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Paludiculture: challenges and perspectives

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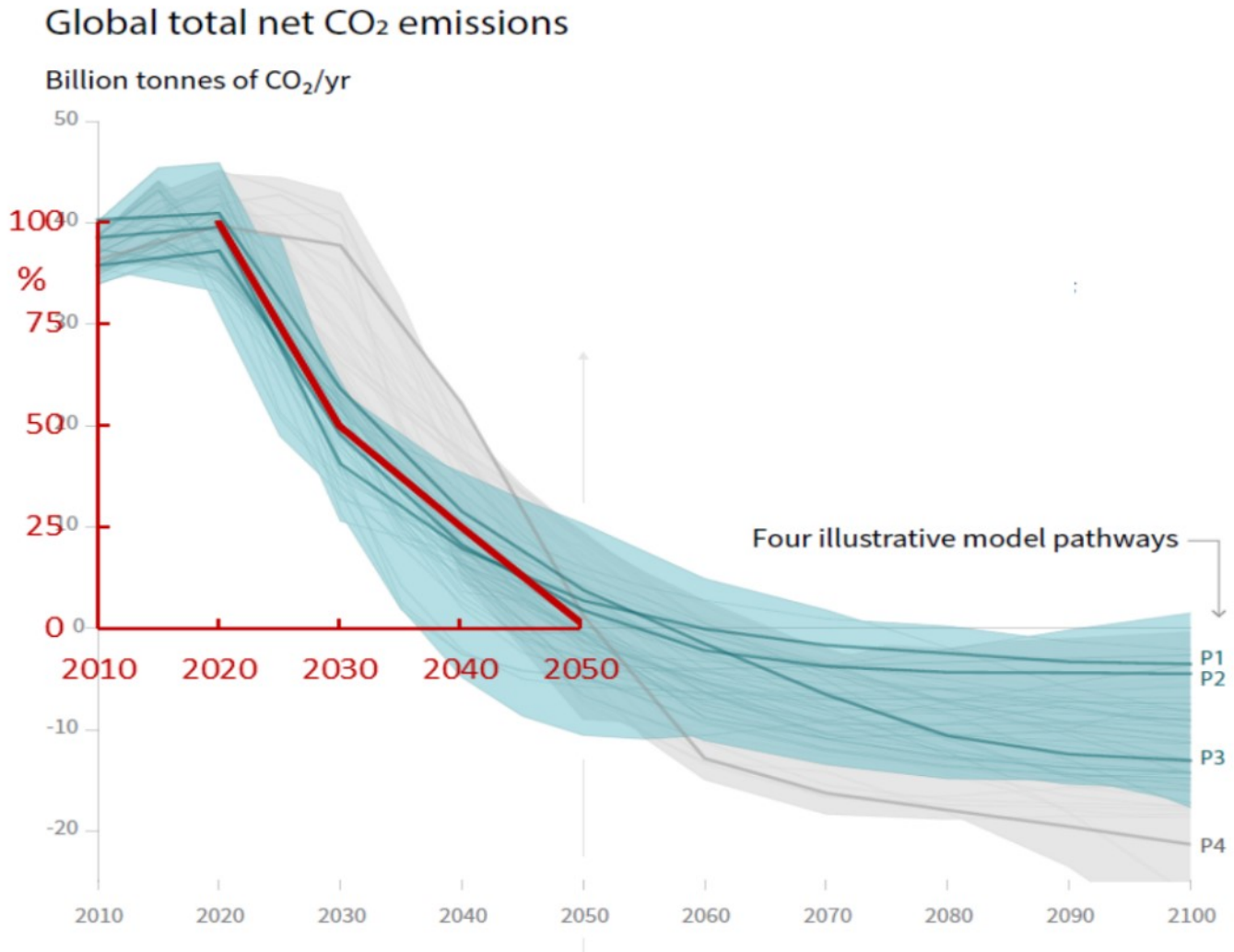
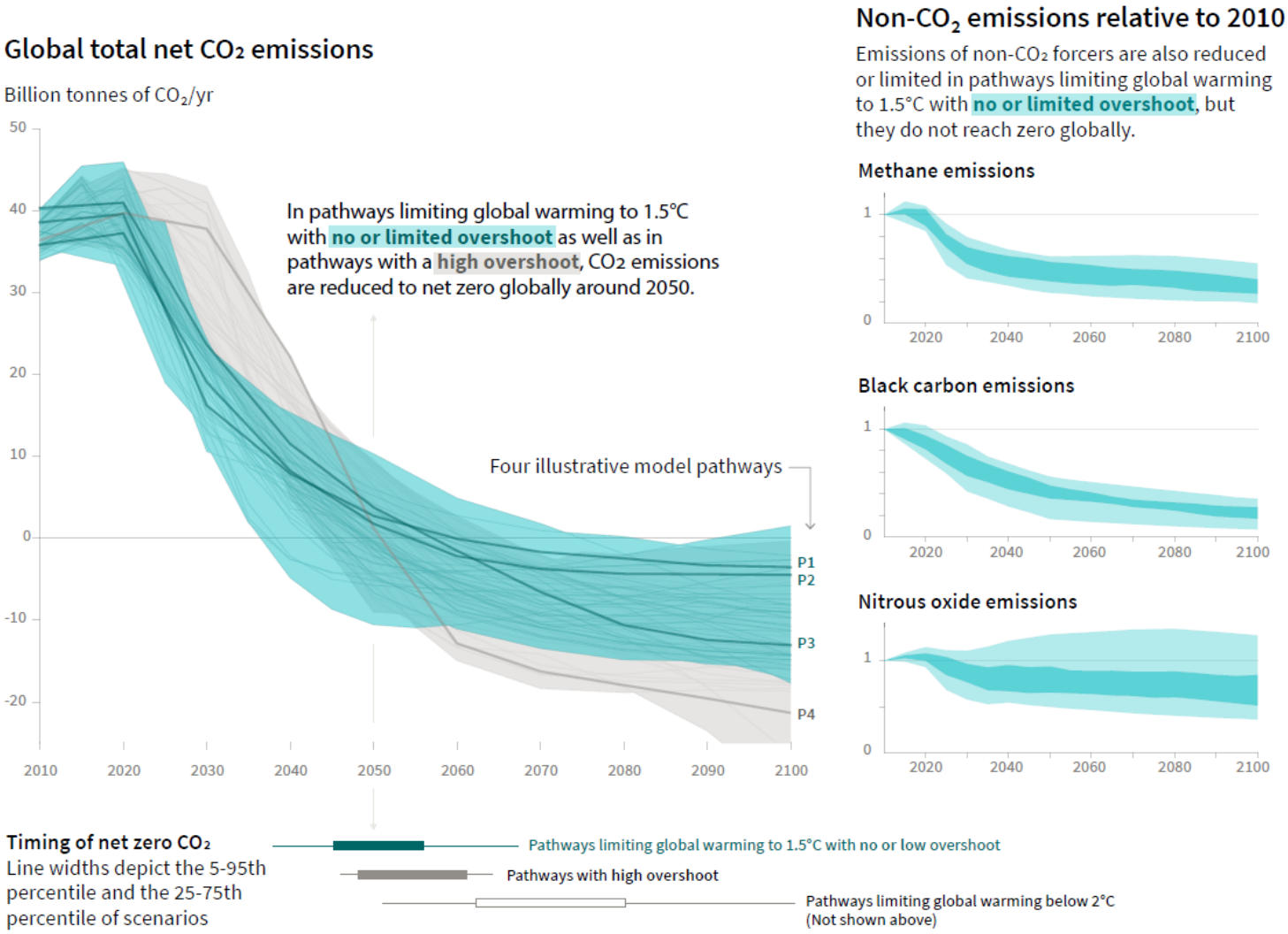
In the coming decades, this graph will drive the world



