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Reflection Group on the Future of the European Civil Service

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**Special
Climate and Ecological
Emergency**



Contents

Foreword	3
The Petition	4
Policy brief	6
Discussion paper	14
Slide show on Discussion paper	135
Campaign material	215

*Changer l'état des choses est aisé,
l'améliorer est très difficile*
ERASME

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Foreword

Dear colleagues,

Here are a file and the text of a petition proposed by a group of officials - EU Staff4Climate - independent of any trade union affiliation that calls on the staff of the European Civil Service to act now on the climate & ecological emergency.

The journal Graspé, founded 18 years ago by European civil servants, is pleased to see that colleagues also act as European citizens, also from their professional experience.

Our magazine supports this initiative and calls on its readers to sign it.



The Petition

Please sign this petition now :

<https://ec.europa.eu/eusurvey/runner/petition>



Act NOW on the climate and ecological emergency!

Petition from EU staff to the incoming leaders of the EU institutions

We, EU staff, call on you — the incoming leaders of the EU institutions — to declare a planetary emergency and do all in your power to stop the impending climate and ecological disaster. We take seriously the multiple warnings issued by the international scientific community and share the concerns expressed by young people in the streets and in recent elections.

Humanity has 10 years — only two EU policy cycles — to reverse global warming and bring the planet back to a safe operating space for this generation and those to come.¹ Human activity has already caused global warming of 1.0°C since the pre-industrial period and nature is declining globally at rates unprecedented in human history, eroding the very foundations of our economies, livelihoods, food security, health and quality of life worldwide.² We are currently on a track towards at least 3°-4° C by the end of this century, and this assumes that all countries meet their commitments. Already by 2030 we may exceed 1.5°C, a threshold scientists see as very disruptive for people, economies and ecosystems.³ The UN points to ‘an enormous gap between what we need to do and what we’re actually doing to prevent dangerous levels of climate change’.⁴

All of us with a duty to act in the public interest have the responsibility to help save the planet as a liveable space. **There is little time left. We need to make unprecedented changes across all aspects of life. We as citizens are committed in our individual lives to make that change but greater change is necessary.**

In its short history, the European Union has been a visionary project and an example for the rest of the world. The European project has delivered lasting peace in a region historically characterised by bloody conflicts. With the same sense of purpose, **leading the fight against the planetary crisis ought to drive the European project for the next decade.**

We therefore ask the incoming leaders of the EU institutions to:

1 Recognise the greatest challenge of our times: declare a planetary emergency and make it the overarching priority of the EU’s agenda for the next five years. No objective should be pursued to the detriment of the planet. Economic prosperity must not lead to the destruction of the planet’s liveable space and ecosystem.

2 Put in place special EU inter-institutional arrangements to address the emergency: establish a mechanism at the highest level of all EU institutions to orient and prioritise actions and a

Commission Task Force to implement them. Introduce fast-tracked procedures to tackle the urgency we face.

3 Engage citizens in a broad democratic debate across the EU about the collective changes needed and how best to achieve the transition to them. Society must become our best ally if we want to change our energy mix, consumption patterns and economic model. Above all, we need to give a voice to those who have most at stake: young people.

4 Start reducing EU greenhouse gas emissions sharply. Europe’s historical responsibility and current consumption require a 65% reduction in its emissions by 2030, that is by 10% every year from 2020 to 2030⁵. Establish an open and transparent monitoring system. Tackle the worst climate polluters in industry, agriculture, transport and society, make businesses and financial institutions truly accountable and protect the interests of the most vulnerable. Phase out coal completely by 2025 and drastically reduce the other fossil fuels by 2030.

5 Ensure coherence of all EU policies for a fair transition to a sustainable and carbon-neutral society and economy, where emissions are drastically reduced, carbon sinks are increased and ecosystems restored and protected. The common agricultural policy, EU structural and investment funds, research and innovation programmes and all other spending programmes under the 2021-2027 EU budget must meet these goals. No EU policies or funding should pull in the opposite direction.

6 Leverage the EU's weight in the world to lead the global fight against climate change and ecosystem destruction. Our trade and development policies need to become tools for fighting and adapting to the climate crisis. Despite the EU's global leadership, international climate conferences and agreements have not been enough to stop the relentless increase in worldwide greenhouse gas emissions.

7 Lead by example: Make the EU institutions’ operations carbon neutral by 2030. Target in particular buildings, business travel, catering, meetings, procurement and local mobility.

As EU civil servants, we are committed to pursuing the common good and delivering sound public policies for EU citizens. We cannot close our eyes to the planetary emergency as the single most serious threat to the future of Europe and the world. **Whatever our roles and tasks in the EU institutions, we stand ready to make individual changes and to work with you as leaders to achieve those goals together, for the good of the planet and its people.**

Sign the petition here <https://ec.europa.eu/eusurvey/runner/petition>

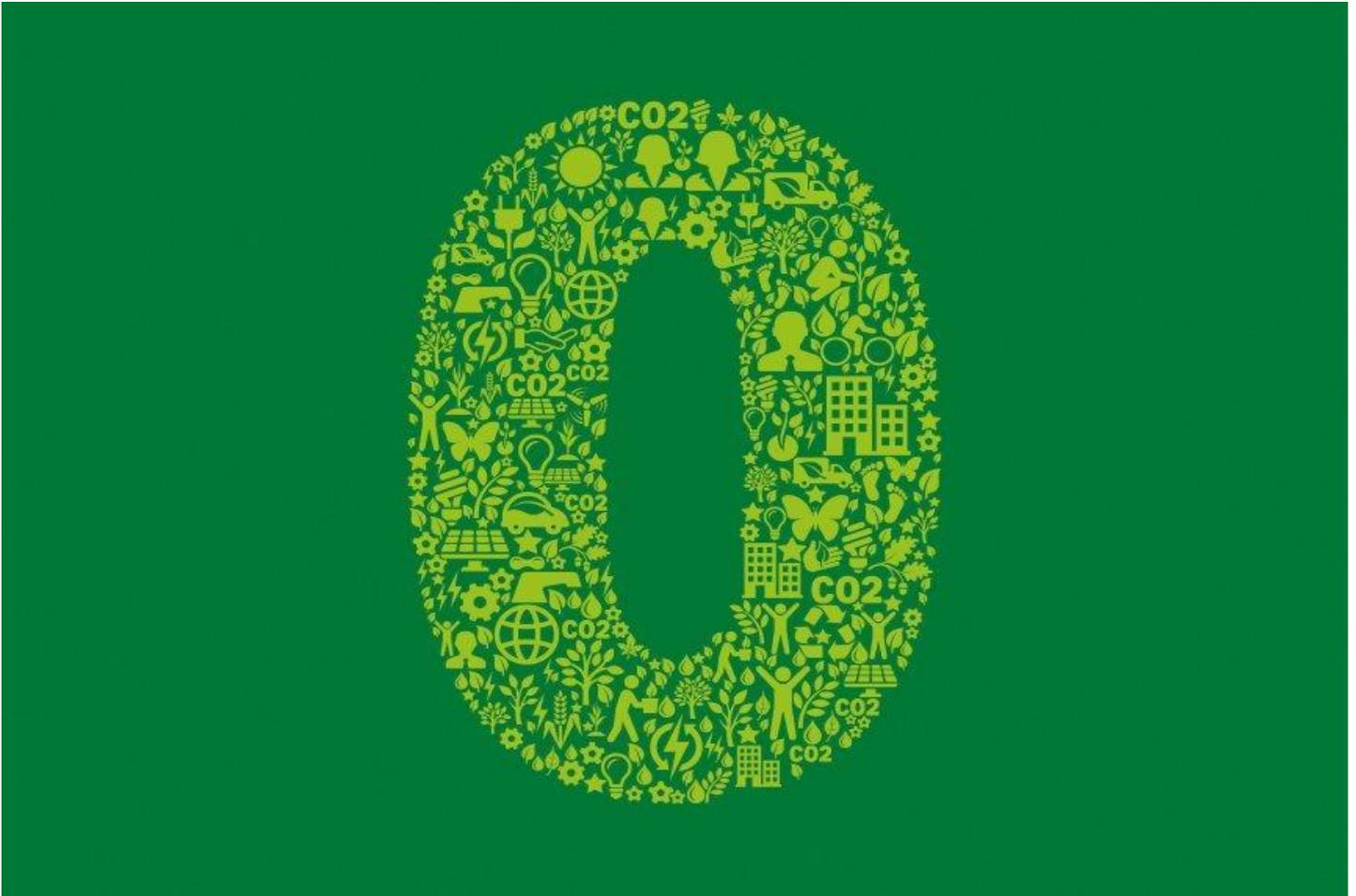
Read more about EUstaff4climate, this petition and the science that supports it here <https://eustaff4climate.info/>

Policy brief



“Rapid and far-reaching”

“Pathways limiting global warming to with no or limited overshoot would require rapid and far-reaching transitions ... and imply deep emissions reductions in all sectors”
(IPCC, Global Warming of 1.5°C; 2018)



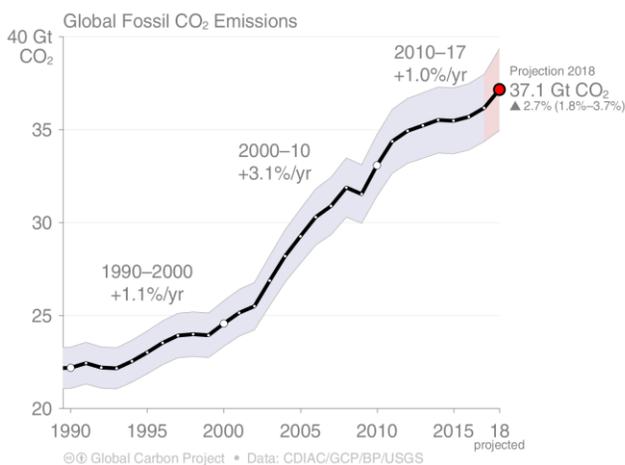
Why do we need decisive climate action now?

Humanity has 10 years to not just start, but to complete a U-turn. Only system-wide transformation within the next decade would allow us to keep climate risks at manageable levels. Today, we have caused already approximately 1.0°C of global warming and are likely to exceed 1.5°C by 2030 if the concentration of greenhouse gases in the atmosphere is not reduced **now** (according to the IPCC).ⁱ

Scientists are alerting us that a 2°C world risks triggering self-reinforcing feedback loops that may lead irreversibly to a “hothouse” Earthⁱⁱ, no matter where we live. We are currently on a path towards at least 3°C warming. We read that with a 4.0°C rise, the Earth becomes uninhabitable. We are a blink away from moving into an era of high risk for humanity.

Today, trends are going in the wrong direction. While we should rapidly decrease CO₂ emissions and start removing CO₂ from the atmosphere, greenhouse gases continue to increase every year (according to the UNⁱⁱⁱ). While we should be rapidly regenerating nature, life on earth is being destroyed at unprecedented scale and speed.^{iv}

Fig.1: The system of multilateral climate negotiations has failed to deliver, as global emissions continue to rise every year. Every year sees new peaks.



The climate crisis will trigger a social, economic and ecological crisis. Our food-supply, infrastructures, ecosystems and economies are at risk already today. Floods, heatwaves and droughts are the first symptoms. Unprecedented hunger and migration may follow. There is no place, no country that will be able to insulate itself from those consequences.

Climate change will soon dwarf all other drivers of mass migration. Forecasts vary from 25 million to 1 billion environmental migrants by 2050, with 200 million being the most widely cited estimate, according to the UN.^v

The global rate of extinction is already 10 to 100 times higher than any time before in earth history.^{vi} Wildlife decreased by 60% globally between 1970 and 2014 (WWF Living Planet Report 2018^{vii}). Insects and pollinators are disappearing at an alarming rate.^{viii} Loss of biodiversity increases the risk of 'extinction cascades'.^{ix}

Even the voice of global business, the World Economic Forum, expresses deep concern. The 2019 WEF “Global Risk Report” headlines with “Global Risks Out of Control”: ... “Is the world sleepwalking into a crisis? Global risks are intensifying but the collective will to tackle them appears to be lacking.”^x

Each of us, and particularly those in power and those with influence or knowledge, has the responsibility to help save the planet as a liveable space. And there is little time left.

In its history, the EU was at its best when it focused on a single transformative project, on one vision – ensuring peace in Europe, building a Single Market. Fighting the climate crisis and making our society carbon-free ought to be that European project for the next decade.

Fig. 2: **Heatwave 2018.** Europe experienced a heat wave for many months during 2018, as shown here for July.

Source: Copernicus Climate Change Service European State of the Climate Monthly Reports; https://library.wmo.int/doc_num.php?explnum_id=5789

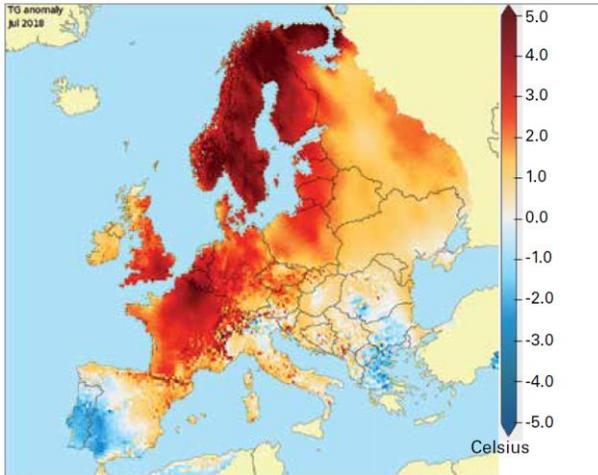


Fig. 3: **Climate change triggers Hunger.** Climate-related droughts already cause much damage. The number of extreme climate-related disasters, including extreme heat, droughts, floods and storms, has doubled since the early 1990s.

Source: FAO, The State of Food Security and Nutrition in the World, 2018 <http://www.fao.org/3/I9553EN/i9553en.pdf>

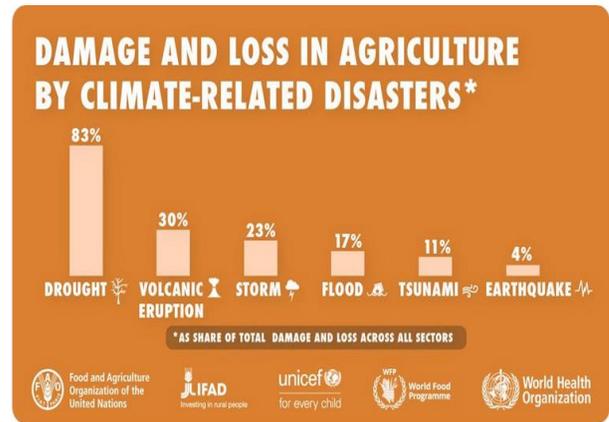
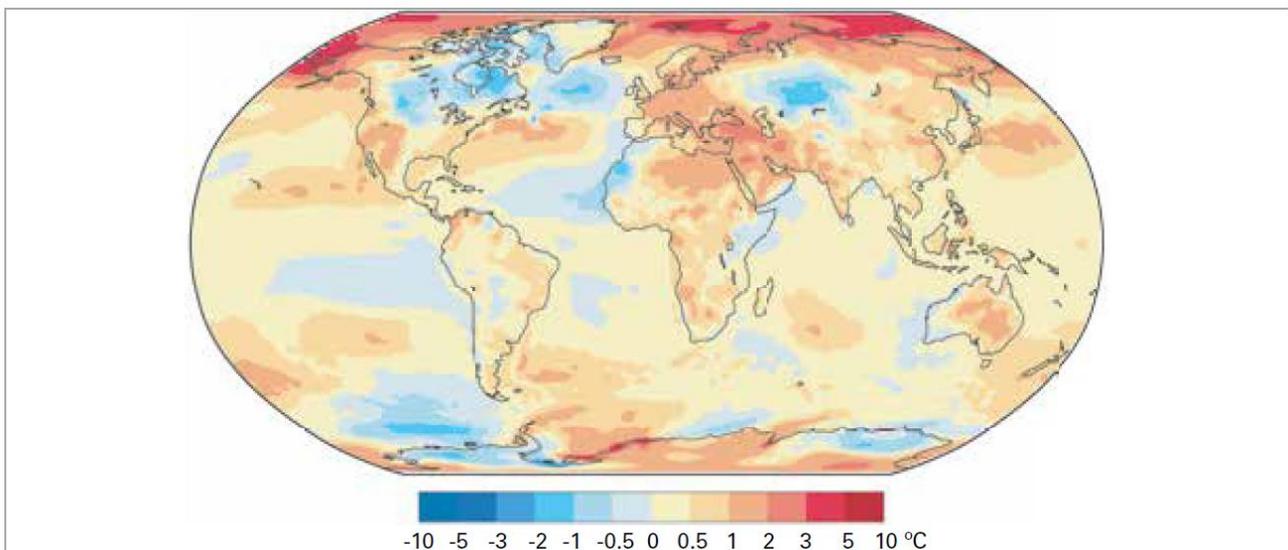


Fig. 4: **The Arctic is warming much faster.** Thawing ice and permafrost can release large amounts of methane, a powerful greenhouse gas that could tip the global climate into a dangerous state. Map: 2018 temperature peaks compared to the 1981–2010 average (surface-air temperature).

Source: ECMWF ERAInterim data, Copernicus Climate Change Service. https://library.wmo.int/doc_num.php?explnum_id=5789



An all-out effort to save our livable space

How much time do we have left?

We must reduce emissions drastically **now**, and not put our hopes in technology solutions that only **may** come later. Every year that goes by reduces our chances. We warn against the comfortable illusion that new technology will solve the climate crisis by increasing our resource efficiency and by removing greenhouse gases from the atmosphere.^{xi} That will not be possible in the time still available, and we cannot bet our future on technologies that remain yet to be developed and deployed.

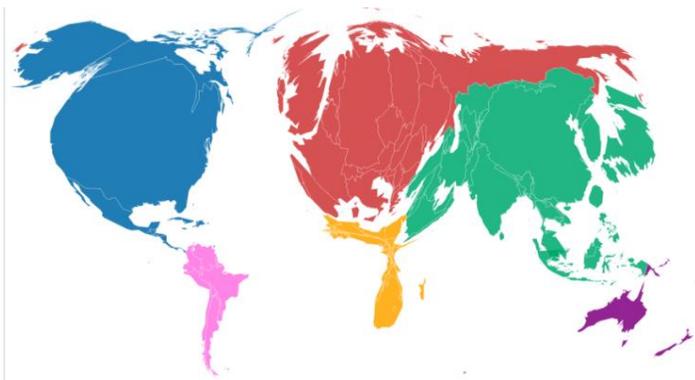
What does "rapid and far-reaching" action mean?

The Intergovernmental Panel on Climate Change urges "rapid and far-reaching" action.^{xii} To still have a chance of reaching the Paris Agreement targets and limit warming to 1.5°C, **CO2 emissions must go down by 7 to 8% every year until 2030, everywhere in the world.** By 2030, global emissions must be more than 50% lower than today.^{xiii}

What should be the EU's share?

Europe should do more than deal with its current share of global emissions. Europe is responsible for some of the largest amounts of greenhouse gases accumulated worldwide in the atmosphere.

Fig. 5: Europe, together with the US, has emitted historically ("cumulative") most CO2 into our atmosphere (Source: carbonmap.org).



And the EU outsources its emissions to other countries which produce goods for Europeans.

Therefore, the EU should aim to reduce its emissions by 10% every year for the next 10 years - by 2030.

Outsourcing of emissions - The Commission's European Political Strategy Centre explains:

"Developed countries are increasing their consumption-based emissions – often faster than they are reducing their production-based emissions - ... by shifting emission-intensive production to developing countries and emerging regions".

EPSC: Europe's Sustainability Puzzle

https://ec.europa.eu/epsc/sites/epsc/files/epsc_sustainability-puzzle.pdf

What needs to be done?

An all-out effort is needed:

- ✓ Fast, sizeable reductions means **tackling the worst climate polluters** with a new sense of urgency (coal, transport, agriculture ...)
- ✓ **New measures** to step up the present effort. Incremental policies will not be enough to achieve a large and immediate drop in emissions.
- ✓ The EU can **lead the global effort** to fight climate change. Europe cannot save itself from the climate crisis through EU climate policies only. A step change is needed to leverage Europe's trade and development policies.
- ✓ A societal debate about broad, **systemic change** is needed. The challenge for our society and its leaders is to face the reality that with today's energy mix and rates of ecosystem consumption, our current economic "growth driven" model needs to be reassessed and reformed.

Give people a real say about climate change

There will be no solution without people's participation. Young people will not stop feeling betrayed. They will not stop articulating their protest, because their very future is at stake, and the danger will not go away.

A decarbonised society will look different than today's, and building it means building consensus about change in behaviours and expectations. The EU should lead a broad debate about solutions, choices and consumption. Climate action can no longer be negotiated only with governments, industry and lobbies. **A societal effort and broad democratic participation are needed.**

Protecting our planet is a political vote winner.

A people's initiative in the German state of Bavaria mobilised 1.8 million voluntary signatures - 20% of all registered voters. The goal: to enshrine organic agriculture in the law. And it succeeded: the government implemented the new legislation on organic agriculture in full.

What does that mean for the EU?

Empower people, not lobbies. The EU should **lower the voting age for European elections**. Young people whose future is most in peril must have a say. And the EU institutions could **convene citizens' assemblies** in which people from all walks of life, and especially young people, can formulate proposals on how to save their future, to host a broad democratic conversation about the changes they demand and they are ready to face.

Inform citizens about the consequences of climate change. Launch a large-scale information campaign about climate change. Information is not scaremongering, but a genuine effort to make people aware of what is at stake. People want to understand what is at stake and be able to participate.

A positive message. It may seem daunting to speak about the need to "reduce". What if we used this crisis as a chance to improve our lifestyle and economic model? What if less car congestion would get us cleaner air, quieter and greener cities that are safer and a pleasure to live in? What if by eliminating from our diets products that destroy our rainforests, we would actually improve the way we eat? An appealing and inspirational communication strategy is needed to inform the European public.

Reach out those who are deeply concerned. Talk to young people. Speak the language of Greta Thunberg. The climate crisis will be centre-stage during the next Commission and European Parliament mandate and beyond. So we must talk about it sincerely and move beyond the slogans of the past - "Europe as a global actor", "Jobs and growth" etc. Rather than trying to "promote Europe", **we should speak about what matters: Our future and the future of our children.**

Tackle those who profit from the climate crisis. Behind most emissions that destroy our climate are corporate profit interests, not the interests of ordinary people. No climate solution is possible without tackling corporate profit interests and making the fossil fuel industry change its business model – and stopping them from using the planet as a free resource.

Corporate interests drive the climate crisis.

- To increase their profits, the world's top banks have poured \$1.9 trillion into fossil fuel financing since the Paris Agreement was signed, with financing on the rise each year ([Banking on Climate Change](#)).
- To make more profit and save on clean technology, carmakers have been cheating for years about the emissions they cause.

What should the EU do?

1 Recognise the greatest challenge of our times.

How? Declare a planetary emergency and make it the overarching priority of the EU's agenda for the next five years. Tell the truth about the problem. No objective should be pursued to the detriment of the planet. Economic gains must not lead to the destruction of the planet's liveable space and ecosystem.

2 Put in place special EU inter-institutional arrangements to address the emergency.

How? Establish an inter-institutional mechanism at the highest level of all EU institutions to orient and prioritise actions and a Commission Task Force to implement them. Fast-tracked procedures must be introduced to tackle the urgency we face.

3 Engage citizens in a broad democratic debate across the EU about the collective changes needed and how best to achieve them.

How? Society must become our best ally if we want to change our energy mix, consumption patterns and economic model. Climate policies are presently negotiated with governments and lobbies. To tackle a crisis as fundamental as the climate crisis, participation of the whole society is needed. The initiative needs to be shifted from those who are invested in the incumbent system to those whose future is at stake. The EU could be uniquely placed to organise a broad societal debate through a Europe-wide participative process, for instance through citizens assemblies, to enable ordinary citizens to express themselves about their future. Above all, we need to give a voice to those who have most at stake: young people.

4 Reduce EU greenhouse gas emissions sharply.

How? Plan for a 10% reduction in its emissions every year from 2020 to 2030. The big GHG sources are energy, transport, industry, construction and food production (agriculture). EU climate policies in those areas have made progress but will still not achieve the GHG reductions needed by 2030. Establish an open and transparent monitoring system. Ensure that the interests of the most vulnerable people are safeguarded. Address climate

polluters in industry, agriculture, transport and society, make businesses and financial institutions truly accountable. Use standards and taxes to fight pollution.

5 Ensure coherence of all EU policies and re-orient them to minimise greenhouse gas emissions, maximise carbon sequestration and restore ecosystems.

How? The common agricultural policy, EU structural and investment funds, research and innovation programmes and all other spending programmes under the 2021-2027 EU budget must be aligned with the goals and must leverage the necessary transition. At present, "climate mainstreaming" in EU funds largely consists in declaring current funding activities as climate-relevant. This needs to change. The policy impact assessments need to account for both direct and indirect effects on the climate and the ecosystem. Most importantly, no EU policies or funding should pull in the opposite direction.

Public funding alone will not be enough for a turnaround. Business is crucial. As long as profits are made from fossil fuels, there is little hope to solve the climate crisis. Practically, regulation should be designed to shift private investment to a clean economy.

6 Leverage the EU's weight in the world to lead the global fight against climate change and ecosystem destruction.

How? Even the best EU climate policies cannot save us if GHG pollution is rising globally, as it is doing incessantly. Despite the EU's global leadership, international climate conferences and agreements have not been enough to stop the relentless increase in worldwide GHG emissions. Our trade and development policies need to become tools for fighting the climate crisis. Carbon tariffs in our borders could compensate for lack of carbon taxes elsewhere. Our international development assistance could become conditional on strengthening carbon sequestration and protection and restoration of ecosystems, and can be used to restrict rises in greenhouse gas emissions resulting from the development process.

7 Lead by example.

How? Make the EU Institutions' operations carbon neutral by 2030. Target in particular buildings, business travel, catering, meetings, procurement and local mobility.

Use carbon budgets for all operations. Target the most polluting operations first and restrict them accordingly. Use new technologies as appropriate. Engage and discuss with

staff about the changes we have to make, if we really want to lead the world in saving the planet and its ecosystems.

ⁱ IPCC Special Report: Global Warming of 1.5 °C <https://www.ipcc.ch/sr15/>

ⁱⁱ If you read only one scientific paper on climate change, we recommend this one: “Trajectories of the Earth System in the Anthropocene” <https://www.pnas.org/content/115/33/8252>

ⁱⁱⁱ United Nations Environment : Emissions Gap Report 2018 <https://www.unenvironment.org/resources/emissions-gap-report-2018>

^{iv} A landmark new report from the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) warns that nature is declining globally at rates unprecedented in human history - and the rate of species extinctions is accelerating, with grave impacts on people around the world now likely. <https://www.ipbes.net/>

Johan Rockström: “Place the IPBES report next to the IPCC 1.5 C report and you have a full picture of a Planetary Emergency. Science cannot be more clear.” <https://twitter.com/jrockstrom/status/1125469426692837377?s=11>

^v UN International Organization on Migration <https://www.iom.int/migration-and-climate-change-0>

^{vi} <https://horizon-magazine.eu/article/sixth-mass-extinction-could-destroy-life-we-know-it-biodiversity-expert.html>

^{vii} <https://wwf.be/fr/actualites/rapport-planete-vivante-2018-en-40-ans-nous-avons-perdu-60-des-populations-danimaux-sauvages-sur-terre/>

^{viii} <https://www.sciencedirect.com/science/article/pii/S0006320718313636>

<https://www.theguardian.com/environment/2019/feb/10/plummeting-insect-numbers-threaten-collapse-of-nature>

^{ix} <https://www.sciencedaily.com/releases/2018/02/180219155019.htm>

^x http://www3.weforum.org/docs/WEF_Global_Risks_Report_2019.pdf

^{xi} The European Academies of Science Advisory Council expresses severe doubts about the mitigation potential of carbon removal from the atmosphere through bio-energy (BECCS): “*The role of bioenergy with carbon capture and storage (BECCS) remains associated with substantial risks and uncertainties, both over its environmental impact and ability to achieve net removal of CO2 from the atmosphere. The large negative emissions capability given to BECCS in climate scenarios limiting warming to 1.5°C or 2°C is not supported by recent analyses, and policy-makers should avoid early decisions favouring a single technology such as BECCS. A suite of technologies is likely to be required.*” Cf. EASAC: Forest bioenergy, carbon capture and storage, and carbon dioxide removal: an update, February 2019.

https://easac.eu/fileadmin/PDF_s/reports_statements/Negative_Carbon/EASAC_Commentary_Forest_Bioenergy_Feb_2019_FINAL.pdf

Other carbon removal technologies are even more uncertain.

^{xii} IPCC 2018, Global Warming of 1.5C <https://www.ipcc.ch/sr15/>

^{xiii} Based on the IPCC, to limit warming to 1.5C, CO2 emissions must be cut at a minimum by 51% by 2030, in other words within 10 years. The calculation is as follows: The IPCC says a cut by at least 45% below 2010 levels is needed (but likely more): <https://www.ipcc.ch/sr15/> We estimate that emissions will have increased by appr. 15% between 2010 and 2020. Therefore, emissions must be cut by at least 51% from 2020 levels by 2030.

Discussion paper





UNPRECEDENTED

CHANGE NOW

**A POSITIVE JOURNEY
BEYOND THE COMFORT ZONE**

Discussion paper by EU Staff 4 Climate

Picture credit: [NASA 1972, Blue Marble—Earth seen from Apollo 17](#); Belgium [Sing for the Climate 2012](#). Back cover: Twitter, <https://twitter.com/Students4Clima1/status/1072788784826253312/photo/1>

Acknowledgements: Greta Thunberg, for the excerpts from her speech at the [European Parliament](#), 16 April 2019

This discussion paper puts forward a systemic analysis and offers perspectives on unprecedented change and its possible implications for Europe. It accompanies and supports the EUStaff4Climate petition to new EU leaders on the planetary emergency. The ideas expressed here are the authors', and do not necessarily represent the views of EUStaff4Climate as a whole. The document is also meant to inspire participatory processes and may be updated further.

DISCLAIMER: The information and views set out in this publication are those of the authors and do not reflect the official opinion of the institutions where they work. Neither the European Union institutions and bodies, nor any person acting on their behalf, may be held responsible for the use which may be made of the information contained therein.

The following people working in the EU institutions, listed in alphabetical order, have co-created this work in their capacity as citizens of Europe. Their views may differ on some minor points but concur and complement each other for the overall vision.

Thomas Arnold, Gwenn Belbéoch, Laurent Bontoux, Claire McCamphill, John Doyle, Myriam Dumortier, Céline Frank, Bernhard Friess, Nikolaos Kastrinos, Philippe Martin, Elena Montani, Kevin O'Connor, Anna Olsson, Mathew Pye, Bettina Schmidbauer-Mogensen, Monika Schroeder, Harald Stieber, Alexandre Vacher, Nathalie Vercruyse, Charles Williams, Karin Zaubnerger.

The document is informed by the outcomes of a participatory workshop, announced as "A strong message to the next Commission", held by EUStaff4Climate on 20 May 2019.

All EU staff, from all the EU institutions, are encouraged to sign and disseminate the EU Staff for Climate petition to new EU leaders. For signing the petition, go to: <https://ec.europa.eu/eusurvey/runner/petition>.

Documents are available at <https://eustaff4climate.info/>

Contact: EU-STAFF4CLIMATE@ec.europa.eu

Facebook: <https://www.facebook.com/EUstaff4climate/>

Twitter: @EUStaffClimate, #EUStaff4Climate



The paper sets the context of the EUStaff4Climate petition to new EU leaders on the planetary emergency and provides supporting evidence.

June 2019 (Version 1.1.2, Update 13.10.2019)

The document is available at <https://eustaff4climate.info/background-info/>. It may be freely distributed for non-commercial purposes, provided that its source is acknowledged and the **disclaimer included**.

Please quote as 'Unprecedented change NOW: A Positive Journey beyond the Comfort Zone, a discussion paper by EU Staff 4 Climate, Brussels, 2019'

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Contents

Greta Thunberg: “ <i>It will take cathedral thinking</i> ”	iv
Executive Summary	1
Introduction: Why is this important?	3
12 key levers for unprecedented change	10
POLICY FOUNDATIONS	17
1. What if we boosted energy saving and renewables now to phase out fossil fuels?	17
2. What if we reinvented mobility and transport now?	24
3. What if we shifted to agro-ecology and a new food system now?	29
4. What if we conserved and restored natural ecosystems and created carbon sinks to remove CO ₂ from the atmosphere now?	34
5. What if we reduced consumption in a regenerative and circular economy now?	40
6. What if we prioritised resilience and disaster preparedness now?	48
CROSS-CUTTING ENABLERS	54
1. What if we sought climate justice and solidarity now?	54
2. What if we turned the financial system into a climate solution now?	59
3. What if we used trade and international cooperation to tackle climate disruption and the planetary emergency now?	66
4. What if we rethought the economy redefining prosperity and wellbeing now?	72
5. What if we re-grounded our values on life and community now?	76
6. What if we practised new forms of deliberation and co-creation now?	82
Conclusion: Facing humanity’s biggest choice – Turn the Tanker	87
Policy recommendations for governance of immediate unprecedented change	90
Annex I: Scenarios for the EU	91
1. All-encompassing immediate and unprecedented transformation	91
2. Bold and immediate action with a focus on selected policy foundations	92
3. Exploiting transformational potential of existing strategies	93
Annex II: Building blocks for unprecedented change NOW	94
Bibliography	97

Greta Thunberg: “It will take cathedral thinking”

My name is Greta Thunberg, I am 16 years old, I am from Sweden and I want you to panic. I want you to act as if the house is on fire.

Around the year 2030, 10 years 259 days and 10 hours away from now, we will be in a position where we set off an irreversible chain reaction beyond human control that will most likely lead to the end of our civilization as we know it.

That is unless in that time, permanent and unprecedented changes in all aspects of society have taken place. Including a reduction of CO2 emissions by at least 50%.

And please note that these calculations depend on inventions that have not yet been invented at scale, inventions that are supposed to clear our atmosphere of astronomical amounts of carbon dioxide.

We are in the midst of the sixth mass extinction and the extinction rate is up to ten thousand times faster than what is considered normal, with up to 200 species becoming extinct every single day.

Erosion of fertile topsoil, deforestation of our great forests, toxic air pollution, loss of insects and wildlife, the acidification of our oceans - these are all disastrous trends being accelerated by a way of life that we, here in our financially fortunate part of the world, see as our right to simply carry on.

Everyone and everything has to change so why waste precious time arguing about what and who needs to change first?

Everyone and everything has to change. But the bigger your platform the bigger your responsibility.

The bigger your carbon footprint the bigger your moral duty.

Our house is falling apart.

The future - as well as all that we have achieved in the past - is literally in your hands now.

But it is not too late to act.

*It will take a far-reaching vision. It will take courage. It will take a fierce determination to act now to lay the foundations when we may not know all of the details about how to shape the ceiling. In other words, **it will take ‘cathedral thinking’.***

I ask you to please wake up and make the required changes possible.

To do your best is no longer good enough. We must all do the seemingly impossible.

And it’s okay if you refuse to listen to me. I am after all just a 16 year-old schoolgirl from Sweden.

But you cannot ignore the scientists. Or the science. Or the millions of schoolchildren school striking for the right to a future.

Transcript of excerpts from [Greta Thunberg’s speech at the European Parliament](#) in Strasbourg, 16 April 2019

Executive Summary

We are facing a planetary emergency. Science has given us one wake-up call after the other. Planetary boundaries have been overstepped. We are starting to feel the bite of climate disruption worldwide. Extreme weather events are multiplying. The conditions necessary for human settlements and food production are deteriorating across the planet. The sixth mass extinction is decimating our wildlife. The very fabric of society is increasingly fragile. Together, these challenges threaten our lives, our prosperity and the future of our children.

Anthropogenic climate disruption and environmental decline are the result of a systemic failure of human civilization as it currently stands. While climate disruption, biodiversity loss and pollution are the most serious consequences of our harmful behaviour, drivers and pressures causing them are embedded in our economy, social values, lifestyles and governance, connected through our resource use.

This discussion paper is based on the understanding that we are facing ‘unprecedented change’. While this expression has entered policy narratives and conversations, practical policy-making and implementation at all levels often lack direction, coherence and breadth. To find ways forward, the discussion paper examines twelve systemic levers to tackle the unprecedented change we are facing. They cover all aspects of our society: energy, mobility, food, carbon removal, regeneration, resilience and preparedness, climate justice, finances, trade, prosperity, social values and democracy. Solutions based on these levers will take full advantage of the potential that exists to bring about the necessary positive transformation and inspire a positive journey beyond our temporary and illusory comfort zone.

For public policies at all different and interacting levels, including the European Union (EU), this is perhaps one final opportunity to focus all our efforts on reversing global heating and bringing the planet back to a safe operating space for this generation and the ones to come. This means that policies must be consistent and that we must use a single compass to navigate their impact on planetary boundaries and on the structures that underpin society. Climate disruption, biodiversity collapse and the social crisis are interlinked and interdependent. Integrated approaches can bring multiple cascading benefits and improve resilience.

We are facing the biggest choice ever to confront humanity: courageous, active system change - or uncontrolled climate disruption and ecosystems collapse. Moving on from the rhetoric of transformation to deep transformation on a huge scale and at unprecedented speed may be ‘*one giant leap for mankind*’. Overshoot of planetary boundaries, unbridled climate disruption, the mass extinction of species and growing inequality are global challenges. They demand bold measures, while each local action counts.

EU leaders, you face a historic moment and have an unprecedented responsibility. The EU has the opportunity to go down in history – thanks to your actions – for catalysing the change needed to turn the tanker away from its current path. If it wants, the EU has the capacity to host a new conversation and orchestrate the necessary change. It needs to team up with citizens, young people, business and others willing and able to effect change. This discussion paper is intended as a possible input into this effort.

To move forward, the EU needs to declare a planetary emergency; work together with citizens to design the change we need, ensuring that all institutions work together fast and efficiently; communicate the full picture to citizens; and align all policies, projects, funding and metrics.

Tweet by Johan Rockström



Johan Rockström ([@jrockstrom](#))

[06/05/2019, 20:36](#)

Place the IPBES report next to the IPCC 1.5 C report and you have a full picture of a Planetary Emergency. Science cannot be more clear. The World needs to Transform. Now.

theguardian.com/environment/20...

Tweet by EUStaff4Climate



EUStaff4Climate ([@EUStaffClimate](#))

[06/09/2019, 12:34](#)

Yesterday [#EUstaff4climate](#) had the privilege of discussing with eminent scientist H.J. Schellnhuber.

“We are in the [#endgame](#)”.

“We need [#unconventionalAlliances](#)”.

Sobering, inspiring, motivating.

[#ClimateEmergency](#) [#EcologicalCrisis](#), [#FutureofEurope](#), [#UnprecedentedChangeNow](#)

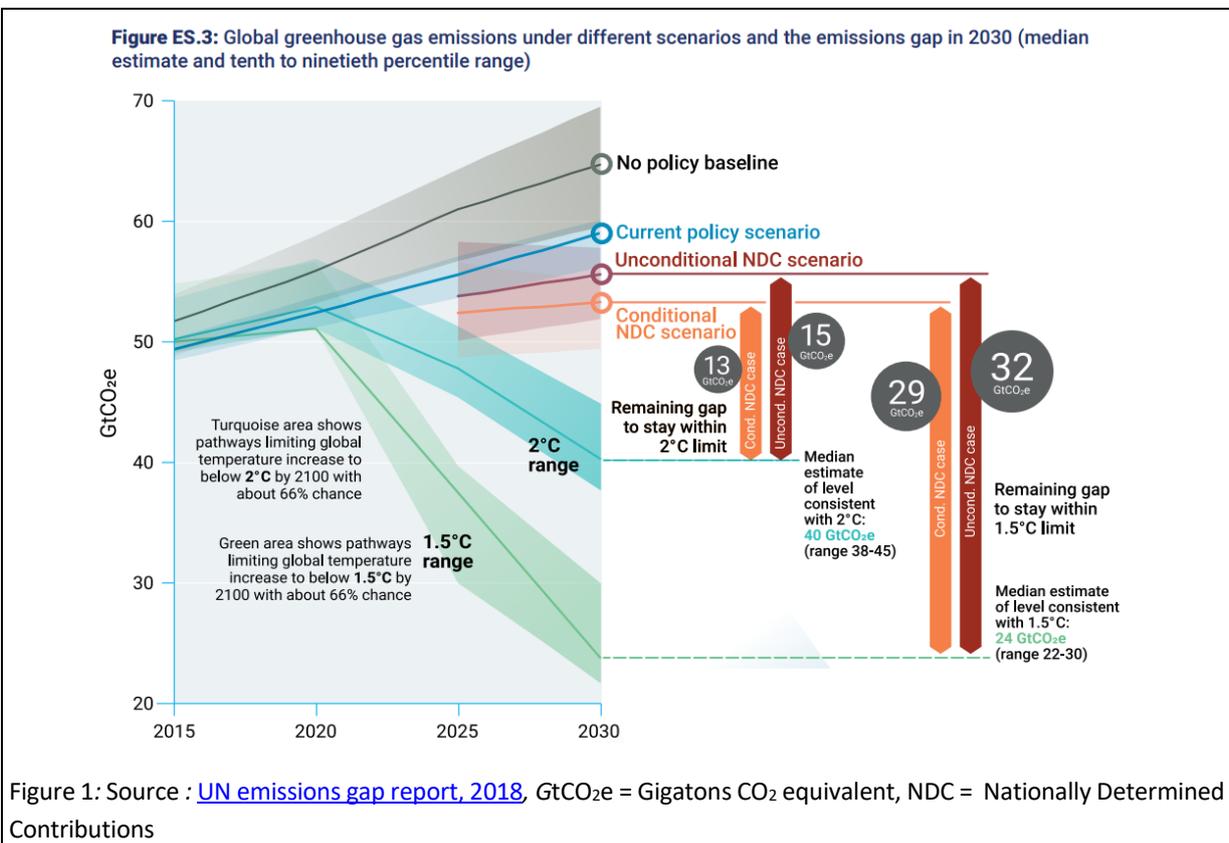
pic.twitter.com/exOsC7mDml

Introduction: Why is this important?

This is a planetary emergency! Science has given us one wake-up call after the other. Planetary boundaries have been overstepped. We are starting to feel the bite of climate disruption worldwide. Extreme weather events are multiplying and intensifying. The conditions necessary for human settlements and food production are deteriorating across the planet. The sixth mass extinction is decimating our wildlife. The very fabric of society is increasingly fragile. Together, these challenges threaten our lives, our prosperity and the future of our children.

1.5°C of global warming is bad enough and 2°C is much worse. Yet humanity is currently on track to heat the planet by at least **3°C**. Each fraction of a degree counts. The IPCC special report [Global Warming of 1.5°C](#) highlights that “climate-related risks to health, livelihoods, food security, water supply, human security, and economic growth are projected to increase with global warming of 1.5°C and increase further with 2°C” (IPCC 2018). Irrespective of whether the increase is 1.5°C or 2°C, these figures are estimated **average** increases. Local temperature rises [may be much higher](#), and **land surface air temperature has risen nearly twice as much** as the global average temperature (IPCC 2019). With each degree, shocks to natural and human systems will increase.

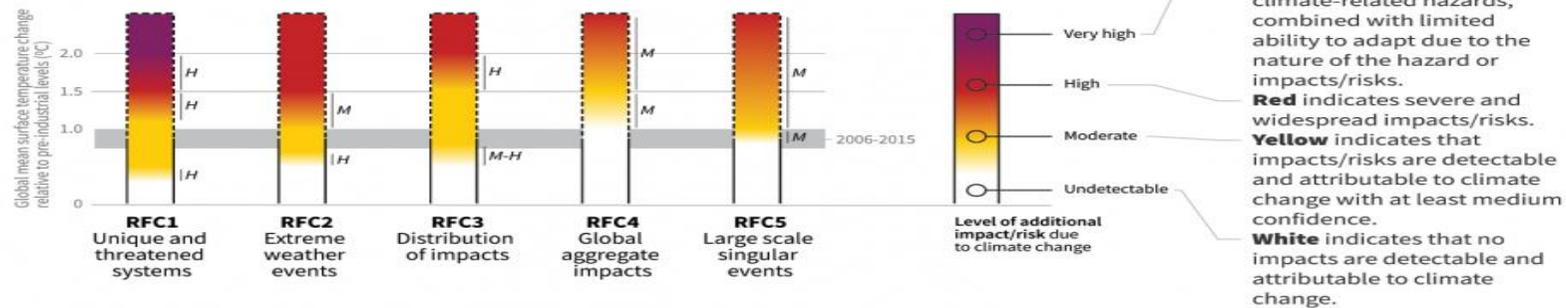
The next ten years are critical. Humankind must act. Only unprecedented transformation within the next decade might allow us to keep climate risks at manageable levels and - possibly - remain on a pathway not much above 1.5°C. The emissions curve must start to turn downwards sharply in **2020**. “Human activities are estimated to have caused approximately 1.0°C of global warming above pre-industrial levels, with a likely range of 0.8°C to 1.2°C. Global warming is likely to reach 1.5°C between 2030 and 2052 if it continues to increase at the current rate. (high confidence)” (IPCC 2018). The three IPCC special reports on [Global Warming of 1.5°C](#), on [Land](#) and on [Ocean and the Cryosphere](#) call for bold action now. [Most recent models](#), yet [to be confirmed](#), would leave the world even less time than is currently thought. Positive and negative feedback loops, unpredictable tipping points and [runaway risks](#) need to be taken into account. [Extreme weather events](#) are already more frequent today.



How the level of global warming affects impacts and/or risks associated with the Reasons for Concern (RFCs) and selected natural, managed and human systems

Five Reasons For Concern (RFCs) illustrate the impacts and risks of different levels of global warming for people, economies and ecosystems across sectors and regions.

Impacts and risks associated with the Reasons for Concern (RFCs)



Impacts and risks for selected natural, managed and human systems

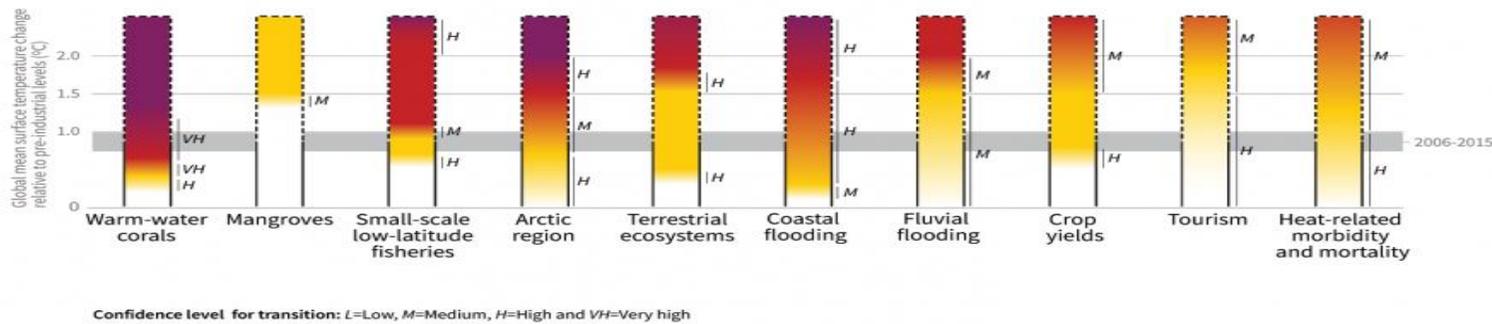


Figure 2: [IPCC \(2018\)](#), 1.5°C Global warming, Summary for Policymaker

In addition to reducing new greenhouse gas (GHG) emissions, there is an urgent need to remove existing atmospheric concentrations of CO₂. “If the concentrations of the different greenhouse gases continue to increase at current rates, the peak concentration levels required to stay below a temperature increase of 1.5°C above pre-industrial levels, could be reached within the next 5-16 years. Peak concentration required to stay below a maximum 2°C temperature increase could be reached in 17-40 years” (EEA,2019)(Schneider et al. 2019).

Steffen et al (2018) have alerted that a 2°C temperature rise already risks an irreversible shift to a **“Hothouse” Earth’ pathway, even if emissions were reduced**: “Our analysis suggests that the Earth System may be approaching a planetary threshold that could lock in a continuing rapid pathway toward much hotter conditions—Hothouse Earth. This pathway would be propelled by strong, intrinsic, biogeophysical feedbacks difficult to influence by human actions, a pathway that could not be reversed, steered, or substantially slowed.” Such a trajectory “will likely exceed the limits of adaptation and result in a substantial overall decrease in agricultural production”. Therefore, the authors highlight that a “Stabilized Earth pathway can only be achieved and maintained by a coordinated, deliberate effort by human societies to manage our relationship with the rest of the Earth System, recognizing that humanity is an integral, interacting component of the system”. This includes a “deep transformation based on a fundamental reorientation of human values, equity, behavior, institutions, economies, and technologies”. The authors are therefore calling for a wide range of responses:

“decarbonization of the global economy, enhancement of biosphere carbon sinks, behavioral changes, technological innovations, new governance arrangements, and transformed social values”.

Climate change may dwarf all other drivers of migration (EPSC 2017). Future forecasts vary from 25 million to 1 billion environmental migrants by 2050, moving either within their countries or across borders, temporarily or permanently, with **200 million** being the most widely cited estimate says IOM. Environmental migration is already a reality today: “In 2017 alone, 18.8 million people in 135 countries were newly displaced in the context of sudden-onset disasters within their own country” (IDMC 2018). While migration sparked off by environmental change occurs primarily within countries, some migrants are forced to cross borders. Climate change is a risk factor for armed conflict (Mach et al. 2019). Human habitability could be impacted in certain areas (Pal/Eltahir 2016).

Biodiversity loss is as dangerous as climate change, according to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), the IPCC’s equivalent on biodiversity and ecosystem services. A major [global assessment report](#) (see also [here](#)) was [published in May 2019](#). It notes that nature's dangerous decline is 'unprecedented' in human history and that species extinction rates are 'accelerating', with a million species threatened and 82% of the biomass of wild animals lost. The report notes that the “direct drivers of change in nature with the largest global impact have been (starting with those with most impact): changes in land and sea use; direct exploitation of organisms; climate change; pollution; and invasion of alien species. Those five direct drivers result from an array of underlying causes – the indirect drivers of change – which are in turn underpinned by societal values and behaviours.” The summary for policymakers concludes:

“Goals for [...] achieving sustainability cannot be met by current trajectories, and goals for 2030 and beyond may only be achieved through transformative changes across economic, social, political and technological factors [...]

A key component of sustainable pathways is the evolution of global financial and economic systems to build a global sustainable economy, steering away from the current, limited paradigm of economic growth”

Regional assessments by IPBES in 2018 on the state of the world’s biodiversity concluded that *“biodiversity – the essential variety of life forms on Earth – continues to decline in every region of the world, significantly reducing nature’s capacity to contribute to people’s wellbeing. This alarming trend endangers economies, livelihoods, food security and the quality of life of people everywhere.”*

Our planet has entered the **sixth mass extinction**. Wildlife population fell by 60% globally between 1970 and 2014 (WWF Report 2018). **Insects** are disappearing at an **alarming rate**. Loss of biodiversity is likely to exacerbate the risk of 'extinction cascades', with an initial species loss producing a **domino effect** of further extinctions. **Over half of Europe’s endemic trees** face extinction, according to the European Red List of Trees (IUCN 2019). The **Ellen MacArthur Foundation** warns that the global ocean might contain more plastics than fish by 2050.

Young protesters’ concerns are justified, say scientists. The Union of Concerned Scientists issued a **second warning to humanity** in 2018, signed by 15,000 scientists. They note that *“since 1992, with the exception of stabilizing the stratospheric ozone layer, humanity has failed to make sufficient progress in generally solving these foreseen environmental challenges, and alarmingly, most of them are getting far worse.”*

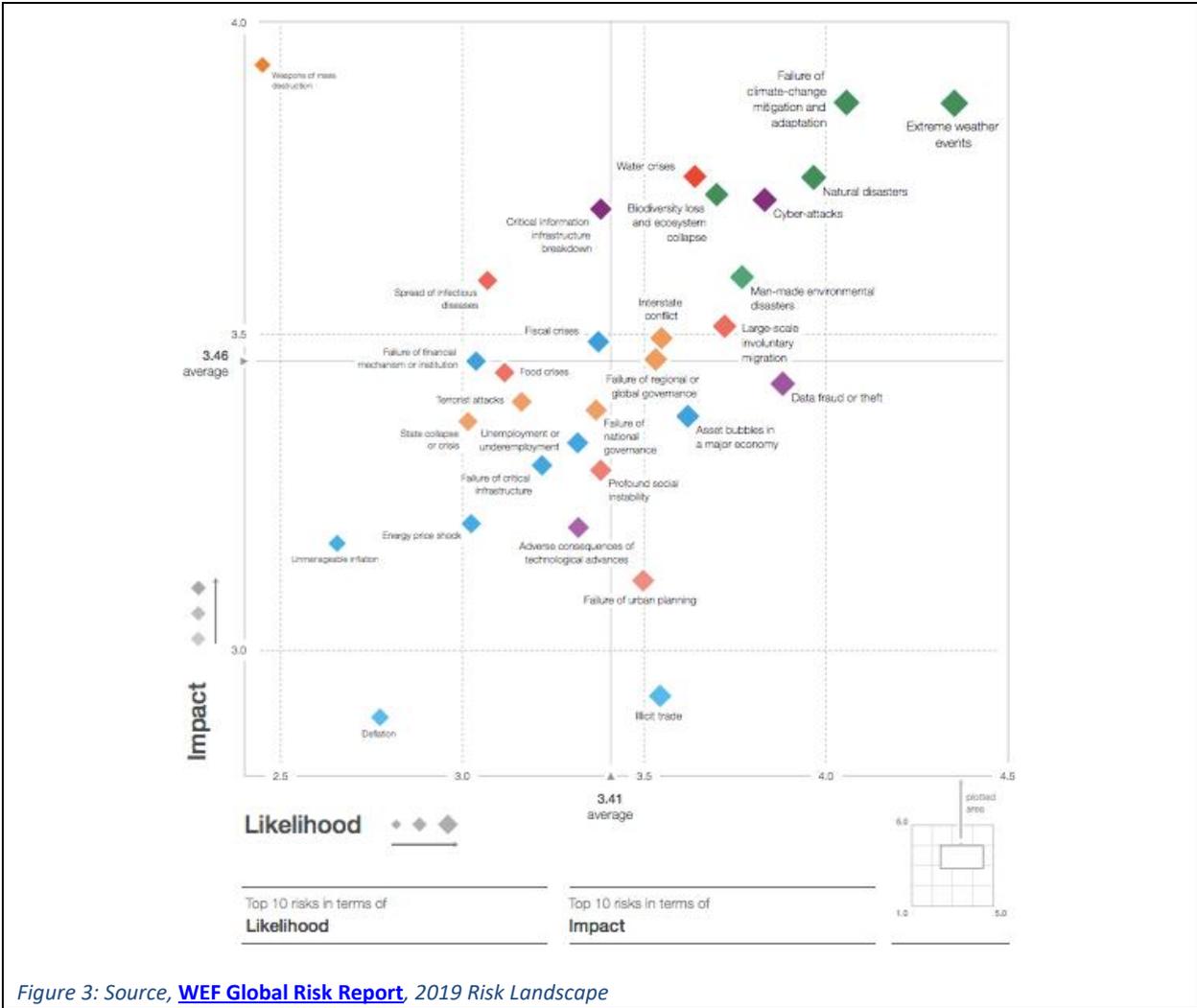
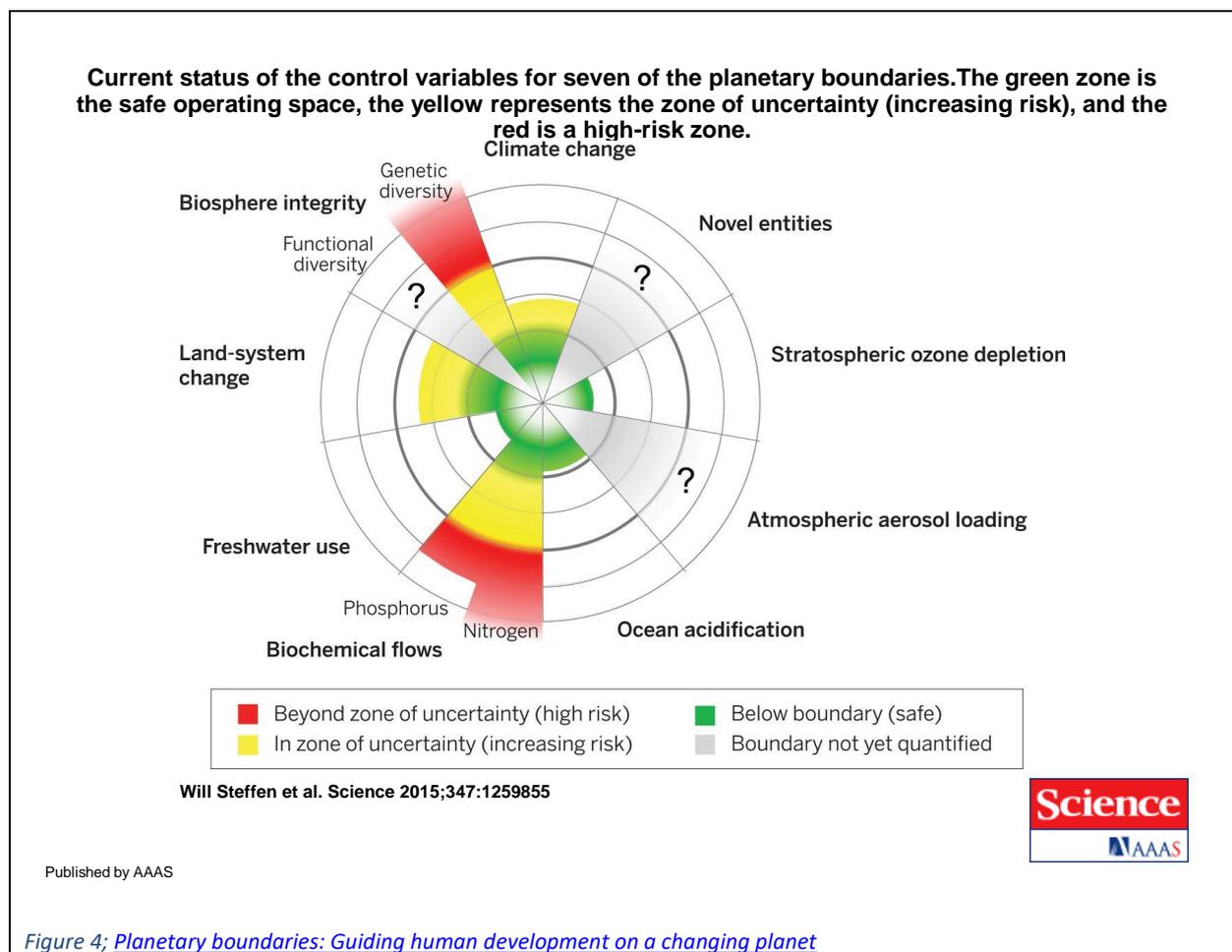


Figure 3: Source, [WEF Global Risk Report, 2019 Risk Landscape](#)

The 2019 **WEF Global Risk Report** headlines with **“Global Risks Out of Control”**, and expresses deep concern: *“Is the world sleepwalking into a crisis? Global risks are intensifying but the collective will to tackle them appears to be lacking. Instead, divisions are hardening.”* Extreme weather events, failure of climate change mitigation and adaptation, natural disasters, biodiversity loss and ecosystems collapse, water crisis, man-made environmental disasters, large-scale involuntary migration combine high likelihood and high impact. The possible impacts of climate-related risks are almost as serious as those of weapons of mass destruction, which are considerably less likely.

Resource use is a connecting element for climate disruption and biodiversity loss, and many other problems such as pollution. According the [International Global Resources Outlook 2019](#), “the use of natural resources has more than tripled from 1970, and continues to grow. 90% of biodiversity loss is due to resource use. [...] A sustainable future will not occur spontaneously. In the absence of urgent and concerted action, rapid growth and inefficient use of natural resources will continue to create unsustainable pressures on the environment.”

Four of the [planetary boundaries](#) are being exceeded, including climate change. The others are biodiversity loss and the nitrogen and phosphorus cycles. **Planetary boundaries** are interrelated in their causes and consequences. Focusing on a single one may even be counter-productive. The extent to which the “safe” boundary threshold has already been exceeded is captured by the radar graph below. Red does not mean the effects of breaching the boundary are greater for humanity – just that the extent to which the boundary is already being overstepped is greater.



Our planet has moved into the **Anthropocene**: humans have a greater impact than ever on the destiny of the Earth’s ecosystems and the future of humanity. Our generation is the first living in a socio-ecological space on a planetary scale. The Anthropocene confers responsibility on humans not to destroy our planet as a liveable space. This increases our individual and collective responsibility for the future enormously. While in the last decades humanity has achieved unprecedented economic and social development, many environmental and socioeconomic trends have been moving in a direction that threatens the balance of earth systems - a [great acceleration](#).

“Up to 5 billion people face higher water pollution and insufficient pollination for nutrition under future scenarios of land use and climate change”, according to work on global modelling of nature’s contributions to people ([Chaplin-Kramer et al. 2019](#)).

We have created a world in which our home, Earth, has become fragile as a result of our irresponsible behaviour. The economy is the activity that includes and connects us all. All of us want in the first place to have a job and security, for us and for our children. The essentials of these problems are summarised by [Potocnik \(2019\)](#) thus:

- *“Political cycles, public and financial institutions, have inbuilt short-term focus and logic. We have to fix the democracies. The challenges we face require a real deep system change and rethinking of the way how we govern our society.*
- *Production and consumption systems are based on the logic of consumerism, quantities and GDP-fuelled growth [...] Future risks have not been clearly identified, existing risk management is not fit for purpose, and there is a clear lack of understanding of what really matters if our future is to be safe.*
- *Transition to a more sustainable economy and society will be possible only if it is just, fair and inclusive. We are currently failing to make good our promises. We need to make our societies fairer and to do more to combat poverty. Social unrest is growing, even in the high-income countries and it is high time to hear the voices from the streets, and from the frustrated younger generation in particular.”*

We know that most trends are still going in the wrong direction. We know that time is running out. We need to slash new CO₂ emissions – while also starting to remove existing CO₂ concentrations from the atmosphere –, yet emissions of greenhouse gases have risen again in 2017 ([UNEP 2018](#)). We should be regenerating nature fast, yet the ecosystems that underpin our prosperity and our very lives continue to decline. We should be taking care to leave nobody behind, yet [hunger is on the increase again](#) and governments are struggling to reconcile the ‘end of the month’ challenge that faces so many people with the existential challenge of the ‘end of the planet’

“If we do not keep temperature increases below 1.5 degrees, we risk heading towards extinction later this century”, the inter-institutional foresight study “Global trends to 2030” ([ESPAS 2019a](#)) puts it bluntly in its executive summary.

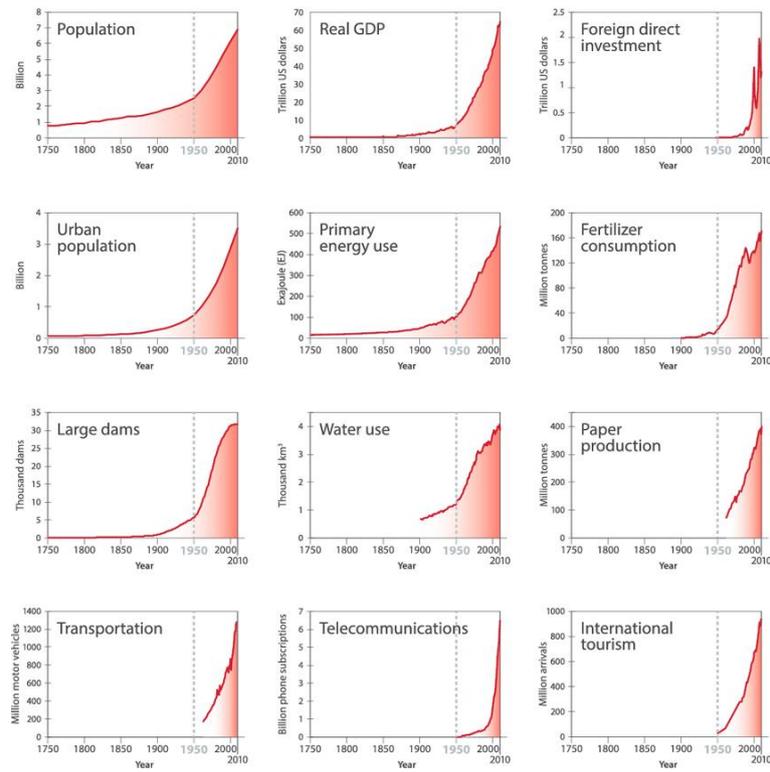
CLIMATE DISRUPTION AS A PLANETARY HEALTH ISSUE

Planetary health is gaining ground as a new interdisciplinary and transdisciplinary approach in science. The concept which is now widely used was framed by the [Rockefeller Foundation–Lancet Commission on Planetary Health](#): *“Planetary health was defined as the health of human civilisations and the natural systems on which they depend. [...] Alterations to climate, water, land and ecosystems are challenging all life on our planet, with serious implications for human health.”* The concept of planetary health is thus useful *“not only to investigate the effects of environmental change on human health, but also to study the political, economic, and social systems that govern those effects.”*

Anthropogenic climate disruption is among the factors exacerbating health problems worldwide. A Lancet Commission has coined the concept of Global Syndemic. *“This Commission following on from two Lancet Series on obesity looks at obesity in a much wider context of common underlying societal and political drivers for malnutrition in all its forms- and climate change. The Commission urges a radical rethink of business models, food systems, civil society involvement, and national and international governance to address The Global Syndemic of Obesity, Undernutrition, and Climate Change. A holistic effort to reorient human systems to achieve better human and planetary health is our most important and urgent challenge.”* (The Global Syndemic of Obesity, Undernutrition, and Climate Change: [The Lancet Commission report, 2019](#)).

Greenhouse gas emissions are the symptom. The disease is rooted in the behaviour of humankind, its values and wants, its power structures and its money flows. Climate disruption is the biggest, but not the only systemic failure of human civilization in its present form. We are facing a multi-faceted crisis: climatic, environmental, social, political and economic. As well as adapting to climate disruption (i.e. preparing to live with new climate realities and reducing vulnerabilities) and mitigating climate disruption (i.e. reducing greenhouse gas emissions and drawing down existing concentrations of such gases), we may need to look for a cure to climate disruption that works on indirect drivers and root causes stemming from the way human civilization is currently organised. As the root causes of climate disruption overlap with the causes of biodiversity loss, and to some extent with those of the social crisis, there may be a large untapped potential for real simultaneous impact on several dimensions of our planetary emergency.

Socio-economic trends



Earth system trends

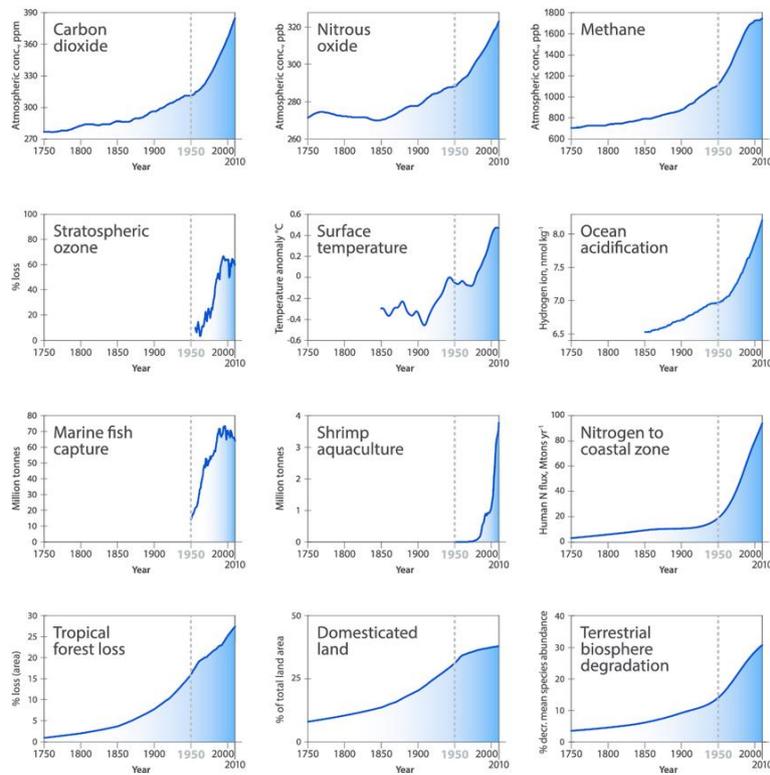


Figure 5: Steffen et al (2015), *The Trajectory of the Anthropocene, The Great Acceleration*

12 key levers for unprecedented change

The intention of this discussion paper is to take 'unprecedented change' as the point of departure for exploration. While this expression has entered policy narratives and conversations, implementation often lags behind. For public policy at different and interacting levels, including the EU, there is an opportunity for coherence within and across policies and using one compass. This has to become a positive journey beyond our comfort zone.

Many issues raised here are not new, but they are generally discussed with longer timelines, which may give an illusionary sense of security, thus pushing the major efforts needed further into the future. Results in 2030 and even 2050 depend largely on bold action now at all levels of decision-making. Many scientists argue that the time for incremental measures to address the planetary emergency is over.

To illustrate ways forward, the authors have worked on twelve key levers for unprecedented change with high systemic impact and the potential to catalyse positive transformation. They cover a broad range of transformative change processes concerning behaviours, governance, values and technologies. In summary, the twelve levers, grouped into policy foundations and cross-cutting enablers, are energy, mobility, food, carbon removal, regeneration, resilience and preparedness, climate justice, finance, trade, prosperity, social values and democracy.

For each key lever, we explore two spaces: a space of transformative opportunity – “what if changes were made on an unprecedented scale and at an unprecedented speed right now?” - and a space of inertia and 'business as usual' – “what if changes were not made or were not bold enough?” Embedded systemic issues are highlighted. In response to the multiple crises, systemic solutions with co-benefits are not a diversion, but a real focus, and possibly the only focus that has a chance of being effective. Specific isolated solutions addressing problems in isolation are inadequate if they are not part of a coherent systemic approach.

The rapidly-evolving gravity of the situation and the scale of necessary change call for readiness to discuss and formulate policy options beyond our comfort zone. Deliberately, the stories explore the edge of feasibility while remaining plausible. Some may judge the storylines developed here unrealistic, while others may claim they still fall short of the effort necessary to slash greenhouse emissions now.

What is set out here is intended to inspire a positive vision. Co-creating such a vision is relevant for all levels of public policy, including the EU. That is why this discussion paper is not about 'What if the EU ...', but about 'What if WE ...', and this 'we' is all of us: citizens, politicians, businesses, organisations within civil society, etc., through our actions, choices, commitments and decisions, and with a major effort of collective deliberation.

At EU level, most of the transformations reviewed would be of relevance for the timeframe of the next Multi-annual Financial Framework (MFF), the incoming Commission and the new Parliament. The transformations would have to be launched and put into full motion within the next five years. The Commission has submitted a strategic long-term plan to go [climate-neutral by 2050](#) and has proposed using a share of 25% of the next MFF for climate spending (meaning the other 75% may not be). Several proposals go further than some Member States are willing to accept at present; though others have announced they will - at a national level - outperform the Commission's requests. [Finland](#) is committing to become carbon-neutral as early as 2035. Leading climate scientist [Schellnhuber](#) suggests to advance Europe's climate neutrality target to 2040.

EU policies on the environment and the climate are among the most ambitious in the world. But still, new scientific evidence regularly updates on the state of emergency (e.g.: [Voosen 2019](#), [WMO 2019](#), [Mouginot et al 2019](#), [Rignot et al 2019](#), [Lamarque-Gagnon 2019](#), [Nunez et al 2019](#), [Tong et al 2019](#), [Sutherland et al 2019](#), [Mora et al 2018](#)) and challenges the view that current ambitions are sufficient and that we are safe.

The [gap between target and reality is growing](#). “The current level of NDC ambition needs to be roughly tripled for emission reduction to be in line with the 2°C goal and increased fivefold for the 1.5°C goal” ([WMO 2019b](#)).

Unless mitigation ambition and action increase substantially and immediately, “*exceeding the 1.5°C goal can no longer be avoided, and achieving the well-below 2°C temperature goal becomes increasingly challenging*” (UNEP 2019). Most countries have submitted [climate pledges \(NDC\) lagging far behind](#) what would be needed to stay below 2°C Urgent action is therefore required at all levels of policy from local, regional and national level to EU and global. The MFF determines EU spending until 2027, locking in today’s pathways unless amended.

SUSTAINABLE DEVELOPMENT AND POLICY MAKING IN A COMPLEX WORLD

To achieve the unprecedented changes needed, it is essential to grasp the overall context of the United Nations’ 2030 Agenda, [Transforming Our World](#), with its 17 Sustainable Development Goals (SDGs), one of which is Climate Action (SDG 13). There are 10 years left to put it into practice. The UN 2030 Agenda is a holistic masterplan designed to bring about radical transformation. The wedding cake developed by the Stockholm Resilience Institute presents a holistic view of the SDGs, showing that the prosperity and wellbeing of societies depend on the health of the planet.

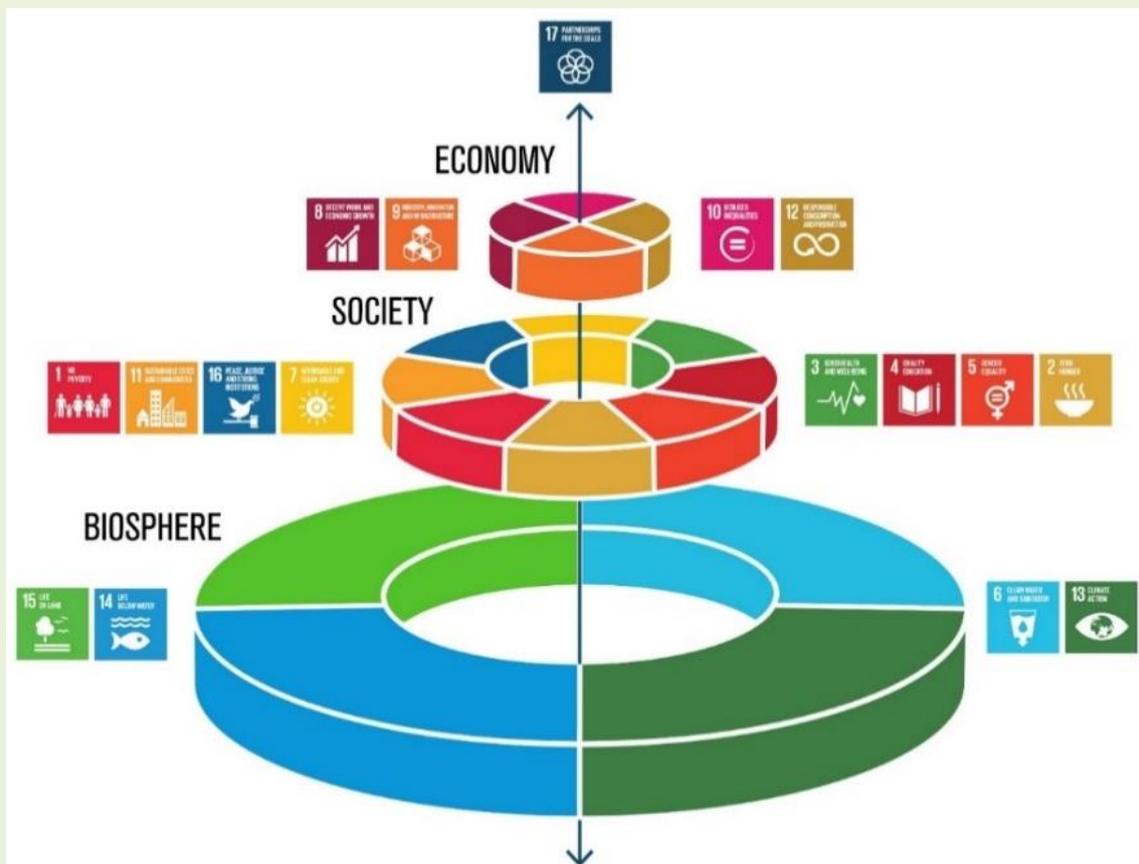


Figure 6: [The SDG ‘wedding cake’](#). Source: [Stockholm Resilience Institute](#)

The European Commission submitted its sixth reflection paper on [Sustainable Europe by 2030](#) in January 2019. The more ambitious scenario 1 is about “*endorsing at the highest EU political level the globally agreed SDGs as the overarching strategic policy objectives for the EU and its Member States. [...] Under this scenario, the United Nations 2030 Agenda and the SDGs would be our compass and map and thus determine the strategic framework for the EU and its Member States*”. In [Europe’s Sustainability Puzzle](#), the EPSC, the European Commission’s internal think-tank, highlights several risks linked to paradoxes embedded in Europe’s socioeconomic system and explores possible solutions that are also relevant to climate action.

