{}$$

Non-CO_2 forcing

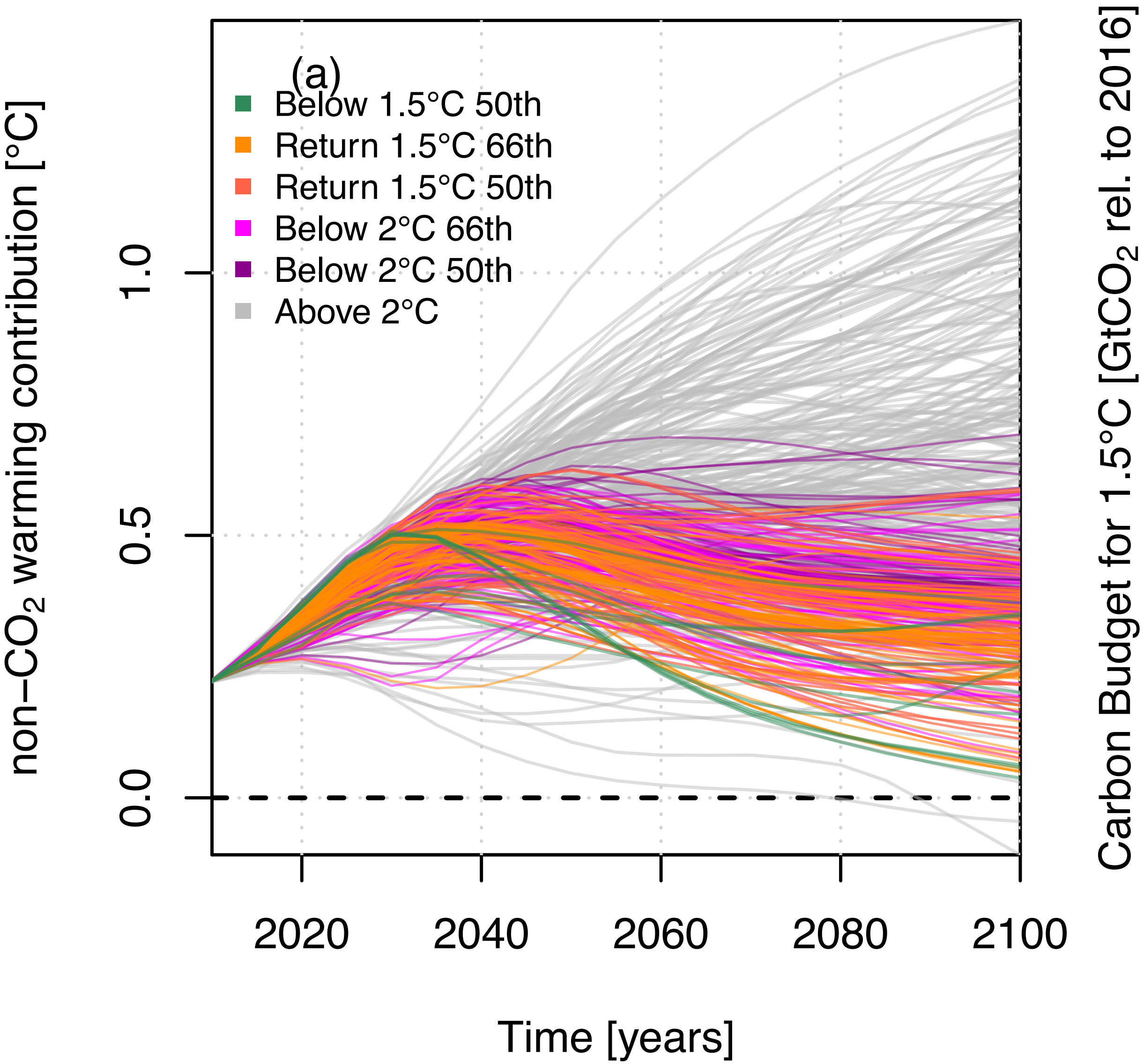
- **Earth system response to forcing** (-69% to +34 %)
- **Future scenario uncertainty** (± 43%)



Rogelj et al. 2019

Contribution of non-CO_2

⇒Warming contribution ~0.5C at the peak of warming
⇒Large uncertainty associated with technological/infrastructure choices



A new framework to determine carbon budgets

Remaining budget

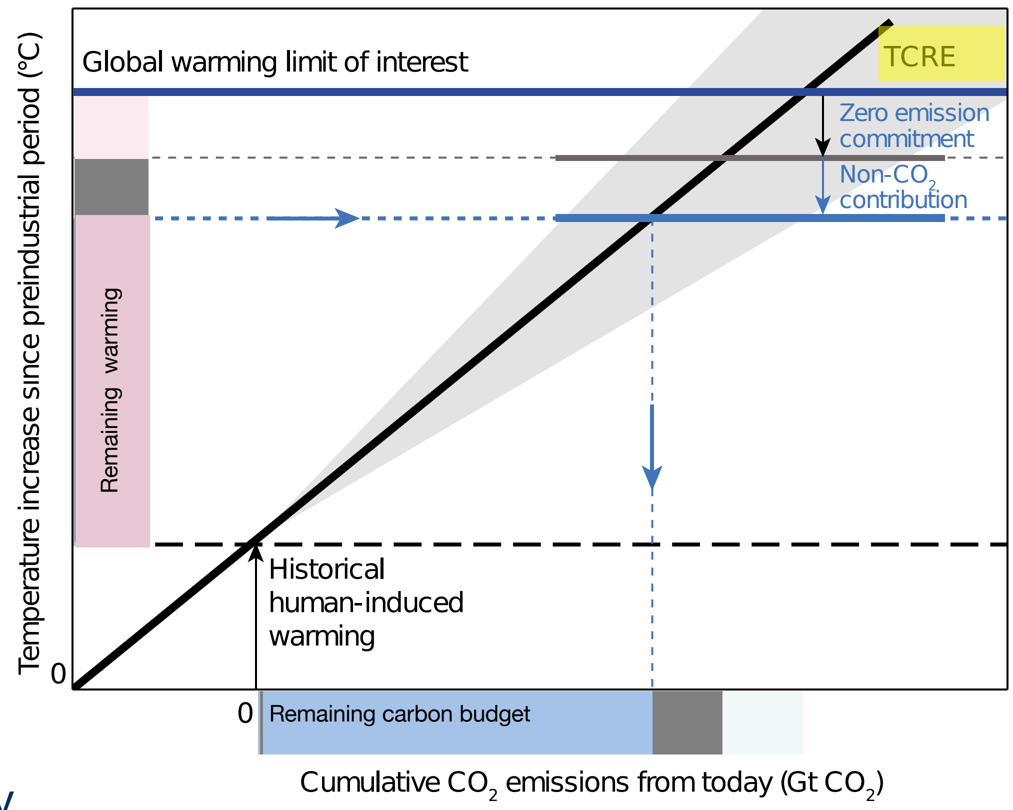
1.5 °C

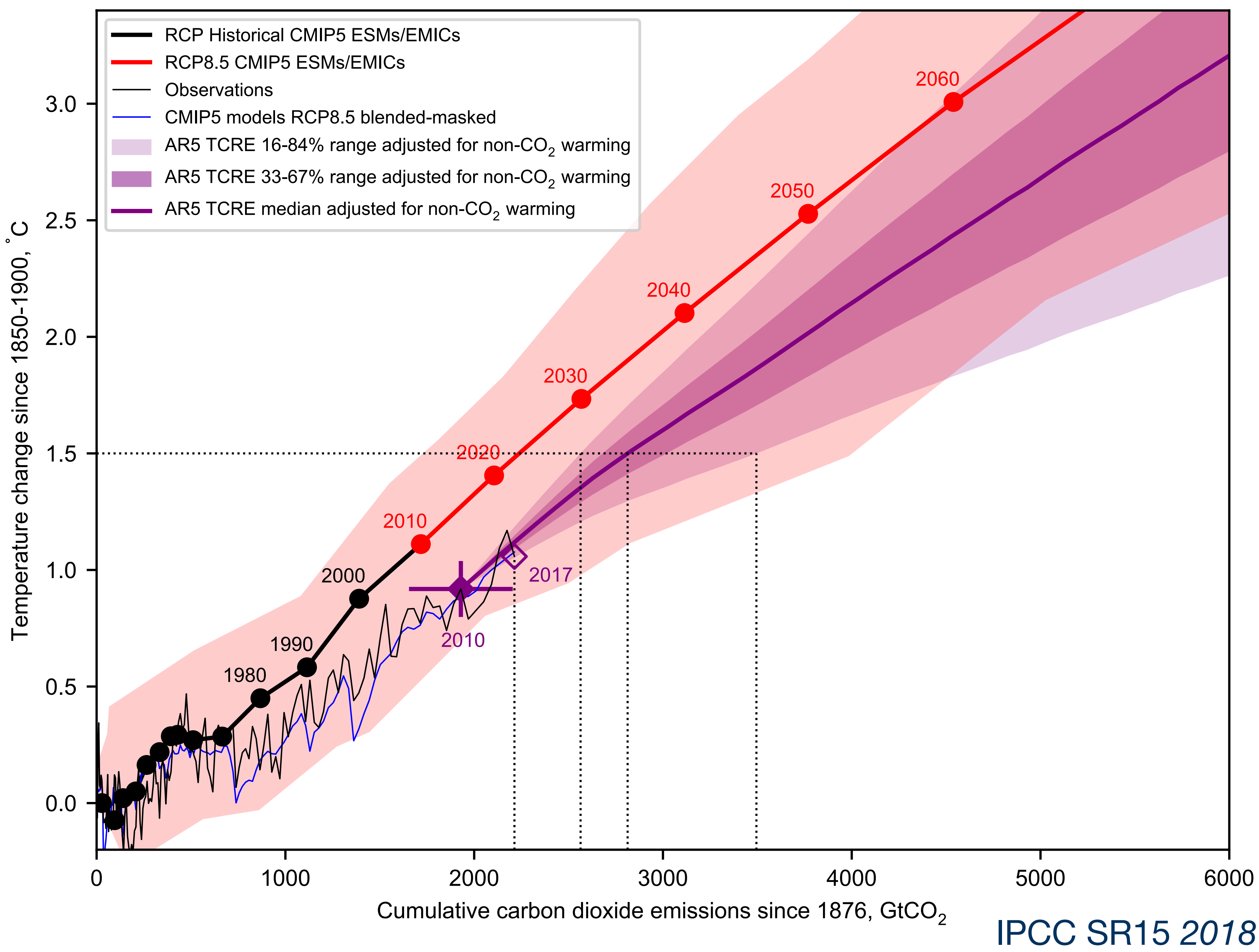
$$B_{lim} = \frac{T_{lim} - T_{hist} - T_{ZEC} - T_{nonCO_2}}{TCRE}$$

TCRE distribution

- Observation contrained TCRE
- Distribution of the TCRE remains poorly constrained

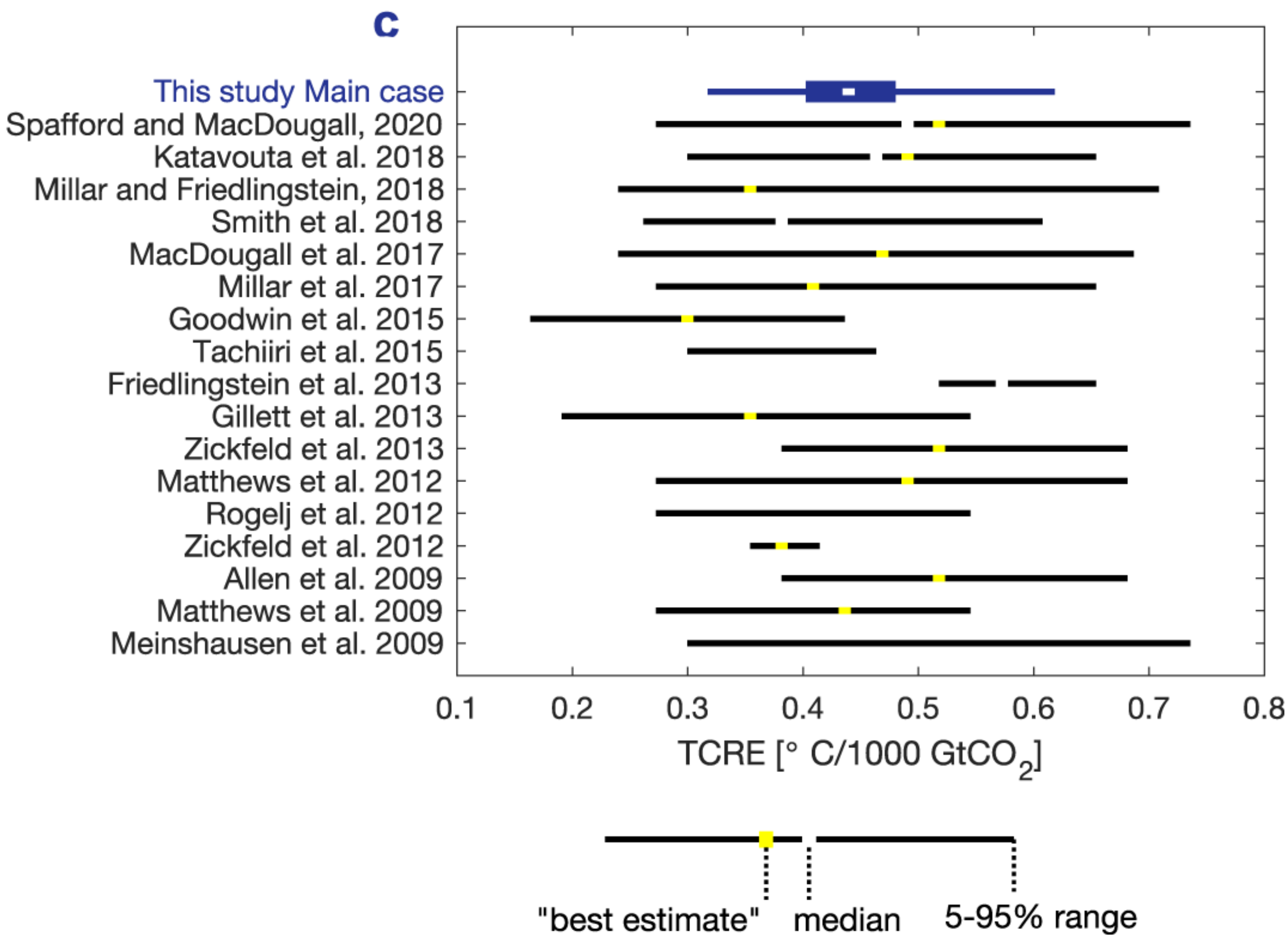
1.5 °C





RCP Historical CMIP5 ESMs/EMICs
RCP8.5 CMIP5 ESMs/EMICs
Observations
CMIP5 models RCP8.5 blended-masked
AR5 TCRE 16-84% range adjusted for non-CO_2 warming
AR5 TCRE 33-67% range adjusted for non-CO_2 warming
AR5 TCRE median adjusted for non-CO_2 warming
Temperature change since 1850-1900, ˚C
Cumulative carbon dioxide emissions since 1876, $GtCO_2$
0.0
0.5
1.0
1.5
2.0
2.5
3.0
0
1000
2000
3000
4000
5000
6000
1980
1990
2000
2010
2020
2030
2040
2050
2060
2010
2017
IPCC SR15 *2018*

