



POTSDAM INSTITUTE FOR
CLIMATE IMPACT RESEARCH

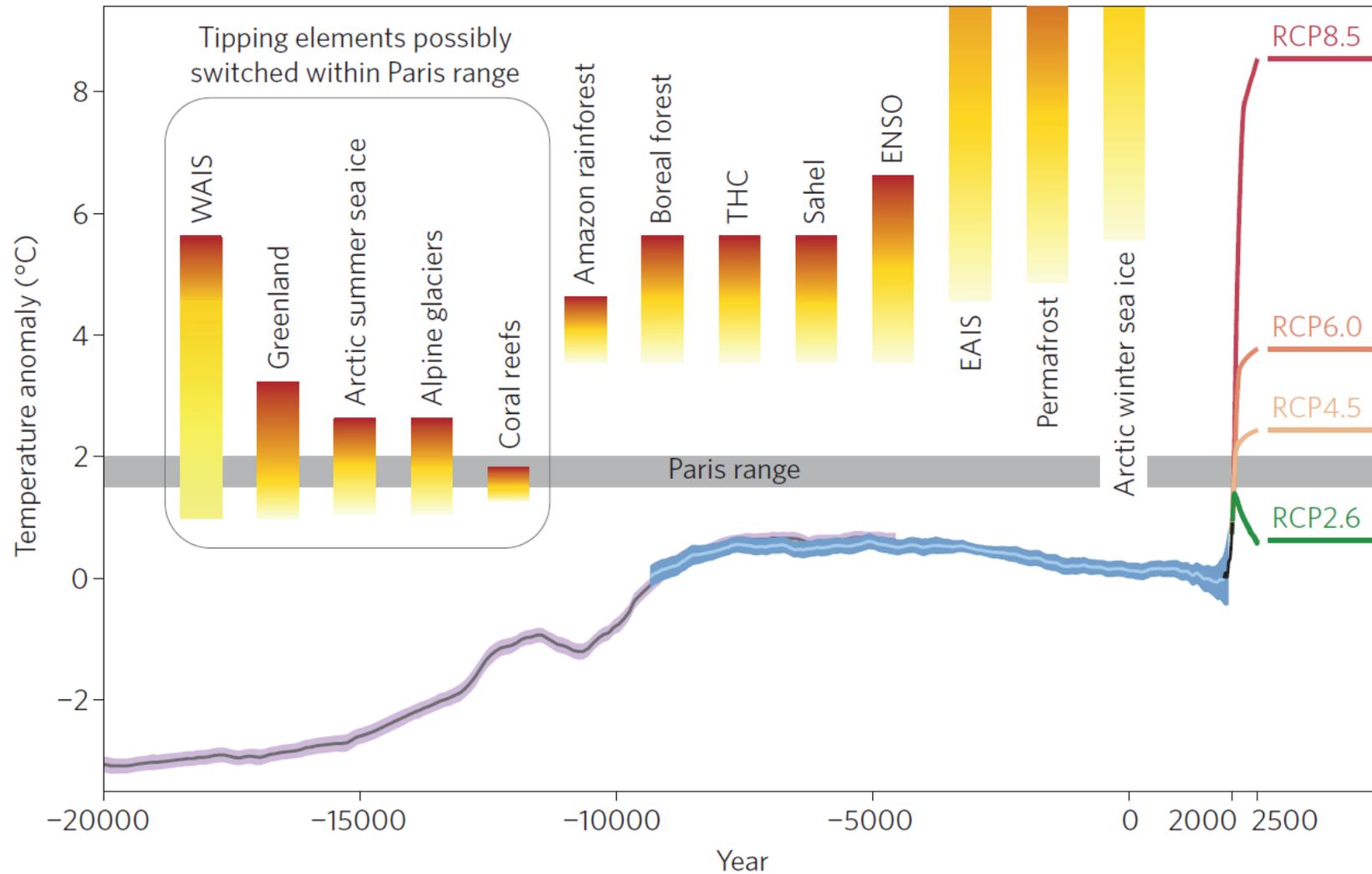
Chancen und Risiken von Holzbau für den Klimaschutz