Climate disruption is a planetary issue. But Europe can be the beacon for the SDGs and leverage joint action by setting the right example. Europe needs courage to make these changes and to make them fast. “*The responsibility to, quite literally, save the planet rests with Europe*” according to the “Global trends to 2030” report (ESPAS 2019).

Climate and environment justice are important. There needs to be a right for less developed countries and poorer populations to achieve the social foundations and a good life within a ‘safe and just operating space’ (Raworth

2017). It is not yet clear if this is at all possible (O'Neill et al. 2018). While the quest for the right to develop sustainable patterns of consumption and production is understandable, that quest cannot merely imitate western overshooting, even if that is precisely the current practice or aspiration of elites and populations moving up into the new middle classes. For overshooting countries, there is a moral obligation to move back to their fair share of resource use and consumption while ensuring social justice and inclusion at home.

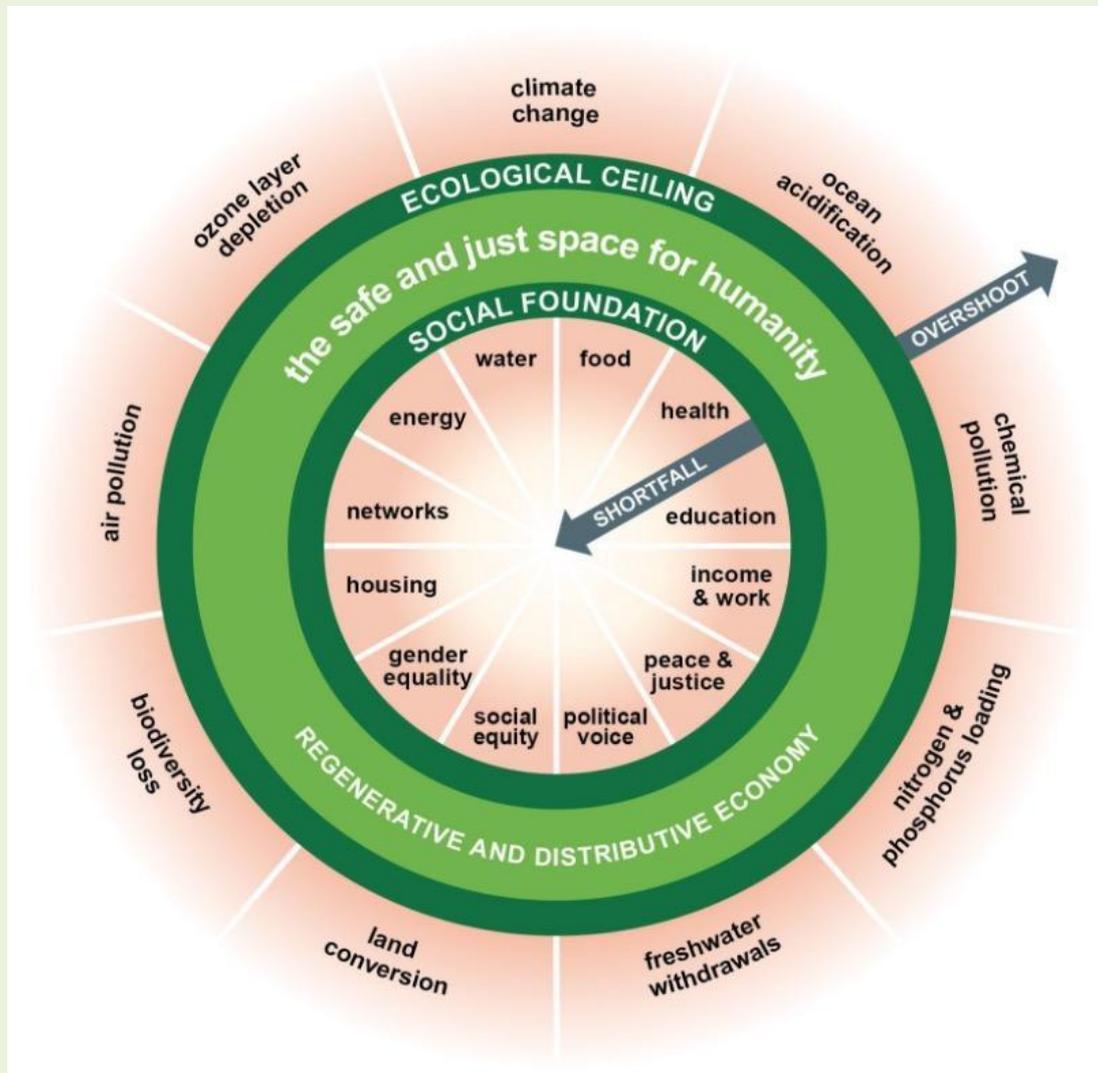


Figure 7: Figure 7 [Kate Raworth](#), *Safe and just operating space*

It is urgent to mobilise the transformative power of sustainable development, interlinking transformative entry points and levers ([The future is now 2019](#))([Messerli et al. 2019](#)) The SDGs encompass a number of big systemic transformations ([Sachs et al 2019](#)). [EEA \(2019c\)](#) identifies practical policy options for responding to systemic environmental and climate challenges through sustainability transitions in Europe and globally.

Policy in the Anthropocene ([Sternier et al. 2019](#)) has to deal with a “*multitude of geographical levels, interconnected boundaries, and spatial, ecological and socio-political complexities*”, but “*the urgency is such that we cannot let complexity be an excuse for inaction [...] Threats of transgressing planetary boundaries are global, long-run, uncertain and interconnected; they must be analysed together to avoid conflicts and take advantage of synergies*”.

Humanity is increasingly facing intractable - or ‘super-wicked’ – problems, defined as follows by [Levin et al \(2012\)](#). “A ‘super wicked’ problem comprising four key features: time is running out; those who cause the problem also seek to provide a solution; central authority needed to address it is weak or non-existent; and, partly as a result, policy responses discount the future irrationally. [...] These four features combine to create a policy-making “tragedy” where traditional analytical techniques are ill equipped to identify solutions, even when it is well recognized that actions must take place soon to avoid catastrophic future impacts”.

Our multiple crises – climatic, environmental and social, with its many simultaneous challenges - can no longer be addressed by single or piecemeal solutions, or by trying to tackle one problem at a time. Action should aim to generate co-benefits in several areas, such as environment and health, making investments even more justified. The best solutions for the climate should therefore address other challenges simultaneously, such as the conservation and restoration of natural ecosystems to enhance carbon sinks, or reducing inequalities so as to make climate measures embraceable by all. The [IPCC](#) highlights these linkages in its presentation of the 1.5°C report:

“Limiting global warming to 1.5°C would require rapid, far-reaching and unprecedented changes in all aspects of society. [...] With clear benefits to people and natural ecosystems, limiting global warming to 1.5°C compared to 2°C could go hand in hand with ensuring a more sustainable and equitable society.”

Like many other studies, the science advice to the Belgian Youth for Climate activists stresses the crucial importance of a systemic approach ([Panel Climat et le Développement Durable, 2019](#)):

“Un changement systémique est nécessaire et urgent si l’on veut s’attaquer efficacement aux changements climatiques et à la crise des écosystèmes”. (‘Systemic change is necessary and urgent if we are to be effective in tackling climate change and the crisis facing ecosystems’).

The time to act is NOW, starting with implementing existing solutions. There are several ambitious scenarios for change and inventories of solutions. These are all relevant to the debate, and it would be useful for the new Commission to examine them ([Transformation is feasible](#), [Sustainability Transitions](#), [Think2030](#), [Drawdown](#), [Shift project](#), [#MoveTheDate](#), [1000 solutions](#), [World Scientists’ Warning to Humanity: A Second Notice](#), [‘Come On!’](#), [Tomorrow](#), [Europe’s Sustainability Puzzle](#), [Ten Trends](#), [Panel Climat et le Développement Durable 2019](#)). The Club of Rome has submitted a [Climate Emergency Plan](#) with 10 ambitious and challenging priority actions by 2020, 2025 or 2030, calling to “*rise to the challenge of climate action, so that our species can survive and create thriving civilizations in harmony with planetary boundaries*”.

Action may need to be faster and bolder than thought. The May 2019 [report to Belgian Youth for Climate](#), coordinated by Van Ypersele, states : “*Pour entre autres rester sous un réchauffement de 1,5°C, les objectifs européens actuels pour 2030 - au moins 40 % de CO₂ en moins en 2030, au moins 32 % d’énergies renouvelables et au moins 32,5 % de réduction de consommation d’énergie - sont radicalement insuffisants.*” (“To keep global heating below 1.5°C, the existing EU goals for 2030 – cutting CO₂ by at least 40% by 2030, increasing the share of renewables in the overall energy mix to at least 32%, and cutting energy consumption by at least 32.5% - are completely inadequate.”) Unprecedented and immediate changes towards a world built on low-carbon lifestyles ([1.5 Degree Lifestyles](#), 2019) are needed to enable this shift to take place. This is about what forms of transport we use, what we eat, where and how we live, what we consume, and so on. The focus so far has been on supply-side solutions rather than on the [demand side](#) ([Creutzig et al 2018](#)), and there has been too little emphasis on nature-based solutions. More women in decision making posts can strengthen a perspective of caring.

Research, innovation and investment are overarching needs. How to get us to embark on unprecedented transformations and overcome unsustainable path dependencies is still one of our major knowledge gaps. One of the biggest ‘moon-shots’ we need is knowledge about how to survive on this planet. We need to find out how to achieve society-wide shifts at unprecedented speed, which calls for input from the social sciences and the humanities as well as from the exact sciences. This requires more system-oriented interdisciplinary research.

Human ingenuity will continue to make remarkable advances. **However, the anticipation of future technological fixes must not be taken as a credit line for overshooting today, or as a justification for lack of ambition and ‘business as usual’.** Future advances in science, technology and innovation should enable future generations to do better, rather than merely compensating for our own shortcomings. Our current ‘legacy’ to future generations is in fact a massive ecological debt. This is our most serious sustainability deficit, says [Sustainable Europe by 2030](#).

Innovation needs to be driven in the right direction, as it does not automatically translate into socially and environmentally sustainable outcomes. The EPSC reminds us in [Europe’s Sustainability Puzzle](#) that “*the more innovative (and wealthy) an economy becomes, the more economic obsolescence accelerates, and the more resources are consumed and waste generated.*”

As new updates from science arrive at increasingly short intervals, it becomes important to set an unambiguous direction of travel, and to adjust regulation and policies accordingly, even if it means toughening some of them up. This is responsible governance. The [February 2019 update](#) of the EASAC advice on negative emission technologies, responding to the widening emissions gap, is an example of how scientific advice can change the basis on which policies operate within a single year.

Digitalization may make many new solutions feasible, or help implement the [SDGs](#). However, it has also been a major driver for a wasteful and resource-intensive just-on-time economy. Digitalization’s own energy footprint needs urgent attention. We need to consider the appropriate role of artificial intelligence in a post-transformation world that will probably be more commons-focused.

[NATURE VALUED](#), Targeted scenario No 13, Glimpses of the future from the [2017 BOHEMIA foresight study](#)

The “Nature valued” scenario from Bohemia suggests what success might look like in a 2040 perspective. This would have to be speeded up in an unprecedented change scenario, with implementation starting now.

“It is 2040. Europe is a place with a high quality of life. Its inhabitants enjoy prosperity and a healthy environment. The diversity of its countryside, the recreational value of its forests, the potential of its biological resources are widely appreciated. While many challenges such as climate change and threats to biodiversity continue, Europe is now more resilient.

To get there, Europe has succeeded in combining bold action, investment and advocacy for planetary health with the development of sustainable systems for consumption and production. Europe has played successfully its unique brand of valuing the environment and fairness. While it has been questioned if Europe alone can have an impact on planetary health, Europe’s evidence-based engagement for sustainable development has had lighthouse effects globally and brought reputational benefits. Intelligent regulation has helped European companies thrive and develop sustainable solutions. Maintaining Europe’s role as a frontrunner for sustainability remains a permanent endeavour, as other parts of the world are following in its footsteps and closing in. While building or rebuilding natural capital has required major efforts, engagement and investments, it has opened opportunities for bioremediation and nature-based solutions industries. There has been growing recognition and awareness that nature can help provide viable solutions to economic and social problems, using the properties of natural ecosystems and the services that they provide in a smart, ‘engineered’ way. Building the economic case for nature and planetary health has been a key enabler for these advances. International initiatives have focused on “making nature’s values visible” by mainstreaming the values of biodiversity and ecosystem services into decision-making at all levels. The EU revised its fiscal policies to orientate private capital flows to sustainable investments. Public and private long-term investment decisions are now integrating wider risks and returns including those linked to the value of environment. Financial markets have increasingly learned to appreciate sustainable investments. Companies have seen the benefit of adopting sustainable business models and disclosing information on their environmental and social impact. A new economic model has emerged where natural capital and social capital are appropriately valued and investments in ecosystem services have become profitable.

All in all, a fair, inclusive post-fossil society which permanently regenerates its resources and is fully reconciled with nature has emerged. Its social needs, new sustainable consumption patterns, and market-creating innovation directed towards a low carbon future drive the value chains of a circular economy (bioeconomy to a considerable degree), contributing to living well within the planet’s boundaries and shared opportunities, and enhancing Europe’s competitiveness as a world leader for sustainability.”

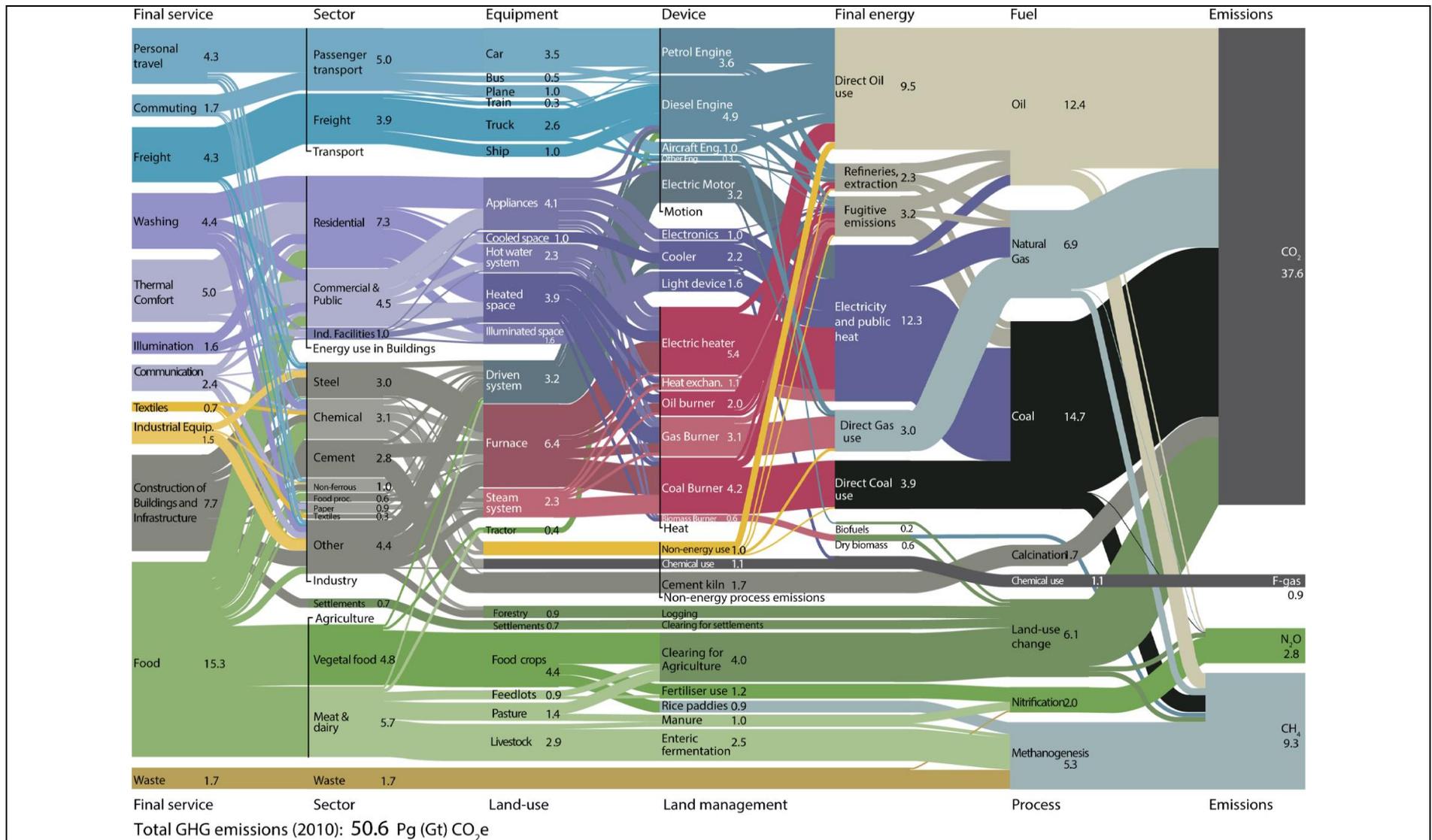
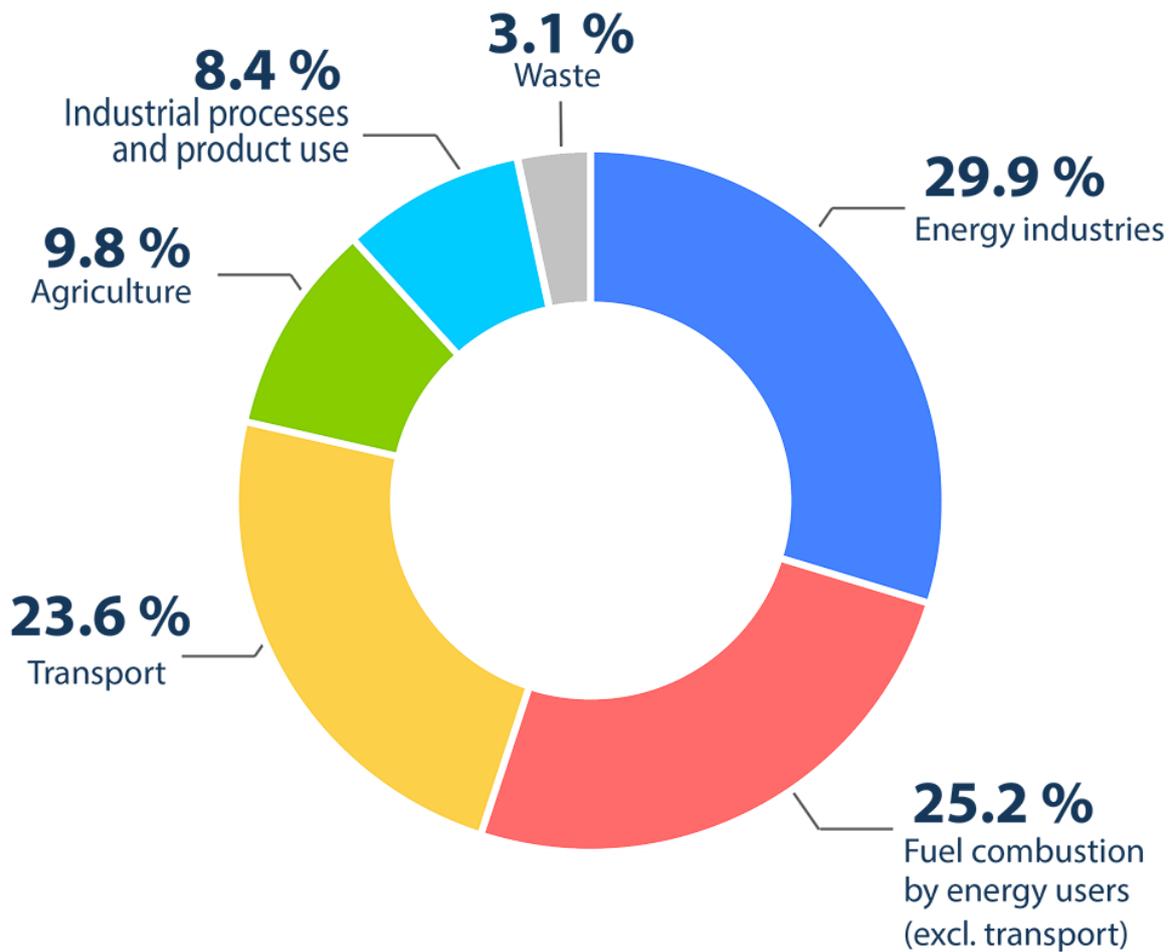


Figure 8: Designing Climate Change Mitigation Plans That Add Up, Bajželj et al (2013), <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3797518/pdf/es400399h.pdf>

Share of EU greenhouse gas emission by source, 2015



Energy industries: Emissions from fuel combustion and to a certain extent fugitive emissions from energy industries, for example in public electricity, heat production and petroleum refining.

Fuel combustion by users (excl. transport): Emissions from fuel combustion by manufacturing industries and construction and small scale fuel combustion, for example, space heating and hot water production for households, commercial buildings, agriculture and forestry.

Transport: Emissions from fuel combustion of domestic and international aviation, road transport, railways and domestic navigation.

Agriculture: This includes among others emissions from livestock-enteric fermentation – greenhouse gases that are produced when animals digest their food, emissions from manure management and emissions from agricultural soils.

Industrial processes: Emissions occurring from chemical reactions during the production of e.g.: cement, glass etc.

Waste: Emissions from landfills, wastewater treatment and composting among others.

Data including international aviation, excluding indirect CO₂ emissions and land use, land use change and forestry.

Source: European Environment Agency

Figure 9: Source: Eurostat: [Shedding light on energy in the EU \(2018c\)](#), EEA data. Trade-related emissions such as land use change for feed imports or outsourcing of production are not included.

POLICY FOUNDATIONS

1. What if we boosted energy saving and renewables now to phase out fossil fuels?

Energy is the main contributor to greenhouse gas emissions. Driven by higher energy demand in 2018, global energy-related CO₂ emissions rose 1.7% to a historic high of 33.1 Gt CO₂, as the International Energy Agency (IEA) notes. In the EU, energy supply was responsible for [30% of EU greenhouse emissions](#). Energy use accounts for a further 24%. In total, energy supply and use (excluding transport) accounted for [54% of EU greenhouse emissions](#) in 2016.

Energy kick-started the industrial revolution and has been the enabler of today's prosperity. Energy fuels our lives and drives our machines, heats and cools our buildings and enables us to get about. A debate on energy and climate disruption needs to address several interrelated systemic questions. How do we produce it? How do we use it? How much do we need, for what, and for what purpose?

Between 2005 and 2016, primary energy consumption in the EU fell by 10 %, while renewables doubled from 7% to 14% ([EEA 2018](#)).

Electricity is not a primary energy source, but a secondary energy carrier. It is still generated largely from fossil primary sources, both globally and in the EU.

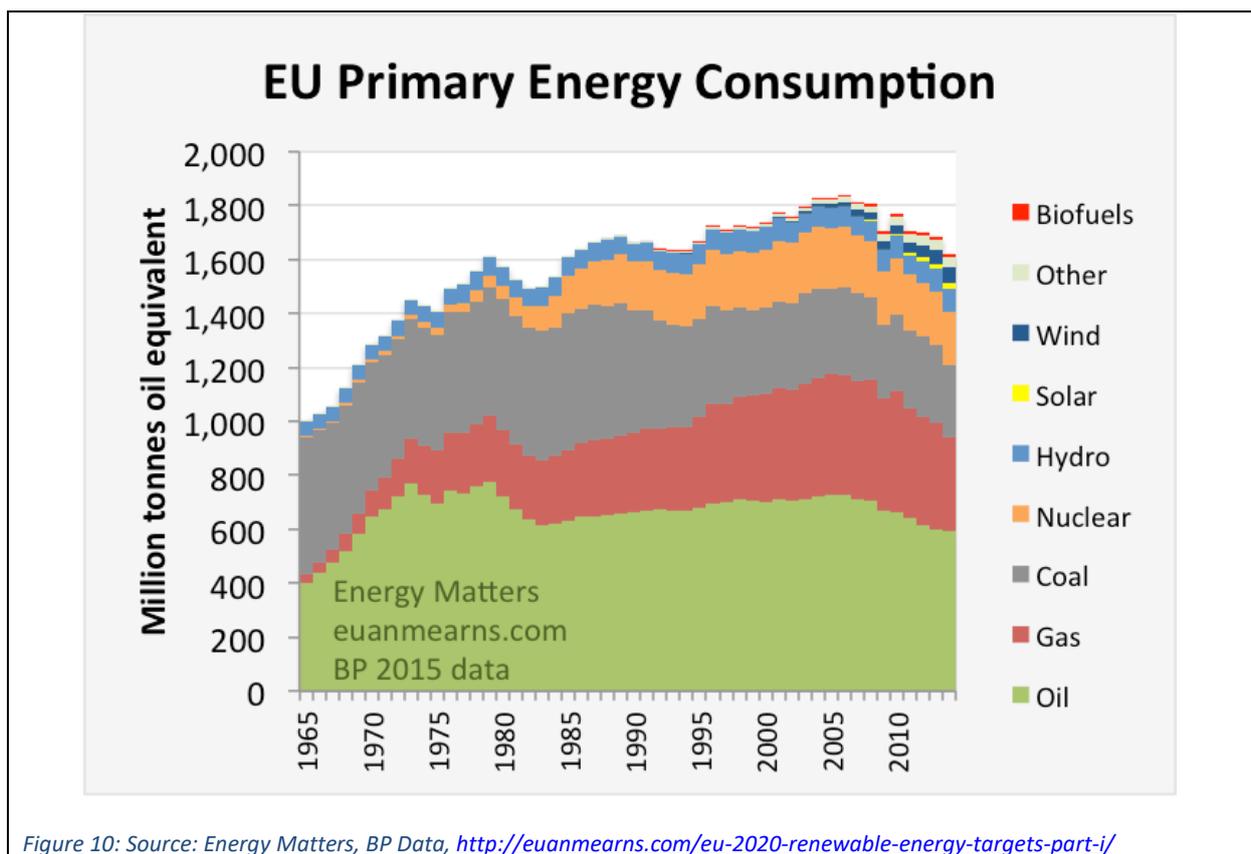


Figure 10: Source: Energy Matters, BP Data, <http://euanmearns.com/eu-2020-renewable-energy-targets-part-i/>

The EU has put ambitious initiatives on the table which are a good starting point: [Set plan](#) and [Clean Planet for all](#). The latter states that “a socially fair transition is crucial to ensure a politically feasible transition. This will be challenging, but nowhere near as challenging as facing the economic and social consequences of failing to act”. The Energy Union directives and regulations adopted in 2018-2019 create a more efficient energy market. But the market alone may not be able to catalyse the required emission reductions. Immediate unprecedented change must rely on bold **additional measures**.

WHAT IF WE STOPPED BURNING COAL?

The IEA highlights in [Global Energy & CO₂ Status Report \(2018\)](#) that CO₂ emitted from coal combustion was responsible for over 0.3°C of the 1°C increase in global average annual surface temperatures above pre-industrial levels. This makes coal the single largest source of global temperature increase.

Phasing out coal-powered electricity generation in the EU by 2030 would be a strong signal of unprecedented change. A large proportion of the greenhouse emissions from electricity generation come from coal-fired power plants, so the effect on greenhouse emissions will be immediate and sizeable. A specific, high carbon price for coal emissions on top of the reformed EU emissions trading scheme (ETS) could be introduced. This tax could be levied on the electricity operators using coal energy, with the resultant revenue being used to fund new jobs for people still employed in coal industries. There is a [positive example in the UK](#), which has scaled down coal considerably thanks to a carbon price set higher than the ETS price. This has been achieved earlier than was expected and ahead of the 2025 phase-out. It is better to use public monies to invest in the new economy.

Phasing out coal will be popular among large parts of the population but will challenge EU coal regions and even meet national resistance in some countries, and it may stretch cohesion policy. A 'coalition of the willing' could give the initial push, but it would have more impact if action were taken by all EU countries simultaneously, advocating for a global phase-out of coal. Germany, which still burns large amounts of lignite (brown coal), has embarked on a process to phase it out by 2038, but this is too slow. How can the end of coal be turned into an opportunity for coal regions in transition? A large-scale EU investment programme could be introduced to fund jobs and new industries for those who are still employed in coal-mining and coal-burning. Large-scale transformation labs are needed with integrated demonstration projects designed to bring about systemic transformation. Creative ways to handle investor-state dispute settlement may need to be designed, offsetting cumulative damage from coal extraction against any claim for "premature" phase-out.

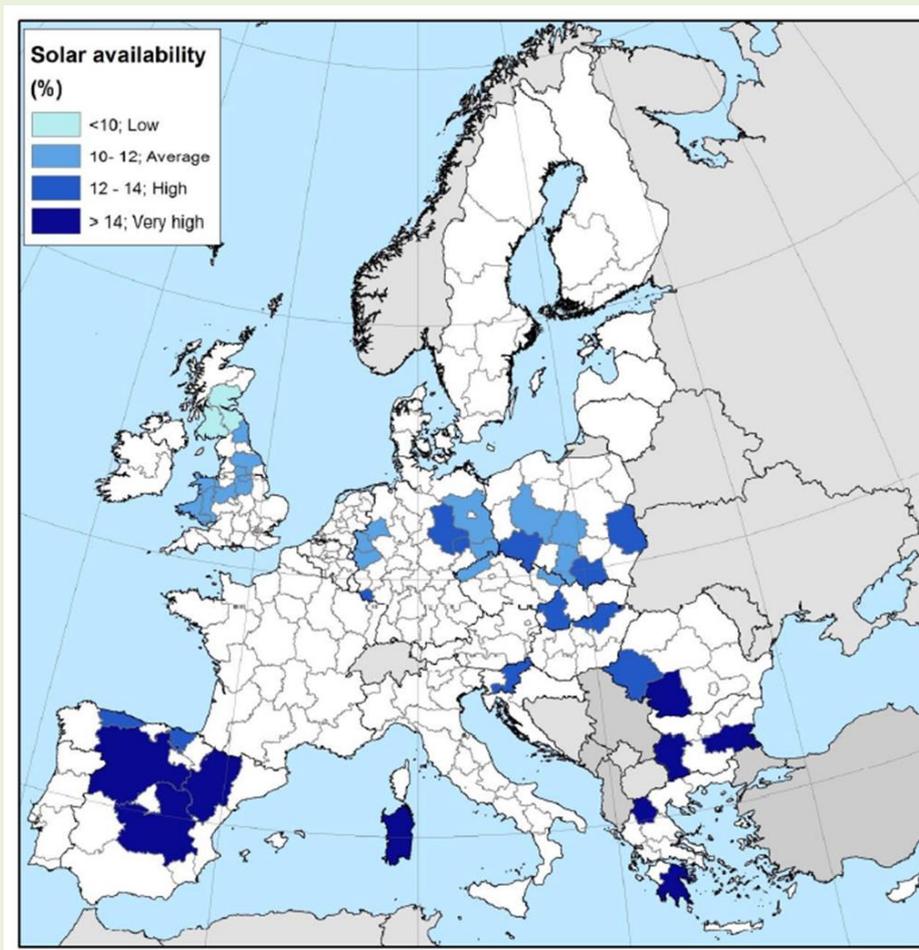
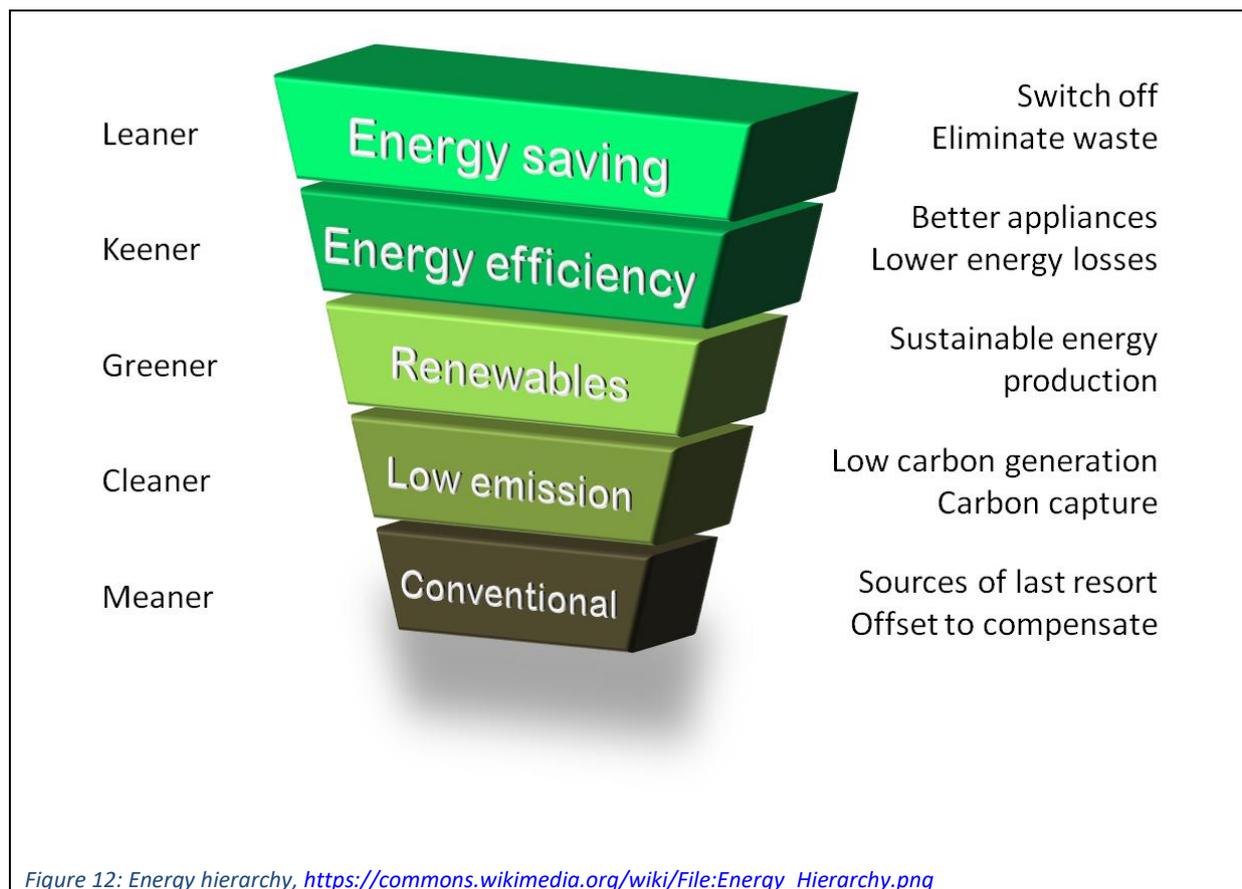


Figure 11: Source: JRC (2018), [EU coal regions: opportunities and challenges ahead](#), Solar availability factors (%) at regions hosting coal mining infrastructure



Energy saving and energy efficiency are at the top of the energy pyramid. While energy efficiency is very important it cannot compensate insufficient ambition on energy saving, which refers to both embedded energy and sufficiency. Reducing energy demand across all sectors of final use, including households, is crucial while addressing energy poverty. This is challenging as our energy use reflects our consumption and production modes. Energy is embedded in everything we do, consume, produce, transport, build, waste or under-use. The **embedded energy** is the energy used to extract raw materials and then to make products and transport them. Losses and wastage in all systems, not only the energy system, need to be eliminated everywhere, as the energy embedded in production is lost as a result. Energy saving from reducing consumption has a large unexploited potential. There is an unavoidable question: how much of what we produce is necessary and compatible with living in a full world within planetary boundaries? Policies therefore might also want to consider **promoting sufficiency** – using LESS (movement, consumption and energy use). The system uses too much, many of us in many parts of the world use too much. Our lifestyles, modes of consumption and business models are directly linked to climate disruption. More ‘frugality’, more responsible business and more responsible investment will make a difference. Consuming local seasonal organic food would drastically reduce the energy consumption of our food system, and it would improve the quality of our food. Renovating (instead of demolishing and building new), recycling renovation materials and ending our steel and concrete dependency by moving towards [wood](#) (possibly even for [sky scrapers](#)) would also reduce the construction sector’s carbon footprint. A shift to **bio-construction** could avoid emissions by reducing demand for steel and concrete. More generally, we could consider **reconnecting production and consumption**, for any goods, as far as possible. Large production plants can be replaced by distributed production.

Pursuing **energy efficiency** in all sectors and reducing energy demand through improved energy efficiency in industry is important, with [energy-intensive industries](#) representing a particular challenge. **Buildings** are a major target in the first building block of the [Clean Planet for All](#) strategy. Renovation of buildings, including insulation, needs to be speeded up radically including through innovative public and private financing, incentives to building

owners, construction sector training and employment schemes, and mandatory energy performance requirements. However, possible environmental or health impacts of construction materials deserve attention. There is a huge **potential for new jobs in green renovation and construction**, in view of the need to radically upgrade the energy performance of our building stock. This also implies up-skilling the current workforce to ensure that new energy efficiency technologies and construction methods are optimised. *“Affordability for all citizens is of central importance”* ([Clean Planet for All](#)). To curb energy use by households, in particular heating, ambitious renovation programmes are needed for income-poor households. New sustainable bio-based insulation materials and techniques are needed. Advances in architecture and design are important to make energy-positive and near zero-energy buildings the norm for all new construction projects. Off-grid and micro-grid solutions and energy ‘prosumers’ (who consume and produce energy) could be further boosted as provided for by the Clean Energy Package with its revised renewables and electricity directives.

While IT is a facilitator of energy efficiency through domotics or ‘virtual batteries’ or through aggregator services optimising peak loads, IT has also driven an economy that is voraciously consuming ever more energy. IT’s own energy use such as cloud services is an increasing matter for concern, possibly more so if some of the promised new technologies such as block chain and artificial intelligence are rolled out at scale.

Now is the time to screen all new investments across the EU for possible path dependencies. Infrastructure built now will create lock-ins for decades, with ‘committed emissions’ in the future, and turn into ‘sunk investments’. Committed emissions from existing energy infrastructure may jeopardize the 1.5 °C climate target ([Tong et al 2019](#)). Therefore, it is important to design new infrastructure for the world we want tomorrow and not for the world of yesterday. From this perspective, some ongoing investments such as the North stream gas pipeline could be questioned. Long-term commitments for import of fossil energy sources may merit to be reviewed now to prepare phase-out scenarios. Undesired energy pathways are locked in [investor protection](#).

Deployment of renewables and the use of electricity to fully decarbonise Europe’s energy supply is building block 2 of [Clean Planet for all](#). It shows the right direction, but are there innovative ways to accelerate this process?

The principle of “positive discrimination” for renewables could be introduced. An EU-level investment and legislative plan to create the most favourable framework conditions for renewable energy is needed to make any promising renewable technology cheaper than fossil energy. This would include subsidising renewable (e.g. off-shore) electricity prices (feed-in tariffs or similar) to make them more attractive to consumers than energy from fossil fuels. CO₂-free [green hydrogen](#) produced from renewable energy has potential to decarbonise heating and cooling, transport and [industrial processes](#). Currently, about 96 percent of global hydrogen is produced by [reforming methane](#), which produces carbon dioxide as a waste product. Policy needs to show direction of travel by creating advantages for renewables. The dogma of technology neutrality may no longer be commensurate with the challenge.

Any financial support from public budgets for fossil fuels and fossil fuel based energy in EU structural and research funds should be stopped. Legislation and strategic programming could exclude any EU funding of projects that involve production or distribution of fossil fuels or electricity generation from fossil fuels. Only renewable energy or immediate transition out of fossil fuels would be eligible for support. The European Investment Bank (EIB) (and other EU public banks) could stop any lending to infrastructure and businesses producing, using or distributing fossil fuels.

Many reports concur that “decarbonizing energy supply and transport is key for transformational change” ([UNEP 2019a](#)).

What if not?

If we are not bold enough early enough, including a possibly substantial reduction of our energy consumption we may continue to stay off track with regard to our climate ambition. [McKinsey](#) is optimistic that the phasing out of coal and the deployment of renewables will curb greenhouse gases, but concludes that *“this downward trajectory is still far off the 2-degree pathway”*.

If we do not find ways to curb the use of coal in Europe and globally, we may not be able to make meaningful progress on climate action. In 2018, [world CO₂ emissions from energy grew at the fastest rate since 2013](#). Emissions from coals-fired power plants contributed the largest share of this increase. The World Economic Forum’s 2019 [‘Fostering Effective Energy Transition’](#) said the pace of change to clean energy across the world had slowed to the lowest rate for five years with investment in clean energy down by almost 10% last year.

If we do not address energy poverty as an integral part of the challenge, rather than as a different issue and a trade-off, wellbeing in large part of our populations may be jeopardised and dissatisfaction will increase. If we do not make massive social investments to renovate houses, many houses of low-income populations will never be renovated and both energy bills and emissions will remain high.

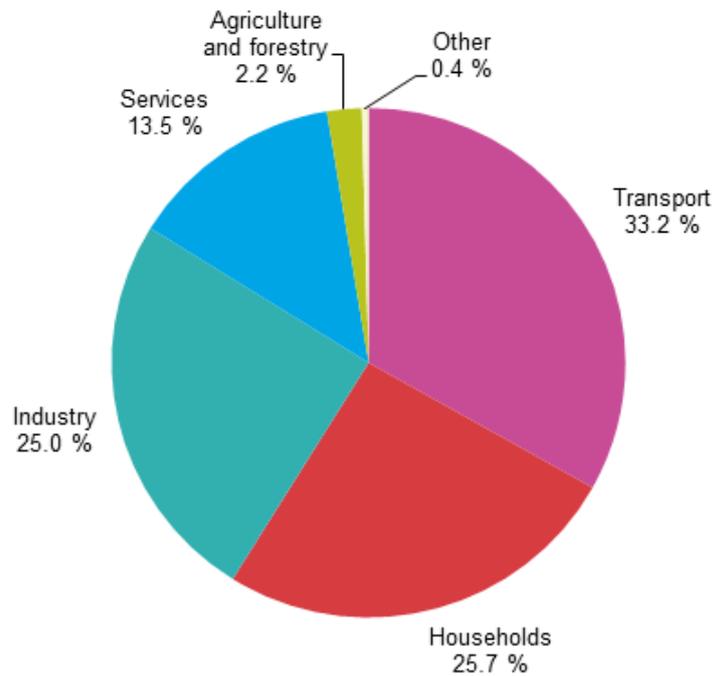
If we fail on getting fast results very soon for a crash down of greenhouse gas emissions – and energy is at centre stage of this endeavour– we may continue our current pathway to a temperature increase well above 2°C. According to the [IPCC \(2014\)](#) *“many global risks are high to very high for global temperature increases of 4°C or more (see Box 2.4). These risks include severe and widespread impacts on unique and threatened systems, the extinction of many species, large risks to food security and compromised normal human activities, including growing food or working outdoors in some areas for parts of the year, due to the combination of high temperature and humidity. The precise levels of climate change sufficient to trigger abrupt and irreversible change remain uncertain, but the risk associated with crossing such thresholds in the earth system or in interlinked human and natural systems increases with rising temperature”*.

We may also find ourselves in runoff scenarios where climate disruption is getting out of control passing irreversible tipping points and turbo-speeded by systemic accelerators. [Steffen et al \(2018\)](#) explore the *“risk that self-reinforcing feedbacks could push the Earth System toward a planetary threshold that, if crossed, could prevent stabilization of the climate at intermediate temperature rises and cause continued warming on a “Hothouse Earth” pathway even as human emissions are reduced.”*

If bold climate action is not leading to rapid success, there is a risk of being overtaken by accelerating climate disruption and exhaustion of carbon budgets. As energy consumption in the EU is still 90 plus percent combustion based, there may be no option but to start rationing, reducing substantially end energy consumption. Energy use is the best measurable and manageable "control lever" for reducing our greenhouse gas emissions. Even today over 95% of our energy needs in the EU are met from processes involving combustion and therefore CO₂ emissions (Fossil fuels, "clean gas", biomass etc.). Even the fraction of renewable energy creates lots of greenhouse gases in the mining of the necessary special materials and their fabrication (solar, windmills, nuclear).

Despite ambitions and good intentions, energy efficiency measures may contribute to increased end energy use through a “rebound effect” (well known in economics as the [Jevons paradox](#)) – although results differ as regards its [significance](#). In accordance with the Second Law of Thermodynamics, energy efficiency alone is not sufficient to avoid entropy generation despite deployment of research efforts (e.g. [Biswal/Basak 2017](#)).

Final energy consumption by sector, EU-28, 2016
(% of total, based on tonnes of oil equivalent)



Source: Eurostat (online data code: nrg_100a)



Figure 13: Source: [Eurostat 2016](#). To be noted that this visual can only give a very simplified view. As an example, construction is significant, but lost here under industry and households.

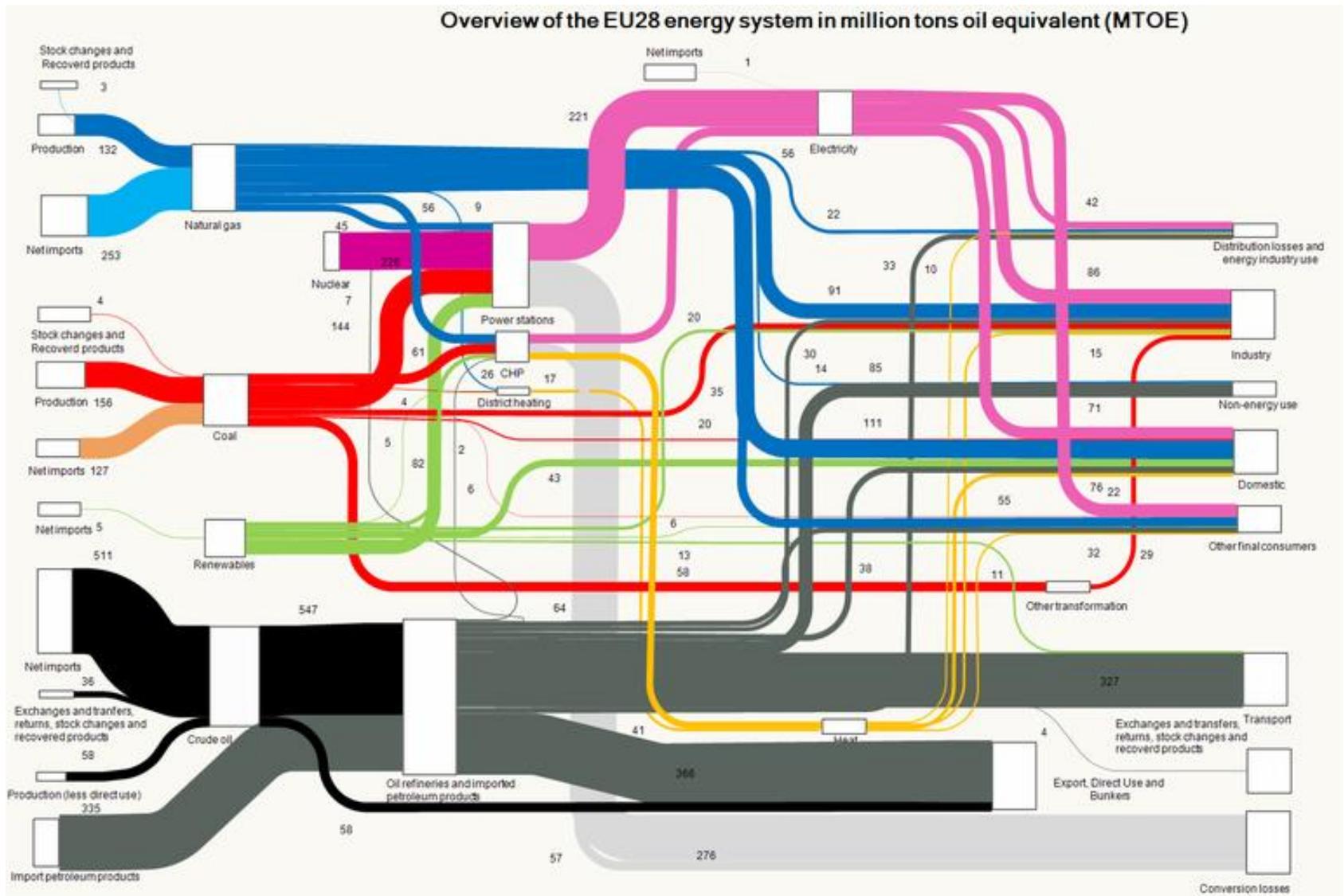


Figure 14: Source: [European Environment Agency](#) (2015, no longer updated). Sankey diagrams give a very good overall view of a system as a whole. Although this one from EEA is no longer updated it gives a good view of the overall EU energy system as it was seen in 2015.

2. What if we reinvented mobility and transport now?

Transport (including international aviation) is the **second largest source of emissions** with **24% of EU GHG emissions** in 2016 (up from 15% in 1990). **Road transport** is now the largest and still growing source of CO₂ emissions in Europe, accounting for one-fifth of all emissions.

There cannot be hope for a solution to the climate crisis without systemic solutions to mobility. Individual mobility and transport of goods have shaped our society more than almost anything else: our rich world cannot think of a life without unlimited mobility and unlimited availability of goods all year round. Mobility is enabling our freedom to move and the access to exchange. Transport of goods is the carrier of free trade and free choice filling our supermarkets. However, **our current paradigms have become a problem simultaneously for the climate, the environment and our health.** Mobility, transport and their infrastructure, for road traffic in particular, have made us wealthy but have disfigured our cities and our countryside, polluted our air and sealed our land with roads and concrete. Ship transport is the main carrier of our imported greenhouse gas emissions. They have impacted on biodiversity by cutting wildlife corridors, and contributed to the destruction of our marine ecosystems. Individually we perceive mobility as freedom, but collectively we pay a huge price.

A new consensus is needed on the priorities and purposes that mobility could serve, and on the ways to best organise it to reduce many of its externalities. The EU can and must lead in a collective deliberation building that new consensus. Some efforts have been made but they remain insufficient. Many of us depend on the availability of mobility for their work, their families and their social needs, for instance those who live in the countryside and need to be mobile to get to work or care for their families. However, many short travels, in particular in cities, are carried out by car although other means of transport are available. Private car ownership contributes to congesting our cities and taking up parking space; it also means a too high number of vehicles needed and the emissions embedded in their production. The biggest challenge is to **reduce the need for mobility** and get people out of their cars, and rather walk, cycle or use public/collective transport. Encouraging people to buy and use shared electric vehicles would be a challenge, too.



Figure 15: Source: Copenhagenize, <http://www.copenhagenize.com/2010/03/human-powered-poetry.html>

Mobility is a good case where systemic solutions can trigger multiple co-benefits and triple wins addressing mobility's own issues and at the same time climate, environment and health. Such [co-benefits](#) are good for society and can attract investors. Clean air is a prominent example for a co-benefit endorsed in the [Clean Planet for All](#) communication. *“At the same time, significant health costs can be saved. Today, air pollution in the EU causes severe diseases and almost half a million premature deaths annually with fossil fuels, industrial processes, agriculture and waste being the main sources of pollution. These activities are also the main sources of greenhouse gases. Achieving a net-zero greenhouse gas emissions economy on top of existing air pollution measures will reduce premature deaths caused by fine particulate matter by more than 40% and health damage by around € 200 billion per annum.”*

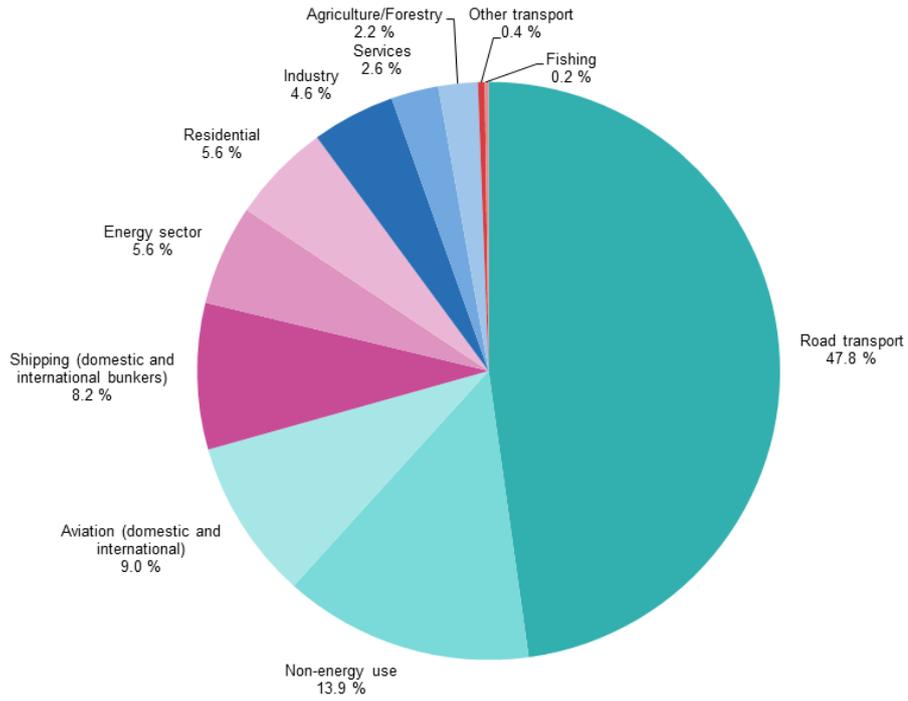
Systemic approaches can induce a shift of thinking how we design our cities, starting with transformation from car friendly to people friendly infrastructure. Making car free mobility the easy option in cities and beyond contributes to lower emissions, better quality of life and better health through cleaner air and more active lifestyles. Through redesign of cities and appropriate infrastructure, active commuting is enhanced which addresses sedentary lifestyles as one of the main causes of obesity. This would change our cities: more bikes, more public transport, more space for walking. Car free commuting deserves high priority in public policies, as it is one of the key levers for a [1.5-degree lifestyle](#). The [report to Belgian Youth for Climate](#) proposes to make all Belgium cyclable by 2030. Cities in Europe and beyond are restricting cars or have even plans to [go car-free](#) (e.g. [Pontevedra](#)). Massive [upscaling of cycling](#) is part of many action plans at different levels. Shared mobility also offers a lot of opportunities. The European Commission could further support to exchange good practices, encourage investments and bold policies at the competent levels for going car-free and boosting alternative, zero-emissions means of transportation. The [OECD \(2019a\)](#) is suggesting a *“shift in focus from physical movement to accessibility”*.

A systemic approach to the climate impact from mobility requires to consider urban and spatial planning. Urban and peri-urban sprawls can be addressed by encouraging densification and multi-functional integration of spaces. The EU approach of sustainable urban mobility planning (SUMP) should be further reinforced and play a key role in achieving zero-emission transport in cities. It should be also properly linked with wider spatial planning processes. The [report to Belgian Youth for Climate](#) reminds that *“les émissions de CO₂ dues à l'utilisation excessive de la voiture et aux embouteillages sont une conséquence directe de la dispersion et du morcellement de l'aménagement du territoire et de l'habitat suburbain”* and therefore recommends *“n'accordez pas la priorité à l'écologisation de l'ensemble de notre parc automobile actuel. Penchez-vous d'abord autant que possible sur la réduction de la demande de mobilité, puis sur la réorganisation de notre aménagement du territoire, en combinaison avec davantage de transports publics, de pistes cyclables et de voitures partagées”*.

Public transport must become more efficient and an attractive alternative to driving on congested roads. Public transport reduces emissions by a modular shift away from cars. Intermodality and pooling of available transport options through intelligent apps will help people to plan their entire journey more easily. People will only shift to public transport once their use is more convenient (higher frequency, late run or at night) and once they are more comfortable. Public transport needs to be improved across Europe. There is a strong need (and demand) to attract people in trains for long distances. Comfortable night trains need to be re-launched. To travel throughout Europe, trains should become the best way to travel, not planes. Currently, booking an international train ticket in Europe is difficult; there is no single site where to book although this would be a first simple solution to get more people on the train. To make the shift towards car-free cities socially sustainable, public transport could become free in cities. [Luxemburg](#) has recently introduced free public transport for the whole country.

The development of a sharing society will foster solutions for mobility as a service. Mobility as a service could be promoted more actively as it reduces the need for individual car ownership. A reflection on new competitive business models for car producers reinventing themselves as mobility providers is underway and should be actively encouraged. Sharing economy solutions could reduce the number of cars needed to ensure mobility. Individual car ownership combined with current patterns of underuse is boosting the material footprint of mobility, as well as energy use and greenhouse gas emissions for car production.

Consumption of oil, EU-28, 2016
(%)

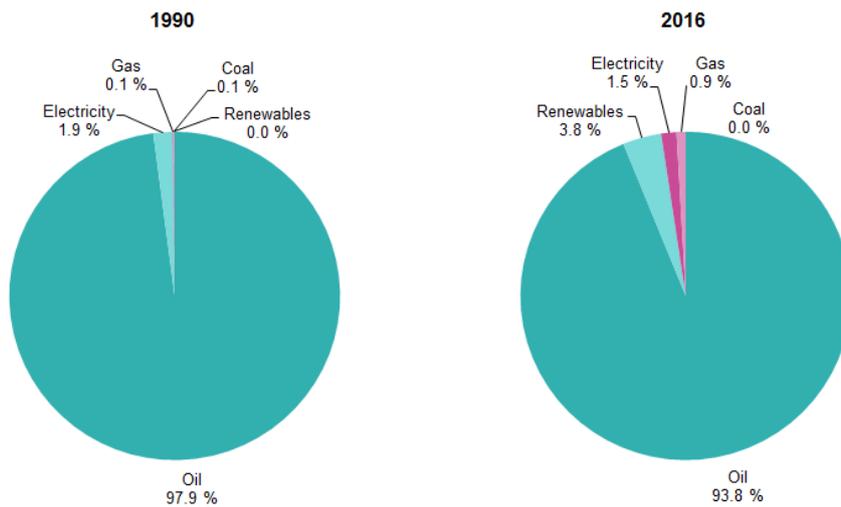


Source: Eurostat (online data code: nrg_110a)

eurostat

Figure 16: Source: Eurostat (2018b), [Oil and petroleum products - a statistical overview](#)

Use of fuels in transport, EU-28, 1990 and 2016
(%)



Source: Eurostat (online data code: nrg_110a)

eurostat

Figure 17: Source: Eurostat (2018b), [Oil and petroleum products - a statistical overview](#)

WHAT IF COMBUSTION ENGINES WERE TO STAY?

The EU has tried to get the car industry to sell low emission cars. But effort must be doubled, in a very short period of time, if we want to keep alive the hope of solving the climate crisis. The transition in the car industry is insufficient and needs to go further than cleaner cars: it needs to go from producing cars to offering mobility solutions. If all levers are being pulled, starting now, car emissions can still be reduced by 40% by 2030 and 95% by 2050, without economic losses (Boston Consulting Group/Prognos: [Analyse Klimapfade Verkehr 2030](#)).

Requiring carmakers to produce more efficient, low and zero-emission vehicles is still one of the best ways to combat climate disruption. It will also save drivers' money and create high-tech jobs. [Within 25 years](#), car traffic has grown by more than 30% and transport on our roads by more than 70%. Road transport is the only area of our economy in which [CO₂ emissions have grown](#), despite all efforts. The huge surge in traffic has wiped out all progress in making cars less polluting and more efficient. Furthermore, this is costly for EU citizens: in average they spend more than 10% of her/his income on [cars and fuel for cars](#) (and less than 3% on public transport and air travel).

The following actions could be envisaged at EU or at the appropriate level to move towards carbon free road traffic:

- **EU can create market conditions to make low emission cars affordable and polluting cars disappear.** Blueprints exist for how to do it ([Agora Verkehrswende](#) and [Shift project](#))
- **Stop carmakers' emission cheating.** Put an end to cheating for good, by introducing **severe financial penalties** on car manufacturers who do so.
- **More ambitious emission standards.** Go further than what is on the table today. Would it be feasible to lower the CO₂ cap by 50% in 2025 and by 75% in 2030 (below the 95g CO₂/km for 2021)?
- **Trucks pollute our environment even more than cars.** Introduce lower CO₂ caps for all trucks than present proposals immediately (as of 2020) and a reduction obligation of 5% per year, 35% by 2030, for trucks above 12 tons. Haulage volumes that exceed the cap will have to move to rail.
- **Increase taxes heavily for polluting cars. SUVs in particular have been responsible for the recent increase of emissions in some countries.** Taxes must increase exponentially for more polluting cars and SUVs, making low emission cars tax free and higher emission cars very heavily taxed.
- **Remove all tax advantages for diesel cars and for company cars throughout the Member States.** For example, request Belgium to put an end on the current tax regimes for company cars. This has actually been repeatedly suggested by the OECD and the European Semester.

Change is also needed to keep our car industry and its jobs in the long term. Jobs may shift from producing cars to assisting citizens in travelling in a multimodal way. As we will need far less cars, some businesses will need to reconvert. Fast evolving technology (e-cars, automated driving, car-sharing, etc.) has already begun making the old-style car industry (the diesel car industry) obsolete. China is far ahead of the EU in electrifying cars. Technology could give more many opportunities if the EU Institutions were resisting carmakers' lobbying to keep the status quo. Carmakers have cheated for a long time about the real emissions of the vehicles they sell. The gap between real-world and declared fuel efficiency has grown to [more than 40%](#). The European Commission's [Scientific Advice Mechanism](#) (SAM) concludes that the growing gap may "*undermine the effectiveness of EU regulations designed to lower CO₂ emissions, affect national taxation and mislead consumers*". Putting an end to those practices will create much stronger incentives for carmakers to mobilise all available emission reduction technologies, and for industry and government to invest in supporting infrastructure.

The emissions of electric vehicles depend on the primary energy used to produce the electricity used to charge their batteries. If the electric grid continues to be massively coal powered, electric vehicles will emit almost as much CO₂ as internal combustion engines do now. To make electric vehicles a solution, coal needs to be phased out from power grids.

In addition, it is absolutely necessary to get goods off the road and put them onto rail, at an entirely different scale. Switzerland and Sweden have demonstrated that this can be done. How much truck transport can be shifted to trains or boats? The very first challenge, regardless of the transportation, is to drastically reduce the need of transporting goods. This can in the first place be achieved by localising the production, in particular our food production. A lot of last-mile logistics could go car free as new forms of electric cargo bikes are developing and delivery services being redesigned.

Air travel is a growing source of emissions. In some Member States there is growing demand for [taxation of air travel](#) (Belgium, the Netherlands). The **current situation** - with **air travel being cheaper** than rail travel over short and medium distances within Europe - is not fair and results primarily from no- or very low taxes for airplane fuels and operations. This is **not acceptable**. With the development of efficient rail transport, it might be possible to phase out air travel on certain shorter routes, or more ambitiously, 'within Europe' or at least within 1,500 km. While tourism is part of individual freedom, emissions and pollution from air traffic and cruise ships need to be addressed. Tourism needs to be shifted toward new forms of eco-tourism, contributing to low-carbon lifestyles.

The European Institutions could already today encourage their staff to give up car ownership and use public transport and car-sharing systems, or alternatively buy electric cars if really needed. Business travel should be reduced to the minimum and much wider use should be made of video-conference meetings. Teleworking could be strongly encouraged, thus reducing the need for commuting, buildings, heating and cooling, etc.

What if not?

If we do not change the transport and mobility schemes we are nurturing today, they will massively contribute to destruction of our health and our planet. According to a recent Eurobarometer, European citizens rank pollution as one of the top three risks facing the EU in the years to come. Our cities are polluted and overloaded with cars, our space is increasingly congested. The aviation industry has not yet been able to decarbonise, and offsetting schemes to "neutralise" the heavy carbon footprint of aircraft and shipping have not been true to their real impact and are utterly ineffective. The European car industry seems unwilling to bring solutions, as they seem to hold on to fossil fuels as long as policy allows them to do so. The decarbonisation efforts preached 20 years ago failed.

If we do not rethink mobility and if we take no action to reduce drastically the damage that our present transport system does to our climate, we would leave the fate of our society increasingly to the lobbying power of the car industry and of those national governments that support "their" car manufacturers. Instead, we propose incentivising the European car industry to abandon its defensive attitude, embrace technological innovation and keep up with international competitors.

Over 90% of our goods are transported by container ships, mainly coming from Asia and overseas. This very much participates to satisfying our individual preoccupations in a globalised consumer society. While goods sent by ship have a smaller carbon footprint than those transported by air, the overall costs for nature are still very high, too high: many old ships are dismantled today on African or Asian beaches, without safety protection to the workers and leaving massive environmental damage. Recycling them remains too expensive. **This logic is not sustainable** (and it never was!). Moreover, the shipping industry resisted emission trading schemes so far, escaping lawmakers due to its global business model and "convenience flags", a relic from the past that makes shippers rich, on the cost of the environment.

Polluting black carbon is also an increasing factor in the acceleration of climate disruption. It not only pollutes our air, it also puts a dark layer on the white spaces such as the ice in the Arctic, which in turn reduces the white colour's albedo effect, i.e. reflecting the heat back to space. The darker the ice, the faster it melts, the darker the open ocean, the more heat is generated. Ships run mainly on heavy fuel oil (HFO), a much cheaper version of the light fuel we use in cars. This dark and sticky fuel is very high in energy, but when it burns, a lot of black carbon is emitted.

The air industry is dramatically increasing: more flights, cheap and convenient. Investments in rail have fallen while the air sector booms, largely thanks to massive public subsidies and unfair (to other modes, in particular railways) taxation schemes. Price structures are wrong. Today's transportation fails to charge the real costs to the person and goods travelling. It also excludes completely the damage made to the environment and climate.

Transport also has a considerable negative impact on biodiversity. Every transport movement is unintentionally transporting living organisms, e.g. seeds or insect eggs hidden in some dirt in a corner of a container, sticking to wheels. Limiting transportation between regions or continent would reduce such risks.

3. What if we shifted to agro-ecology and a new food system now?

Agriculture and food systems contribute to transgressing or putting stress on several planetary boundaries simultaneously and in complex interactions and feedbacks: biodiversity integrity, nitrogen and phosphorous cycles, climate disruption, land system change, ocean acidification. Action therefore needs to be conceived from a multi-boundary perspective to be meaningful and deliver impact at scale. The greenhouse gas footprint of the food system is substantially higher than the emissions from agriculture alone. Globally **food is the largest greenhouse gas emitter if taken as a final service**, including CO₂ emissions from land use change, industrial processes such as fertiliser production, embedded energy and transport (see [Bajželj et al 2013](#)). In its special report on land and climate change, the [IPCC \(2019\)](#) highlights that “climate change, including increases in frequency and intensity of extremes, has adversely impacted food security and terrestrial ecosystems as well as contributed to desertification and land degradation in many regions (high confidence)”.

An immediate systemic shift towards agro-ecology, in a faster way than what the existing scenarios and models envisage, and fully implemented across the EU before the next ten harvests, would be a major contribution to immediate and unprecedented change. With transformative drive and easier consensus building, the Common Agricultural Policy (CAP) could be the EU’s biggest lever to tackle one of the most unsustainable systems. To introduce agro-ecology rapidly wherever possible, the CAP and all possible levers should be re-examined to shift radically from current to ecological farming techniques (e.g. [Volksbegehren Artenvielfalt](#)). The end of the glyphosate authorisation in 2022 is an opportunity to accelerate the pace of the transformative process and to facilitate the transition.

Transformation of agricultural systems is one of the key levers towards overall sustainability and climate change mitigation. This includes a shift from industrial mono-cropping and predominantly animal agriculture to organics, agro-ecology (including [permaculture](#)), agro-forestry, horticulture or crop-livestock integration. Among [Drawdown’s](#) 100 solutions to reverse global warming [12 of the top 20](#) solutions ready for implementation refer to food or land use: reduced food waste, plant-rich diets, tropical forests, silvo-pasture, regenerative agriculture, temperate forests, peatlands, tropical staple trees, afforestation, conservation agriculture, tree intercropping, managed grazing.

We need to restore the resilience of our food systems, by cultivating a larger variety of crops, animals, varieties and breeds. Small scale local breeding is needed to rebuild and further develop a resilient agriculture. This is the opposite of focussing breeding efforts on a handful of cash crops with highly proprietary business models.

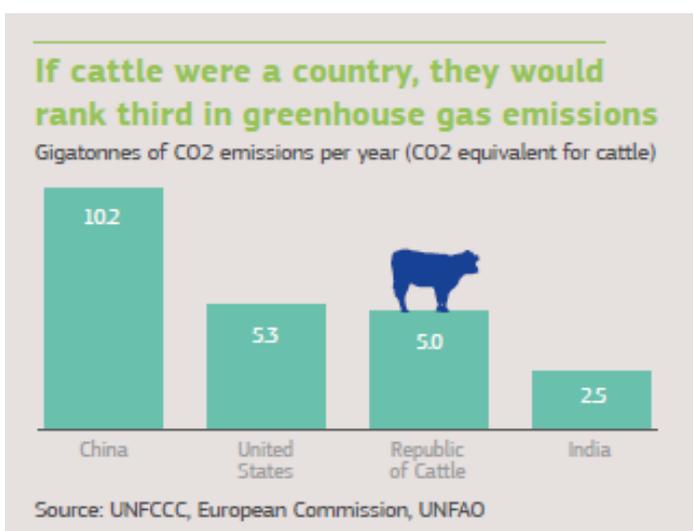


Figure 18: [EPSC](#), Ten trends reshaping Climate and Energy

Meat and animal products are not a peripheral issue; they are at the centre of the current lock-ins. Livestock needs to be brought back within planetary boundaries ([Campbell et al 2017](#)) ([Rise Foundation 2018](#), see [also](#)). What matters is not so much the cow, but the how of the cow and how many. A reduction of meat production, in particular grain-fed beef and other grain-fed livestock is unavoidable. Where meat production is maintained, its footprint and impact on multiple planetary boundaries needs to be reduced. High quality grass fed cattle is likely to stay. The vicious circle of feed-import dependant and export oriented intensive agriculture, contributes to [deforestation](#) where the feed is grown and may hamper development of local markets where the products are sold.

Agro-ecology or [regenerative agriculture](#) delivers substantial co-benefits on several boundaries. There are multiple [co-benefits of organic farming](#) (more [here](#)) for soil fertility, resource efficiency, biodiversity, water protection, climate change mitigation and adaptation, animal welfare. The IDDRI scenario exercise for [mainstreaming agro-ecology in Europe](#) by 2050 concludes it is possible: “The TYFA [Ten Years For Agroecology] scenario is based on generalising agro-ecology, abandoning imports of plant proteins and adopting healthier diets by 2050. Despite an induced decline in production of 35% compared to 2010 (in Kcal), this scenario feeds Europeans healthily while maintaining export capacity; reduces Europe’s global food footprint; results in a 40% reduction in agricultural GHG emissions; and helps to restore biodiversity and to protect natural resources.”

Beyond primary production, the transformation of the entire **food system** is critical to achieve the SDGs as a whole ([CIRAD 2018](#)) and is often top priority in masterplans for action ([Transformation is feasible](#)). Evidence accumulates that food systems have to be transformed completely from farm to fork and back. ([Springmann et al. 2018](#)) ([Carron et al. 2018](#)) ([IPES Food 2016](#)), ([EASAC 2017](#)), ([EEA 2017](#)). Changing existing power structures, engaging more directly, regaining autonomy and food sovereignty are important. So is relearning to cook non-processed food. Local or regional food policies ([Milan Urban Food Policy Pact](#) signed by more than 190 cities, [Brussels Good Food](#)) or sustainable food cities can be engines of change.



Figure 19: arc20 <http://www.arc2020.eu/agroecology-tale-two-continents/>

The systemic transformation of the EU agricultural system will make uncomfortable questions such as land imports for feed, fertiliser and chemicals use and export orientation of the EU agriculture unavoidable. The food system transformation needs to be supported by a coherent food policy linking nutrition with environmental and health outcomes and changing the governance of food systems. IPES Food pleads for a Common Food Policy to address issues the CAP cannot (see [IPES Food \(2019\)](#), [open letter to the lead candidates for the role of European Commission president](#)). External policy instruments can also be explored to help third countries to shift towards ecological agriculture (trade, tariffs, development aid).

We need to relocalise food production, restore the connection between producers and consumers, concentrate on local and seasonal food (which will prevent enormous transport costs). There are currently plenty of bottom-up initiatives. Small organic farmers can actually only survive thanks to such initiatives. In Flanders, there are plenty of new farmers ready to start with small scale organic farming, however they have difficulties with accessing land (prices rise because speculation on land, this is a global trend).

One third of all food, including its embedded emissions, is currently wasted. Food waste is a major climate killer (key data about food waste is provided by [FAO](#) or can be found in this [GLOPAN policy brief](#)). Food waste needs to be fought at every level, and appropriate EU measures could be taken wherever possible. Good private and business initiatives (e.g. [OzHarvest](#) in Australia) are available and should be encouraged and supported.

Diet change is one of the levers of transformation, by encouraging a move to food systems which are based upon predominantly plant-based diets for flexitarians, with vegan and vegetarian as the prime and easy choice. Responsible consumption of small quantities of sustainably sourced high quality meat and other animal products should become occasional add-on. More knowledge is needed how consumption can be reduced ([Wellesley et al/Chatham House 2015](#), [Carrington 2017](#), Finnish [Dairies to Berries](#) project) and a major economic sector such as livestock can be successfully reoriented on an unprecedented scale within a short time. According to [Herero et al. \(2016\)](#) *“establishing the societal impacts of land-sparing opportunities, in terms of livelihoods, employment, economics, gender and equity, needs to receive urgent attention due to its policy relevance.”*

A coherent food policy is widely pledged, including by the IPCC (2019) in its special report on climate change and land: *“Policies that operate across the food system, including those that reduce food loss and waste and influence dietary choices, enable more sustainable land-use management, enhanced food security and low emissions trajectories (high confidence). Such policies can contribute to climate change adaptation and mitigation, reduce land degradation, desertification and poverty as well as improve public health (high confidence).”*

The OECD (2019a) is applying a well-being lens to the food system to accelerate climate action and advance sustainable development: *“A shift in perspective is needed to better integrate growing challenges to the sustainability of the food system. Economic criteria (GDP, trade, farmers’ income) are currently the main drivers for decisions in agriculture and associated food systems. Integrating wider social objectives (e.g. healthy diets, climate, sustainable resource management) as priorities is key. [...] Applying a well-being lens can help governments make visible the hidden costs of the current food system and identify the potential to achieve synergies (i.e. health, improved environment, carbon storage) and better manage potential trade-offs (e.g. jobs, food access and affordability) between climate and broader well-being goals.”*

Innovation is producing new protein alternatives (plant-based, micro-algae, aquaculture and aquaponics) and old protein sources such as pulses are being rediscovered. Plant-based fake meat products are gaining success in retail. Plant-based fake meat products are gaining success in retail, and there are even veggie burgers that ‘bleed’. Insects and clean meat may still have a temporary ‘yuck factor’ for many consumers. In-vitro-based [animal-free clean meat](#) is on the verge of becoming commercially viable. It may soon come from local breweries, like craft beer. However, if they become industrial plants, they may end up in the same model as industrial agriculture. Decoupling food and biomass production from land through recirculation aquaculture, aquaponics, vertical farming or cell factories, new technologies and management practices such as combining artificial intelligence and robotics with agro-ecology and agro-forestry, are just some examples of recent technological avenues to pursue. However, techno-fixes must be evaluated in a systemic way before scale-up.

WHAT IF: ADDRESSING AGRICULTURE'S LARGE "HOOFPRINT"

There is a major opportunity to use the CAP for reducing agriculture's own emissions in addition to the potential of soil sequestration. The EU's agricultural sector accounted for **10 % of the EU's total GHG emissions** in 2015. These non-CO₂ gases - methane (mainly from enteric fermentation in ruminants – mostly cows and sheep) and nitrous oxides (from agricultural soils) do not have EU specific reduction targets. As a result, action at Member State level is weak to non-existent. This must change for agriculture to help meet the 1.5°C Paris obligation.

According to the European Commission's [Evaluation study of the impact of the CAP on climate change and GHG emissions](#), a lack of tools from the Commission is hampering the fight to reduce emissions. The study also questions the effectiveness of current CAP subsidy rules that allow farmers to farm on wetlands and peatlands and plough up "*permanent grasslands*", releasing large volumes of carbon dioxide as they do so. The main conclusions are: "*The CAP has objectives which are broad enough to encompass the necessary climate action, and which correspond closely to the needs identified by Member States and at holding level. However, it does not provide Member States with the tools they would need to require farmers to reduce the two most significant categories of emissions (enteric emissions and emissions of N₂O from soil management).* [...]"