Since Paris the world has one simple, common goal: $< 2^{o}$

Georgia

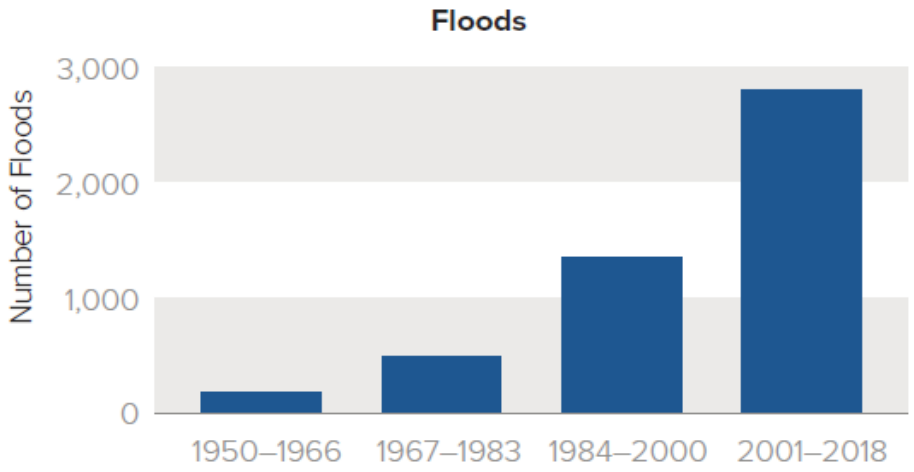
IPCC 1.5° Report (2018) spells out what this means for GHGs: CO_2 **Zero** in 2050, **net sink after 2050**, CH_4 -50%, N_2O - 20%

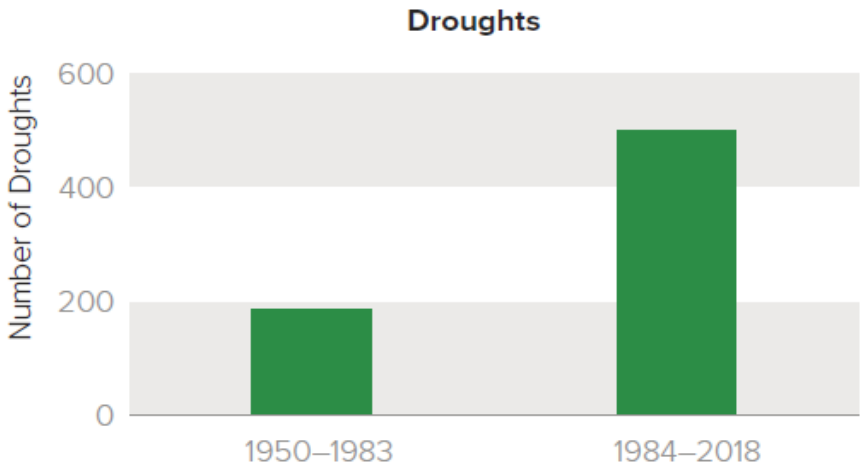


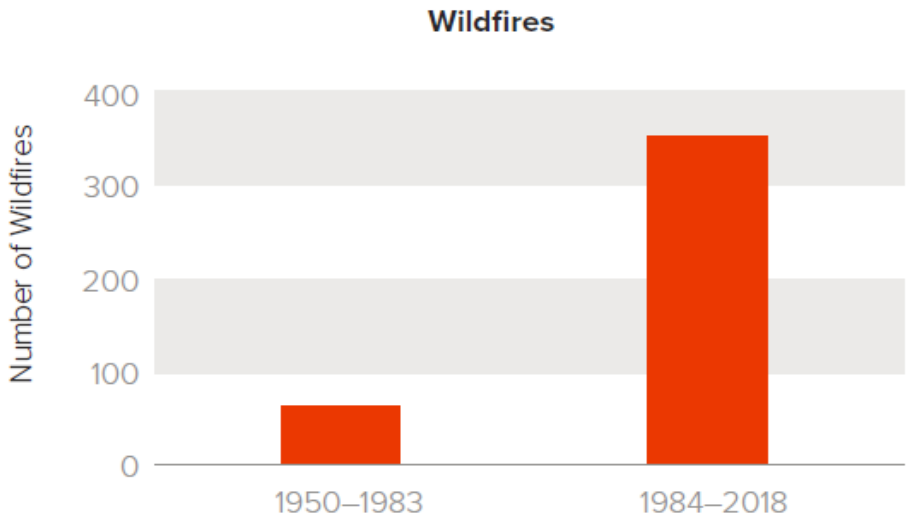
Either we follow this course and change our entire economy