Transient Climate response to Cumulative CO_2 emissions



Matthews et al. (2021)

A new framework to determine carbon budgets

Remaining budget

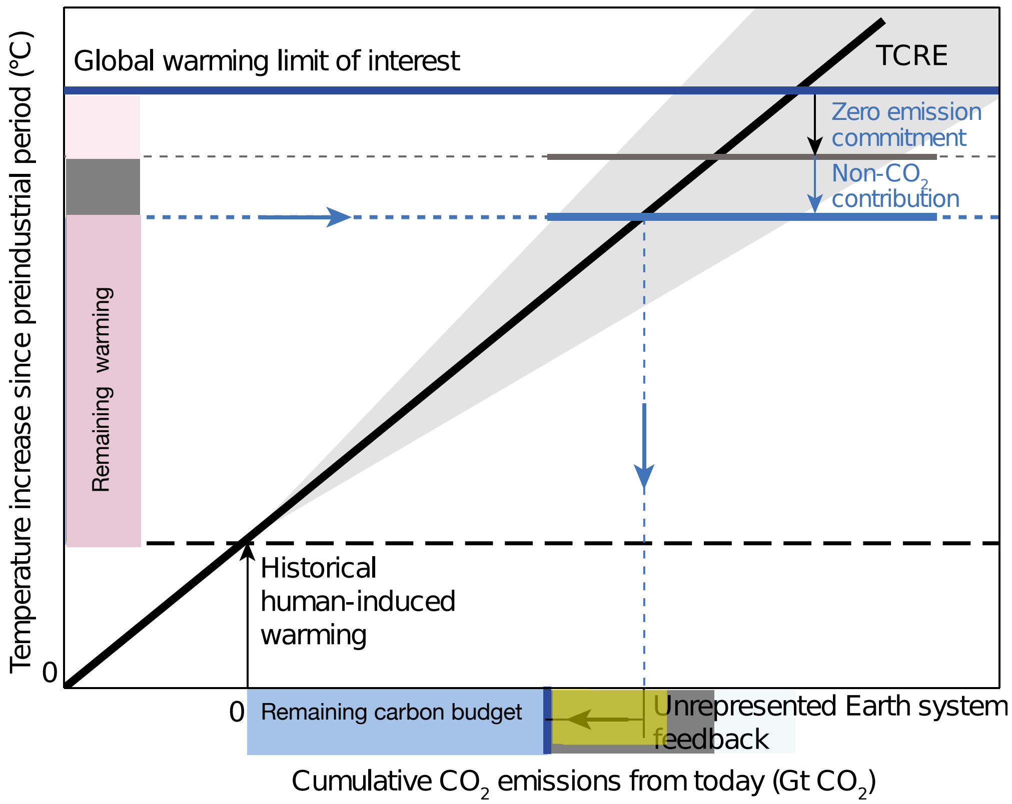
1.5 °C

1.5 °C

$$B_{lim} = \frac{T_{lim} - T_{hist} - T_{ZEC} - T_{non_{CO_2}}}{TCRE} - E_{fdb}$$

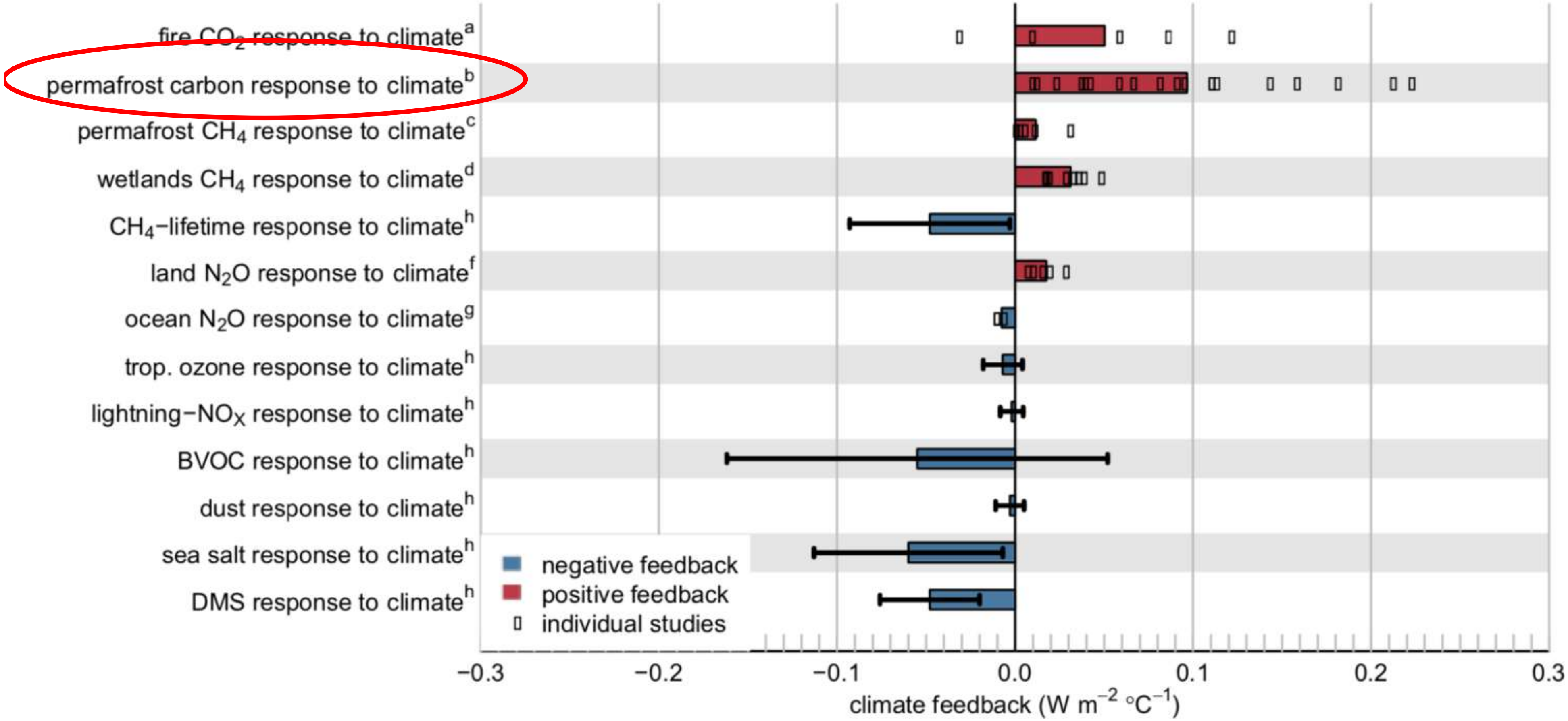
Unrepresented Earth System Feedbacks

- e.g. permafrost carbon cycle feedbacks (- 17%)
- Reductions of carbon budgets due to permafrost carbon cycle feedbacks (Gasser et al., 2017; MacDougall et al., 2016).



Rogelj et al. 2019

Unrepresented Earth system feedbacks



⇒Uncertain, poorly understood

⇒Permafrost carbon feedback remains the prominent contributor of the carbon budget reduction

⇒May reduce remaining carbon budget by 100 $GtCO_2$

IPCC AR6 WGI (2021)

Carbon budgets compatible with 1.5C or 2C

Table SPM.2 | Estimates of historical carbon dioxide (CO_2) emissions and remaining carbon budgets. Estimated remaining carbon budgets are calculated from the beginning of 2020 and extend until global net zero CO_2 emissions are reached. They refer to CO_2 emissions, while accounting for the global warming effect of non-CO_2 emissions. Global warming in this table refers to human-induced global surface temperature increase, which excludes the impact of natural variability on global temperatures in individual years.
{Table 3.1, 5.5.1, 5.5.2, Box 5.2, Table 5.1, Table 5.7, Table 5.8, Table TS.3}

Global Warming Between 1850–1900 and 2010–2019 (°C)		Historical Cumulative CO_2 Emissions from 1850 to 2019 ($GtCO_2$)					
1.07 (0.8–1.3; likely range)		2390 (± 240; likely range)					
Approximate global warming relative to 1850–1900 until temperature limit (°C)[a]	Additional global warming relative to 2010–2019 until temperature limit (°C)	Estimated remaining carbon budgets from the beginning of 2020 ($GtCO_2$) *Likelihood of limiting global warming to temperature limit*[b]					Variations in reductions in non-CO_2 emissions[c]
		17%	*33%*	*50%*	*67%*	*83%*	
1.5	0.43	900	650	500	400	300	Higher or lower reductions in accompanying non-CO_2 emissions can increase or decrease the values on the left by 220 $GtCO_2$ or more
1.7	0.63	1450	1050	850	700	550	
2.0	0.93	2300	1700	1350	1150	900	

[a] Values at each 0.1°C increment of warming are available in Tables TS.3 and 5.8.

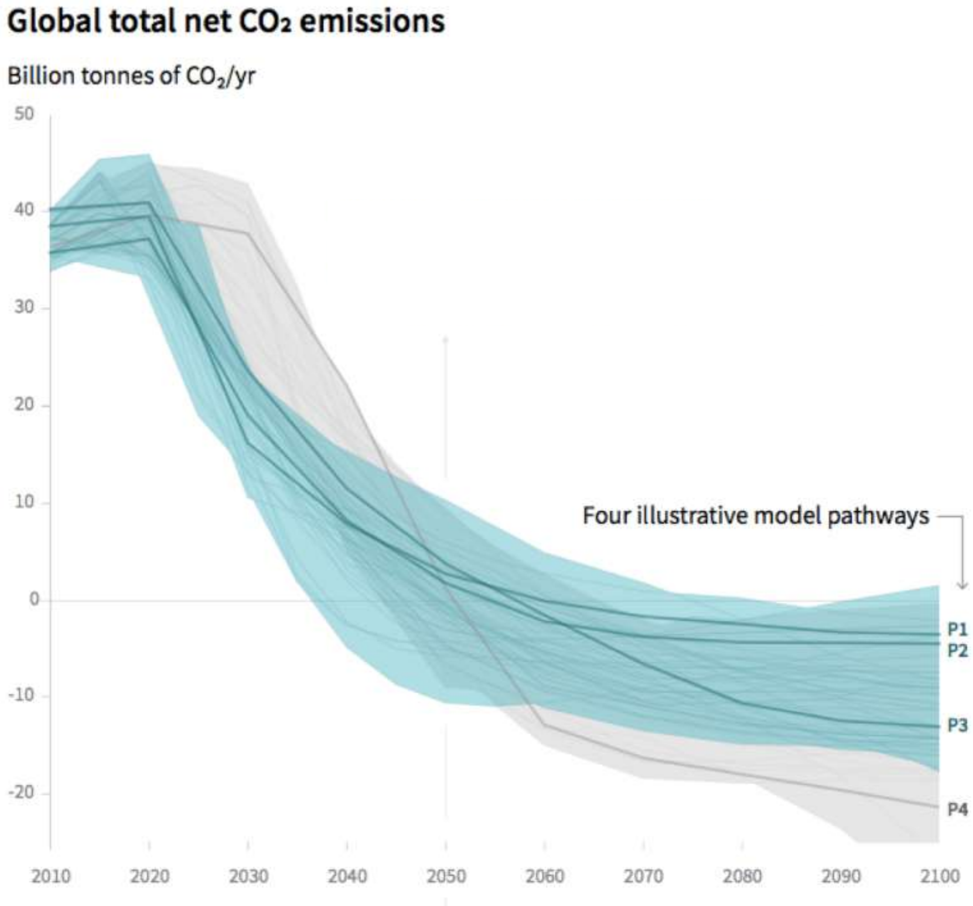
[b] This likelihood is based on the uncertainty in transient climate response to cumulative CO_2 emissions (TCRE) and additional Earth system feedbacks and provides the probability that global warming will not exceed the temperature levels provided in the two left columns. Uncertainties related to historical warming (±550 $GtCO_2$) and non-CO_2 forcing and response (±220 $GtCO_2$) are partially addressed by the assessed uncertainty in TCRE, but uncertainties in recent emissions since 2015 (±20 $GtCO_2$) and the climate response after net zero CO_2 emissions are reached (±420 $GtCO_2$) are separate.

[c] Remaining carbon budget estimates consider the warming from non-CO_2 drivers as implied by the scenarios assessed in SR1.5. The Working Group III Contribution to AR6 will assess mitigation of non-CO_2 emissions.