A number of factors have determined the extent to which Member States have used the CAP to secure climate action. The first of these is the absence of any strong external driver encouraging Member States to make the most of the CAP's potential to secure climate action in the agriculture or forestry sectors. This is because targets at EU level for the non-ETS sectors can be achieved by most Member States without a significant contribution from agriculture beyond what is already being achieved. The proposed Soils Framework which could have been expected to drive more ambitious GAEC rules for the protection of soils was abandoned. Secondly, the CAP's strategic objective for climate action is not accompanied by specific targets or a requirement that they be set. Finally, there is evidence from the case studies that Member States are reluctant to tackle climate emissions in the livestock sector because of its perceived economic difficulties. Timing issues and lack of expertise in climate issues relating to agriculture have also contributed to the limited ambition of Member States' CAP implementation in respect of climate action."

If agriculture were to contribute the same at the levels already agreed by the EU for other sectors, this would mean a 40% reduction by 2030 and 80% by 2050. However, as the evidence shows, we need to move more quickly than was previously thought.

Clear emission reductions averaging 50% across the EU should be agreed for each country and particularly there should be a focus on determining a safe operating space for livestock, especially ruminants, which contribute the most to agricultural emissions. It is not enough to offset rising agricultural emissions by sequestering carbon by planting a few more trees. Strict emissions reductions must be set for the sector in addition to sequestration if there is any hope of meeting the 1.5°C target.

While production needs to operate within limits, there is also an urgent need to counter the prevailing narrative that increased consumption of animal products is an inevitable and desirable component of wealthier lifestyles. EU citizens' consumption and EU exports of meat affect not only our health but are the single biggest reason why we are exceeding 3 of the planet's safe boundaries - for climate, biodiversity and nutrient cycles. The CAP needs to urgently be taken out of the hands of vested interests and transformed into a policy that Europeans can be proud of. However, the CAP - which should have addressing this challenge as its compass - will leave it to Member States to deliver incremental change.

With genuine leadership, half of the 40% of the EU budget allocated for agriculture (i.e. CAP payments) could be turned into the largest payment for ecosystem services scheme in the world. Properly planned, this could fund the large-scale implementation of natural climate solutions (in soils, forests, peatlands and wetlands) which are vital in turning around the twin crises of climate breakdown and ecological collapse. The rest of the budget should be used to fund the food transition – "more beans, less beef" - through agro-ecological practices, as reported is needed by the Lancet for human and planetary health.

Europe's agriculture impacts do not stop at its borders; for instance, we import tropical deforestation in the form of cheap protein crops to feed EU livestock. As the evidence shows, one of the best solutions to climate disruption is stopping deforestation. Natural climate solutions on the EU's own land and through foreign policy intervention should be a priority for sustainability.

What if not?

If we continue on our current path, the damaging effects of intensive agriculture and exaggerated consumption of animal products on greenhouse gas emissions, loss of biodiversity, nitrogen leakages into the environment and eutrophication of waters will continue. Our way to produce food is one of the key drivers for the currently ongoing sixth mass extinction of species. Agriculture is a [main driver to transgress planetary boundaries](#).

The total [GHG emissions of the food system](#) are estimated to represent 20-30% of global greenhouse gas emissions. Meat and animal products are one seventh of greenhouse gas emissions and they have many negative environmental consequences. According to the FAO's widely recognised conservative figures livestock is [14.5% of green-house gas emissions globally](#). Other more radical estimates of up to 51% are not accepted throughout the scientific community.

A recent research review ([Sánchez-Bayo, Wyckhuys 2019](#)) has highlighted that over 40% of insect species are threatened with extinction and concludes: *"unless we change our ways of producing food, insects as a whole will go down the path of extinction in a few decades"*. Habitat loss by conversion to intensive agriculture is the main driver of the declines. This is confirmed by [FAO's report on biodiversity in agriculture](#).

If we do not urgently regenerate biodiversity in cropland, in urban areas, in the seas and oceans, and if we do not massively carve out land sparing opportunities to give it back to nature, biodiversity decline may continue and get out of control. Ultimately this may threaten conditions for humanity's survival. Intensive agriculture is claiming that due to higher yields per hectare it is more climate-friendly and has more [potential for land sparing](#) compared to organic or more extensive farming. However, this claim fails to acknowledge that the majority of agricultural land produces grain-based feed for animals, and that an ever increasing global meat consumption will lead to ever increasing pressures of intensive agriculture on land rather than to land sparing opportunities.

Soils are suffering from intensive agriculture and their regeneration is urgent to ensure food security tomorrow. The first [UNCCD Global Land report](#) has stated that *"over the last two decades, approximately 20 per cent of the Earth's vegetated surface shows persistent declining trends in productivity, mainly as a result of land/water use and management practices"*. The IPBES (2018) assessment report on [Land degradation and restoration](#) highlights that combating land degradation and restoring degraded land is an urgent priority to protect the biodiversity and ecosystem services vital to all life on Earth and to ensure human wellbeing.

If we do not succeed behavioural changes and leapfrogging together globally towards sustainable and healthy diets, figures for meat consumption will sky-rock in the next decades with billions moving into the new middle classes. While there has been a food versus fuel debate on 1st generation biofuels (ILUC), this has been much less the case for food versus feed. Deforestation and land conversion to animal feed is a major issue, and meat could be considered as "hidden" ILUC as not all statistics distinguish between crops for human consumption and for animal feed.

Obesity, malnutrition and climate change are framed by the Lancet as a [Global Syndemic](#), they can no longer be dealt with in isolation. A recent Lancet report on the state of the [food system in the Anthropocene](#) rings the alarm bell: *"Civilisation is in crisis. We can no longer feed our population a healthy diet while balancing planetary resources. For the first time in 200 000 years of human history, we are severely out of synchronisation with the planet and nature. This crisis is accelerating, stretching Earth to its limits, and threatening human and other species' sustained existence."*

4. What if we conserved and restored natural ecosystems and created carbon sinks to remove CO₂ from the atmosphere now?

Removing existing CO₂ concentrations from the atmosphere is urgent and must happen now. The current failure to reverse the growth in global emissions is widely recognised. The distinction between nature- and ecosystem based solutions versus technology-based solutions is important. [EASAC \(2019\)](#) notes that meeting the Paris Agreement targets depends increasingly on deployment of Negative Emission Technologies (NETs). *“Technologies for removing CO₂ from the atmosphere will need to be integrated into climate policy in 2019”*. This means the time horizon has changed from a long-term perspective of compensating the remaining emissions in the future to an immediate priority. The [report to Belgian Youth for Climate](#) also underlines the importance of drawing down existing emissions: *“En parallèle à une décarbonisation approfondie de notre société, nous devons également éliminer le CO₂ de l’atmosphère. En d’autres termes, nous devons réaliser des émissions négatives”* recommending research and innovation on sustainable negative emission technologies and existing natural and semi-natural solutions.

Natural carbon sinks provided by ecosystems and the bioeconomy, if used or rolled out widely, have major potential for drawing down CO₂ and delivering carbon dioxide removal (CDR). These techniques work: *“Reversing deforestation, reforestation, increasing soil carbon levels and enhancing wetlands remain the most cost-effective and viable approaches to CDR”* ([EASAC 2019](#)). Some of these are among the top of the 100 solutions analysed in [Drawdown. Natural climate solutions](#) can capture carbon and improve ecosystems (see also [here](#)). *“Nature-based solutions can make a large contribution and are currently the main option for CO₂ removal”* ([UNEP 2019b](#)). [Griscom et al \(2017\)](#) show that natural climate solutions *“can provide over one-third of the cost-effective climate mitigation needed between now and 2030 to stabilize warming to below 2 °C”*. A recent campaign has underlined that [ecological restoration](#) can be a powerful means of protecting the atmosphere and called for rewilding on a massive scale. A [video](#) by Greta Thunberg and Montbiot went viral. The UN recognizes [nature](#) as one of the most effective ways of combatting climate change. Several initiatives propose to set aside [half of the Earth](#) or [30% of the planet](#). [Dinerstein et al \(2019\)](#) outline guiding principles, milestones, and targets of a global deal for nature. Legal frameworks protecting ecosystems and species they host, especially milestone and endangered species, are needed. China is envisaging protecting one quarter of its land through its [red line initiative](#).

CLIMATE-BIODIVERSITY NEXUS

Climate disruption and biodiversity loss are interdependent. They are inseparable threats to humankind and must be addressed together. On the one hand, biodiversity is strongly affected by climate disruption with negative consequences for human wellbeing and the long-term stability of critical ecosystems. On the other hand, the conservation of biodiversity, through the ecosystem services it supports, makes an indispensable contribution to addressing climate disruption. Terrestrial and marine ecosystems currently absorb more than half of anthropogenic CO₂ emissions. Better protection, management and restoration of natural and managed ecosystems can make significant contributions to the mitigation of human-induced climate disruption. Ecosystem-based approaches can also contribute significantly to climate change adaptation and disaster risk reduction thereby reducing the vulnerability of people, and the ecosystems upon which they depend. Finally, many direct (e.g. changes in land and sea use) and indirect (e.g. consumption of food, materials and energy) effects of climate disruption and biodiversity loss are the same and thus there are important synergies in addressing these issues together. **Ecosystem-based approaches provide multiple benefits including for sustainable development and human health.** They are ready for use and easily accessible.

The Parties to the Convention on Biological Diversity at their 14th Conference in November 2018 adopted *Voluntary Guidelines for the Design and Effective Implementation of Ecosystem-based Approaches to Climate Change Adaptation and Disaster Risk Reduction* ([CBD COP XIV/5](#)).

Bold action is needed urgently to stop deforestation now. Business engagement is crucial. Consumers need to be informed about the choices they make. EU Trade policy instruments could be used more to steer trade flows away from undesired outcomes. Despite the potential and prime importance of forest land to remove CO₂, the

world seems to move in the wrong direction and is increasing deforestation, such as recently in the Amazon. The [Earth Biogenome project](#) has proposed to test an alternative model to the trade-off between agriculture and ecosystem preservation, based on seeing the “Amazon as a global public good of biological assets for the creation of high-value products and ecosystem services” ([Nobre et al 2016](#)). Leasing of tropical forests with remuneration of their custodians is a possible business case.

Massive reforestation with "emergency planting" could contribute to a rapid drawdown of CO₂. There is need to assess the space that is available ([Bastin et al 2019](#)) or can be made available for afforestation in Europe and what EU measures could be used within the EU. Afforestation in developing countries where the benefits would be manifold and obvious should be supported. The global south will be more affected by droughts and floods because of climate disruption, we should do enormous efforts to help their survival. There are also private sector opportunities for planting trees in developing countries (e.g. [Komaza](#) in Kenya). The [European Solidarity Corps](#) could provide opportunities to young people to engage in afforestation activities and forest restoration programmes.

Sylvo-ecological approaches are central as a single focus on afforestation may be harmful for biodiversity. Planting the right trees, avoiding spruce or other monocultures, diversifying with agroforestry or sylvo-pastoral systems create co-benefits for ecosystems. The final destination of the wood is important as it impacts substantially on the carbon sink benefits of growing trees: Leave or harvest it? How and when? Build it or burn it? New literature claims that wooden biomass for bioenergy is wrongly considered as renewable and damages the climate ([Searchinger, van Ypersele 2018](#)). The IPBES [global assessment report](#) also highlights that “land-based climate change mitigation activities can be effective and support conservation goals {Table SPM.1}. However, the large-scale deployment of bioenergy plantations and afforestation of non-forest ecosystems can come with negative side effects for biodiversity and ecosystem functions”.



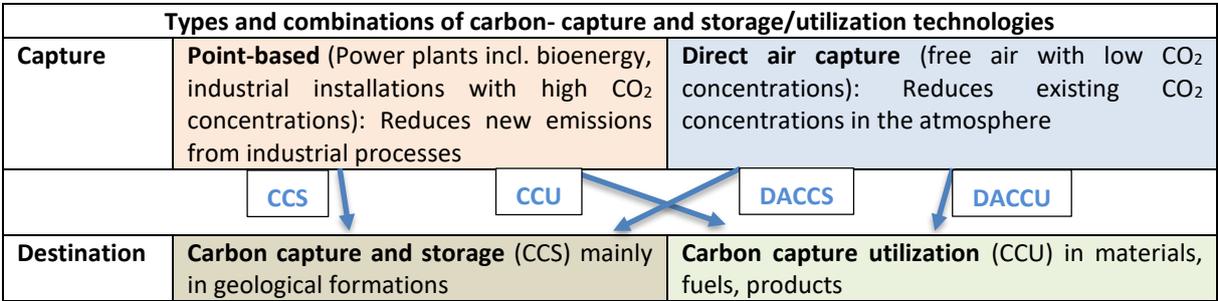
Figure 20: Source: [EMoNFU](#), Life Project, Urban and Peri-urban Forests

Storing carbon in products with a long-live cycle, such as construction, is gaining increasing interest. There is a major opportunity for the development of a bio-construction sector with many 'green jobs'. With sustainable and regenerative forest management, steel and concrete for construction could be replaced wherever possible by wood. When burning wood for energy use, the opportunity cost of not replacing energy intensive inputs such as coal and steel in construction should be considered. The bioeconomy is developing new technologies enabling wood side-streams to be put to higher-value uses than burning. Reforestation and rewilding has its place in urban areas as well.

Carbon **biosequestration** opportunities in land, through farming or instead of farming, should be harnessed wherever possible. Particular attention should be given to peatlands, wetlands and other biodiversity-rich lands aiming at multiple ecosystem co-benefits. 'Land sparing' opportunities, in particular from growing animal feed, could be reframed into 'land valorisation' opportunities with new business and funding models for farmers as 'carbon stewards'. Lands considered 'unproductive' from a crop production perspective should be explored for their carbon storage potential. The concept of "yield" needs to be redefined from ton/ha of crop to carbon storage per ha. Public subsidies need to be reoriented. Australia is experimenting with a new scheme of "carbon farming", introducing the first payments for soil carbon in a [government regulated scheme](#). However, it is important to keep agricultural land for (agro-ecological) food production (which also sequesters a lot of carbon), and restore the other ecosystems (which will also leads to carbon sequestration).

TECHNOLOGICAL OPTIONS: HOPES AND UNCERTAINTIES

Great hopes have been put in climate scenarios into a range of technological solutions for carbon dioxide removal. The debate is focusing on **BECCS** which has important land-use and biodiversity trade-offs. [EASAC \(2019\)](#) signals that the "role of bioenergy with carbon capture and storage (BECCS) remains associated with substantial risks and uncertainties, both over its environmental impact and its ability to achieve net removal of CO₂ from the atmosphere". This is important for policymakers: "The large negative emissions capability given to BECCS in climate scenarios limiting warming to 1.5°C or 2°C is not supported by recent analyses, and policy-makers should avoid early decisions favouring a single technology such as BECCS. A suite of technologies is likely to be required in the future."



Point-based carbon capture, currently the dominant technological path, is [advocated](#) to make energy production and energy-intensive industries (such as cement, steel or aluminium) cleaner than they are now. This should be a second-best option after exploiting the full potential of reduction or elimination of these emissions in the first place. For coal, it is more appropriate to phase it out than to prolong its life by capturing part of the fossil emissions through technical solutions. While steel and concrete cannot be replaced entirely now, public policies could aim at substituting them where possible by sustainably grown wood. However, *in fine* emissions are linked to the overall level of consumption and material throughput, which we need to reduce. Despite the opportunities for industrial symbiosis of energy-intensive industries, point-based Carbon Capture & Utilisation (CCU) or Carbon Capture, Utilisation & Storage (CCUS) only partly recover the new CO₂ emissions from energy production or industrial processes; they do not reduce existing CO₂ concentrations in the atmosphere. BECCS from wood burning for bioenergy is accounted as a "negative" emission technology because the feedstock is considered renewable; this is nevertheless contested.

Two destinations for the captured carbon are being explored: carbon storage, mainly in geological formations, or carbon use in materials and products. "Carbon Capture and Utilisation in industry refers to processes where CO₂ is captured and then converted into a new product. E-fuels can be an example where the CO₂ gets released

again when the fuel is combusted, displacing emissions of fossil fuels. Other CCU products such as plastic and building materials exist, which contain the CO₂ for long periods of time” ([Clean Planet for all](#)). There are serious societal concerns about CCS while CCU has interesting opportunities to substitute fossil raw materials or land-based biomass. A new [CO₂ economy](#) is developing using greenhouse gases as raw materials for [fuels](#) or [products](#).

Direct air capture is making technological advances. Although not yet commercially viable at scale today, and therefore left aside by more short-term interested industries, it can become a promising target for R&I, risk capital, and institutional investments interested in long-term horizons. “Significant progress has been achieved with direct air capture with carbon storage (DACCS) but it is not yet possible to identify a preferred technology” (EASAC 2019). The [Clean Planet for all In-depth analysis](#) states, “in the long run, DACCS has a real potential for technological development and could become the predominant technological option to remove CO₂ from the atmosphere”. Direct air capture carbon capture and utilization (DACCU), for material use – and even food ([Solarfood](#)) - could become a game changer.

The screenshot shows a dark-themed banner for Science magazine. At the top left is the Science logo and navigation links: Home, News, Journals, Topics, Careers. In the center, it reads 'TOP TEN Big Data TRENDS FOR 2017' with a 'SEE THE TRENDS' button. On the right, there are links for 'Log in | My account' and 'Contact us'. A Tableau logo is visible on the left side of the banner.

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The Climeworks carbon sucking plant in Switzerland.

Climeworks

In Switzerland, a giant new machine is sucking carbon directly from the air

By [Christa Marshall, E&E News](#) | Jun. 1, 2017, 10:30 AM

Figure 21: Source : [Christa Marshall, Science, In Switzerland, a giant new machine is sucking carbon directly from the air, ClimeWorks Carbon sucking plant](#)

While these technologies are in development, nature does work. Nature- and ecosystem-based CO₂ removal techniques should not only be considered as part of a net-zero emissions strategy compensating other emissions, but more ambitiously as humanity’s greatest asset for proactive removal of existing CO₂ concentrations as of now. To move forward from a compensation approach to a proactive removal approach we need to reduce emissions from agriculture, often considered to be the remaining emissions after deep decarbonisation of all sectors. Natural solutions, in particular rewilding, allow to circumvent the trade-offs between climate change mitigation and biodiversity loss associated with bioenergy and BECCS in particular, if rolled out at scale.

Preservation of the oceans and of marine and coastal ecosystems is important to preserve their carbon storage capacity. Ocean and coastal sinks (mangroves, salt marshes, seagrass beds) within Europe and globally can preserve up to 3.5% of all greenhouse gas emissions in sinks if we stop their destruction. The [International Blue Carbon Initiative](#) is a coordinated, global programme focused on mitigating climate disruption through the conservation and restoration of coastal and marine ecosystems. The functionality of the ocean ecosystems is increasingly threatened as highlighted by many scientists. *“The ocean covers 71% of the Earth’s surface. It regulates our climate and holds vast and in some cases untouched resources. It provides us with basics such as food, materials, energy, and transportation, and we also enjoy the seascape for religious or recreational practices. Today, more than 40% of the global population lives in areas within 200 km of the ocean and 12 out of 15 mega cities are coastal. Doubling of the world population over the last 50 years, rapid industrial development, and growing human affluence are exerting increasing pressure on the ocean. Climate change, non-sustainable resource extraction, land-based pollution, and habitat degradation are threatening the productivity and health of the ocean”* ([Visbeck 2018](#)).

What if not?

If we are not fully exploiting the nature- and ecosystem-based carbon sinks, failing to move to a highly circular economy and unable to get out from carbon-intensive lifestyles, we shall be driven into a future where we have to bet on currently uncertain technologies to keep the planet in a safe state, without a sure success.

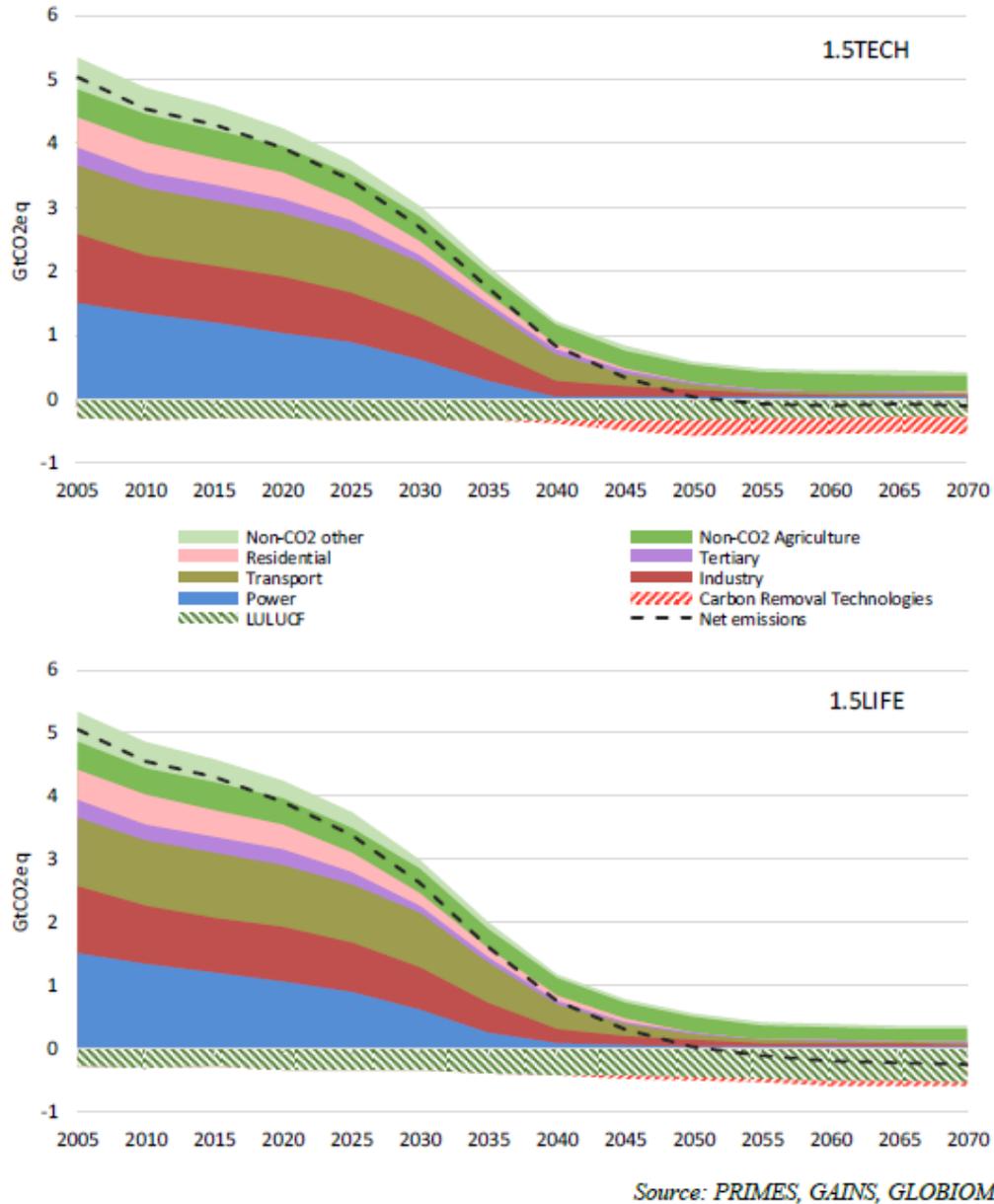
If we are not massively deploying nature- and ecosystem-based negative emission techniques now, we shall leave an increased debt to future generation, which would be an ethically unacceptable choice. [EASAC \(2018\)](#) has noted the *“danger of moral hazard in accepting as legitimate future scenarios that are based on assumed carbon dioxide removal of many gigatonnes of CO₂ each year via unproven technologies.”*

The [Clean Planet for all](#) communication considers that **only two scenarios (1.5 TECH, 1.5 LIFE) can reach net zero-emissions by 2050:** *“The seventh scenario pushes all zero-carbon energy carriers as well as efficiency, and relies on a negative emissions technology in the form of bioenergy combined with carbon capture and storage to balance remaining emissions. The eighth scenario builds upon the previous scenario but assesses the impact of a highly circular economy and the potential beneficial role of a change in consumer choices that are less carbon intensive. It also explores how to strengthen the land use sink, to see by how much this reduces the need for negative emissions technologies.”*

We could explore a ninth more ambitious scenario addressing the emissions from agriculture, reducing overall energy demand, reducing consumption and production, and enhancing ecosystem conservation and restoration.

[McLaren et al \(2019\)](#) move beyond ‘net-zero’ and make a case for separate targets for emissions reduction and negative emissions. They argue that *“targets and accounting for negative emissions should be explicitly set and managed separately from existing and future targets for emissions reduction. Failure to make such a separation has already hampered climate policy, exaggerating the expected future contribution of negative emissions in climate models, while also obscuring the extent and pace of the investment needed to deliver negative emissions. Separation would help minimize the negative impacts that promises and deployments of negative emissions could have on emissions reduction, arising from effects such as temporal trade-offs, excessive offsetting, and technological lock-in”*. They conclude that a *“clear separation would expose interests and politics—deliberate efforts to substitute negative emissions for emissions reduction could no longer be hidden behind “net-zero” rhetoric; and the justice implications of who generates residual emissions would become clearer. Clarity would reveal both where negative emissions investment and development is inadequate, and where negative emissions (or future promises thereof) could undermine emissions reduction.”*

Figure 90: Two ways to reach net zero GHG emissions - reduction pathways for 1.5TECH (above) and 1.5LIFE scenario (below) with enhanced LULUCF sink⁴⁵¹



Source: PRIMES, GAINS, GLOBIOM.

Figure 22: Source: [In-Depth Analysis in support of Clean Planet for all](#)

If we do not massively reduce GHG emissions and protect the oceans working on the drivers causing the [depletion of marine ecosystems](#), the functionality of the oceans as a central part of Earth system resilience will be increasingly threatened. It must be expected that tropical corals are lost soon. Ocean acidification is becoming increasingly an issue for great concern. The [IPCC Special report on the ocean and the cryosphere](#) highlights that “it is virtually certain that the global ocean has warmed unabated since 1970 and has taken up more than 90% of the excess heat in the climate system (high confidence). Since 1993, the rate of ocean warming has more than doubled (likely). Marine heatwaves have very likely doubled in frequency since 1982 and are increasing in intensity (very high confidence). By absorbing more CO₂, the ocean has undergone increasing surface acidification (virtually certain).”

5. What if we reduced consumption in a regenerative and circular economy now?

Both the **circular economy** and the **bioeconomy** play a key role among the pathways for the transition to a net zero greenhouse gas emissions economy ([Clean Planet for all](#)). “A highly circular economy and the potential beneficial role of a change in consumer choices that are less carbon intensive” are an essential part of one of the two only scenarios considered compatible with a 1.5°C pathway. The science advice to Belgian Youth for Climate ([Panel Climat et le Développement Durable 2019](#)) also highlights the importance of the circular economy. A more circular economy can cut emissions from heavy industry by 56% by 2050 according to [Materials Economy \(2019\)](#).

The circular economy, together with the bioeconomy, would disconnect itself from the use of non-renewable resources. Compared to the traditional linear economy, the circular economy, if fully rolled out, is a major leap forward. The two cycles of the "butterfly" model have been popularised by the [Ellen MacArthur Foundation](#) – one renewable that is bio-based, one non-renewable that is recycled. The circular economy is often misunderstood as being just about recycling, but it is about exploiting all the R-s (inner loops) like reuse and repair before recycling. It can be boosted by giving more attention to the bioeconomy on the left side of the "butterfly".

If products were designed for recovery (easily separable components, each from a single, ideally well known material, or a well-separable material mix) and accompanied by the right information, they could be separated and recovered at high grade/purity, and therefore the number of recycling times could be kept high, at least in theory. Short-term actions include boosting the inner circles of repair, reuse, share. Contamination is one of the issues leading to loss of value in each cycle. The direction for the economy as a whole could be more local and more bio-based. Biomimicry holds a great promise in replacing the rare earths and technical materials with bio-based materials that provide the same functions through common elements built into sophisticated structures. What if we 3D printed our objects as much as possible locally, with locally available bio-based materials? What if we could share the designs and ideas globally but produced locally, ‘moving around bits instead of atoms’?

Regulation can be a driver for more sustainable practices through ‘green tape’. What if we required all products put on the market to be either bio-based and compostable, or designed for full disassembly, material separation and high-grade recovery? What if VAT was only paid on the parts of the product made with virgin non-renewable materials and non-recyclable components, to begin with, and with both options progressively phased out altogether?

Further efforts are needed to overcome the current limitations of the circular economy and to deploy it globally. The inner circles are often neglected and need more focus. Many raw materials are remaining in linear extraction modes. And whatever we produce, circular or not, uses embedded energy. Despite major policy ambition, technological developments and investments, we may find ourselves confronted with limits of circularisation. Many material cycles are leading inherently to a downgrading or are unfit for any recycling. Circularisation at a global level is disappointingly insufficient, [material value is lost in each cycle](#), the potential of reducing and reusing remain under-exploited. “Raw materials are indispensable enablers for carbon-neutral solutions in all sectors of the economy” notes the [Clean Planet for all Communication](#), and given the scale of fast growing material demand, “primary raw materials will continue to provide a large part of the demand”.

The focus on the bio-based circles is important, but even these circles remain often within a linear model of intensive agriculture, using resources which are renewable but not limitless, and have important negative externalities on the environment. Indeed, extractive modes remain wide-spread in a fossil-based agriculture and lead to depletion of non-renewable resources such as soil ([EASAC 2018b](#)). This means that the bioeconomy needs to become fully regenerative to preserve resources and ecosystems. Furthermore, the bioeconomy is often following a paradigm of substitution of fossil by biobased products, but still remains in the paradigm of producing products.

Rethinking resource use is critical to address climate disruption, biodiversity loss and many others of the challenges of the environmental emergency. The 2019 edition of the [Global Resources Outlook](#) highlights that

“fundamental change in how natural resources are used around the world is necessary to succeed.” Environmental impacts of resource extraction and processing explain 90% of water stress and land-use related biodiversity loss (mainly biomass, which means food systems and agriculture in particular), half of climate change and one third of all the pollution. Yet the conclusion is optimistic: *“Through a combination of resource efficiency, climate mitigation, carbon removal, and biodiversity protection policies, this report finds that it is feasible and possible to grow economies, increase wellbeing and remain within planetary boundaries.”*

REGENERATION: THE NEXT LEAP FOR THE CIRCULAR ECONOMY

Completing the circular economy through the [concept of a regenerative economy](#) allows to go further. The [regenerative economy](#) addresses more holistically the links between human activity and ecological life support systems. This is very much in line with the works on ecological economics, by scholars such as Roberta Costanza (2007, 2008). In her report to the Club of Rome, [Hunter Lovins \(2018\)](#) draws up a policy roadmap for a regenerative economy which includes 1) transforming finance and corporation, 2) reimagining energy, agriculture, and the nature of how we work, 3) enhancing human wellbeing and 4) delivering a world that respects ecosystems and human community.

A regenerative economy would have to be regenerative by purpose, circular by design, biological where healthy. A Regenerative Economy unifies the Circular Economy and the Bioeconomy and takes them to the next level, making the circular economy more biobased, the bioeconomy regenerative, and anchor more concern for equity. A Regenerative Economy heals the planet rather than depleting it, spreads happiness rather than despair. A Regenerative Economy cultivates a new balance between the long term and the short term, between the commons and private interest, between global challenges and local concerns. How could a regenerative economy move investments from hurting and harming to healing?

A regenerative bioeconomy could play a key role on the pathway towards a mainstream regenerative circular economy. By nature, regeneration is the circularity of biological cycles. Some of the limits of circularisation (loss of value in each cycle, too much virgin raw material and un-recycled waste, too much extractive practices in primary production of food, feed and biomass) could be addressed if the bioeconomy was at the forefront of empowering a regenerative economy. First and foremost this would be through [regenerative agriculture](#), but also through closing urban biocycles ([Ellen MacArthur Foundation 2017b](#)), phasing down use of virgin biomass and land, storing carbon in soils, forests and oceans, using CO₂ from direct air capture as feedstock, providing bio-services and nature-based solutions, restoring ecosystems and biodiversity, moving from bulk biomass to bio-inspiration and bio-intelligence ([World Economic Forum 2017](#), [Fraunhofer 2018](#)), focussing on community, reconnecting with nature. Bioremediation could make the regenerative bioeconomy a key actor for healing the planet.

Decoupling **prosperity and wellbeing from environmental and climate impact, and from exceeding planetary boundaries**, is the next generation decoupling 2.0, which could be much more complex and multi-dimensional than decoupling growth from the use of resources.

Beyond substitution and circularisation, reducing consumption may be becoming an uncomfortable, but unavoidable challenge. Reducing total consumption and waste is one of the key leverage points for change concludes the [IPBES global assessment](#). Policy will need strategies that square the circle of consuming (much) less, at least in certain parts of the world, while generalising and further developing prosperity. Unfettered consumption by all at the level of developed countries will appear increasingly incompatible with keeping Earth systems in a stable balance. Although consumerism provides jobs, income and profits, and responds to the human quest for self-realisation, it works against planetary boundaries. This will require to search for alternatives and to **decouple wellbeing and happiness from consumption**.

Informed and conscious consumer choice is powerful to make companies adjust value chains. There may be more need for responsible consumption education, nudging, intelligent regulation and taxation to steer consumption and production towards sustainable and Anthropocene-compatible pathways. The drive towards immaterial consumption includes a gradation of possibilities: consuming more experiences and less physical goods; "consuming" proportionately more of health, sustainability, equality; decoupling wellbeing from (physical) consumption; measuring accordingly.

OUTLINE OF A CIRCULAR ECONOMY

PRINCIPLE

1

Preserve and enhance natural capital by controlling finite stocks and balancing renewable resource flows
 ReSOLVE levers: regenerate, virtualise, exchange



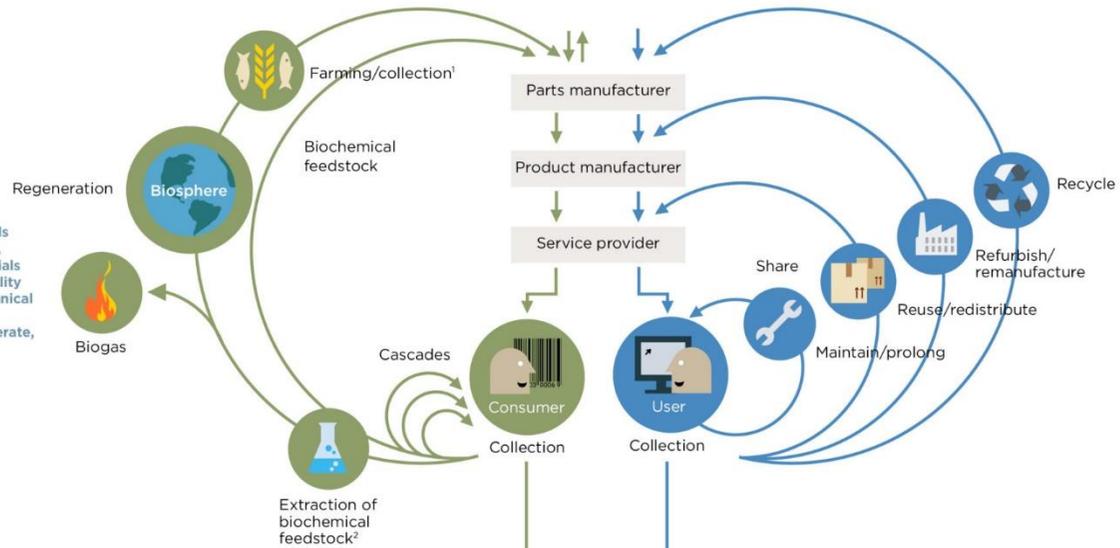
Renewables flow management

Stock management

PRINCIPLE

2

Optimise resource yields by circulating products, components and materials in use at the highest utility at all times in both technical and biological cycles
 ReSOLVE levers: regenerate, share, optimise, loop



PRINCIPLE

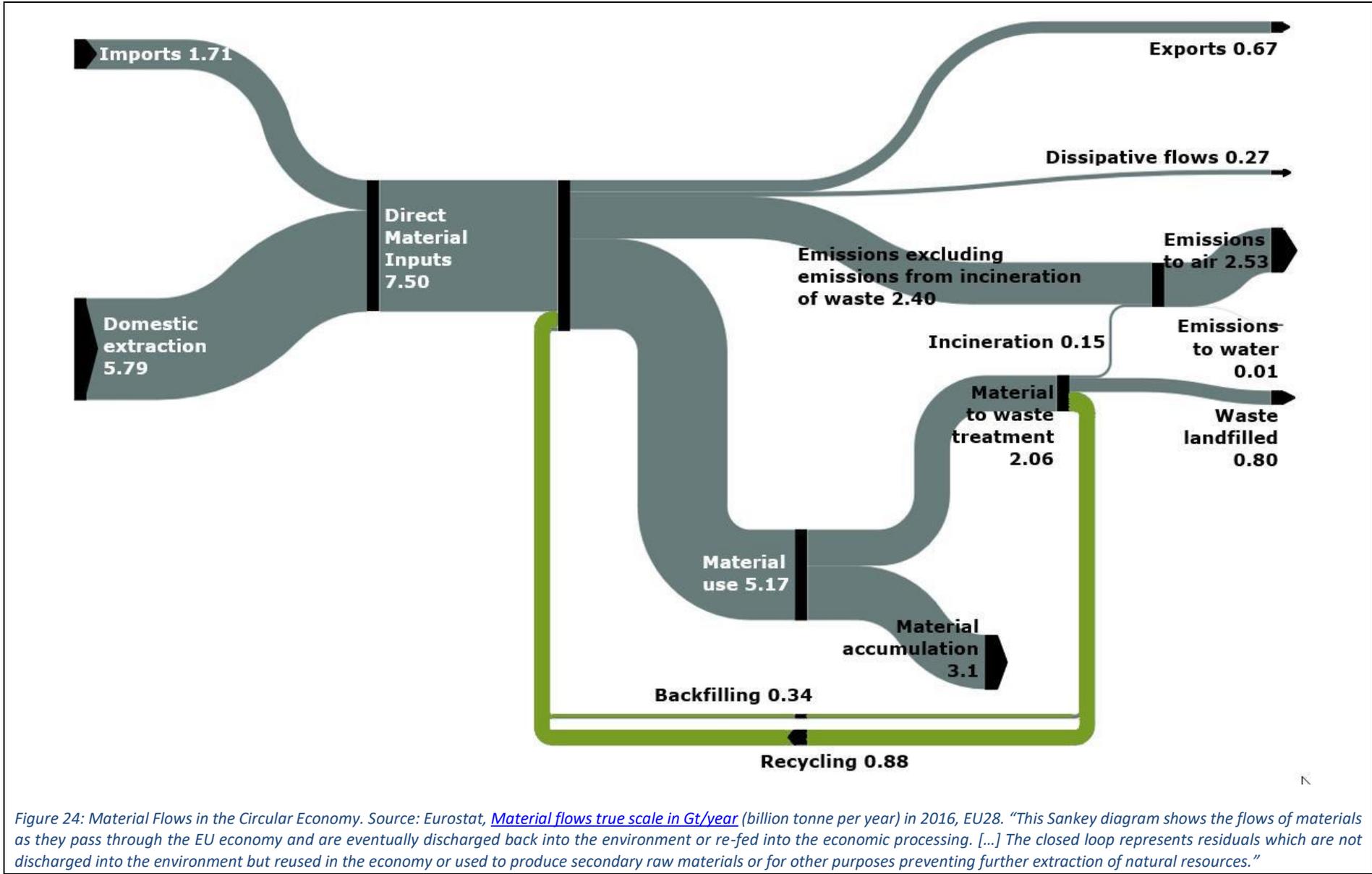
3

Foster system effectiveness by revealing and designing out negative externalities
 All ReSOLVE levers

Minimise systematic leakage and negative externalities

1. Hunting and fishing
 2. Can take both post-harvest and post-consumer waste as an input
 Source: Ellen MacArthur Foundation, SUN, and McKinsey Center for Business and Environment; Drawing from Braungart & McDonough, Cradle to Cradle (C2C).

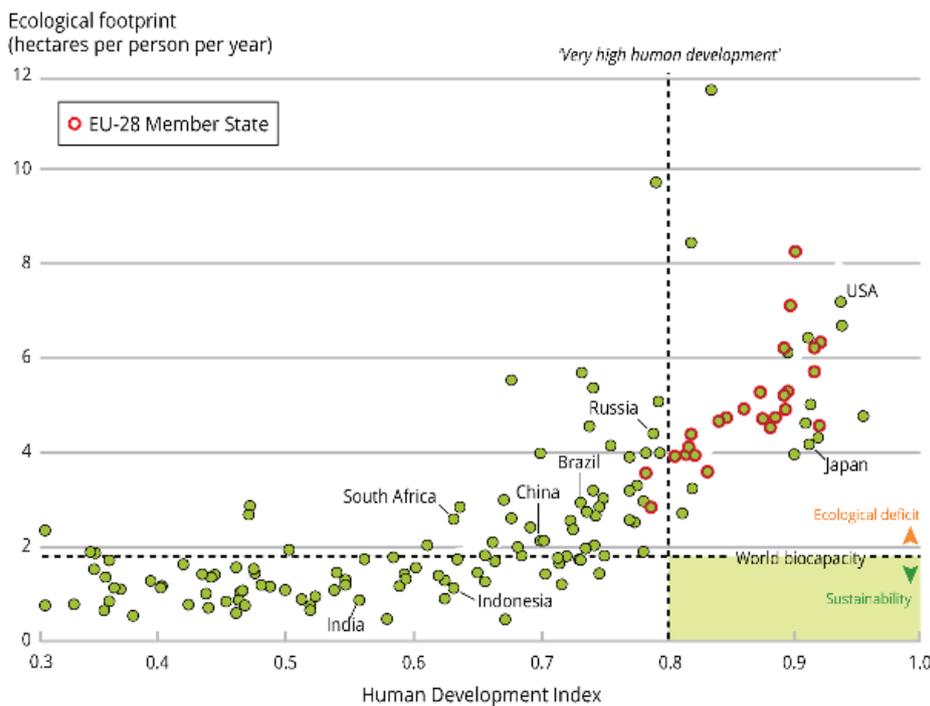
Figure 23; Source Ellen Macarthur Foundation, <https://www.ellenmacarthurfoundation.org/circular-economy/infographic>



It is increasingly recognised that consumption patterns, in particular in the developed world, require a fundamental rethink. “Widespread lifestyle change is the most difficult frontier of sustainability”, recognises the EPSC in [Europe’s Sustainability Puzzle](#), recommending that “**policy should aim for a new form of ‘public luxury and private sufficiency’**: by strengthening the quality and availability of shared goods, services and networks, public policy can reduce duplication of resources across individual households, thereby favouring efficiency, as well as strengthening community involvement and collective responsibility”.

How to achieve a behavioural shift from consumerism and convenience to a more conscious life driven by autonomy, authenticity and engagement? Humanity has not yet found solutions at large scale on the way to move beyond the toxic link between unsustainable and often unhealthy convenience and irresponsible profit, except personal choices of happy frugality ([Rabhi 2010](#)) or community-based experiments in civil society such as transition towns. Could such niches become a more widespread type of responsible behaviour? Is there an economic case for sufficiency, slowness or deceleration? Unchecked consumption is no longer an option in tomorrow’s markets ([WRI 2017](#)).

Figure 0.1: Correlation of ecological footprint (2008) and the human development index (2012)



Source: Global Footprint Network, 2012; UNDP, 2014a. National footprint accounts 2008 and Human Development Index (HDI)

Figure 25: Source : EEA, *Setting the Scene*, <https://www.eea.europa.eu/soer-2015/global/setting-the-scene>

WHAT-IF: ECO-POINTS, A QUANTIFIED FOOTPRINT ACCOUNTANCY SCHEME

Ecopoints, developed as a quantified footprint accountancy scheme, could be the premises of an eco-currency. Today, with the product environmental footprint (PEF) being built up, the “eco-cost” concept could become a reality in bigger and larger supply chains (and why not ultimately the whole economy?). The notion of eco-currency could be generalised to guide consumer choices. [myEcoCost](#) is a novel, bottom up approach to measuring the resource efficiency of products, services and technologies. This 7th RTD Framework Programme project also demonstrates how it is technically possible to provide timely and accurate resource efficiency statements applicable to business, industry and the everyday consumer.

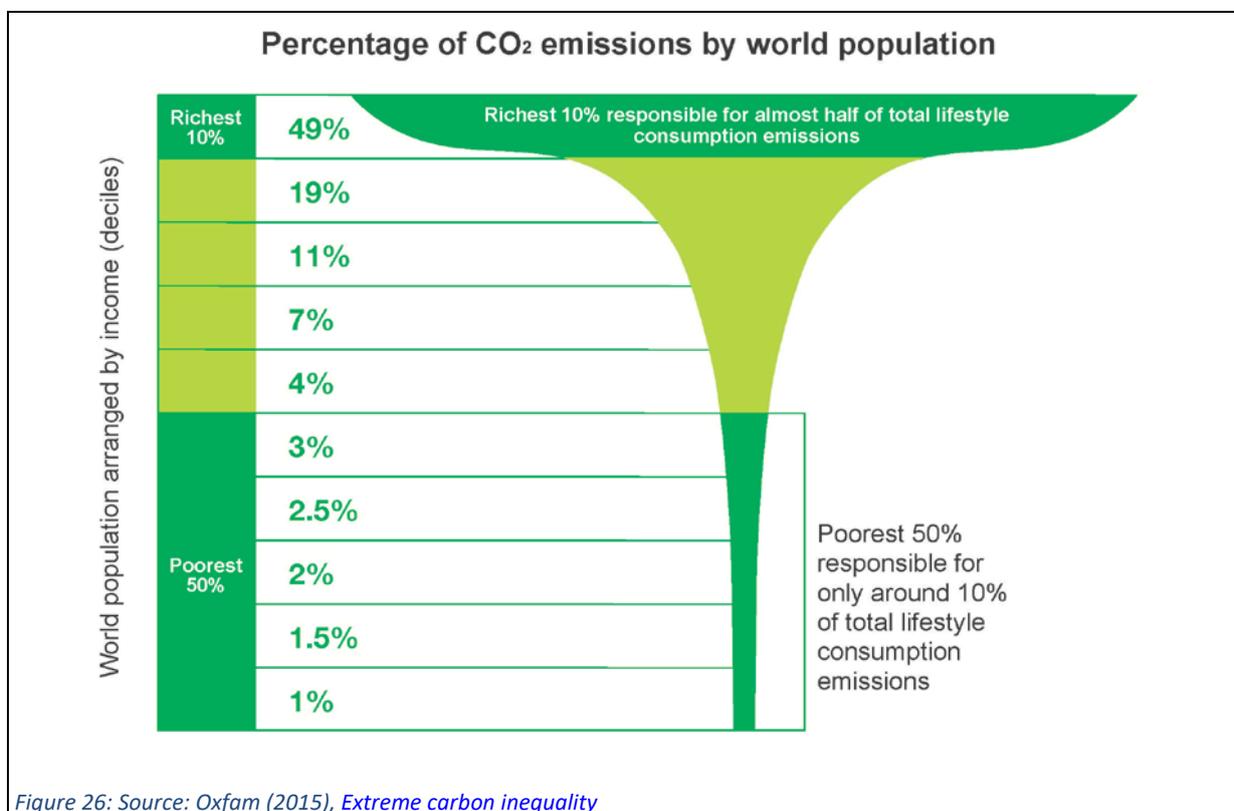
What if not?

With high political ambition and engagement from businesses and citizens we shall be able to make substantial advances in rolling out the circular economy in Europe. This is very important. It is likely to transform a large number of sectors of the economy. It cannot be taken for granted that this will be sufficient to curb material flows at a global level.

The Ellen MacArthur (2017) report '[New textiles economy](#)' points to the growing climate and environmental footprint of fashion and the need for making fashion circular. Currently only 1% of fabric is recycled, 73% of textiles end in landfills or are incinerated, the number of times an item is worn has decreased dramatically. In 2050 the textile industry alone could have CO₂ emissions as high as 26% of the 2°C carbon budget. A [pair of new jeans](#) needs [7600 litres of water to produce](#). Repairing could reduce this footprint.

Plastics is a major issue of (predominantly fossil) resource (ab)use. It is present everywhere, as a product, product ingredient or product packaging and as waste in the oceans and on land. Plastics has become during the 20th century a defining element of our lifestyles and has enabled convenience. It has come to dominate many of our value chains who cannot imagine any longer some of their key requirements, such as shelf life or easy transport and retail, without plastics. Microplastics is embedded in many of our production processes, it contaminates the food chain and harms the environment. The EU has adopted a plastics strategy and decided to ban several replaceable items of single use plastics most commonly found on beaches. Circulation of [plastics](#) needs to increase. The bioeconomy can contribute to make plastics both biobased and fully biodegradable. But the problem is of planetary scale and goes beyond. Rethinking plastics must be part of a more general lifestyle change.

If we do not, in addition to deploying the circular economy, urgently address what we consume and how, it is unlikely that we shall succeed to revert the trend of overshooting beyond the ecosystem's capacity with all the related negative transmission effects on climate disruption or biodiversity loss. Without incentives and public policies encouraging to simply consume less, the unprecedented transformation may not go far enough.



Through consumption patterns, use of resources, depletion of ecosystems and greenhouse gas emissions are linked. The richest 10% of the world population is responsible for 49% of total lifestyles consumption emissions, as highlighted by [Oxfam](#). Bringing consumption patterns in line with 1.5 degree lifestyles is therefore first and foremost a challenge and a responsibility for the global rich. “Considering current consumption levels, citizens in many developed countries would have to cut their lifestyle carbon footprints by about 80-90% or more, and some in developing countries by about 30-80% within the next 30 years” is one of the key conclusions of the [1.5 Degrees Lifestyles](#) report.

Today, at the Earth's scale, we need [1.75 earths every year](#) to sustain our economy and our way of living, the industrialised world much more than others. No trend of reversal is in sight. Earth Overshoot Day was 1 August in 2018; and is foreseen to be 3 days earlier in 2019: 29 July. The [Earth Overshoot days](#) were on 20 December in 1980, November in 1980, 11 October in 1990, 23 September in 2000 and 7 August in 2010. This [trend](#) is a clear sign that swift fundamental changes are urgently needed.



Figure 27: Global Footprint Network, [Country Overshoot Days 2018](#)

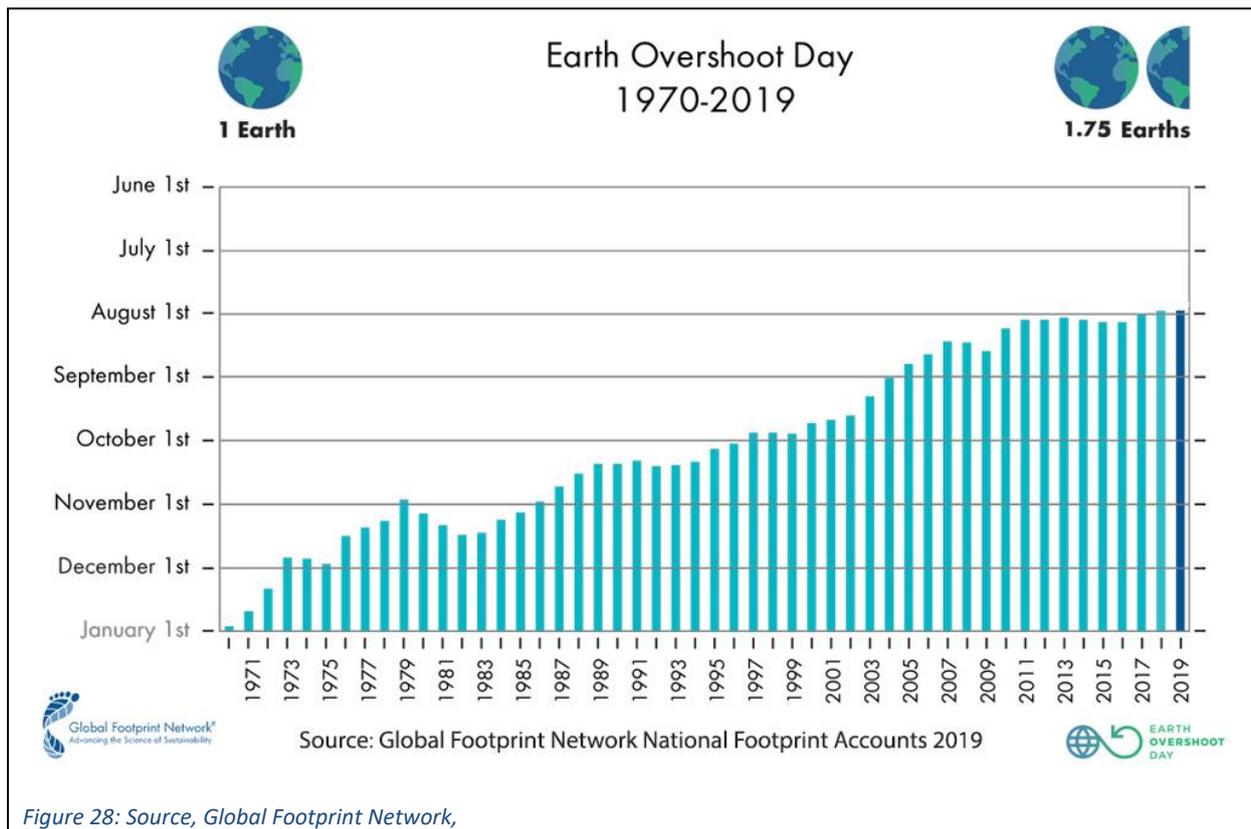


Figure 28: Source, Global Footprint Network,

Parts of the scientific community are now questioning the compatibility of green growth with a 1.5°C climate scenario and respect of planetary boundaries. [Hickel/Kallis \(2019\)](#) are writing in ‘Is green growth possible?’ that “examining relevant studies on historical trends and model-based projections, we find that: (1) there is no empirical evidence that absolute decoupling from resource use can be achieved on a global scale against a background of continued economic growth, and (2) absolute decoupling from carbon emissions is highly unlikely to be achieved at a rate rapid enough to prevent global warming over 1.5°C or 2°C, even under optimistic policy conditions”.

The shift towards a regenerative economy may become a condition to maintain the sustainability of the economic model as a whole and to uphold prosperity. While a massive shrinking of the economy, if it remains based on the current production - consumption pattern may be unavoidable, at least in the developed countries, there is potential to revalue many personal services that are currently not priced, including interpersonal value creation, and then of course the vast services by nature. This shift will be challenging as we cannot rely on market prices for many of the services that we will want to value and that will step in for the current production-consumption tuples that make up our current economy.

6. What if we prioritised resilience and disaster preparedness now?

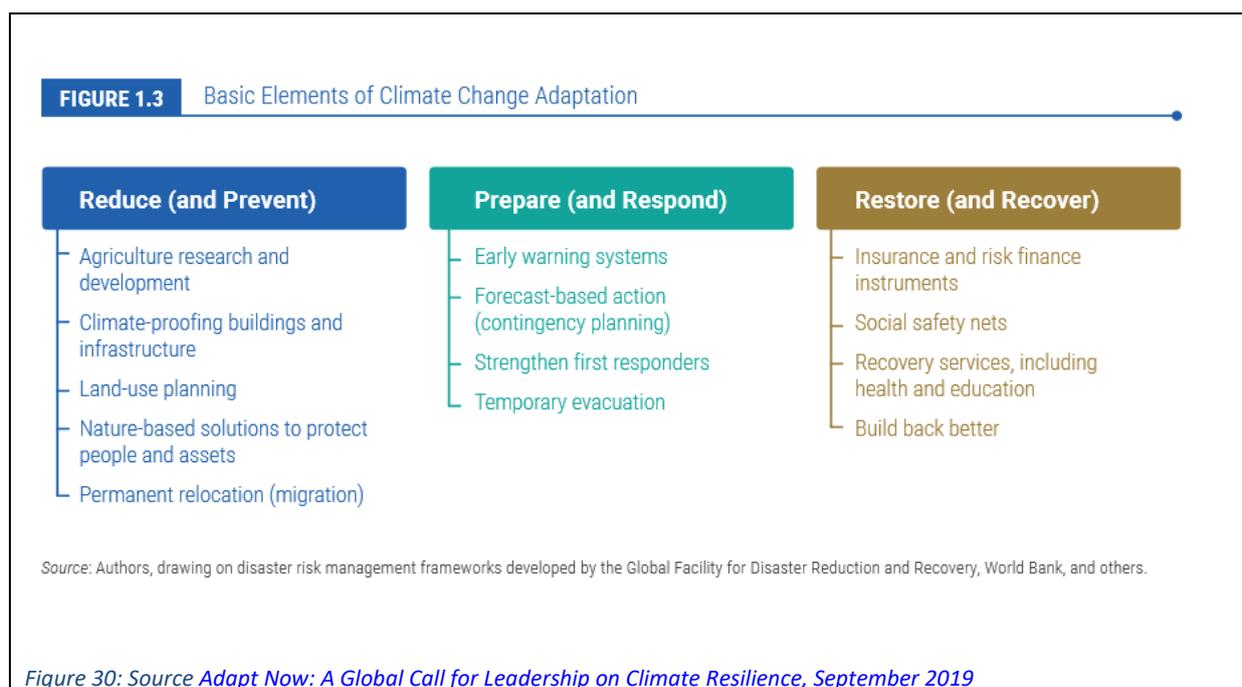
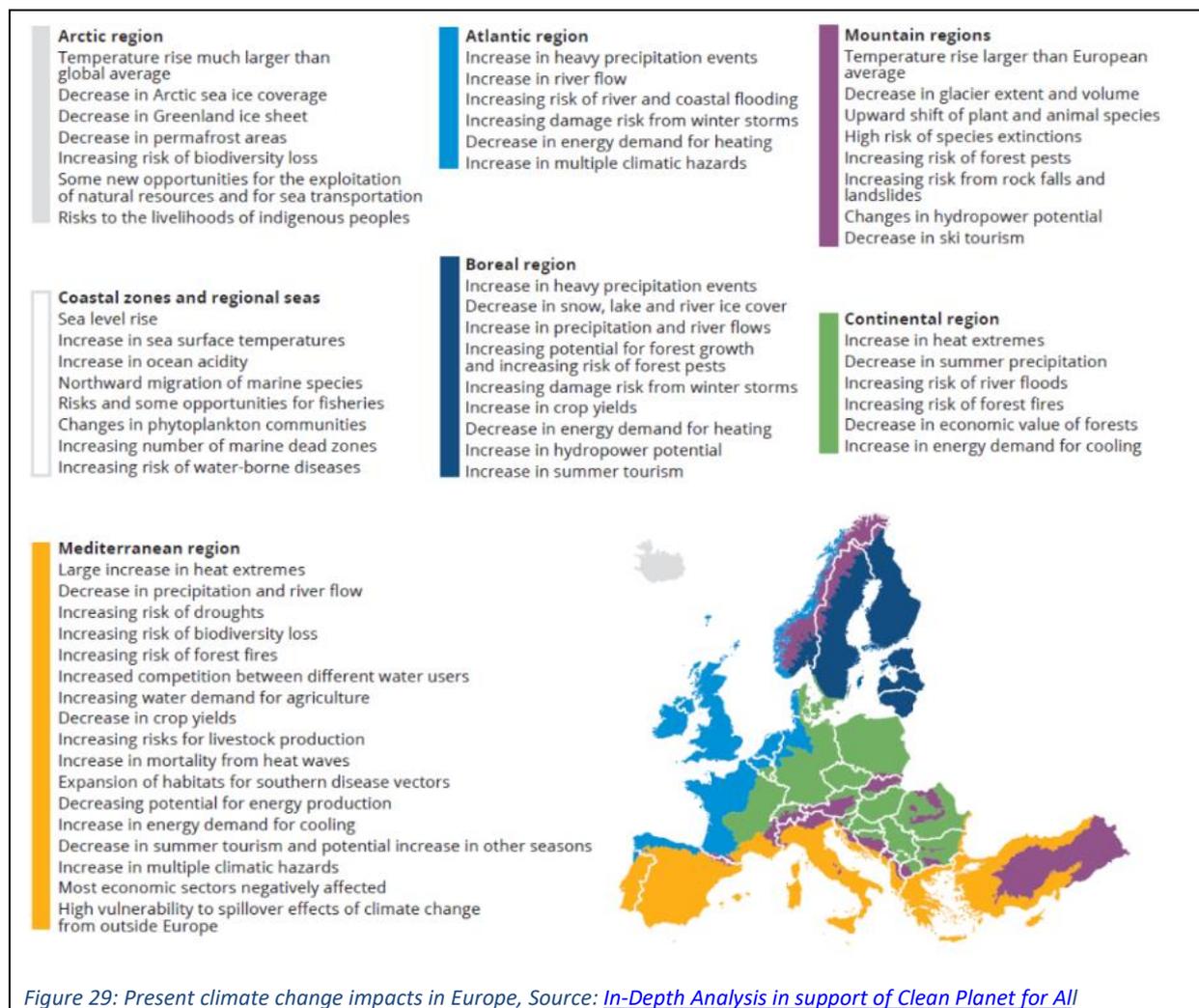
Strengthening resilience of habitats and human beings through low-carbon approaches requires a different mind-set and different skills in policy-making. Resilience thinking leads to prioritise ‘cooperativeness’ over competitiveness, adaptability of systems over productivity and optimisation of processes. The [Stockholm Resilience Centre](#), a world leading research actor in its field produced a set of [seven principles](#) for building resilience in social-ecological systems: 1) Maintain diversity and redundancy, 2) Manage connectivity, 3) Manage slow variables and feedbacks, 4) Foster complex adaptive systems thinking, 5) Encourage learning, 6) Broaden participation, 7) Promote polycentric governance. The authors of the [Hothouse Earth article](#) say that “*generic resilience-building strategies include developing insurance, buffers, redundancy, diversity, and other features of resilience that are critical for transforming human systems in the face of warming and possible surprise associated with tipping points*”.

Restoration of the life- and prosperity supporting ecosystems needs to be framed from a perspective of resilience and security, keeping the long-term viability for survival of humankind in mind. There is a need for ‘rewilding’ the Earth, including our cities, and leaving large spaces, including oceans, to nature for biodiversity to recover. This is necessary for resilience of our life- and prosperity supporting ecosystems. Genetic diversity is also important for survival of humankind.

To ensure future food security, agro-biodiversity is needed with more attention to orphan crops and heirloom seeds. Their genetic potential is crucial for adaptation of agriculture to new climatic conditions. The IPBES [global assessment report](#) warns that “*globally, local varieties and breeds of domesticated plants and animals are disappearing. This loss of diversity, including genetic diversity, poses a serious risk to global food security by undermining the resilience of many agricultural systems to threats such as pests, pathogens and climate change*”. Conserving seed, in seed vaults or elsewhere, and further local scale breeding need to be part of an overall resilience strategy. We may need to find back lost genetic diversity through retro-breeding. This means going back to the wild relatives of our agricultural crops with their full potential of genetic options, in particular those traits that have been deselected for the sake of efficiency during several millennia of plant breeding and optimisation. A discussion with society is necessary on the way commons-led and non-profit oriented conventional and modern breeding technologies can be helpful in this endeavour.

New challenges appear on the radar at the interface of health and resilience. Anti-microbial resistance (AMR), driven by drug overuse and animal agriculture, are increasingly becoming a public health threat with last resort drugs becoming resistant. Vector-borne diseases, such as malaria, are changing their geographic coverage and move North with climate disruption. Global trade and air travel are spreading infectious diseases and pests worldwide. Melting permafrost is reserving a wide array of health surprises to humanity with the awakening of bacteria from ancient times.

Investment in jobs, assets and infrastructures emerges as a key component – not just of economic recovery – but of new macroeconomics for sustainability. Targets for this include: public sector jobs in building and maintaining public assets; investments in renewable energy, public transport infrastructure, and public spaces; retrofitting the existing building stock with energy- and carbon-saving measures; investing in ecosystem maintenance and protection; and providing fiscal support and training for green businesses, clean technologies and resource efficiency. This investment could safeguard human lives and improve resilience, building adaptive capacity. It could also lead to employment and income opportunities, e.g. 'risk' collar jobs (i.e. urban development risk specialists, disaster Risk reduction agents) could mitigate job losses associated with a transition to cleaner energy and to the information society, provided that adequate (re-)skilling schemes are put in place.



READY FOR DISASTER?

There is increasing concern, widely supported by science that [extreme weather events are getting worse as emissions rise and the planet warms](#). It is therefore urgent to put in place the necessary policies and mechanisms to protect populations from adverse weather events, as part of a comprehensive resilience strategy. Nature-based solutions such as greening cities provide co-benefits for climate change adaptation, as they are sparing soil from sealing or improve flood control. Another example is the reintroduction of natural slopes instead of fences in the countryside.

Since 1996 the EU has been delivering aid and disaster risk reduction (DRR) guidelines through the set-up of its Humanitarian Aid and Civil Protection department (ECHO). The 2015 Sendai Conference on Disaster Risk Reduction was significant for encouraging decisions that will determine the way people and assets are protected from climate disruption impacts. There was strong consensus on the need for trans-boundary cooperation and technology transfer between developed and developing nations. The adopted Sendai Framework recognises the important role of ecosystems for disaster risk reduction. For example, flood plains buffer floods, corals and mangroves buffer waves and storm surges, urban green spaces buffer the heat island effect.

As in the 1912 Titanic disaster, will “survival of the richest” still apply? Instead of pushing for action to stabilise the climate, some of the wealthiest are building bunkers, hiring security guards, buying private planes, and trying to figure out how to escape the worst impacts. The “window of opportunity” to mitigate the disastrous effects is closing rapidly. When revising or designing EU policies, it does not suffice to examine resilience for infrastructures. Far beyond the current compulsory measures for industrial installations, disaster preparedness for EU populations and if possible beyond EU borders, must also receive due attention and funding from the EU budget.

Massive investment must be directed towards sustainability and climate protection. Many countries lack the incentives to mainstream climate and disaster risks into economic planning and investment decisions. Effective mainstreaming, in particular, can help ensure that climate and disaster resilience becomes reflected in strategic sectoral programs and budgets, thus becoming, in effect, part of the core work program of participating stakeholders. To lead to meaningful value creation, innovative policies are needed in the field of preparedness to support the transition towards resilient human settlements.

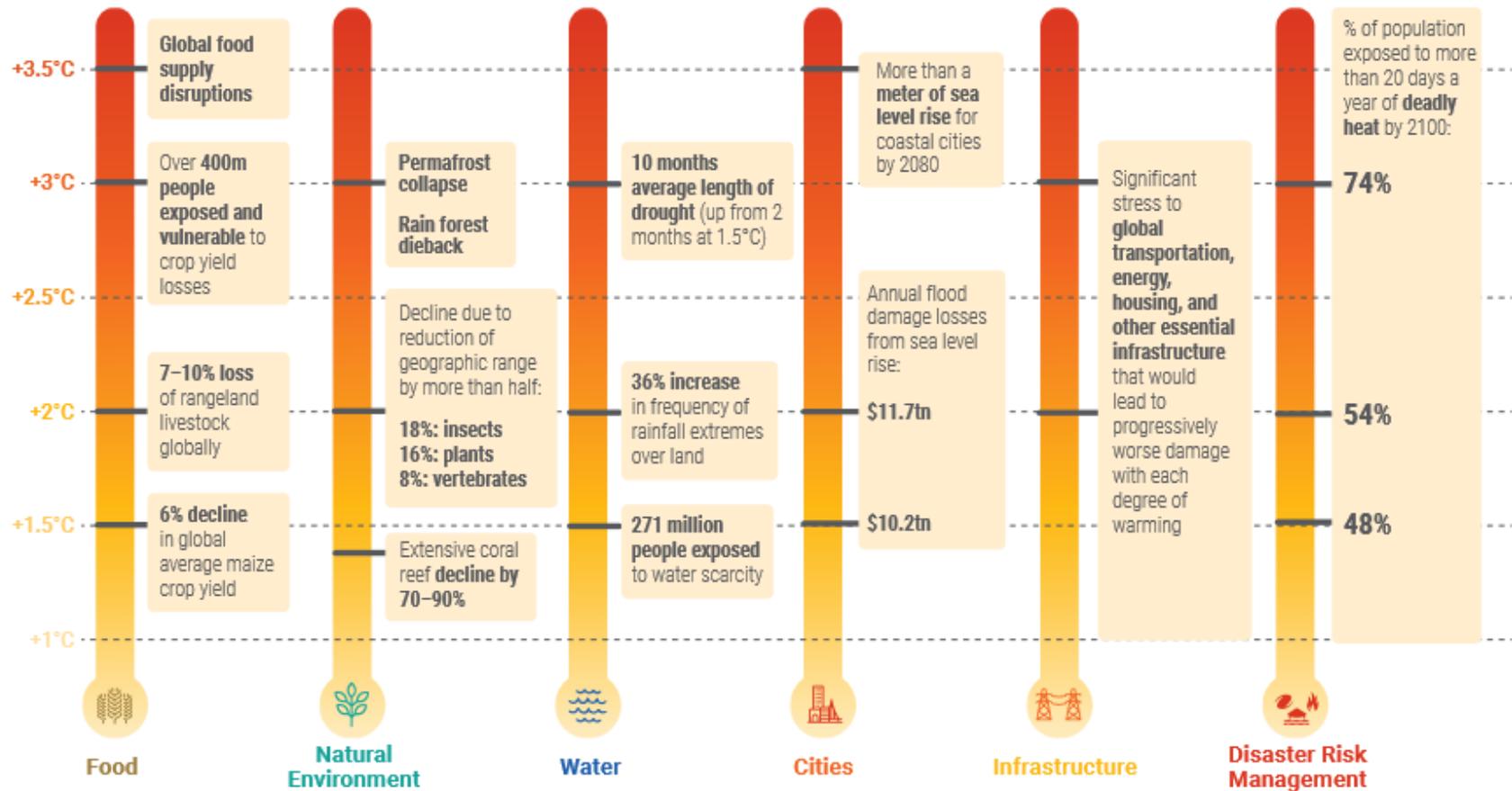
Better coordination between involved agencies will also be fundamental to keep all stakeholders focused on the objective to cope with climate disaster ahead. Progress has been made, but many challenges remain, the biggest of which is overcoming institutional barriers that can enhance coordination between climate resilience and disaster risk management. EU Military forces could also be prepared for humanitarian interventions.

A better standardisation of disaster databases at the national level could also help collect more consistent information for potential climate disruption impacts. Finally, climate and disaster risk management need to be integrated much more closely with any policy planning.

Given the scale and speed of change needed to address risks of resource commodity price increases and environmental disasters, a multiple-track approach is needed. A set of measures at EU level is attempted below:

- Establishing a process that coordinates and encourages risk assessments and early warning systems to develop strategies to mitigate risks through unprecedented collaboration.
- Asking Member States to upgrade substantially in human resources for disaster preparedness suggesting use of R&D results (e.g. sense-making of data). Support the development of resilience skills across the population (at local levels) through specific channels like public/private partnerships between industry and national and EU education programmes.
- Seeking greater efficiency of multilateral systems dealing with humanitarian aid.
- EU staff should itself be trained, becoming akin to ECHO European civil protection & Humanitarian agents. EU staff volunteering to become ECHO agents on the ground could be given required training.

FIGURE 1.1 The Risk of Catastrophic Events Increases with Temperature



Source: World Resources Institute, adapted from the IPCC and others. ¹¹

Figure 31: Source [Adapt Now: A Global Call for Leadership on Climate Resilience, September 2019](#)

What if not?

Stupefying unpreparedness costs many lives. People drowned in the Titanic collision because of poor planning, lax regulation and an abyssal lack of leadership. Scientific warnings are just starting to be more seriously considered by policy-makers. However, we should not have illusions that we can magically recuperate the lost years spending foolishly our carbon budget. We will need to cope anyway, at unprecedented scale, with aggravated disasters such as intense wildfires, hurricanes, heatwaves and flooding.

Without emergency plans for essentials needs (food, water, shelter, urgent medical aid) for very large numbers of people, the ecological shocks in preparation will bring chaos. Flooding, droughts, extinction rates of species all combine to reduce world agricultural outputs because of the acceleration of climate disruption. As global warming reaches a tipping point that accelerates melting of Arctic and Greenland's ice, huge flooding and disruptions could occur, creating anyway migration even within the EU itself.

The Special report on "Climate change and Land" (IPCC 2019a) has highlighted that food security is at stake in a warming world: *"Climate change creates additional stresses on land, exacerbating existing risks to livelihoods, biodiversity, human and ecosystem health, infrastructure, and food systems (high confidence)".* There are regional differences, but Europe is also impacted strongly. *"Crop and livestock production is projected to decrease and may even have to be abandoned in parts of Europe's southern and Mediterranean regions due to the increased negative impacts of climate change"*, notes the EEA in its presentation of the report on "Climate change adaptation in the agriculture sector in Europe" (EEA 2019d). Even if yields could increase in Northern parts of Europe, food production will suffer increasingly from extreme weather events.

The Special report on "The ocean and Cryosphere in a changing Climate" (IPCC 2019b) gives a challenging picture how sea level rise, extreme weather events, melting glaciers and disrupted mountain systems will threaten human communities and infrastructure in many areas of the world. Extreme sea level events that historically occurred once in a century are projected to become annual in most locations. Responses to rising mean and extreme sea levels include hard and ecosystem-based protection as well as retreat with planned relocation or forced displacement. *"In light of observed and projected changes in the ocean and cryosphere, many nations will face challenges to adapt, even with ambitious mitigation (very high confidence). In a high emissions scenario, many ocean and cryosphere-dependent communities are projected to face adaptation limits (e.g. biophysical, geographical, financial, technical, social, political and institutional) during the second half of the 21st century."* The IPCC highlights the *"enabling influence of taking a long-term perspective when making short-term decisions, explicitly accounting for uncertainty of context-specific risks beyond 2050 (high confidence), and building governance capabilities to tackle complex risks (medium confidence)"*.

It can be expected that climate disruption and the planetary crisis will increasingly become a security concern, the competence for which may shift to the military. Recognizing the inappropriateness of classical risk analysis tools to perceive unprecedented change, Spratt/Dunlop (2019) adopt a qualitative scenario approach which *"provides a glimpse into a world of 'outright chaos' on a path to the end of human civilisation and modern society as we have known it, in which the challenges to global security are simply overwhelming and political panic becomes the norm"*. Their policy recommendations include a stronger military engagement: *"Urgently examine the role that the national security sector can play in providing leadership and capacity for a near-term, society-wide, emergency mobilisation of labour and resources, of a scale unprecedented in peacetime, to build a zero-emissions industrial system and draw down carbon to protect human civilisation."* At the same time, they raise important questions regarding the role of science facing unprecedented change: *"Because the consequences are so severe — perhaps the end of human global civilisation as we know it — even for an honest, truth-seeking, and wellintentioned investigator it is difficult to think and act rationally in regard to existential risks. Particular issues arise: What are the plausible worst cases? And how can one tell? Are scientists self-censoring to avoid talking about extremely unpleasant outcomes? Do scientists avoid talking about the most alarming cases to motivate engagement?"*

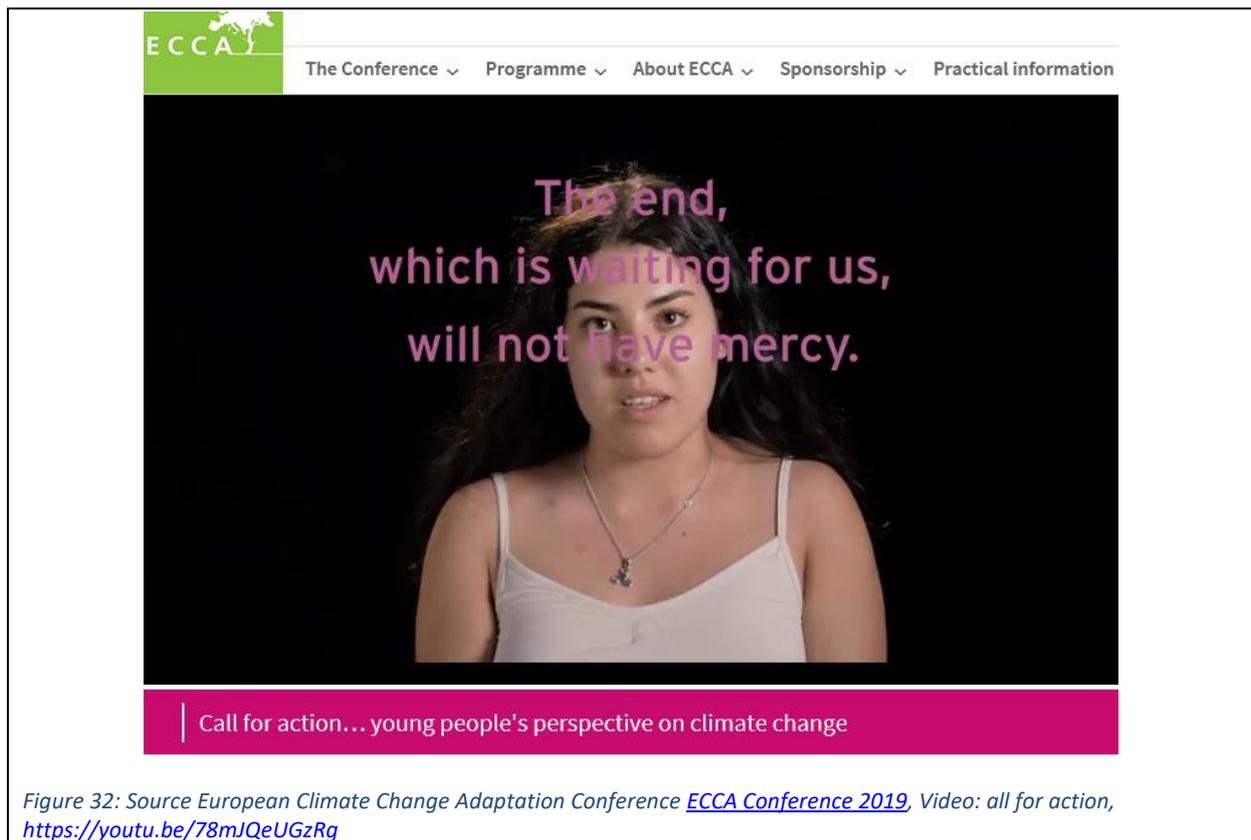


Figure 32: Source European Climate Change Adaptation Conference [ECCA Conference 2019](https://youtu.be/78mJQeUGzRg), Video: all for action, <https://youtu.be/78mJQeUGzRg>

WHAT IF: BEYOND ADAPTATION – PSYCHOLOGICAL RESILIENCE

A scientific community is developing – currently still largely outside peer-reviewed processes – to frame the concept of “**deep adaptation**” ([Jem Bendell](#)) within the wider area of psychological resilience. This threat of work, while rejecting the idea that it would be too late to change course which could lead to inaction at the worst moment, argues that we have entered a time of dire uncertainty, including the possibility of near term societal collapse, which we need to accept and move beyond to prepare our psyche. [The 4 R’s of the deep adaptation agenda](#) are the following:

“Resilience – which asks us ‘how do we keep what we really want to keep?’