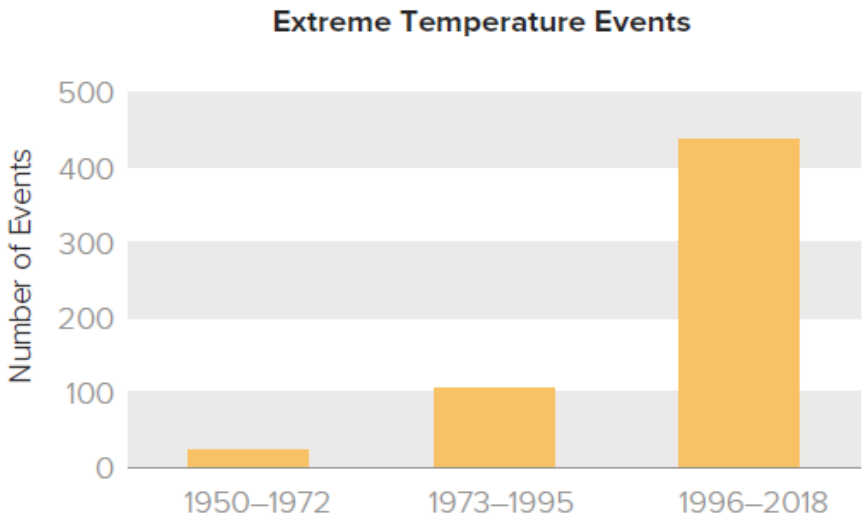
Belarus

or we will face ever bigger ‘natural’ catastrophes…



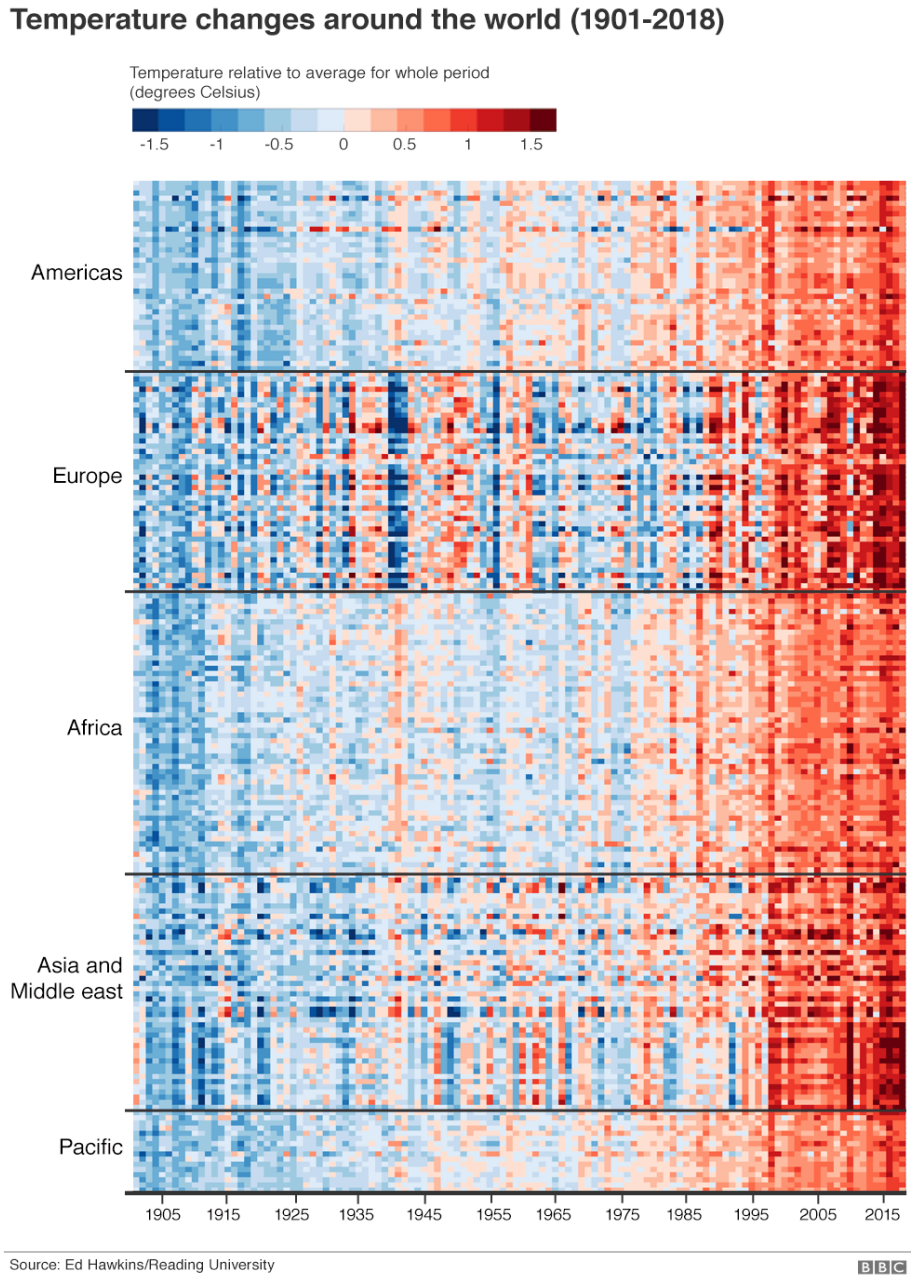






…accompanied by decreasing food and water security, growing social breakdown, conflict and migration…

In order not to *be* changed for the worse, *we* have to change



https://www.bbc.com/news/science-environment-48678196

We do have a coherent strategy…

and a program with worldwide wall-to-wall support

Now we have to change: everything, everybody, everywhere

Indonesia

Familiar landscapes: cows on drained peat: over and out….

Denmark

…hay from drained peatland: over and out…

Netherlands

…potatoes form drained peatland: over and out…

Germany

…carrots on drained peatland: over and out…

… forests on drained peatland: over and out...

Scotland

… oil palm on drained peatland: over and out…

… pulpwood on drained peatland: over and out….

Sumatra

… drained peatland: over and out…
Stop talking: hands out of the pockets and close that ditch!

Iceland

Drained peatlands have huge GHG emissions

Germany

Food print…

1 kg cheese
> 50 kg CO_2

1 l milk
> 2 l petrol

Climate damage costs according to **UBA-2019**

Tabelle 1: UBA-Empfehlung zu den Klimakosten in €$_{2016}$ / t $CO_{2\,äq}$

	Klimakosten in €$_{2016}$ / t $CO_{2\,äq}$		
	2016	2030	2050
1% reine Zeitpräferenzrate	180	205	240
0% reine Zeitpräferenzrate	640	670	730

Für Mensch & Umwelt
Umwelt Bundesamt

In Germany peatland agriculture causes annually a climate damage of € 7.4 billion, and gets > 400 million EU-subsidies

€ 7,4 billion climate damage equals the total net value-added of total German agriculture

In 25 countries, peatlands emit > 50% compared to their emissions from fossil fuels & cement

Uganda

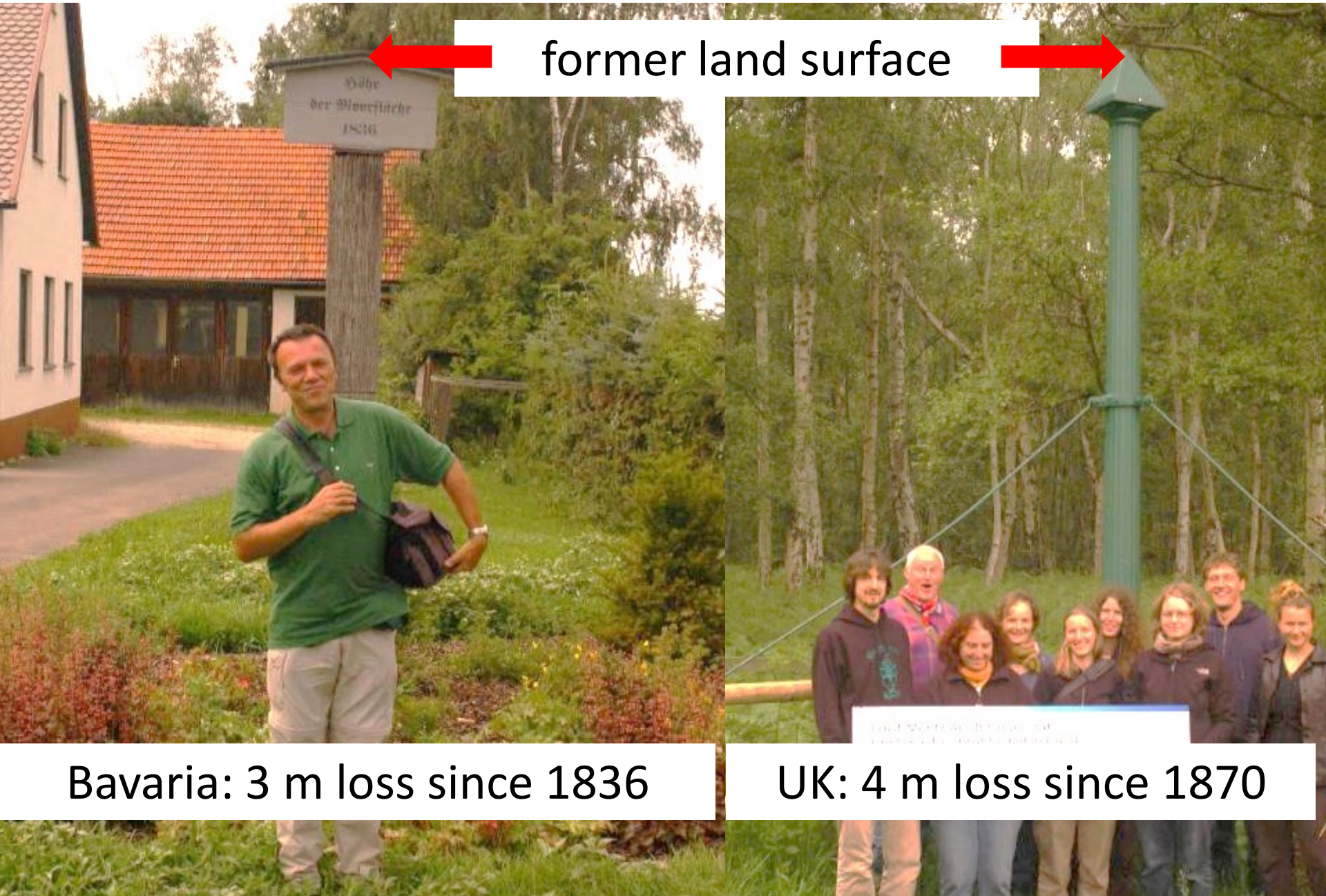
Drained peatland use creates deserts…

…with soils like made of stone…

Drained peatlands cause emissions of nitrate to waters.
In the EU: 3 million tonnes per year (= 150 million people)

Vorpommern

Drained peatland use leads to subsidence (loss of height)



Netherlands: € 300 million annual damage to infrastructure and sewage systems, until 2050 € 80 billion damage to houses