IPCC SR15 (2018), IPCC AR6 WGI (2021)

Mitigation pathways compatible with the remaining carbon budget for 1.5° C (or 2° C)

Mitigation pathways compatible with 1.5-2° C



In order to hold global warming below 1.5° C, CO_2 emission should be reduced by 45% in 2030 with respect to 2010 level

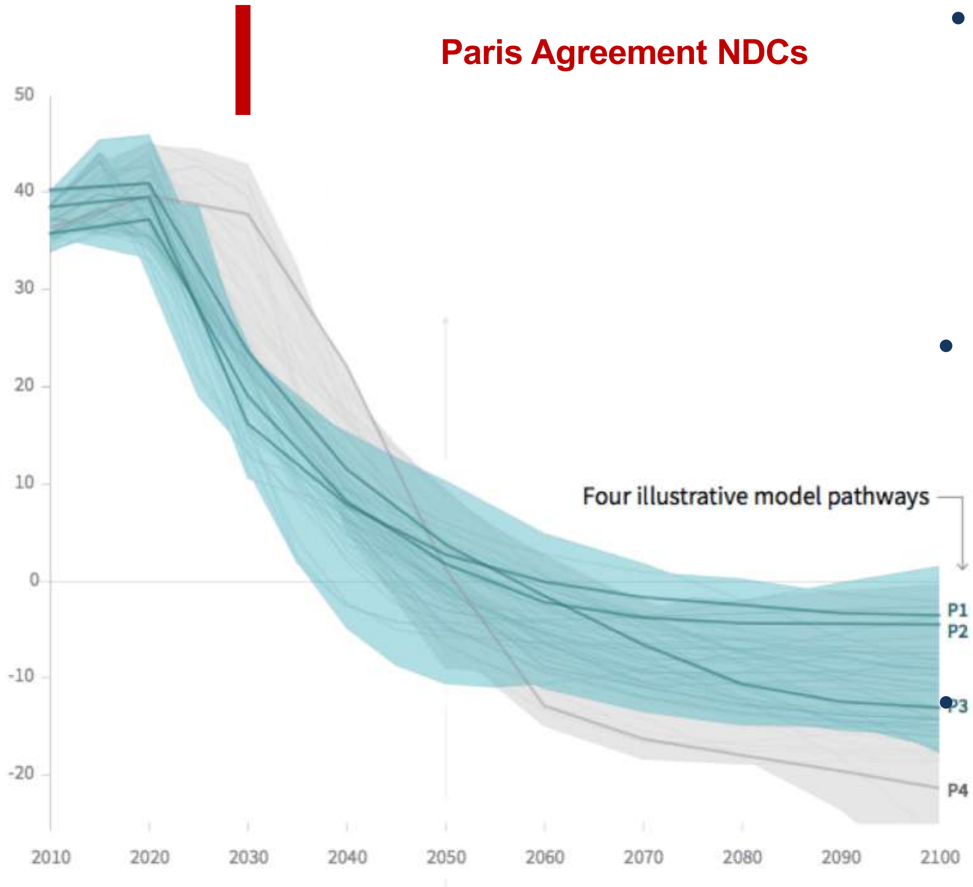
→ *20% for 2° C*

In order to hold global warming below 1.5° C, CO_2 emission shoud be "net zero" by 2050

→ *By 2075 for 2° C*

Reduction in other (non CO_2) greenhouse gases and aerosols will have immediated impact on health

Mitigation pathways compatible with 1.5-2° C



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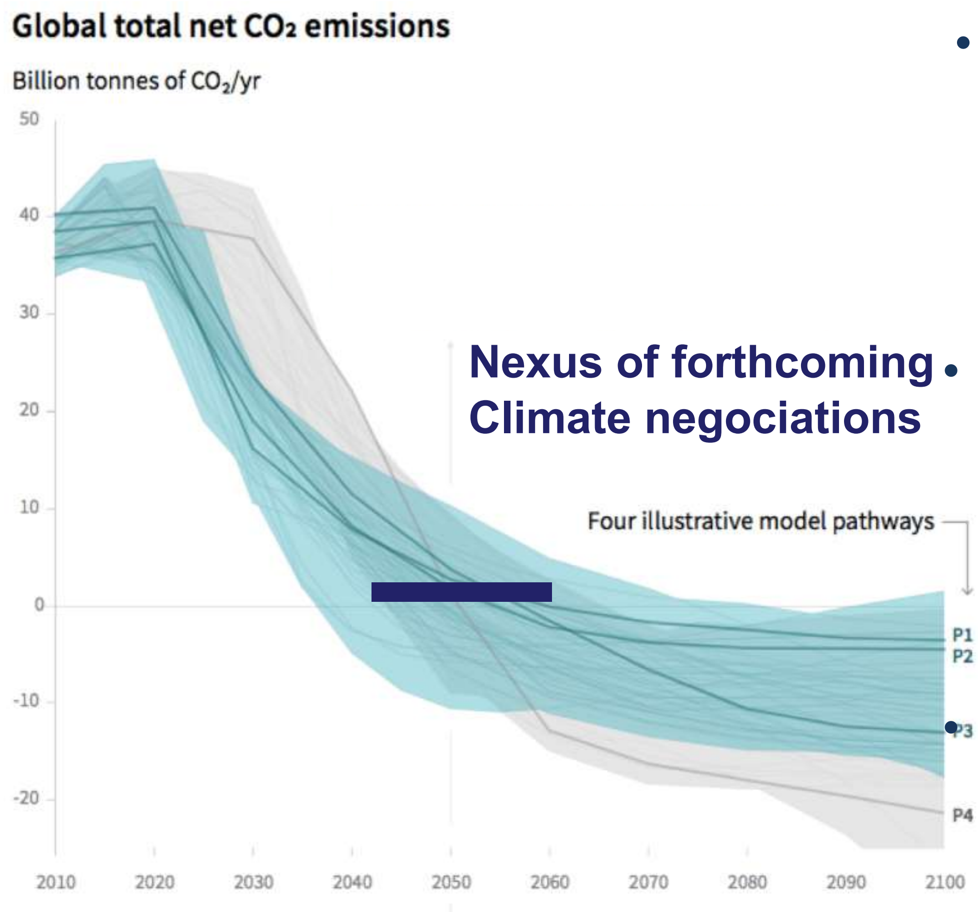

Nexus of forthcoming Climate negociations

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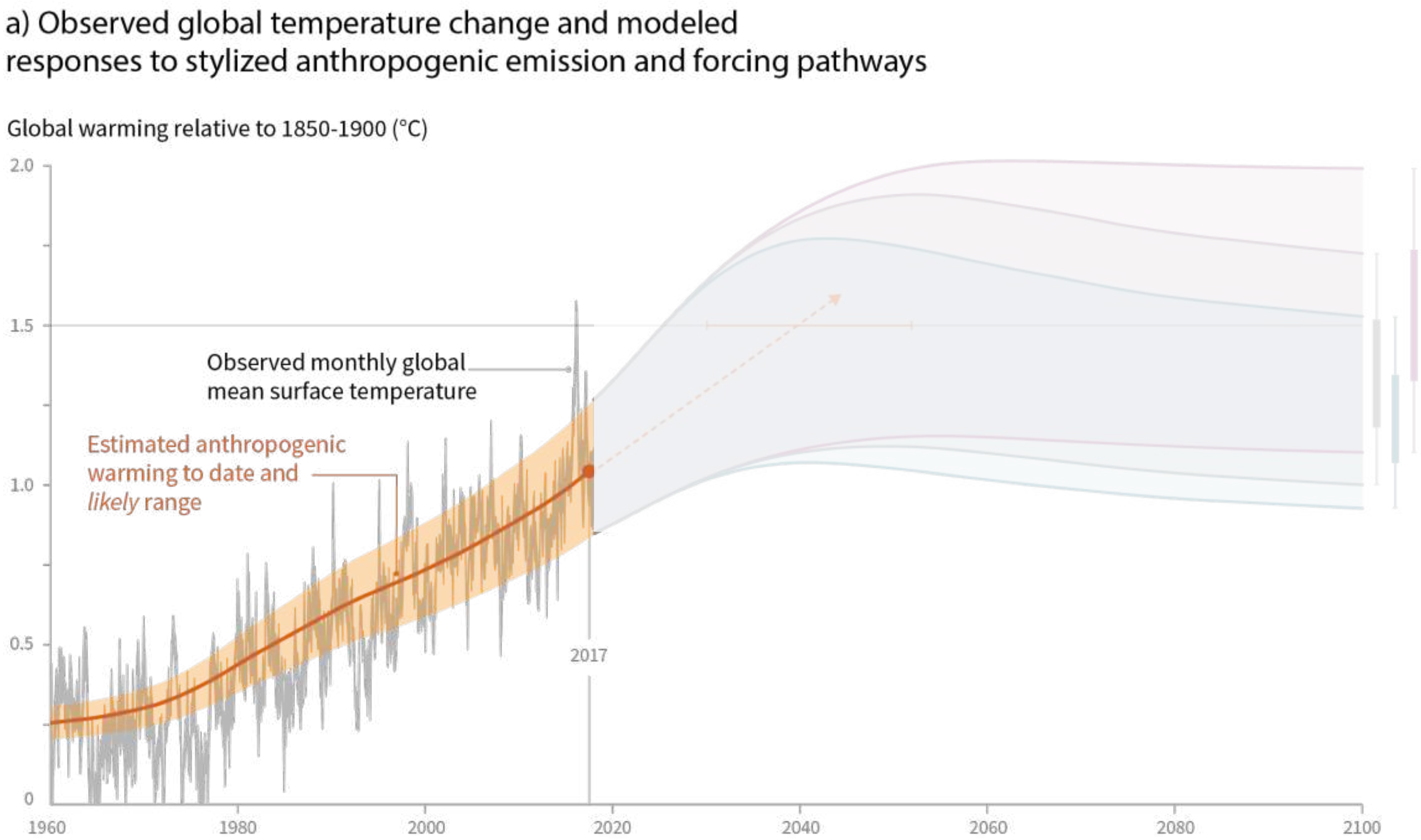
- Reduction in other (non CO_2) greenhouse gases and aerosols will have immediated impact on health

Associated warming projections by 2100

Our ambition to reduced human-induced greenhouse gases emission drive the likelihood to halt global warming below 1.5° C



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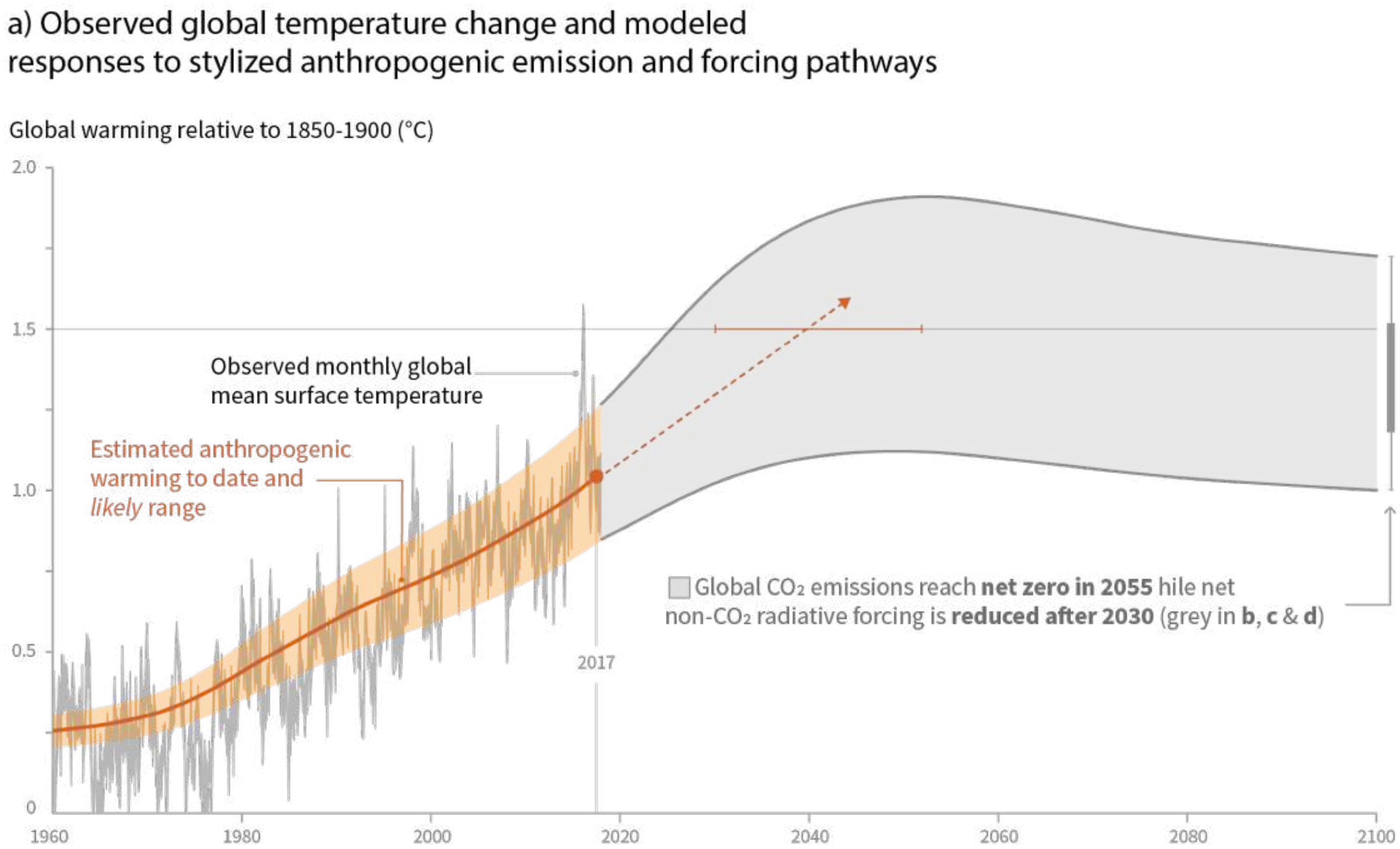
⇒ Carbon Neutrality in 2055 + emission cuts for CH_4, N_2O, CFCs