A number explanations or definitions are given from both a physical and psychological perspective. In pursuit of a conceptual map of ‘deep adaptation’, the resilience of human societies can be conceived as the capacity to adapt to changing circumstances so as to survive with valued norms and behaviors. The question is asked ‘What are the valued norms and behaviors that human societies will wish to maintain as they seek to survive?’

Relinquishment – which asks us ‘what do we need to let go of in order to not make matters worse?’

‘The concept involves people and communities letting go of certain assets, behaviors, and beliefs where retaining them could make matters worse (e.g. withdrawing from coastlines, shutting down vulnerable industrial facilities, or giving up expectations for certain types of consumption).’

Restoration – which asks us ‘what do we bring back to help us with the coming difficulties and tragedies?’

‘It involves people and communities rediscovering attitudes and approaches to life and organisation that our fossil fuel-based civilization has eroded. (e.g. rewilding landscapes so they provide more ecological benefits and require less management, changing diets back to match the seasons, rediscovering non-electronically powered forms of play, and increased community-level productivity and support).’

Reconciliation – ‘What could I make peace with lessening suffering? This question incorporates the idea of Reconciliation with one’s death, including any difficulties and regrets in one’s life, any anger towards existence itself (or God). It also invites reconciliation between peoples, genders, classes, generations, countries, religions and political persuasions. Because it is time to make our peace. Otherwise, without this inner deep adaptation to climate collapse we risk tearing each other apart and dying hellishly.’

CROSS-CUTTING ENABLERS

1. What if we sought climate justice and solidarity now?

Pathways based on overshooting emissions are theft of life- and prosperity opportunities of future generations. Mitigation efforts will have to be much higher in developed countries to address their overshooting. A fair sharing of climate and environmental costs may make massive redistribution plans unescapable. Climate justice and solidarity need to be considered in a wider sense with three complimentary dimensions:

- Trans-generational:
- international,
- intra-societal

Climate Justice asks us to put the survival of future generations - of our children - first. There must be justice for future generations. The generations that follow ours, our children and their children, have little say in today's political decision making. But their very survival is at stake, and they are beginning to raise their voice now on the streets. We must start acting in a way that gives at least as much weight to the survival of future generations, as to corporate profit and to consumption today. [Discounting](#) future generations in economic models is no longer appropriate as it can no longer be assumed that they will be better off than current generations. [Heilmann \(2017\)](#) argues that controversies about time discounting in climate change decision making, including the famous Stern/Nordhaus controversy on discount rates in climate economics, are very much value-driven.

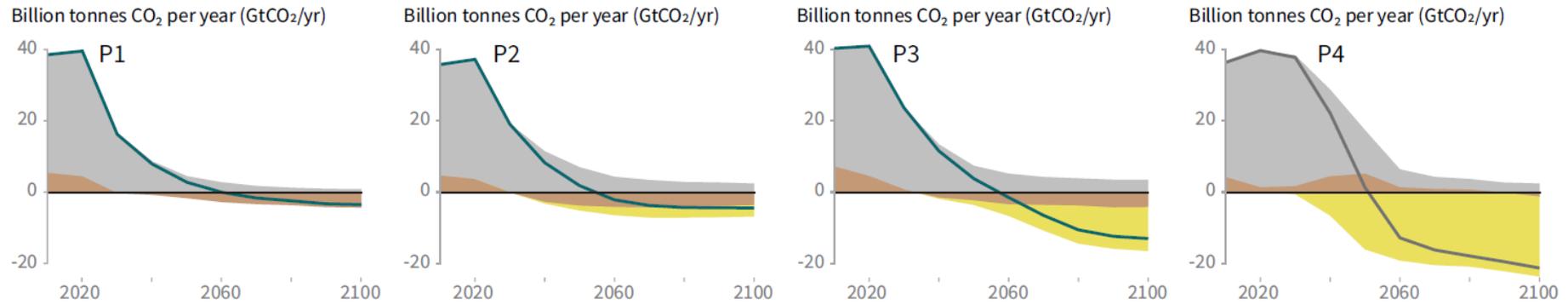
From a trans-generational perspective, climate justice requires to exclude any overshoot with recuperation through future technologies as a viable and morally acceptable policy option. This puts additional ambition and pressure on all current policy options and targets (see pathway P1 in following figure). In particular, continuing on resource-intensive and energy-intensive socio-economic pathways is theft of life and prosperity opportunities from future generations (see pathway P4 in following figure). The price of more growth now is an increased environmental debt tomorrow.

From an international dimension, climate justice requires us to accept the true size of Europe's contribution to climate disruption and to act accordingly as regards financial compensations. Until this day, Europe has been responsible for one of the largest shares of greenhouse gas emissions in the atmosphere of our planet. **10% of the world's greenhouse gas of emissions are generated on the European continent** but the EU is responsible for more emissions if we take into account trade flows that also generate substantial greenhouse gas emissions. This 10% does not cover the amount of emissions we are "outsourcing": excluding thus the production of our consumer goods, food and services imported from other continents. In reality, excluding the "outsourcing" from the measurement enables the EU and the U.S. to have a much lower carbon footprint than is actually the case.

Climate Justice requires us to think of those who are much more vulnerable than we are and who will suffer more than we - and to show solidarity. Although the economic powers of the developed world have contributed by far most to making climate disruption an existential problem, it is the nations of the developing world - in Africa, Asia, on small island states - who will suffer most. We are heading for a divided world in which rich nations may have resources to protect themselves while poor nations may suffer at a scale not experienced in human history.

Breakdown of contributions to global net CO₂ emissions in four illustrative model pathways

● Fossil fuel and industry ● AFOLU ● BECCS



P1: A scenario in which social, business and technological innovations result in lower energy demand up to 2050 while living standards rise, especially in the global South. A downsized energy system enables rapid decarbonization of energy supply. Afforestation is the only CDR option considered; neither fossil fuels with CCS nor BECCS are used.

P2: A scenario with a broad focus on sustainability including energy intensity, human development, economic convergence and international cooperation, as well as shifts towards sustainable and healthy consumption patterns, low-carbon technology innovation, and well-managed land systems with limited societal acceptability for BECCS.

P3: A middle-of-the-road scenario in which societal as well as technological development follows historical patterns. Emissions reductions are mainly achieved by changing the way in which energy and products are produced, and to a lesser degree by reductions in demand.

P4: A resource- and energy-intensive scenario in which economic growth and globalization lead to widespread adoption of greenhouse-gas-intensive lifestyles, including high demand for transportation fuels and livestock products. Emissions reductions are mainly achieved through technological means, making strong use of CDR through the deployment of BECCS.

Global indicators

Pathway classification

P1

No or limited overshoot

P2

No or limited overshoot

P3

No or limited overshoot

P4

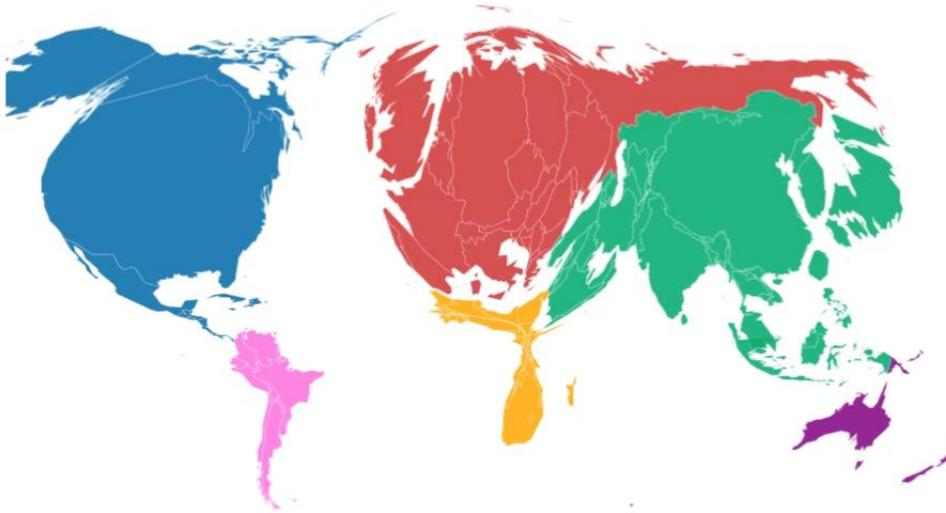
Higher overshoot

Interquartile range

No or limited overshoot

Figure 33: [IPCC 1.5°C report, Summary for Policymakers](#). Abbreviations: AFOLU – Agriculture, Forestry and Other Land Use, BECCS – Bioenergy with Carbon Capture and Storage, CDR – Carbon dioxide removal

Figure 2: Historic CO₂ emissions from energy use 1850–2011



Country sizes show CO₂ emissions from energy use 1850–2011. These historical (or 'cumulative') emissions remain relevant because CO₂ remains in the atmosphere for centuries. Europe and the US dominate, having released around half the CO₂ emitted since 1850.

Source: [Carbonmap.org](https://carbonmap.org), Data source: Climate Analysis Indicators Tool ([CAIT 2.0](#)).

Figure 34: [EPRS, Historic CO₂ emissions from energy use 1850–2011](#)

Climate justice within our own societies means that we need to have a close look on how climate disruption and climate and environmental policies affect different populations in different places. Aggregated averages at country level are inappropriate to tell the truth about real impact on people. Increasing numbers of people suffer energy poverty, often in conjunction with other factors of social exclusion.

“Overlooking the intersections between social and environmental policies, therefore compromising both” is one of the key risks highlighted by the EPSC in [Europe’s Sustainability puzzle](#): *“There needs to be a questioning of the way the costs of the transition – as well as the resources to manage the transition (e.g. climate adaptation measures or reskilling workers for a climate-friendly economy) – are currently allocated.”* Among the policy responses to explore are *“a systemic policy mix that acknowledges environmental and social progress as two sides of the same coin”* and equitable ways to abate pollution considering that *“the way in which revenues from carbon pricing are used can have a significant distributional impact”*. Distributed energy projects, recycling and reuse schemes, or shared communal resources are also important.

[Inequalities in sharing the transformation burden](#) need to be addressed. If conceived in isolation, environmental taxes on consumption may have a regressive character, as the consumption rate is higher at lower income levels. Redistribution and social policy measures are necessary to counteract. The regressive outcomes of eco-, carbon- or resource taxes could be compensated by direct returns, increasing minimum wages, introducing a ‘negative income tax’ for smaller salaries, or a even basic universal salary for all. To enhance tax justice, exemptions in the form of pollution havens to energy-intensive industries, airlines etc. may need to stop.

Social inequalities are often coupled with spatial inequalities in terms of lack of access or dependencies. A rural and peri-urban renaissance is necessary to transform areas of urban and peri-urban sprawl. “Lifestyle” taxes are more easily embraced by those having an easier choice over their lifestyle because they live close to city centres, have a choice for commuting, access to healthy and sustainable food.

A fundamental review of the social contract is now considered a necessity by many (e.g. [Lamy et al. 2018](#)). One of the recommendations of an [Open letter by 230 academics to the EU](#) is to turn the Stability and Growth

Pact (SGP) into a [Stability and Wellbeing pact](#). *“The SGP is a set of rules aimed at limiting government deficits and national debt. It should be revised to ensure member states meet the basic needs of their citizens, while reducing resource use and waste emissions to a sustainable level.”*

The fair sharing of the burden of climate and environmental costs may require broader approaches with regard to addressing and reducing inequalities. *“Unprecedented inequality reduction”* is one of the five transformational strategies to reach most SDGs within planetary boundaries proposed by the 50-year anniversary report to the **Club of Rome** [Transformation is feasible](#). Imaginative new models of redistribution may become necessary.

If we decide today to embrace justice and show solidarity with future generations and with those who are more vulnerable, then a new, positive agenda for action can unfold. Immediate action to fight climate disruption now can preserve jobs and good living conditions in Europe. Corporates will be made more responsible for sharing the cost of change and adaptation. International trade will be reoriented towards climate change mitigation and adaptation. Low cost production overseas will be replaced by sustainable development. Development aid and cooperation will be redesigned to helping mitigate and adapt to climate disruption.

WHAT IF: IMPACT OF UNPRECEDENTED CHANGE ON LABOUR

The impact of rapid unprecedented transformation on employment needs to be seen, together with other drivers such as robotisation and automation, in the wider context of overall tectonic shifts foreseen for the nature of work and its role in society. There will be reskilling and redeployment challenges in sectors becoming redundant with the transformation. Decent employment in the post-transformation economy would need to be supported wherever possible. With a move to more local, more small-scale, more diversified and resilient business models it can be expected that new employment could be massively created. A reduction in consumption may shift employment to repair and care. With a tax shift away from labour, a shift towards more labour-intensive processes, could become economically sustainable. A lot of this new employment could emerge at low-skill level and compensate the expected shift to more high skilled labour resulting from robotisation and automation.

The [2019 ESDE](#) report outlines possible developments in Chapter 5 *“Towards a greener future: employment and social impacts of climate change”*. It is expected that *“initially high-skilled labour may benefit more than lower-skilled labour but as the green economy develops, many traditionally lower-skilled sectors will see increased demand too, notably waste management and sectors related to the circular economy, making it possible to harness the employment potential of the green economy in a way that could benefit all skill levels in society. In turn, these sectors can be expected to also employ more sophisticated technologies and become more capital intensive, thus demanding higher skills”*. Agriculture, power generation, construction and consumer goods sectors are seen as the biggest projected winners.

What if not?

If we do not act with justice and fairness, the conflicts that are already on the horizon will soon start to reach us with force and violence. It is likely that by the end of the mandate of the new Parliament and new Commission, a number of conflicts will be developing fast. Those who will feel treated most unfairly - young people, lower-income citizens, third countries - may increasingly turn against our system of governance or run-off into populism.

- **Young people will see ever more clearly how their future is in jeopardy,** and the acceptance of conventional politics preserving the status quo may diminish rapidly, moving towards radical political movements. As the destruction of our natural environment will have become irreversible, discontent and reproach may rise rapidly with radical messages and views.
- **Increasingly severe impacts of climate disruption will affect those who are most vulnerable in our society,** through heat waves, mortality of old and sick people, drought, rising sea levels, damage to roads, rail and buildings, and more. The heatwaves of 2018 and 2019 may serve as a foretaste of what is to come. Climate change threatens to undo 50 years of development and bring "[climate apartheid](#)".
- **The cost of addressing those impacts will have begun to rise exponentially, and any delay in reversing climate disruption will add much higher cost later, as we will be forced to take increasingly desperate emergency measures.** If the financial burden from that rising cost were to be levied on the general population, widespread dissatisfaction might tip into revolt. The "*gilets jaunes*" movement of 2018-2019 may serve as an early warning. Involuntary 'unhappy frugality' may lead to social unrest and severe tensions if not compensated by a clearly visible reduction of inequalities and a fair sharing of efforts in line with financial capacity.
- **Climate catastrophes outside Europe, in the Middle East, Africa and Asia, which seem far away today, may rapidly impact our borders. Food shortages, conflicts for water and resources, and mass migration may soon become common and at a scale that will surpass present crises.** Already, the limited level of migration today has caused considerable political and societal upheaval here in Europe and has already fundamentally transformed the political landscape in Europe up to threatening the European Union itself. If such trends were multiplying, the implications for the stability of our democracies are hard to imagine. How will the EU and its Member States cope with substantially higher numbers of incoming environmental migrants without political, social and cultural collapse? This will be an open door to nationalisms and anti-EU messages.
- **Climate justice will increasingly become a legal issue with lawsuits against those accused to contribute to climate disruption. Climate justice is likely to become a condition for peace in future: international peace, peace within our societies and trans-generational peace.** There are a growing number of cases showing that [climate litigation](#) is already possible. A Dutch NGO took the government to court on their climate plans for not being ambitious enough and won. How will future generations judge? [Montbiot](#) has reported on Polly Higgins' new push to make ecocide an international crime. Businesses and governments would be liable for the harm they do: *"Will I end up in the international criminal court for this?" It could make the difference between a habitable and an uninhabitable planet. There are no effective safeguards preventing a few powerful people, companies or states from wreaking havoc for the sake of profit or power. Though their actions may lead to the death of millions, they know they can't be touched. Their impunity, as they engage in potential mass murder, reveals a gaping hole in international law.*" 16 children, including Greta Thunberg, have filed a complaint to the United Nations Committee on the [Rights of the Child](#).

Those scenarios are difficult to anticipate in every detail, but it is safe to predict their overall magnitude and timing: they are likely to start playing out within less than a decade. They will be seen in part as the legacy of the next Parliament and next Commission, whether we want it or not, unless we take unprecedented and immediate action.

2. What if we turned the financial system into a climate solution now?

Internalising externalities everywhere in the financial system is key for addressing nature decline and climate disruption. The IPBES [global assessment report](#) has highlighted that “*economic incentives have generally favoured expanding economic activity, and often environmental harm, over conservation or restoration. Incorporating the consideration of the multiple values of ecosystem functions and of nature’s contribution to people into economic incentives has, in the economy, been shown to permit better ecological, economic and social outcomes*”. This means, in the first place, making business and finance responsible.

In addition, all harmful subsidies would need to be phased out. Eliminating harmful subsidies, against vested interests, or taxing harmful activities is challenging, but necessary to make progress on climate action. This is increasingly acknowledged as necessary. “*Identify, assess and reform subsidies harmful to biodiversity at the national level, and expand internationally comparable information on those subsidies, for example, through peer review,*” recommends the OECD in their report on [Biodiversity: Finance and the Economic and Business Case for Action](#) presented at the Metz G7 meeting.

Any meaningful success on the unprecedented transformations ahead requires action at the level of financial system. “*In order to tap into the transformational potential of financial systems, coherent and comprehensive action at international, domestic and market level is needed*” (IGES 2018), including by G20 and UN. To achieve this, the 2018 IGES Discussion on “[Transforming the financial system for delivering sustainable development](#)” calls for immediate progress on “*Incorporating climate-related risks to global monitoring of financial stability and stress tests led by the IMF and the World Bank; Developing a global and comprehensive way to track and assess flows and stocks of sustainable finance, and developing impact indicators; Developing taxonomies of sustainable assets and drive international harmonisation*”.



Figure 35: Source: EBRD, <https://www.ebrd.com/news/2018/new-calls-to-cities-and-investors-to-deliver-sustainable-finance-growth.html>

The EU Sustainable Finance action plan is an ambitious project to make the financial system more sustainable The [present EU legislative proposals](#) (taxonomy of green investment, disclosure etc.) are a positive first step - what more can be done? The new taxonomy of sustainable investments is based on a positive list. Is this enough or does it need to be complemented by a negative list which would facilitate rating of climate- or environment-unfriendly investments into risk grades? This would make it legally impossible for many institutional investors to keep assets in such categories. Furthermore, it would prevent future stranding of assets, which will come as the direction of change is unavoidable and only the speed of change remains a variable. Institutional investors and financial institutions do not presently see a large enough incentive to invest seriously and fast enough into decarbonisation.

MAKE BUSINESS AND FINANCE RESPONSIBLE

There is no way of overcoming the climate crisis as long as corporates are able to make huge profits from businesses that destroy the climate and attract large sums of investment in fossil fuel industries.

To illustrate the huge misallocation of capital to climate-destructive business, a report on “Banking on Climate Change” shows that 33 global banks financed the fossil fuel industry with an amount of \$1.9 trillion since the Paris Agreement was adopted (2016–2018). [Bank financing for fossil fuels](#) has increased each year since Paris: 2018 - \$654 billion; 2017 - \$646 billion; 2016 - \$612 billion. Of the 1.9 trillion of bank financing to the fossil fuel industry; \$600 billion of this went to 100 companies aggressively expanding fossil fuels. Just 25 companies world-wide account for 51% of global industrial greenhouse gas emissions – mainly oil and coal producers. These are all very lucrative, profitable and expanding businesses, and they see no business reason whatsoever to change course.

The [CDP Carbon Majors Report 2017](#) gives a detailed analysis of how a large portion of greenhouse gas emitted can be attributed to a limited number of global companies – the “Carbon Majors”. They are mostly fossil fuel producers and distributors – oil majors, coal companies and similar businesses. 100 fossil fuel producers are responsible for nearly 1 trillion tonnes of greenhouse gas emissions. The top 100 fossil fuel producers (“Carbon Majors”) include: 41 public investor-owned companies; 16 private investor-owned companies; 36 state-owned companies; and 7 state producers. 90% of total company emissions and result from the downstream combustion of coal, oil and gas for energy purposes.

In an [open letter](#), the governors of the Bank of England and the Banque de France are warning that a “massive reallocation of capital” is necessary to prevent global warming above the 2°C maximum target set by the Paris climate agreement. The financial sector must be at the heart of tackling climate change they say.

Yet, that reallocation of capital is not happening. There are several reasons:

- Financial markets are not good at anticipating systemic risk. While there are ample warnings that the climate breakdown will cause market breakdown, history shows that markets fail to heed such warnings. The 2007 financial crisis, with its rush into sub-prime assets, showed that hope for profit overrides caution even where systemic risk looms large.
- Banks and lenders are not presently obliged to factor in the full risk of stranded assets and lost loans. They may adjust the conditions of loans (for instance to a shorter time horizon) but will not drive change.
- It would be a tragic error to rely on shareholders and institutional investors shifting from polluting to climate-friendly investments. Laudable as “sustainable investment” or “responsible investment” may be, it will not be near enough to drive the massive capital shift away from fossil industries. There is no time.

Investment managers and financial institutions all over the world are [warning](#) that assets on a massive scale are at risk once fossil fuel industries are no longer viable and, even more importantly, when production and infrastructure assets become stranded as climate disruption makes them unviable or obsolete. For instance: The Bank of England recently warned that US\$20tn (£15.3tn) of assets could eventually be wiped out by climate change. Mark Carney, Governor of the Bank of England, and François Villeroy de Galhau, Governor of Banque de France, write: “*If some companies and industries fail to adjust to this new world, they will fail to exist*”. Some [institutional fund managers](#) have indeed begun pulling their investments out of fossil fuels. They include the World Council of Churches, the Rockefeller family and insurance giants AXA and Allianz, with portfolios collectively totalling about £7tn. Yet that alone will not reduce fossil fuel expansion, let alone expedite a switch away from fossil fuels. A recent report of the UK House of Commons’ business select committee said: “*We do not have confidence in institutional investors in exercising their stewardship functions. We cannot rely on shareholders to exert pressure*”.

Present policy on sustainable investment is well-intended but fails to address the fundamental driver of the expanding investment in fossil industries: They remain highly profitable for the moment and so the money goes where the profits are. However, change must happen now and it can only be triggered by regulation.

EU financial regulation can tackle the climate crisis. This could be done through simultaneous action on banking, insurance and financial markets regulation, public spending, and taxation, all coming together in the purpose of turning around the carbon bias in the financial system. While individual measures can be complex and require detailed scrutiny, the lines of reform to consider could include:

- **Carbon Added Tax and Tariffs** at every step of the value chain to remove the profit incentive for investing in fossil fuel businesses;
- **Banking and insurance regulation** to adjust capital adequacy and lending/underwriting requirements to the market risk of a climate breakdown, and to assign risk premiums to make climate-destructive lending,

underwriting and investment more expensive and less profitable;

- **Reform of public markets**, by adjusting public procurement rules to make greenhouse gas reduction and circular economy the main procurement criteria;
- **Elimination of all investment support** to fossil fuel and greenhouse gas emitting activities from the portfolios of EU public promotional and development banks – starting with the European Investment Bank.

Investment levels – private and public - in climate change mitigation are nowhere near where they need to be. For public investment the goal must be to leverage whatever finance is necessary to tackle the crisis. Given the long cycle of infrastructure investment and the lag of new infrastructure to contribute to lowering emissions, what infrastructures need to be tackled with priority? Can the EU table a proposal to change the procurement directives to make greenhouse gas reduction the main procurement criterion? What about the portfolio and investment policy of the European Investment Bank? With regard to EU structural funds, the present legislative proposals do not sufficiently prioritise greenhouse gas reduction (or adaptation).

Massive amounts of private investment will be required to contribute to the solution, but investors have no or insufficient incentives. Liquidity does not seem to be the main problem. There is presumably a very large amount of private money waiting to be invested into the right things. How to mobilise it? Not enough has been done to make sustainable investment the default choice for investment by institutional investors or savings by private households. Institutional investors remain reluctant.

The position of BlackRock, the world's largest asset manager, is symptomatic for the industry. BlackRock is among the top three shareholders in every oil “supermajor” and is among the top 10 shareholders in seven of the 10 biggest coal producers. Larry Fink, BlackRock’s CEO, [argues](#) that it is not his company’s duty to fight the climate emergency. In his annual [letter to shareholders](#), published in January, Fink said that his overriding duty is to make customers money, whatever the environmental consequences. The structural lack of incentives to invest in climate change mitigation cannot be expressed more clearly:

“Our firm is built to protect and grow the value of our clients’ assets. We often get approached by special interest groups who advocate for BlackRock to vote with them on a cause. In many cases, I or other senior managers might agree with that same cause – or we might strongly disagree – but our personal views on environmental or social issues don’t matter here. Our decisions are driven solely by our fiduciary duty to our clients.”

That fundamental lack of the right investment incentives can only be addressed through fiscal measures, in particular by taxing carbon emissions. A major challenge is to design environmental or carbon taxation or carbon prices in a way that it taxes corporates and not [people](#). Environmental taxation of any kind often ends up on product prices, either directly through product taxes, or indirectly through transmission on prices. This results in regressive effects of such taxation, as the consumption rate is higher in lower income classes. Possible ways forwards could include:

- greenhouse gas taxes on all significantly emitting economic industrial activities (concrete production; energy-intensive industries using fossil fuels). Example could be a tax on concrete;
- greenhouse gas tariffs on imports to prevent “carbon leakage”. This is a sensitive issue, but may merit to be taken up with WTO if global climate action is serious;
- “Fee and dividend”: Distribution of the revenues earned on an egalitarian, per capita basis, to subsidise consumption of carbon-free goods/services (with a premium for lower incomes).

The [IMF \(2019\)](#) argues that “**carbon taxes—levied on the supply of fossil fuels (for example, from oil refineries, coal mines, processing plants) in proportion to their carbon content—are the most powerful and efficient**”, but “*alternative approaches, like ‘feebates’ to impose fees on high polluters and give rebates to cleaner energy users, can play an important role when higher energy prices are difficult politically*”.

THE CASE FOR A CARBON-ADDED TAX

To stop climate disruption, business has to stop emitting carbon for free. To disconnect economic activity from climate disruption, we need to change the incentive structures across our economy, to pay for carbon emissions and reward carbon sequestration. This means systemic change, not just incremental modifications of industrial processes here and there.

How the fossil fuel economy works: *Imagine that you discovered that there is a treasure buried in the public park of your city. You hire a few workers, rent a digger and chainsaws. You fence off an area in the park and begin to cut down trees, then start digging. On the third day of the excavations, a construction worker hits the treasure chest with his shovel. Now you sell the gold coins, tax the profit, pay the workers and equipment rental and enjoy the huge profit. If someone complains that you have devastated the park, left a huge hole in the ground and left dozens of felled trees, you point out that you created jobs and paid taxes. You've been good for "jobs and growth".*

One example: *The energy giant RWE says that it earns 3 cents per KWH from turning polluting brown coal (lignite) into electricity. The health and environmental damage amounts to 19 cents per KWH, as estimated by the German Environment Agency REF. Who pays for that damage? All of us except RWE.*

The key innovation which a carbon-added tax would introduce would be a change in the pricing structure along all transactions in value chains, for all products, making it unavoidable to pay for the carbon emitted, instead of the value produced. It would set a carbon price for all products, not just for energy.

A carbon-added tax would bring transparency and simplicity to carbon pricing, and because it would apply to all products sold in the EU, it would avoid unfair competition and a loss in competitiveness of the EU vis-à-vis the rest of the world.

Carbon taxation and tariffs are being discussed by the public in the EU. They are being raised by EU governments. They are frequently recommended by international bodies. The EU's High-Level Group on Own Resources, chaired by Mario Monti, stressed the value of an EU carbon tax for "*the EU's credibility as a world leader in the fight against climate change*" ([FUTURE FINANCING OF THE EU, Final report and recommendations of the High-Level Group on Own Resources, December 2016](#))

Carbon taxes work: Finland and Switzerland have effective CO₂ taxation systems. An excellent overview of carbon taxation systems is given in a paper produced by the Scientific Service of the [German Bundestag](#) (2018) "Die CO₂-Abgabe in der Schweiz, Frankreich und Großbritannien. Mögliche Modelle einer CO₂-Abgabe für Deutschland" ('The CO₂ tax in Switzerland, France and Great Britain: possible models for a CO₂ tax in Germany').

At what level should a carbon-added tax be set? The UN High-Level Commission on Carbon Prices, set up by the Marrakech COP 22 in 2016, concludes that "*a carbon price is an indispensable part of a strategy for reducing emissions in an efficient way*". The Commission considers a carbon-price level of **at least US\$40–80 per ton/CO₂ by 2020 and US\$50–100 per ton/CO₂ by 2030** to be necessary if the Paris temperature target is to be achieved. This is far above the present average carbon price of only \$8 per ton/CO₂ across the 42 major economies ([High-Level Commission on Carbon Prices: Report of the High-Level Commission on Carbon Prices, Washington, 29 May 2017](#)). The [International Monetary Fund](#) estimates that a carbon tax of (only) \$70 per ton CO₂ would yield revenues for the G20 countries exceeding 2% of their GDP. That would amount to annual revenues of at least \$630 billion (based on a G20 GDP of \$63 trillion). To illustrate the gap between reality and necessity, a recent report from the [Organization for Economic Cooperation and Development](#) found that few countries are setting carbon prices high enough to meet climate targets; the average carbon price across 42 major economies was only around \$8 per ton in 2018.

The real damage that one ton of CO₂ causes is closer to US\$200 (calculated by the German Environment Agency). **This is the cost to us and to future generations.** It would be logical to set a carbon-added tax at that level - **€180 per ton of CO₂** – as the "Fridays for Future" movement is demanding.

Even [BusinessEurope](#) is among those in favour. Marking a departure from its existing policy, Europe's biggest business association said it was discussing a carbon tariff at the EU border, to restore a level playing field with countries like China or the US which do not impose a pollution constraint on their industries. "*For the first time, we have discussed a carbon adjustment mechanism,*" Markus J. Beyrer, BusinessEurope's director-general of trade told a [press briefing](#) on Monday, 29 April 2019.

It is time to take that big step now. But we must not be naive about the scale of adaptation needed. In the drastic restructuring of economic activities that must happen, there will be both winners and losers.

WHAT IF: A NEW DEBT ARCHITECTURE SUPPORTS CLIMATE AND NATURAL CAPITAL INVESTMENTS

Debt cancellation mechanisms could be based on sustainability or stock regeneration cross-compliance.

Deficit monitoring would be adapted to include [earth overshoot](#) as a liability and positive externalities as an asset. Investing in ecosystems would generate positive externalities which would be considered in the calculation of the debt ratios of the Stability and Growth Pact. The new metrics could reward ecosystem-positive policies and if used intelligently it could lead to a reduction of debt ratios and increase budgetary leeway for planetary health investments.

New debt instruments for private investors would be issued to build planetary health. Banks would issue a new generation of planetary health bonds. It may be worth reflecting if a debt instrument can be built on the anticipated revenue and if this approach could be scaled up more widely for a new asset type of planetary health bonds. An example for an interesting approach is presented in [Harnessing the Fourth Industrial Revolution for Life on Land. Towards an Inclusive Bio-Economy \(2018\)](#) by the World Economic Forum. The Earth BioGenome Project intends to build an Earth Bank of Code for bio-functionalities, starting with the Amazon. It is argued that it will create more value to preserve biodiversity and remunerate the indigenous populations as its guardians than to clear the forest.

New credit for climate and planetary health investments would be created through a bold [Pacte-Finance Climat](#). It contains proposals on directing new liquidity created by the ECB towards key priority areas such as climate action: *"Pour éviter la double peine (une nouvelle crise financière & le chaos climatique), il est urgent de dégonfler la spéculation et de donner de nouveaux moyens à la lutte contre le réchauffement climatique. [...]. Nous souhaitons que la création monétaire de la BCE soit mise au service de la lutte contre le dérèglement climatique et contre le chômage, et nous voulons qu'un impôt européen sur les bénéfices (de l'ordre de 5 %) permette de dégager un vrai budget pour investir dans la recherche et lutter contre le réchauffement climatique, en Europe, en Afrique comme dans tout le pourtour méditerranéen"*.

EIB could refocus its activities on funding only sustainable development. The [Pacte Finance Climat](#) has received the support of [Philippe Maystadt](#): *"On pourrait imaginer que la BEI devienne la banque du développement durable, finançant principalement la transition énergétique, la mobilité écologique et l'innovation et renonçant à financer des projets traditionnels auxquels est encore affectée une part majoritaire de ses prêts"*.

Move from 'quantitative easing' (QE) to 'qualitative easing', directed towards a purpose. QE by the ECB or other central banks does normally not include criteria for sustainability. This has been criticised by organizations such as [Positive Money](#) (and [here](#)). In their [Guide to Public Money Creation](#) they outline the alternatives to quantitative easing through a number of unconventional monetary policy proposals, also known as 'Helicopter Money', 'Overt Monetary Finance', 'Strategic QE', 'Green QE', 'Green Infrastructure QE', 'People's QE' and 'Sovereign Money Creation'.

ECB reinvestment of mature bonds after QE phase out are an opportunity for a debt shift. After the end of the current QE mechanism through bond purchases by [ECB](#), the reinvestment of mature bonds might provide a window of opportunity for a targeted approach towards the unprecedented transitions ahead, depending on orientations for the reinvestment phase.

WHAT IF: UNPAID NEGATIVE EXTERNALITIES WERE CONSIDERED INDIRECT STATE AID IN ORDER TO INCENTIVISE STATES TO TAX THOSE EXTERNALITIES APPROPRIATELY

Any depletion of natural capital for which undertakings are not charged would be considered as ‘indirect state aid’ in the sense that it gives these undertakings an unfair competitive advantage. To avoid distortion in the internal market, the EU could claim competence to oversee the implementation by Member States through appropriate measures (such as tax shifts). DG COMP should be directed as a matter of priority to investigate instances where the negative externalities of the EU’s worst polluting energy companies have not be taxed appropriately, distorting competition by giving them a competitive edge over companies which have fewer emissions.

The failure to tax those externalities should be treated by the Commission as a transfer of State resources in favour of the polluting undertakings. Although it is the case that those undertakings which pollute less often benefit from tax exemptions, were the untaxed negative externalities taxed properly, it is certain that those undertakings which emit less would be at a disadvantage, meaning the greatest polluters would enjoy a selective advantage. The business activity of many of these undertakings is cross border so it would clearly affect trade across Member States. The resulting negative decision with recovery would result it Member States having to recover the difference in the effective tax rate applied to the polluting and non-polluting undertakings.

WHAT IF: FLY TO LIFT OUT OF POVERTY – PERSONALISED EMISSIONS TRADE THROUGH MICRO-CONTRACTS

We are in 2030. Imagine an overall global ceiling on flight mileage were fixed, compatible with a desired greenhouse gas reduction outcome. The available flight miles were evenly distributed across all inhabitants of the planet. This has become the biggest ever privately funded programme to lift billions out of poverty. The price for extra miles has been set to be progressive, and applies to private planes. Those flying more than their free share, and in particular those flying a lot, would have to purchase flight miles from those that never fly.

How did we get there? ‘Flygskam’ (air shame) has been spreading beyond Sweden and announced a wider evolution of societal values. Following the increasing need to drawdown existing greenhouse gas concentrations from the air and the unavailability, at large scale, of technical solutions to achieve negative emissions, the international community felt obliged to foster land-based carbon capture, in particular afforestation, as a genuine solution for drawdown, no longer compatible with previous use for offsetting practices. The air transport sector needed to come up with new solutions to enact its climate commitments. Following some initial efforts for self-regulation, this was then taken over into multi-lateral agreements.

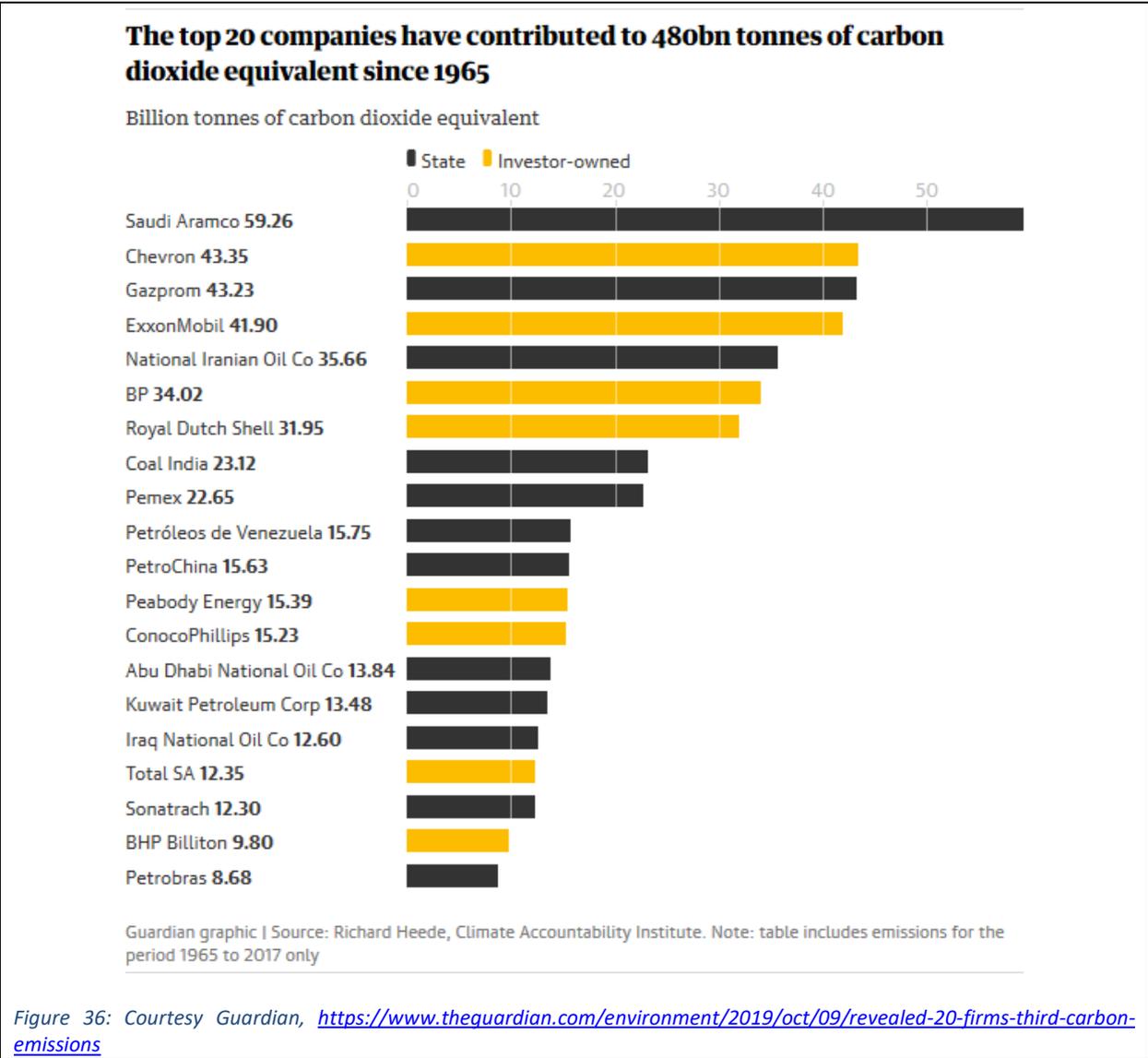
What next? Since the mid-twenties of the 21st century, it has been vividly discussed in politics if the scheme could not be applied to other areas of high footprint western lifestyles nudging developed countries into more sustainable behaviours.

What if not?

If it will remain profitable to destroy the planet for the benefit of some, but at the expense of most, there is no reason to believe that inherently rent-seeking activities would stop doing so. Then the probably most powerful force perpetuating a fossil-fuel economy – business profit – will remain in place, and sustainable business models would face a near impossible challenge to impose themselves against incumbents. A report by [Rainforest Action Network](#) has highlighted that 33 global banks provided \$1.9 trillion to fossil fuel companies since the adoption of the Paris Climate Agreement at the end of 2015 and that the amount of fossil fuel financing has increased in each of the past two years. [20 firms](#) are behind a third of all carbon emissions, as the Carbon Major reports have analysed. Vested interests are blocking progress and hindering innovation to go into the right direction (see Nature editorial on [‘earth-shots’](#))

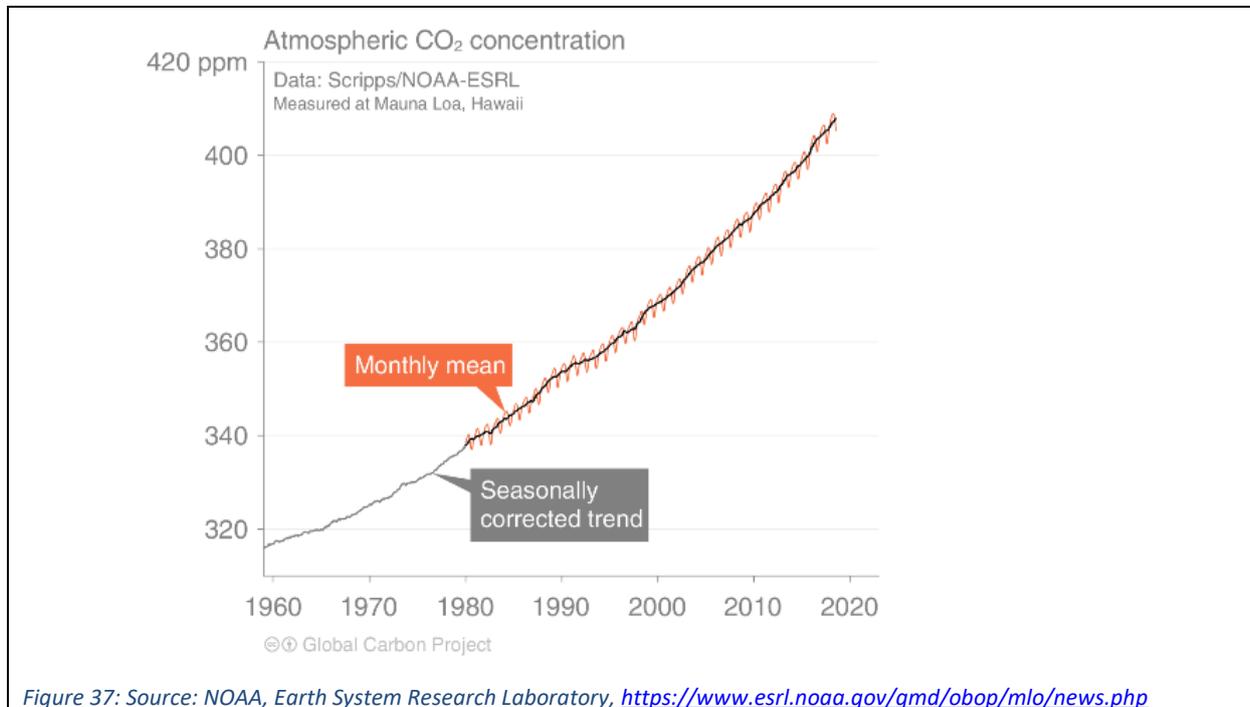
If we do not succeed to divest massively from climate- and environment-unfriendly assets now, these assets are at massive risk of [stranding](#). Chances of business as usual leading to a crash are high.

If politics do not show leadership and dare a hard talk with incumbents benefitting from harmful subsidies unsustainable practices will continue and possibly cancel or reduce the positive effects of climate and environmental policies. Vested interest would continue to lobby politics to keep up the status quo as long as possible. Efforts to deploy sustainable solutions would be thwarted by a prevailing status quo.



3. What if we used trade and international cooperation to tackle climate disruption and the planetary emergency now?

Emissions must fall worldwide, not just in Europe. While we can readily acknowledge the efforts made – successfully - within the EU in reducing greenhouse gas emissions, Europe will not be spared from the catastrophic consequences of climate breakdown if emissions continue rising on a global scale and are not brought down rapidly worldwide. The following figure shows the continuous rise in CO₂ concentration worldwide:



Europe can only survive if it leverages all its influence globally. Europe cannot save itself from climate disaster through its internal EU climate policies only, because those mostly do not reach beyond Europe’s borders. Fortunately, Europe does not depend solely on global consensus, which is difficult to achieve; the EU has means and powers it can use in its own as well as the common global interest. The system of multilateral climate negotiations has failed to deliver, as emissions continue to rise and every year sees new peaks in temperatures.

However, the EU has the means to lead the global effort to fight climate disruption. To do so, a step change is needed in leveraging Europe’s global weight as the largest consumer market. The EU could leverage its trade and development cooperation instruments. A **Carbon Added Tax** could become part of the Union’s trade agreements with other countries. **Carbon duties at borders** could compensate for differential rates across trading blocks.

The post WWII era was shaped by free trade. Free trade brought enormous economic growth, wealth and development. However, corporates were free to emit as much greenhouse gas as they pleased, so the environmental costs of productivity growth and transport kept mounting. The engine of growth became the engine of climate disruption.

The case for Carbon-free Trade and Development Aid relies on the European Union’s competencies and powers in trade and development policies. In emission-free trade, a Carbon Tariff, equivalent to the carbon tax, is imposed on every item entering the EU. The tariff is proportionate to the amount of carbon emissions that have occurred in its production – all stages of it together. Reciprocal arrangements ensure that tariffs combine to a level playing field, and the World Trade Organization ensures this, and provides dispute settlement mechanisms. None of these changes is beyond the ability of the EU. Carbon taxation and tariffs are being discussed by the EU’s public and raised by EU governments. They are a frequent recommendation of international bodies. Even BusinessEurope is adding its voice in favour.

What about developing nations that export goods which are produced with energy from coal burning power-stations purchased from European and Chinese companies with money from international aid? Would it not be fair to allow them to export without carbon duties? It would be anything but fair, because the climate catastrophe will hit those poor countries first and hardest. Instead, we need to a) share technology; b) finance the transformation of their energy and production systems to zero carbon, and c) encourage them to build carbon sinks. **This should be the EU's agenda for development aid.**

Can all this be done without agreement in the WTO? Could the EU make such a move unilaterally? To a certain extent, yes. It can be argued that climate change is a [health and security issue](#) that supersedes the authority of trade arrangements. There is no doubt that there will be disputes, but it is important to attempt the modernization of the world trade system through the WTO. **However, we must understand the scale of the adaptation needed.** In the drastic restructuring of economic activities that must happen, some will win and others will lose. For consumers, a number of things that are cheap today will become expensive: products containing palm oil, and beef - just to name two that destroy our climate most – may become very difficult to afford. The current equilibria between prices will no longer apply, because the prices will reflect the true cost of production, including the costs of the damage to our climate. Therefore, price competition will be led by those using technologies that minimize carbon emissions, and growth will be dissociated from the “greenhouse effect”. Nevertheless, the distribution of benefit and burden across countries, social groups and economic sectors will not be equitable unless there is unprecedented solidarity and support to those who will need it.

Redistribution of income from a Carbon-Added Tax/Tariff will therefore be a necessity. The aim of a Carbon Added Tax or Tariff cannot be to generate additional income for governments, but to encourage change. Revenues should be given back to citizens in the most socially fair way. The basic rule should be to give back to households at least as much as they paid, and to lower income households more than they paid:

- An annual “carbon bonus” could be paid out (receiving money is more attractive than a tax abatement)
- Payments should be per capita, to benefit families and single parent households
- Low-income recipients should be entitled to an increased (e.g. double) payment automatically and without having to apply.

In addition, revenue from a Carbon Added Tax/Tariffs could be used for special support to households in regions that will inevitably feel the fall-out from restructuring carbon-polluting industries (the coal industry being the most obvious example).

It is important to realise that leveraging the EU's external policies (trade policy, development policy) will be crucial for Europe's chances of surviving the climate crisis. The current public and policy debate mostly concentrates on the EU's own climate change mitigation efforts. However, those efforts, indispensable as they are, can never be sufficient if the “rest of the world” cannot be incentivised to follow suit.

A CARBON BORDER TAX (OR BORDER CARBON ADJUSTMENT)

JRC scientists highlight in [Rocchi et al \(2018\)](#) that “*designing a real-world border carbon adjustment instrument implies to consider significant issues: technical feasibility, data availability, the risk of retaliation from developing countries, and its compatibility within the World Trade Organization legal framework*”.

A [CEPS study](#), carried out back in 2010, had analysed the economic and political consequences of **introducing a tax on the carbon content of imported goods at EU borders** and found that:

1. “A CO₂ border tax or import tariff would **increase global welfare**.”
2. Such a carbon import tariff **can be made to be compatible with WTO rules**.
3. There are no insurmountable practical obstacles to introducing such a tariff.
4. The **equity concerns of the UNFCCC** could be taken into account by rebating the proceeds of the tariff to those countries manifestly unable to shoulder the burden themselves”.

A [Brugel blog](#) highlights that “*there is no inherent conflict between climate preservation and safeguarding the rules-based multilateral trading system*” if critical conditions are respected.

[Development coherence](#) is an important policy objective of the EU (see New European Consensus on Development - '[Our world, our dignity, our future](#)'). However, trade flows are currently not always in coherence with best development outcomes, such as in certain trade flows in agricultural products. A reflection on better policy coherence is necessary and urgent. Do certain trade flows need to be reduced to ensure development or to fit within environmental limits drawn by the planetary boundaries? If yes, how to reduce trade flows with WTO rules or the GATT framework, which the EU upholds? The IEEP has issued a report on [Sustainable Development Goals & the EU: uncovering the nexus between external and internal policies](#). The report highlights that “a multitude of EU internal policies can result in spill over impacts outside the EU borders, with potential negative – or indeed positive – impacts on other countries’ endeavours to achieve SDGs. These include a range of EU policies that govern the production and consumption of goods and services in the Union. In the external context, the vehicles for SDG delivery outside the EU borders consist of policies for external action and trade.”

The depletion of natural resources outside EU, including fertile soil, water, fish populations, forests and materials, is partly linked to EU consumption and acts a driver for global conflicts, in particular in Africa and Asia. These conflicts result in huge movements of Internally Displaced Persons and migration to the EU. To address the migration problems, it would therefore be appropriate to put in place external policies (mainly development and trade) that protect natural resources outside the EU.

[UNCTAD](#) officials and experts have elaborated a plan to rebalance development and guide a new form of [multilateralism for trade](#). “A renewed multilateralism is required to provide the global public goods needed to deliver shared prosperity and a healthy planet”. The ‘Geneva Principles for a Global Green New Deal’ are outlined in the report [A New Multilateralism for Shared Prosperity](#).

“GENEVA PRINCIPLES FOR A GLOBAL GREEN NEW DEAL

Goals for Rebalancing Development:

1. A productive global economy built around full and decent employment at livable wages, for all countries;
2. A just society that targets closing socio-economic gaps, within and across generations, nations, households, race and gender;
3. A caring community that protects vulnerable populations and promotes economic rights;
4. A participatory politics that defeats policy capture by narrow interest groups and extends the democratic principle to economic decision making;
5. A sustainable future based on the mobilization of resources and policies to decarbonize growth and recover environmental health in all its dimensions

Principles for a New Multilateralism:

1. Global rules should be calibrated toward the overarching goals of social and economic stability, shared prosperity, and environmental sustainability and be protected against capture by the most powerful players;
2. States share common but differentiated responsibilities in a multilateral system built to advance global public goods and protect the global commons;
3. The right of states to policy space to pursue national development strategies should be enshrined in global rules;
4. Global regulations should be designed both to strengthen a dynamic international division of labor and to prevent destructive unilateral economic actions that prevent other nations from realizing common goals;
5. Global public institutions must be accountable to their full membership, open to a diversity of viewpoints, cognizant of new voices, and have balanced dispute resolution systems”.

The UNCTAD [A New Multilateralism for Shared Prosperity](#) report gives an outline for possible common elements of a green deal, to be adapted to local circumstances and different levels of development:

“Governments everywhere need to **end austerity** and boost demand in support of sustainable and inclusive economies using an active mix of fiscal and monetary policies as part of a general expansion of government spending that covers physical and social infrastructure but also employing, whenever appropriate, public employment schemes. **Significant public investment** in clean transport and energy systems is imperative to establish low carbon growth paths and to transform food production for a growing global population as well as addressing problems of pollution and environmental degradation more generally. This will need to be supported by a **green industrial policy**, using a mixture of general and targeted subsidies, tax incentives, equity investments, loans and guarantees, as well as accelerated investments in research, development and technology adaptation, and a new generation of intellectual property and licensing rules. Specific measures and support will be required in developing countries to help them leapfrog the old, dirty development path of the Global North. **Raising wages**

*in line with productivity will be key to moving to a fairer society; this is best achieved by giving workers a secure and protected right to organise into unions. At the same time, job insecurity also needs to be corrected through appropriate legislative action (including on informal and precarious work contracts) and active labor market measures. And again, more progressive tax policies, including on income, wealth, corporations, property and other forms of rent income, could help address income inequalities. **Regulating private financial flows** will be essential to steering private finance toward these broader social goals. **Curtailing restrictive business and predatory financial practices** will be key to reining in corporate rentierism and crowding in private investment to productive activities included in the green economy.”*

Systemic actions are the most effective: “The most effective efforts will be those that recognize the systemic nature of the challenge, rather than piecemeal policy tinkering”. The need for action is motivated as follows: *“The rules and practices of the multilateral trade, investment and monetary regime are in need of urgent reform. These rules are currently skewed in favor of global financial and corporate interests, and powerful countries, leaving national governments, local communities, households, and future generations to bear the costs of economic insecurity, rising inequality, financial instability, and climate change. The rules of the global trade and investment regime have been instrumental in delivering this unbalanced outcome.”*

Climate disruption and environmental decline require bold action on the economic system and a recast of the multilateral trade system. The report notes that *“after eons of co-existence between humans and nature, changes such as rapid technological advances, exploitation of new sources of carbon-based energy, greater intensity in the use of land and water, and changing consumption patterns have transformed our relationship with nature to one of exploitation in support of “boundless” wealth creation. It has come at a huge cost. With global temperatures set to exceed the desired 1.5-degree increase by 2030, keeping that increase well below 2 degrees is now the urgent challenge and a core organizing principle for the world economy”.* In their analysis of the post WWII multilateral trade system they note: *“That system began to break down in the late 1970s, when giant global banks, corporations, and their allies in government regained the reins of power that they had temporarily lost in the Great Depression and the War. Once power was recaptured, these actors rewrote the rules of the global system. The system later became an instrument for the diffusion of a neo-liberal order that has triggered crises of financial instability, inequality, and climate change”.* Therefore, the UNCTAD report [A New Multilateralism for Shared Prosperity](#) argues: *“The persistence of neo-liberalism will make solutions to climate catastrophe more difficult to achieve”.*

What if not?

Unabated free trade without a global sustainability governance risks hampering European efforts to roll out sustainable solutions in Europe and risks to put European companies in unfair competition with less sustainable practices elsewhere. Redesigning the trade system for sustainability through standards and other policy instruments is a precondition for making Europe's claim to be a global sustainability leader economically viable.

Without addressing the global trade system, Europe sustainability efforts may remain isolated. A 100% renewable energy Europe may find itself surrounded by a world extracting and trading Arctic fossil and other resources unsustainably.

The half-hearted measures of the global emissions trading system have resulted in greenhouse gases increasing their rate of accumulation in the atmosphere. We cannot be too little too late against climate disruption. The outlook is bleak. Nations that we trade with are likely to suffer enormously from climate driven disasters. The economic and social costs of these disasters will be borne by all of us.

If we do not succeed to build full coherence between trade and development policies, unsustainable trade practices will hamper the development of poorer countries and regions. It may limit their capacity to contribute to the mitigation of climate disruption and to invest in adaptation. It may negatively impact the development of livelihoods and local economies, and fuel conflict and both intra-regional and international migration. It is plausible to assume that Europe will be a key destination for increased migration, driven by climate or by other possibly mutually reinforcing causes.

Without shifting global trade and development towards a new multilateralism built on shared prosperity, and a new global green deal at its core, current unsustainable trends may remain locked in and prevent bold measures to address the planetary emergency in the interest of humanity as a whole. The UNCTAD report [A New Multilateralism for Shared Prosperity](#) gives a glimpse on how that may unfold: *"The social consequences of environmental breakdown will no doubt follow a complex path and will be clouded in uncertainty. At the very least it will produce more suffering and more migration. Its encouragement of rent-seeking behavior privileges private profit over social returns and short-term actions over longer-term assessments. Not surprisingly, even the WTO's own research shows that trade and investment agreements tend to increase the carbon dioxide that underpins our climate crisis. More importantly, hyperglobalization doesn't offer a way out; "market-like" solutions to the environmental breakdown, such as carbon pricing or tax incentives, are only as good as the state policies that define them. The market does not achieve remedies on its own accord. The use of pricing disciplines has a place in a comprehensive global strategy to arrest and reverse climate catastrophe, but they are, by themselves, not a solution."*

If telecouplings are not efficiently addressed through consumption-based accounting, a different multilateral trade framework or other measures, it will be difficult to impact some of the key drivers of climate disruption and ecosystem depletion, such as land use. [Pendrill et al \(2019\)](#) conclude that agricultural and forestry trade drives a large share of tropical deforestation emissions. They highlight that *"tropical deforestation for agriculture and tree plantations releases 2.6 GtCO₂ yr."*, and that *"29–39% of emissions are driven by international trade, mainly in beef and oilseeds"*, and that *"a sixth of the carbon footprint of av. EU diets is due to deforestation emissions. Imported deforestation emissions rival domestic agricultural emissions in many countries"*.

4. What if we rethought the economy redefining prosperity and wellbeing now?

THE ECONOMIC SYSTEM: ENABLING SHIFTS FOR UNPRECEDENTED TRANSFORMATION

Several big shifts need to occur simultaneously across the different systems in transformation:

- **Tax shift** from desirable activities (e.g. labour) to undesired outputs (pollution, greenhouse gas emissions) as the tax base, without introducing regressivity;
- **Investment shift** from divesting and stranding-prone assets, working as obstacles, to investments, catalysing transformational change and creating long-term value;
- **Business case shift** from against planetary health to business in harmony with planet and people;
- **Profit shift** (or “value migration”) from fossil to green, from short-term extractive to long-term natural and social capital building, and to some extent from incumbents to new crowds;
- **Behaviour shift** from consumerism and convenience to a more conscious life driven by authenticity, engagement and the search for happiness.

This socio-economic transformation requires systemic science advice to policies as well as social, business model and governance innovation to be successful.

Current mainstream economic discourse is caught in a silo, disconnected from environmental and physical realities. This system failure is one of the key reasons for our widespread misperception of reality and inertia.

In the news, car production, winter sales or the oil price are disconnected from climate or the survival of bees.

While prosperity is one of the most widely shared aspirations of humanity it needs to be redefined for the 21st century ([Club of Rome 2019](#)). The current economic concept of value creation needs an update. In her book the [Value of everything](#), Mazzucato analyses how modern economies reward activities that extract value rather than create it. The blurriness between value creation and value extraction has allowed certain actors in the economy to “*portray themselves as value creators, while in reality they were just moving existing value around or, even worse, destroying it.*” [Rockström](#) has recalled that avoiding Hothouse Earth requires “*a redirection of human actions from exploitation to stewardship of the Earth system.*” [Kate Raworth \(2017a\)](#) has designed the ‘*Doughnut Economics*’ as a **new model for prosperity**, with a regenerative and distributive economy in a safe and just operating space for Humanity. [New Zealand](#) and other countries are adopting budgets with priority on wellbeing.

Decoupling wellbeing and prosperity from environmental impact and from exceeding planetary boundaries at global level – with, without or with different growth – is becoming a moral imperative and a *conditio sine qua non* to avoid political crisis or environmental collapse, and ultimately to ensure human survival. **Restoring and growing the stock of life- and prosperity supporting ecosystems** is much more than environmental policy, it is a key dimension of **economic sustainability**. How to measure prosperity is a key issue ([Corlet Walker/Jackson 2019](#)).

Ecosystems and their services often remain taken for granted and are not included in traditional economic accounting. It will be critical to redesign national accounts beyond GDP to include variations to the stock (gains, losses and their long-term impacts on stock value) and find ways to capture key human development indices (vast literature from OECD and many others, e.g. [Giovannini & Rondinella \(2018\)](#)). The Economics of Ecosystems and Biodiversity ([TEEB](#)) is a global initiative focused on “*making nature’s values visible*”. Other initiatives include [Natural Capital Protocol](#) and [Business & Biodiversity Platform](#) (see also [Umweltbundesamt \(2018\)](#)). With both depletion and regeneration of natural and social capital incorporated into national accounts as a holistic metrics for ‘**true growth**’, past policies would be shown to have over-estimated growth or even resulted in ‘**hidden de-growth**’.

Redesigning national accounts beyond GDP to include the stock value of natural capital would require agreeing on metrics to calculate depletion or regeneration of stock, forgone losses or gains, positive or negative interest on stock variation (to incorporate trans-generational justice), negative opportunity costs of early investments into transformation, etc. or any of the above cumulated. Inclusion of social capital would have to find ways to consider intangible and non-quantifiable assets such as trust or happiness. A stronger focus on the stock, and not only on the flow, would allow rebalancing between resilience and efficiency. The shift towards a regenerative economy can be a catalyst for the shift of the economic model as a whole.

From 'hidden de-growth' to 'true growth'

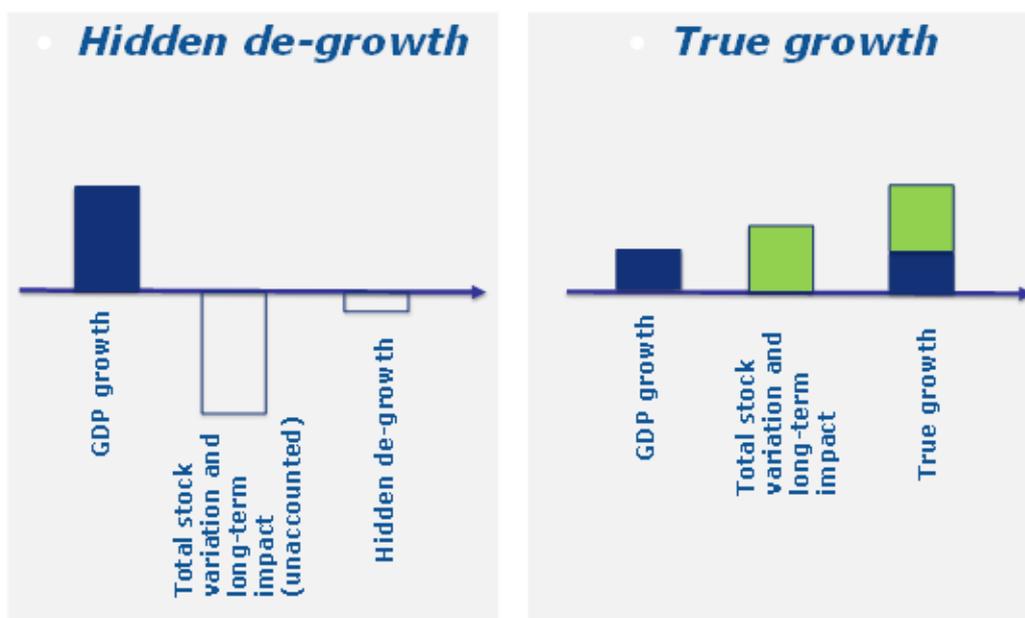


Figure 39: The concept of true growth (not based on data). The result of changing the metrics could be that we may find out we have been running de facto policies of 'hidden de-growth', and regenerating the stock of natural/social capital could lead to 'true growth'.

“High growth and prosperity have tended to come with higher levels of pollution and unsustainable resource use”, EPSC notes in [Europe’s Sustainability puzzle](#) and identifies **“aiming only for high growth regardless of the sustainability imperative”** as a risk. In a sustainable future **“GDP growth will no longer singularly define progress”**. The IPBES [global assessment report](#) concludes that **“a key component of sustainable pathways is the evolution of global financial and economic systems to build a global sustainable economy, steering away from the current, limited paradigm of economic growth. [...] It would also entail a shift beyond standard economic indicators such as gross domestic product to include those able to capture more holistic, long-term views of economics and quality of life.”** **Refocussing policies through a well-being lens** with attention to undervalued co-benefits could accelerate climate action and increase political and social support (OECD 2019a). The UNCTAD report [A New Multilateralism for Shared Prosperity](#) also argues that **“growth has become dependent on punishing levels of debt and a pace of resource extraction and energy consumption that is threatening the survival of the planet itself.”**

Doubts, including in the scientific community, that current models of growth are compatible with a trajectory within planetary boundaries are already widespread now (e.g. Jackson 2018a), while many countries, including those in the EU, count on growth to serve their sovereign debt. Some emerging countries, including India and China, consider high annual growth rates indispensable to develop their economies.

Although there appears to be no credibly scalable alternative to growth yet, moving Europe, and humanity at large, beyond conventional growth pathways may become the biggest governance innovation challenge in the transformation scenario. Concepts such as post-growth, de-growth and growth agnosticism are advocated as alternatives ([Open letter by 230 academics to the EU](#)). Are there limits to decarbonisation with growth? How to walk the last miles to net zero carbon societies? Switching from quantitative growth models based on products and services to qualitative growth models focusing on wellbeing and human development with new metrics complementing or replacing GDP is urgent. How to preserve and enhance prosperity without growth (Jackson 2017), or with different growth based on wellbeing? The ‘Economy of arrival’ (Trebeck, Williams 2019) explores a move from **“enlarging the economy to improving it, and the benefits this would bring for all”**.

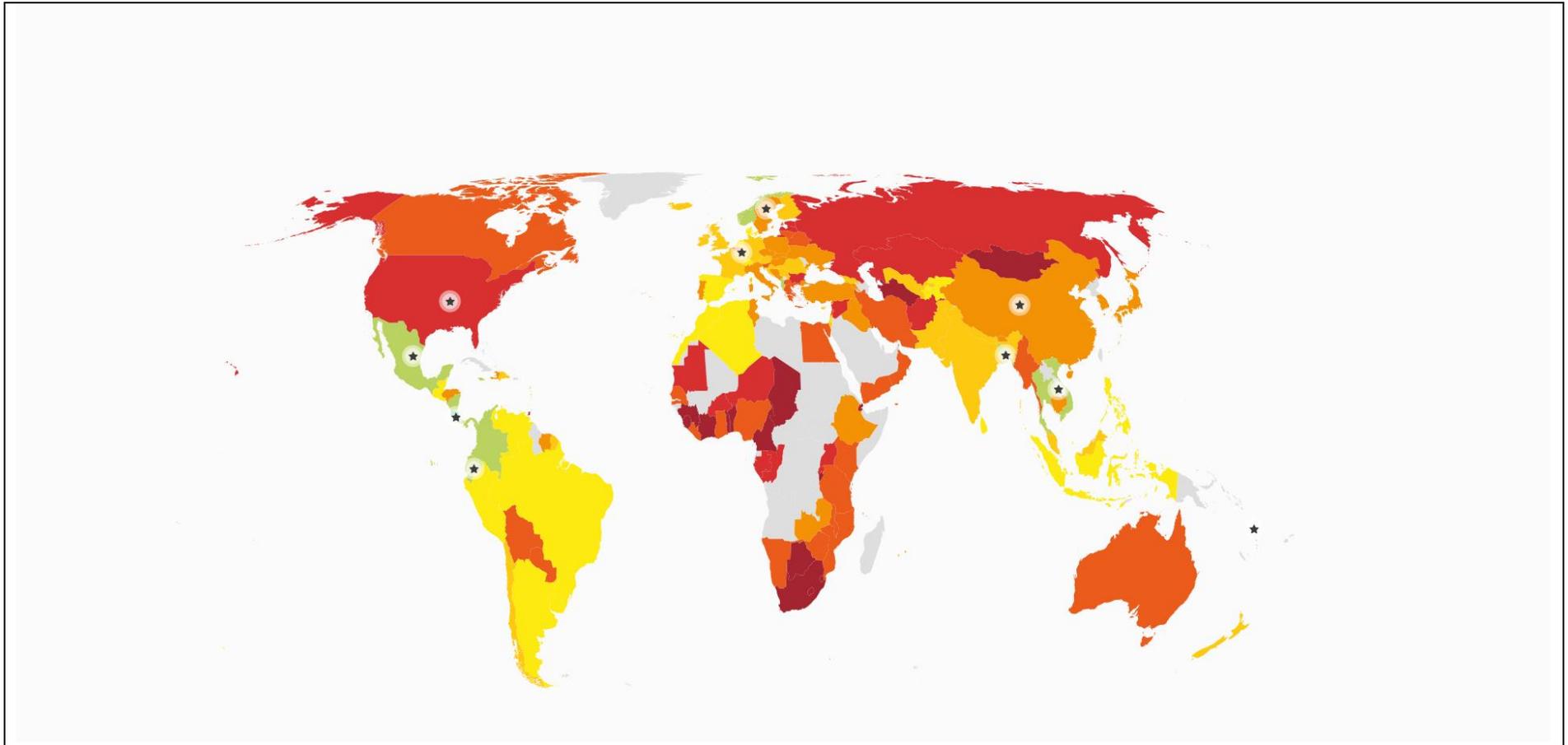


Figure 40: Source; [Happy Planet Index](#), "The Happy Planet Index measures what matters: sustainable wellbeing for all. It tells us how well nations are doing at achieving long, happy, sustainable lives. Wealthy western countries, often seen as the standard of success, do not rank highly on the Happy Planet Index. Instead, several countries in Latin America and the Asia Pacific region lead the way by achieving high life expectancy and wellbeing with much smaller Ecological Footprints. The Happy Planet Index provides a compass to guide nations, and shows that it is possible to live good lives without costing the Earth".

R&I FOR TRANSFORMING ECONOMIC MODELS

Several construction sites of transforming economic models and practices require R&I including research in (heterodox) economics and transdisciplinary approaches:

- Framing **economic sustainability with a stock and flow** paradigm ([Towards a Stock-Flow Consistent Ecological Macroeconomics Working Paper no 114 WWWforEurope](#)), whereby the stock encompasses ecosystems that support life and prosperity;
- Making the **economic case for planetary health** and finding ways to **include natural and social capital in national accounts** (e.g. the [Oxford INET wealth project](#));
- Changing the metrics **from quantitative growth of products and services (GDP) to qualitative growth of wellbeing and human development** ([OECD conference](#) on Future of Wellbeing, Incheon 2019);
- Complementing or **redesigning economic models based on *homo economicus*** as an individual who acts rationally and pursues self-interest alone. After neurosciences and behavioural economics, *homo economicus* is now also being challenged by moral psychology and identity economics ([Hausmann 2017](#));
- **Transforming the entire financial system towards sustainability**, based on [EU Action Plan for Sustainable Finance](#);
- **Transition management and reconversion of unsustainable incumbent businesses**, impacts on employment and economic risks associated with massive asset stranding.

What if not?

Without the cross-cutting enablers relating to the economic system, even the best-intentioned efforts to boldly implement the policy foundations may remain incoherent and lack leverage. Economic system change is increasingly recognised as critical for success, but difficult to enact. Path dependencies appear invincible, and deep-rooted worldviews prevent a constructive dialogue on the way forward.

Striving after growth in accordance with current paradigms and based on GDP is likely to continue. While this will be considered desirable by politicians and stakeholders, it is locking in consumerism and short-termism to uphold the system and keep it running. This momentum can be abated by decoupling growth from the use of resources through the circular economy, but this will always be partial and exposed to the biological and physical realities of limited carrying capacity of ecosystems and entropy enshrined in the laws of thermodynamics.

The disconnect between economic activities and planetary boundaries will be further locked in. It is not clear how the ecosystems that support our lives and our prosperity can absorb skyrocketing expansions of material use and consumption, in particular across the developing world where the major increases are expected in the next decades. There is a great likelihood that such a pathway, focusing only on the flow, will be counterproductive for economic sustainability as it depletes the stock on which future flows are based.

The belief that innovation and new technologies will enable unlimited growth by pushing the planetary boundaries will continue to have its adepts. However, it cannot be the purpose of R&I to push us into a hotter world or increase the threat of biodiversity integrity. Research and Innovation have to help us to enhance our prosperity and wellbeing within the safe operating space.

Is it at all possible to achieve a good life for all within planetary boundaries? Results by [Hickl \(2018\)](#) suggest that we are unlikely to reduce the biophysical footprints of rich nations by 40–50% solely through efforts to decouple GDP growth from environmental impact, even under highly optimistic conditions. *“Therefore, for rich nations to fit within the boundaries of the safe and just space will require that they abandon growth as a policy objective and shift to post-capitalist economic models”.*

Questions are raised more frequently about the commonalities between the ‘end of the planet’ and the ‘end of the month’ challenges. What are the overlaps in vested interests or power structures that both drive climate disruption and environmental destruction and create inequalities, exclusion and social difficulties?

5. What if we re-grounded our values on life and community now?

VALUE CHANGE: CRITICAL FOR SUCCESS, BUT CHALLENGING

Reorientation of values, although considered important, has been an underdeveloped dimension of climate science and climate action. Admittedly, it is a politically sensitive issue and untested, but courageous policy may need to start a conversation. [Steffen et al \(2018\)](#) insist that the “*Stabilized Earth trajectory requires deliberate management of humanity’s relationship with the rest of the Earth System*”, suggesting that “*a deep transformation based on a fundamental reorientation of human values, equity, behavior, institutions, economies, and technologies is required*”.

Numerous references in the detailed chapters of the IPCC [Global Warming of 1.5°C](#) report emphasise the importance of values and behavioural change. In section 4.4.3 on Enabling Lifestyle and Behavioural Change, the report reiterates that “*humans are at the centre of global climate change: their actions cause anthropogenic climate change, and social change is key to effectively responding to climate change*”. The IPCC suggests reconsidering values in section 5.6.5.: “*the profound transformations that would be needed to integrate sustainable development and 1.5°C-compatible pathways call for examining the values, ethics, attitudes and behaviours that underpin societies (Hartzell-Nichols, 2017; O’Brien, 2018; Patterson et al., 2018). Infusing values that promote sustainable development (Holden et al., 2017), overcome individual economic interests and go beyond economic growth (Hackmann, 2016), encourage desirable and transformative visions (Tàbara et al., 2018), and care for the less fortunate (Howell and Allen, 2017) is part and parcel of climate-resilient and sustainable development pathways. This entails helping societies and individuals to strive for sufficiency in resource consumption within planetary boundaries alongside sustainable and equitable wellbeing (O’Neill et al., 2018). Navigating 1.5°C societal transformations, characterized by action from local to global, stresses the core commitment to social justice, solidarity and cooperation, particularly regarding the distribution of responsibilities, rights and mutual obligations between nations (medium evidence, high agreement) (Patterson et al., 2018; Robinson and Shine, 2018)*”.