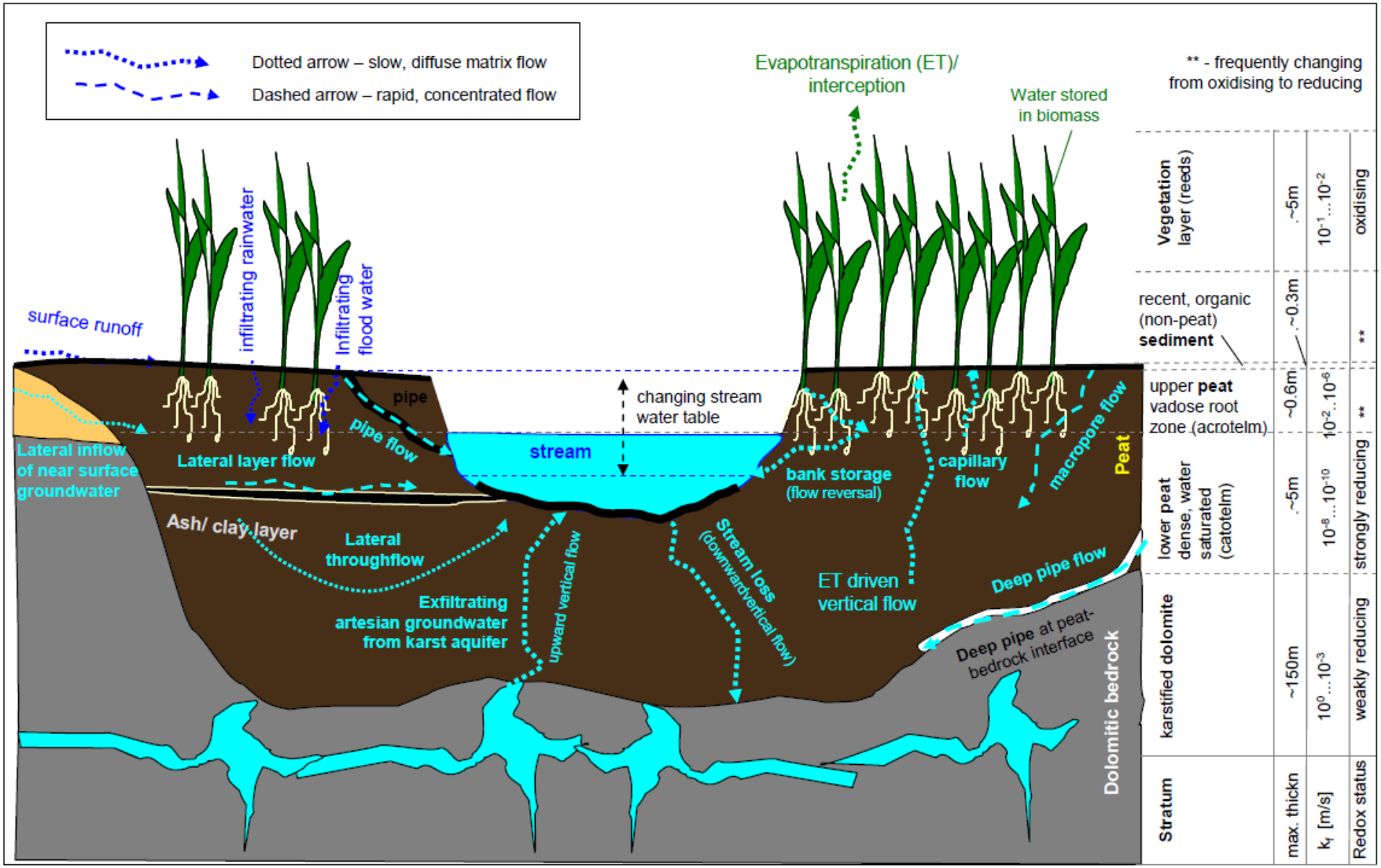
Netherlands

Peatland subsidence will in this century lead to uncontrolled flooding of 10-20 million ha of productive land worldwide

Rewetting solves most of the problems and provides additional ecosystem services

Wet peatlands are ‘cool’: they cool the landscape:
More energy for evaporation → less for heat

Wet peatlands remove nitrogen and purify and protect waters



Peatlands absorb high water events and reduce peak flow

And rewetting creates new opportunities for nature

Vorpommern

Rewetting in Europe has hitherto focused on the easy stuff: abandoned and low productive land with few emissions

Scotland

Average rewetting costs worldwide: € 2500 per ha

Russia

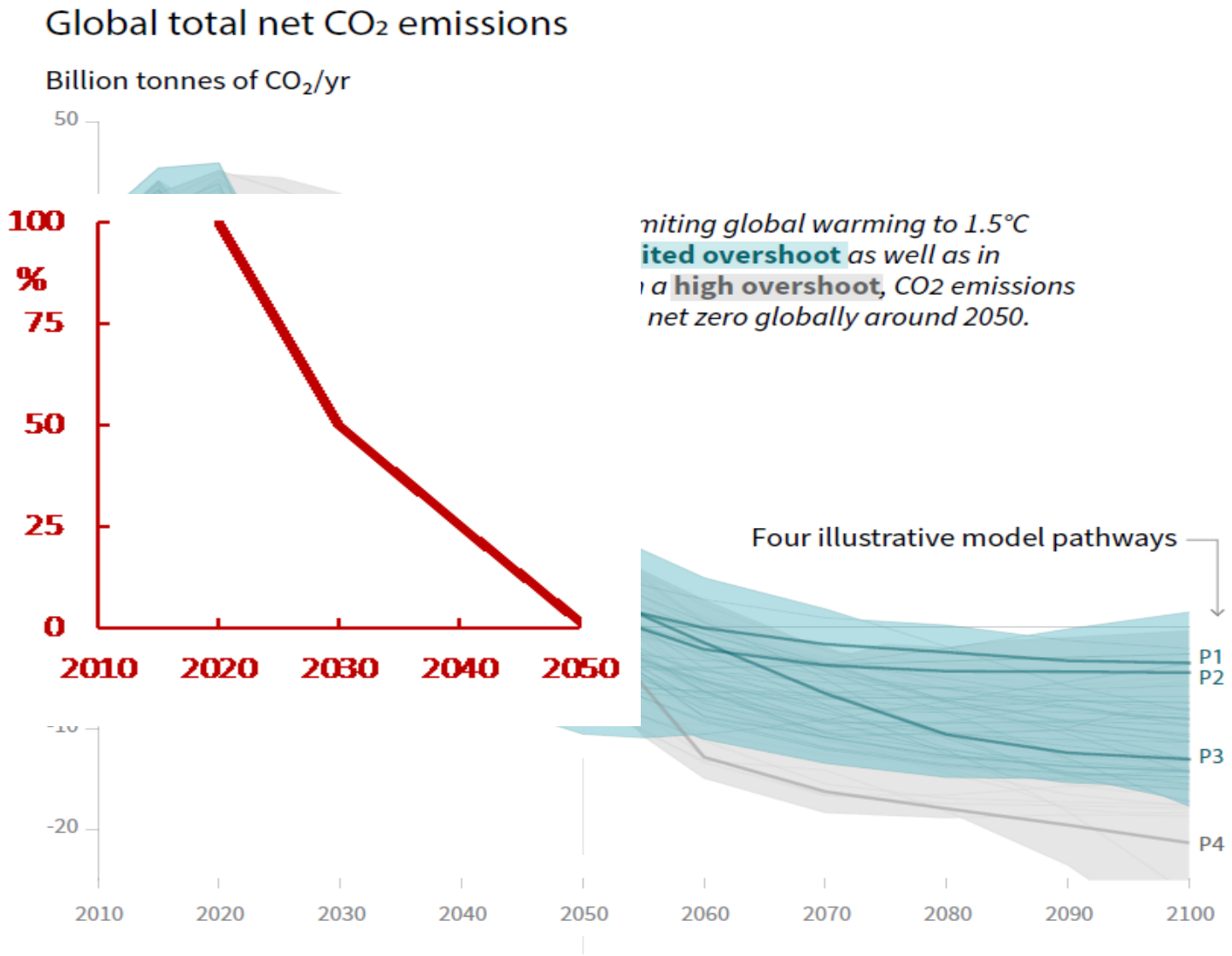
→ Rewetting all peatlands of the world will cost € 125 billion

… but these are merely technical rewetting costs:
What about opportunity costs of rewetting the hard stuff?