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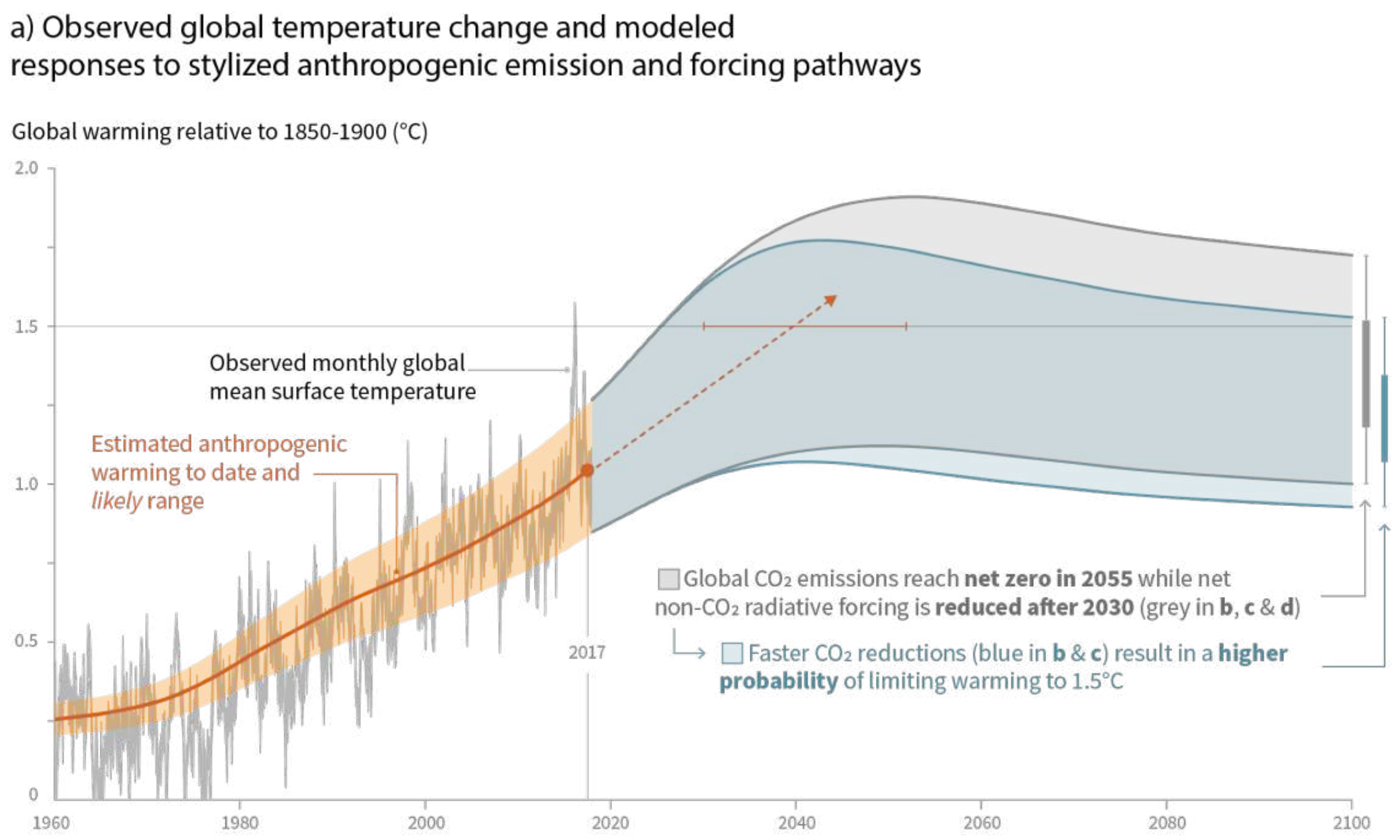
⇒ The timing of carbon neutrality increase this likelihood



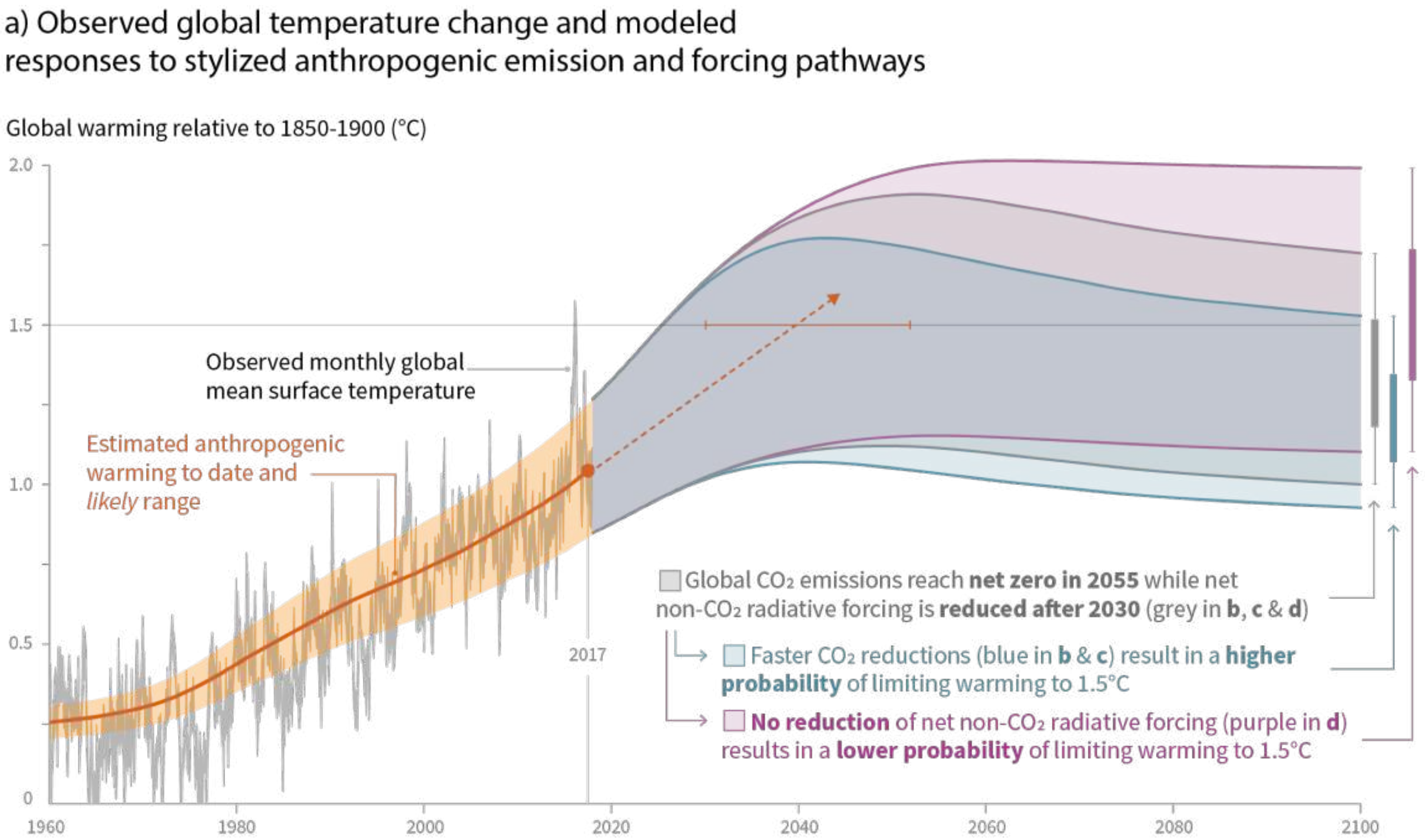
Associated warming projections by 2100

Our ambition to reduced human-induced greenhouse gases emission drive the likelihood to halt global warming below 1.5° C:

⇒ Carbon Neutrality in 2055 + emission cuts for CH_4, N_2O, CFCs

⇒ The timing of carbon neutrality increase this likelihood

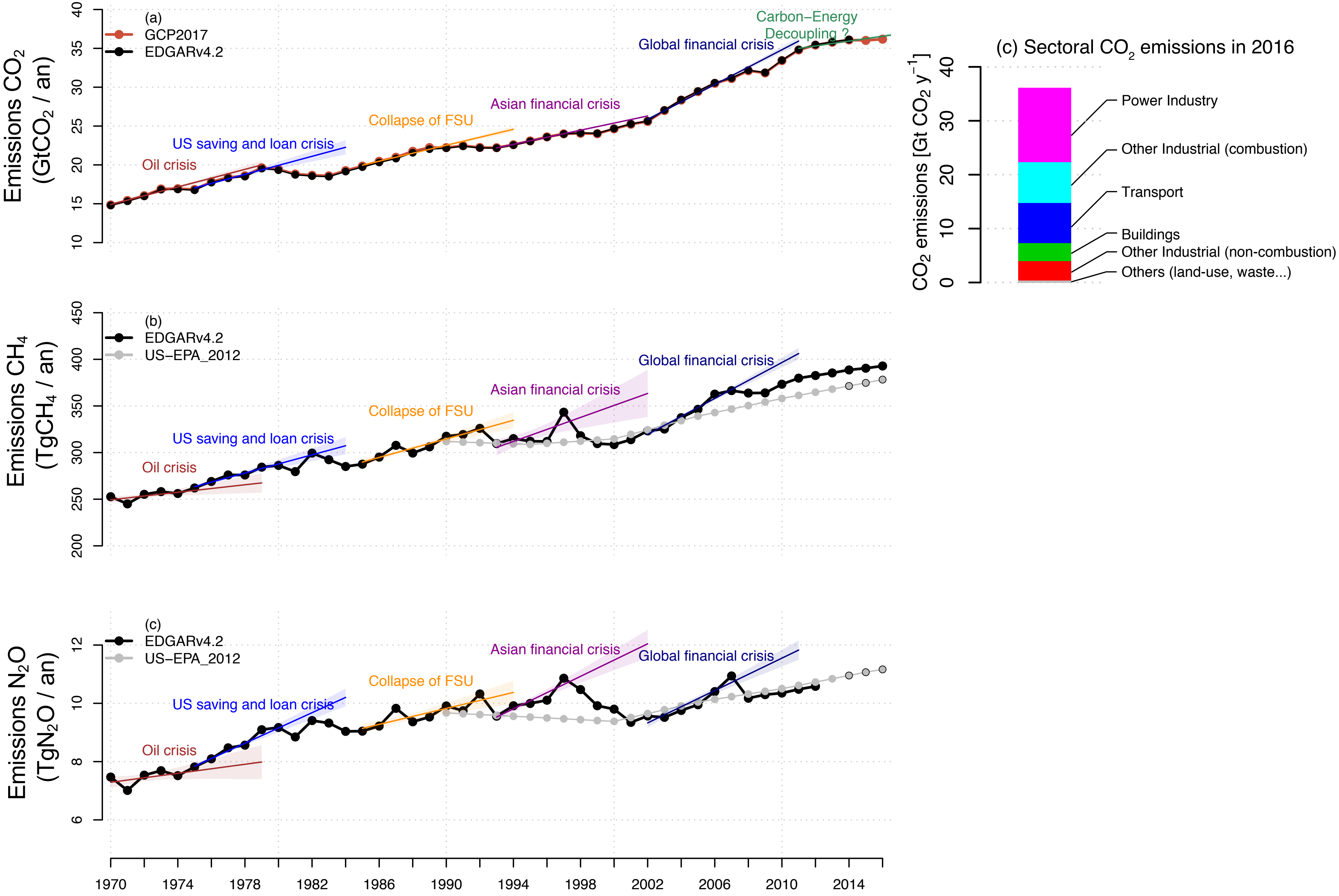
⇒ Emission cuts for CH_4, N_2O, CFCs are required to halt warming below 1.5° C