The IPBES [global assessment](#) on biodiversity also highlights the crucial importance of values as part of the transformation. “*The Sustainable Development Goals and the 2050 Vision for Biodiversity cannot be achieved without transformative change, the conditions for which can be put in place now (well established)*”. Transformative change is defined as a “*fundamental, system-wide reorganization across technological, economic and social factors, including paradigms, goals and values*”. Societal values and behaviours underpin all drivers. Working on societal values is therefore a key priority. The IPBES advocates working towards a “*change in the definition of what a good quality of life entails – decoupling the idea of a good and meaningful life from ever-increasing material consumption. All those approaches are more effective when they are mutually reinforcing. Actions that help to voluntarily unleash existing social values of responsibility in the form of individual, collective and organizational actions towards sustainability can have a powerful and lasting effect in shifting behaviour and cultivating stewardship as a normal social practice (established but incomplete)*”.

For policies this means to undergo the effort of moving into unexplored territory. However there is literature pointing to the feasibility of social norms changes catalysed by policies. [Nyborg et al \(2016\)](#) states in “*Social norms as solutions*” that “*if conditions are right, policy can support social norm changes, helping address even global problems. To judge when this is realistic, and what role policy can play, we discuss three crucial questions: Is a tipping point likely to exist, such that vicious cycles of socially damaging behavior can potentially be turned into virtuous ones? Can policy create tipping points where none exist? Can policy push the system past the tipping point? [...] Role models are critical in this process. The tipping point occurs when sufficient positive social feedback emerges, causing the new behavior to become cool and ultimately normal*”.

Sensitive questions may arise with regard to worldview neutrality in the Anthropocene. The IPCC [Global warming of 1.5°C](#) report reviews conditions for implementing far-reaching and rapid change and notes in section 4.4.3.3 on Acceptability of policy and system changes: “*Climate policy and renewable energy systems are more acceptable when people strongly value other people and the environment, or support egalitarian worldviews, left-wing or green political ideologies (Drews and Van den Bergh, 2016), and less acceptable when people strongly endorse self-enhancement values, or support individualistic and hierarchical worldviews (Dietz et al., 2007; Perlaviciute and Steg, 2014; Drews and Van den Bergh, 2016). Solar radiation modification is more acceptable when people strongly endorse self-enhancement values, and less acceptable when they strongly value other people and the environment (Visschers et al., 2017)*”.

Democracy is at the core of our value system in Europe. It is deeply rooted in our fundamental values, such as the Treaty and the European Declaration of Human Rights. It must remain our DNA. The same goes for human dignity, freedom, equality, the rule of law and respect for human rights, including the rights of people belonging to minorities ([Art 2 TEU](#)). However, values are much more than democracy; some of the values that currently dominate our societies merit discussion and a rethink.

The Anthropocene will radically overthrow how we think of our place in the world. A new bio-centric worldview which places the full web of life – including humans – with its complex interactions in the middle will become the dominant way of thinking, either because humanity wakes up to the transformations ahead or because those transformations overtake human societies. For centuries, if not millennia, our dominating worldviews have been anthropocentric. Man is at the centre of much of our western philosophical thinking. Such a worldview, which considers everything else as peripheral surroundings, may no longer be fit for purpose in today's full world. The concept that the natural world is interconnected was already developed by the 19th-century German scientist [Alexander von Humboldt](#). The contribution from spirituality, including Non-Western belief and value systems deserves to be explored and valorized. [Laudato Si'](#) is a good example.

What is a 'good life' in the Anthropocene? In its conceptual framework for the global assessment the [IPBES](#) combines under '*good quality of life*' the scientific concept of human wellbeing with concepts from other knowledge systems, including indigenous ones such as '*living in harmony with nature and living well in balance and harmony with Mother Earth*'. The wider relevance of the Andean concept of '*sumac kawsay*' or '[Buen vivir](#)' may also deserve attention. A challenge will be to leapfrog together (or co-leapfrog) globally to a new vision of good life, different from the current western model.

In its ["Come on!"](#) report the Club of Rome (2017) proposed "*develop[ing] a new Enlightenment for a 'Full World'*". The reason for this is that "*we can no longer depend on a societal model that was developed for a world of less than one billion people*". The approach is based on a new balance "*between humans and nature, between markets and the law, between private consumption and public goods, between short-term and long-term thinking, between social justice and incentives for excellence*". Going a step further, would it be appropriate to redefine peace as a state of balance between these dimensions, giving a new dimension to the EU's role of promoting peace?

Since centuries, two visions of progress have been opposed: a Promethean worldview of growth optimism, where creativity and ingenuity enables civilization and makes the world limitless, and a Malthusian view of growth-pessimism where uncontrolled population growth ultimately exceeds planetary capacities. The planetary boundaries that exist are non-negotiable, yet how humans understand 'growth' is entirely open. Human creativity and ingenuity can arise from existential challenges. Even if clear limits might not motivate some to innovate, no-one can ignore them now. A profound excavation of how we think about growth is needed that sustains a **Promethean spirit within clear sight of the planetary boundaries.**

While humans have always affected their environment through their economic activities this is now happening in a full world with an unprecedented destructive potential. Does the Anthropocene, in which some powerful people can now act in a way that drives the collective self-destruction of humanity give a new dimension to Immanuel Kant's '[categorical imperative](#)' which says: "*Handle nur nach derjenigen Maxime, durch die du zugleich wollen kannst, daß sie ein allgemeines Gesetz werde*" (Act only according to that maxim whereby you can, at the same time, will that it should become a universal law). **Does the Anthropocene need an ecological imperative?** "*An ethics of the Anthropocene must embrace a principle of responsibility as it was developed, for example, by the German philosopher and ethicist Hans Jonas in 1979 in a book in which he reconceived Kant's categorical imperative for an ecological age, proposing an ecological imperative that considers not just the immediate effects of our actions upon other people, but the long-term effects on the entire living and non-living world*" ([Wilke 2013](#)).

The EU could convene a Convention to kick-start and co-create a European or Universal Declaration of Planetary Health setting out rights and responsibilities in the Anthropocene. While the 1789 Declaration of Rights of Man and the Citizen was framed as man-centred for an empty world, the new Declaration of Planetary Health has to focus on the web of life in a full world. It has taken the UN two years from 1946 to 1948 to elaborate and adopt the Universal Declaration of Human Rights. There is also a new trend towards Earth Jurisprudence through constitutional rights to nature ([Rühs/Jones 2016](#)) ([Chapron et al 2019](#)) with several countries including Bolivia and Peru having modified their constitution accordingly. The [Te Urewera](#), land of the Tuhoë people in New Zealand, has been given legal personality.

Can we move beyond ‘homo economicus’ where we compete as self-interested profit-maximising individuals towards a world prioritising on us as **social and relational beings**? Since the enlightenment and before, we have considered ourselves primarily as rationally thinking beings, e.g. “*Je pense, donc je suis*” ([René Descartes 1637, Discours de la Méthode](#)). Rationality has influenced our perception of us as individuals and given rise to the concept of rationally acting selfish rent-optimising ‘homo economicus’. Now, new insights from neurology and other sciences are revealing how important are our other dimensions, such as emotions and empathy, and how much these are also relevant for economic decisions ([Cambridge Neurosciences, Krajbich/Dean 2015, IfW Project From Homo Economicus towards a Caring Economics, Rahnev/Denison 2017, Rinaldi 2009](#)).



Figure 41 Source; Ville de Bordeaux, http://www.aquitaineonline.com/images/stories/Bordeaux_2018/pique_nique_bordeaux_2018b.jpg

We are part of a complex web of life with its enabling interdependencies. We cannot live without the community of our gut microbiome, and vice versa. We are finally realising that ‘cooperativeness’ has evolutionary advantages over competitiveness ([Servigne/Chapelle 2017](#)), but we have not yet made this part of a worldview which is strong enough to shape our societies. The role of cooperation in evolutionary theory has been revisited by scholars. [Nowak \(2016\)](#) has noted that *“evolution is constructive because of cooperation. New levels of organization evolve when the competing units on the lower level begin to cooperate. Cooperation allows specialization and thereby promotes biological diversity. Cooperation is the secret behind the open endedness of the evolutionary process. Perhaps the most remarkable aspect of evolution is its ability to generate cooperation in a competitive world. Thus, we might add ‘natural cooperation’ as a third fundamental principle of evolution beside mutation and natural selection.”*

The importance of cooperation in the current unprecedented challenge of planetary emergency deserves to be fully recognised at political level. Policies could shift in an unprecedented way from a strong current focus on competitiveness towards a new focus on ‘cooperativeness’. This would enhance the competitiveness of humanity as a whole to face the planetary emergency. Cooperativeness needs to embrace inclusiveness.

Education and innovative ways of life-long learning will be critical for success. [‘Rethinking Education, Towards a global common good’](#) (UNESCO 2015) says that education needs to be *“moving beyond literacy and numeracy, to focus on learning environments and on new approaches to learning for greater justice, social equity and global solidarity. Education must be about learning to live on a planet under pressure.”* Revising learning cultures and curricula for schools is important, but will not be enough. It may be more challenging to develop new spaces for life experimentation and open up adults to such experiences. Transgenerational learning is worth promoting, including upwards from children to parents. As shown by [Monroe \(2019\)](#) children can teach their parents and make them change their views on climate change even if they have a more conservative mindset and are more reluctant to accept the existence of anthropogenic climate change: *“Well-designed instructional units can foster family interactions that increase adult concern about climate change.”* [Child Press International](#) is an innovation in this field: the establishment of Climate and Media Academies develops climate and media literacy for young people who through their research and publications influence both.

A shift towards more cooperation is also becoming a success factor for [management in the Anthropocene](#). The Cambridge Institute for Sustainability Leadership notes that *‘Business sustainability 2.0’ relies less on the ‘1.0’ response of firms innovating their products and processes to reduce environmental and social burdens, and more on them seeing themselves as part of a complex system. In this system, environmental and social impacts are far-reaching, hard to localise to a single firm or even single industry, and are often amplified in unpredictable ways. The necessary shifts in how we manage within such systems will only occur through concerted work across sectors, and with the collaboration of firms, non-profits, and policymakers.”*

Policies will need to learn to support behaviour and lifestyle changes and encourage public engagement. New narratives are needed for a positive journey which people are ready to embrace. This is uncharted territory for politics, but a ‘must do’ in response to the planetary emergency. It may imply that politics need to re-think their own worldviews and underlying values. The [Committee on Climate Change \(CCC\)\(2019\)](#) highlights in its independent advice to the UK government: *“If the public are to become engaged with the climate challenge and contribute to achieving net-zero emissions then the wider policy context will also need to be more supportive. New, compelling narratives will be needed to inspire and mobilise mainstream participation in solutions, adoption of technologies and change in behaviours”.* Are **big lifestyle changes** the only answer to climate change as stated by the [BBC](#)? Many [examples](#) at local levels or in niches merit to be scaled up.

Ongoing research at [Oxford Martin School](#) explores how it can be possible to leverage sensitive intervention points ([Farmer et al 2019](#)) to [catalyse massive change](#). This new approach aims at *“designing climate interventions to take advantage of socio-economic and political tipping points, seeking real-world social, political and economic situations in which a small action can trigger rapid or dramatic change”.*

What if not?

An insulated anthropocentric world view has been made increasingly easy due to the rise in technology and the accompanying rise in virtual realities (on many levels). Once systemic breakdown in the ecological base of our economies kicks in it will necessarily cause a breakdown of the insulated worldview that has so far been maintained.

If we do not succeed, through a collective or widespread shift in our values, in rebranding a more frugal and conscious lifestyle as attractive, it will be difficult to develop co-ownership of the unprecedented transformations ahead. Our societies may find it hard to handle widespread 'unhappy frugality'. The perception of being caught involuntarily in the journey will spread, and the disruption of the unprecedented change will be felt to be unnecessary and self-inflicted. We may be failing to see that the transformation is unavoidable and that our choice is to steer it or to suffer it.

If we do not find ways to tackle simultaneously wasteful consumption and irresponsible profits, they will both prevail as strong inter-related drivers of climate change and the destruction of nature. Wasteful consumption cannot continue to be an indicator of status and wellbeing. Irresponsible profit needs to be decoupled from economic success. This will be challenging, but it is a key dimension of the root problem of our crisis. If no alternative narrative is found towards which to leapfrog together globally the current insane pathway will spread further throughout the world and into the new middle classes.

If we do not succeed in bringing about a value shift towards more cooperative values, deeply entrenched competition thinking and greed will continue unabated. Trust in the transformation journey will be lost if free-riders are seen to be above the burden-sharing. If we do not refocus our worldviews on life – and this includes ourselves – we may fail to see the forces of balance and to translate them into policy action and behaviours. Balance is insufficiently valued as a helpful concept in policymaking, with the current focus lying more on trade-offs.

If we continue on our current pathway, globally standardised mass consumerism may lead to ever more atomisation, isolation from community, loss of place, loss of identity and sense of belonging, loss of purpose, and loss of empowerment. The price for convenience has been the loss of autonomy, and this is linked directly to our lock-ins into carbon-intensive lifestyles. A large, widespread and often desperate quest for re-rootedness and identity remains unanswered or is wrongly answered. There are new needs for self-appropriation in society leading to 'Take back control' and 'Occupy everything', including maybe first our own life. There are also increasingly worrying signs of readiness to follow anybody in the quest for compass and anchor. A more difficult enquiry is to deepen the short vs. long-term issue into human psychology. While humans need both satisfaction and fulfilment, how does the balance between both feed into the climate and the environment? And what is the space in the Anthropocene for greed?

"No Common Sense" ([Pye, 2019](#)) argues that Arendt's study of 'Eichmann in Jerusalem' exposes the limits of our traditional ethical thinking when it comes to dealing with global catastrophe. Wrestling with the monumental horrors of the Third Reich, Arendt confronted the uncomfortable truth that thoughtlessness can be genocidal. Banality, however it comes about, can be profoundly destructive. **The 21st century's banality could be inertia in the face of a planetary emergency threatening the survival of human civilization.** 'Extinction' is already being reframed into 'extermination' (e.g. [Sparrow 2019](#)).

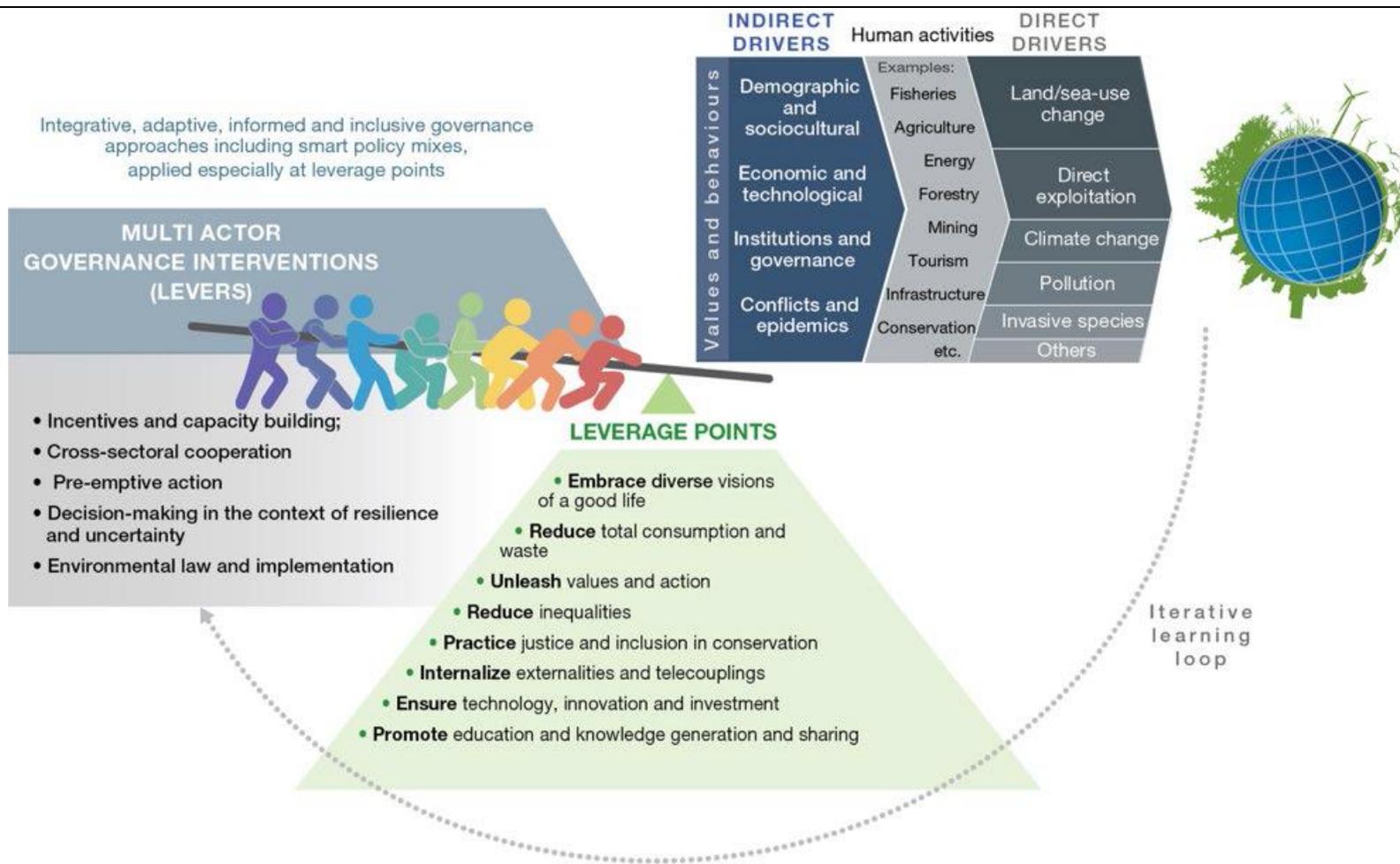


Figure 42: Source IPBES, [Summary for policymakers of the global assessment report on biodiversity and ecosystem services](#)

“Transformative change in global sustainability pathways. Collaborative implementation of priority governance interventions (levers) targeting key points of intervention (leverage points) could enable transformative change from current trends towards more sustainable ones. Most levers can be applied at multiple leverage points by a range of actors, such as intergovernmental organizations, governments, non-governmental organizations, citizen and community groups, indigenous peoples and local communities, donor agencies, science and educational organizations, and the private sector, depending on the context. Implementing existing and new instruments through place-based governance interventions that are integrative, informed, inclusive and adaptive, using strategic policy mixes and learning from feedback, could enable global transformation.

6. What if we practised new forms of deliberation and co-creation now?

INNOVATIVE AND PUBLIC INTEREST-LED GOVERNANCE

The IPCC [Global Warming of 1.5°C](#) report reminds in section 5.5.3 on Climate-Resilient Development Pathways that *“pathways compatible with 1.5°C warming are not merely scenarios to envision possible futures but processes of deliberation and implementation that address societal values, local priorities and inevitable trade-offs. This includes attention to politics and power that perpetuate business-as-usual trajectories (O’Brien, 2016; Harris et al., 2017), the politics that shape sustainability and capabilities of everyday life (Agyeman et al., 2016; Schlosberg et al., 2017), and ingredients for community resilience and transformative change (Fazey et al., 2018). [...] This entails contestation, inclusive governance and iterative engagement of diverse populations with varied needs, aspirations, agency and rights claims, including those most affected, to deliberate trade-offs in a multiplicity of possible pathways (high confidence)”*.

The IPBES [global assessment](#) on biodiversity and ecosystems highlights the importance of governance: *“Transformative change is facilitated by innovative governance approaches that incorporate existing approaches, such as integrative, inclusive, informed and adaptive governance. While such approaches have been extensively practised and studied separately, it is increasingly recognized that together, they can contribute to transformative change (established but incomplete) {6.2}. They help to address governance challenges that are common to many sectors and policy domains and create the conditions for implementing transformative change. Integrative approaches, such as mainstreaming across government sectors, are focused on the relationships between sectors and policies, and help to ensure policy coherence and effectiveness (well established). Inclusive approaches help to reflect a plurality of values and ensure equity (established but incomplete), including through equitable sharing of benefits arising from their use and rights-based approaches (established but incomplete). Informed governance entails novel strategies for knowledge production and co-production that are inclusive of diverse values and knowledge systems (established but incomplete). Adaptive approaches, including learning from experience, monitoring and feedback loops, contribute to preparing for and managing the inevitable uncertainties and complexities associated with social and environmental changes (established but incomplete) {6.2, 5.4.2}”*.

The current climate and ecological emergency requires governments at all levels to refocus their vision, narratives, policies and goals on the public interest and **public goods**. This may also help to overcome vested interests working against the transformation. The IPBES [global assessment](#) highlights in the Summary for Policymakers that *“since current structures often inhibit sustainable development and actually represent the indirect drivers of biodiversity loss, such fundamental, structural change is called for. By its very nature, transformative change can expect opposition from those with interests vested in the status quo, but such opposition can be overcome for the broader public good”*.

The alarming [IPBES report](#) ends with a positive note. There is a way forward: *“collaborative implementation of priority governance interventions (levers) targeting key points of intervention (leverage points) could enable transformative change from current trends towards more sustainable ones”*. This involves iterative learning loops. The top lever for multi-actor governance intervention is *‘incentives and capacity building’*, followed by *‘cross-sectoral cooperation’*. The top leverage point is *‘visions of a good life’*, followed by *‘reduce total consumption and waste’*.

The ultimate cross-cutting enabler reviewed here relates to the way we engage as citizens, the way politics works and deliberates, and the way the EU sets an example in her own Institutions. The Rapid Transition Alliance, in [‘How did we do that? The possibility of rapid transition’](#), has collected stories of rapid transitions to *“show what we can learn from history and the present day about how people adapt to rapid change”*. They say *“Public leadership is needed: Initial public investment in a sector or activity can leverage disproportionately larger levels of investment from other sources, and visible public sector leadership on issues can trigger broader change. For example, if government departments visibly shift to using renewable energy, public transport, ethical procurement and shorter hours, it sends a signal. More comprehensive approaches to change, embracing investment, cultural shifts, and new governance approaches, can lead to self-reinforcing change.”* The compelling conclusion of this short booklet is *“The science is in place, the international agreements are signed, the technology is available but two key things are missing and they are linked: the political will to act at a scale and speed implied by the agreements that have been signed; and the belief that real change is possible.”*

Participation and engagement matters, as citizens, at all levels of society and at all levels of government. It may start with planting lettuce and running the community garden next door, it is about consciously choosing our utility provider. It can be about participating in an online crowdfunding campaign for off-grid solar in Africa. It is also about civil engagement in the public space to get climate laws through Parliaments. How do we take policy making out of institutional settings and put our mark on it as engaged citizens? Let us be courageous if we want to change things. Let us *#OccupyPolicymaking*. Let us *#GrassrootingEurope* to make it ours.

Democracy and staff engagement in enterprises could also be a way to advance climate action at corporate level. In a world of unprecedented change, staff may develop new forms of action to increase momentum for bold responses to the planetary crisis. Staff speaking up within their own organizations or companies, possibly beyond formal mechanisms of consultation and representation, and possibly widening the conversation outside the organization, may be a challenge to established procedures and hierarchies, but at the same time an opportunity for organizations to move beyond inertias, rejuvenate and open up to fresh ideas. It may become an ingredient of what is making up new agile organizations. For public administrations, opening up the conversation can enrich the experimentation ground for co-creation with citizens. At [Amazon](#) more than 7,000 employees have recently advocated in an open letter for a bold climate plan: *“Amazon has the resources and scale to spark the world’s imagination and redefine what is possible and necessary to address the climate crisis. We believe this is a historic opportunity for Amazon to stand with employees and signal to the world that we’re ready to be a climate leader”*.

The process of engagement and collective deliberation has to be two-way, or better multiple way, to be meaningful and trustworthy. This is important to make policy direction and policy choices owned by citizens, and to make our democracies fit for the 21st century. We have a difficult journey towards the right side of history. But the journey to the right side of history needs to be co-created. Politics and policymaking will need to be creative to find better, and more convincing ways, to listen to citizens (see [principles for public engagement](#) worked out by [Nesta](#)). There is array of digital solutions and new GovTech to support deliberative democracy. These allow *“extending the reach of dialogue: broadening the process of deliberation outside the room”*, gaining *“more viral engagement: improving the diversity ideas that feed into the process”* or enhancing transparency ([Nesta](#)).

A much stronger mobilisation and involvement of citizens in research and innovation at all stages ([Lamy report](#)) can make research and innovation more credible by addressing the issues of concern to citizens and of relevance to society. As an example, the [CIMULACT](#) project has developed a model for citizen and multi-actor consultation and provided unique input into research and innovation agendas from 30 countries.

The European Commission’s Joint Research Centre (JRC) has done work on [Citizen Involvement in Science and Policy-Making](#). The JRC recommends the Commission should foster more inclusive practices and *“more participatory consultations involving ‘real people’ in face-to-face processes, such as open round tables, or engaging younger generations”*. The conclusions are valid for many policy areas and different levels of government. Citizen engagement can lead to a *“boost in democratic legitimacy, accountability and transparent governance”*, *“improvements for trust building among citizens and institutions”* as well as *“ownership of policy outcomes”* by the final beneficiaries. It means, *“moving away from mere ‘info-giving’ and towards more deliberation practices at each stage of the policy-making process”*. Citizens' inputs can offer a *“unique understanding of societal concerns, desires and needs, and thus, a better definition and targeting”* of policies. This approach requires a culture change from the predominant paradigm for policy-making, *“based on expert inputs (evidence based) in detriment of non-expert or lay knowledge coming from other parts of society”* ([JRC 2016](#)). Emotions, values, identities, framings and narratives are important dimensions of our political nature to be taken into account in policy making ([Enlightenment 2.0](#))

Many new forms of co-creation, collective deliberation, citizen-governance dialogues, citizen panels and citizen assemblies need to emerge, such as Living-labs or Citizen Policy Makers Co-Learning labs or Co-Discovery labs. These facilitate consensus-building, citizen-relevance of policies and societal ownership. The [World Bank](#) highlights that *“citizens play a critical role in advocating and helping to make public institutions more transparent, accountable and effective, and contributing innovative solutions to complex development*

challenges". This applies to climate disruption as humanity's most complex challenge. The [report to Belgian Youth for Climate](#) states that "La recherche montre que les panels de citoyens sont prêts à supporter un lourd fardeau en matière de climat à court terme, même si seules les générations futures en recueilleront le fruit". Sarah Allan from INVOLVE wrote an article on "[What would a meaningful citizens' assembly on climate look like?](#)" New ways need to be found how to navigate worldviews and uncover the interests lying behind worldviews. This means to move beyond Interest-Politics declared as Real-Politics. Do we need to move from Real-Politics to [Dream-Politics](#) co-dreamed by citizens? [Earthshots](#) may become easier to achieve through inclusiveness beyond vested interest.

A COMPASS TO STEER THE DIRECTION OF TRAVEL

The EU needs a new compass to devise solutions which address both climate breakdown and the collapse of the natural world. The two crises are driven by the same problem: the pursuit of economic growth fuelled by consumption, and ignoring environmental degradation as 'externalities'. Classical economics got it wrong, never imagining that 'externalities' could threaten our very survival. This brings a need to reshape economic thinking itself. Newly-aligned to deliver equity within safe planetary boundaries, this reshaped economics can be brought within the new compass that guides our future.

This same compass must ensure that incremental technological fixes that simply shift the problem elsewhere are discarded (from diesel cars to first generation biofuels borne of deforestation). The compass must show us that while new technologies (e.g. electric cars) are necessary, direct substitution is no solution. More often than not, the frame must also change e.g. resource conservation means that mass transit should be the priority, with electric vehicles being shared rather than privately owned.

Further, the compass must ensure that nature guides our solutions, where tree-planting wins out over risky notions of shooting sulphur into the upper atmosphere; restoring natural floodplains rather than higher and higher flood walls.

Over-consumption has brought us to the point where we would need 1.75 Earths to sustain us at global level, with this resource use largely privatised. The alternative is sharing and community. A new vision – with 'public luxury and private sufficiency at the centre' - will be an important compass point for the resilient future Europe we need to build.



Figure 43; Source: [LabGovCity](#), New democracy co-creating the city, *Commonspoly-a-hacked-version-of-the-Monopoly* -©- Julio-Albarrán.jpg

A shift from policy supply to policy demand could complement representative democracy, reassuring citizens they are taken seriously and rebuild trust into public policy and into Europe. To be credible in democracy, a ‘compass’ needs to be citizen sensitive and at the same time steer the journey. Citizen engagement, coupled with intelligent citizen radars could shape new forms of participation. To make this work, citizens would need to be engaged in framing the questions and giving feedback into the compass. The [report to Belgian Youth for Climate](#) underlines that *“Plus de vingt ans de recherche sur la démocratie délibérative ont montré que la formule des panels de citoyens débouche sur une prise de décision rationnelle, une assise sociale, des solutions innovantes, une confiance entre les citoyens et les politiques, et des citoyens heureux. Alors que le système électoral provoque très souvent la colère et la frustration du côté de l’électeur et la paralysie du côté du dirigeant, la démocratie délibérative réussit souvent à créer une nouvelle dynamique positive par des décisions qui vont bien au-delà de ce qui était possible avec la politique des partis”*.

Moving politics beyond electoral cycles is a particularly challenging, but important task more urgent today than ever. To move out of short-termism, philosopher [Roman Krznaric](#) insists that *“the daunting challenge we face is to reinvent democracy itself to overcome its inherent short-termism and to address the intergenerational theft that underlies our colonial domination of the future.”* **Lowering the voting age to 16 years** could be a way forward to give voice and weight to young generations in the participative democracy. Opening up European elections to younger voters could be a way to gain support for Europe among young people. The EU could orchestrate a conversation with Member States on voting of young people in local, regional or national election.

In [Out of the Wreckage: A New Politics in the Age of Crisis](#), George Monbiot is developing a new politics: a **“politics of belonging”**, based on new findings in psychology, neuroscience and evolutionary biology which *“cast human nature in a radically different light: as the supreme altruists and co-operators”*. He calls for a positive vision, a new story that re-engages people in politics and lights a path to a better world. A new story for a brighter Europe could give more attention to the commons as stated by [Commons Network \(2019\)](#): *“It is the story of people jointly stewarding resources, like water or energy or even cities and knowledge. It is a story of communities, of collaborative and democratic practices. The commons have been a forgotten sector of our society and our economy. They convey the space in which communities write their own rules. The commons presuppose activity, communication and democratic stewardship. They move us away from linear thinking and individualism, towards ecosystems and social relationships”*.

The role of citizens in co-creating the solutions is fundamental if there is going to be a chance of implementing them. This is not just for the way to consume differently, but also for hard issues like finance and fossil fuel phase-out. People, if taken seriously, are willing to contribute and shape solutions which they will own. Process, through a reinvention of democracy, is going to matter more than content for buy-in. Solutions developed by policy makers in the traditional way, with experts and incumbent stakeholders will no longer be sufficient. A new conversation is needed with deliberate democracy at its core. This requires to open up government into the public space. The European Commission could use its right of initiative and convening power to orchestrate a conversation of change. Staff initiatives such as EU Staff 4 Climate are also made up of citizens and can therefore help to build bridges.

What if not?

Climate disruption is made by humans, by their power structures and their money flows. Climate disruption is a problem of civilization. Runaway anthropogenic greenhouse gas emissions are the symptom for issues that are much deeper embedded in humankind as it functions today. Greenhouse gas emissions are not the disease. If we only look at them, we will not win the race against climate disruption.

It is urgent to co-create the right side of History together, if we do not want the wrong answers given to the right questions. It is more convenient to ignore the inconvenient truth about climate disruption (our own brain systematically/unconsciously puts aside what is difficult to face). It is therefore important to make unprecedented change a positive journey. If we do not find new ways of engagement, co-creation and action, we will remain stuck in our collective inertia.

CAN THE EUROPEAN COMMISSION WALK THE TALK?

The EU Institutions cannot just tell other people to change their behaviour while they and their staff carry on as now. The authors of this report work for the EU Institutions and know that many EU staff members are amongst the most energy-profligate Europeans. The European Institutions need to make the sure that in their own operations they are on the path to progressively lower greenhouse gas emissions.

Concerning the European Commission, building on its good record in environmental management of its workplace thanks to the work of its Offices for Infrastructure in Brussel (OIB) and in Luxembourg (OIL), this report proposes that **the incoming College of Commissioners should set a new target of halving the Commission's own greenhouse gas emissions in the 5 years from now (baseline 2019) until the end of 2024. This means a 14% reduction each year** as compared to the previous year, for five years.

The greenhouse gas emissions in question are notably those that result from:

- Operating Commission buildings (HVAC, electricity use, redecoration/refurbishment; canteens);
- Operating Commission vehicles and equipment (including embedded emissions);
- Business travel of Commission staff;
- Travel to work of Commission staff.

To achieve this overall objective, the Commission should engage with its staff, in particular elected staff representatives, to produce a detailed **greenhouse gas Reduction Plan**. This would be likely to include:

- Counting greenhouse gas emissions: administrative budgets and expenditure to be measured not just in euro and cents, but also in tonnes and kilos of CO₂/ greenhouse gas emitted.
- Changing procurement practices so that minimising CO₂/ greenhouse gas emissions is one of the criteria for choosing the economically most advantageous offer. Commission canteens go plastic free and modify food choices (vegan offers; less meat offers)
- In Commission offices: in winter, turning down our heating temperatures; in summer, learning to keep cool without air-conditioning.
- For staff travel to work: most staff switching to walking or cycling, at least for most short-distance journeys; ending free at-work car parking for able-bodied staff,
- For staff business travel: budgets greenhouse gas /CO₂ emissions alongside the financial budgets (carbon offset of missions).

Right to Know demonstration



Published on 10 Dec 2018, Second after movie for the Right to Know demonstration/school strike on the 20th of November, Shot and edited by Katriina Surquin, <https://youtu.be/48113eD2w90>

Conclusion: Facing humanity's biggest choice – Turn the Tanker

Today, new EU leaders are facing humanity's biggest choice ever: either they take the courageous action needed to initiate system change, or they give free rein to uncontrolled climate disruption, with the collapse of ecosystems that entails. Moving from transformation rhetoric to deep transformation implementation on a large scale and at unprecedented speed is '[one giant leap for mankind](#)'. Climate disruption, biodiversity loss and depletion of ecosystems are global, but at the same time each local action counts.

Today is a historic moment: EU leaders have the opportunity to go down in history for helping to steer the tanker away from its current path and restore a safe operating space for the present and future inhabitants of Planet Earth. The EU *has* the capacity to host a new conversation and orchestrate the necessary change. To that end, it also needs to team up with citizens, young people and actors of change. This discussion paper is intended to contribute to that conversation.

We need to declare a climate, biodiversity and social emergency. Immediate unprecedented transformation of our societies is clearly a pathway that demands considerable effort, which may be uncomfortable. It means facing the facts, being consistent and persistent, and, of course, communicating effectively with the general public. However, this is our only chance to avoid chaos arising from climate disruption, biodiversity loss and other threats to the ecosystems that support our lives and our prosperity. Making low-carbon lifestyles feasible will be difficult, as will the transition to such lifestyles. Accepting a more frugal way of life may also require effort – but it will be easier if it is planned than if it is dictated by chaos.

Climate disruption is a long-term existential battle that will require remaking every part and functioning of society. It involves unpopular political choices and unpopular way-of-life changes for years to come. On our current track we are headed for at least a [three-degree scenario](#). Our system did not even start to comprehend all the difficulties to come, let alone the daunting task of mitigating them. Can we call this a war on climate disruption? No, there is no enemy other than ourselves, our greed, our laziness or our fear of radical change and the unknown, our individual and collective inertia.

Those with vested interests and entrenched power will play hard and will pretend that unprecedented change can be effected within existing frameworks. There will have to be unprecedented change to our economies with unprecedented displacement of innovation opportunities and value creation to new actors, or unprecedented adaptation challenges to existing actors to reinvent their business. Policies will need to resist incumbency bias. Many of our fellow-citizens do not realise the scale of what is coming, not because they do not want to know, but because they lack information and are not being told the truth.

Ultimately this is about the survival of humankind. The opportunity space for humanity's survival is becoming our biggest commons. It is therefore crucial to develop public policies which put the commons first before private rent seeking. If we direct human ingenuity and financial resources towards this unprecedented endeavour, we shall increase our chances of success. Convincing and engaged policies focussing on the common good will help to turn panic back into hope.

Climate disruption cannot be tackled in isolation. It is indeed a triple intertwined challenge of climate disruption, ecosystem degradation and equity. The good news is that addressing the three challenges in an integrated manner holds the potential for solutions with multiple benefits, empowering people, calling upon their intelligence as individuals and members of a collective whole. We can turn the vicious cycle of over-exploitation, increased greenhouse emissions and ecosystem degradation into a virtuous one of sustainable use, zero emissions, and ecosystem conservation and restoration.

The authors of this paper are not utopians: Utopia has changed sides, becoming the unrealistic belief that things will remain as they are now and that we can carry on without any radical change. Asking for the impossible is now necessary and has entered the political discourse. *“To avoid climate catastrophe, we must go beyond what is considered politically possible. A Green New Deal would mobilise resources on a scale unprecedented in peacetime, to tackle the climate emergency and address spiralling inequality”* ([Brighton MP Caroline Lucas](#)).

Climate disruption is something we humans have brought about. Countering and limiting it is thus a task for humans: we urgently need a frank and engaged conversation on what constitutes a ‘good life’, and redesign our societies around it. This includes adding new dimensions to what we currently understand by wellbeing and happiness, togetherness, purpose and fulfilment. It may mean more culture and less consumption. It is a civilizational shift, rather than a shift in production. The EU is well-placed to enable and host this conversation – if it wants to. The EU would be a learner, co-creator and advocate of solutions, rather than telling Member States and the public what to do. The EU can use and strengthen its convening power.

At the same time, can the EU afford to initiate the journey of transformation in a world where competitiveness would continue to rule, profits from pollution move elsewhere and many countries count on expansionist growth rates and exploding consumption to fuel their development? This question requires a positive reframing. How could the EU not take advantage of its vast experience of approaches based on more solidarity, more cooperativeness, more fairness, and greater attention to the commons? It can be a lighthouse for sustainability and climate neutrality. The EU has a considerable first-mover advantage in multilateral advocacy at the level of other international institutions. EU Cities are showcasing examples. EU youngsters have initiated a grass-root movement going viral. Some major EU companies have taken a forward-looking approach. Synergy of competences in finance and in climate has produced sensible recommendations (e.g. [European Finance-Climate PACT](#)).

The economy and the environment are intrinsically connected, and both are in crisis. Society is also in crisis. Our century will be the one in which we as a species will need to learn to cooperate on an unprecedented scale and depth. We are the first generation to feel the sting of climate disruption. We are the last that can do something about it. Mitigating climate disruption requires global action and the EU is a global actor. It can give the right impetus for action - also beyond its borders. And at the same time found bold action on its overall aim enshrined in the Treaty: peace, values and wellbeing of its people ([Art. 3.1 TEU](#)).

After World War II, Europe has built the longest lasting peace ever seen on this continent and has been awarded the Nobel prize (2012). The EU now needs to set out the path to rebuild peace with the planet, to regain balance with our climate, our biodiversity, while at the same time reinventing wellbeing and prosperity. A Marshall plan for the Planet and a new Social Contract for the 21st century are mutually reinforcing each other. This is the New Green Deal that Europe needs NOW.

The EU could become a think- and do-tank for a new vision of happiness and wellbeing. The new European Commission could use its right of initiative and convening power to orchestrate a grand European project co-created with and carried by its citizens, young people and actors of change. This could lead to a fresh re-enchantment for Europe.

It is about turning the future of Europe into a Europe for the future. This is a positive agenda, but it requires efforts and political leadership to turn the tanker.

“With the right investments and policies, we can be the first generation that ends poverty and the last that avoids the worst effects of climate change.”

[Ban Ki-moon](#), Financing for Development Conference, Addis Ababa, 10th July 2015

“If we don’t take action the collapse of our civilisations and the extinction of much of the natural world is on the horizon.”

[Sir David Attenborough](#), COP24, Katowice, Poland, 3rd December 2018

"Some people say the 1.5C target is impossible, but the difference between possible and impossible is political leadership"

[Stephen Cornelius](#), WWF-UK's chief adviser for climate change, October 2018

"Until you start focusing on what needs to be done rather than what is politically possible, there is no hope. We can't solve a crisis without treating as a crisis. We need to keep the fossil fuels in the ground, and we need to focus on equity. And if solutions within the system are so impossible to find, maybe we should change the system itself."

[Greta Thunberg, COP 24, Katowice, December 2018.](#)

"The fate of humanity is entirely dependent upon its moral development"

[Albert Einstein](#)

"L'Europe, c'est une géographie qui veut devenir philosophie.

Un passé qui veut devenir boussole"

[Laurent Gaudé, Nous, l'Europe. Banquet des peuples \(2019\)](#)

EPILOGUE FOR THE SEPTEMBER 2019 UPDATE

In her political guidelines for the next European Commission 2019-2024 ([von der Leyen 2019](#)), the president-elect of the European Commission presents her vision for "A Union that strives for more". The first headline ambition is a European Green Deal. To give a greater say to citizens, a conference on the Future of Europe is to start in 2020.

Policy recommendations for governance of immediate unprecedented change

1. **Declare a planetary emergency, making the climate, ecological and social crisis the top priority.**
2. **Develop a vision and narrative jointly created by citizens and young people for the unprecedented transformation journey, building on the SDGs and the Paris agreement.**
3. **Set up a cross-institutional collaborative arrangements, supported by a multidisciplinary high-level expert group of scientists for guidance and citizen groups through participative processes for oversight. Translate co-created vision into a concrete transformation action plan.**
4. **Communicate on the emergency and inform citizens – give the full picture about the efforts required and the cost of inaction.**
5. **Link up all policies, programmes and finance to follow this vision, breaking the silos, ensuring external and internal policy consistency. Adjust metrics.**
 - a. **Account and measure success against the planetary boundaries and the safe and just operating space for humanity.**
 - b. **Use in-built flexibility of existing policies and programmes** exploiting any margins of manoeuvre within existing tools to move towards transformative edge.
 - c. **Introduce a mechanism to readjust all policies when new major new insights from science trigger a new and more ambitious response** (“science alert principle” with revision clause). Possibly prepare to revise key policy instruments (CAP, etc.) and MFF in 2019, following publication of, in particular, the next set of key reports from IPCC or other relevant science.
 - d. **Screen all EU regulation for a 'carbon and nature-fitness test'** and prepare phasing out counter-productive subsidies. Assess all policies, regulation and funding proposals for embedded inter-generational debt.
 - e. **Identify most transformation-harmful economic and social activities**; coordinate with all levels of public policy to remove all subsidies and preferential treatment as a first step and further disincentivise through taxation and regulation.
 - f. **Use finance as a key lever to obtain rapid unprecedented change wherever possible**: MFF should not finance greenhouse gas emissions. Invest only in carbon-neutral investments, divest everything else, impose greenhouse gas neutrality on tenders, grants, subsidies, beneficiaries, rethink taxation.
 - g. **Exclude any policy option based on overshoot in emissions. Leave benefits of future scientific and technological advances for future generations to do better**, rather than as a credit line for overshooting today or a justification for lack of ambition and business as usual.
 - h. **Intensify debate about complex, and possibly controversial, economic issues** such as future of growth, reframing and measuring wellbeing and happiness, valuing natural and social capital etc., acknowledge that they are central and not peripheral to overall success of the transformation, and pass rapidly to action.

Annex I: Scenarios for the EU

The following scenarios allow the opportunity space explored in the preceding 12 sections on key levers to be modulated and the ‘what if’ storylines to be adjusted to different levels of ambition. Elements from the various scenarios can be combined into new mixed scenarios, creating a wide range of possible levels of desired transformative ambition.

1. All-encompassing immediate and unprecedented transformation

Scenario 1	All-encompassing immediate and unprecedented transformation based on all key levers (policy foundations and cross-cutting enablers)
Key characteristics	All-in approach. Synergies between policy foundations and cross-cutting enablers fully exploited
Pros	<ul style="list-style-type: none"> • This is the most comprehensive and radical approach, commensurate with alerts from science and young people. • It would endow the EU with charisma, as the leader of a new ‘grand project’. • The EU institutions would win public trust in their capacity to work for the common good and for future generations. • This is an opportunity for the EU to set the agenda for a difficult but necessary journey, through collective deliberation and co-creation.
Cons	<ul style="list-style-type: none"> • MFF and key next-generation programmes would need to be reopened. • Some Member States would be hard to convince. • Core EU economic policies would need a far-reaching overhaul. • Some of the cross-cutting enablers are difficult to address through policy, or reach beyond current orthodoxies.

2. Bold and immediate action with a focus on selected policy foundations

Scenario 2	Bold and immediate action with a focus on selected policy foundations
Key characteristics	Bold and immediate action on policy foundations, with a lighter approach to those cross-cutting enablers which seem more workable to start with. Pragmatic search for the highest immediate return for the planet.
Pros	<ul style="list-style-type: none"> • Allows concentration of resources on a number of mega-issues with possible spill-overs. • Allows some of the cross-cutting enablers which are difficult and go against current orthodoxies to be temporarily avoided. • Single stakeholder communities may more easily find their place in a challenging transformation agenda without being turned away by over-complexity.
Cons	<ul style="list-style-type: none"> • The synergies between policy foundations and cross-cutting enablers are not exploited to the full. • Risk of inconsistency and policy failures in addressing the interdependent complex challenges. • Without considering overarching systemic issues such as inequalities, money flows, economic growth, and social values, progress towards unprecedented change may remain piecemeal, even with ambitious action on single policy foundations.

3. Exploiting transformational potential of existing strategies

Scenario 3	Exploiting transformational potential of existing strategies
Key characteristics	Implementation of current strategies, exploration of potential for unprecedented change within MFF and next generation of programmes in their current form, ad hoc development of more ambitious transformations
Pros	<ul style="list-style-type: none"> • Easier implementation • No disruption due to reopening of MFF and next programme generation • Better chance of acceptability to Member States and citizens reluctant to change
Cons	<ul style="list-style-type: none"> • May soon be overtaken by new science. First signs are emerging • Risk of inertia and loss of relevance in the event of abrupt environmental or climate disruption • Growing mismatch between subsidies, price signals and targets if targets were to be strengthened. • Without a fresh and holistic start, it may be difficult to overcome existing inconsistencies between policies, which may be harmful to the transformation

Annex II: Building blocks for unprecedented change NOW

These are examples for possible actions meant to complement or strengthen EU policies, or to move possibly into new territory. The examples represent different levels of ambition and are not necessarily compatible with each of the preceding scenarios.

Attention is drawn to table SPM.1 of the IPBES [global assessment](#) which summarises possible actions and pathways to achieve transformative change.

POLICY FOUNDATIONS

Energy

- Phasing out coal from energy generation by 2024 and making coal regions in transition future-fit
- Reducing energy demand beyond efficiency gains across all sectors of energy use (including shift from steel/concrete to bio-construction)
- Rolling out social eco-renovation and bio-insulation programme
- Enacting massive investment in renewable energy deployment
- Promoting renewable energy autonomy everywhere (including off-grid, community-grid and prosumer solutions)
- Screening long-term fossil energy supply commitments to prepare phase-out
- Auditing infrastructure and creating guidelines for new infrastructure to avoid locking in current paradigms for next decades
- Introducing systematic positive discrimination for renewable energy solutions
- Phasing out of all fossil fuel subsidies, No EU funds to be used for investment in fossil fuels (including gas pipelines)

Mobility/Transport

- Supporting scaling of cyclo-services and infrastructures and of Pan-European roll out of car-free cities, based on co-learning from good practice
- Making private car ownership redundant (in cities) through investment in excellent public transport (regional and cohesion funds)
- Deploying digital and real Trans-European Mobility Delivery networks with integrated multi-modal mobility solutions and services, replacing private car ownership
- Mapping of renewable charging opportunities for electric vehicles across Europe
- Adopting more ambitious emission standards for combustion engines; ban on internal combustion engine vehicles being produced or entering cities (2030)
- Coordinating removal of tax advantages for diesel cars and company cars, and increase of taxes for heavily polluting cars and SUVs
- Shifting transport of goods from road to rail and co-discovering sustainable delivery solutions for e-commerce; readjusting air/rail pricing imbalances
- Coordinating introduction of taxes on kerosene, air traffic and crusades (Frequent flyer tax on flights and ban on 'free miles' schemes)
- Readjusting air/rail transport pricing
- No EU funds for airport expansion (beyond xx passengersto allow newer Member States to develop)
- Taxing shipping emissions

Agro-ecology/Food systems

- Scaling up introduction of agro-ecology; mixed farming systems re-established again
- Safe operating space for livestock determined (addressing climate and biodiversity crises)
- Transforming the CAP into a major instrument for ecosystem regeneration (CAP to deliver by 2030 50% reduction in methane and N₂O emissions, 50% of CAP payments directed to restore ecosystem services related to climate and biodiversity)

- Comprehensive Common EU Food Policy package addressing both environment and climate challenges as well as health outcomes
- Developing guidelines for sustainable and healthy diets

Natural ecosystems and carbon sinks/CO₂ removal

- Co-creating a major nature restoration and rewilding plan
- Stepping up multilateral initiatives to stop deforestation
- Advancing protection of ocean eco-systems through increase of marine protected areas
- Advancing protection of European seas through a ban on ships fuelled by sulphur (content should go from 3.5% to 0.5%)
- Developing an afforestation master-plan with support of public and private initiatives
- Promoting the extension of natural carbon sinks across all policies
- Developing and scaling technologies for removal of existing CO₂ concentrations (e.g. direct air capture)

Responsible consumption/Regenerative circular economy

- Developing a cross-cutting coherent policy to enable and promote low-carbon lifestyles (e.g. car-free commuting, low-carbon diets, eco-housing)
- Labelling EU products to take account of embedded energy and external costs such as land use and biodiversity loss
- Regulatory framework for repair guarantee of products and guidelines for positive discrimination of secondary consumption over primary consumption
- Public-Private R&I partnership on business model innovation for regenerative economy, share and repair economy and low-carbon lifestyle society
- Co-designing a concept for sober consumption in developed countries
- Organising a EU deliberation campaign on responsible consumption - 'Less is better'

Resilience/Disaster preparedness

- Help Member States to develop country-wide emergency plans
- Develop a communication on the need for resilience at all level of society

CROSS-CUTTING ENABLERS

Climate Justice/Solidarity

- Banning policies resulting in overshooting at the expense of future generations
- Supporting multilateral endeavours to identify and punish ecocide
- Developing redistribution models and testing new measures such as universal basic income in collaboration with Member States
- Supporting creation of green jobs, with focus on local community environments and labour-intensive business models
- Developing a major re-skilling initiative to prepare for the post-transformation economy

Financial System

- Speeding up actions to mainstream sustainability and climate action throughout financial system
- Elaborating and proposing EU Climate Finance master-plan
- Making a subsidy fitness check and phasing out harmful subsidies
- Developing alternative options for current ETS system (Reformed ETS, Carbon tax, Carbon added tax, Personal carbon budget or ration)
- Hosting and orchestrating a conversation with competent levels of governance for a radical tax shift and suppression of fiscal paradises

Trade

- Reinforcing sustainability and climate provisions in EU trade agreements and multilateral trade negotiations
- Co-creating fair trade rules aiming to counter displacement of unsustainable and climate-unfriendly practices and spearhead through multi-lateral cooperation

- Re-thinking tariffs and standards for sustainability and climate-compatibility to ensure level playing field for sustainable EU business

Prosperity/Wellbeing

- Supporting and catalysing endeavours to develop alternative economic and wellbeing indicators to GDP
- Developing radically new and Anthropocene-compliant alternatives to current economic model
- Hosting and orchestrating a conversation with society on current narratives for prosperity and wellbeing

Values

- Convening a Convention to elaborate and co-create a European or Universal Declaration for Planetary Health setting out rights and responsibilities in the Anthropocene
- Convening a conversation with civil society, citizens, academia, thought leaders, politics at all levels on social values and alternative framings to 'homo economicus'
- Organising a European deliberation campaign on 'Good Life'
- Co-creating with citizens and promoting new visions for a good life and visions of happiness with less material consumption; convene a European Happiness summit
- Scaling-up the European Solidarity Corps to promote volunteering
- Developing and testing new approaches to cooperativeness in governance, society, business
- Re-shifting of policies from competitiveness to cooperativeness

Deliberation/Co-creation

- Ensuring policy coherence and cross-governmental focus on climate and environment
- Reorienting radically all policies towards the common good and co-lead a strategic discussion what is the public interest
- Redesigning the structures of governance, deliberation and citizen engagement
- Orchestrating governance innovation with all levels concerned, open policy labs, test new forms of participative democracy
- Developing new ways for reaching out to citizens, co-host citizen assemblies with other levels of governance

Bibliography

- Agora Verkehrswende (2018), Klimaschutz im Verkehr: Maßnahmen zur Erreichung des Sektorziels 2030, https://www.agora-verkehrswende.de/fileadmin/Projekte/2017/Klimaschutzszenarien/Agora_Verkehrswende_Klimaschutz_im_Verkehr_Massnahmen_zur_Erreichung_des_Sektorziels_2030.pdf
- Allen, Sara (2019), A CITIZENS' ASSEMBLY ON CLIMATE CHANGE: HOW WOULD IT WORK?, <https://www.involve.org.uk/resources/blog/opinion/citizens-assembly-climate-change-how-would-it-work>
- Amazon Employees for Climate Justice (2019), Open letter to Jeff Bezos and the Amazon Board of Directors, Medium, <https://medium.com/@amazonemployeesclimatejustice/public-letter-to-jeff-bezos-and-the-amazon-board-of-directors-82a8405f5e38>
- Arc2020 (2018), Agroecology | A Tale of Two Continents, retrieved, <http://www.arc2020.eu/agroecology-tale-two-continents/>
- Attenborough, Sir David (2018), Transcript of the speech by Sir David Attenborough COP24, Katowice, Poland, 3rd December 2018, The People's Seat, https://unfccc.int/sites/default/files/resource/The%20People's%20Address%202.11.18_FINAL.pdf
- Australian Government, Department of Environment and Energy (2018), The Supplement To the Carbon Credits (Carbon Farming Initiative—Measurement of Soil Carbon Sequestration in Agricultural Systems) Methodology Determination 2018, Version 1.0 – January 2018, <http://www.environment.gov.au/system/files/consultations/072b4825-ec0f-49d9-991e-42dfa1fbae3/files/supplement-soil-carbon-agricultural-systems.pdf>
- Auzanneau, Mathieu (2018), Augmenter les taxes sur l'essence sans proposer d'alternative cohérente, c'est faire le lit du fascisme, Reporterre, 16 novembre 2018, <https://reporterre.net/Matthieu-Auzanneau-Augmenter-les-taxes-sur-l-essence-sans-proposer-d>
- Azam, Geneviève (2017), From Growth to Degrowth: a brief history, <https://www.localfutures.org/growth-degrowth-brief-history/>
- B Corps, <https://bcorporation.net/b-economy>, see <https://bthechange.com/will-wall-street-embrace-b-corps-5df5c91c4f4a>
- Bailey, R, Laura Wellesley, Antony Fogatt (2014), Livestock - Climate Change's Forgotten Sector, Global Public Opinion on Meat and Dairy Consumption, Chatham House, <https://www.chathamhouse.org/publication/livestock-climate-change-forgotten-sector-global-public-opinion-meat-and-dairy>
- Baldock, David and Céline Charveriat (2018). 30x30 Actions for a Sustainable Europe, #Think2030 Action Plan A Sustainable Future for Europe. Led by IEEP in collaboration with Globe, <https://ieep.eu/uploads/articles/attachments/8002441e-c67f-4811-b212-8189a75ae9af/Think2030%20report%20launch.pdf?v=63710096102>
- Baldock, David and Céline Charveriat (2018). A Sustainable Future for Europe. Think 2030 Synthesis Paper. Led by IEEP in collaboration with Globe, <https://ieep.eu/publications/draft-think-2030-synthesis-paper>
- Bastin et al (2019), The global tree restoration potential, Science 05 Jul 2019:Vol. 365, Issue 6448, pp. 76-79, DOI: 10.1126/science.aax0848, <https://science.sciencemag.org/content/365/6448/76.full>
- BCG/Prognos (2019), Analyse Klimapfade Verkehr 2030, <https://e.issuu.com/embed.html#2902526/67315068>
- Bendell, Jem (2018), Deep Adaptation: A map for navigating the climate tragedy. IFLAS 2nd Occasional Paper, <http://iflas.blogspot.com/2018/07/new-paper-on-deep-adaptation-to-climate.html>
- Biswal, Pratibha and Tanmay Basak (2017), Entropy generation vs energy efficiency for natural convection based energy flow in enclosures and various applications: A review, Renewable and Sustainable Energy Reviews, Volume 80, December 2017, Pages 1412-1457, <https://doi.org/10.1016/j.rser.2017.04.070>, <https://www.sciencedirect.com/science/article/pii/S1364032117305671>
- Blue carbon initiative, MITIGATING CLIMATE CHANGE THROUGH COASTAL ECOSYSTEM MANAGEMENT, <https://www.thebluecarboninitiative.org/>
- Boffey, Daniel (2018), Luxembourg to become first country to make all public transport free, The Guardian, 3 Dec 2018, <https://www.theguardian.com/world/2018/dec/05/luxembourg-to-become-first-country-to-make-all-public-transport-free>
- Brecher, Jeremy (2018). Global Visions: Beyond the New World Order, <http://www.jeremybrecher.org/global-visions-beyond-the-new-world-order/>
- Brown, L (2013), Full Planet, Empty Plates: The New Geopolitics of Food Scarcity, <http://www.earth-policy.org/books/fpep>
- Bruxelles Environnement, <https://environnement.brussels/news/mieux-produire-bien-manger-cest-la-strategie-good-food-de-la-region>
- Burgen, Stephen (2018), 'For me, this is paradise': life in the Spanish city that banned cars, The Guardian, 18 September 2018, <https://www.theguardian.com/cities/2018/sep/18/paradise-life-spanish-city-banned-cars-pontevedra>

Burston, Jane (2018), Why hydrogen could be the future of green energy, WEF, 22 May 2018, <https://www.weforum.org/agenda/2018/05/this-forgotten-element-could-be-the-key-to-our-green-energy-future-heres-why/>

Business Europe (2019), EU should rebalance trade and become climate neutral, Press briefing, 29 April 2019, <https://www.buinessurope.eu/publications/eu-should-rebalance-trade-and-become-climate-neutral>

Caesar, L and S. Rahmstorf, A. Robinson, G. Feulner & V. Saba (2018). Observed fingerprint of a weakening Atlantic Ocean overturning circulation. Nature volume 556, pages 191–196 (2018), <https://www.nature.com/articles/s41586-018-0006-5>

Campbell, B. M., D. J. Beare, E. M. Bennett, J. M. Hall-Spencer, J. S. I. Ingram, F. Jaramillo, R. Ortiz, N. Ramankutty, J. A. Sayer, and D. Shindell. 2017. Agriculture production as a major driver of the Earth system exceeding planetary boundaries. Ecology and Society 22(4):8. <https://www.ecologyandsociety.org/vol22/iss4/art8/>.

Capital Institute, Eight principles of a Regenerative Economy, <http://capitalinstitute.org/8-principles-regenerative-economy/>

Carbon Market Watch (2019), CRACKING EUROPE'S HARDEST CLIMATE NUT, How to kick-start the zero-carbon transition of energy-intensive industries?, <https://www.euractiv.com/wp-content/uploads/sites/2/2019/04/Cracking-Europes-hardest-climate-nut.pdf>

Carbon Pricing Leadership Coalition (2017), Report of the High-Level Commission on Carbon Prices, <https://static1.squarespace.com/static/54ff9c5ce4b0a53decccfb4c/t/5949402936e5d3af64b94bab/1497972781902>

Carmichael, R. (2019) Behaviour change, public engagement and Net Zero. A report for the Committee on Climate Change. Available at <http://www.imperial.ac.uk/icept/publications/> and <https://www.theccc.org.uk/publication/behaviour-change-public-engagement-and-net-zero-imperial-college-london/>

Carney, Mark, Governor of the Bank of England, and François Villeroy de Galhau, Governor of Banque de France, "The financial sector must be at the heart of tackling climate change", <https://www.theguardian.com/commentisfree/2019/apr/17/the-financial-sector-must-be-at-the-heart-of-tackling-climate-change>, Bank of England recently [warned](https://www.bbc.com/news/business-47941180) that US\$20tn (£15.3tn) of assets could eventually be wiped out by climate change. <https://www.bbc.com/news/business-47941180>

Caron, P, G. Ferrero y de Loma-Osorio, D. Nabarro, E. Hainzelin, M. Guillou, I. Andersen, T. Arnold, M. Astralaga, M. Beukeboom, S. Bickersteth, M. Bwalya, P. Caballero, B. M. Campbell, N. Divine, S. Fan, M. Frick, A. Friis, M. Gallagher, J.-P. Halkin, C. Hanson, F. Lasbennes, T. Ribera, J. Rockstrom, M. Schuepbach, A. Steer, A. Tutwiler & G. Verburg (2018). Food systems for sustainable development: proposals for a profound four-part transformation, Agronomy for Sustainable Development. <https://link.springer.com/article/10.1007/s13593-018-0519-1>

Carrington, Damian (2017), Meat tax 'inevitable' to beat climate and health crises, says report The Guardian, Mon 11 Dec 2017, <https://www.theguardian.com/environment/2017/dec/11/meat-tax-inevitable-to-beat-climate-and-health-crises-says-report>

Carrington, Damian (2019a), Plummeting insect numbers 'threaten collapse of nature', The Guardian, 10.2.2019, <https://www.theguardian.com/environment/2019/feb/10/plummeting-insect-numbers-threaten-collapse-of-nature>

Carrington, Damian (2019b), Greta Thunberg: 'We are ignoring natural climate solutions', The Guardian, 19.9.2019, <https://www.theguardian.com/environment/2019/sep/19/greta-thunberg-we-are-ignoring-natural-climate-solutions>

Cavicchioli, Ricardo, William J. Ripple, Nicole S. Webster (2019), Scientists' warning to humanity: microorganisms and climate change, Consensus Statement, Published: 18 June 2019, Nature Reviews Microbiology, <https://www.nature.com/articles/s41579-019-0222-5>

CCAFS (2018), Agriculture is destabilizing the Earth system, according to recent study, <https://ccafs.cgiar.org/blog/agriculture-destabilizing-earth-system-according-recent-study#.W-BvHeRkCUl>

CDP (2018) Carbon Majors Report (2017) <https://6fefcbb86e61af1b2fc4-c70d8ead6ced550b4d987d7c03fcd1d.ssl.cf3.rackcdn.com/cms/reports/documents/000/002/327/original/Carbon-Majors-Report-2017.pdf?1501833772>

Ceballos, Gerardo, Paul R. Ehrlich, and Rodolfo Dirzo (2018). Biological annihilation via the ongoing sixth mass extinction signaled by vertebrate population losses and declines. PNAS July 25, 2017 114 (30) E6089-E6096; published ahead of print July 10, 2017 <https://doi.org/10.1073/pnas.1704949114>, <http://www.pnas.org/content/114/30/E6089> .

Centre for Low Carbon Futures (2011), Carbon Capture and Utilisation in the green economy, Using CO2 to manufacture fuel, chemicals and materials, <http://co2chem.co.uk/carbon-capture-and-utilisation-in-the-green-economy>

Chadwick, Paul (2019), The urgency of climate crisis needed robust new language to describe it, The Guardian 16 June 2019, <https://www.theguardian.com/commentisfree/2019/jun/16/urgency-climate-crisis-robust-new-language-guardian-katharine-viner>, see also reactions from science at <https://www.sciencemediacentre.org/expert-reaction-to-changes-to-guardian-style-guide-on-reporting-of-climate-change/>

Chapron, Guillaume (2019), A rights revolution for nature, <https://science.sciencemag.org/content/363/6434/1392.full>

CIMULACT (2018), Engaging all of Europe in shaping a desirable and sustainable future, <http://www.cimulact.eu/>

CIRAD (2018). Press release. There can be no sustainable development without profound changes in food systems. 9 August 2018. <https://www.cirad.fr/en/news/all-news-items/press-releases/2018/transforming-food-systems-for-sustainable-development>

Climate Liability News (2019), Carbon Capture: Will It Save the Climate, or the Fossil Fuel Industry?, <https://www.climateliabilitynews.org/2019/03/13/carbon-capture-fossil-fuels-ciel-report/>

Club of Rome (2019a), THE CLUB OF ROME CLIMATE EMERGENCY PLAN, A Collaborative Call for Climate Action, <https://www.clubofrome.org/project/the-club-of-rome-climate-emergency-plan/>

Club of Rome (2019b), REDEFINING PROSPERITY DISCUSSION PAPER, “The time is Now”, European Research & Innovation Days, 24-26/9/19, Published by the Club of Rome on 18 September 2019 <https://www.clubofrome.org/2019/09/19/redefining-prosperity-discussion-paper/>

Cohen-Setton, Jérémie and Dana Andreicut (2012), Blogs review: the discounting debate in climate change mitigation, Bruegel, April 20, 2012, <https://bruegel.org/2012/04/blogs-review-the-discounting-debate-in-climate-change-mitigation/>

Commons Network (2019), Our Commons: Political Ideas for a New Europe, Edited by Sophie Bloemen and Thomas de Groot, <https://www.commonsnetwork.org/ourcommons/>

Corlet Walker, C and T Jackson (2019): Measuring Prosperity—Navigating the Options. CUSP Working Paper No 20. Guildford: University of Surrey, <https://www.cusp.ac.uk/themes/aetw/measuring-prosperity/>

Costanza, Roberta (2008). Stewardship for a “Full” World. Current History, January 2008. http://capitalinstitute.org/wp-content/uploads/2014/08/Costanza_Stewardship_2008.pdf

Costanza, Roberta, Lisa J. Graumlich, Will Steffen (2007). Sustainability or Collapse?: An Integrated History and Future of People on Earth, Series: Dahlem Workshop Reports, MIT Press, <https://www.jstor.org/stable/j.ctt5hhsc>

Covenant of Mayors, <https://www.covenantofmayors.eu/>

Creutzig, Felix et al. (2018), Towards demand-side solutions for mitigating climate change, Comment | Published: 03 April 2018, Nature Climate Change volume 8, pages260–263(2018), <https://www.nature.com/articles/s41558-018-0121-1>

Curiosity (2016), There Are 2,000 Gallons Of Water In Your Jeans, Sort Of, December 20, 2016, <https://curiosity.com/topics/there-are-2000-gallons-of-water-in-your-jeans-sort-of-curiosity/>

Darby, Megan (2019), Finland to be carbon neutral by 2035. One of the fastest targets ever set, Carbon Home News, Published on 03/06/2019, <https://www.climatechangenews.com/2019/06/03/finland-carbon-neutral-2035-one-fastest-targets-ever-set/>

De Schutter, Olivier and Carlo Petrini: Time to put a Common Food Policy on the menu. Politico, 2 February 2017. <http://www.politico.eu/article/opinion-time-to-put-a-common-food-policy-on-the-menu/>.