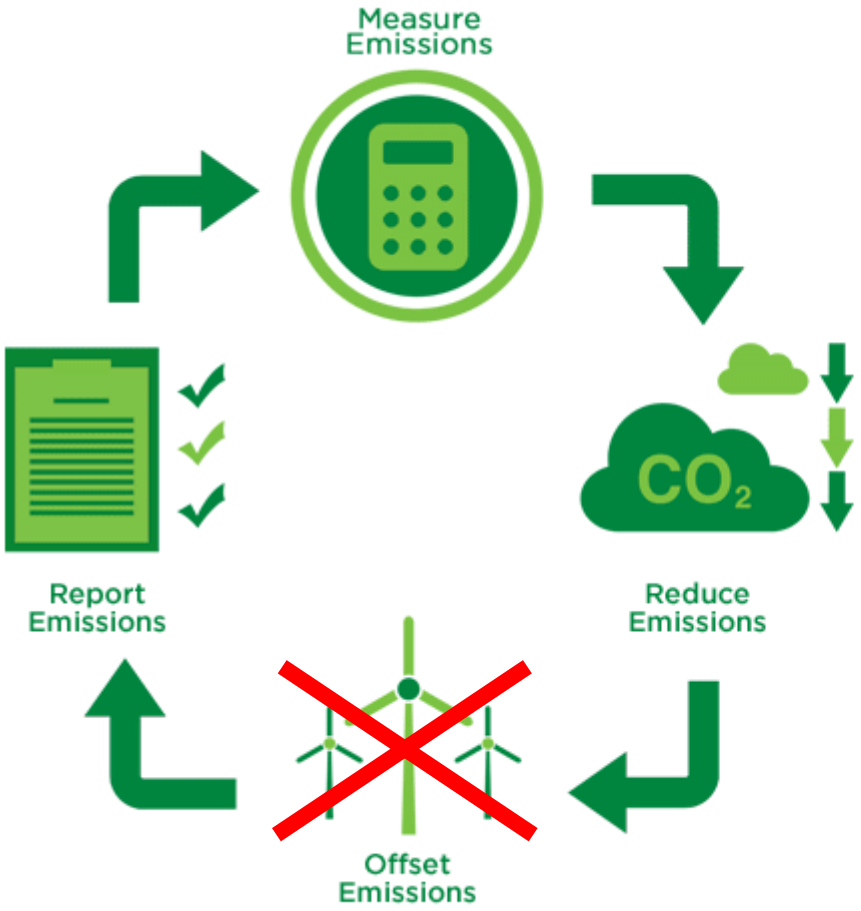
Depends on land use: with an added value of € 500/ha/yr, reducing 1 GT CO_2-e would cost € 25,-- per ton avoided CO_2

Netherlands

But nobody is going to pay forever: 2050 offsets will be over

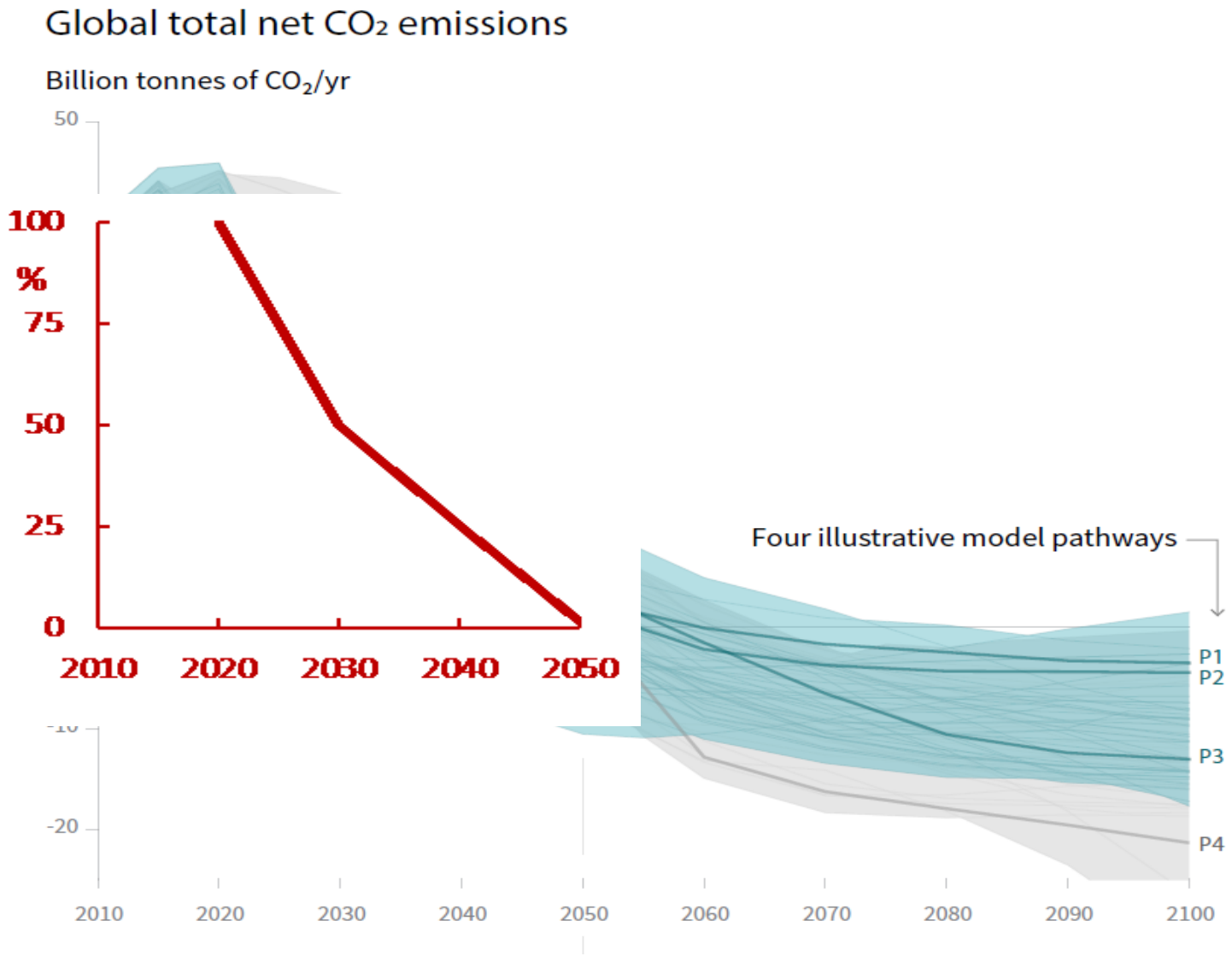


If everybody has to be at Zero, no offsets will exist anymore



1. Measure Emissions
2. Reduce Emissions
3. ~~Offset Emissions~~
4. Report Emissions

CO_2 **Zero** in 2050, **net sink after 2050**



But we cannot flood all drained peatlands worldwide. We also need production →paludiculture

Lower Saxony

Paludiculture is not about an alternative crop,
it is about a change we need, a future we want

The question “Can we grow” has largely been answered. Now the more important question is: “Can we sell?”