Sectoral Implications
of stringent mitigation pathways

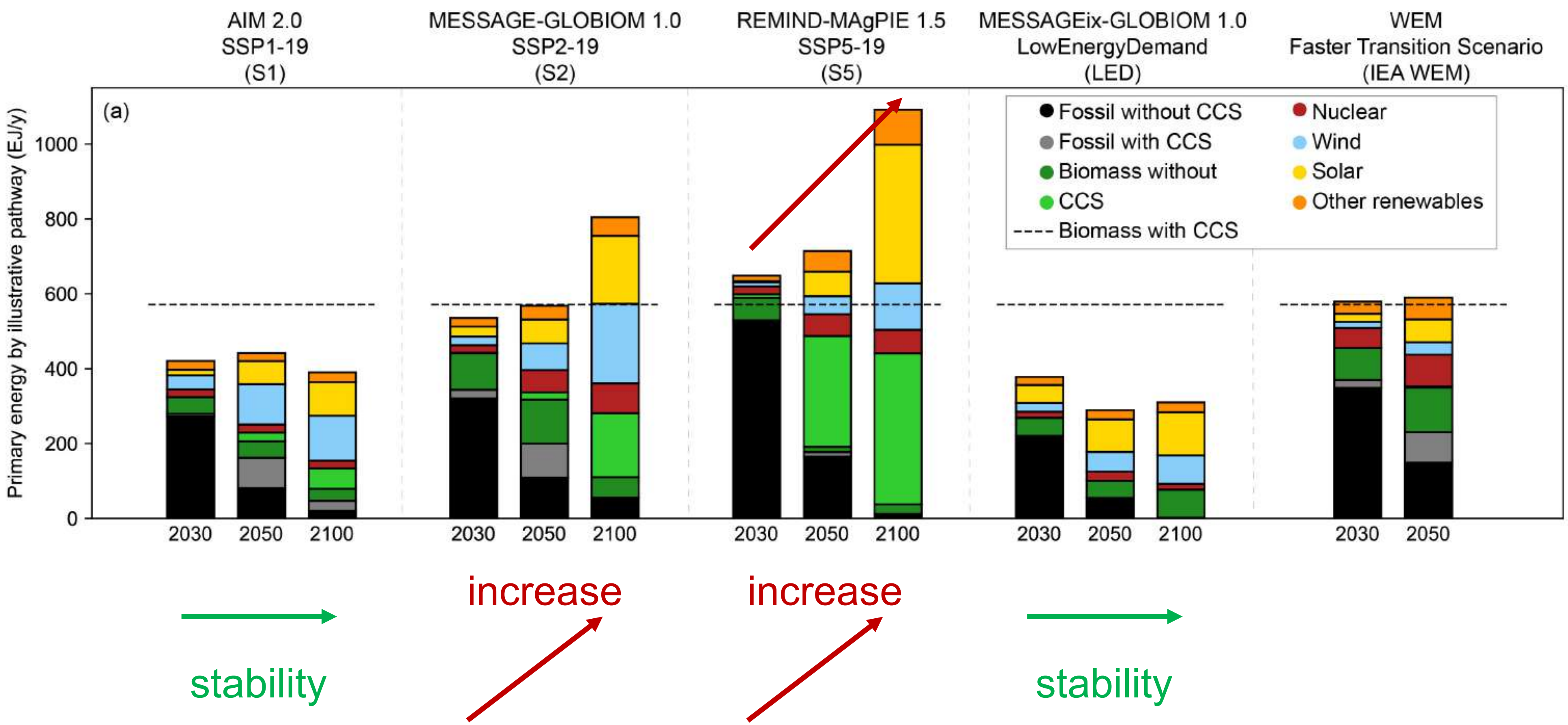
Overview

Anthropogenic GHG emissions are connected to global economics



Primary energy supply

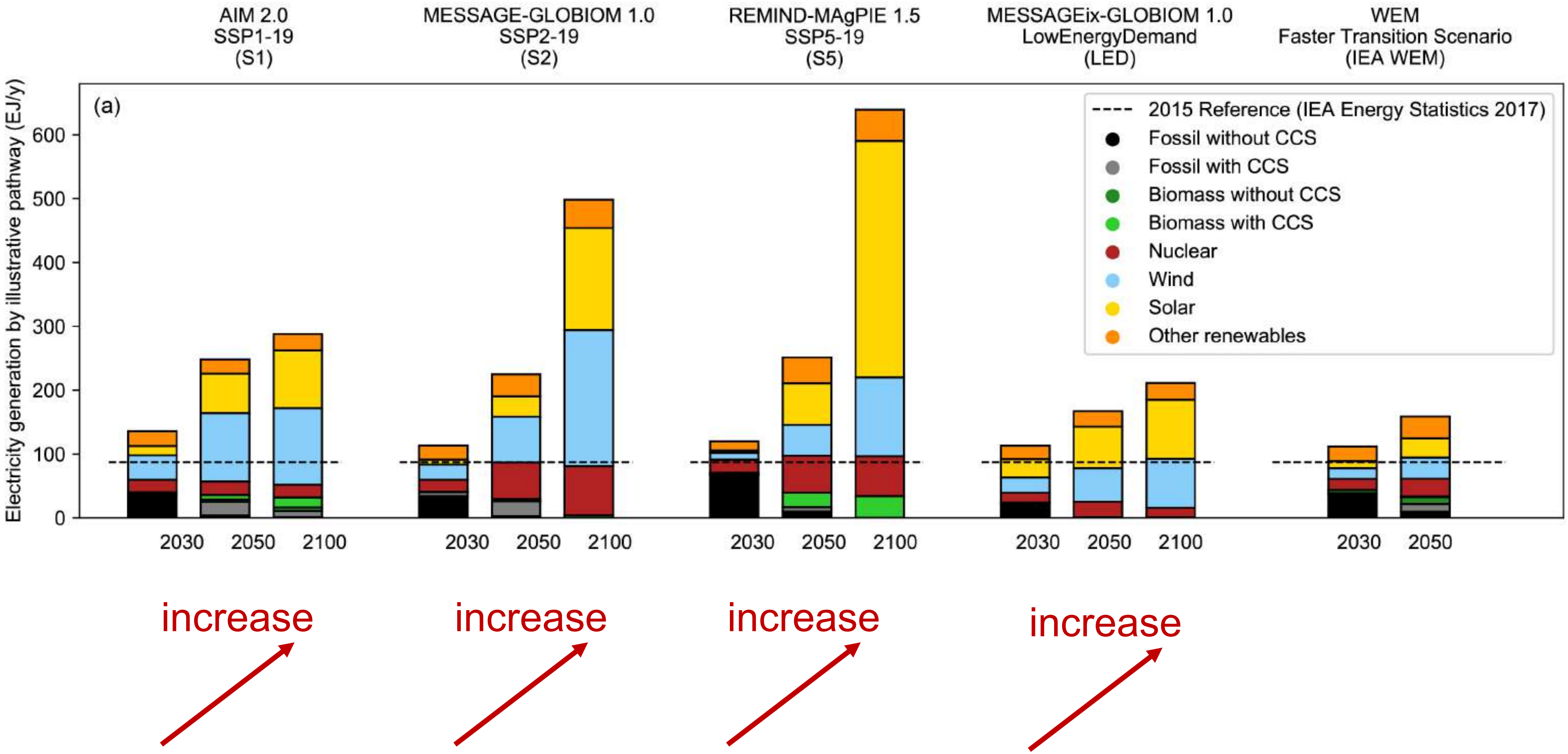
for the four illustrative pathway archetypes plus the IEA's Faster Transition Scenario



IPCC SR15 (2018)

Electricity generation

for the four illustrative pathway archetypes plus the IEA's Faster Transition Scenario



Reduction in Energy Supply but Increase in Electricity, **why ?**

IPCC SR15 (2018)

What mitigation pathways tell us on the energy supply ?

Global indicators	P1	P2	P3	P4	Interquartile range
Pathway classification	No or low overshoot	No or low overshoot	No or low overshoot	High overshoot	No or low overshoot
CO_2 emission change in 2030 (% rel to 2010)	-58	-47	-41	4	(-59,-40)
└ in 2050 (% rel to 2010)	-93	-95	-91	-97	(-104,-91)
Kyoto-GHG emissions in 2030 (% rel to 2010)*	-50	-49	-35	-2	(-55,-38)
└ in 2050 (% rel to 2010)	-82	-89	-78	-80	(-93,-81)
*Final energy demand** in 2030 (% rel to 2010)*	-15	-5	17	39	(-12, 7)
└ in 2050 (% rel to 2010)	-32	2	21	44	(-11, 22)
Renewable share in electricity in 2030 (%)	60	58	48	25	(47, 65)
└ in 2050 (%)	77	81	63	70	(69, 87)
Primary energy from coal in 2030 (% rel to 2010)	-78	-61	-75	-59	(-78, -59)
└ in 2050 (% rel to 2010)	-97	-77	-73	-97	(-95, -74)
from oil in 2030 (% rel to 2010)	-37	-13	-3	86	(-34,3)
└ in 2050 (% rel to 2010)	-87	-50	-81	-32	(-78,-31)
from gas in 2030 (% rel to 2010)	-25	-20	33	37	(-26,21)
└ in 2050 (% rel to 2010)	-74	-53	21	-48	(-56,6)
from nuclear in 2030 (% rel to 2010)	59	83	98	106	(44,102)
└ in 2050 (% rel to 2010)	150	98	501	468	(91,190)
from biomass in 2030 (% rel to 2010)	-11	0	36	-1	(29,80)
└ in 2050 (% rel to 2010)	-16	49	121	418	(123,261)
from non-biomass renewables in 2030 (% rel to 2010)	430	470	315	110	(243,438)
└ in 2050 (% rel to 2010)	832	1327	878	1137	(575,1300)
Cumulative CCS until 2100 ($GtCO_2$)	0	348	687	1218	(550, 1017)
└ of which BECCS ($GtCO_2$)	0	151	414	1191	(364, 662)
Land area of bioenergy crops in 2050 (million hectare)	22	93	283	724	(151, 320)
Agricultural CH_4 emissions in 2030 (% rel to 2010)	-24	-48	1	14	(-30,-11)
in 2050 (% rel to 2010)	-33	-69	-23	2	(-46,-23)
Agricultural N_2O emissions in 2030 (% rel to 2010)	5	-26	15	3	(-21,4)
in 2050 (% rel to 2010)	6	-26	0	39	(-26,1)

NOTE: Indicators have been selected to show global trends identified by the Chapter 2 assessment. National and sectoral characteristics can differ substantially from the global trends shown above.

** Kyoto-gas emissions are based on SAR GWP-100*
*** Changes in energy demand are associated with improvements in energy efficiency and behaviour change*

Température et émissions

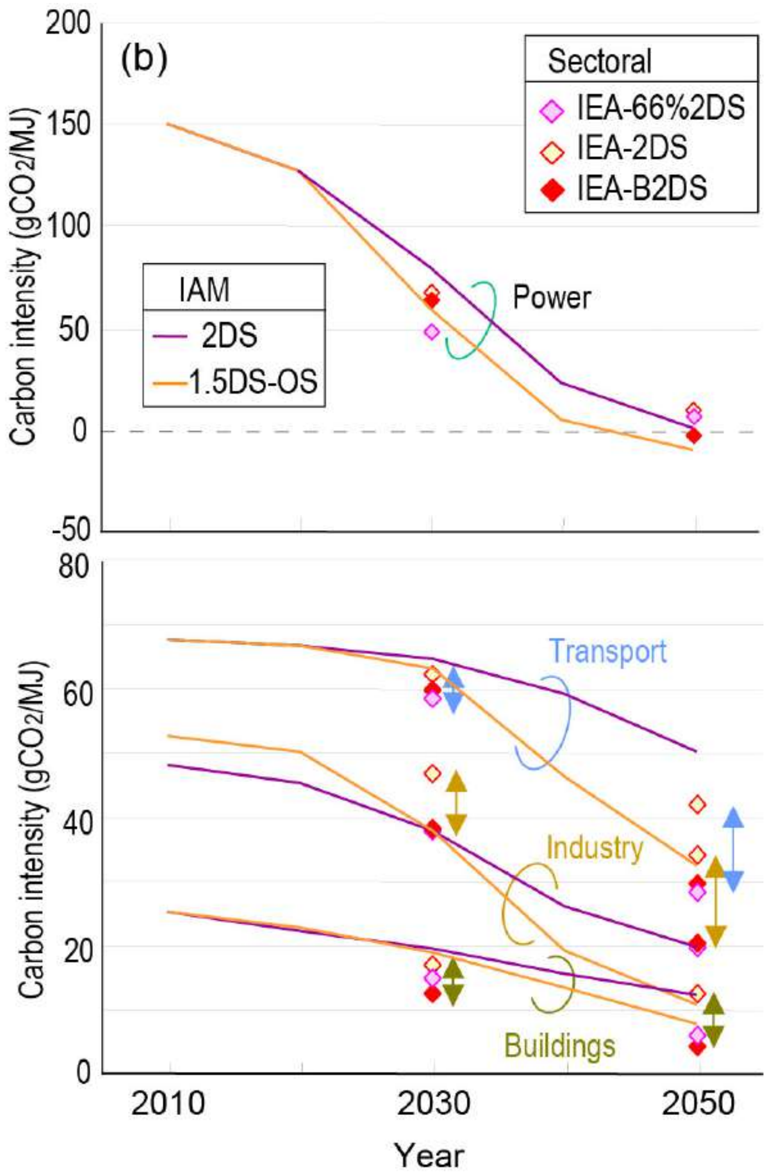
Systèmes énergétiques

Énergie Météo-dépendante

Extraction du CO_2

Agriculture

Reduction of the carbon intensity in all sectors



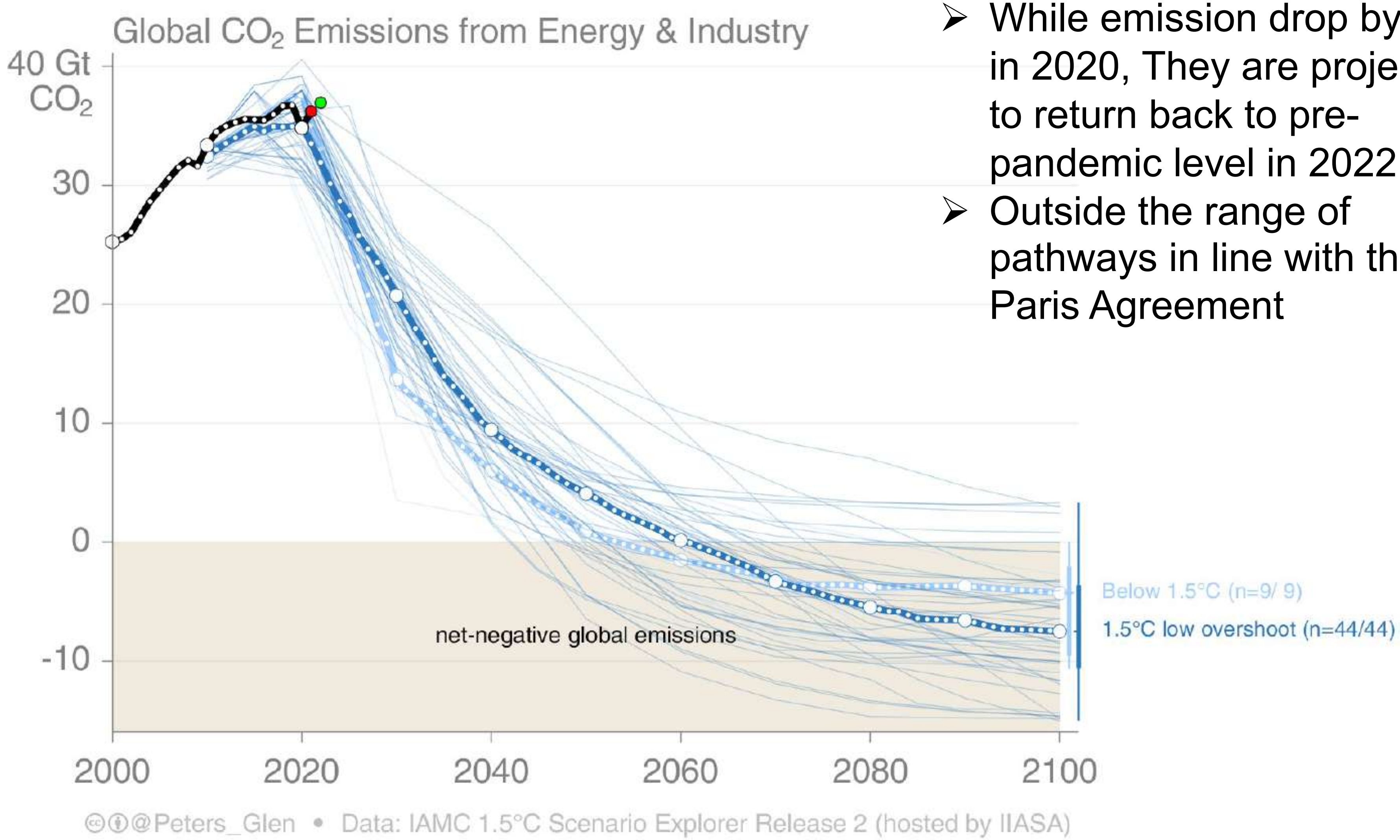
No magical solution in sectoral transformation: reduction in carbon intensity in all sector.