Deep Ocean Facts (2019), 20 Threats to Marine Ecosystems – Solutions, <https://deepoceanfacts.com/threats-to-marine-ecosystems>

Der Spiegel (2019), Belgien fordert höhere Steuern auf Flüge, 2.3.2019, <https://www.spiegel.de/wirtschaft/soziales/klimaschutz-belgien-fordert-eu-weite-steuer-auf-fluege-a-1255992.html>

Descartes, René (1636), Discours de la Méthode, <https://www.gutenberg.org/ebooks/13846>

Deutscher Bundestag, Wissenschaftliche Dienste (2018), Die CO2-Abgabe in der Schweiz, Frankreich und Großbritannien, Mögliche Modelle einer CO2-Abgabe für Deutschland, <https://www.bundestag.de/resource/blob/559622/266b55977294ca9f45956c5d398173be/wd-8-027-18-pdf-data.pdf>

Deutsche Welle (2018), The rise of wooden skyscrapers, 10.4.2018, <https://www.dw.com/en/the-rise-of-wooden-skyscrapers/a-43267745>

Dinerstein, E et al (2019), A Global Deal For Nature: Guiding principles, milestones, and targets, Science, <https://advances.sciencemag.org/content/5/4/eaaw2869.full>

Drawdown, Solutions, <https://www.drawdown.org/solutions/>, Drawdown project in Horizon Magazine https://horizon-magazine.eu/article/global-warming-could-be-reverse-2050-if-we-take-action-now-chad-frischmann_en.html, and <https://www.drawdown.org/solutions-summary-by-rank>, <https://www.drawdown.org/solutions/food/regenerative-agriculture>

Duncombe, Stephen (2002), POLITICS AS ART OF THE IMPOSSIBLE: THE CASE FOR A DREAMPOLITIK IN THE UNITED STATES, <http://cafephilosophy.co.nz/articles/art-of-the-impossible/>

EASAC (2017), Opportunities and Challenges for Research on Food and Nutrition Security and Agriculture in Europe <https://easac.eu/publications/details/opportunities-and-challenges-for-research-on-food-and-nutrition-security-and-agriculture-in-europe/>

EASAC (2018), Negative emission technologies: What role in meeting Paris Agreement targets?, EASAC policy report 35, February 2018. ISBN: 978-3-8047-3841-6. This report can be found <https://easac.eu/press-releases/details/negative-emission-technologies-will-not-compensate-for-inadequate-climate-change-mitigation-efforts/>

EASAC (2018b), Opportunities for soil sustainability in Europe, EASAC policy report 36, September 2018, <https://easac.eu/publications/details/opportunities-for-soil-sustainability-in-europe/>

EASAC (2019), Forest bioenergy, carbon capture and storage, and carbon dioxide removal: an update, https://easac.eu/fileadmin/PDF_s/reports_statements/Negative_Carbon/EASAC_Commentary_Forest_Bioenergy_Feb_2019_FINAL.pdf

EASAC (2019a), Technologies for removing CO2 from the atmosphere will need to be integrated into climate policy in 2019, say national science academies across the EU, 19.2.2019, <https://easac.eu/press-releases/details/technologies-for-removing-co2-from-the-atmosphere-will-need-to-be-integrated-into-climate-policy-in/>

EEA (2015), Setting the scene, <https://www.eea.europa.eu/soer-2015/global/setting-the-scene>

EEA (2017), Food in a green light, A systems approach to sustainable food. <https://www.eea.europa.eu/publications/food-in-a-green-light>

EEA (2018), Primary energy consumption by fuel, <https://www.eea.europa.eu/data-and-maps/indicators/primary-energy-consumption-by-fuel-6/assessment-2>

EEA (2018a), Sustainability transitions, <https://www.eea.europa.eu/themes/sustainability-transitions/intro>

EEA (2019), Atmospheric greenhouse gas concentrations, Indicator Specification: Indicator codes: CSI 013, CLIM 052, Created 15 Jan 2019, Published 20 Mar 2019, <https://www.eea.europa.eu/data-and-maps/indicators/atmospheric-greenhouse-gas-concentrations-6>, Key messages: <https://www.eea.europa.eu/data-and-maps/indicators/atmospheric-greenhouse-gas-concentrations-6/assessment>

EEA (2019b), Annual European Union greenhouse gas inventory 1990–2017 and inventory report 2019, Submission under the United Nations Framework Convention on Climate Change and the Kyoto Protocol, 27 May 2019, <https://www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2019>

EEA (2019c), Sustainability transitions: policy and practice, EEA Report No 09/2019, <https://www.eea.europa.eu/publications/sustainability-transitions-policy-and-practice>

EEA (2019d), Climate change adaptation in the agriculture sector in Europe, EEA Report, No 04/2019, <https://www.eea.europa.eu/publications/cc-adaptation-agriculture>

EEB (2018), 'Last chance CAP', https://eeb.org/wp-admin/admin-ajax.php?juwfpisadmin=false&action=wpfd&task=file.download&wpfd_category_id=55&wpfd_file_id=94565&token=84bea68771f874b666fb041f7accb2d9&preview=1

Ellen MacArthur Foundation (2016), Rethinking the future of plastics, <https://newplasticseconomy.org/about/publications/report-2016>

Ellen MacArthur Foundation (2017), Make Fashion Circular, <https://www.ellenmacarthurfoundation.org/our-work/activities/make-fashion-circular>

Ellen MacArthur Foundation (2017a), The New Plastics Economy: Rethinking the future of plastics & catalysing action, <https://www.ellenmacarthurfoundation.org/publications/the-new-plastics-economy-rethinking-the-future-of-plastics-catalysing-action>

Ellen MacArthur Foundation (2017b). Urban Biocycles. <https://www.ellenmacarthurfoundation.org/publications/urban-biocycles>

Ellen MacArthur Foundation, New Plastics Economy (2019), First Global Commitment report reveals details of industry and government efforts to tackle plastic waste and pollution, <https://newplasticseconomy.org/>

Ellen MacArthur Foundation, Infographic, Circular Economy System Diagram, <https://www.ellenmacarthurfoundation.org/circular-economy/infographic>

Elliot, Alexander et al. (2017), Climate Change and the Humanities, Historical, Philosophical and Interdisciplinary Approaches to the Contemporary Environmental Crisis, <https://link.springer.com/book/10.1057/978-1-137-55124-5>

Emonfur Life, Urban and Periurban Forests, Management, monitoring and ecosystem services, http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=home.showFile&rep=file&fil=EMONFUR_Manual_EN.pdf

ENCYCLICAL LETTER LAUDATO SI' OF THE HOLY FATHER FRANCIS ON CARE FOR OUR COMMON HOME (2015), http://m.vatican.va/content/francescomobile/en/encyclicals/documents/papa-francesco_20150524_eniclica-laudato-si.html

European Central Bank (2018), Asset purchase programmes, Reinvestment phase of the asset purchase programme, <https://www.ecb.europa.eu/mopo/implement/omt/html/index.en.html>

European Climate Foundation (2018), Net zero by 2050: From whether to how. Zero emission pathways to the Europe we want, <https://europeanclimate.org/a-net-zero-emissions-european-society-by-2050-is-within-reach-but-getting-there-starts-today/>

European Climate Foundation (2019), Planning for net zero: Assessing the Draft National Energy and Climate Plans, <https://europeanclimate.org/national-climate-plans-2030/>

European Commission (2015), COMMUNICATION FROM THE COMMISSION, Towards an Integrated Strategic Energy Technology (SET) Plan: Accelerating the European Energy System Transformation, Brussels, 15.9.2015 C(2015) 6317 final, <https://ec.europa.eu/energy/en/topics/technology-and-innovation/strategic-energy-technology-plan>

European Commission (2015a). Sustainable Agriculture, Forestry and Fisheries in the Bioeconomy - A Challenge for Europe, 4th SCAR Foresight Exercise, <https://ec.europa.eu/research/scar/pdf/ki-01-15-295-enn.pdf>, see Annex 3: Raw material and biomass supply and demand of the world — Today and in 2050. The figure of 58% of biomass used for animal feed in 2011 relates to only 14% used for food

European Commission (2016), FUTURE FINANCING OF THE EU, Final report and recommendations of the High Level Group on Own Resources December 2016, https://ec.europa.eu/info/sites/info/files/about_the_european_commission/eu_budget/future-financing-hlgor-final-report_2016_en.pdf

European Commission (2017), Beyond the Horizon: foresight in support of future EU research and innovation policy (BOHEMIA), https://ec.europa.eu/info/research-and-innovation/strategy/support-policy-making/support-eu-research-and-innovation-policy-making/foresight/activities/current/bohemia_en

European Commission (2018), A Clean Planet for all, A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy, Brussels, 28.11.2018 COM(2018) 773 final, https://ec.europa.eu/clima/policies/strategies/2050_en

European Commission (2018a), EU energy in figures, Pocket Book 2018, https://ec.europa.eu/info/news/eu-energy-statistics-latest-data-now-available-2018-oct-04_en

European Commission (2018b), Evaluation study of the impact of the CAP on climate change and greenhouse gas emissions, Final report, https://ec.europa.eu/agriculture/sites/agriculture/files/evaluation/market-and-income-reports/2019/cap-and-climate-evaluation-report_en.pdf

European Commission (2018c), In-depth analysis in support on the COM(2018) 773: A Clean Planet for all - A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy, https://ec.europa.eu/knowledge4policy/publication/depth-analysis-support-com2018-773-clean-planet-all-european-strategic-long-term-vision_en

European Commission (2018d), Final Report 2018 by the High-Level Expert Group on Sustainable Finance, Secretariat provided by the European Commission https://ec.europa.eu/info/publications/180131-sustainable-finance-report_en

European Commission (2019), Horizon Magazine, Sixth mass extinction could destroy life as we know it– biodiversity expert, <https://horizon-magazine.eu/article/sixth-mass-extinction-could-destroy-life-we-know-it-biodiversity-expert.html>

European Commission (2019a), Reflection paper, Towards a Sustainable Europe by 2030, https://ec.europa.eu/commission/publications/reflection-paper-towards-sustainable-europe-2030_en

European Commission, Climate Action (2018), Innovation Fund, https://ec.europa.eu/clima/policies/innovation-fund_en

European Commission, Employment, Social Affairs and Inclusion (2019), Employment and Social Developments in Europe (ESDE), Sustainable growth for all: choices for the future of social Europe, Annual Review 2019, <https://ec.europa.eu/social/main.jsp?catId=738&langId=en&pubId=8219>

European Commission, Environment, EU Business @ Biodiversity Platform, http://ec.europa.eu/environment/biodiversity/business/index_en.htm

European Commission, EPSC (2017), Ten trends shaping migration. https://ec.europa.eu/epsc/publications/other-publications/10-trends-shaping-migration_en

European Commission, EPSC (2017a), Greenfield investment monitor, Issue 1, May 2017, <https://ec.europa.eu/epsc/sites/epsc/files/greenfield-investment-monitor-1.pdf>

European Commission, EPSC (2018), 10 Trends Reshaping Climate and Energy, https://ec.europa.eu/epsc/publications/other-publications/10-trends-reshaping-climate-and-energy_en

European Commission, EPSC (2018a), The State of Investment in Europe and the World, https://ec.europa.eu/epsc/publications/other-publications/state-investment-europe-and-world_en

European Commission, EPSC (2019), Europe's Sustainability Puzzle, Broadening the Debate, https://ec.europa.eu/epsc/publications/other-publications/europes-sustainability-puzzle_en

European Commission, EU Science Hub (2018), EU coal regions: opportunities and challenges ahead, <https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/eu-coal-regions-opportunities-and-challenges-ahead>

European Commission, EU Science Hub (2019), Green hydrogen opportunities in selected industrial processes, workshop 18 February 2019, <https://ec.europa.eu/jrc/en/science-update/green-hydrogen>

European Commission, European Solidarity Corps, , https://europa.eu/youth/solidarity_en

European Commission, Final Report 2018 by the High-Level Expert Group on Sustainable Finance, Secretariat provided by the European Commission. https://ec.europa.eu/info/publications/180131-sustainable-finance-report_en

European Commission, Nature-Based Solutions, <http://ec.europa.eu/research/environment/index.cfm?pg=nbs>

European Commission, International Cooperation and Development (2017), New European Consensus on Development - 'Our world, our dignity, our future', https://ec.europa.eu/europeaid/new-european-consensus-development-our-world-our-dignity-our-future_en

European Commission, International Cooperation and Development (2019), EU Report on Policy Coherence for Development including Member States replies, Monday, 28 January, 2019, https://ec.europa.eu/europeaid/2019-eu-report-policy-coherence-development-including-member-states-replies_en

European Commission, JRC (2016), Citizen Engagement in Science and Policy-Making, <http://publications.jrc.ec.europa.eu/repository/bitstream/JRC105004/lbna28328enn.pdf>

European Commission, Research and Innovation (2017), LInvesting in the European future we want, Report of the independent High Level Group on maximising the impact of EU Research & Innovation Programmes, http://ec.europa.eu/research/evaluations/pdf/archive/other_reports_studies_and_documents/hlg_2017_report.pdf

European Commission, Sustainable finance, https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance_en

European Commission, Trade (2015), Trade for all, Towards a more responsible trade and investment policy, http://trade.ec.europa.eu/doclib/docs/2015/october/tradoc_153846.pdf

European Parliament Research Service Blog (2015), Historic CO2 Emissions From Energy Use 1850–2011, <https://epthinktank.eu/2015/11/30/negotiating-a-new-un-climate-agreement-challenges-for-the-paris-climate-change-conference/screen-shot-2015-11-27-at-12-12-39/>

European Policy and Strategy Centre (ESPAS) (2019), Global Trends to 2030, Challenges and Choices for Europe, Report https://ec.europa.eu/epsc/sites/epsc/files/espas_report2019.pdf

European Policy and Strategy Centre (ESPAS) (2019a), Global Trends to 2030, Challenges and Choices for Europe, Executive Summary, https://ec.europa.eu/epsc/sites/epsc/files/espas_report2019-summary.pdf

Eurostat (2016) File:Final energy consumption by sector, EU-28, 2016, [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Final_energy_consumption_by_sector,_EU-28,_2016_\(%25_of_total,_based_on_tonnes_of_oil_equivalent\).png](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Final_energy_consumption_by_sector,_EU-28,_2016_(%25_of_total,_based_on_tonnes_of_oil_equivalent).png)

Eurostat (2017), Agri-environmental indicator - greenhouse gas emissions, Statistics Explained, https://ec.europa.eu/eurostat/statistics-explained/index.php/Agri-environmental_indicator_-_greenhouse_gas_emissions

Eurostat (2017a), MATERIAL FLOW DIAGRAM 2016, <https://ec.europa.eu/eurostat/web/circular-economy/material-flow-diagram>

Eurostat (2018), Greenhouse gas emission statistics - emission inventories, Statistics explained, <https://ec.europa.eu/eurostat/statistics-explained/pdfscache/1180.pdf>

Eurostat (2018a), Household expenditure by purpose in the EU, 2017, <https://ec.europa.eu/eurostat/news/themes-in-the-spotlight/household-expenditure-2017>

Eurostat (2018b), Oil and petroleum products - a statistical overview, Statistics Explained, https://ec.europa.eu/eurostat/statistics-explained/index.php/Oil_and_petroleum_products_-_a_statistical_overview#Trade_in_petroleum_products

Eurostat (2018c), Shedding light on energy in the EU, A GUIDED TOUR OF ENERGY STATISTICS, 2018 edition, <https://ec.europa.eu/eurostat/cache/infographs/energy/index.html>

Extinction Rebellion (2019), This Is Not A Drill: An Extinction Rebellion Handbook Paperback – 13 Jun 2019, <https://www.amazon.co.uk/This-Not-Drill-Extinction-Rebellion/dp/0141991445>

Extinction Rebellion, <https://extinctionrebellion.org/>, see also <https://www.theguardian.com/commentisfree/2018/nov/04/the-guardian-view-on-environmental-activism-new-energy-is-welcome>

FAO (2013), TACKLING CLIMATE CHANGE THROUGH LIVESTOCK, A Global Assessment of Emissions and Mitigation Opportunities, <http://www.fao.org/3/a-i3437e.pdf>

FAO (2018), The State of Food Security and Nutrition in the World, <http://www.fao.org/state-of-food-security-nutrition/en/>

FAO, FAO Commission on Genetic Resources for Food and Agriculture (2019), The State of the World's Biodiversity for Food and Agriculture, <http://www.fao.org/state-of-biodiversity-for-food-agriculture/en/>

FAO, Inter-departmental working group on organic agriculture, <http://www.fao.org/organicag/oa-faq/oa-faq6/en/>

FAO, SAVE FOOD: Global Initiative on Food Loss and Waste Reduction, Key facts on food loss and waste you should know, retrieved, <http://www.fao.org/save-food/resources/keyfindings/en/>

Farmer, J.D. et al (2019), Sensitive intervention points in the post-carbon transition, Science 12 Apr 2019, Vol. 364, Issue 6436, pp. 132-134, DOI: 10.1126/science.aaw7287, <https://science.sciencemag.org/content/364/6436/132.full>

FCRN, Oxford Martin School (2015), Foodsource Chapter 3. Food systems & greenhouse gas emissions, https://foodsource.org.uk/sites/default/files/chapters/pdfs/foodsource_chapter_3.pdf

Finance-Climat (2018), CALL FOR A EUROPEAN FINANCE-CLIMATE PACT, <https://www.pacte-climat.net/en/the-call/>

Financial Times (2018), Can reinvestment policy be a vehicle for differential stimulus across countries while still respecting the ECB's capital key? Yes. And here is how, <https://www.ft.com/content/3768fa76-b5b8-11e8-a1d8-15c2dd1280ff>

Flavelle, Christopher (2018). 'New Climate Debate: How to Adapt to the End of the World.' Bloomberg 26/06/2018. <https://www.bloomberg.com/news/articles/2018-09-26/new-climate-debate-how-to-adapt-to-the-end-of-the-world>

Fourth National Climate Assessment Volume II (NCA4 Vol. II) (2018), Impacts, Risks, and Adaptation in the United States, USGCRP's quadrennial assessment of the impacts of climate change in the U.S. , <https://www.globalchange.gov/>, See also <https://www.reuters.com/article/us-climate-change-usa/us-report-says-climate-change-will-batter-economy-in-clash-with-trump-idUSKCN1NS19D>

Fraunhofer Gesellschaft, Biological Transformation Nature as a driver of innovations in engineering and manufacturing, <https://www.fraunhofer.de/en/press/research-news/2018/june/Biological-Transformation-nature-as-a-driver-of-innovations-in-engineering-and-manufacturing.html>

Gao, Jixi (2019), How China will protect one-quarter of its land, WORLD VIEW, 21 May 2019, <https://www.nature.com/articles/d41586-019-01563-2>

Garfield, Leanna (2018), 13 cities that are starting to ban cars, Business Insider, 1 Juni 2018, <https://www.businessinsider.com/cities-going-car-free-ban-2017-8?r=US&IR=T>

Garrett, Laurie (2019), Macron's top-down approach to fighting climate change serves as a cautionary tale, CNN, 6 December 2018, <https://www.cnn.com/2018/12/06/opinions/macron-yellow-vest-protest-lesson-garrett/index.html>

Gaudé, Laurent (2019), Nous, l'Europe. Banquet des peuples, <http://www.laurent-gaude.com/nous-leurope-banquet-des-peuples-2019/>

Giovannini, Enrico and Tommaso Rondinella (2018), Going beyond GDP: theoretical approaches, In: Handbook of Research on Economic and Social Well-Being, https://ideas.repec.org/h/elg/eechap/15128_1.html

Girardet, Herbert (2013). Sustainability is unhelpful: we need to think about regeneration, <https://www.theguardian.com/sustainable-business/blog/sustainability-unhelpful-think-regeneration>

Global Commission on Adaptation (2019), Adapt Now: A Global Call for Leadership on Climate Resilience, September 2019, https://cdn.gca.org/assets/2019-09/GlobalCommission_Report_FINAL.pdf

Global Footprint Network (2018), Country Overshoot Days 2018, <https://www.overshootday.org/content/uploads/2018/07/GFN-Country-Overshoot-Day-2000.jpg>

Global Footprint Network, #MoveThatDate, Solutions, <https://www.overshootday.org/solutions/>

Global Panel on Agriculture and Food Systems for Nutrition (2018), Preventing nutrient loss and waste across the food system: Policy actions for high-quality diets, POLICY BRIEF No. 12 | November 2018, <http://glopan.org/sites/default/files/Downloads/GlopanFoodLossWastePolicyBrief.pdf>

GoodFood.brussels (2018), La stratégie Good Food, Vers un système alimentaire durable en Région de Bruxelles-Capitale, <https://www.goodfood.brussels/fr/content/la-strategie-good-food>

Gosling, Jonathan (2017), Will we know what counts as good leadership if Things Fall Apart? Questions prompted by Chinua Achebe's novel - First Published December 12, 2016 in Leadership, Research Article <https://doi.org/10.1177/1742715016680675>, <http://journals.sagepub.com/doi/abs/10.1177/1742715016680675>

Graham-Lay, Charlotte (2019), New Zealand's Next Liberal Milestone: A Budget Guided by 'Well-Being', NYT, May 22, 2019, <https://www.nytimes.com/2019/05/22/world/asia/new-zealand-wellbeing-budget.html>

Griscorn et al. (2017), Natural climate solutions, PNAS October 31, 2017 114 (44) 11645-11650; first published October 16, 2017 <https://doi.org/10.1073/pnas.171046511>, <https://www.pnas.org/content/114/44/11645>

Gros, Daniel et al. (2019), Climate Change and Trade: Taxing carbon at the border?, Research paper, CEPS, <https://www.ceps.eu/ceps-publications/climate-change-and-trade-taxing-carbon-border/>

Groupe d'experts pour le climat et le Développement Durable (2019), Rapport final, <https://www.klimaatpanel.be/fr>

Gudynas, Eduardo (2011), Buen Vivir: Today's tomorrow, <https://link.springer.com/article/10.1057/dev.2011.86>

Haddad, Laurence et al (2016), A new global research agenda for food, Nature Comment, 30 November 2016, <http://www.nature.com/news/a-new-global-research-agenda-for-food-1.21052>

Hagedorn, Gregor et al. (2019), Concerns of young protesters are justified, <https://science.sciencemag.org/content/364/6436/139.2.full>

Hance, Jeremy (2016), Could we set aside half the Earth for nature?, The Guardian, 15 June 2016, <https://www.theguardian.com/environment/radical-conservation/2016/jun/15/could-we-set-aside-half-the-earth-for-nature>

Happy Planet Index, <http://happyplanetindex.org/>

Hausfather, Zeke (2019), Extreme CO2 levels could trigger clouds 'tipping point' and 8C of global warming, GLOBAL TEMPERATURE, 25 February 2019 16:00, <https://www.carbonbrief.org/extreme-co2-levels-could-trigger-clouds-tipping-point-and-8c-of-global-warming>

Hausmann, Ricardo (2017), The moral identity of homo economicus, First published by Project Syndicate, <https://www.livemint.com/Opinion/K6RH8wgaVAYsx516Xwb0cO/The-moral-identity-of-homo-economicus.html>

Heilman, Conrad (2017), Values in Time Discounting, Science and Engineering Ethics. 2017; 23(5): 1333–1349, doi: 10.1007/s11948-017-9950-y, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5636865/>

Herrero, Mario, Benjamin Henderson, Petr Havlík, Philip K. Thornton, Richard T. Conant, Pete Smith, Stefan Wirsenius, Alexander N. Hristov, Pierre Gerber, Margaret Gill, Klaus Butterbach-Bahl, Hugo Valin, Tara Garnett, Elke Stehfest (2016), Greenhouse gas mitigation potentials in the livestock sector. Nature Climate Change, DOI: 10.1038/nclimate2925, <https://www.nature.com/articles/nclimate2925>

Hickl, Jason (2018), Is it possible to achieve a good life for all within planetary boundaries?, <https://www.tandfonline.com/doi/full/10.1080/01436597.2018.1535895>

Hickl, Jason and Georges Kallis (2019), Is Green Growth Possible?, New Political Economy, <https://www.tandfonline.com/doi/full/10.1080/13563467.2019.1598964>

High-Level Commission on Carbon Prices: Report of the High-Level Commission on Carbon Prices, Washington, 29 May 2017, <https://static1.squarespace.com/static/54ff9c5ce4b0a53decccfb4c/t/5949402936e5d3af64b94bab/1497972781902/>

Horn, Henrik and André Sapir (2019), Border Carbon Tariffs: Giving Up on Trade to Save the Climate?, bruegel blog post, 29 August 2019, <https://bruegel.org/2019/08/border-carbon-tariffs-giving-up-on-trade-to-save-the-climate/>

Howard-Grenville, Jennifer (2016), Management in the Age of the Anthropocene, Cambridge Institute for Sustainability Leadership, <https://www.cisl.cam.ac.uk/news/blog/management-age-anthropocene>

Hull, Vanessa and Jianguo Liu (2018), Telecoupling: A new frontier for global sustainability, <https://www.ecologyandsociety.org/vol23/iss4/art41/#abstract>

Hunter Lovins, L and Stewart Wallis, Anders Wijkman & John Fullerton (2018). A Finer Future, Creating an Economy in Service to Life, A report to the Club of Rome, <https://www.newsociety.com/Books/F/A-Finer-Future>

IDDR (2018), Issue Brief, September 2018, An agro-ecological Europe: a desirable, credible option to address food and environmental challenges, <https://www.iddri.org/en/publications-and-events/issue-brief/agro-ecological-europe-desirable-credible-option-address-food>

IDDR (2018), Agro-ecology Study, An agroecological Europe in 2050: multifunctional agriculture for healthy eating, Findings from the Ten Years For Agroecology (TYFA) modelling exercise, Study, <https://www.iddri.org/en/publications-and-events/study/agroecological-europe-2050-multifunctional-agriculture-healthy-eating>

IDDR (2018a), An agro-ecological Europe by 2050: a credible scenario, an avenue to explore, Blog post 17 September 2018, <https://www.iddri.org/en/publications-and-events/blog-post/agro-ecological-europe-2050-credible-scenario-avenue-explore>

IEA (2019), Global Energy & CO2 Status Report, The latest trends in energy and emissions in 2018, <https://www.iea.org/geco/emissions/>

IDMC (2018), Global Report on Internal Displacement 2018, <http://www.internal-displacement.org/global-report/grid2018/>

IGES, Aalto University, D-mat, Sitra, KR-Foundation (2019), 1.5 Degrees Lifestyles, Targets and options for reducing lifestyle carbon footprints, <https://www.aalto.fi/en/departement-of-design/15-degrees-lifestyles>

Independent Group of Scientists appointed by the Secretary-General (2019), Global Sustainable Development Report (GSDR) 2019: The Future is Now – Science for Achieving Sustainable Development, United Nations, New York, <https://sustainabledevelopment.un.org/globalsdreport/2019>

International Monetary Fund (2018), Mitigation Policies for the Paris Agreement: An Assessment for G20 Countries, IMF working Papers, <https://www.imf.org/en/Publications/WP/Issues/2018/08/30/Mitigation-Policies-for-the-Paris-Agreement-An-Assessment-for-G20-Countries-46179>

International Monetary Fund (2019), Fiscal Monitor: How to Mitigate Climate Change, September 2019, <https://www.imf.org/en/Publications/FM/Issues/2019/09/12/fiscal-monitor-october-2019>

International Resource Panel (2019), Global Resources Outlook 2019: Natural Resources for the Future We Want, <https://www.resourcepanel.org/reports/global-resources-outlook>

IOM, Migration and Climate Change, <https://www.iom.int/migration-and-climate-change-0>

IPBES (2018), The assessment report on LAND DEGRADATION AND RESTORATION, https://www.ipbes.net/system/tdf/2018_ldr_full_report_book_v4_pages.pdf?file=1&type=node&id=29395, https://www.ipbes.net/system/tdf/spm_3bi_ldr_digital.pdf?file=1&type=node&id=28335

IPBES (2018a). Media Release: Biodiversity and Nature’s Contributions Continue Dangerous Decline, Scientists Warn. <https://www.ipbes.net/news/media-release-biodiversity-nature%E2%80%99s-contributions-continue-%C2%A0dangerous-decline-scientists-warn>.

IPBES (2019), Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, <https://www.ipbes.net/global-assessment-report-biodiversity-ecosystem-services>

IPBES (2019a). Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science- Policy Platform on Biodiversity and Ecosystem Services. E. S. Brondizio, J. Settele, S. Díaz, and H. T. Ngo (editors). IPBES Secretariat, Bonn, Germany - Unedited draft chapters 31 May 2019, <https://www.ipbes.net/global-assessment-report-biodiversity-ecosystem-services>

IPCC (2014), Climate Change 2014 Synthesis Report, Fifth Assessment Report, <https://ar5-syr.ipcc.ch/index.php>

IPCC (2018), 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. <http://ipcc.ch/report/sr15/>. See also comment from PIK Potsdam at <https://www.pik-potsdam.de/news/in-short/ipcc-1-5degc-sonderbericht-veroeffentlicht>

IPCC (2018a), Press release highlighting next 12 years are critical https://www.ipcc.ch/news_and_events/pr_181008_P48_spm.shtml

IPCC (2018b), Summary for Policymakers of IPCC Special Report on Global Warming of 1.5°C approved by governments, Newsroom, <https://www.ipcc.ch/2018/10/08/summary-for-policymakers-of-ipcc-special-report-on-global-warming-of-1-5c-approved-by-governments/>

IPCC (2019a), 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 <https://www.ipcc.ch/report/srcccl/>

IPCC(2019): Summary for Policymakers. In: IPCC Special Report on the Ocean and Cryosphere in a Changing Climate [H.-O. Pörtner, D.C. Roberts, V. Masson-Delmotte, P. Zhai, M. Tignor, E. Poloczanska, K. Mintenbeck, M. Nicolai, A. Okem, J. Petzold, B. Rama, N. Weyer (eds.)]. In press. https://report.ipcc.ch/srocc/pdf/SROCC_FinalDraft_FullReport.pdf

IPES Food (2016), From Uniformity to Diversity: A paradigm shift from industrial agriculture to diversified agroecological systems. http://www.ipes-food.org/images/Reports/UniformityToDiversity_FullReport.pdf

IPES Food (2019), Towards a Common Food Policy for the EU, <http://www.ipes-food.org/pages/CommonFoodPolicy>

IUCN (2019). European Red List of Trees. <https://portals.iucn.org/library/node/48512>

Jack, Simon (2019), UK's biggest money manager warns on climate catastrophe, BBC, 16 April 2019, <https://www.bbc.com/news/business-47941180>

Jackson, T, Victor, P and A Asjad Naqvi (2016). Towards a Stock – Flow Consistent Ecological Macroeconomics. WWW for Europe: Working Paper 114. http://www.foreurope.eu/fileadmin/documents/pdf/Workingpapers/WWWforEurope_WPS_no114_MS40.pdf

Jackson, Tim (2017). Prosperity without growth, 2nd edition. <http://timjackson.org.uk/ecological-economics/pwg/>

Jackson, Tim (2018), Prosperity without Growth, Foundations for the Economy of Tomorrow, <https://degrowth.org/2018/09/06/post-growth-open-letter/>

Jackson, Tim (2018), The Post-Growth Challenge: Secular Stagnation, Inequality and the Limits to Growth. CUSP Working Paper No 12. Guildford: University of Surrey. <https://www.cusp.ac.uk/themes/aetw/wp12/>

Jackson, Tim (2018a), The Post-growth Challenge: Secular Stagnation, Inequality and the Limits to Growth, <https://www.sciencedirect.com/science/article/pii/S0921800918309455>

Jackson, Tim (2019). The Post-Growth Challenge: Secular Stagnation, Inequality and the Limits to Growth. Ecological Economics, Volume 156, February 2019, Pages 236-246. <https://doi.org/10.1016/j.ecolecon.2018.10.010>, <https://www.sciencedirect.com/science/article/pii/S0921800918309455>, based on Tim Jackson (2018): The Post-Growth Challenge: Secular Stagnation, Inequality and the Limits to Growth. CUSP Working Paper No 12. Guildford: University of Surrey. <https://www.cusp.ac.uk/themes/aetw/wp12/>

Jackson Tim (2019a), Zero Carbon Sooner—The case for an early zero carbon target for the UK. CUSP Working Paper No 18. Guildford: University of Surrey, <https://www.cusp.ac.uk/themes/aetw/zero-carbon-sooner/>

Jackson T (2019c): “All Models Are Wrong”—The challenge of modelling ‘deep decarbonisation’. CUSP Working Paper No 19. Guildford: University of Surrey, <https://www.cusp.ac.uk/themes/s2/all-models-are-wrong/>

Kant, Immanuel (1785), Grundlegung zur Metaphysik der Sitten, <https://korpora.zim.uni-duisburg-essen.de/Kant/aa04/421.html>

Kettunen, Marianne (2018), Sustainable Development Goals & the EU: uncovering the nexus between external and internal policies, IEEP, <https://ieep.eu/publications/sustainable-development-goals-and-the-eu-uncovering-the-nexus-between-external-and-internal-policies>

Kiel Institute for World Economics (2017), Project, from Homo Economicus towards a Caring Economics, Kiel Institute Unit: Social and Behavioral Approaches to Global Problems <https://www.ifw-kiel.de/institute/research-consulting-units/social-and-behavioral-approaches-to-global-problems/projects/from-homo-economicus-towards-a-caring-economics/>

Ki-Moon, Ban (2017), We can be the first generation that ends poverty, <https://www.un.org/sustainabledevelopment/blog/2015/07/we-can-be-the-first-generation-that-ends-poverty-ban-ki-moon/>

Komaza, Welcome to Africa's New Face of Forestry, Growing sustainable incomes for the next generation, <http://www.komaza.com/>

Krajbich, Ian and Mark Dean (2015), How can neuroscience inform economics?, Current Opinion in Behavioral Sciences, Volume 5, October 2015, Pages 51-57, <https://www.sciencedirect.com/science/article/pii/S2352154615001035>, <https://doi.org/10.1016/j.cobeha.2015.07.005>

Kramer, Bill, The Regenerative Economy: A New Approach to Capitalism, <https://nextbillion.net/the-regenerative-economy-a-new-approach-to-capitalism/>

Kranzberg, Melvin (1986), Technology and History: "Kranzberg's Laws". Technology and Culture. 27 (3): 544–60. doi:10.2307/3105385

Krebs, Julius and Sonja Bach (2018), Permaculture—Scientific Evidence of Principles for the Agroecological Design of Farming Systems, Sustainability 2018, 10(9), 3218; <https://doi.org/10.3390/su10093218>, <https://www.mdpi.com/2071-1050/10/9/3218>

Krishna Bahadur KC, Dias GM, Veeramani A, Swanton CJ, Fraser D, Steinke D, et al. (2018), When too much isn't enough: Does current food production meet global nutritional needs?, PLoS ONE 13(10): e0205683. <https://doi.org/10.1371/journal.pone.0205683>

Krznicar, Roman (2019), Why we need to reinvent democracy for the long-term, BBC Future, 19 March 2019, <http://www.bbc.com/future/story/20190318-can-we-reinvent-democracy-for-the-long-term>

LaCanne CE, Lundgren JG. (2018) Regenerative agriculture: merging farming and natural resource conservation profitably. PeerJ 6:e4428 <https://doi.org/10.7717/peerj.4428>, <https://peerj.com/articles/4428/>

Lamarche-Gagnon, Guillaume et al (2019), Greenland melt drives continuous export of methane from the ice-sheet bed, Nature 565, 73–77 (2019), <https://www.nature.com/articles/s41586-018-0800-0>

Lamy, Pasal et al (2018). #EuropeMatters: Towards a Renewed European Social Contract. Friends of Europe. <https://www.bureau-fz.eu/en/news/europematters-die-erneuerung-des-sozialen-vertrags-fuer-europa/>

Lancet (2009), “Climate change is the biggest global health threat of the 21st century”. [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(09\)60935-1/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(09)60935-1/fulltext)

Leinfelder, Reinhold, 'Der Anthropozäniker - Unswelt statt Umwelt'. <https://scilogs.spektrum.de/der-anthropozaeniker/about-the-blog/>

Lesser, Rich, Martin Reeves, and Johann Harnoss (2016), Saving Globalization and Technology from Themselves. Imperatives for Corporate Leaders. Boston Consulting Group July 26, 2016, <https://www.bcg.com/publications/2016/strategy-globalization-saving-globalization-technology-from-themselves.aspx>

Letter by 238 academics (2018), The EU needs a stability and wellbeing pact, not more growth The Guardian, <https://www.theguardian.com/politics/2018/sep/16/the-eu-needs-a-stability-and-wellbeing-pact-not-more-growth>

Levin, Kelly and Dennis Tirpak (2018), This Month in Climate Science: Extreme Weather, Glaciers Losing Mass and Ecosystems Less Effective at Storing Carbon, WRI, August 2018, <https://www.wri.org/blog/2018/08/month-climate-science-extreme-weather-glaciers-losing-mass-and-ecosystems-less>

Levin, Kelly and Dennis Tirpak (2018a), This Month in Climate Science, Runaway Warming, Marine Heat Waves and Foods Get Less Nutritious, WRI, September 17, 2018, <https://www.wri.org/blog/2018/09/month-climate-science-august-2018-runaway-warming-marine-heat-waves-and-foods-get-less>

Levin, Kelly, Benjamin Cashore, Steven Bernstein and Graeme Auld (2012). Overcoming the tragedy of super wicked problems: constraining our future selves to ameliorate global climate change. Policy Sciences, Vol. 45, No. 2 (June 2012), pp. 123-152, <https://www.jstor.org/stable/41486859>.

Levitt, Daniel et al (2018), Deadly weather: the human cost of 2018's climate disasters – visual guide, The Guardian, 21 December 2018, <https://www.theguardian.com/environment/ng-interactive/2018/dec/21/deadly-weather-the-human-cost-of-2018s-climate-disasters-visual-guide>

Liu, Wei, Shang-Ping Xie, Zhengyu Liu and Jiang Zhu (2017). Overlooked possibility of a collapsed Atlantic Meridional Overturning Circulation in warming climate, Science Advances, Vol. 3, no. 1, e1601666, DOI: 10.1126/sciadv.1601666, <http://advances.sciencemag.org/content/3/1/e1601666.full>

Lucas, Caroline (2018), Parliament must declare a climate emergency – not ignore it, The Guardian, <https://www.theguardian.com/commentisfree/2019/mar/04/climate-change-emergency-westminster>

Lucas, Tamara and Richard Horton (2019), The 21st-century great food transformation, Lancet, Published: January 16, 2019 DOI: [https://doi.org/10.1016/S0140-6736\(18\)33](https://doi.org/10.1016/S0140-6736(18)33), [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(18\)33179-9/fulltext?utm_campaign=tleat19&utm_source=hub_page](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(18)33179-9/fulltext?utm_campaign=tleat19&utm_source=hub_page)

Mach, Katharine J. et al. (2019), Climate as a risk factor for armed conflict, Nature, Analysis | Published: 12 June 2019, <https://www.nature.com/articles/s41586-019-1300-6>

Mackay, Kevin (2017), Radical Transformation: Oligarchy, Collapse, and the Crisis of Civilization. <https://mahb.stanford.edu/library-item/radical-transformation/>, see <https://mahb.stanford.edu/blog/ecological-crisis-political-crisis/>.

Malhi, Yadvinder (2017), The Concept of the Anthropocene, Annual Review of Environment and Resources , Vol. 42:77-104 (Volume publication date October 2017), First published online as a Review in Advance on September 11, 2017, <https://doi.org/10.1146/annurev-environ-102016-060854>, <https://www.annualreviews.org/doi/abs/10.1146/annurev-environ-102016-060854>.

Marshall, Christa E (2017), In Switzerland, a giant new machine is sucking carbon directly from the air, Science, <https://www.sciencemag.org/news/2017/06/switzerland-giant-new-machine-sucking-carbon-directly-air>

Material Economics (2017), Retaining value in the swedish materials system, https://materialeconomics.com/me_rapport_eng_summary.pdf?cms_fileid=4aba8bbdd943ddc6fe8298ba70784eee

Mazzucato, Mariana (2013), The Entrepreneurial State: debunking public vs. private sector myths. <https://marianamazucato.com/entrepreneurial-state/>

Mazzucato, Mariana (2018), The value of everything. Making and taking in the global economy. <https://www.penguin.co.uk/books/280466/the-value-of-everything/9780241188811.html>, <https://marianamazucato.com/publications/books/value-of-everything/>

Mazzucato, Mariana and Michael Jacobs co-edited (2016), Rethinking Capitalism: Economics and Policy for Sustainable and Inclusive Growth, <https://marianamazucato.com/publications/rethinking-capitalism/>.

McKinsey&Company (2019), Global Energy Perspective 2019, <https://www.mckinsey.com/industries/oil-and-gas/our-insights/global-energy-perspective-2019>

Mair D. et al (2019), Understanding our political nature: How to put knowledge and reason at the heart of political decision-making, European Commission, Joint Research Centre, <https://ec.europa.eu/jrc/en/publication/understanding-our-political-nature-how-put-knowledge-and-reason-heart-political-decision-making>

Material Economics (2019), The circular economy – a powerful force for climate mitigation, Transformative innovation for prosperous and low-carbon industry, <https://www.sitra.fi/en/publications/circular-economy-powerful-force-climate-mitigation/>

McLaren, Duncan P et al (2019), Beyond “Net-Zero”: A Case for Separate Targets for Emissions Reduction and Negative Emissions, Policy Brief ARTICLE, Front. Clim., 21 August 2019 | <https://doi.org/10.3389/fclim.2019.00004>, <https://www.frontiersin.org/articles/10.3389/fclim.2019.00004/full>

Messerli et al. (2019), Expansion of sustainability science needed for the SDGs, Nature Sustainability volume 2, pages 892–894 (2019), <https://www.nature.com/articles/s41893-019-0394-z>

Mis, Magda, How Big Is Your Water Footprint?, Scientific American, Reuters, https://www.scientificamerican.com/article/how-big-is-your-water-footprint/2014-08-22T162427Z_2_KBN0GM1LW_RTROPTT_0_US-FOUNDATION-WATER-CONSUMPTION.XML

Monroe, Martha A (2019), Children Teach their parents, <https://www.nature.com/articles/s41558-019-0478-9>

Monbiot, George (2017), Out of the Wreckage: A New Politics in the Age of Crisis, <https://www.goodreads.com/book/show/32171783-out-of-the-wreckage>

Montbiot, Georges (2018), The destruction of the Earth is a crime. It should be prosecuted, The Guardian 28.3.2019, <https://www.theguardian.com/commentisfree/2019/mar/28/destruction-earth-crime-polly-higgins-ecocide-george-monbiot>

Montbiot, Georges (2018a), Too right it's Black Friday: our relentless consumption is trashing the planet, The Guardian, <https://www.theguardian.com/commentisfree/2017/nov/22/black-friday-consumption-killing-planet-growth>

Montbiot, Georges (2019), The natural world can help save us from climate catastrophe, The Guardian, 3 April 2019, <https://www.theguardian.com/commentisfree/2019/apr/03/natural-world-climate-catastrophe-rewilding>

Montgomery, Charles (2013), Happy City: Transforming Our Lives Through Urban Design, <https://thehappycity.com/the-book/>

Mooney, Chris & Brady Dennis (2019), "We Are in Deep Trouble": Carbon Emissions Break Record in Devastating Global Setback, THE WASHINGTON POST, 27 MAR 2019, <https://www.sciencealert.com/coal-plants-are-emitting-more-than-ever-and-we-are-headed-for-disaster>

Mora, Camilo et al., Daniele Spirandelli, Erik C. Franklin, John Lynham, Michael B. Kantar, Wendy Miles, Charlotte Z. Smith, Kelle Free, Jade Moy, Leo V. Louis, Evan W. Barba, Keith Bettinger, Abby G. Frazier, John F. Colburn IX, Naota Hanasaki, Ed Hawkins, Yukiko Hirabayashi, Wolfgang Knorr, Christopher M. Little, Kerry Emanuel, Justin Sheffield, Jonathan A. Patz & Cynthia L. Hunter (2018), “Broad threat to humanity from cumulative climate hazards intensified by greenhouse gas emission,” Nature Climate Change, <https://www.nature.com/articles/s41558-018-0315-6>.

Mouginot, Jérémie et al (2019), Forty-six years of Greenland Ice Sheet mass balance from 1972 to 2018, PNAS May 7, 2019 116 (19) 9239-9244; first published April 22, 2019 <https://doi.org/10.1073/pnas.1904242116>, <https://www.pnas.org/content/116/19/9239>

myEcoCost, Welcome to myEcoCost, <https://www.myecocost.eu/>

NASA (2017), July 20, 1969: One Giant Leap For Mankind, https://www.nasa.gov/mission_pages/apollo/apollo11.html

National Intelligence Council (2017), The future summarized, <https://www.dni.gov/index.php/global-trends/the-future-summarized>, <https://www.dni.gov/files/images/globalTrends/documents/GT-Main-Report.pdf>

Natural Capital Protocol, <https://naturalcapitalcoalition.org/natural-capital-protocol/>

Nature (2019), Cancer, climate, plastics: why ‘earthshots’ are harder than moonshots, Editorial, 10/07/2019, <https://www.nature.com/articles/d41586-019-02093-7>

NCCPE (2018), It's time to get creative about public engagement in innovation policy, <https://www.publicengagement.ac.uk/whats-new/blog/its-time-get-creative-about-public-engagement-innovation-policy>

NESTA (2018), Seven principles for public engagement in research and innovation policymaking, A guide from Nesta's Inclusive Innovation team, <https://www.nesta.org.uk/report/seven-principles-public-engagement-research-and-innovation-policymaking/>

NESTA (2019), Three ideas for blending digital and deliberative democracy, https://www.nesta.org.uk/blog/three-ideas-blending-digital-and-deliberative-democracy/?utm_source=Lab+Notes+Newsletter&utm_campaign=3cca49ac01-EMAIL_CAMPAIGN_2019_05_10_10_22&utm_medium=email&utm_term=0_8348f36a26-3cca49ac01-182018681

Network for Greening the Financial System (2019), First comprehensive report, A call for action, Climate change as a source of financial risk, April 2019, https://www.banque-france.fr/sites/default/files/media/2019/04/17/synthese_ngfs-2019_-_17042019_0.pdf

Neukom Raphael et al (2019), No evidence for globally coherent warm and cold periods over the preindustrial Common Era, Nature volume 571, pages 550–554 (2019), <https://www.nature.com/articles/s41586-019-1401-2>

New Europe Online (2019), MEPs propose that 45% of NDICI funds should support climate and environmental objectives, 7 March 2019, <https://www.neweurope.eu/article/eu-funding-to-support-climate-and-environmental-goals/>

Nobre, Carlos A et al (2016), Land-use and climate change risks in the Amazon and the need of a novel sustainable development paradigm, PNAS September 27, 2016 113 (39) 10759-10768; first published September 16, 2016 <https://doi.org/10.1073/pnas.1605516113>, <https://www.pnas.org/content/113/39/10759>

Nordic Council of Ministers (2019), Wood in Construction 25 cases of Nordic Good Practice, Anders Vestergaard Jensen & Nic Craig Nordic Wood in Construction Secretariat, ISBN 978-92-893-6072-2 (EPUB) <http://dx.doi.org/10.6027/Nord2019-010>, <https://woodinconstruction.net/news/item/73-25-cases-report-launch.html>

Nowak, Martin A. (2006), Five rules for the evolution of cooperation, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3279745/>

Nunez, Sarahi et al (2019), Assessing the impacts of climate change on biodiversity: is below 2 °C enough?, Climatic Change, June 2019, Volume 154, Issue 3–4, pp 351–365, <https://link.springer.com/article/10.1007/s10584-019-02420-x>

Nyborg, Karine (2016), Social norms as solutions, <https://science.sciencemag.org/content/354/6308/42.full>

O'Neill, D.W., Fanning, A.L., Lamb, W.F., and Steinberger, J.K. (2018), A good life for all within planetary boundaries, Nature Sustainability 1, 88-95. doi: 10.1038/s41893-018-0021-4, see also <https://goodlife.leeds.ac.uk/about/>

O'Callaghan, Jonathan (2018), Can we produce enough green hydrogen to save the world?, Horizon Magazine, 15 November 2018, <https://horizon-magazine.eu/article/can-we-produce-enough-green-hydrogen-save-world.html>

OECD (2018), Few countries are pricing carbon high enough to meet climate targets, <http://www.oecd.org/environment/few-countries-are-pricing-carbon-high-enough-to-meet-climate-targets.htm>

OECD (2018a), The 6th OECD World Forum: the Future of Well-being, 27-29 November 2018, Incheon, Korea, <http://www.oecd.org/statistics/6wf.htm>

OECD (2019), Biodiversity: Finance and the Economic and Business Case for Action, <http://www.oecd.org/environment/resources/biodiversity/biodiversity-finance-and-the-economic-and-business-case-for-action.htm>

OECD (2019a), Accelerating Climate Action, Refocusing Policies through a Well-being Lens, <http://www.oecd.org/tax/accelerating-climate-action-2f4c8c9a-en.htm>

OMFIF (2018), ECB must address QE misallocation risk, <http://www.omfif.org/analysis/commentary/2018/november/ecb-must-address-qe-misallocation-risk/>, see also OMFIF: <https://www.omfif.org/analysis/commentary/2018/november/ecb-must-address-qe-misallocation-risk/>, and (<http://www.omfif.org/analysis/commentary/2018/october/ecb-ponders-reinvestment-options/>). (<http://www.omfif.org/analysis/commentary/2018/october/speedy-communication-needed/>).

Opus12, A Profitable Solution to Carbon Emissions (retrieved 30/04/2019), <https://www.opus-12.com/>

Oswald, Andrew (2013), The Economics of Happiness - Warwick Economics Summit 2013, <https://www.youtube.com/watch?v=Ggcexz4ZNL>

Overshoot Day, <http://www.overshootday.org/>, Past Earth Overshoot Days re-calculated with National Footprint Accounts 2017 Edition, <https://www.overshootday.org/newsroom/past-earth-overshoot-days/>

Oxfam (2015), EXTREME CARBON INEQUALITY, Oxfam Media Briefing, 2 December 2015, https://www-cdn.oxfam.org/s3fs-public/file_attachments/mb-extreme-carbon-inequality-021215-en.pdf

Oxford INET Wealth project <https://www.inet.ox.ac.uk/projects/view/178>.

Oxford Initiative on AI×SDGs <https://www.sbs.ox.ac.uk/research/centres-and-initiatives/oxford-initiative-aisdgs>

Oxford Martin School, Mercator Research Institute on Global Commons and Climate Change (2018), Understanding demand-side solutions to climate change, 09 Apr 2018, <https://www.oxfordmartin.ox.ac.uk/news/2018-news-climate-change-solutions/>, <https://www.mcc-berlin.net/en/news/information/information-detail/article/climate-better-understand-demand-side-solutions.html>

Ozharvest, Let's Fight FoodWaste, retrieved, <https://www.ozharvest.org/fightfoodwaste/>

Pacte Finance-Climat européen: <https://www.pacte-climat.eu/fr/l-appel-detail/>. The Pacte Finance Climat (<https://www.pacte-climat.eu/fr/l-appel/>) has received the support of Philippe Maystadt, <https://www.pacte-climat.eu/fr/un-soutien-de-poids-philippe-maystadt-president-honoraire-de-la-banque-europeenne-dinvestissement/>

Pal, Jeremy S, Elfatih A. B. Eltahir (2016), Future temperature in southwest Asia projected to exceed a threshold for human adaptability, Nature Climate Change, volume 6, pages 197–200 (2016), <https://www.nature.com/articles/nclimate2833>

Pam, Berry et al. (2018), High End Climate Change in Europe, Impacts, Vulnerability and Adaptation, http://impressions-project.eu/news/14200_Policy%20Booklet:%20Understanding%20impacts%20and%20adaptation%20to%20high-end%20climate%20scenarios%20in%20Europe

Pendrill, Florence (2019), Agricultural and forestry trade drives large share of tropical deforestation emissions, <https://www.sciencedirect.com/science/article/pii/S0959378018314365>

Pfeiffer, Alexander et al (2018), Committed emissions from existing and planned power plants and asset stranding required to meet the Paris Agreement, *Env. Research Letters*, <https://iopscience.iop.org/article/10.1088/1748-9326/aabc5f/meta>

Phys.org (2018), Avoiding climate chaos means 'unprecedented' change: UN report, <https://phys.org/news/2018-10-climate-chaos-unprecedented.html>

Phys.org (2018a), World must act by 2020 to avoid runaway climate change: UN chief, <https://phys.org/news/2018-09-world-runaway-climate-chief.html>

PIK Potsdam (2018), Sonderbericht, <https://www.pik-potsdam.de/news/in-short/ipcc-1-5degc-sonderbericht-veroeffentlicht>

Pincetl, Stephanie (2017) Cities in the age of the Anthropocene: Climate change agents and the potential for mitigation. *Anthropocene* Volume 20, December 2017, Pages 74-82, <https://www.sciencedirect.com/science/article/pii/S2213305417300413?via%3Dihub>

Positive Money (2016), Guide to Public Money Creation, <https://positivemoney.org/2016/04/our-new-guide-to-public-money-creation/>

Positive Money Europe (2018), From Dialogue to Scrutiny: Strengthening the Parliamentary Oversight of the European Central Bank, <https://www.positivemoney.eu/2019/04/report-strengthening-parliamentary-scrutiny-ecb/>

Positive Money Europe (2018a), THE END OF QUANTITATIVE EASING IS NEAR, LONG LIVE QE!, <https://www.positivemoney.eu/2018/06/ecb-ends-qe-reinvestments/>

Posner, Eric A & E. Glen Weyl (2018), "Radical Markets, Uprooting Capitalism and Democracy for a Just Society", (<https://press.princeton.edu/titles/11222.html>). See also book review in *The Economist*. <https://www.economist.com/books-and-arts/2018/05/10/dont-shrink-the-role-of-markets-expand-it>

Potočník, Janez (2019), New Social and Economic Model, Co-chair UNEP International Resource Panel (IRP), 26th May 2019, UN Environment, <http://resourcepanel.org/>, <https://circularchange-conference.com/event/a-new-social-and-economic-model/>

Poux, Xavier and Pierre-Marie Aubert (2018), An agroecological Europe in 2050: multifunctional agriculture for healthy eating, Findings from the Ten Years For Agroecology (TYFA) modelling exercise, IDDRI Study, N°09/18 SEPTEMBER 2018, <https://www.iddri.org/sites/default/files/PDF/Publications/Catalogue%20Iddri/Etude/201809-ST0918EN-tyfa.pdf>

Putt del Pino, Samantha, Eliot Metzger, Deborah Drew and Kevin Moss (2017). Elephant in the Boardroom: Why Unchecked Consumption is Not an Option in Tomorrow's Markets. WRI working paper. <https://www.wri.org/publication/elephant-in-the-boardroom>

Pye, M (2019), No Common Sense: Philosophy tackles climate change Part 1, Fysio Educatief, https://issuu.com/fysioeducatief/docs/no-common-sense_pocket_a5_issuu, Kindle Edition, <https://www.amazon.ca/No-Common-Sense-Philosophy-tackles-ebook/dp/B07PGHXM9H>

Pyrkalo, Svitlana (2018), New calls to cities and investors to deliver sustainable finance growth, EBRD, <https://www.ebrd.com/news/2018/new-calls-to-cities-and-investors-to-deliver-sustainable-finance-growth.html>

Rabhi, Piere (2010). Vers la sobriété heureuse. <https://www.actes-sud.fr/catalogue/economie/vers-la-sobriete-heureuse>

Rainforest Action Network (2019), Banking on Climate Change, Fossil Fuels Finance Report, https://www.ran.org/wp-content/uploads/2019/03/Banking_on_Climate_Change_2019_vFINAL1.pdf.

Rahnev D, Denison R (2017), Suboptimality in Perceptual Decision Making, *Behav Brain Sci.* 2018 Feb 27:1-107. doi: 10.1017/S0140525X18000936, <https://www.ncbi.nlm.nih.gov/pubmed/29485020>

Ranasinghe, Dhara and Ritvik Carvalho (2018), From QE to QT: Five questions for the ECB, Reuters, 10 September 2018, From QE to QT: Five questions for the ECB, <https://www.reuters.com/article/us-eurozone-markets-ecb/from-qe-to-qt-five-questions-for-the-ecb-idUSKCN1LQOHO>

Randers, J., Rockström, J., Stoknes, P.E., Golüke, U., Collste, D., Cornell, S. (2018) Transformation is feasible - How to achieve the Sustainable Development Goals within Planetary Boundaries), A report to the Club of Rome from Stockholm Resilience Centre and BI Norwegian Business School, <https://www.stockholmresilience.org/publications/artiklar/2018-10-17-transformation-is-feasible---how-to-achieve-the-sustainable--development-goals-within-planetary-boundaries.html>.

Raworth, Kate (2017), A Doughnut for the Anthropocene: humanity's compass in the 21st century. *www.thelancet.com/planetary-health*, Vol 1 May 2017, [https://www.thelancet.com/pdfs/journals/lanph/PIIS2542-5196\(17\)30028-1.pdf](https://www.thelancet.com/pdfs/journals/lanph/PIIS2542-5196(17)30028-1.pdf), see also <https://www.stockholmresilience.org/research/research-videos/2016-02-16-kate-raworth-living-in-a-safe-and-just-operating-space.html>

Raworth, Kate (2017a), Doughnut Economics: Seven Ways to Think Like a 21st-Century Economist, <https://www.amazon.com/Doughnut-Economics-Seven-21st-Century-Economist/dp/1603586741>

Research & Degrowth (2018), Post-Growth Open Letter to EU institutions signed by over 200 scientists: “Europe, It’s Time to End the Growth Dependency”, <https://degrowth.org/2018/09/06/post-growth-open-letter/>

Research and Degrowth, <https://degrowth.org/2018/09/06/post-growth-open-letter/> and <https://you.wemove.eu/campaigns/europe-it-s-time-to-end-the-growth-dependency>, Degrowth Org: <https://degrowth.org/2018/09/06/post-growth-open-letter/> and <https://you.wemove.eu/campaigns/europe-it-s-time-to-end-the-growth-dependency>, <https://www.theguardian.com/politics/2018/sep/16/the-eu-needs-a-stability-and-wellbeing-pact-not-more-growth>

Reyers, B., Folke, C., Moore, M-L., R. Biggs, Galaz, V. (2018), Social-Ecological Systems Insights for Navigating the Dynamics of the Anthropocene. *Annu. Rev. Environ. Resour.* 2018. 43:267–89. <https://doi.org/10.1146/annurev-environ-110615-085349>, <https://www.stockholmresilience.org/publications/artiklar/2018-10-23-social-ecological-systems-insights-for-navigating-the-dynamics-of-the-anthropocene.html>

Ridley, Matt (2012), Apocalypse Not: Here's Why You Shouldn't Worry About End Times. *Wired* <https://www.wired.com/2012/08/ff-apocalypsenot/>

Rignot, Eric, Jérémie Mouginot, Bernd Scheuchl, Michiel van den Broeke, Melchior J. van Wessem, and Mathieu Morlighem (2019), Four decades of Antarctic Ice Sheet mass balance from 1979–2017, *PNAS* January 22, 2019 116 (4) 1095–1103; first published January 14, 2019 <https://doi.org/10.1073/pnas.1812883116>, <https://www.pnas.org/content/116/4/1095>

Rinaldi, Andrea (2009), Homo economicus? Neuroeconomics and other disciplines aim to identify the biological traits governing our financial behaviour, but not without accompanying criticism, *Science and Society, Analysis, EMBO Rep.* 2009 Aug; 10(8): 823–826, doi: 10.1038/embor.2009.175, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2726679/>

Rip, Arie (2014), The past and future of RRI. *Life Sciences, Society and Policy.* December 2014. <https://link.springer.com/article/10.1186/s40504-014-0017-4>

Ripple, William J., Christopher Wolf, Thomas M. Newsome, Mauro Galetti, Mohammed Alamgir, Eileen Crist, Mahmoud I. Mahmoud, William F. Laurance (2017), World Scientists’ Warning to Humanity: A Second Notice, 15,364 scientist signatories from 184 countries, *BioScience*, Volume 67, Issue 12, 1 December 2017, Pages 1026–1028, <https://doi.org/10.1093/biosci/bix125>, <https://academic.oup.com/bioscience/article/67/12/1026/4605229>, see also <https://www.sciencedaily.com/releases/2018/03/180307095210.htm>

RISE Foundation (2018), What is the Safe Operating Space for EU livestock? http://www.risefoundation.eu/images/files/2018/2018_RISE_LIVESTOCK_EXEC_SUMM.pdf, see also <https://iegpolicy.agribusinessintelligence.informa.com/PL217636/EU-policy-makers-ignore-livestocks-damaging-impact--RISE-foundation>

Roberts, Joanna (2019), ‘I would like people to panic’ – Top scientist unveils equation showing world in climate emergency, European Commission, DG RTD, *Horizon Magazine*, 24/09/2019. <https://horizon-magazine.eu/article/i-would-people-panic-top-scientist-unveils-equation-showing-world-climate-emergency.html>

Rocchi, et al. (2018), Border Carbon Adjustments Based on Avoided Emissions: Addressing the Challenge of Its Design, *Ecological Economics*, Volume 145, March 2018, Pages 126–136, <https://doi.org/10.1016/j.ecolecon.2017.08.003>, <https://www.sciencedirect.com/science/article/pii/S0921800917300903?via%3Dihub>

Rockefeller Foundation Economic Council on Planetary Health at the Oxford Martin School, Making the economic and policy case for the emerging field of planetary health, <https://www.planetaryhealth.ox.ac.uk/>

Rockström et al. (2009), Planetary boundaries: exploring the safe operating space for humanity. *Ecology and Society* 14(2): 32. <http://www.ecologyandsociety.org/vol14/iss2/art32/>

Rogelj, Joeri et al (2019), A new scenario logic for the Paris Agreement long-term temperature goal, *Nature* volume 573, pages 357–363 (2019), <https://www.nature.com/articles/s41586-019-1541-4>

Rowlatt, Justine (2019), Climate change: Big lifestyle changes are the only answer, By Justin Rowlatt Chief Environment correspondent, *BBC News* 11 October 2019, <https://www.bbc.com/news/science-environment-49997755>

Rühs, Nathalie and Aled Jones (2016), The Implementation of Earth Jurisprudence through Substantive Constitutional Rights of Nature, <https://www.mdpi.com/2071-1050/8/2/174>

Sachs, Jeffrey D et al (2019), Six Transformations to achieve the Sustainable Development Goals, *Nature Sustainability*, volume 2, pages 805–814 (2019), <https://www.nature.com/articles/s41893-019-0352-9>

Sánchez-Bayo, Francisco and Kris A.G. Wyckhuys (2019), Worldwide decline of the entomofauna: A review of its drivers, <https://www.sciencedirect.com/science/article/abs/pii/S0006320718313636>

Sanders, D. et al. (2018), Trophic redundancy reduces vulnerability to extinction cascades, <https://www.pnas.org/content/115/10/2419>

Schneider, Tapio, Colleen M. Kaul & Kyle G. Pressel (2019), Possible climate transitions from breakup of stratocumulus decks under greenhouse warming, *Nature Geoscience* 12, 163–167(2019), <https://www.nature.com/articles/s41561-019-0310-1>

Schot, Johan and W. Edward Steinmueller (2018), Three frames for innovation policy: R&D, systems of innovation and transformative change, *Research Policy*, <https://www.sciencedirect.com/science/article/pii/S0048733318301987>

Schwab, Nicole and Kristin Rechberger (2019), We need to protect 30% of the planet by 2030. This is how we can do it, *World Economic Forum*, <https://www.weforum.org/agenda/2019/04/why-protect-30-planet-2030-global-deal-nature-conservation/>

Searchinger, Timothy D, Stefan Wirsenius, Tim Beringer & Patrice Dumas (2018), Assessing the efficiency of changes in land use for mitigating climate change, *Nature* 564, 249–253 (2018), <https://www.nature.com/articles/s41586-018-0757-z>

Searchinger, Timothy D. et al (2018), Europe’s renewable energy directive poised to harm global forests, *Nature*, <https://www.nature.com/articles/s41467-018-06175-4>

Servigne, Pablo and Gauthier Chapelle (2017), L’entraide, l’autre loi de la jungle, <https://pabloservigne.com/entraide-2/>.

Servigne, Pablo Raphaël Stevens (2017), Comment tout peut s'effondrer, *Petit manuel de collapsologie à l'usage des générations*, <http://www.seuil.com/ouvrage/comment-tout-peut-s-effondrer-pablo-servigne/9782021223316>.

Shift Project (2018), DÉCARBONONS ! 9 PROPOSITIONS POUR DÉCARBONER L’EUROPE, <https://theshiftproject.org/en/article/the-shift-publishes-decarbonons-9-propositions-pour-decarboner-leurope/>

Simms, Andrew and Peter Nevell (2017), How did we do that? The possibility of rapid transition, *Rapid Transition Alliance*, <https://www.rapidtransition.org/resources/how-did-we-do-that-the-possibility-of-rapid-transition/>

Simon, Frédéric (2019), BusinessEurope warms to Macron’s EU carbon tariff idea, *euractiv*, 29 April 2019, <https://www.euractiv.com/section/emissions-trading-scheme/news/businesseurope-warms-to-macrons-eu-carbon-tariff-idea/>

Siskinds, LLP (2015), The Dutch Climate Case: Beginning of a New Era of Climate Litigation?, <https://www.siskinds.com/the-dutch-climate-case-beginning-of-a-new-era-of-climate-litigation/>

Smart Prosperity Institute (2018), DO ENVIRONMENTAL REGULATIONS COST AS MUCH AS WE THINK THEY DO?, *Policy Brief*, December 2018, <https://institute.smartprosperity.ca/sites/default/files/regulations-2018december-10.pdf>

Soete, Luc (2013), Is innovation always good? In: *Innovation Studies. Evolution and Future Challenges*. Ed. Jan Fagerberg et al. https://edisciplinas.usp.br/pluginfile.php/4103729/mod_resource/content/1/Fagerberg-MaartinAndersen-Innovation%20Studies%202013.pdf#page=149

Soete, Luc (2019), From "destructive creation" to "creative destruction": Rethinking Science, Technology and innovation in a global context, Working paper #2019-001, Maastricht Economic and social Research institute on Innovation and Technology (UNU-MERIT), www.merit.unu.edu/publications/wppdf/2019/wp2019-001.pdf

Solarfoods (2019), Solein, FOOD OUT OF THIN AIR, <https://solarfoods.fi/>

SolarImpulse Foundation, 1000 solutions, <https://solarimpulse.com/>

Sparrow, Jeff (2019), This isn't extinction, it's extermination: the people killing nature know what they're doing, *The Guardian* 20/09/2019, <https://www.theguardian.com/environment/commentisfree/2019/sep/20/this-isnt-extinction-its-extermination-the-people-killing-nature-know-what-theyre-doing>

Spratt, David and Ian Dunlop (2018), What lies beneath. The understatement of existential climate risk. Breakthrough. <http://climateextremes.org.au/wp-content/uploads/2018/08/What-Lies-Beneath-V3-LR-Blank5b15d.pdf>

Spratt, David and Ian Dunlop (2019), Existential climate-related security risk: A scenario approach, Breakthrough National Centre for Climate Restoration, [breakthroughonline.org.au, https://docs.wixstatic.com/ugd/148cb0_a1406e0143ac4c469196d3003bc1e687.pdf](https://docs.wixstatic.com/ugd/148cb0_a1406e0143ac4c469196d3003bc1e687.pdf)

Springmann, Marco, Michael Clark, Daniel Mason-D’Croz, Keith Wiebe, Benjamin Leon Bodirsky, Luis Lassaletta, Wim de Vries, Sonja J. Vermeulen, Mario Herrero, Kimberly M. Carlson, Malin Jonell, Max Troell, Fabrice DeClerck, Line J. Gordon, Rami Zurayk, Peter Scarborough, Mike Rayner, Brent Loken, Jess Fanzo, H. Charles J. Godfray, David Tilman, Johan Rockström & Walter Willett (2018), Options for keeping the food system within environmental limits. *Nature* volume 562, pages 519–525 <https://www.nature.com/articles/s41586-018-0594-0>., See also <https://foodplanethealth.org/the-report/> and https://www.oxfordmartin.ox.ac.uk/news/201810_Springmann_Nature

Steffen, Will, Johan Rockström, Katherine Richardson, Timothy M. Lenton, Carl Folke, Diana Liverman, Colin P. Summerhayes, Anthony D. Barnosky, Sarah E. Cornell, Michel Crucifix, Jonathan F. Donges, Ingo Fetzer, Steven J. Lade, Marten Scheffer, Ricarda Winkelmann, and Hans Joachim Schellnhuber (2018), Trajectories of the Earth System in the Anthropocene, <https://www.pnas.org/content/115/33/8252>

Steffen, Will, Katherine Richardson, Johan Rockström, Sarah E. Cornell, Ingo Fetzer, Elena M. Bennett, Reinette Biggs, Stephen R. Carpenter, Wim de Vries, Cynthia A. de Wit, Carl Folke, Dieter Gerten, Jens Heinke, Georgina M. Mace, Linn M. Persson, Veerabhadran Ramanathan, Belinda Reyers, Sverker Sörlin (2015), Planetary boundaries: Guiding human development on a

changing planet, *Science* 13 Feb 2015: Vol. 347, Issue 6223, 1259855, DOI: 10.1126/science.1259855 <http://science.sciencemag.org/content/347/6223/1259855>.

Steffen, Will, Wendy Broadgate, Lisa Deutsch et al (2015), The trajectory of the Anthropocene: The Great Acceleration. *The Anthropocene Review*, First Published January 16, 2015 Review Article <https://doi.org/10.1177/2053019614564785>

Sterner, Thomas et al (2019), Policy design for the Anthropocene, *Nature Sustainability* 2, 14–21 (2019), <https://www.nature.com/articles/s41893-018-0194-x>

Stilgoe, Jack, Richard Owen, Phil Macnaghten (2013), Developing a framework for responsible innovation. *Research Policy* Volume 42, Issue 9, November 2013, Pages 1568-1580. <https://doi.org/10.1016/j.respol.2013.05.008>, <https://www.sciencedirect.com/science/article/pii/S0048733313000930>

Stockholm Resilience Centre (2016), Sustainable Development Goals, How food connects all the SDGs, <https://www.stockholmresilience.org/research/research-news/2016-06-14-how-food-connects-all-the-sdgs.html>

Stockholm Resilience Centre, Applying resilience thinking, Seven principles for building resilience in social-ecological systems, <https://www.stockholmresilience.org/research/research-news/2015-02-19-applying-resilience-thinking.html>

Strona, Giovanni, Corey J. A. Bradshaw (2018), Co-extinctions annihilate planetary life during extreme environmental change. *Scientific Reports*, 2018; 8 (1) DOI: 10.1038/s41598-018-35068-1, <https://www.nature.com/articles/s41598-018-35068-1>

Surquin, Katriina (2018), Right to Know, Second after movie for the Right to Know demonstration/school strike on the 20th of November, Published on 10 Dec 2018, Shot and edited by Katriina, <https://youtu.be/48113eD2w90>

Sutherland, D. A. et al (2019), Direct observations of submarine melt and subsurface geometry at a tidewater glacier, *Science* 26 Jul 2019; Vol. 365, Issue 6451, pp. 369-374, DOI: 10.1126/science.aax3528, <https://science.sciencemag.org/content/365/6451/369>

Swinburn, Boyd A et al. (2019), The Global Syndemic of Obesity, Undernutrition, and Climate Change: The Lancet Commission report, <https://www.thelancet.com/commissions/global-syndemic>

Taylor, Mathew and Jonathan Watts (2019), Revealed: the 20 firms behind a third of all carbon emissions, *The Guardian*, 09/10/2019, <https://www.theguardian.com/environment/2019/oct/09/revealed-20-firms-third-carbon-emissions>

The Economics of Ecosystems and Biodiversity (TEEB), Making Nature's Values Visible, <http://www.teebweb.org/>

The Lancet Planetary Health, Editorial (2017), Welcome to The Lancet Planetary Health, [https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196\(17\)30013-X/fulltext](https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(17)30013-X/fulltext)

The Lancet, Trends in adult body-mass index in 200 countries from 1975 to 2014: a pooled analysis of 1698 population-based measurement studies with 19.2 million participants, [http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(16\)30054-X/abstract](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(16)30054-X/abstract)

The Nature Conservancy, Natural Climate Solutions, Nature's sleeping giant, retrieved, <http://naturalclimatesolutions.org/>

The New Climate Economy (2018), The 2018 Report of the Global Commission on the Economy and Climate, Unlocking the Inclusive Growth Story of the 21st Century - Accelerating Climate Action in Urgent Times, <https://newclimateeconomy.report/2018/>

The Organic Center (2017), 2018: Make a difference by making it organic, <https://www.organic-center.org/2018-make-a-difference-by-making-it-organic/>

The Rockefeller Foundation Economic Council on Planetary Health at the Oxford Martin School, Making the economic and policy case for the emerging field of planetary health, <https://www.planetaryhealth.ox.ac.uk/>

Thunberg, Greta (2019), Speech at European Parliament, 16 March 2019, <http://www.europarl.europa.eu/news/en/press-room/20190410IPR37531/climate-activist-greta-thunberg-urges-meps-to-put-words-into-action>

Thunberg, Greta (2019a), No One Is Too Small to Make A Difference (Paperback), <https://www.waterstones.com/book/no-one-is-too-small-to-make-a-difference/greta-thunberg/9780141991740>

Tong, Dan et al (2019), Committed emissions from existing energy infrastructure jeopardize 1.5 °C climate target, *Letter* | Published: 01 July 2019, This is an unedited manuscript that has been accepted for publication. *Nature Research* are providing this early version of the manuscript as a service to our customers. The manuscript will undergo copyediting, typesetting and a proof review before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers apply. <https://www.nature.com/articles/s41586-019-1364-3>

Tooley, Diane (2016), The Legacy of the Man Who Changed Our View of Nature, *Yale Environment*, https://e360.yale.edu/features/legacy_of_the_man_who_change_our_view_of_nature_alexander_von_humboldt_andrea_wulf

Transport & Environment (2016), Mind the Gap 2016 – Report, <https://www.transportenvironment.org/publications/mind-gap-2016-report>

Trebeck, Katherine and Jeremy Williams (2019), The Economics of Arrival, Ideas for a Grown-Up Economy, <https://policy.bristoluniversitypress.co.uk/the-economics-of-arrival>

Unai, Pascual et al. (2017), Valuing nature's contributions to people: the IPBES approach, Current Opinion in Environmental Sustainability, Volumes 26–27, June 2017, Pages 7-16, <https://www.sciencedirect.com/science/article/pii/S1877343517300040>

Ulsan National Institute of Science and Technology (2019), Scientists turn carbon emissions into usable energy, phys.org, JANUARY 21, 2019, <https://phys.org/news/2019-01-scientists-carbon-emissions-usable-energy.html>

Umweltbundesamt (2018), Methodological Convention 3.0 for the Assessment of Environmental Costs - Cost Rates. <https://www.umweltbundesamt.de/en/publikationen/methodological-convention-30-for-the-assessment-of>.

Umweltbundesamt (2019), Emissionen des Verkehrs, Das Mehr an Pkw-Verkehr hebt den Fortschritt auf, <https://www.umweltbundesamt.de/daten/verkehr/emissionen-des-verkehrs>

Umweltbundesamt (2019), Fahrleistungen, Verkehrsaufwand und „Modal Split“, <https://www.umweltbundesamt.de/daten/verkehr/fahrleistungen-verkehrsaufwand-modal-split>

UNCCD (2017), GLOBAL LAND OUTLOOK, <https://www.unccd.int/actions/global-land-outlook-glo>

UNCTAD (2016), Promoting Green FDI: Practices and Lessons from the Field. The IPA Observer, N.5, https://unctad.org/en/PublicationsLibrary/webdiaepcb2015d6_en.pdf.

UNCTAD (2019), A New Multilateralism for Shared Prosperity, Geneva Principles for a Global Green New Deal, Report by Richard Kozul-Wright and the University of Boston's Kevin Gallagher, <https://unctad.org/en/pages/newsdetails.aspx?OriginalVersionID=2057>

UNDP (2018), Human Development Indices and Indicators. 2018 Statistical Update, <http://hdr.undp.org/en/2018-update>.

UNEP (2018), Emissions Gap Report 2018, <http://www.unenvironment.org/resources/emissions-gap-report-2018>

UNEP (2018a), The Adaptation Gap Report 2018. United Nations Environment Programme (UNEP), <https://www.unenvironment.org/resources/adaptation-gap-report>

UNEP (2019), Lessons from a decade of emissions gap assessments. Christensen, J. and Olhoff, United Nations Environment Programme, Nairobi. <https://www.unenvironment.org/resources/emissions-gap-report-10-year-summary>

UNESCO (2015), Rethinking Education, Towards a Global Common Good?, <https://unesdoc.unesco.org/ark:/48223/pf0000232555>

UNFCCC, <https://unfccc.int/sites/default/files/resource/IEEP%20at%20COP23%20-%20Agriculture%20net-zero%202050.pdf>

United Nations (2015), Transforming our world: the 2030 Agenda for Sustainable Development, <https://sustainabledevelopment.un.org/post2015/transformingourworld>

UN News (2019), World faces 'climate apartheid' risk, 120 more million in poverty: UN expert <https://news.un.org/en/story/2019/06/1041261>

Vaughan, Adam (2016), UK coal-powered electricity projected to fall by record amount, The Guardian, 2 Nov 2016, <https://www.theguardian.com/environment/2016/nov/02/uk-coal-powered-electricity-projected-to-fall-by-record-amount>

Visbeck, Martin (2018), Ocean science research is key for a sustainable future, Comment | Open | Published: 15 February 2018, Nature Communications 9, Article number: 690 (2018), <https://www.nature.com/articles/s41467-018-03158-3>

von der Leyen, Ursula (2019), A Union that strives for more, My agenda for Europe, POLITICAL GUIDELINES FOR THE NEXT EUROPEAN COMMISSION 2019-2024, https://ec.europa.eu/commission/sites/beta-political/files/political-guidelines-next-commission_en.pdf

von Weizsaecker, Ernst, Wijkman, Anders (2018), Come On!, Capitalism, Short-termism, Population and the Destruction of the Planet, Report to the Club Of Rome, <https://www.springer.com/gp/book/9781493974184> , <https://www.clubofrome.org/2017/10/25/new-report-to-the-club-of-rome-come-on/>

Voosen, Paul (2019), New climate models forecast a warming surge, <https://science.sciencemag.org/content/364/6437/222.full>

Watts, Jonathan (2018), Our planet can't take many more populists like Brazil's Bolsonaro, The Guardian 24/10/2018. https://www.theguardian.com/commentisfree/2018/oct/24/planet-populists-brazil-jair-bolsonaro-environment?CMP=share_btn_link

Watts, Jonathan (2019), Human society under urgent threat from loss of Earth's natural life, The Guardian, 6 May 2019, <https://www.theguardian.com/environment/2019/may/06/human-society-under-urgent-threat-loss-earth-natural-life-un-report>

Wellesley, Laura, Catherine Happer and Antony Froggatt (2015), Changing Climate, Changing Diets, Pathways to Lower Meat Consumption, Chatham House Report, November 2015, <https://www.chathamhouse.org/publication/changing-climate-changing-diets>

Wille, Sabine (2013), Anthropocenic Poetics: Ethics and Aesthetics in a New Geological Age, <https://www.jstor.org/stable/26240510>

Willett W, Rockström, J Loken B et al. (2019), Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. *Lancet*. 2019; (published online Jan 16.), [http://dx.doi.org/10.1016/S0140-6736\(18\)31788-4](http://dx.doi.org/10.1016/S0140-6736(18)31788-4)

Wilke, Sabine (2013), Anthropocenic Poetics: Ethics and Aesthetics in a New Geological Age, *RCC Perspectives*, No. 3, Anthropocene: Envisioning the Future of the Age of Humans (2013), pp. 67-74, https://www.jstor.org/stable/26240510?seq=1#metadata_info_tab_contents

Winner, Langdon (2017). Rebranding the Anthropocene. Langdon Winners' blog, August 24, 2017, originally published in *Techné*: 21: 2 & 3 (2017), a publication of the Society for Philosophy and Technology. <https://www.langdonwinner.com/technopolis/2017/8/24/rebranding-the-anthropocene>

WMO (2018), WMO GREENHOUSE GAS BULLETIN No. 14 | 22 November 2018, The State of Greenhouse Gases in the Atmosphere, Based on Global Observations through 2017, https://library.wmo.int/doc_num.php?explnum_id=5455

WMO (2019), State of the Climate in 2018 shows accelerating climate change impacts, Published 28 March 2019, Press Release Number: 2803201, <https://public.wmo.int/en/media/press-release/state-of-climate-2018-shows-accelerating-climate-change-impacts>

WMO (2019a), WMO Statement on the state of the global climate in 2018, https://library.wmo.int/index.php?lvl=notice_display&id=20799#XPPBOorRbmo

WMO (2019b), United In Science, High-level synthesis report of latest climate science information convened by the Science Advisory Group of the UN Climate Action Summit 2019, https://public.wmo.int/en/resources/united_in_science

World Bank (2019), Citizen Engagement, <http://www.worldbank.org/en/about/what-we-do/brief/citizen-engagement>

World Economic Forum (2018). Harnessing the Fourth Industrial Revolution for Life on Land. Towards an Inclusive Bio-Economy. January 2018. <https://www.weforum.org/reports/harnessing-the-fourth-industrial-revolution-for-life-on-land/>

World Economic Forum (2019), Fostering Effective Energy Transition 2019, <https://www.weforum.org/reports/fostering-effective-energy-transition-2019>

World Economic Forum (2019a), Meat: The Future Series - Alternative Proteins, <https://www.weforum.org/whitepapers/meat-the-future-series-alternative-proteins>

World Economic Forum (2019b), The Global Risks Report 2019, http://www3.weforum.org/docs/WEF_Global_Risks_Report_2019.pdf

World Economic Forum and Ellen McArthur Foundation (2016), The New Plastics Economy Rethinking the future of plastics, <https://www.ellenmacarthurfoundation.org/publications/the-new-plastics-economy-rethinking-the-future-of-plastics>

WWF (2018), Living Planet Report 2018, Aiming Higher, http://wwf.panda.org/knowledge_hub/all_publications/living_planet_report_2018/, see also <https://www.theguardian.com/environment/2018/oct/30/humanity-wiped-out-animals-since-1970-major-report-finds>.

Yamin, Farhana (2019), Why I broke the law for climate change, COMMENT 17 September 2019, <https://www.nature.com/articles/d41586-019-02736-9>

York, Richard and Julius Alexander McGee (2016), Understanding the Jevons paradox, *Environmental Sociology*, 2:1, 77-87, DOI: 10.1080/23251042.2015.1106060, <https://www.tandfonline.com/doi/abs/10.1080/23251042.2015.1106060>

YouTube, Albert Einstein in His Own Voice, <https://www.youtube.com/watch?v=TmlyGdBodQ>

Zorlu, Pelin (2018), Transforming the Financial System for Delivering Sustainable Development: A high-level overview, IGES Discussion Paper, <http://www.greengrowthknowledge.org/resource/transforming-financial-system-delivering-sustainable-development-high-level-overview>

Further useful links:

<https://www.un.org/en/climatechange/reports.shtml>

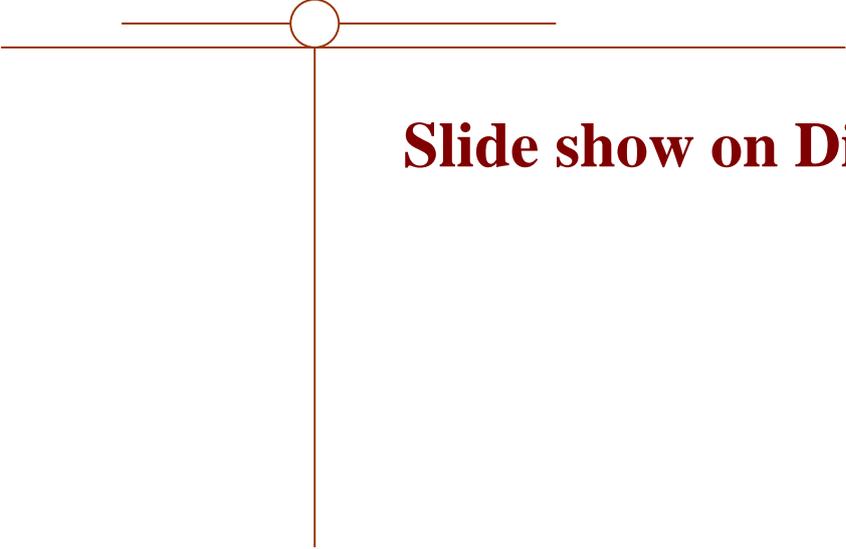
<http://iagpeoethics.blogspot.com/2015/07/geoethics-anthropocene-and-pope-by.html>

<http://theconversation.com/why-the-world-needs-more-global-citizens-84680>

<http://www.regenerativeagriculturedefinition.com/>

Stockholm Resilience Centre, <https://www.stockholmresilience.org/>





Slide show on Discussion paper



Discussion paper “Unprecedented Change NOW”

EU Staff 4 Climate

www.eustaff4climate.info

<https://ec.europa.eu/eusurvey/runner/petition>

August 2019



Who we are



Global Strike for Climate, Brussels, 15 March 2019

EU Staff 4 Climate is a bottom-up initiative led by EU staff in their individual/private capacity. It brings together colleagues from across the EU institutions who are deeply concerned about the climate, ecological and social crisis facing our planet.

Launched in March of this year in solidarity with the global [Youth for Climate](#) movement, we have come together as concerned citizens, parents, grandparents and as employees whose duty is to act in the public interest.