Brandenburg

Michael Succow

Let it be clear: Paludiculture can *under similar conditions* not compete with conventional agriculture

Vorpommern

Paludiculture must focus on markets for which it is *intrinsically* better positioned

Vorpommern

Three strategic areas: Climate impact, structure, ingredients

Bayern

Paludiculture provides renewable resources with *negative* emissions, when rewetting is included in the final product

Companies and institutions are outbidding each other to achieve O emissions faster. They need offsets or better *insets*!

Heathrow takes vital step towards carbon neutrality

- Lancashire nature reserve is first peatland restoration chosen by Heathrow as carbon offsetting project

Example: Malchin heating plant:
Negative emission: ~0,95 t CO_2 pro MWh

Malchin Mecklenburg

Building material from paludiculture: Negative emission: ~0.65 t CO2 per m³ reed insulation board

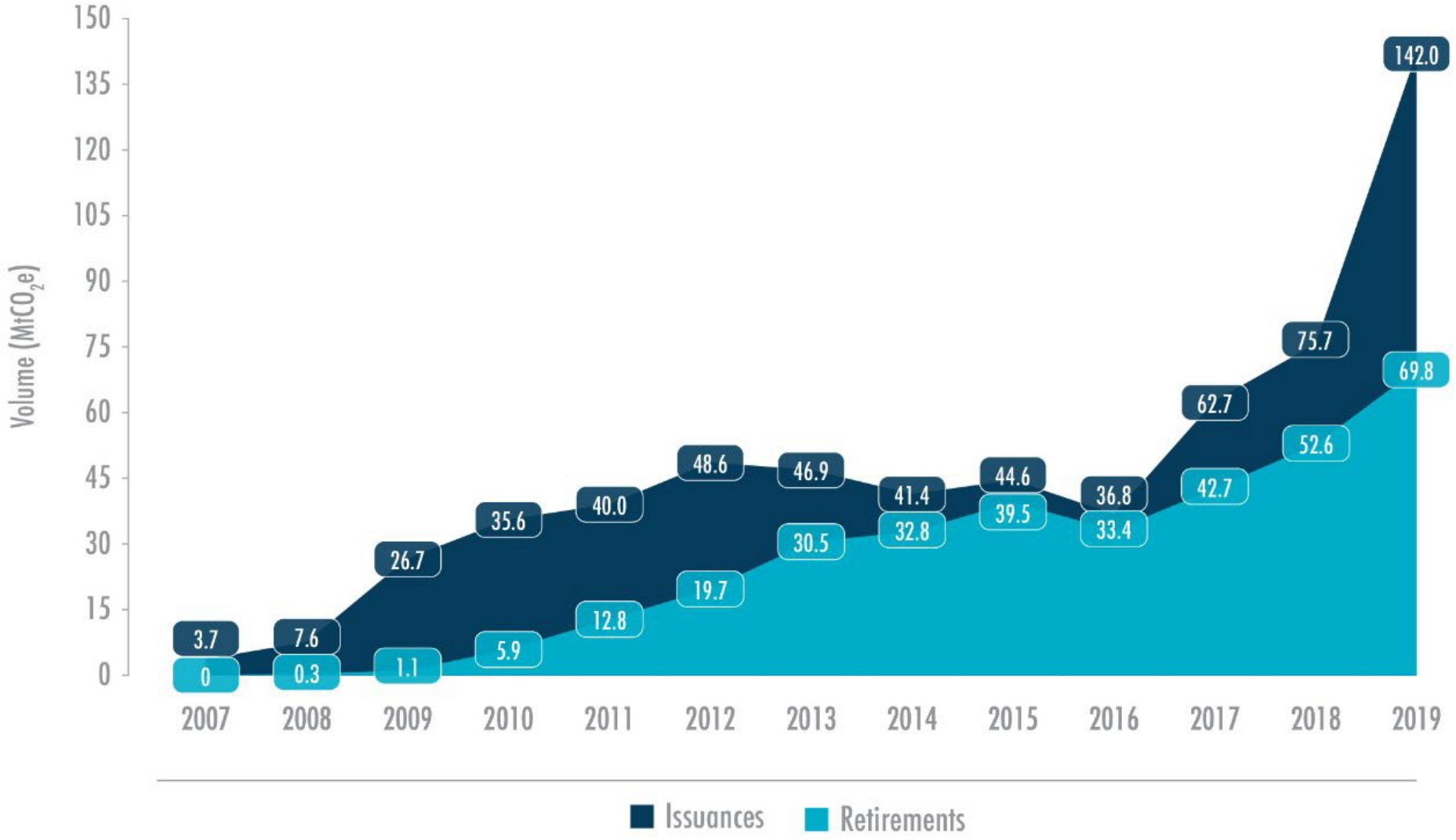
Schleswig-Holstein

Substrate for horticulture: Peat from peat extraction: +200 kg CO_2/m^3, peatmoss from paludiculture: -140 kg CO_2/m

Lower Saxony

Tobias Dahms, lensescape.org

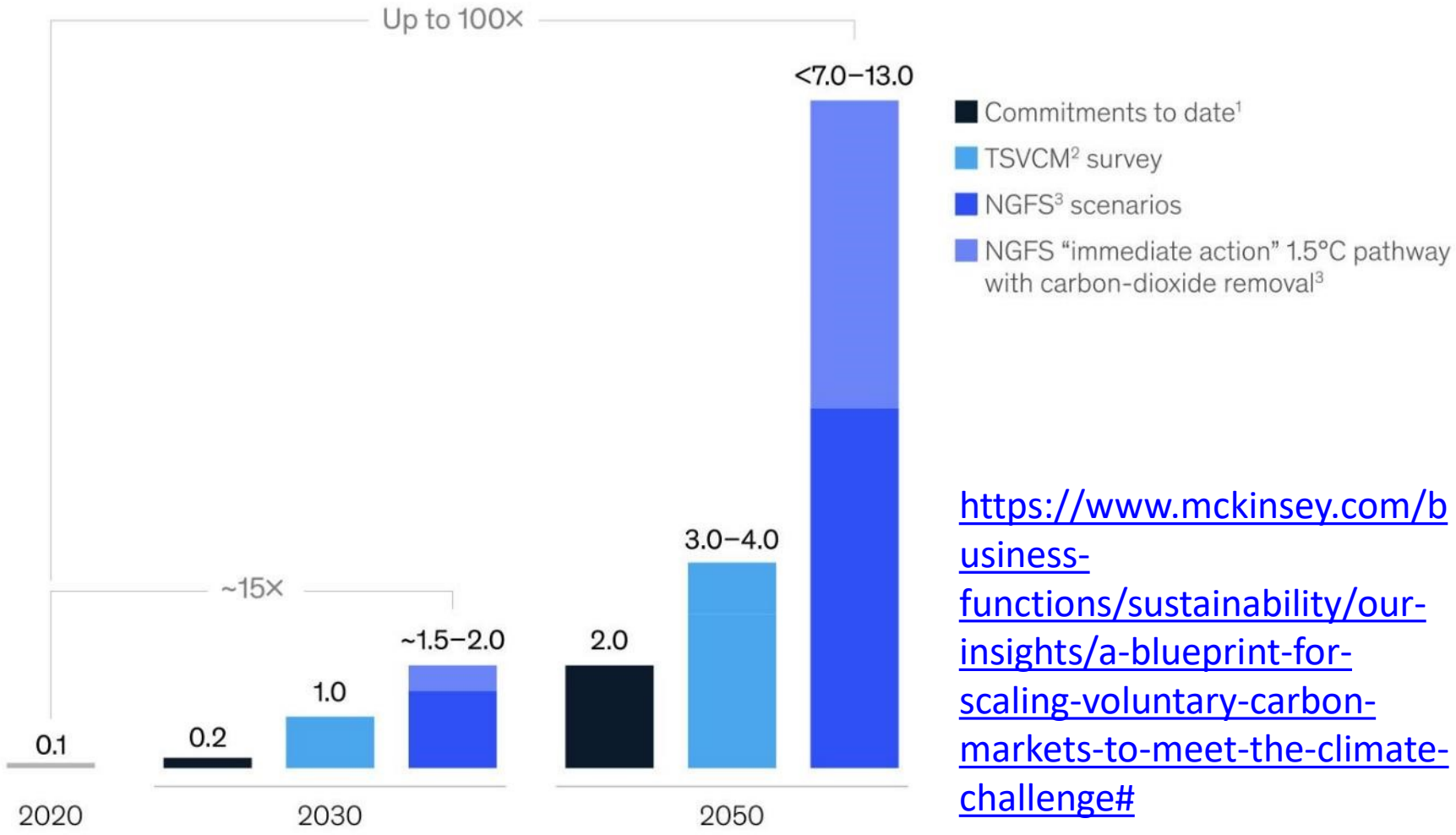
Annual voluntary carbon offset issuances and retirements, 2007–2019