Greater changes in transportation are required for halting warming below 1.5° C

IPCC SR15 (2018)

Translation of scientific knowledge in climate policies

Are we on track ?



- While emission drop by ~6% in 2020, They are projected to return back to pre-pandemic level in 2022
- Outside the range of pathways in line with the Paris Agreement

Ambitious climate policies implemented so far

Target categories	G20 countries	Country level	Regional level
Zero emissions by year x	**2 G20** members (France, UK) have passed legislation **3 G20** members (EU and Germany and Italy as part of EU[1]) currently in process of passing legislation **15 G20** members have no binding (net-) zero-emission targets	**71 countries**	**33 regions**
Ambitious comprehensive CO_2 pricing in all sectors by year x [2]	**No G20** member has implemented ambitious comprehensive CO_2 pricing in all sectors, but 9 G20 members have implemented carbon pricing as ETS or carbon tax with partial coverage and/or lower CO_2 prices (as at August 2019)	No country ✖	No regions ✖
Phase out all fossil fuel sub-sidies by year x	**No G20** member has existing reform plans to fully phase out all fossil fuel subsidies, but the G20 took a decision in 2009 to gradually phase out fossil fuel subsides with an annual peer-review among G20 members	No country ✖	No regions ✖
Make all finance flows consistent with the Paris Agreement goals by year x *	**No G20** member has made all finance flows fully aligned with the Paris Agreement goals, but the UK has published a Green Finance Strategy in 2019 as an example of intermediate action	No country ✖	No regions ✖

UNEP, Gap Report 2019

Comitted structural changes compliant with ambitious climate target

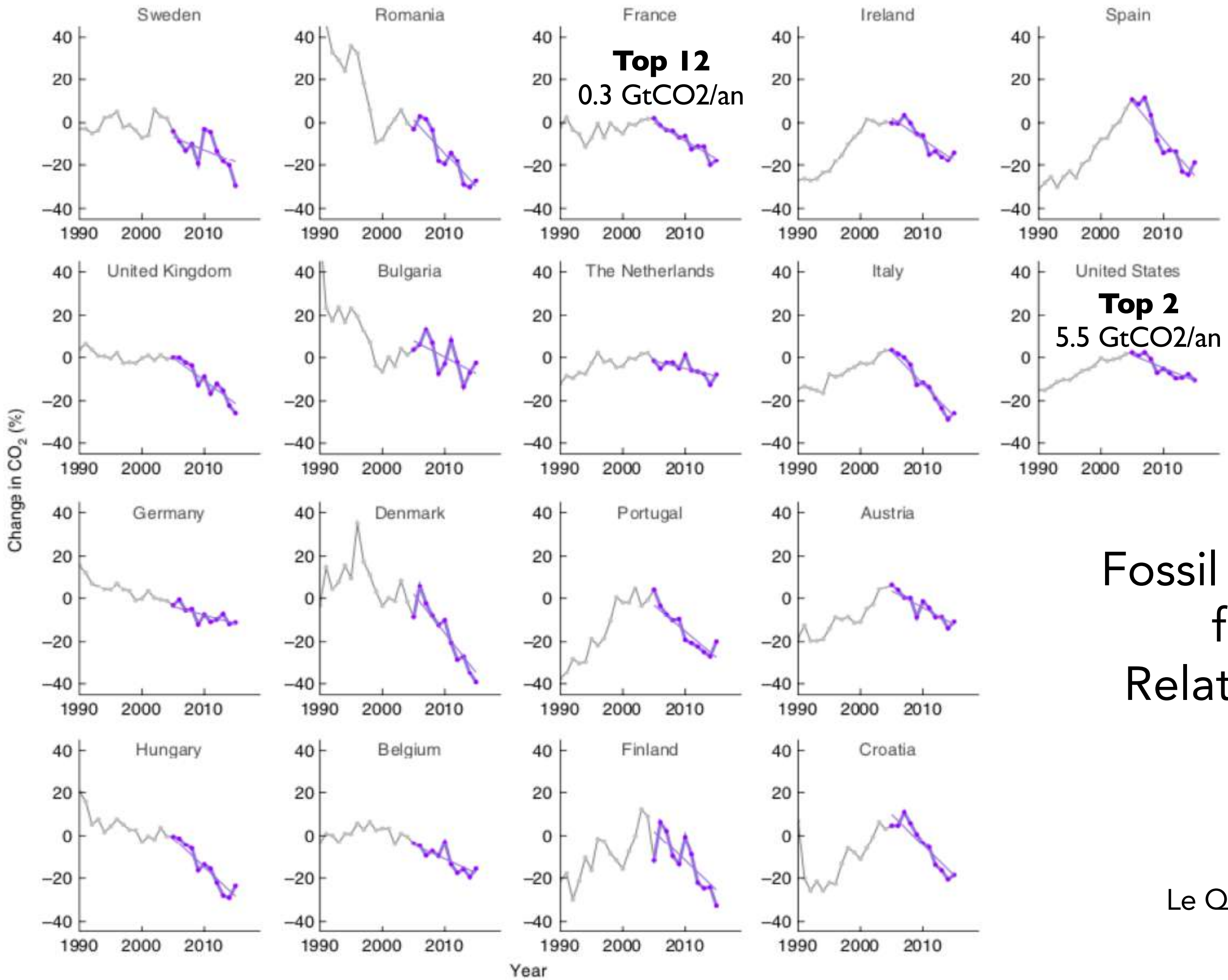
Target categories	G20 countries	Country level	Regional level
100% share of new zero-emission motor-bikes, cars and/or buses as of year x	**5 G20** members (Canada, France, Japan, Mexico, UK) have announced target **2 G20** members (India, Indonesia) have announced target but confirmation is pending **13 G20** members have not announced target for 100% new zero-emission motorbikes, cars and/or buses	21 countries	5 regions
Shift to x% public transport by year x *	**3 G20** members (China, India, Indonesia) with distinct modal shift targets No conclusion possible for all other G20 members	4 countries	No regions
100% carbon-free heavy trans-port and ships as of year x **	**No G20** member with legally binding target for 100% carbon-free heavy transport and ships	No country	No regions
100% carbon-free aviation as of year x ***	**No G20** member with legally binding target for 100% carbon free aviation	No country	No regions

UNEP, Gap Report 2019

National-scale pathways

Cas de la France

Several countries show emission reduction



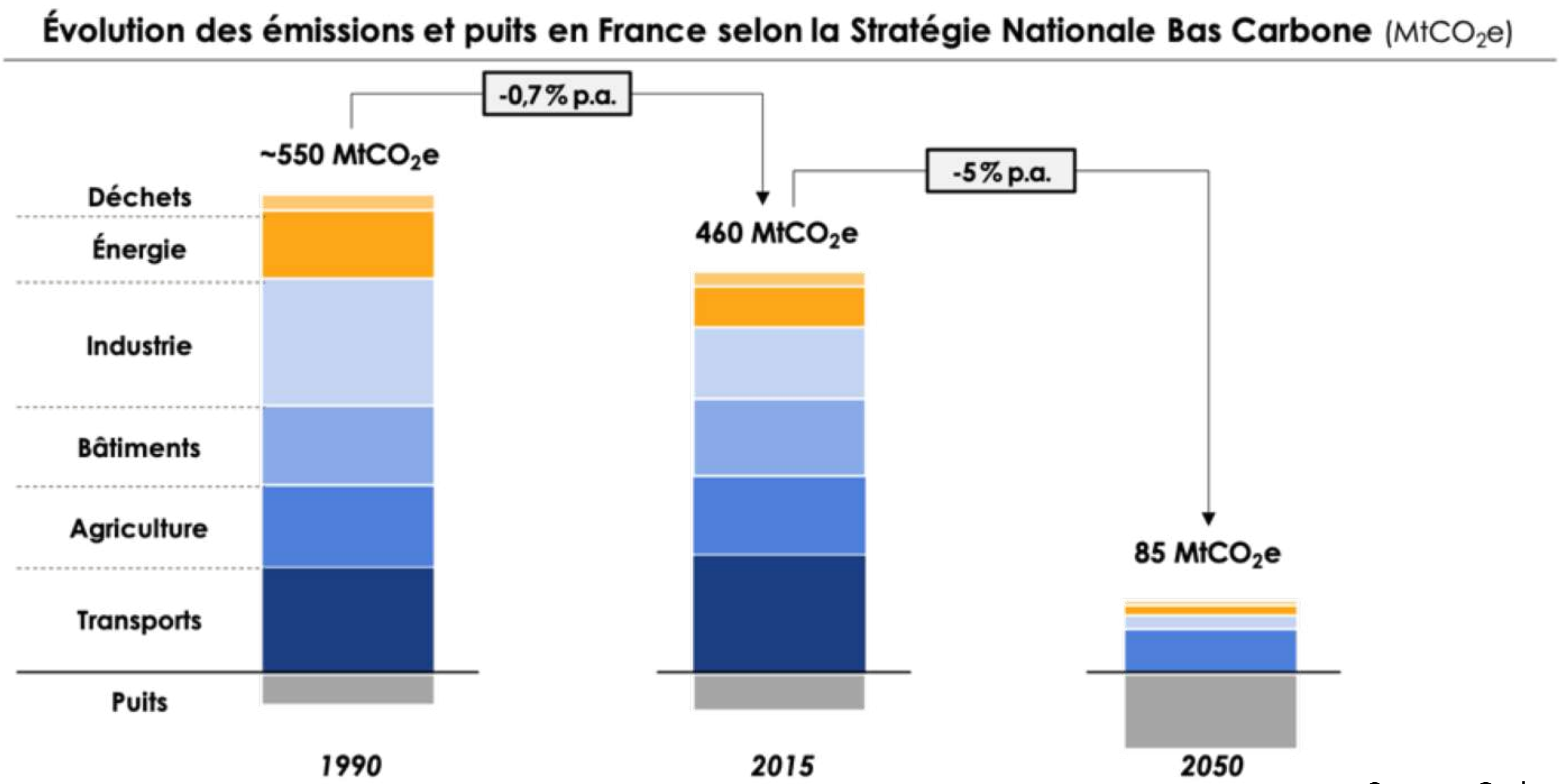
Fossil fuel emission from IAE
Relative to 2000-2005

Le Quéré et al. (2019)

⇒ Reduction is CO2 emission in several countries

⇒ Emission cut-off is largely driven by an increase of the energy-to-carbon intensity

Stratégie national bas carbone: Ambition neutralité carbone en 2050



Source: Carbone 4

⇒Atténuation des principaux poles d'émissions de CO_2 (transport et bâtiments)

⇒Renforcement des puits de carbone (naturel et artificiels via CCS

⇒Compatibilité de cette trajectoire par rapport au budget carbone restant planétaire ?