UNPRECEDENTED

CHANGE NOW

A POSITIVE JOURNEY

BEYOND THE COMFORT ZONE

Discussion paper by EU Staff 4 Climate

A discussion paper

Systemic analysis and perspectives on
'unprecedented change'

Supporting evidence

The information and views set out in this publication are those of the authors and do not reflect the official opinion of the institutions where they work. Neither the European Union institutions and bodies, nor any person acting on their behalf, may be held responsible for the use which may be made of the information contained therein.



Greta Thunberg: “It will take cathedral thinking”



Press room / Climate activist Greta Thunberg urges MEPs to put words into action

Climate activist Greta Thunberg urges MEPs to put words into action

Press Releases **EN** 16-04-2019 - 17:47



Greta Thunberg addressing environment MEPs in an extraordinary meeting in Strasbourg © EP

The 16-year old Swede, who inspired the worldwide “School Strike For Climate” movement, addressed MEPs in an Environment Committee meeting in Strasbourg on Tuesday.

- *“The future - as well as all that we have achieved in the past - is literally in your hands now.*
- *But it is not too late to act.*
- *It will take a **far-reaching vision**. It will take courage. It will take a fierce **determination to act now** to lay the foundations when we may not know all of the details about how to shape the ceiling. In other words, it will take **‘cathedral thinking’**”*

<http://www.europarl.europa.eu/news/en/press-room/20190410IPR37531/climate-activist-greta-thunberg-urges-meps-to-put-words-into-action>



Outline

This is a planetary emergency!

Unprecedented change is needed NOW

12 key levers for unprecedented change NOW
explored in discussion paper

No credibility without walking the talk

Conclusion: Turning the tanker

Three possible scenarios to modulate ambition



This is a planetary emergency!

 **Johan Rockström**
@jrockstrom Following

Place the IPBES report next to the IPCC 1.5 C report and you have a full picture of a Planetary Emergency. Science cannot be more clear. The World needs to Transform. Now.



Human society under urgent threat from loss of Earth's natural life
Scientists reveal one million species at risk of extinction in damning UN report
theguardian.com

8:36 pm - 6 May 2019

2,404 Retweets 3,782 Likes

47 2.4K 3.8K

Multi-crisis

- Climate Disruption
- Biodiversity loss
- Ecosystem depletion
- Resource overuse
- Pollution
- Social crisis
- Extreme weather events are here today...

***“Science cannot be more clear.
The World needs to transform.
Now”***

(Rockström)

Humans are increasingly influencing the climate

European Commission > Energy, Climate change, Environment > Climate Action > Climate change >

Climate Action

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Causes of climate change

Climate change consequences

Causes of climate change



Humans are increasingly influencing the climate and the earth's temperature by **burning fossil fuels, cutting down rainforests and farming livestock.**

This adds enormous amounts of greenhouse gases to those naturally occurring in the atmosphere, increasing the greenhouse effect and global warming.

https://ec.europa.eu/clima/change/causes_en



Humans are increasingly influencing the climate

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Causes for rising emissions

- **Burning coal, oil and gas produces carbon dioxide and nitrous oxide.**
- **Cutting down forests (deforestation).** Trees help to regulate the climate by absorbing CO₂ from the atmosphere. So when they are cut down, that beneficial effect is lost and the carbon stored in the trees is released into the atmosphere, adding to the greenhouse effect.
- **Increasing livestock farming.** Cows and sheep produce large amounts of methane when they digest their food.
- **Fertilisers containing nitrogen produce nitrous oxide emissions.**
- **Fluorinated gases produce a very strong warming effect, up to 23 000 times greater than CO₂.** Thankfully these are released in smaller quantities and are being phased down by EU regulation.

https://ec.europa.eu/clima/change/causes_en



Humans are increasingly influencing the climate

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Causes of climate change

Climate change

“An increase of 2°C compared to the temperature in pre-industrial times is seen by scientists as the threshold beyond which there is a much higher risk that dangerous and possibly catastrophic changes in the global environment will occur. For this reason, the international community has recognised the need to keep warming below 2°C.”

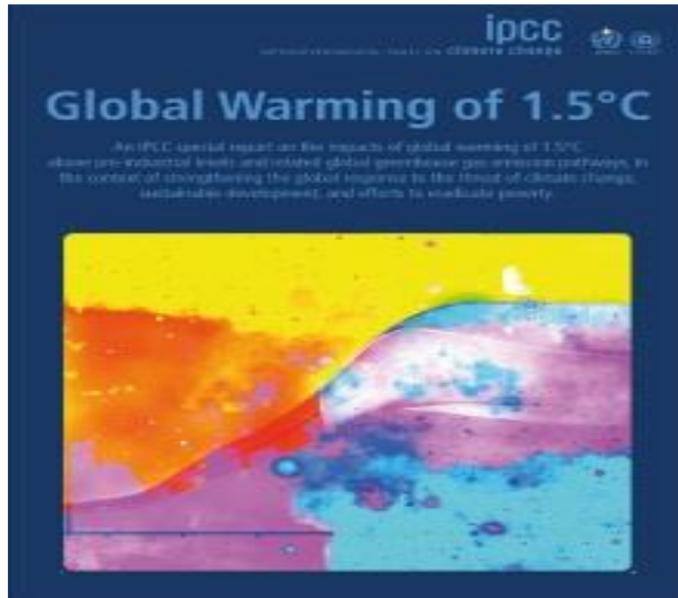
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https://ec.europa.eu/clima/change/causes_en



We are at 1°C today, 1.5°C degrees is bad, 2°C is worse, with current pledges we are off towards at least 3°C



- “Human activities are estimated to have caused approximately **1.0°C** of global warming above pre-industrial levels, with a likely range of 0.8°C to 1.2°C”.
- “**Climate-related risks** to health, livelihoods, food security, water supply, human security, and economic growth are **projected to increase with global warming of 1.5°C and increase further with 2°C**”

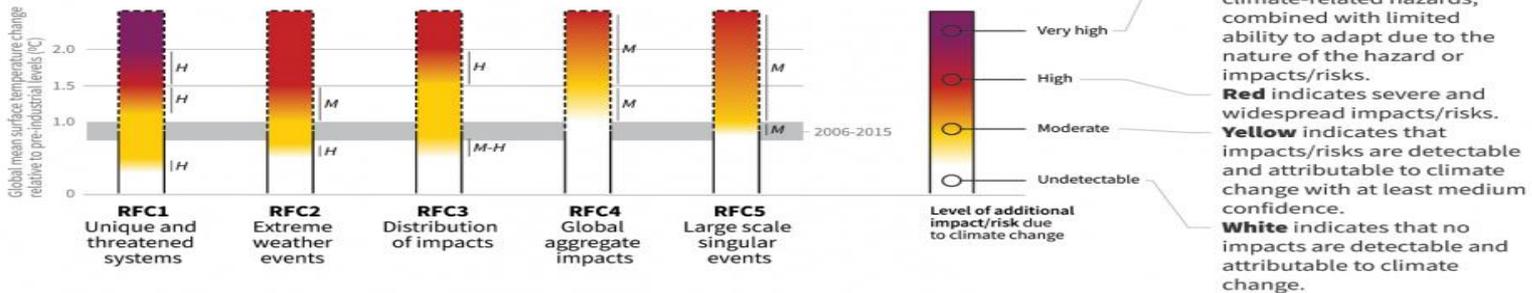
IPCC special report [Global Warming of 1.5°C](#)

We are at 1°C today, 1.5°C degrees is bad, 2°C is worse, with current pledges we are off towards at least 3°C

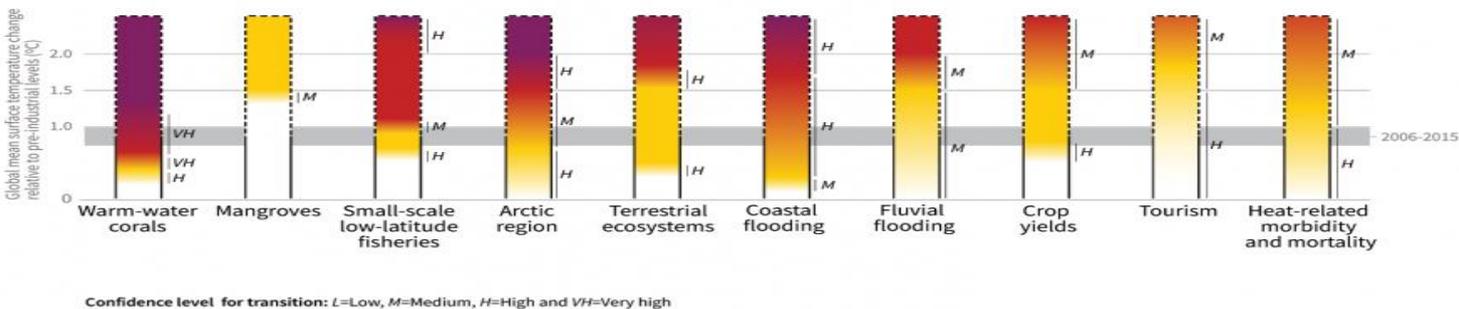
How the level of global warming affects impacts and/or risks associated with the Reasons for Concern (RFCs) and selected natural, managed and human systems

Five Reasons For Concern (RFCs) illustrate the impacts and risks of different levels of global warming for people, economies and ecosystems across sectors and regions.

Impacts and risks associated with the Reasons for Concern (RFCs)



Impacts and risks for selected natural, managed and human systems



IPCC (2018), 1.5°C Global warming, Summary for Policymakers



We are at 1°C today, 1.5°C degrees is bad, 2°C is worse, with current pledges we are off towards at least 3°C



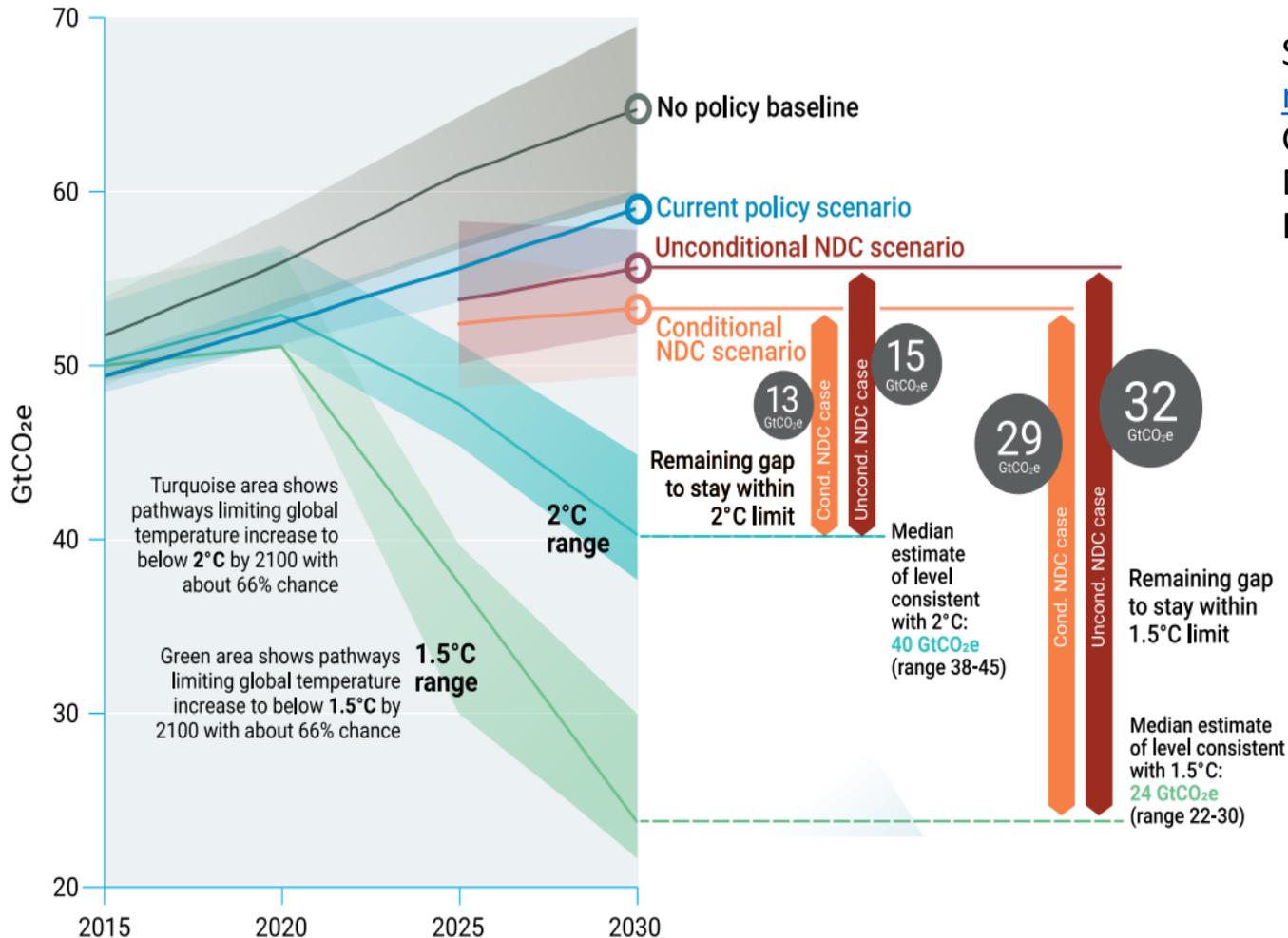
*“Pathways reflecting current NDCs imply global warming of **about 3°C by 2100**, with warming continuing afterwards. If the emissions gap is not closed by 2030, it is very plausible that the goal of a well-below 2°C temperature increase is also out of reach”.*

NDC = Nationally Determined Commitments, UN 2018 Emissions Gap Report,
<https://www.unenvironment.org/resources/emissions-gap-report-2018>



The emissions gap is widening

Figure ES.3: Global greenhouse gas emissions under different scenarios and the emissions gap in 2030 (median estimate and tenth to ninetieth percentile range)



Source : [UN emissions gap report, 2018](#), GtCO₂e = Gigatons CO₂ equivalent, NDC = Nationally Determined Contributions

The emissions gap is larger than ever

Both 1,5°C and well below 2°C are at stake

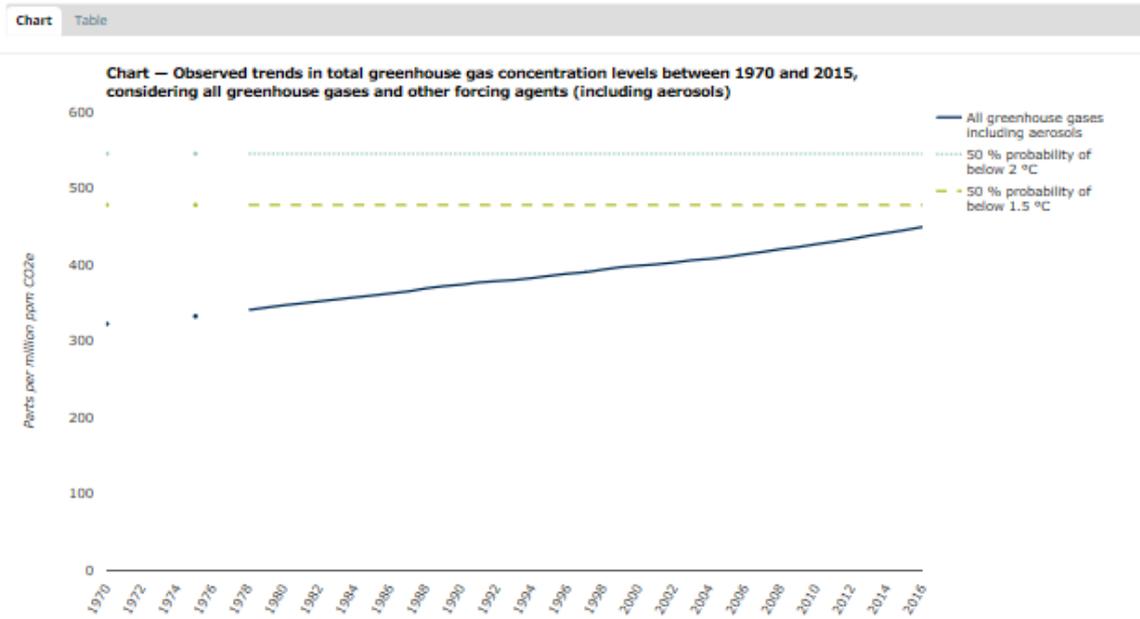


- *“Despite a decade of increasing political and societal focus on climate change and the milestone Paris Agreement, global greenhouse gas (GHG) **emissions have not been curbed, and the emissions gap is larger than ever.**”*
- *“**Unless mitigation ambition and action increase substantially and immediately** in the form of new or updated nationally determined contributions (NDCs) by 2020 and are reflected in ambitious long-term GHG development strategies, **exceeding the 1.5°C goal can no longer be avoided, and achieving the well-below 2°C temperature goal becomes increasingly challenging**”*

<https://wedocs.unep.org/bitstream/handle/20.500.11822/30022/EGR10.pdf?sequence=1&isAllowed=y>

Existing CO₂ concentrations in the atmosphere require urgent attention

Fig. 1: Observed trends in total greenhouse gas concentration levels between 1970 and 2015, considering all greenhouse gases and other forcing agents (including aerosols)



- “If the concentrations of the different greenhouse gases continue to increase at current rates, the peak concentration levels required to stay below a temperature increase of 1.5°C above pre-industrial levels, could be reached within the next 5-16 years. Peak concentration required to stay below a maximum 2°C temperature increase could be reached in 17-40 years” ([EEA,2019](#))

Notes:

Data expressed in CO₂ equivalents (see rationale for explanation). The figure includes the contribution of Kyoto Protocol gases (KPG), gases under the Montreal Protocol (MPG) and other forcing agents, such as ozone and aerosols (here called non-Protocol Gases, NPG). The 430 and 530 ppm CO₂ in equivalents correspond with a 50% probability of limiting the increase in global mean temperature to a respective 1.5 °C and 2.0 °C, above pre-industrial levels. Note that the trend only covers the 1970–2015 period, due to the limited availability of historical data on ozone forcing

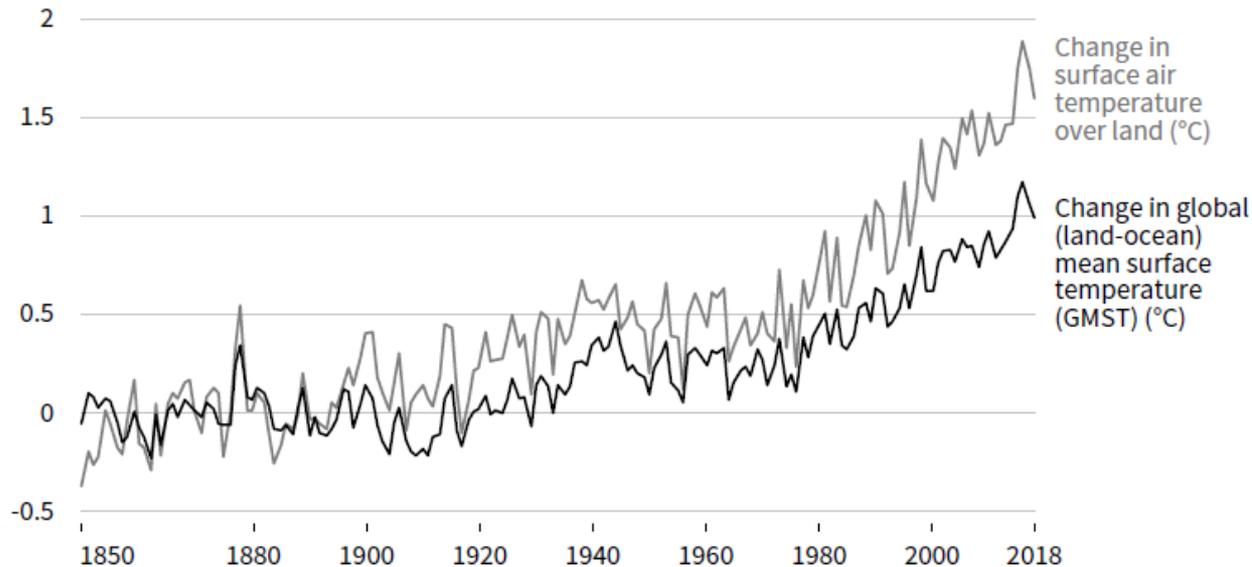
Land surface air temperature has risen nearly twice as much as the global average temperature

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).

CHANGE in TEMPERATURE rel. to 1850-1900 (°C)



ipcc

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<https://www.ipcc.ch/report/srccl/>

Extreme weather events are here now, future casualties will increase without adaptation

THE LANCET
Planetary Health

ARTICLES | VOLUME 1, ISSUE 5, PE200-E208, AUGUST 01, 2017

Increasing risk over time of weather-related hazards to the European population: a data-driven prognostic study

Dr Giovanni Forzieri, PhD   • Alessandro Cescatti, PhD • Filipe Batista e Silva, PhD • Luc Feyen, PhD

Open Access • Published: August, 2017 • DOI: [https://doi.org/10.1016/S2542-5196\(17\)30082-7](https://doi.org/10.1016/S2542-5196(17)30082-7) •



Results:

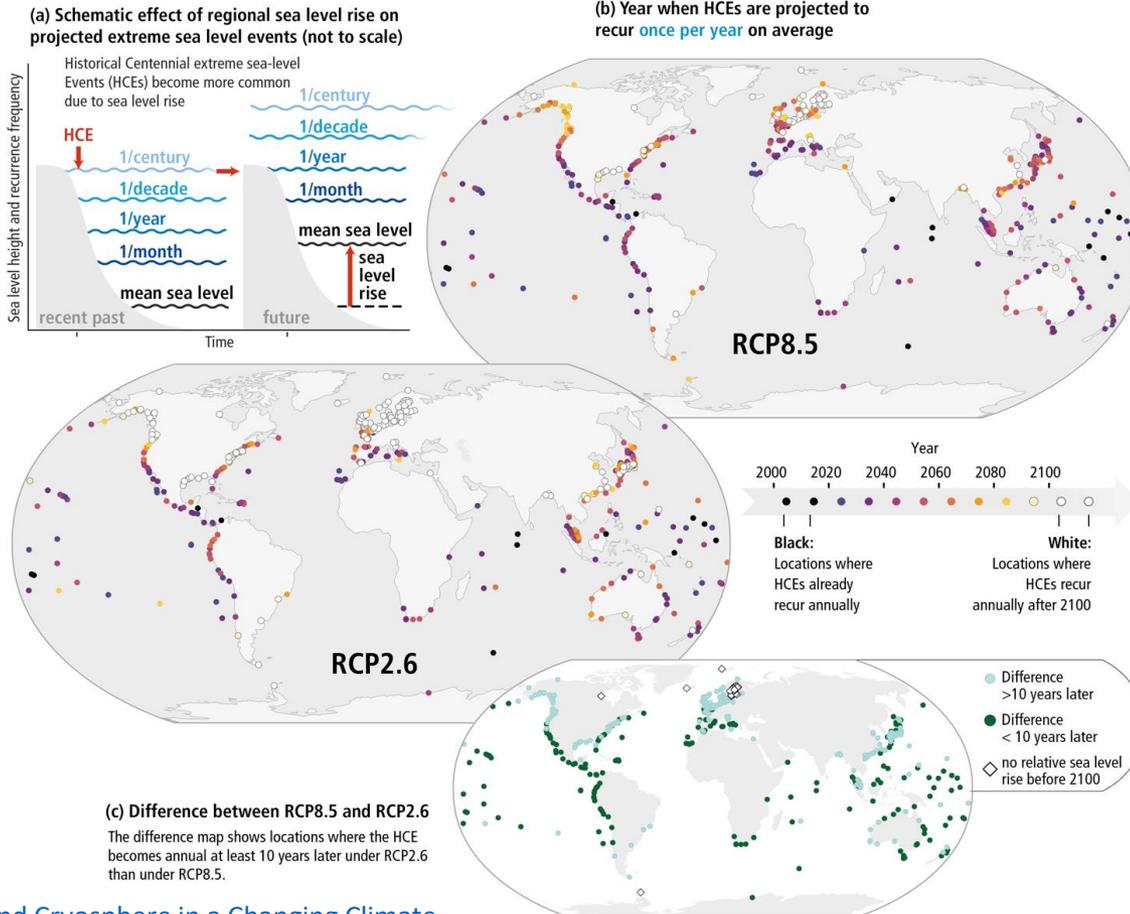
“During the reference period (1981–2010), around 3000 Europeans lose their lives each year because of weather disasters. If no adaptation measures are implemented, this number could rise substantially in the coming decades, to reach 32 500 deaths (uncertainty range 10 700–59 300) by the period 2011–40 (about a ten-times increase), 103 300 (48 300–179 300) by 2041–70 (about a 30-times increase), and 152 000 (80 500–239 800) by 2071–100 (about a 50-times increase)” [https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196\(17\)30082-7/fulltext](https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(17)30082-7/fulltext)



Extreme sea level events – from once a century to annual

Extreme sea level events

Due to projected global mean sea level (GMSL) rise, local sea levels that historically occurred once per century (historical centennial events, HCEs) are projected to become at least annual events at most locations during the 21st century. The height of a HCE varies widely, and depending on the level of exposure can already cause severe impacts. Impacts can continue to increase with rising frequency of HCEs.



Source: IPCC (2019), [The Ocean and Cryosphere in a Changing Climate](#)
RCP2.6 and RCP8.5 (Representative Concentration Pathways) are possible GHG concentration trajectories based on higher or lower future emissions



New science is challenging existing pathways

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SHARE IN DEPTH GLOBAL WARMING

New climate models forecast a warming surge

Paul Voosen
+ See all authors and affiliations

Science 19 Apr 2019;
Vol. 364, Issue 6437, pp. 222-223
DOI: 10.1126/science.364.6437.222

<https://science.sciencemag.org/content/364/6437/222>

Article Figures & Data Info & Metrics eLetters PDF

You are currently viewing the summary.

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Summary

A host of global climate models developed for the United Nations's next major assessment of global warming, due in 2021, are now showing a puzzling but undeniable trend: They are running hotter than they have in the past. In earlier models, doubling atmospheric carbon dioxide over preindustrial levels led models to predict somewhere between 2°C and 4.5°C of warming once the planet came into balance. But in at least eight of the next-generation models, produced by leading centers in the United States, the United Kingdom, Canada, and France, that "equilibrium climate sensitivity" has come in at 5°C or warmer. Many scientists, including the model developers, are doubtful this increased warming is likely to be real. Over the next year, they will be comparing notes on what happened in their models, which in many cases simulate the Earth system better than ever before. It's also possible that climate sensitivities from models will be de-emphasized in the next U.N. climate assessment, further replaced instead by restraints from the ancient climate and modern observations.

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Home Media Press Releases State of the Climate in 2018 shows accelerating climate change impacts



State of the Climate in 2018 shows accelerating climate change impacts

Tags: Climate Climate change Natural hazards Agriculture security Public health Environment Oceans

28 Published 28 March 2019

Press Release Number: 28032019

The physical signs and socio-economic impacts of climate change are accelerating as record greenhouse gas concentrations drive global temperatures towards increasingly dangerous levels, according to a new report from the World Meteorological Organization.

The WMO Statement on the State of the Global Climate in 2018, its 25th anniversary edition, highlights record sea level rise, as well as exceptionally high land and ocean temperatures over the past four years. This warming trend has lasted since the start of this century and is expected to continue.

"Since the Statement was first published, climate science has achieved an unprecedented degree of robustness, providing authoritative evidence of global temperature increase and associated features such as accelerating sea level rise, shrinking sea ice, glacier retreat and extreme events such as heat waves," said WMO Secretary-General Petteri Taalas.

These key climate change indicators are becoming more pronounced. Carbon dioxide levels, which were at 357.0 parts per million when the statement was first published in 1994, keep rising – to 405.5 parts per million in 2017. For 2018 and 2019, greenhouse gas concentrations are expected to increase further.

Latest WMO News

- Monthly Weather Summary – Kingdom of Bahrain 10 July 2019
- Wildfires: all it takes is one 8 July 2019
- European heatwave sets new temperature records 2 July 2019

<https://public.wmo.int/en/media/press-release/state-of-climate-2018-shows-accelerating-climate-change-impacts>



New science is challenging existing pathways



Climatic Change

June 2019, Volume 154, Issue 3-4, pp 351-365 | [Cite as](#)

Assessing the impacts of climate change on biodiversity: is below 2 °C enough?

Authors Authors and affiliations

Sarahi Nunez , Eric Arets, Rob Alkemade, Caspar Verwer, Rik Leemans

Open Access Article

First Online: 22 May 2019

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Abstract

Large changes in biodiversity are expected to occur if climate change continues at its current pace. Adverse effects include changes in species habitats and compositions, and consequently changes in ecosystem functioning. We assessed the magnitude of expected changes of biodiversity by performing a meta-analysis of the responses of species distributions to climate change. We focused on the proportion of local remaining species and their habitats. We summarized 97 studies and calculated two effect-size metrics from their results to quantify changes in biodiversity. These metrics are the fraction of remaining species (FRS) and the fraction of remaining area (FRA) with suitable climate for each species. Both metrics calculate deviations from the original biodiversity state and together they indicate biodiversity intactness. We found an expected gradual decrease in both FRS and FRA with significant reductions of 14% and 35% between 1 and 2 °C increase in global mean temperatures. Strong impacts are projected for both mammals and plants with FRS reductions of 19%. The climate-change response of biodiversity varies strongly among taxonomic groups and biomes. For some taxonomic groups the FRA declines strongly beyond 3 °C of temperature increase. Although these estimates are conservative, as we assume that species are unable to disperse or adapt, we conclude that already at moderate levels (i.e., 1–2 °C) of temperature increase a significant decrease of original biodiversity is projected. Our research supports the pledge to limit climate change to 1.5 °C and preferably lower to protect biodiversity.

<https://link.springer.com/article/10.1007/s10584-019-02420-x>

nature
International journal of science

Letter | Published: 02 January 2019

Greenland melt drives continuous export of methane from the ice-sheet bed

Guillaume Lamarche-Gagnon , Jemma L. Wadham, Barbara Sherwood Lollar, Sandra Arndt, Peer Fietzek, Alexander D. Beaton, Andrew J. Tedstone, Jon Telling, Elizabeth A. Bagshaw, Jon R. Hawking, Tyler J. Kohler, Jakub D. Zarsky, Matthew C. Mowlem, Alexandre M. Anesio & Marek Stibal

Nature 565, 73–77 (2019) | [Download Citation](#)

Abstract

Ice sheets are currently ignored in global methane budgets^{1,2}. Although ice sheets have been proposed to contain large reserves of methane that may contribute to a rise in atmospheric methane concentration if released during periods of rapid ice retreat^{3,4}, no data exist on the current methane footprint of ice sheets. Here we find that subglacially produced methane is rapidly driven to the ice margin by the efficient drainage system of a subglacial catchment of the Greenland ice sheet. We report the continuous export of methane-supersaturated waters (CH_{4(gaq)}) from the ice-sheet bed during the melt season. Pulses of high CH_{4(gaq)} concentration coincide with supraglacially forced subglacial flushing events, confirming a subglacial source and highlighting the influence of melt on methane export. Sustained methane fluxes over the melt season are indicative of subglacial methane reserves that exceed methane export, with an estimated 6.3 tonnes (discharge-weighted mean; range from 2.4 to 11 tonnes) of CH_{4(gaq)} transported laterally from the ice-sheet bed. Stable-isotope analyses reveal a microbial origin for methane, probably from a mixture of inorganic and ancient organic carbon buried beneath the ice. We show that subglacial hydrology is crucial for

<https://www.nature.com/articles/s41586-018-0800-0>



Sixth mass extinctions threatens web of life

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INTERVIEW ENVIRONMENT

Sixth mass extinction could destroy life as we know it – biodiversity expert

04 March 2019

by Richard Gray

Republish      



Prof. Mace says that we need to address the food system which is the major driver of biodiversity loss. Image credit - Courtesy of Professor Georgina Mace

Alarming declines in the number of insects, vertebrates and plant species around the world have raised fears that we are in the midst of a sixth major extinction that could cause a collapse of the natural ecosystems we rely upon to survive.

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*“Alarming declines in the number of insects, vertebrates and plant species around the world have raised fears that we are in the midst of a sixth major extinction that could cause a **collapse of the natural ecosystems** we rely upon to survive.”*

<https://horizon-magazine.eu/article/sixth-mass-extinction-could-destroy-life-we-know-it-biodiversity-expert.html>

IPBES Global assessment report on biodiversity and ecosystem services is an ultimate wake-up call

The biosphere and atmosphere, upon which humanity as a whole depends, have been deeply reconfigured by people.

- **75%** of the land area is very significantly altered
 - By 2050 **90%** of land is projected to be significantly altered
 - Land degradation negatively impacts the well-being of **3.2 billion** people
- **66%** of the ocean area is experiencing increasing cumulative impacts;
- **>85%** of wetland area has been lost
- By 2010, **34%** of global biodiversity had been lost with a projected increase to **38-46%** by 2050

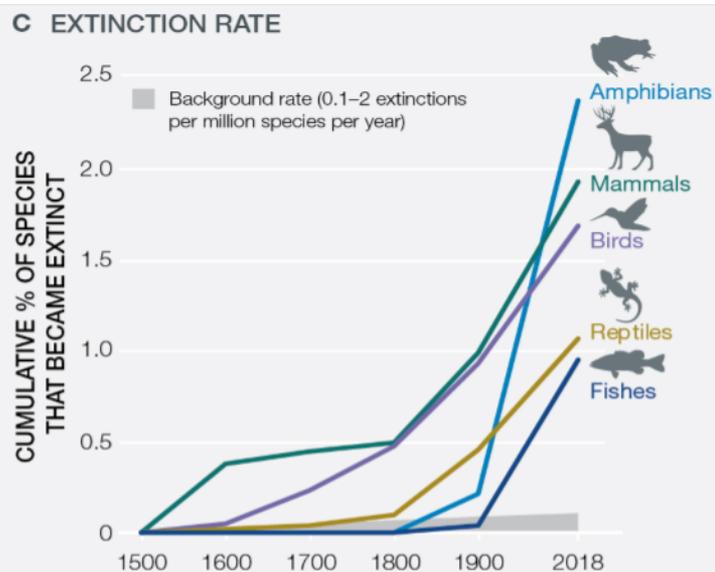
Intergovernmental
Science-Policy
Platform on
Biodiversity and
Ecosystem Services
(IPBES)

https://seea.un.org/sites/seea.un.org/files/seea_presentation_of_ipbes_global_assessment_0.pdf



IPBES Global assessment report on biodiversity and ecosystem services is an ultimate wake-up call

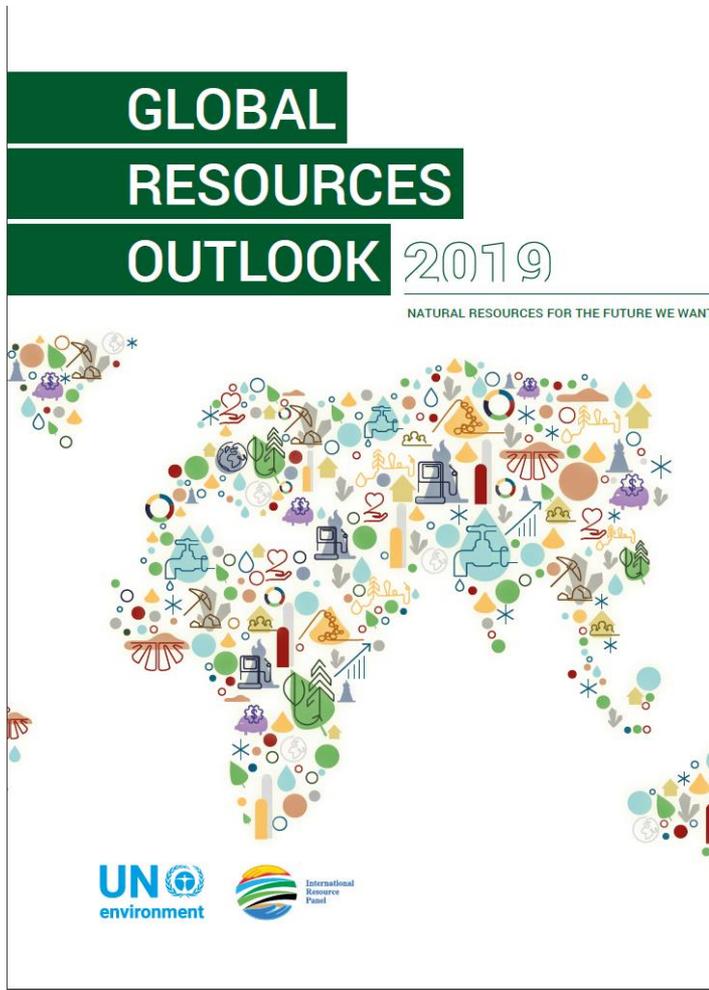
- **“Human actions threaten more species with global extinction now than ever before.** An average of around 25 per cent of species in assessed animal and plant groups are threatened (Figure SPM.3), suggesting that **around 1 million species already face extinction**, many within decades, unless action is taken to reduce the intensity of drivers of biodiversity loss. Without such action, there will be a further acceleration in the global rate of species extinction, which is already **at least tens to hundreds of times higher than it has averaged over the past 10 million years.**”



- “Globally, local varieties and breeds of domesticated plants and animals are disappearing. This loss of diversity, including genetic diversity, poses a **serious risk to global food security** by undermining the resilience of many agricultural systems to threats such as pests, pathogens and climate change.”

Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (2019), <https://www.ipbes.net/global-assessment-report-biodiversity-ecosystem-services>

Our resource use is a driver for the planetary emergency

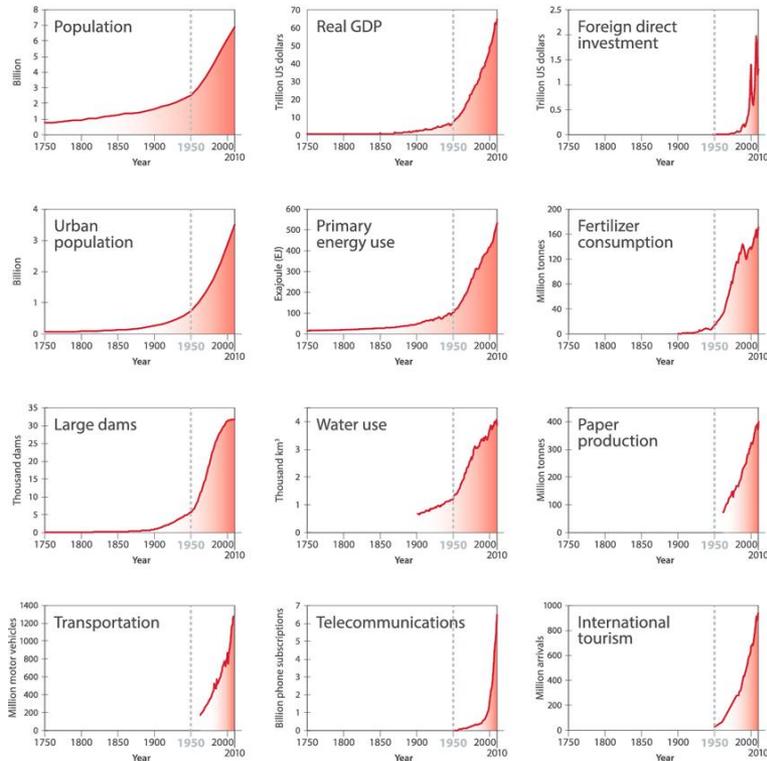


*“Natural resource extraction and processing make up approximately **50 per cent of the total greenhouse gas (GHG) emissions**. Resource-related **impacts on water stress and biodiversity loss due to land use are even more significant at over 90 per cent**. If the rising trend in resourcerelated impacts persists, the goals of the Paris agreement will become difficult to meet and the achievement of the Sustainable Development Goals, including SDG 15.5 to halt biodiversity loss, will be put at risk.”*

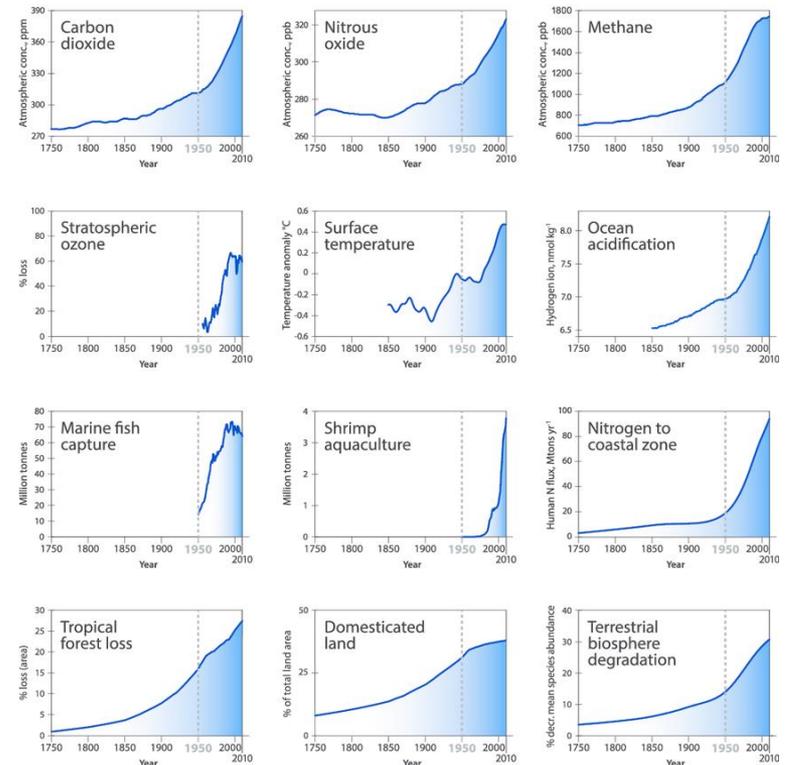
<https://www.resourcepanel.org/reports/global-resources-outlook>

Humankind has entered the Anthropocene

Socio-economic trends



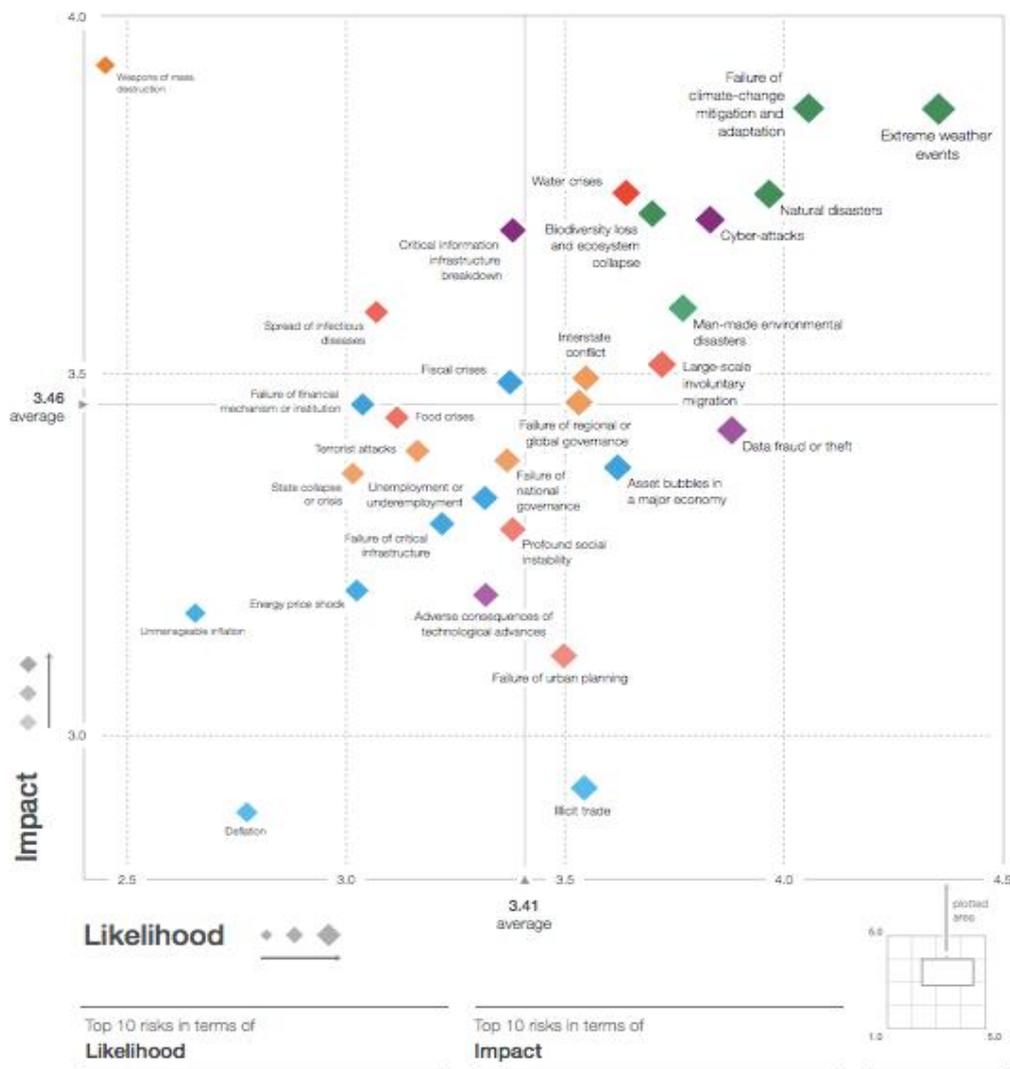
Earth system trends



Steffen et al (2015), [The Trajectory of the Anthropocene, The Great Acceleration](#)



Climate and environmental risks combine high impact and high likelihood



“Is the world sleepwalking into a crisis? Global risks are intensifying but the collective will to tackle them appears to be lacking. Instead, divisions are hardening”.

Source, [WEF Global Risk Report, 2019 Risk Landscape](#)



Unprecedented change is needed NOW

- **“Limiting global warming to 1.5°C would require rapid, far-reaching and unprecedented changes in all aspects of society. [...] With clear benefits to people and natural ecosystems, limiting global warming to 1.5°C compared to 2°C could go hand in hand with ensuring a more sustainable and equitable society.”**

The [IPCC](#) highlights these linkages in its presentation of the 1.5°C report

- **“deep transformation based on a fundamental reorientation of human values, equity, behavior, institutions, economies, and technologies”**

[Steffen et al \(2018\)](#)

- **« Un changement systémique est nécessaire et urgent si l'on veut s'attaquer efficacement aux changements climatiques et à la crise des écosystèmes. »**

[Panel Climat et le Développement Durable, 2019](#)

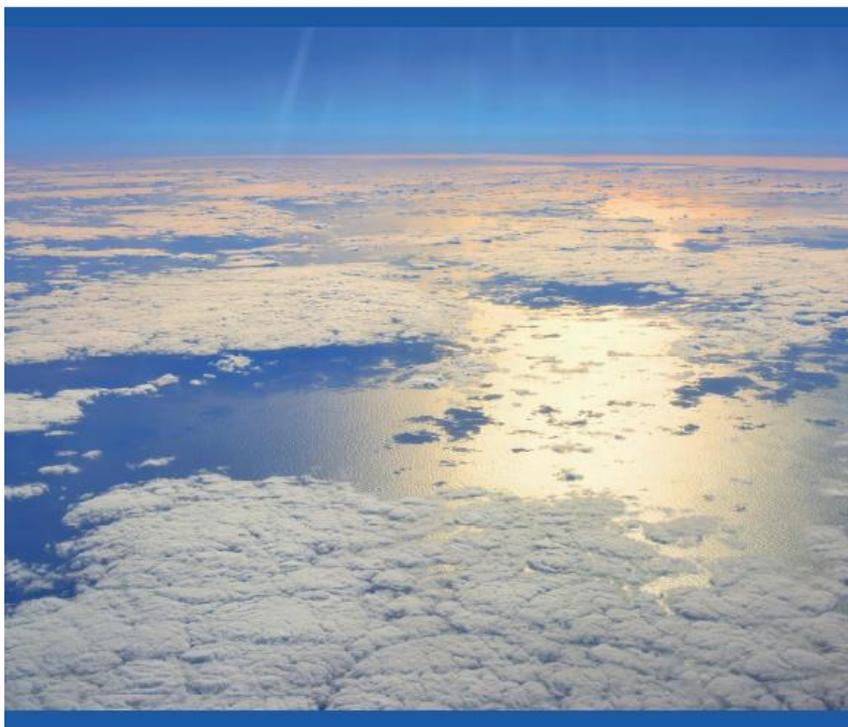


Only immediate and all-inclusive action leaves us a chance Need to multiply ambition



United In Science

High-level synthesis report of latest climate science information
convened by the Science Advisory Group of
the UN Climate Action Summit 2019



*“Only **immediate and all-inclusive action** encompassing: deep decarbonization complemented by ambitious policy measures, protection and enhancement of carbon sinks and biodiversity, and efforts to remove CO₂ from the atmosphere, will enable us to meet the Paris Agreement.”*

*“The current level of NDC ambition needs to be roughly tripled for emission reduction to be in line with the 2°C goal and **increased fivefold for the 1.5°C goal**. Technically it is still possible to bridge the gap”*

NDC = Nationally determined contributions

https://public.wmo.int/en/resources/unity_in_science



Climate emergency is calling to go faster



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ENVIRONMENT POLICY

'I would like people to panic' – Top scientist unveils equation showing world in climate emergency

24 September 2019

by Joanna Roberts



'As Greta Thunberg would say, I would like people to panic and take action,' said Prof. Schellnhuber. Image credit - PlanetMallika/ Pixabay

'If we don't solve the climate crisis, we can forget about the rest.'

Professor Hans Joachim Schellnhuber, founder, Potsdam Institute for Climate Impact Research, Germany

*"Prof. Schellnhuber believes that as the industrial revolution started in Europe, the bloc should show further leadership by **bringing the decarbonisation target forward to 2040.**"*

<https://horizon-magazine.eu/article/i-would-people-panic-top-scientist-unveils-equation-showing-world-climate-emergency.html>



IPBES: Transformative changes across economic, social, political and technological factors

- *“Goals for [...] achieving sustainability cannot be met by current trajectories, and goals for 2030 and beyond may only be achieved through transformative changes across economic, social, political and technological factors. [...]”*

[IPBES, Global assessment report](#), Summary for policymakers, 2019

A key constituent of sustainable pathways is the evolution of global financial and economic systems to build a global sustainable economy

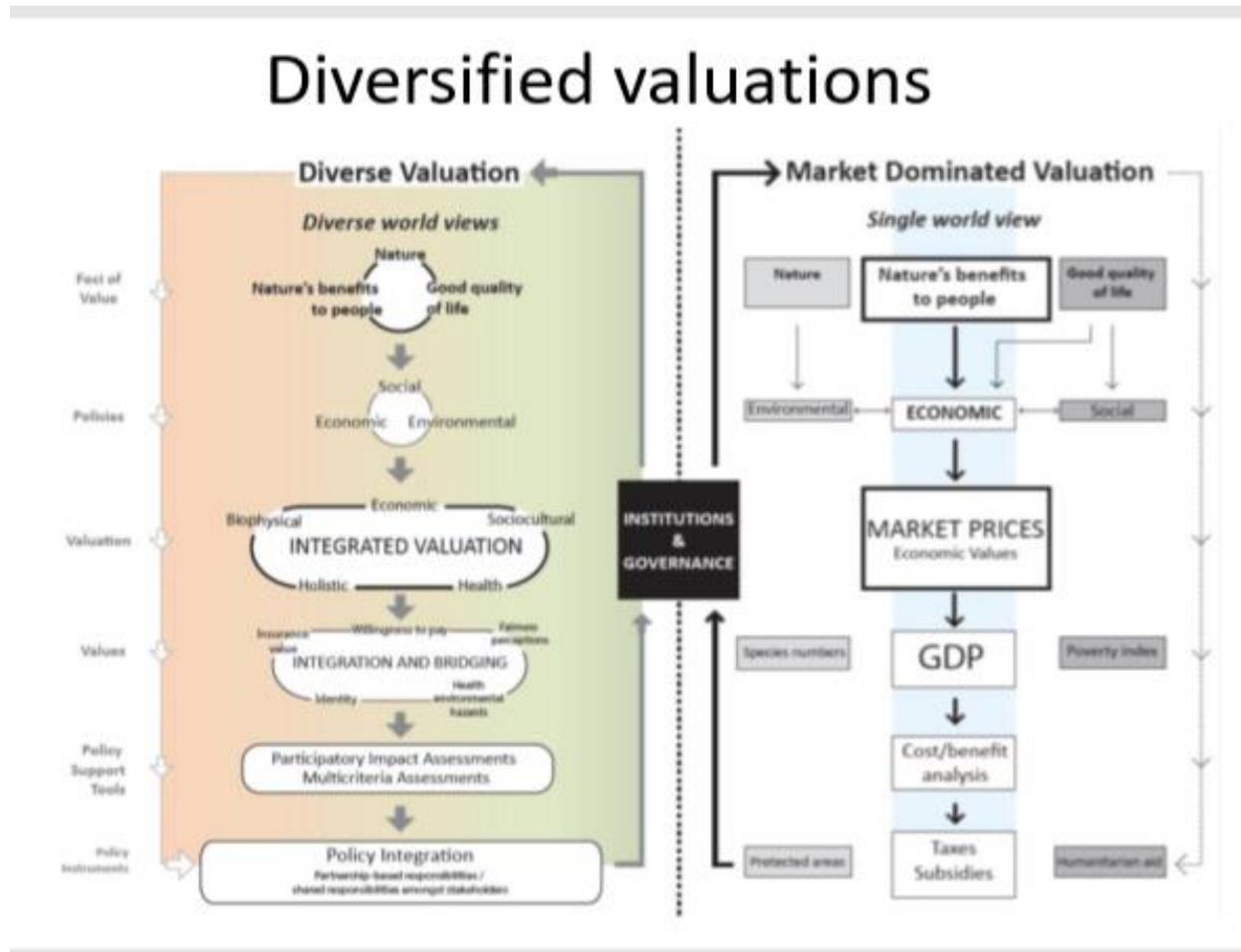
One that steers away from the current limited paradigm of economic growth

- **Incorporate natural capital into national accounting systems**
- **Recognize both market, non-market and social values in decision-making**
- **Eliminate harmful agricultural, energy and transportation subsidies**
- **Incentives for sustainable production and consumption**
- **Internalize extranalties**

https://seea.un.org/sites/seea.un.org/files/seea_presentation_of_ipbes_global_assessment_0.pdf



IPBES: From market prices to diversified valuations



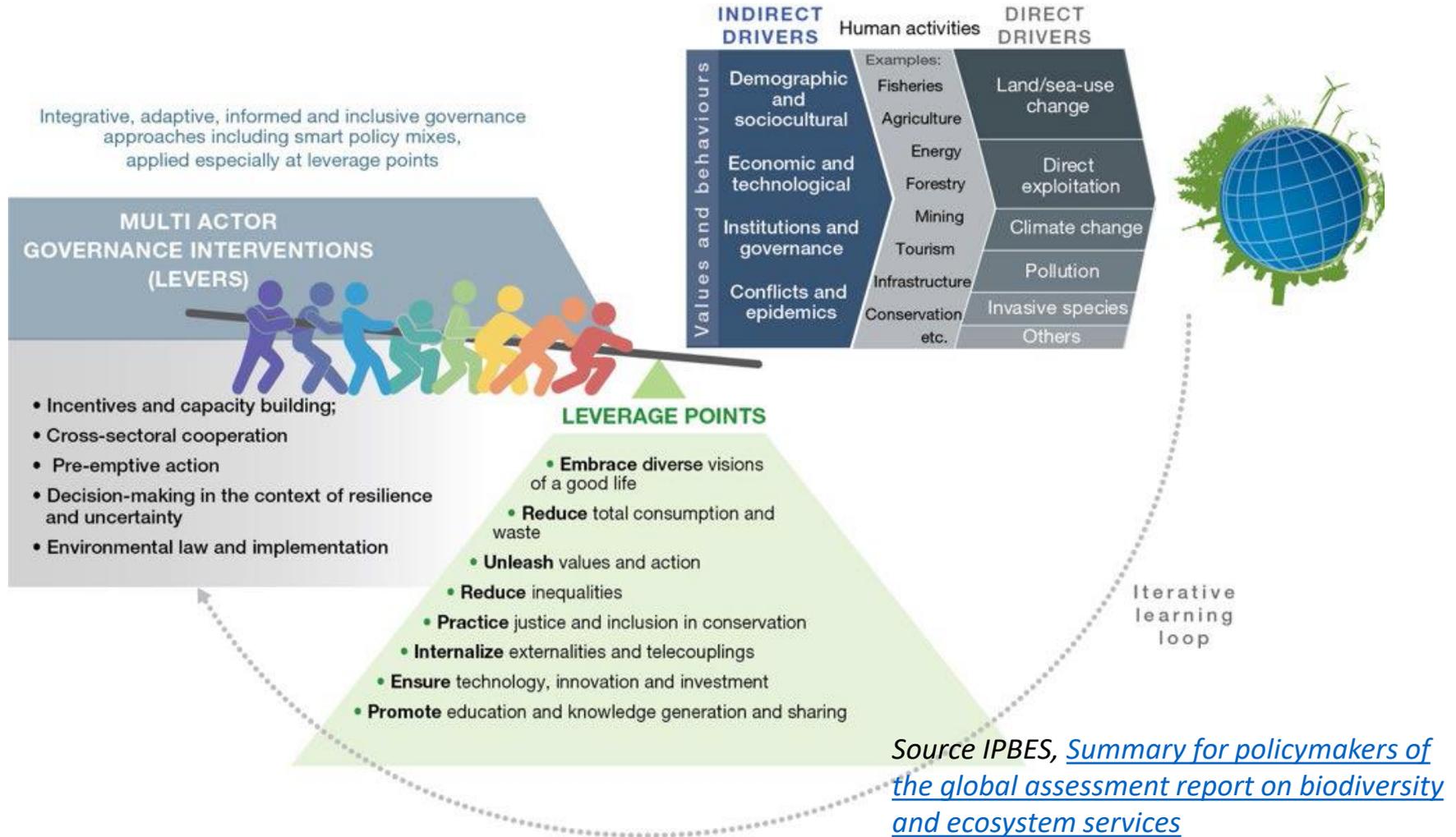
IPBES, [Global assessment report](https://www.ipbes.org/global-assessment-report), Summary for policymakers, 2019, https://seea.un.org/sites/seea.un.org/files/seea_presentation_of_ipbes_global_assessment_0.pdf

See also <https://www.sciencedirect.com/science/article/pii/S1877343517300040> and

https://www.researchgate.net/publication/334523003_Understanding_the_diversity_of_values_of_Nature's_contributions_to_people_insights_from_the_IPBES_Assessment_of_Europe_and_Central_Asia



IPBES: Multi-actor interventions on leverage points



IPBES Global assessment report on biodiversity and ecosystem services is a call for transformational change

In Conclusion

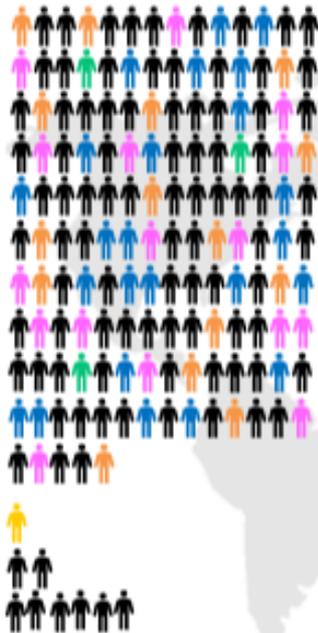
- Trends worrying (loss of species, degradation of ecosystems, loss of ecosystem services) and business-as-usual clearly unsustainable
- A call for action – transformational change:
 - Tackle the direct and indirect drivers of biodiversity loss
 - Address climate change and loss of biodiversity together
 - Replicate and scale successful policies and projects
 - Coordinate and integrate cross sectoral actions
 - Evolve economic and financial systems
 - Eliminate harmful agriculture, energy and transportation subsidies
 - Incorporate natural capital into decision-making
 - Provide incentives to stimulate sustainable production and consumption
 - Embrace circular economy
- Ensure inclusive governance structures (inc Governments, private sector, civil society and IPLCs)
(IPLCs = Indigenous people and local communities)

[IPBES, Global assessment report](#), Summary for policymakers, 2019

https://seea.un.org/sites/seea.un.org/files/seea_presentation_of_ipbes_global_assessment_0.pdf

Planetary emergency is not an issue for natural sciences alone

The Author Team



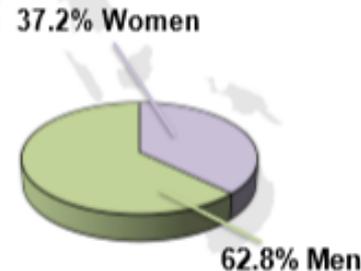
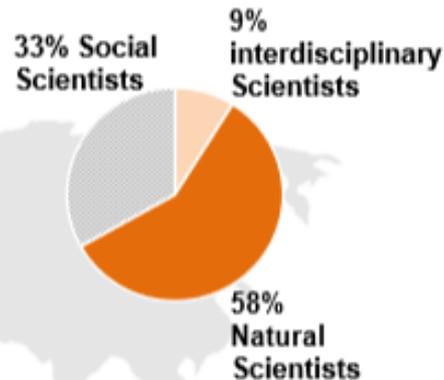
**~156,000 Hours of
Voluntary Hours =
~17 years**

145 experts:
3 co-chairs
24 coordinating lead authors
87 lead authors
310 contributing authors
15 review editors
16 fellows
From 51 countries

2 expert and
Government reviews

Supported by:
The Global TSU
6 Chapter scientists
1 resource person

Other supporting TSUs:
Indigenous and local
Knowledge, Scenarios, Values,
Knowledge & Data, Capacity
Building



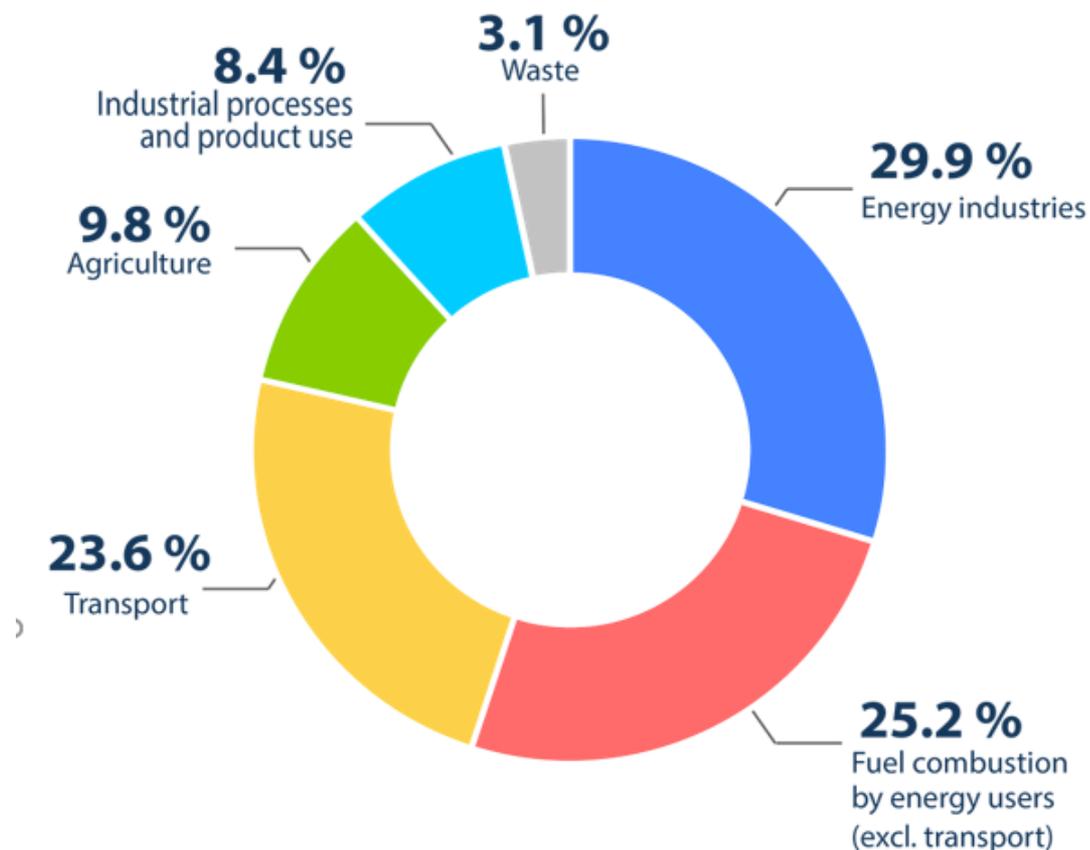
Management
Committee

IPBES Global
Assessment 2019,
Presentation of
report,

https://seea.un.org/sites/seea.un.org/files/seea_presentation_of_ipbes_global_assessment_0.pdf

Targeting EU greenhouse gas emissions in all sectors

Share of EU greenhouse gas emission by source, 2015



Eurostat: [Shedding light on energy in the EU \(2018c\)](#), EEA data. Trade-related emissions such as land use change for feed imports or outsourcing of production are not included.

12 key levers for unprecedented change NOW explored in discussion paper

Overarching:

- Sustainable Development with one **single compass** to navigate planetary boundaries and social foundations
- Research, Innovation, Investment and Digitalization **directed** towards positive systemic transformation

Policy foundations

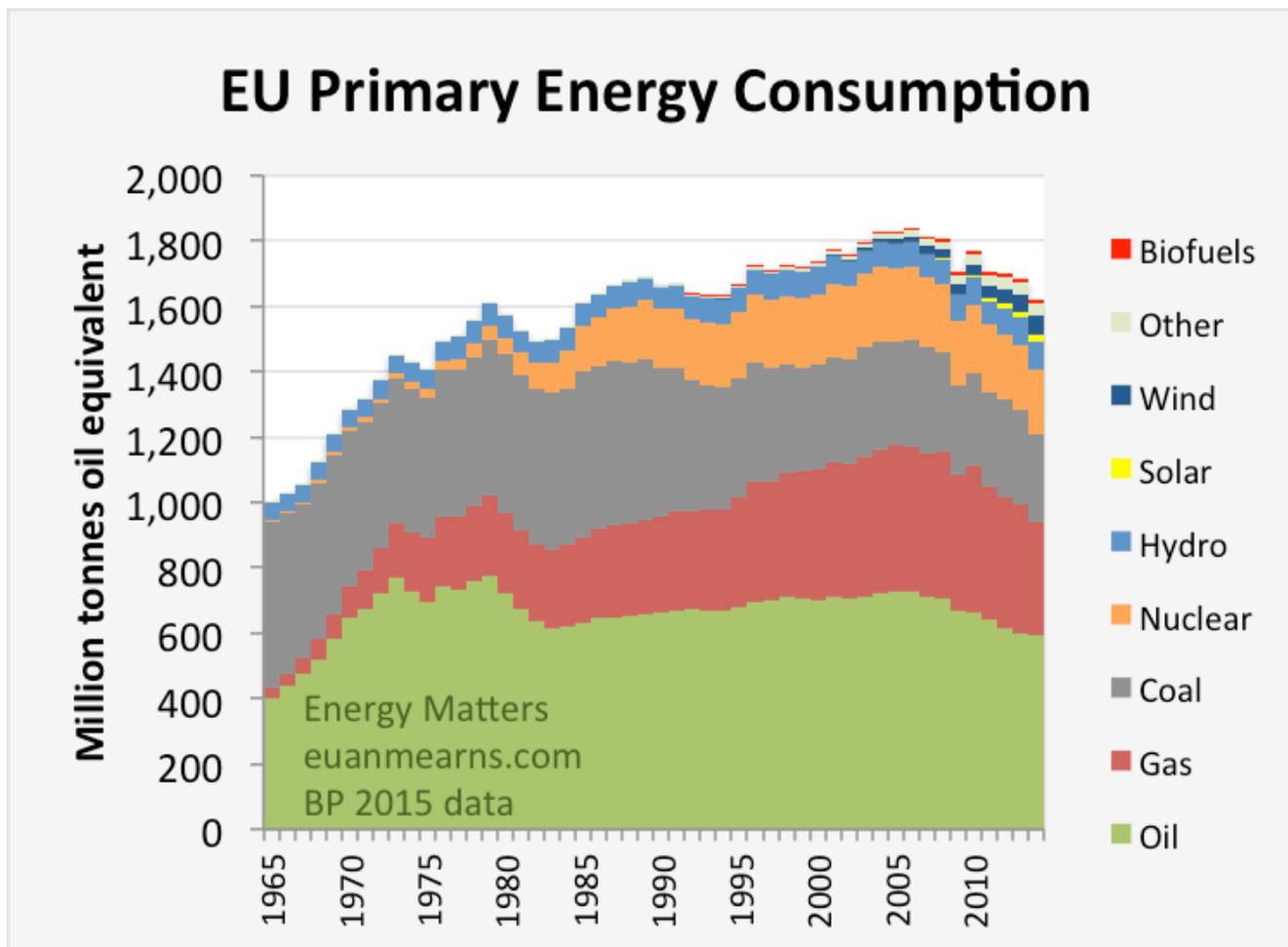
- Boosting energy saving and renewables now to phase out fossil fuels
- Reinventing mobility and transport now
- Shifting to agro-ecology and a new food system now
- Conserving and restoring natural ecosystems and creating carbon sinks to remove CO₂ from the atmosphere now
- Reducing consumption in a regenerative and circular economy now
- Prioritising resilience and disaster preparedness now

Cross-cutting enablers

- Seeking climate justice and solidarity now
- Turning the financial system into a climate solution now
- Using trade and international cooperation to tackle climate disruption and the planetary emergency now
- Rethinking the economy redefining prosperity and wellbeing now
- Grounding our values on life and community now
- Practising new forms of deliberation and co-creation now and Walking the talk

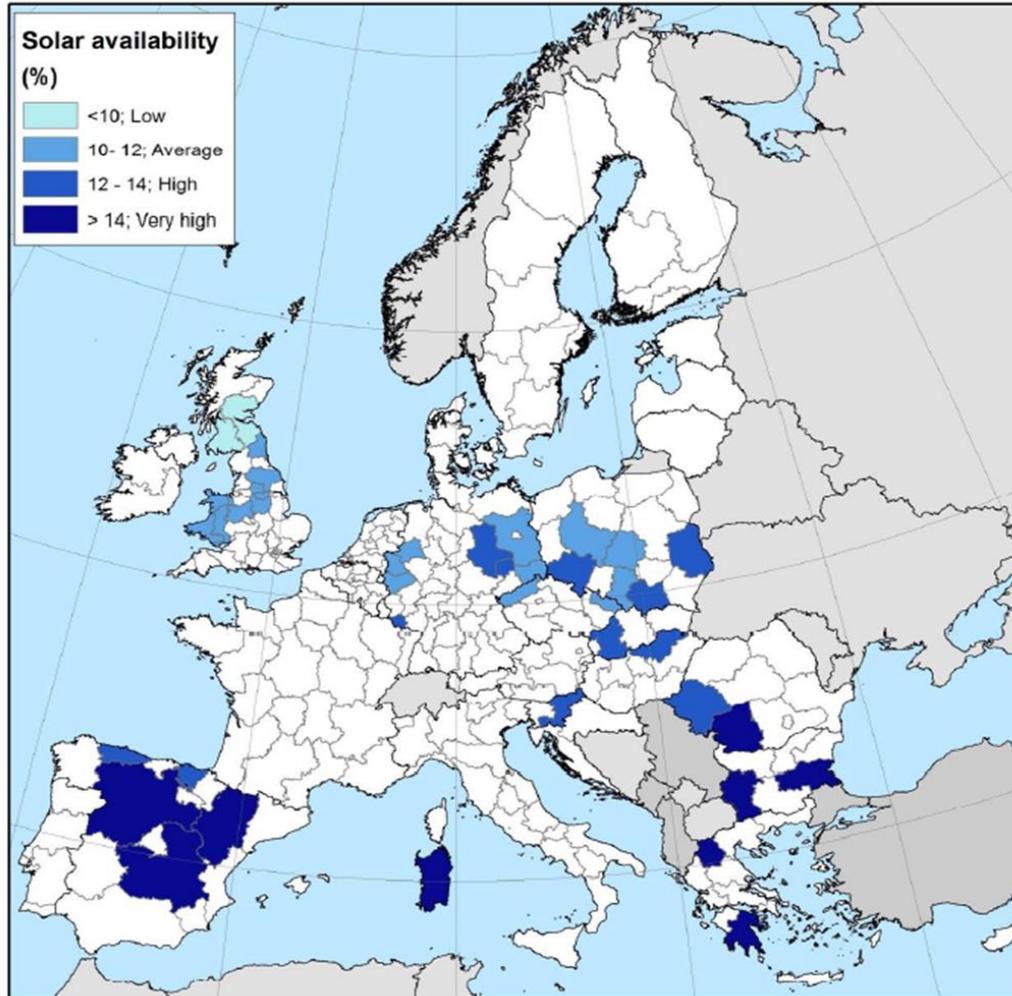


Our energy system remains largely fossil-based



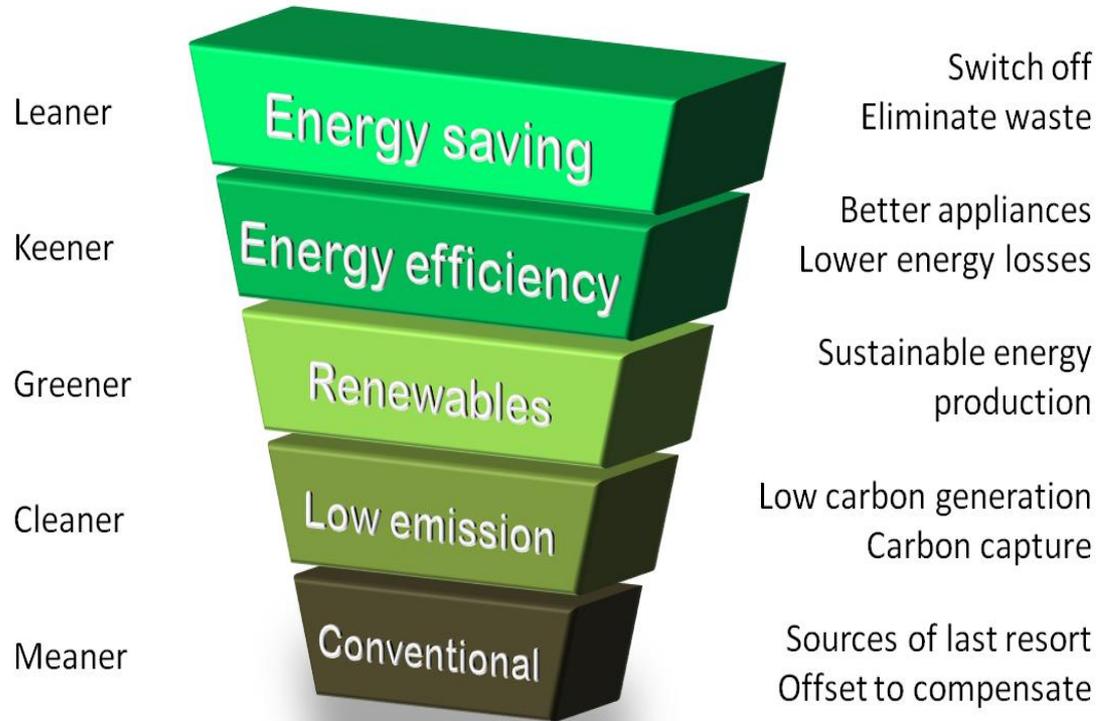
Source: Energy Matters, BP Data, <http://euanmearns.com/eu-2020-renewable-energy-targets-part-i/>

Post-coal is now



Source: JRC (2018), [EU coal regions: opportunities and challenges ahead](#), Solar availability factors (%) at regions hosting coal mining infrastructure

Energy saving first: LESS

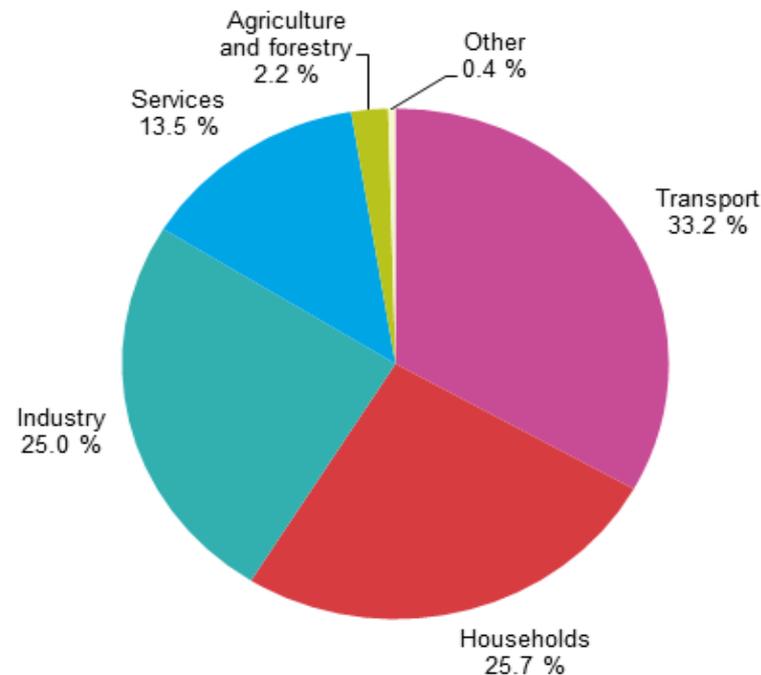


Energy hierarchy, https://commons.wikimedia.org/wiki/File:Energy_Hierarchy.png



Energy is embedded in everything we produce, consume, under-use or waste

Final energy consumption by sector, EU-28, 2016
(% of total, based on tonnes of oil equivalent)



Source: Eurostat (online data code: nrg_100a)

Source: [Eurostat 2016](#)

eurostat 



Boosting renewables everywhere

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ENERGY

Can we produce enough green hydrogen to save the world?