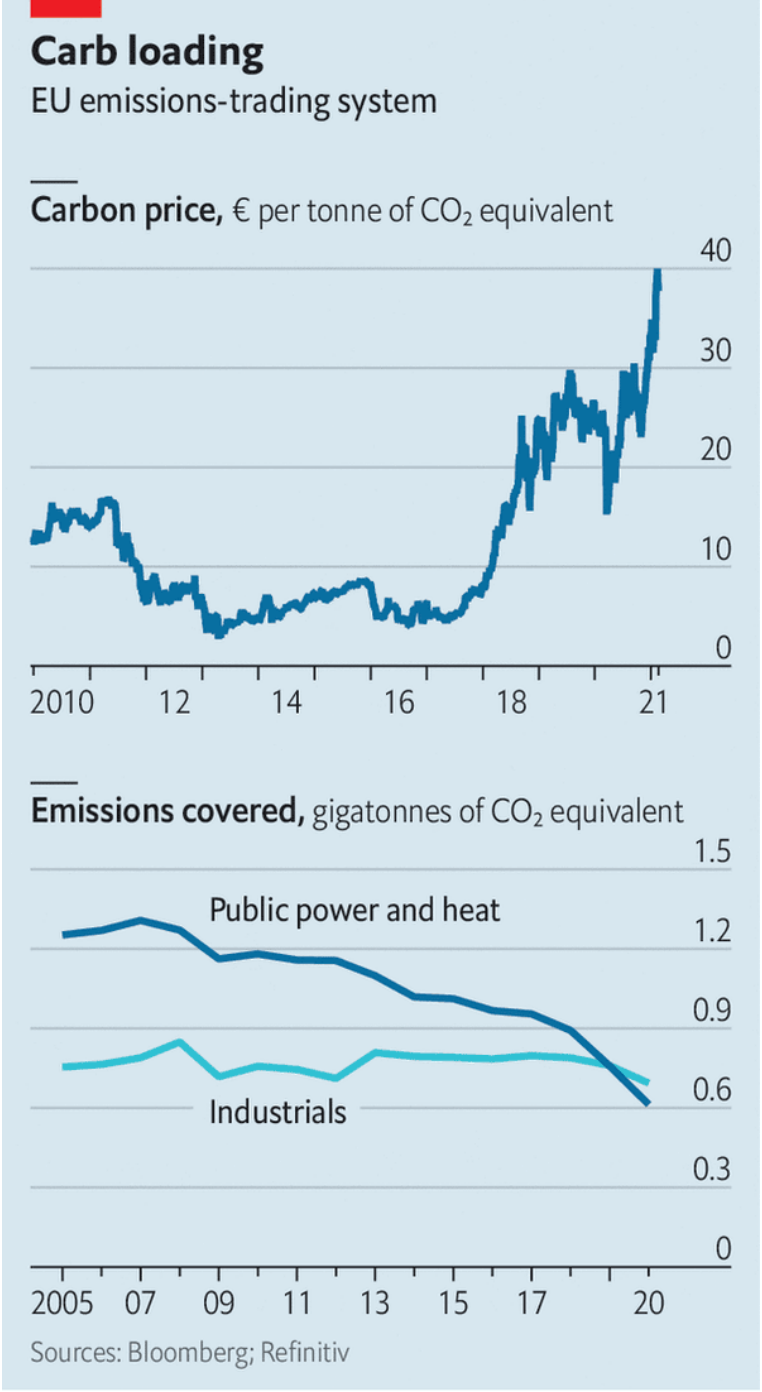
From: Voluntary Carbon and the Post-Pandemic Recovery 2020

Global demand for voluntary carbon credits could increase by a factor of 15 by 2030 and a factor of 100 by 2050.

Voluntary demand scenarios for carbon credits, gigatons per year



https://www.mckinsey.com/business-functions/sustainability/our-insights/a-blueprint-for-scaling-voluntary-carbon-markets-to-meet-the-climate-challenge#



Prices start to rise rapidly!

https://www.economist.com/finance-and-economics/2021/02/24/prices-in-europes-carbon-market-the-worlds-biggest-are-soaring

But demands should fade out by 2050…. → alternative income

Real negative emissions? Peatlands may contribute….

NATURAL
FORESTRY / AGRICULTRUE

Afforestation/ Reforestation

Tree growth takes up CO_2 from the atmosphere

Biochar

Partly burnt biomass is added to soil absorbing additional CO_2

Soil Carbon Sequestration

Land management changes increase the soil carbon content, resulting in a net removal of CO_2 from the atmosphere

Other Land-Use/ Wetlands

Restoration or construction of high carbon density, anaerobic ecosystems

COMBINED
NATURAL + TECHNOLOGICAL

Bioenergy with Carbon Capture and Storage (BECCS)

Plants turn CO_2 into biomass that fuels energy systems; CO_2 from conversion is stored underground

TECHNOLOGICAL
ENERGY / INDUSTRY

Accelerated Weathering

Natural minerals react with CO_2 and bind them in new minerals

Direct Air Capture

CO_2 is removed from ambient air and stored underground

Ocean Alkalinity Enhancement

Alkaline materials are added to the ocean to enhance atmospheric drawdown and negate acidification

CO_2 to Durable Carbon

CO_2 is removed from the atmosphere and bound in long-lived materials

→ **Less costly**
→ **Closer to deployment**
→ More vulnerable to reversal

More costly ←
Greater R&D needs ←
Less vulnerable to reversal ←

New markets: Structural properties

- Wetland plants: unique structural characteristics
- Exposed to much greater forces than terrestrial plants (water weighs more than air) → strong structures.
- Roots under water also need oxygen → aerenchyma without weakening structure → light, open structures
- Climate-friendly building material, insulation