Nouveaux Scénarios de l'ADEME
Transition(s) 2050

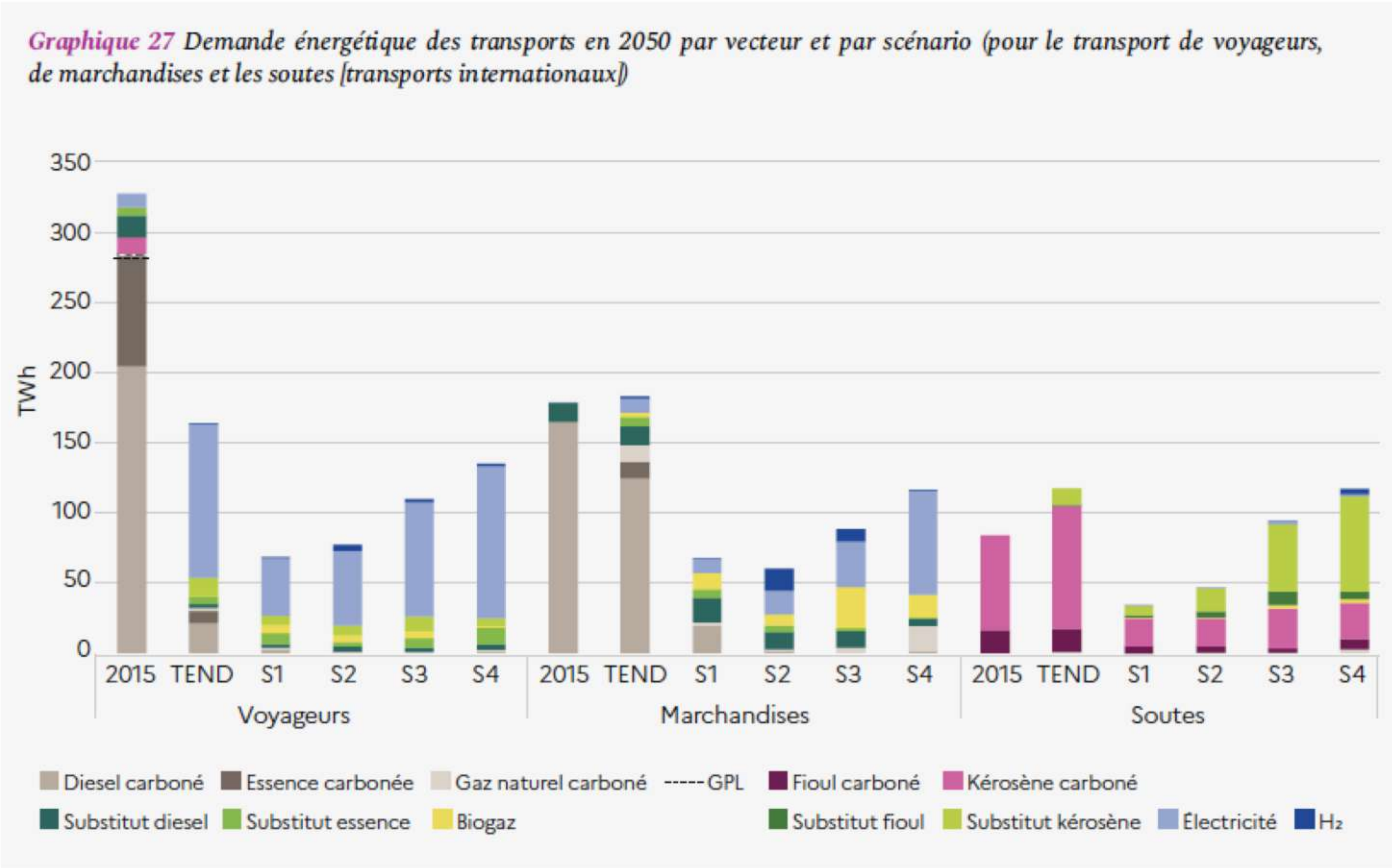
LA SOCIÉTÉ EN 2050




		S1 GÉNÉRATION FRUGALE	S2 COOPÉRATIONS TERRITORIALES	S3 TECHNOLOGIES VERTES	S4 PARI RÉPARATEUR
MODES DE VIE	Société	• Recherche de sens • **Frugalité choisie mais aussi contrainte** • Préférence pour le local • Nature sanctuarisée	• Évolution soutenable des modes de vie • **Économie du partage** • Équité • Préservation de la nature inscrite dans le droit	• **Plus de nouvelles technologies que de sobriété** • Consumérisme « vert » au profit des populations solvables, société connectée • Les services rendus par la nature sont optimisés	• Sauvegarde des modes de vie de **consommation de masse** • La nature est une ressource à exploiter • Confiance dans la capacité à réparer les dégâts causés aux écosystèmes
MODES DE VIE	Alimentation	• Division par 3 de la consommation de viande • **Part du bio : 70 %**	• **Division par 2 de la consommation de viande** • Part du bio : 50 %	• Baisse de 30 % de la consommation de viande • **Part du bio : 30 %**	• Consommation de viande quasi-stable (baisse de 10 %), complétée par des **protéines de synthèse ou végétales**
MODES DE VIE	Habitat	• Rénovation massive et rapide • **Limitation forte de la construction neuve** (transformation de logements vacants et résidences secondaires en résidences principales)	• Rénovation massive, **évolutions graduelles mais profondes des modes de vie** (cohabitation plus développée et adaptation de la taille des logements à celle des ménages)	• **Déconstruction-reconstruction** à grande échelle de logements • Ensemble des logements rénovés mais de façon peu performante : la moitié seulement au niveau Bâtiment Basse Consommation (BBC)	• Maintien de la **construction neuve** • La moitié des logements seulement est rénovée au niveau BBC • **Les équipements se multiplient**, alliant innovations technologiques et efficacité énergétique
MODES DE VIE	Mobilité des personnes	• **Réduction forte de la mobilité** • Réduction d'un tiers des km parcourus par personne • La moitié des trajets à pied ou à vélo	• **Mobilité maîtrisée** • - 17 % de km parcourus par personne • Près de la moitié des trajets à pied ou à vélo	• Mobilités accompagnées par l'État pour les maîtriser : infrastructures, télé**travail** massif, covoiturage • **+ 13 % de km parcourus par personne** • 30 % des trajets à pied ou à vélo	• Augmentation forte des mobilités • + 28 % de km parcourus par personne • Recherche de **vitesse** • 20 % des trajets à pied ou à vélo
	Technique Rapport au progrès, numérique, R&D	• Innovation autant organisationnelle que technique • **Règne des low-tech**, réutilisation et réparation • Numérique collaboratif • **Consommation des data centers stable** grâce à la stabilisation des flux	• Investissement massif (efficacité énergétique, EnR et infrastructures) • Numérique au service du développement territorial • **Consommation des data centers stable** grâce à la stabilisation des flux	• Ciblage sur les **technologies les plus compétitives pour décarboner** • Numérique au service de l'optimisation • Les data centers consomment 10 fois plus d'énergie qu'en 2020	• Innovations tout azimut • Captage, stockage ou usage du carbone capté indispensable • Internet des objets et intelligence artificielle omniprésents : les **data centers consomment 15 fois plus d'énergie** qu'en 2020
	Gouvernance Échelles de décision, coopération internationale	• **Décision locale**, faible coopération internationale • Réglementation, interdiction et rationnement *via* des quotas	• Gouvernance partagée • **Fiscalité environnementale** et redistribution • Décisions nationales et coopération européenne	• Cadre de **régulation minimale** pour les acteurs privés • État planificateur • Fiscalité carbone ciblée	• Soutien de l'offre • Coopération internationale forte et ciblée sur quelques filières clés • **Planification centralisée du système énergétique**
	Territoire Rapport espaces ruraux – urbains, artificialisation	• Rôle important du territoire pour les ressources et l'action • **« Démétropolisation »** en faveur des villes moyennes et des zones rurales	• **Reconquête démographique des villes moyennes** • Coopération entre territoires • Planification énergétique territoriale et politiques foncières	• **Métropolisation**, mise en concurrence des territoires, villes fonctionnelles	• Faible dimension territoriale, **étalement urbain**, agriculture intensive
ÉCONOMIE	Macro-économie	• **Nouveaux indicateurs de prospérité** (écarts de revenus, qualité de la vie...) • Commerce international contracté	• Croissance qualitative, **« réindustrialisation »** de secteurs clés en lien avec territoires • Commerce international régulé	• **Croissance verte**, innovation poussée par la technologie • Spécialisation régionale • Concurrence internationale et échanges mondialisés	• **Croissance économique carbonée** • Fiscalité carbone minimaliste et ciblée • Économie mondialisée
ÉCONOMIE	Industrie	• **Production au plus près des besoins** • 70 % de l'acier, mais aussi de l'aluminium, du verre, du papier-carton et des plastiques viennent du recyclage	• Production en valeur plutôt qu'en volume • **Dynamisme des marchés locaux** • 80 % de l'acier, mais aussi de l'aluminium, du verre, du papier-carton et des plastiques viennent du recyclage	• **Décarbonation de l'énergie** • 60 % de l'acier, mais aussi de l'aluminium, du verre, du papier-carton et des plastiques viennent du recyclage	• Décarbonation de l'industrie pariant sur le **captage et stockage géologique de CO_2** • 45 % de l'acier, mais aussi de l'aluminium, du verre, du papier-carton et des plastiques viennent du recyclage

Transition(s) 2050 (ADEME 2021)

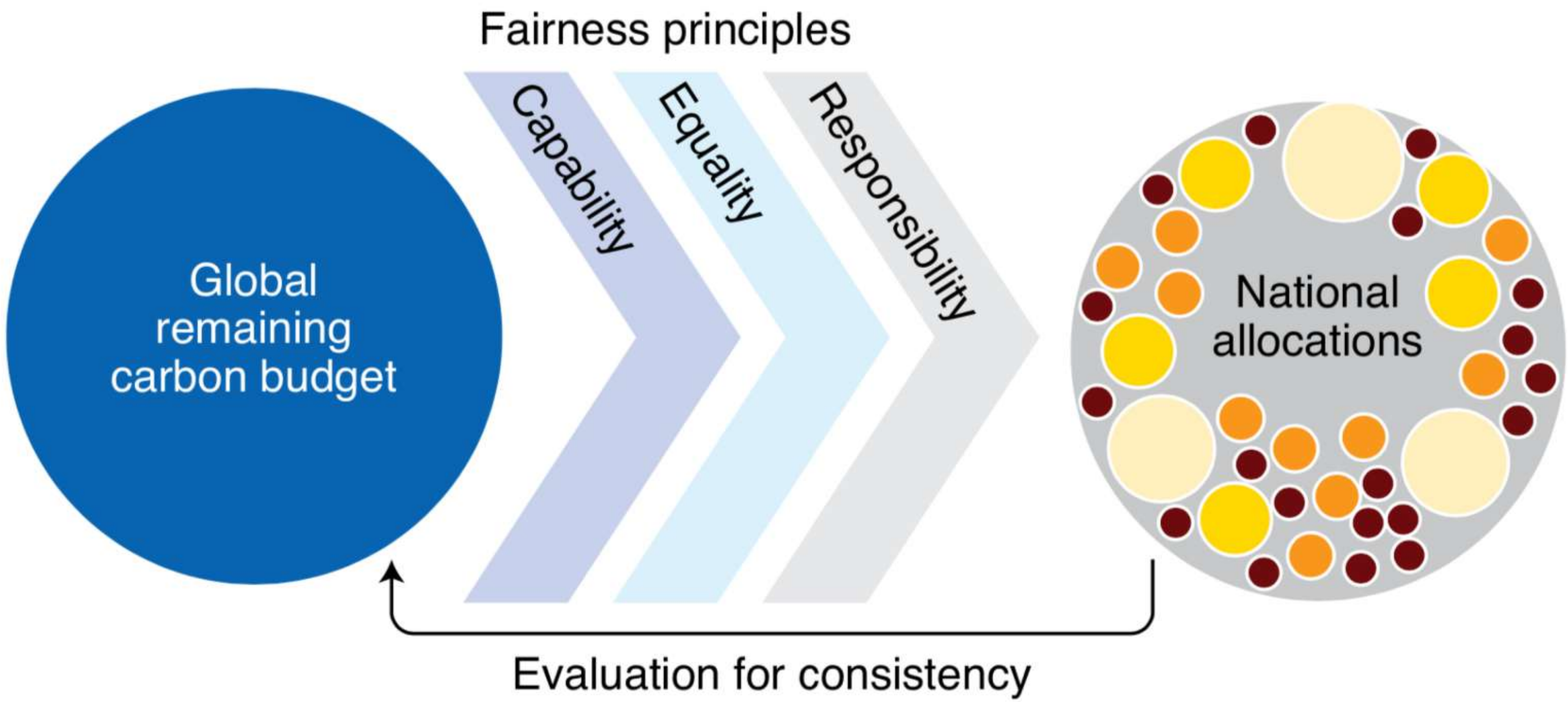
Nouveaux Scénarios de l'ADEME
Transition(s) 2050



Transition(s) 2050 (ADEME 2021)

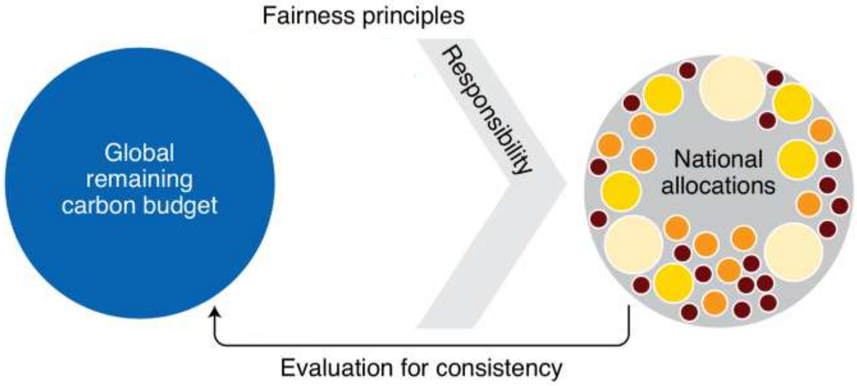
Réconsilier les allocations nationales avec le budget Mondial

-un enjeu majeur-

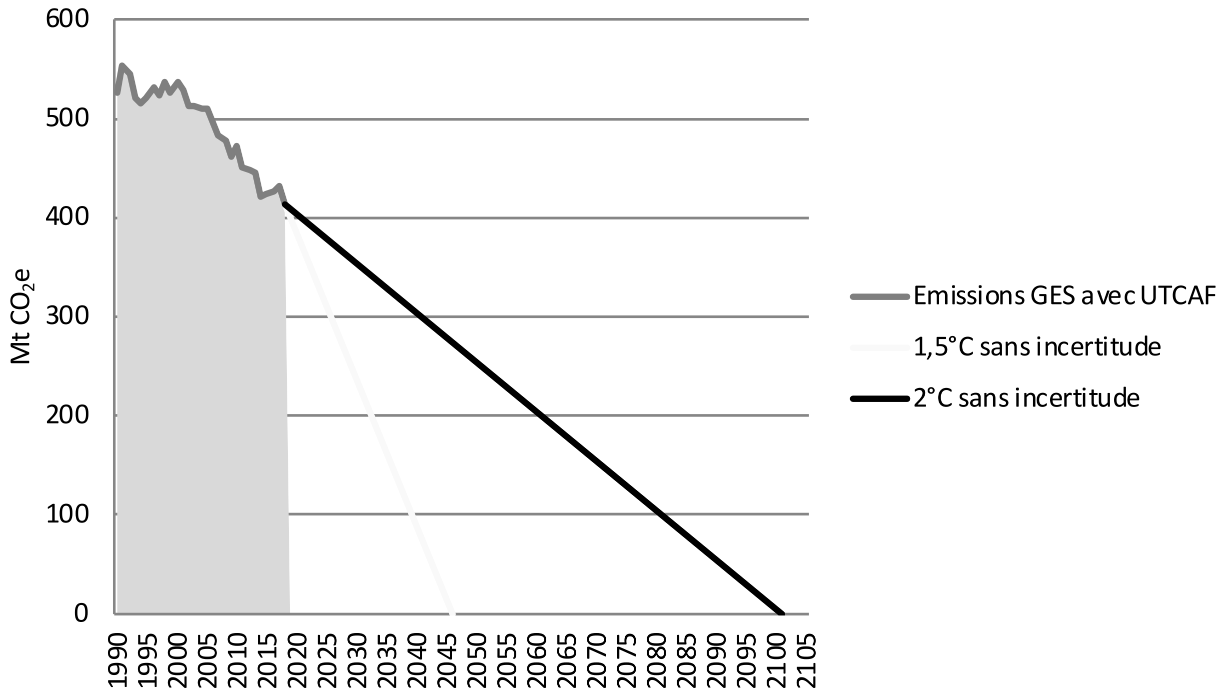


Matthews et al. (2020)

Principes appliqués au budget carbone de la France

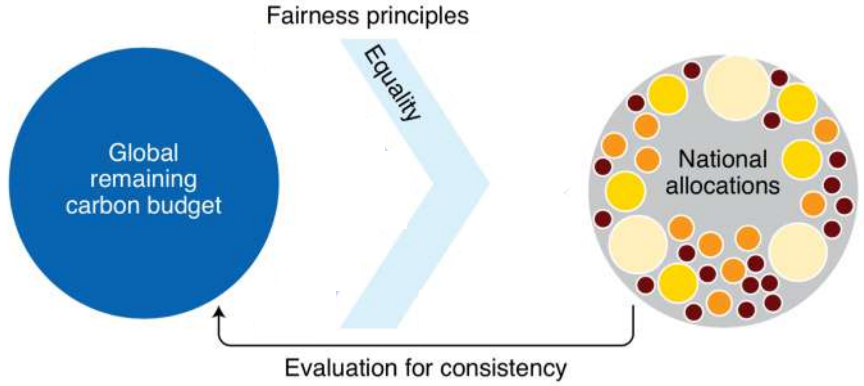


Granfathering= prorata des émissions de la France par rapport aux émissions mondiales