15 November 2018

by Jonathan O'Callaghan

Republish      



Using a proton exchange membrane electrolyser to produce hydrogen from renewable electricity and water can help industry slash emissions. Image credit - Siemens

Around a fifth of all greenhouse gas emissions are produced by industries such as steel and cement so if we're going to work towards an emission-free society then this is a good place to start. And one promising technology may have a key role to play.

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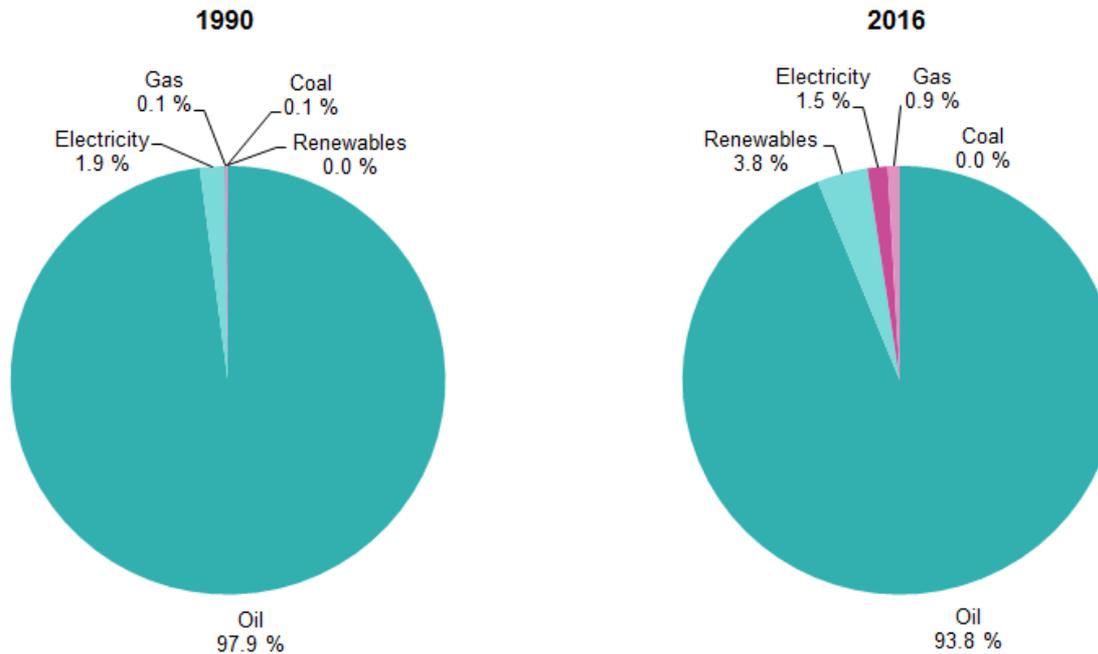
Enter your email address

<https://horizon-magazine.eu/article/can-we-produce-enough-green-hydrogen-save-world.html>



Our transport system depends 94% on oil

Use of fuels in transport, EU-28, 1990 and 2016 (%)



Source: Eurostat (online data code: nrg_110a)

eurostat 



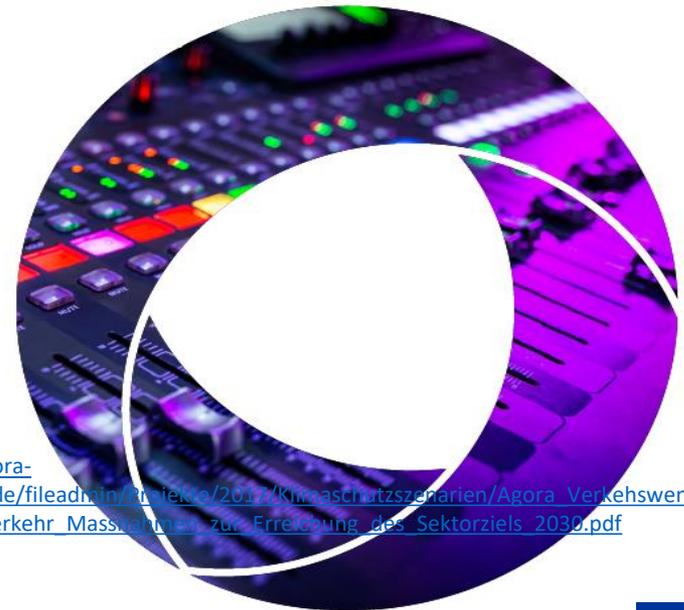
Systemic solutions for mobility generate co-benefits



Source: Copenhagenize, <http://www.copenhagenize.com/2010/03/human-powered-poetry.html>



Klimaschutz im Verkehr:
Maßnahmen zur Erreichung des
Sektorziels 2030



https://www.agora-verkehrswende.de/fileadmin/Projekte/2017/Klimaschutzszenarien/Agora_Verkehrswende_Klimaschutz_im_Verkehr_Maßnahmen_zur_Erreichung_des_Sektorziels_2030.pdf



Agro-ecology, a new food system, rewarding land for storing carbon

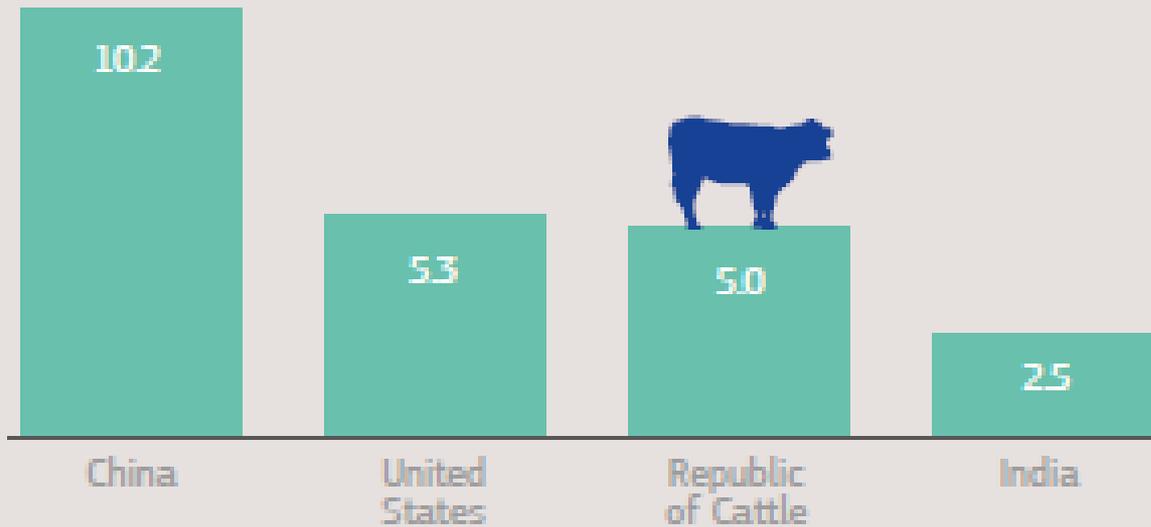


arc20 <http://www.arc2020.eu/agroecology-tale-two-continents/>

Meat is not a side issue

If cattle were a country, they would rank third in greenhouse gas emissions

Gigatonnes of CO₂ emissions per year (CO₂ equivalent for cattle)



Source: UNFCCC, European Commission, UNFAO

EPSC, Ten trends reshaping Climate and Energy



Protecting and restoring ecosystems

MENU

nature
International Journal of Science

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WORLD VIEW · 21 MAY 2019

How China will protect one-quarter of its land



Other nations could learn from China's red-line initiative to preserve nature, biodiversity and ecosystem services in the country, says Jixi Gao.

Jixi Gao



China's dramatic growth has brought staggering air and water pollution. So some people are surprised to learn of a major initiative to protect more than one-quarter of the Chinese mainland – an area almost the size of France, Spain, Turkey, Germany and Italy combined, totalling more than 2.4 million square kilometres.

Called the China Ecological Conservation Red Line (ECRL), the initiative began in 2011, building on ten years of local practice and drawing on economic, population, ecological and other government and academic data. The ECRL implements strategies I developed in 2010 to identify and protect important ecological systems. Plans are already in place for 15 provinces, including Beijing and the Yangtze River economic area. The rest will be completed by the end of the year.

Next year's landmark Convention on Biological Diversity (CBD) will be held in China for the first time since going into force in 1993. It will set the global game plan for preserving nature over the next decade: a major focus is innovation around biodiversity and land degradation. Past biodiversity targets have not been met, and the 2020 CBD meeting needs to put forward goals that are both ambitious and practical. The red-line approach could be instructive, because it is designed to protect almost all rare and endangered species and their habitats in China.

PDF version

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<https://www.nature.com/articles/d41586-019-01563-2>

We need to protect 30% of the planet by 2030. This is how we can do it



We are losing species at a rate 1000 times greater than the natural extinction rate.

Image: REUTERS/Bruno Kelly

22 Apr 2019

Nicole Schwab
Director, International Relations, Last Wild Places, National Geographic Society

Kristin Rechberger
Chief Executive Officer, Dynamic Planet



New report: Top 10 Emerging Technologies of 2019

At a time when the world is grappling with meeting the Paris Climate Agreement and trying to prevent the sixth mass extinction on Earth, an international team of scientists has published a way forward – a [Global Deal for Nature](#).

The science-backed plan, published in *Science Advances*, proposes ambitious targets for the conservation of nature as the most effective pathway to address the extinction crisis and help us avert catastrophic climate change, before it's too late.

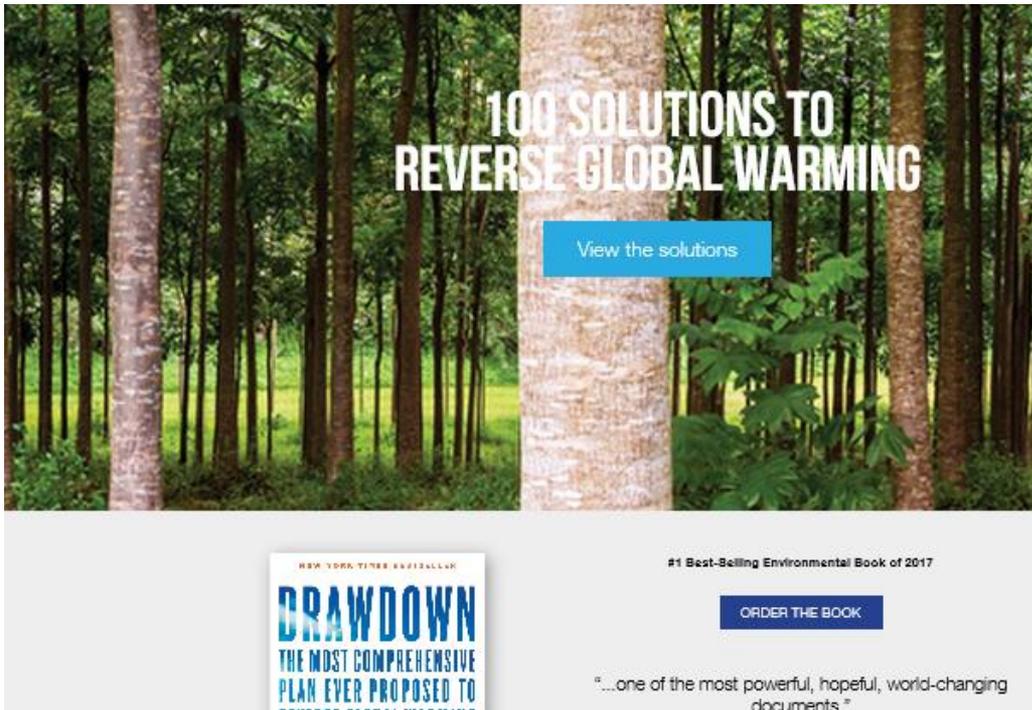
The deal calls for 30% of the planet to be protected by 2030, with an additional 20% to be maintained or restored to a natural state and designated as climate stabilization areas.

The link between biodiversity and climate change

<https://www.weforum.org/agenda/2019/04/why-protect-30-planet-2030-global-deal-nature-conservation/>



Natural solutions for carbon removal work



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Source: [EMoNFU](#) Life Project, Urban and Peri-urban Forests

In search of sustainable technical solutions for carbon dioxide removal



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The Climeworks carbon sucking plant in Switzerland.

Climeworks

In Switzerland, a giant new machine is sucking carbon directly from the air

By Christa Marshall, E&E News | Jun. 1, 2017, 10:30 AM

Source : Crista Marshall, Science, [In Switzerland, a giant new machine is sucking carbon directly from the air](#), [ClimeWorks Carbon sucking plant](#)



More circular, more bio-based, more regenerative

OUTLINE OF A CIRCULAR ECONOMY

PRINCIPLE

1

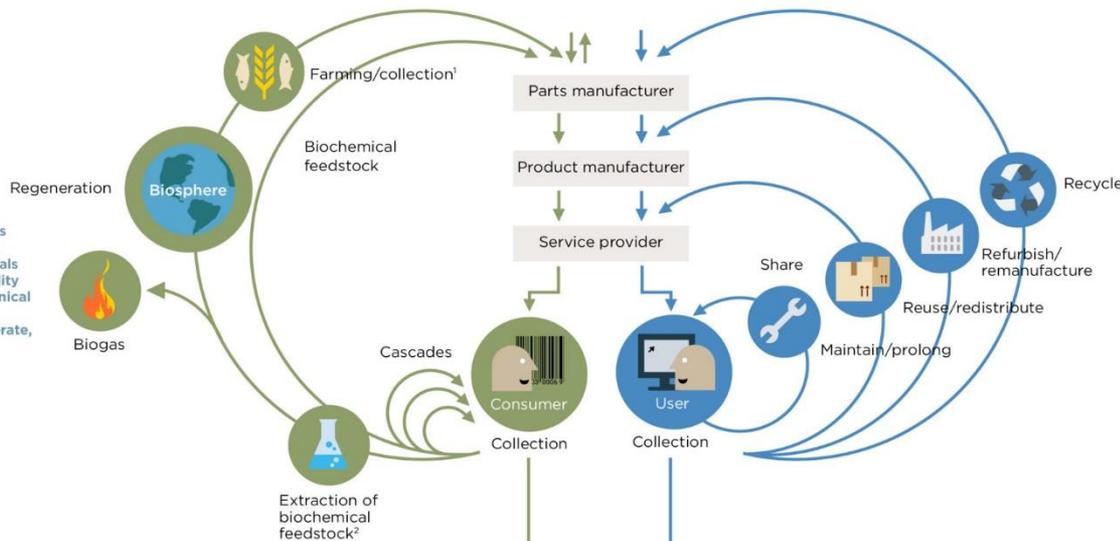
Preserve and enhance natural capital by controlling finite stocks and balancing renewable resource flows
 ReSOLVE levers: regenerate, virtualise, exchange



PRINCIPLE

2

Optimise resource yields by circulating products, components and materials in use at the highest utility at all times in both technical and biological cycles
 ReSOLVE levers: regenerate, share, optimise, loop



PRINCIPLE

3

Foster system effectiveness by revealing and designing out negative externalities
 All ReSOLVE levers

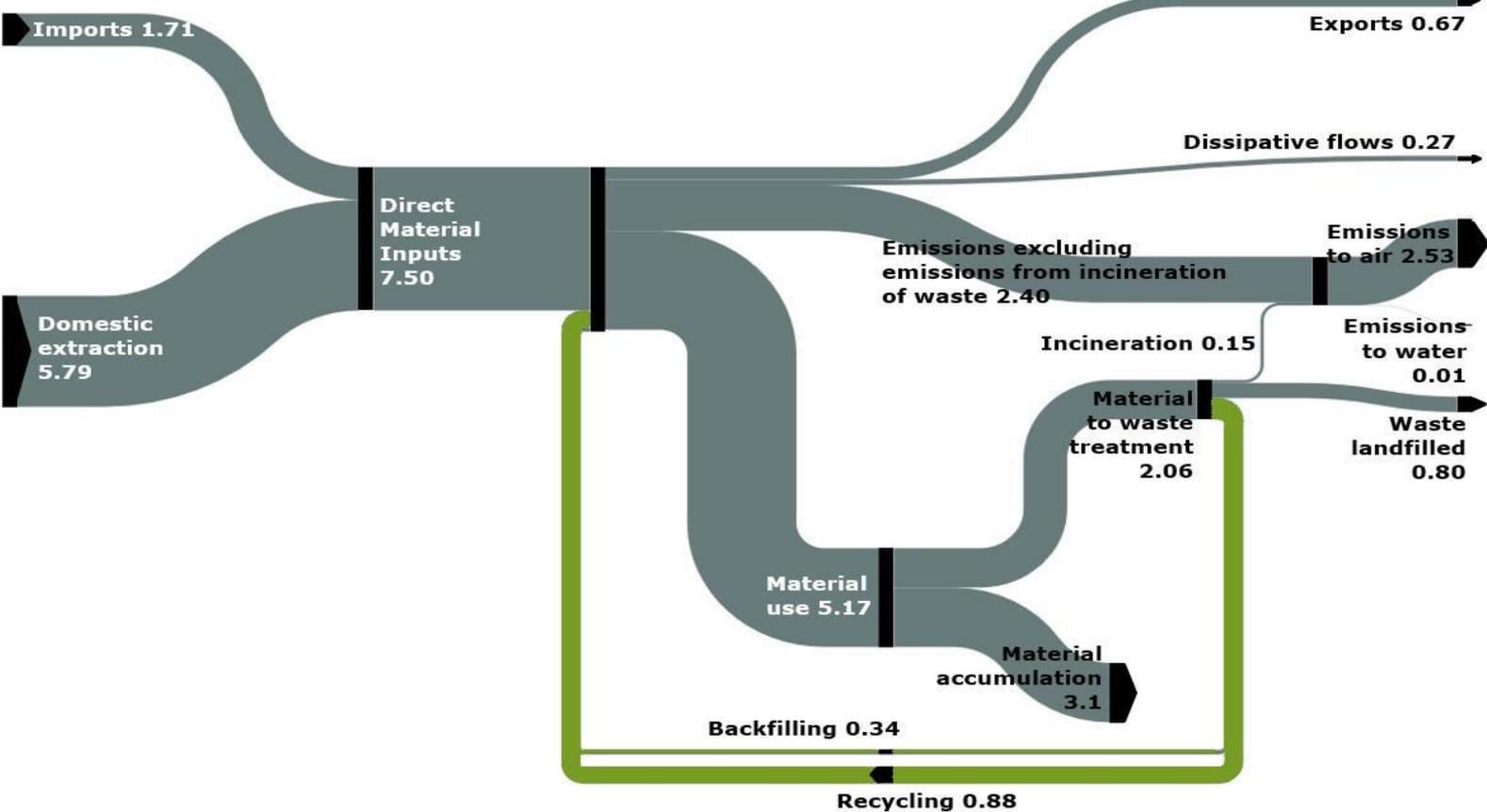


1. Hunting and fishing
 2. Can take both post-harvest and post-consumer waste as an input
 Source: Ellen MacArthur Foundation, SUN, and McKinsey Center for Business and Environment; Drawing from Braungart & McDonough, Cradle to Cradle (C2C).

Source; Ellen MacArthur Foundation,
<https://www.ellenmacarthurfoundation.org/circular-economy/infographic>



More circular, more bio-based, more regenerative

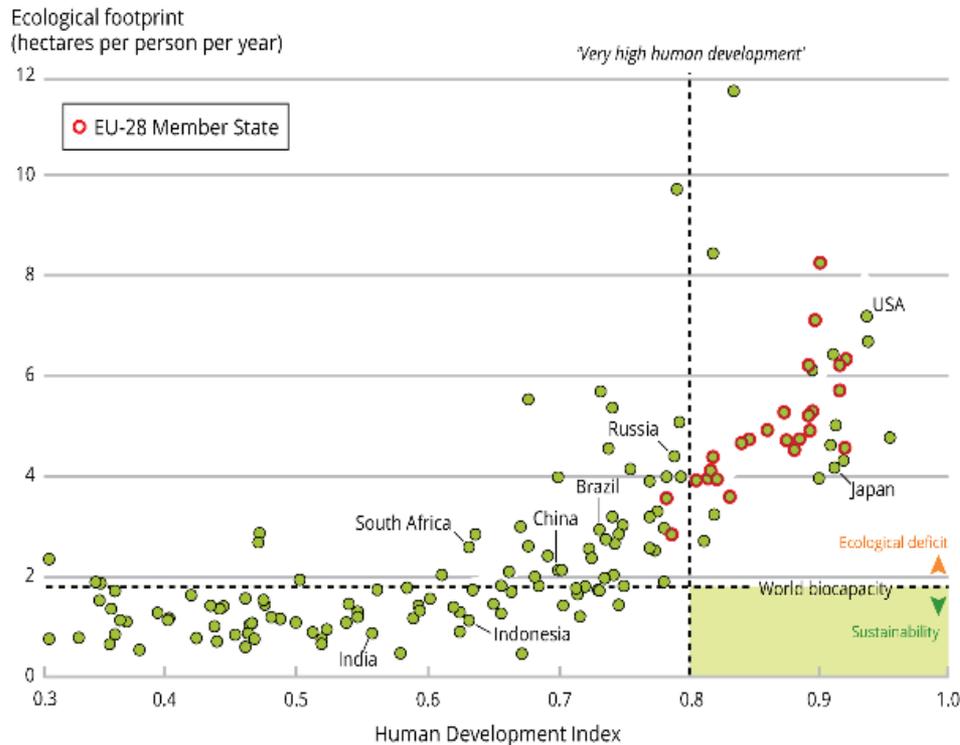


Material Flows in the Circular Economy. Source: Eurostat, [Material flows true scale in Gt/year](#) (billion tonne per year) in 2016



Do we need to reduce consumption?

Figure 0.1: Correlation of ecological footprint (2008) and the human development index (2012)



Source: Global Footprint Network, 2012; UNDP, 2014a.  National footprint accounts 2008 and  Human Development Index (HDI)

Source : EEA, Setting the Scene, <https://www.eea.europa.eu/soer-2015/global/setting-the-scene>

Do we need to reduce consumption?

Country Overshoot Days 2018

When would Earth Overshoot Day land if the world's population lived like...



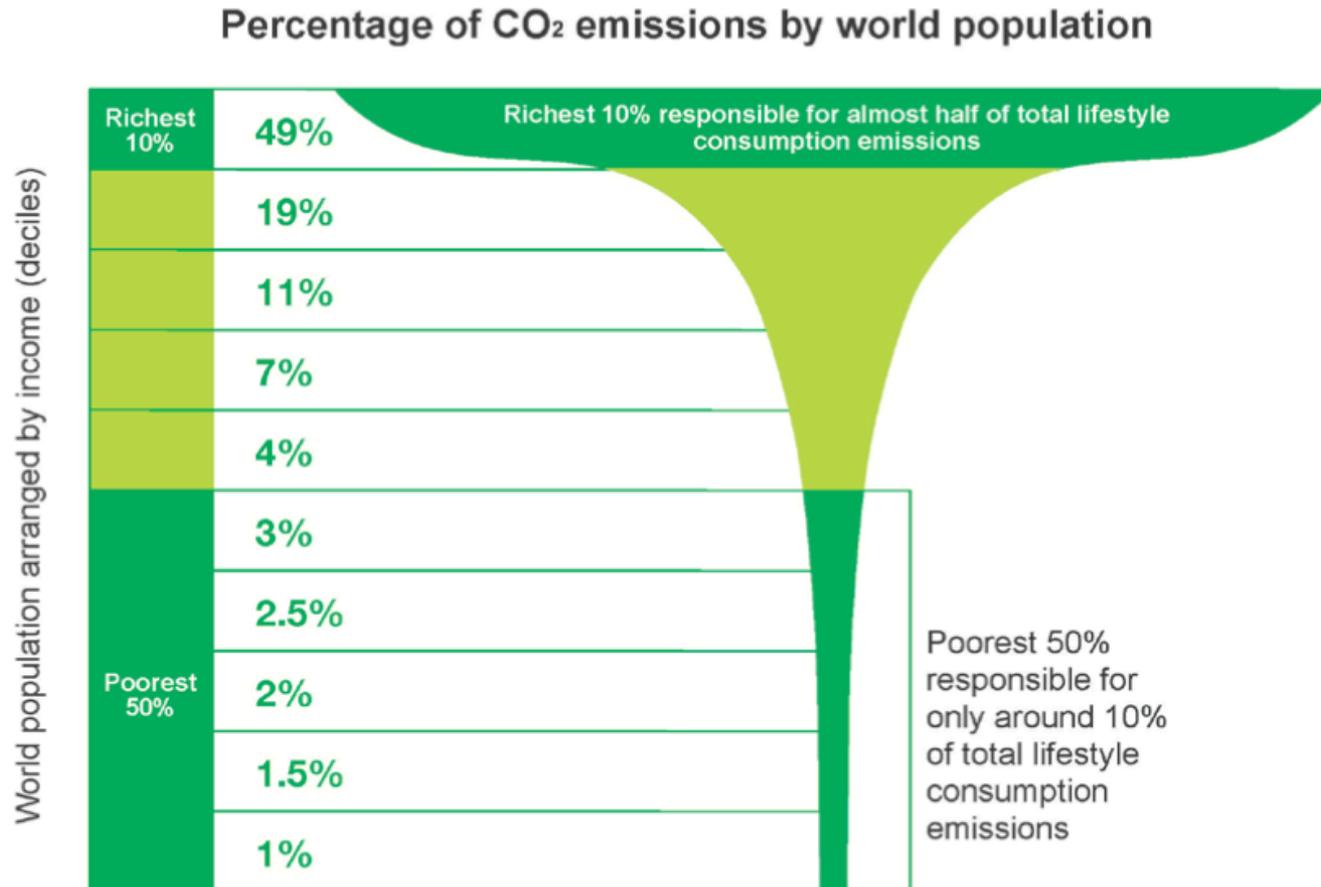
Source: Global Footprint Network National Footprint Accounts 2018



Global Footprint Network, [Country Overshoot Days 2018](#)

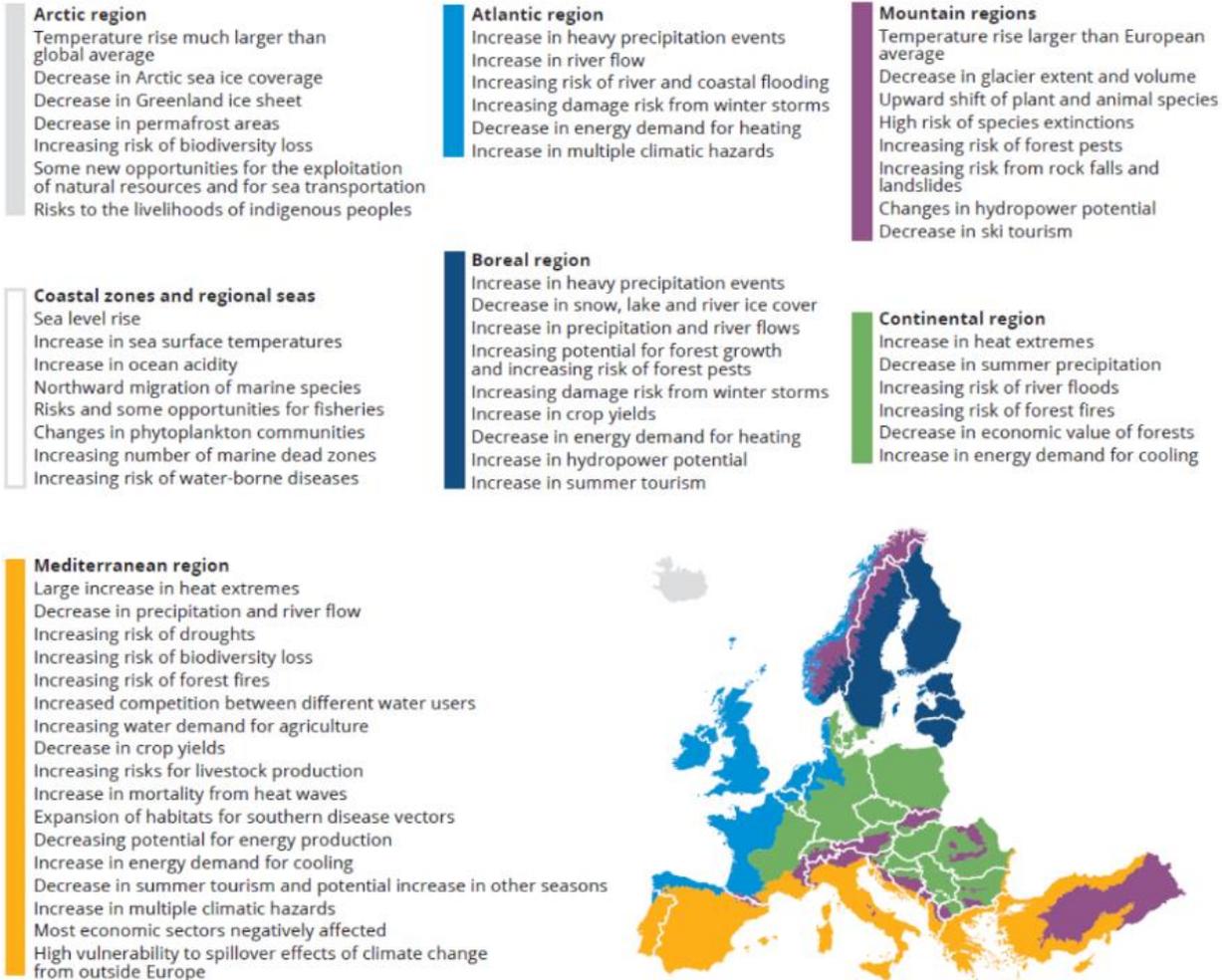


Do we need to reduce consumption?



Source: Oxfam (2015), [Extreme carbon inequality](#)

Europe will not be spared from climate disasters



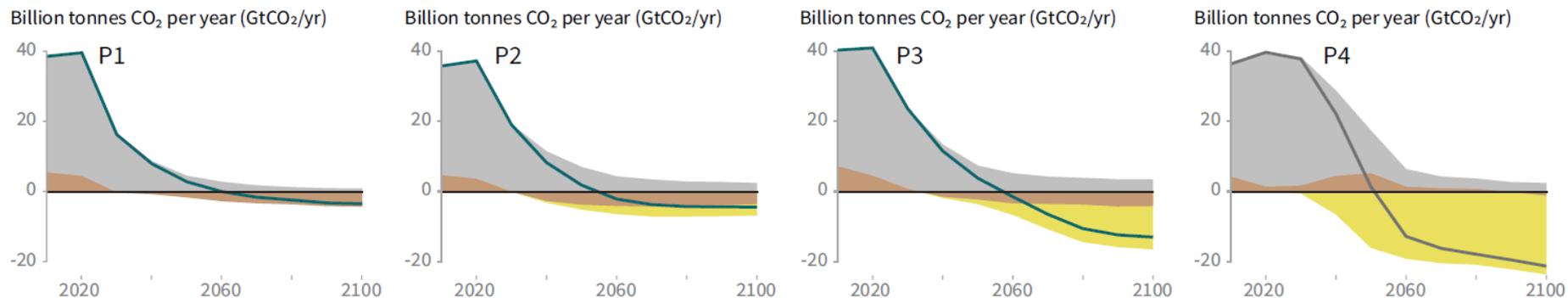
Present climate change impacts in Europe, Source: [In-Depth Analysis in support of Clean Planet for All](#)



Overshoot scenarios reduce future generations life and prosperity opportunities

Breakdown of contributions to global net CO₂ emissions in four illustrative model pathways

● Fossil fuel and industry ● AFOLU ● BECCS



P1: A scenario in which social, business and technological innovations result in lower energy demand up to 2050 while living standards rise, especially in the global South. A downsized energy system enables rapid decarbonization of energy supply. Afforestation is the only CDR option considered; neither fossil fuels with CCS nor BECCS are used.

P2: A scenario with a broad focus on sustainability including energy intensity, human development, economic convergence and international cooperation, as well as shifts towards sustainable and healthy consumption patterns, low-carbon technology innovation, and well-managed land systems with limited societal acceptability for BECCS.

P3: A middle-of-the-road scenario in which societal as well as technological development follows historical patterns. Emissions reductions are mainly achieved by changing the way in which energy and products are produced, and to a lesser degree by reductions in demand.

P4: A resource- and energy-intensive scenario in which economic growth and globalization lead to widespread adoption of greenhouse-gas-intensive lifestyles, including high demand for transportation fuels and livestock products. Emissions reductions are mainly achieved through technological means, making strong use of CDR through the deployment of BECCS.

Global indicators

Pathway classification

P1

No or limited overshoot

P2

No or limited overshoot

P3

No or limited overshoot

P4

Higher overshoot

Interquartile range

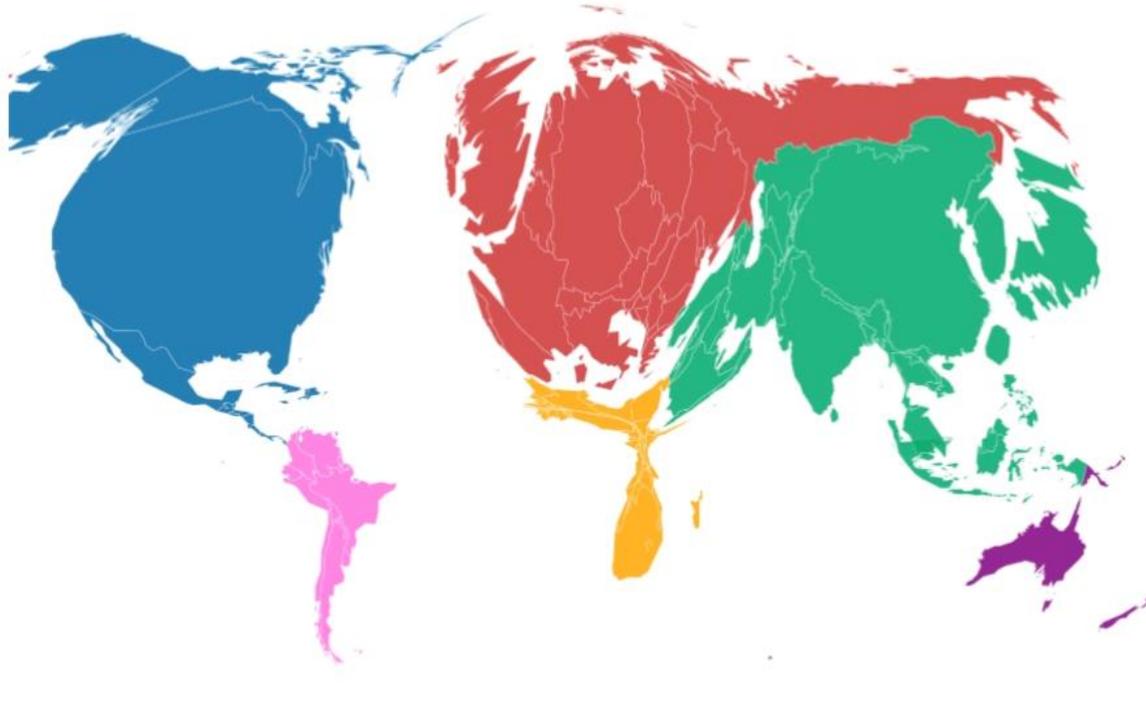
No or limited overshoot

[IPCC 1.5°C report, Summary for Policymakers](#), Abbreviations: AFOLU – Agriculture, Forestry and Other Land Use, BECCS – Bioenergy with Carbon Capture and Storage, CDR – Carbon dioxide removal



Taking responsibility for historic emissions

Figure 2: Historic CO₂ emissions from energy use 1850–2011

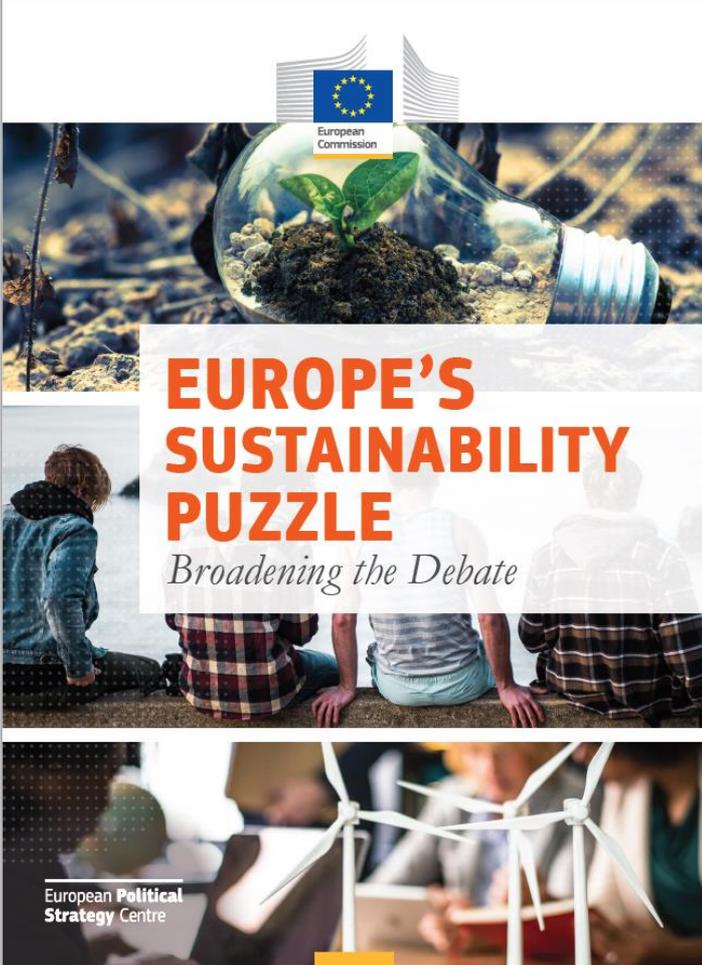


Country sizes show CO₂ emissions from energy use 1850–2011. These historical (or 'cumulative') emissions remain relevant because CO₂ remains in the atmosphere for centuries. Europe and the US dominate, having released around half the CO₂ emitted since 1850.

Source: [Carbonmap.org](https://carbonmap.org), **Data source:** Climate Analysis Indicators Tool ([CAIT 2.0](#)).

[EPRS, Historic CO₂ emissions from energy use 1850–2011](#)

Addressing both 'end of month' and 'end of planet' challenges requires burden sharing



European Commission

EUROPE'S SUSTAINABILITY PUZZLE

Broadening the Debate

European Political Strategy Centre

https://ec.europa.eu/epsc/publications/other-publications/europes-sustainability-puzzle_en

RISK #2

OVERLOOKING THE INTERSECTIONS BETWEEN SOCIAL AND ENVIRONMENTAL POLICY, THEREBY COMPROMISING BOTH

The issues at stake

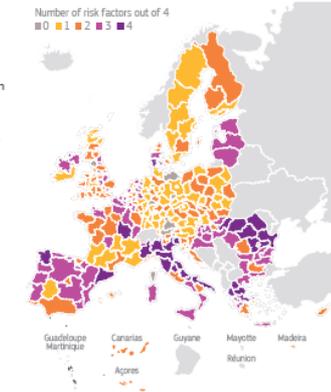
- The transition toward a climate-compatible and sustainable economy comes at a significant socio-economic cost – a cost that is unevenly borne by different regions, industrial sectors and individuals.
- Climate change itself is already increasingly disrupting contemporary societies and economies. A significant proportion of Europeans have already been affected by natural hazards such as forest fires, floods, droughts and storms. Farming is particularly affected with the European continent recording large-scale crop losses. An increase of more than 2 degrees Celsius will have even more dramatic consequences and costs, in particular for coastal areas and Southern Europe, which is most at risk of heat-related deaths and forest fires.¹⁰
- What is more, although policies intended to curb climate change and environmental degradation will pay off in the long-term, they also come with short-term costs that may seem bearable for wealthier segments of society, but are a heavy burden for lower-income individuals, businesses or regions – in some cases sparking strong social contestation.
- It is clear that, on the one hand, there remains a lack of understanding among some actors that the repercussions of failing to address climate and planetary breakdown overshadow by far any short-term economic concerns.
- Yet, on the other, there needs to be a questioning of the way the costs of the transition – as well as the resources to manage the transition (e.g. climate adaptation measures or reskilling workers for a climate-friendly economy) – are currently allocated.
- As an illustration, pricing 'negative externalities' of products and services, such as greenhouse gas emissions and other pollutants, is one of the most powerful tools available to drive the transition. However, a large proportion of these costs disproportionately affects lower-income households, compared to the rich ones, because the former spend a larger percentage of their income on energy and other basic consumption needs.¹¹ Similarly, renewable energy subsidies aimed at easing the transition (e.g. for placing solar panels) are often taken up first by wealthy and middle-class citizens

More Europeans unable to pay their utility bills in recent years



Source: Eurostat, Energy poverty indicator

Not all regions are equal in the face of globalisation and technological change



Source: European Commission, 2017 Report on Economic, Social and Territorial Cohesion

Note: A risk factor is defined as: a negative value for the first indicator and a value above the EU28 regional average for the next indicators:
 1. Employment growth in the industry between 2000 and 2014
 2. Share in employment of low-technology manufacturing, 2016
 3. Share of people between 25 and 64 with a low educational attainment, 2016
 4. Change in manufacturing unit labour cost between 2003 and 2014



A non-regressive carbon tax can work

MENU ▾

nature
climate change

Perspective | Published: 30 July 2018

Making carbon pricing work for citizens

David Klener , Linus Mattauch, Emmanuel Combet, Ottmar Edenhofer, Cameron Hepburn, Ryan Rafaty & Nicholas Stern

Nature Climate Change **8**, 669–677 (2018) | [Download Citation](#) ↓

13

Citations

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Abstract

The gap between actual carbon prices and those required to achieve ambitious climate change mitigation could be closed by enhancing the public acceptability of carbon pricing through appropriate use of the revenues raised. In this Perspective, we synthesize findings regarding the optimal use of carbon revenues from both traditional economic analyses and studies in behavioural and political science that are focused on public acceptability. We then compare real-world carbon

<https://www.nature.com/articles/s41558-018-0201-2>

Putting a Price on Carbon with a Tax

Summary of Key Findings:

- A carbon tax is a form of **explicit carbon pricing directly linked to the level of carbon dioxide emissions**.
- While a maximum level of emission reductions is not guaranteed, a carbon tax is a **cost-effective economic instrument**.
- **Fifteen countries** are implementing or have passed legislation for a direct carbon tax.

SOURCE: WUFIU BdtIK,

https://www.worldbank.org/content/dam/Worldbank/document/SDN/background-note_carbon-tax.pdf

Wissenschaftliche Dienste



Deutscher Bundestag

Sachstand

Die CO₂-Abgabe in der Schweiz, Frankreich und Großbritannien
Mögliche Modelle einer CO₂-Abgabe für Deutschland

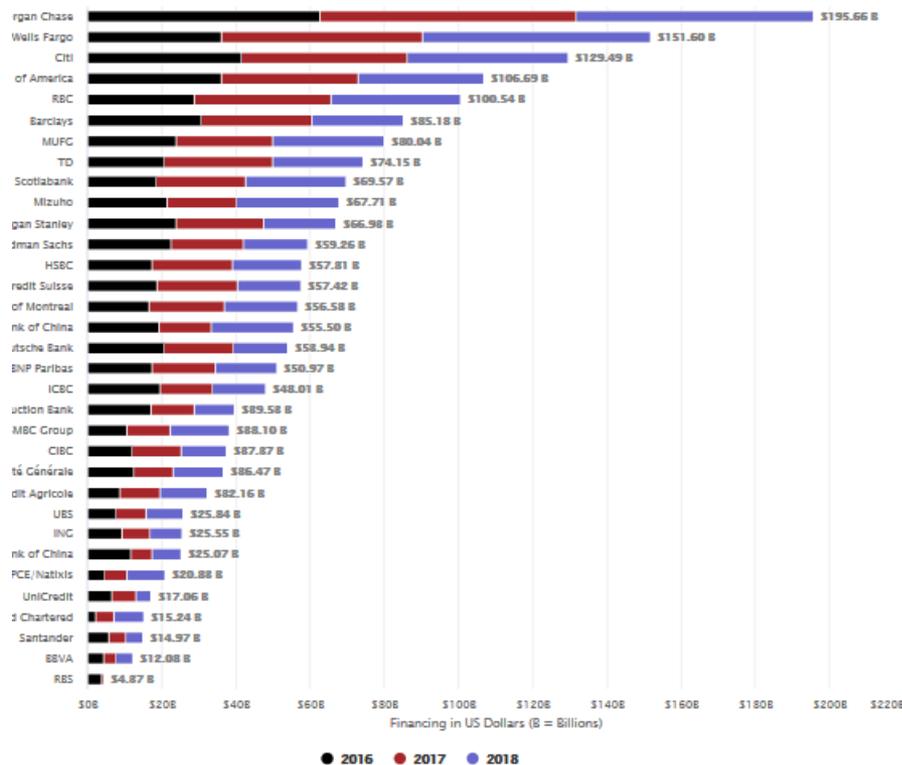
<https://www.bundestag.de/resource/blob/559622/266b55977294ca9f45956c5d398173be/wd-8-027-18-pdf-data.pdf>



Our financial system is locking in the wrong investments

VIEW DETAILS BY SECTOR:

TOTAL FOSSIL FUEL FINANCING BY YEAR ▼



“33 global banks provided \$1.9 trillion to fossil fuel companies since the adoption of the Paris Climate Agreement at the end of 2015 and that the amount of fossil fuel financing has increased in each of the past two years.”

Source: Rainforest Action Network, https://www.ran.org/wp-content/uploads/2019/03/Banking_on_Climate_Change_2019_vFINAL1.pdf



Shifting private and public investment towards sustainability



<https://www.ebrd.com/news/2018/new-calls-to-cities-and-investors-to-deliver-sustainable-finance-growth.html>

The screenshot shows the OECD website interface. At the top, the OECD logo is displayed with the tagline 'BETTER POLICIES FOR BETTER LIVES'. Navigation menus include 'OECD Home', 'About', 'Countries', 'Topics', and 'Français'. A search bar is also present. The main content area features a sidebar with a list of topics: Biodiversity, water and natural resource management; Climate change; Consumption, innovation and the environment; Environment and development; Environment in emerging and transition economies; Environmental country reviews; Environmental indicators, modelling and outlooks; Environmental policy tools and evaluation; Greening transport; Resource productivity and waste; and Economic policies to foster green growth. The main article is titled 'Biodiversity: Finance and the Economic and Business Case for Action'. It includes a summary paragraph, a detailed paragraph about the report's content, and a paragraph about the report's preparation for the G7 Environment Ministers' Meeting. Download links for the full report, executive summary, and annexes are provided. The event is identified as 'G7 Environment Ministers' Meeting, Metz, 5-6 May 2019'. Additional links for speeches, charters, and agendas are listed at the bottom.

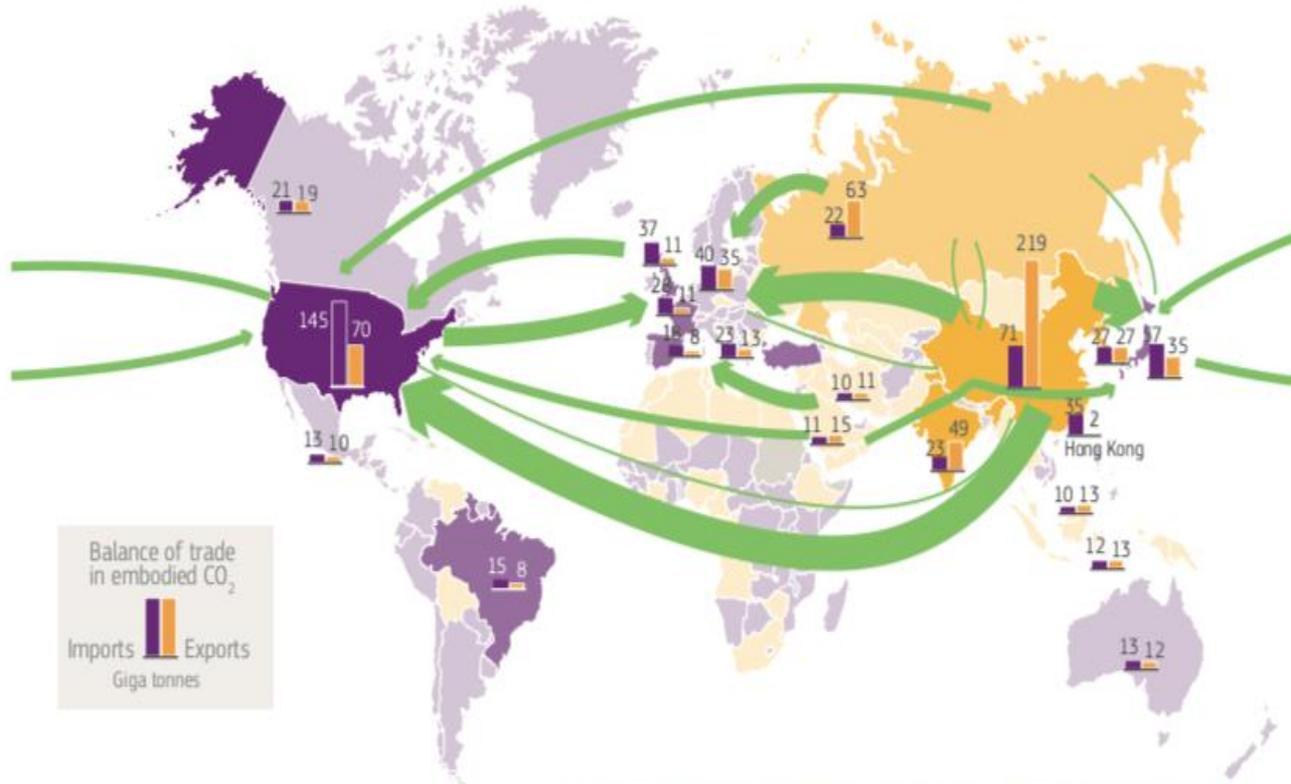
<http://www.oecd.org/environment/resources/biodiversity/biodiversity-finance-and-the-economic-and-business-case-for-action.htm>



Telecouplings : Our outsourced production and our imported deforestation

China and India produce carbon-intensive products for consumption by Americans and Europeans

Purple bars show embodied imports; yellow bars show exports – Purple shaded countries are predominantly importers, yellow are primarily exporters.



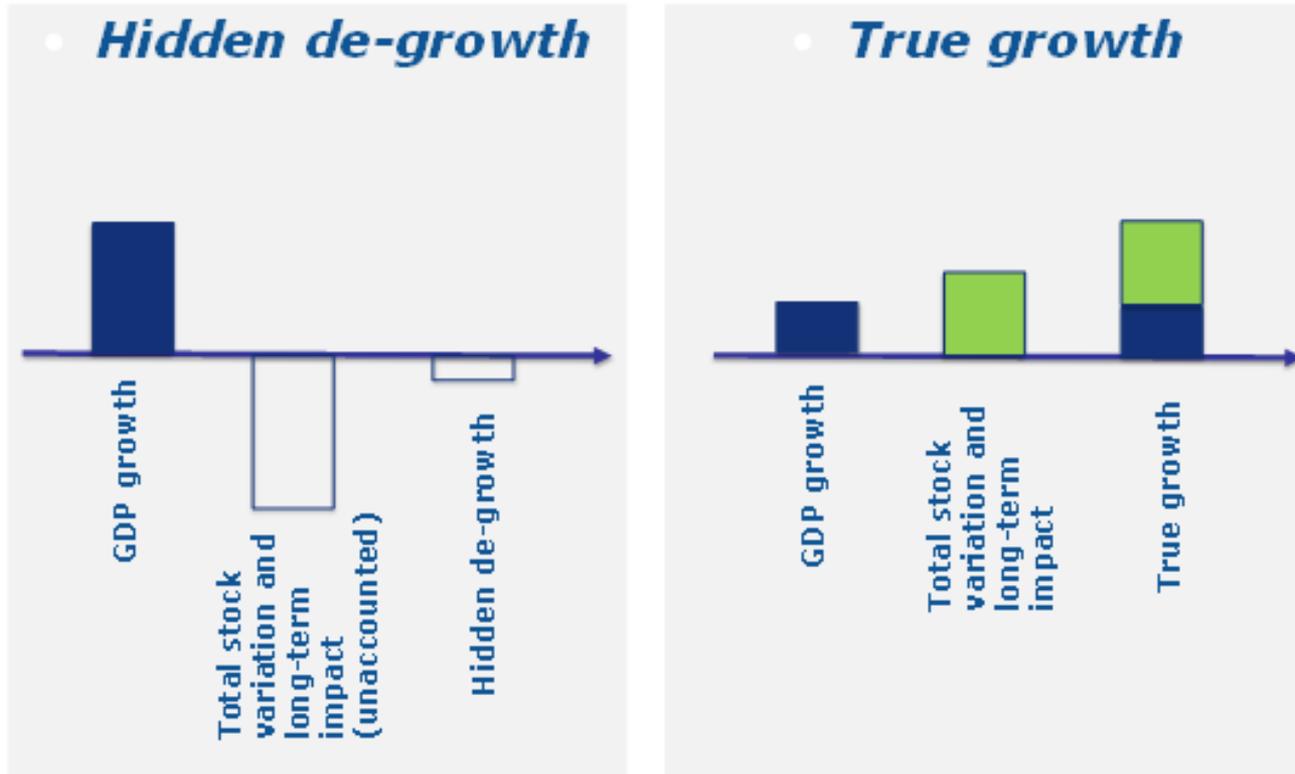
Source: KGM & Associates; Global Efficiency Intelligence, 2018, [The Carbon Loophole in Climate Policy: Quantifying the embodied carbon in traded products](#)

Source: EPSC, [Europe's Sustainability Puzzle](#)



Our economic model does not account for the planetary emergency

From 'hidden de-growth' to 'true growth'



The concept of true growth (not based on data). The result of changing the metrics could be that we may find out we have been running de facto policies of 'hidden de-growth', and regenerating the stock of natural/social capital could lead to 'true growth'

Transformation of social values is critical, but insufficiently explored by politics

“We scientists don’t know how to do that”

“I used to think the top environmental problems were biodiversity loss, ecosystem collapse and climate change.

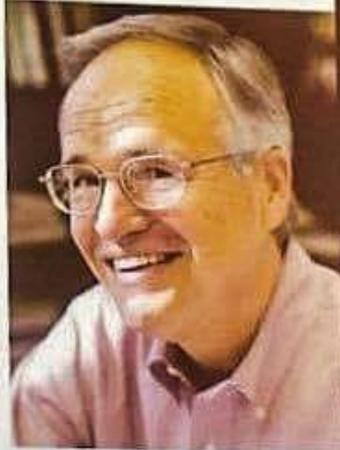
I thought that with 30 years of good science we could address those problems.

But I was wrong.
The top environmental problems are selfishness, greed and apathy...

...and to deal with those we need a spiritual and cultural transformation

- and we scientists don't know how to do that.”

Gus Speth

A portrait of Gus Speth, an older man with glasses, smiling. He is wearing a light-colored shirt.

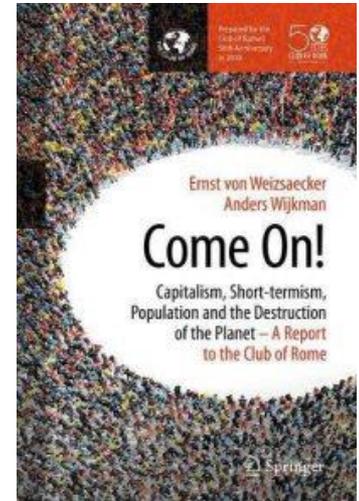
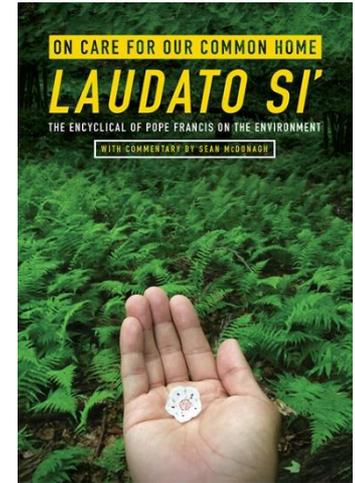
<https://www.facebook.com/photo.php?fbid=10220197515347211&set=gm.717899211997665&type=3&theater>

A new vision of a good life at the centre of the positive journey

This is a major space for exploring and learning, including from indigenous cultures, philosophy, [spirituality](#), ..., moving beyond convergence towards current “Western” model

The [IPBES](#) advocates working towards a “*change in the definition of what a good quality of life entails – decoupling the idea of a good and meaningful life from ever-increasing material consumption. All those approaches are more effective when they are mutually reinforcing. Actions that help to unleash, voluntarily, existing social values of responsibility in the form of individual, collective and organizational actions towards sustainability can have a powerful and lasting effect in shifting behaviour and cultivating stewardship as a normal social practice (established but incomplete)*”.

In its “Come on!” report the [Club of Rome \(2017\)](#) proposed “*develop[ing] a new Enlightenment for a 'Full World'*”. The reason for this is that “*we can no longer depend on a societal model that was developed for a world of less than one billion people*”. The approach is based on a new balance “*between humans and nature, between markets and the law, between private consumption and public goods, between short-term and long-term thinking, between social justice and incentives for excellence*”.



A new collaborative and deliberative democracy re-inventing the commons



JRC SCIENCE FOR POLICY REPORT

Citizen Engagement in Science and Policy-Making

Reflections and recommendations across the European Commission

Figueiredo Nascimento, S.
Cuccillato, E.
Schade, S.
Guimarães Pereira, A.

2016



<http://publications.jrc.ec.europa.eu/repository/bitstream/JRC105004/lbna28328enn.pdf>

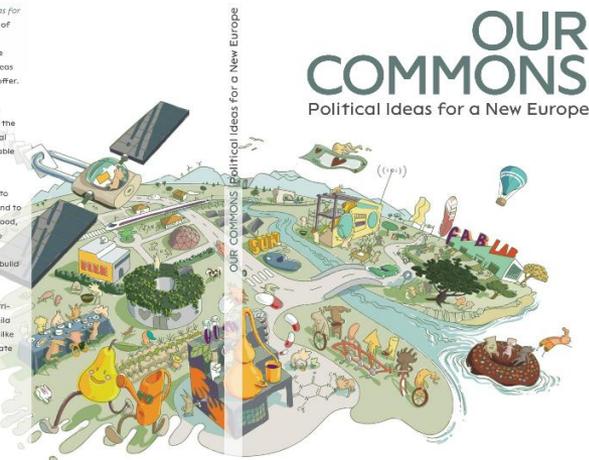
Source: [LabGovCity](#),
New democracy co-creating the city,
Commonspoly-a-hacked-version-of-the-Monopoly -©-Julio-Albarrán.jpg



Our Commons: Political Ideas for a New Europe is a collection of essays, case studies and interviews that showcase the wealth of transformative ideas that the commons have to offer.

Featuring reflections on the enclosure of knowledge and the monopolization of the digital sphere, stories about renewable energy cooperatives and community foodwaste initiatives and urgent pleas to see the city as a commons and to treat health as a common good, this book is a political call to arms for all Europeans to embrace the commons and build a new Europe.

Our Commons features contributions by David Bollier, Sheila R. Foster, Benjamin Coriat, Silke Helfrich, George Monbiot, Kate Raworth, Trebor Scholz and many others.



Source: Commons Network,
<https://www.commonsnetwork.org/ourcommons/>



No credibility without walking the talk



Together we make a world of difference

Since implementing an environmental management system, together, the European Parliament, the European Commission, the General Secretariat of the Council, the European Central Bank and the European Economic and Social Committee and the European Committee of the Regions have saved...*



* The raw data can be found in the institutions' environmental statements

Discover our stories...

If you want to find out more please click on the EU Institutions logos or the best practices thematic areas.



Best practices



https://ec.europa.eu/environment/emas/emas_registrations/emas_in_the_european_institutions_en.htm#stories



Conclusion: Turning the tanker

- Today, new EU leaders are facing humanity's biggest choice ever: either they take the courageous action needed to initiate system change, or they give free rein to uncontrolled climate disruption, with the collapse of ecosystems that entails. Moving from transformation rhetoric to deep transformation implementation on a large scale and at unprecedented speed is '[one giant leap for mankind](#)'. Climate disruption, biodiversity loss and depletion of ecosystems are global, but at the same time each local action counts.
- Today is a historic moment: EU leaders have the opportunity to go down in history for helping to steer the tanker away from its current path and restore a safe operating space for the present and future inhabitants of Planet Earth. The EU has the capacity to host a new conversation and orchestrate the necessary change. To that end, it also needs to team up with citizens, young people and actors of change. This discussion paper is intended to contribute to that conversation.



Conclusion: Turning the tanker

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Opinion
Climate change

Individuals can't solve the climate crisis. Governments need to step up

Anders Levermann

Wed 10 Jul 2019 13:25 BST

171 246

People do have a responsibility - to stay informed and demand the politicians make the planet their priority



▲ Students protest in London in May. 'It's only as a society that we can collectively demand our politicians take the action needed to address the climate crisis.' Photograph: Peter Marshall/Alamy

https://www.theguardian.com/commentisfree/2019/jul/10/individuals-climate-crisis-government-planet-priority?CMP=Share_iOSApp_Other



Three possible scenarios to modulate ambition

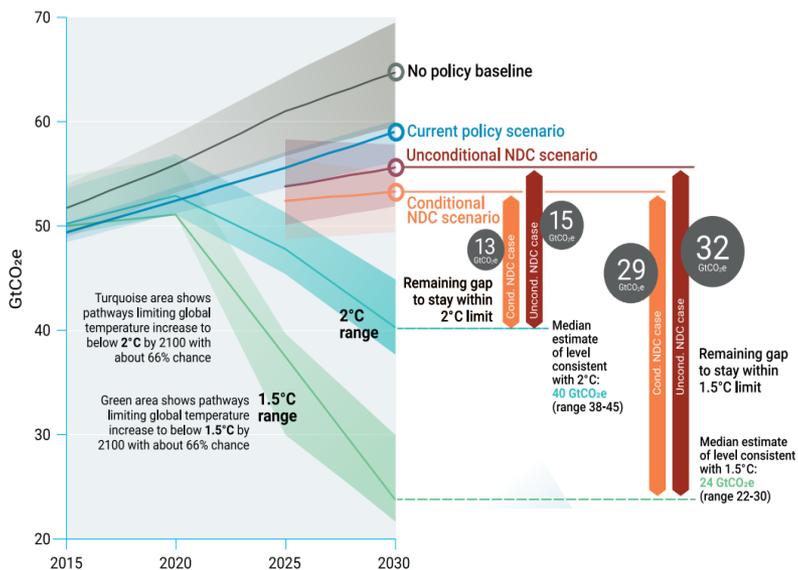
- All-encompassing immediate and unprecedented transformation
- Bold and immediate action with a focus on selected policy foundations
- Exploiting transformational potential of existing strategies



A linear annual reduction of 7,25% at global level delivers 24 GtCO₂eq in 2030 compatible with 1,5°C

- Calculations for global reduction based on 2018 UN Gap report, <https://www.unenvironment.org/resources/emissions-gap-report-2018>
- 2019 global emissions estimated with 1,3% annual increase since 2017 with 53,5 GtCO₂eq (LULUCF included)
- 2030 target for global emissions 24 GtCO₂eq annually (median estimate of level consistent with 1,5°C)

Figure ES.3: Global greenhouse gas emissions under different scenarios and the emissions gap in 2030 (median estimate and tenth to ninetieth percentile range)



Source for calculations: [UN emissions gap report, 2018](#), GtCO₂e = Gigatons CO₂ equivalent, NDC = Nationally Determined Contributions

7,25% annual reduction	GtCO ₂ eq/yr
2019 (Estimate)	54,9
2020	50,9
2021	47,2
2022	43,8
2023	40,6
2024	37,7
2025	35,0
2026	32,4
2027	30,1
2028	27,9
2029	25,9
2030	24,0



What do linear annual reduction rates as of now mean for overall period 2020-2030?

Annual reduction	7%	8%	9%	10%
2019	100%	100%	100%	100%
2020	93%	92%	91%	90%
2021	86%	85%	83%	81%
2022	80%	78%	75%	73%
2023	75%	72%	69%	66%
2024	70%	66%	62%	59%
2025	65%	61%	57%	53%
2026	60%	56%	52%	48%
2027	56%	51%	47%	43%
2028	52%	47%	43%	39%
2029	48%	43%	39%	35%
2030	45%	40%	35%	31%
Overall reduction	55%	60%	65%	69%



The baseline matters: 1990 versus 2019

Annual reduction as of 2020	0%	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1990	129,4%										
2019	100,0%										
2020	100,0%	99,0%	98,0%	97,0%	96,0%	95,0%	94,0%	93,0%	92,0%	91,0%	90,0%
2021	100,0%	98,0%	96,0%	94,1%	92,2%	90,3%	88,4%	86,5%	84,6%	82,8%	81,0%
2022	100,0%	97,0%	94,1%	91,3%	88,5%	85,7%	83,1%	80,4%	77,9%	75,4%	72,9%
2023	100,0%	96,1%	92,2%	88,5%	84,9%	81,5%	78,1%	74,8%	71,6%	68,6%	65,6%
2024	100,0%	95,1%	90,4%	85,9%	81,5%	77,4%	73,4%	69,6%	65,9%	62,4%	59,0%
2025	100,0%	94,1%	88,6%	83,3%	78,3%	73,5%	69,0%	64,7%	60,6%	56,8%	53,1%
2026	100,0%	93,2%	86,8%	80,8%	75,1%	69,8%	64,8%	60,2%	55,8%	51,7%	47,8%
2027	100,0%	92,3%	85,1%	78,4%	72,1%	66,3%	61,0%	56,0%	51,3%	47,0%	43,0%
2028	100,0%	91,4%	83,4%	76,0%	69,3%	63,0%	57,3%	52,0%	47,2%	42,8%	38,7%
2029	100,0%	90,4%	81,7%	73,7%	66,5%	59,9%	53,9%	48,4%	43,4%	38,9%	34,9%
2030	100,0%	89,5%	80,1%	71,5%	63,8%	56,9%	50,6%	45,0%	40,0%	35,4%	31,4%
Overall reduction (baseline 1990)	22,7%	30,8%	38,1%	44,7%	50,7%	56,1%	60,9%	65,2%	69,1%	72,6%	75,8%
Overall reduction (baseline 2019)	0,0%	10,5%	19,9%	28,5%	36,2%	43,1%	49,4%	55,0%	60,0%	64,6%	68,6%

- proportion EU emissions 1990 versus 2019: 2017 figures and estimate 2019 (extrapolated from increase 2016-2017) based on EEA figures: <https://www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2019>

- annual reduction of 7,25% globally as of now delivers 24 Gt CO₂ eq compatible with 1,5 target, based on figures of 2018 UN gap report, <https://www.unenvironment.org/resources/emissions-gap-report-2018>

- Limitations: Calculations are based on two separate datasets from UNEP and EEA . This delivers a big picture view of grand proportions, but may not be suitable for calculations at lower levels of granularity.



Why should Europe do more?

1. Europe's historic emissions
2. Europe's outsourcing of emissions
3. Europe's global clout as a sustainability leader
4. Europe's technological capacity
5. Overshooting is unfair for younger generations
6. New developments and new science challenge existing assumptions





ACT NOW ON THE CLIMATE & ECOLOGICAL EMERGENCY

**SIGN THE EU STAFF PETITION
TO NEW EU LEADERS**

SIGN: <https://ec.europa.eu/eusurvey/runner/petition>

- 1** Declare a **planetary emergency**
- 2** Put in place **special EU inter-institutional arrangements** to address the emergency
- 3** Engage citizens in a **broad democratic debate**
- 4** **Sharply reduce EU greenhouse gas emissions**
- 5** Ensure **coherence of all EU policies** for a fair transition to a sustainable and carbon-neutral society and economy
- 6** **Leverage the EU's weight in the world** to lead the global fight against climate change and ecosystem destruction
- 7** **Lead by example:** Make the EU institutions' operations carbon neutral by 2030

For more info: <https://eustaff4climate.info/>



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@EUStaff4Climate

Following



Yesterday #EUstaff4climate had the privilege of discussing with eminent scientist H.J. Schellnhuber.

“We are in the #endgame” 🕒

“We need #unconventionalAlliances”

Sobering, inspiring, motivating. 🙏

#ClimateEmergency #EcologicalCrisis
#FutureofEurope
#UnprecedentedChangeNow



12:34 pm - 6 Sep 2019

21 Retweets 39 Likes



Carlos Moedas, Margrethe Vestager, Frans Timmermans and 6 others



21

39





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Following



#EUstaff4climate marched in Brussels on Friday in the global #ClimateStrike 🙌🙌 calling for #unprecedentedchangenow

In @guardiannews

✓ theguardian.com/environment/li...



▲ EU civil servants on climate strike in Brussels Photograph: Jennifer Rankin/The Guardian

7:16 pm - 22 Sep 2019



EUStaff4Climate

@EUStaffClimate

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« We are 10.000 and rising ! »
#EUstaff4climate speaking today at
@Rise4ClimateBE event in #Brussels.

« We are committed as civil servants to act in
the public interest & saving the planet is the
biggest public interest there is. » 
#ClimateEmergency
#unprecedentedchangenow



1:54 pm - 22 Sep 2019



1 PLANET
Keep it COOL!

EU staff for climate
#EUstaff4climate

Employees of the European institutions including the European Commission, European Parliament, European Council, Committees and Agencies. * Employé.e.s des institutions européennes y compris la Commission européenne, le Parlement européen, le Conseil européen, les Comités et les Agences

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Campaign material



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SCAN
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Act NOW on the climate and ecological emergency!

Petition to the incoming leaders of the EU institutions



Recognise the greatest challenge
of our times:

declare a planetary emergency
and make it the overarching
priority of the EU's agenda
for the next five years.

EU staff for climate

#EUstaff4climate



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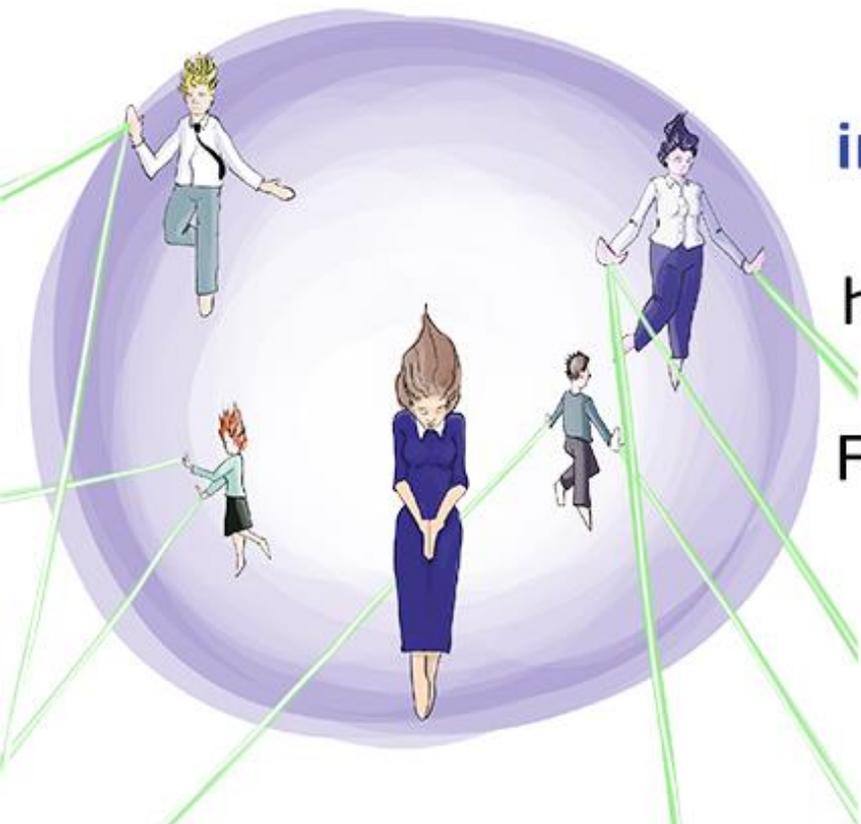


Page 2/3



Act NOW on the climate and ecological emergency!

Petition to the incoming leaders of the EU institutions



Put in place special EU inter-institutional arrangements:

high-level mechanism to prioritise actions, and a Commission Task Force to implement them urgently.

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Act NOW on the climate and ecological emergency!

Petition to the incoming leaders of the EU institutions



Engage citizens in a broad democratic debate

across EU about collective changes and transition needed (energy, consumption, economic model...)
Give a voice to young people!

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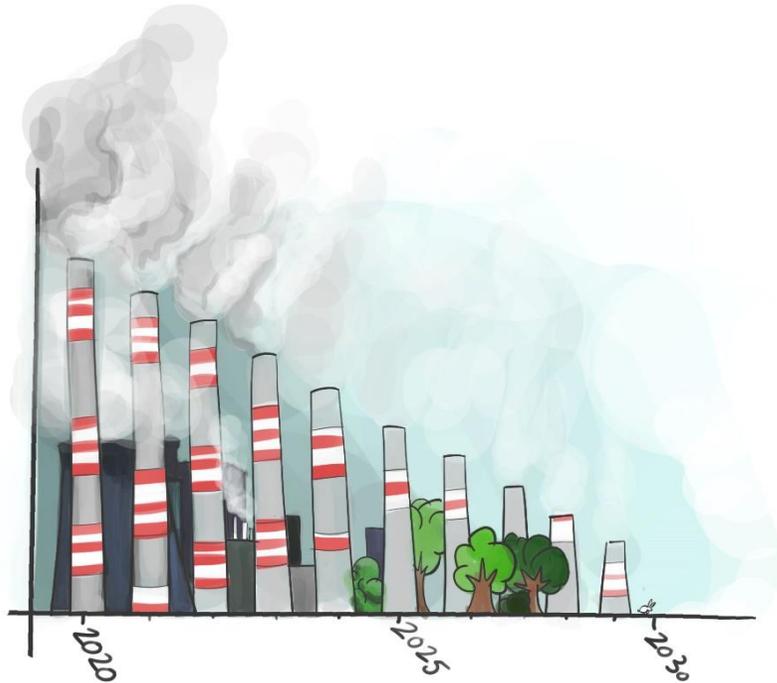
For more info: <https://eustaff4climate.info/>

**SCAN
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Act NOW on the climate and ecological emergency!

Petition to the incoming leaders of the EU institutions



Start reducing EU greenhouse gas emissions sharply.

65% reduction by 2030 (10% every year), open monitoring system. Tackle worst climate polluters. Phase out coal by 2025.

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Act NOW on the climate and ecological emergency!

Petition to the incoming leaders of the EU institutions



Ensure coherence of EU policies
for a fair transition to a
sustainable, carbon-neutral
society and economy

All EU programmes must meet these
goals. No EU policies or funding
pulling in the opposite direction.

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Act NOW on the climate and ecological emergency!

Petition to the incoming leaders of the EU institutions



Leverage the EU's weight in the world

to lead the global fight against
climate change and ecosystems
destruction, using EU trade and
development policies as tools.

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Act NOW on the climate and ecological emergency!

Petition to the incoming leaders of the EU institutions



Lead by example

Make the EU institutions carbon neutral by 2030: buildings, business travel, catering, meetings, procurement, and local mobility.

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Nous avons des coûts (impression, site web, organisation des événements...). Vous pouvez nous aider par une contribution annuelle (montant indicatif : 40 €) à verser sur le compte de GRAACE AISBL (IBAN : **BE20 0017 6787 9156** ; BIC : GEBABEBB).

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