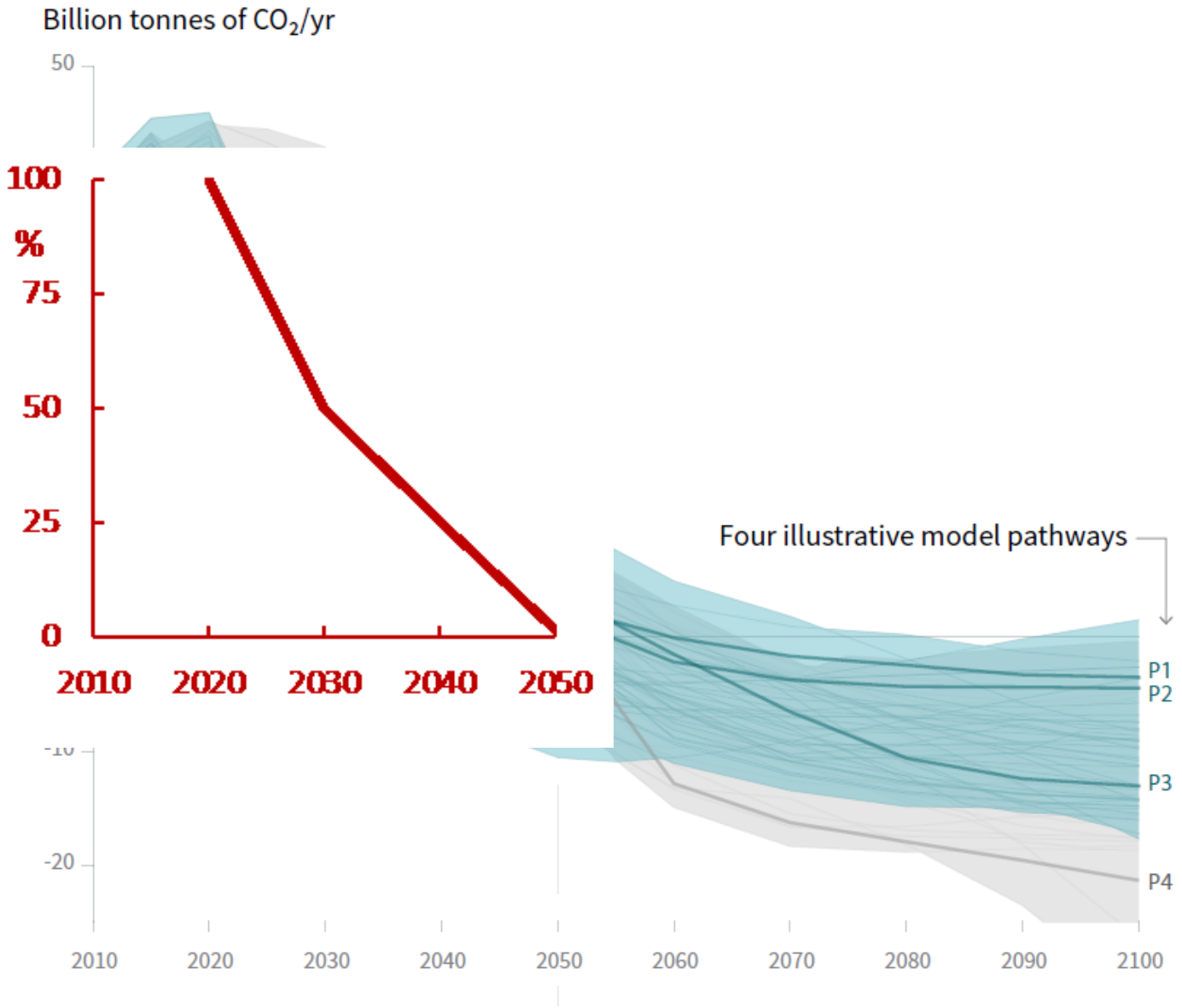
Wetland plants most important lightweight building materials

New markets: Ingredients

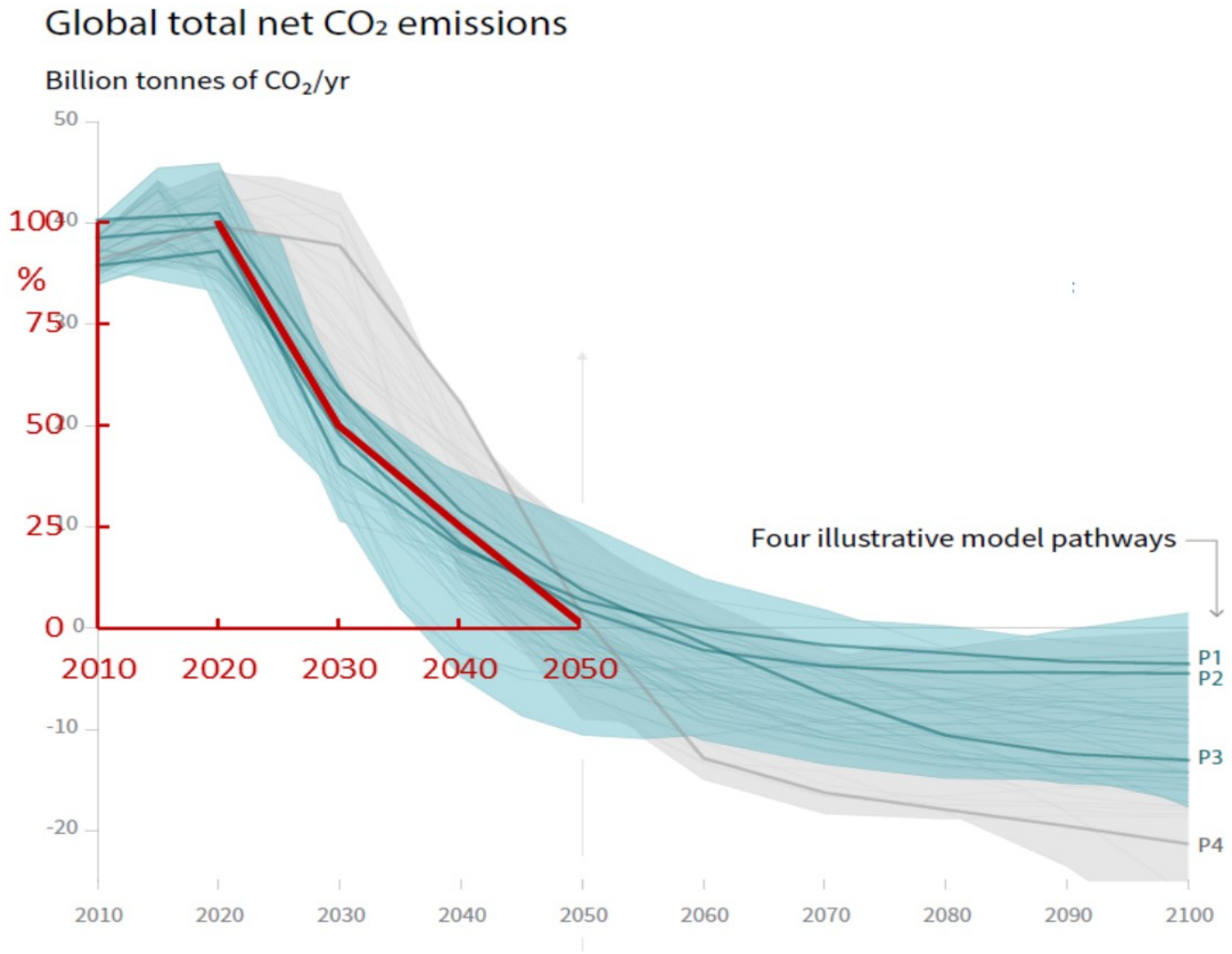
- Helophytes in water strongly attacked by fungi etc.
- Therefore reinforce tissues with silicon and produce fungicides etc.
- Uptake of Si leads to uptake of related elements (such as germanium and rare earths)
- Protective agents often have medicinal effects (Drosera!)
- Think also of phosphate!
- → Phytomining, biorenewables

That is why wetland plants are the world's most important building raw materials. Millions of years of selection!

Paris implies for the world: We must rewet 500,000 km^2 of drained peatland until 2050!



Rewetting challenge for Germany 50,000, for EU 500,000, for Europa 1,000,000 and for World 2,000,000 ha/yr!



EU: until 2050 rewet 500,000 ha per year…

Illusorious, naive…?

Finland in the 1970s *drained* 300,000 ha every year!

Indonesia has 2017-2020 rewetted 4.4 million ha of peatland, i.e. 20x as much as *entire* Europe in its *entire* history!

Sumatra

We in Europe live at the best time in history on the best place on Earth: if we cannot manage, who can???

GREIFSWALD
MOOR
CENTRUM

Mehr Info: https://greifswaldmoor.de/

Und https://www.moorwissen.de

Peatlands must be wet: for the climate, for the land, for the people, for ever…