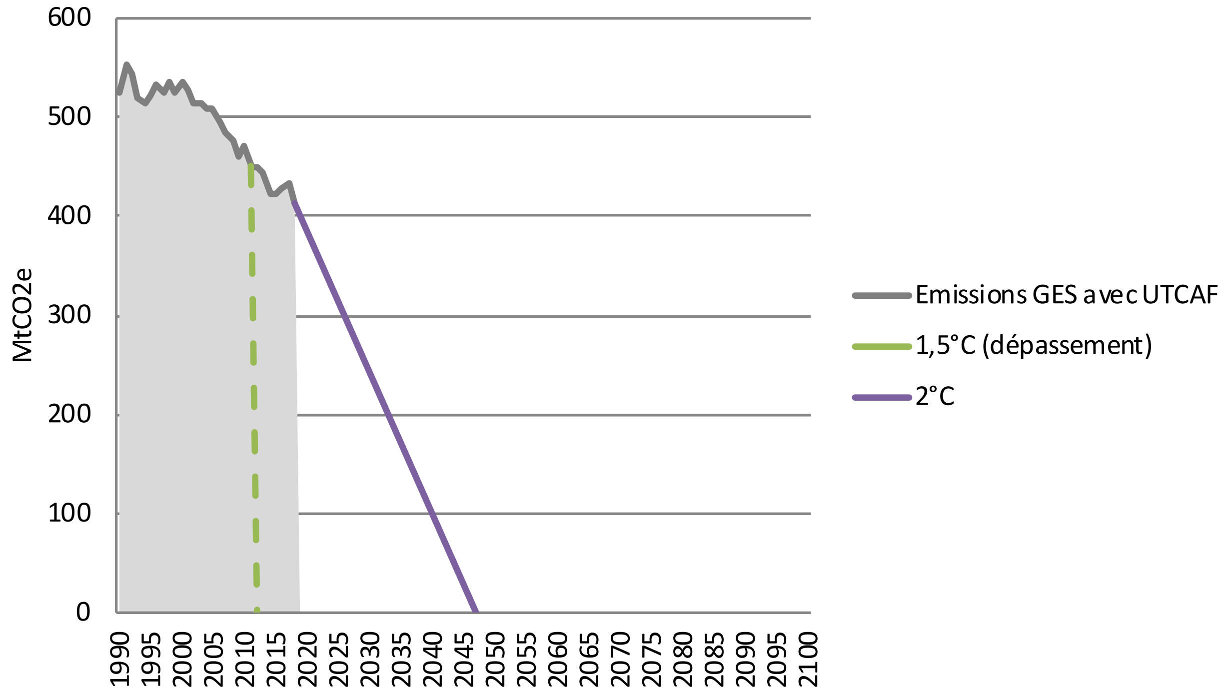


Belaunde and Bueb (2019)

Principes appliqués au budget carbone de la France

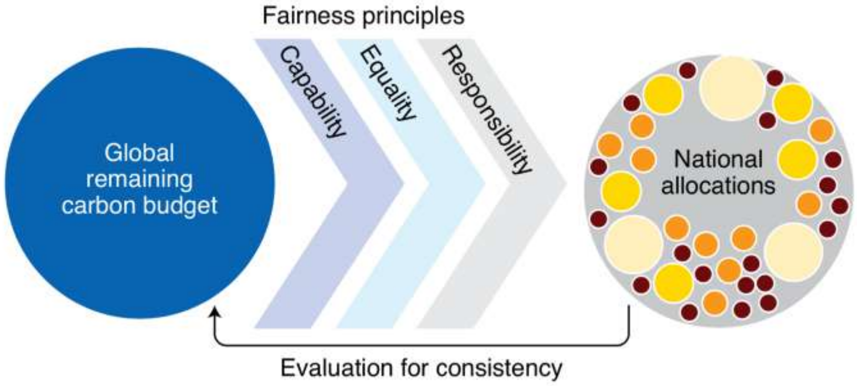


Égalité= ponderation par rapport aux indices de développement comme l'indice de Gini

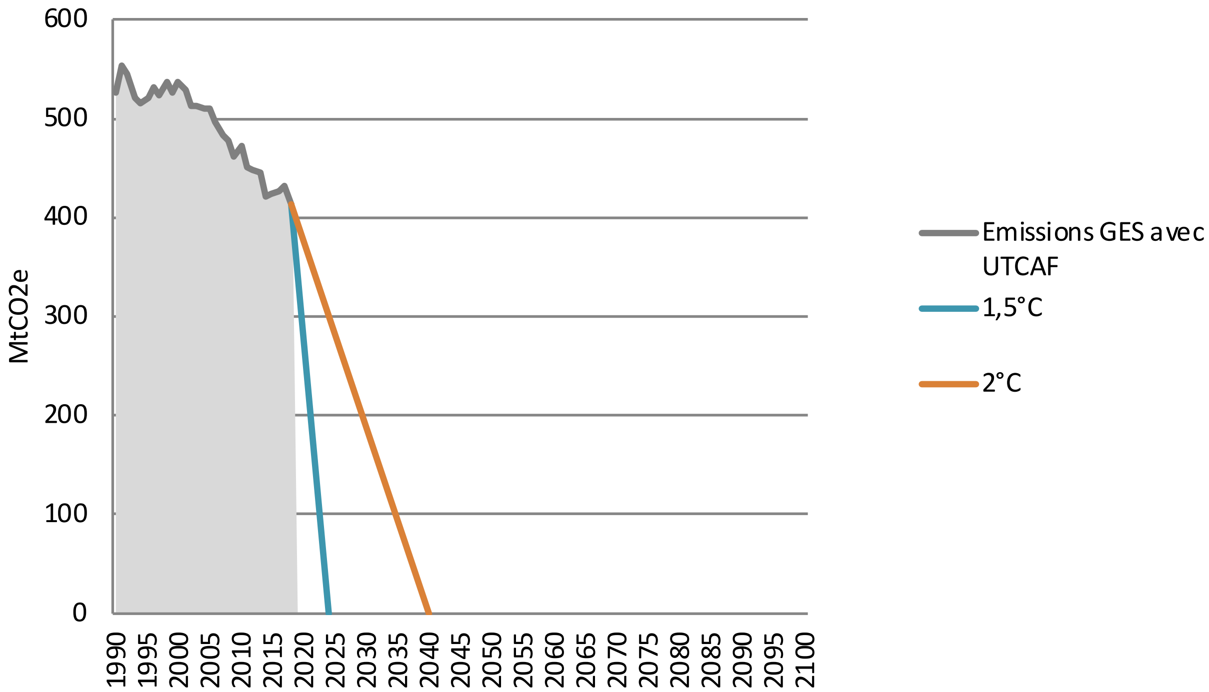


Belaunde and Bueb (2019)

Principes appliqués au budget carbone de la France

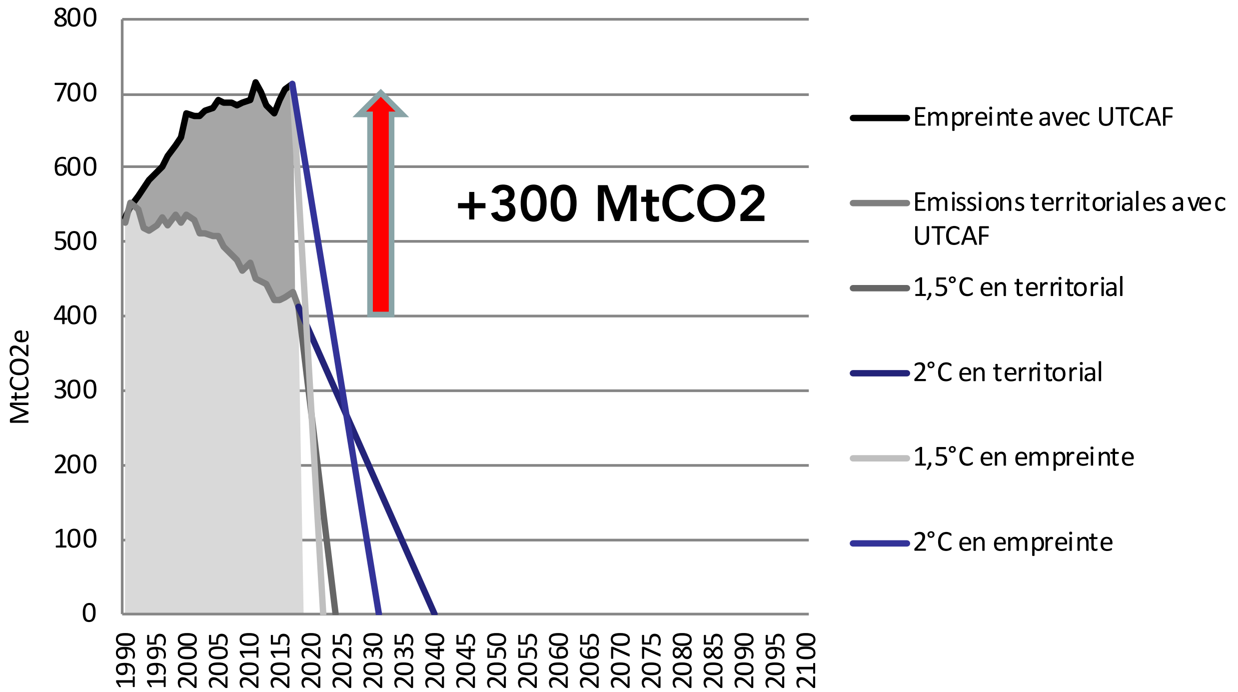


Approche combinée= integration de tous les critères dans la determination des trajectoires vers la neutralité



Belaunde and Bueb (2019)

Quid de l'empreinte ?

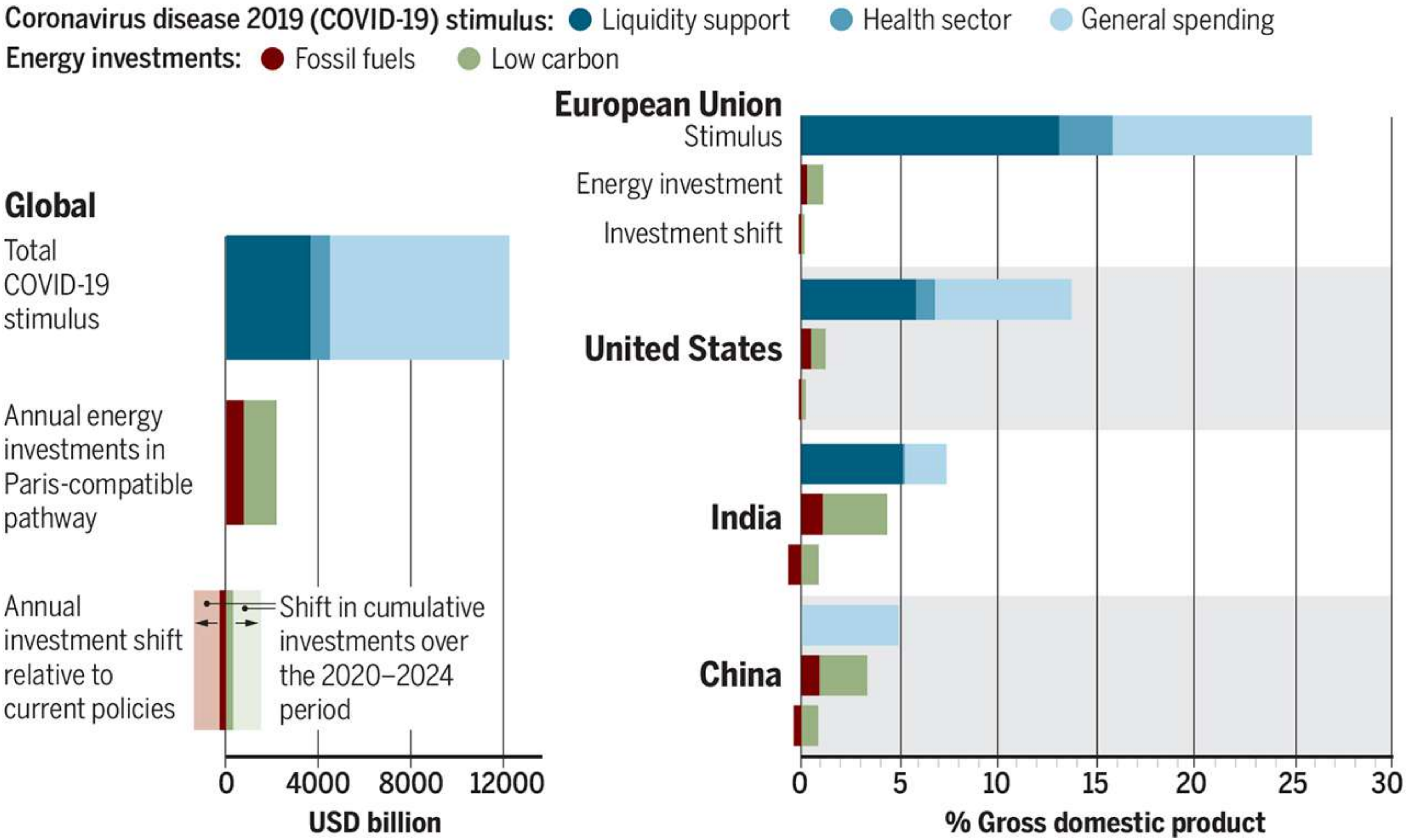


Belaunde and Bueb (2019)

Outro

Climate policies and post-COVID recovery plans

An unexpected opportunity ?



Andrijevic et al. 2021

⇒ 20 additional billion USD per year = 0.2% of the total fund

⇒ Same with Ukraine-Russia war ?