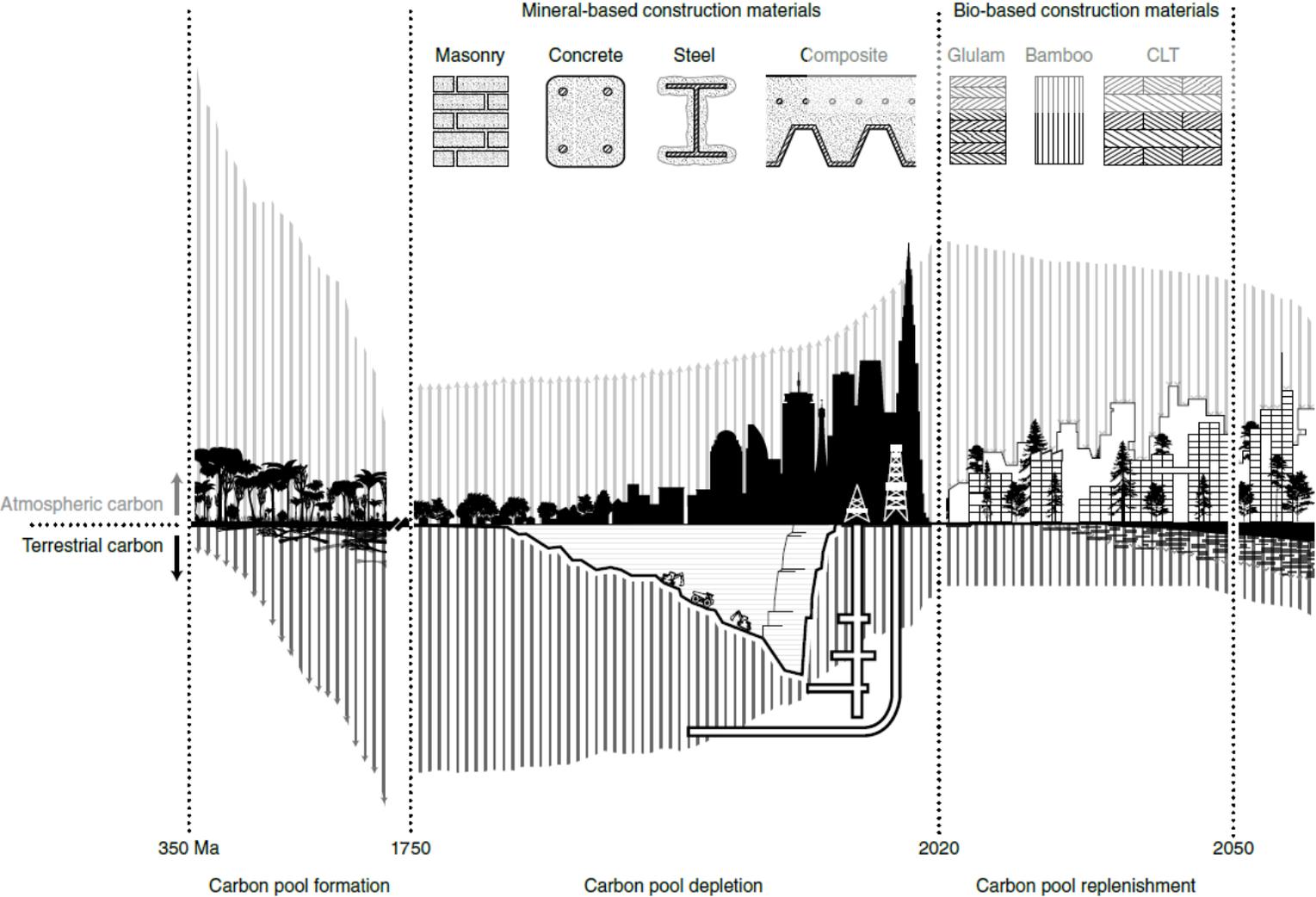
**Gebäude und der Bausektor sind zusammen
für 40% der totalen direkten und indirekten
CO2 Emissionen verantwortlich**

IEA 2019

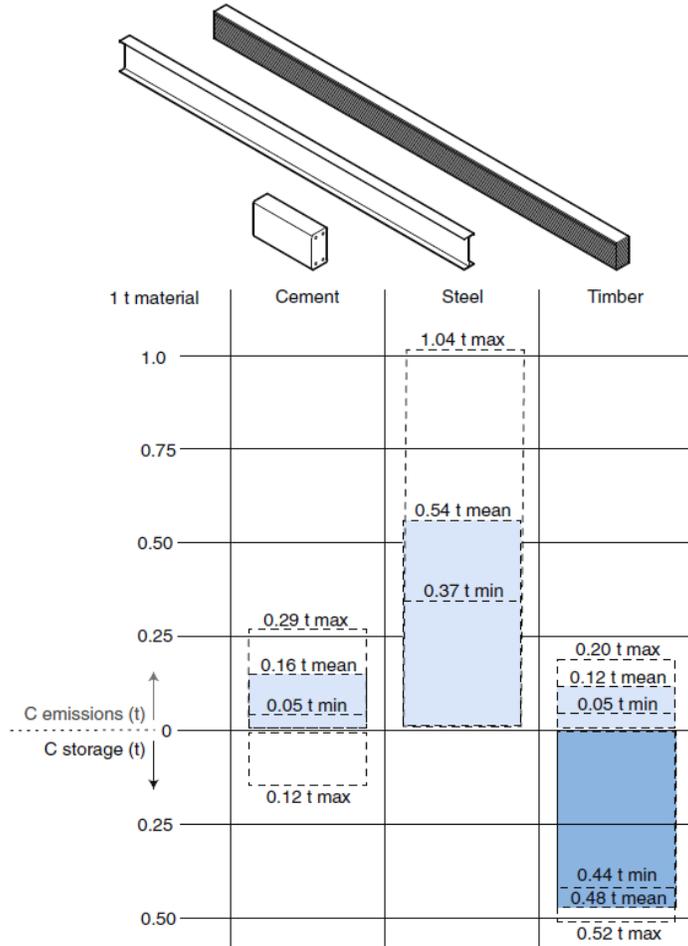
Das Pariser Abkommen ist zentral



Kann eine Transformation des Bausektors zum Klimaschutz beitragen?



Warum Holz? Konventionelle Baumaterialien verursachen Emissionen und speichern kaum Kohlenstoff



PARALLEL STRAND LUMBER

PSL is a composite of wood strands with fibers. The strongest and stiffest engineered wood product available, it is usually the most effective choice for large single beams. Unlike other heavy timber options, PSL is often used in exterior applications because it can be pressure treated.

Manufacturing Process:

1. Selection of log
2. Debarking
3. Peeling into veneers
4. Drying and clipping
5. Adhesive application
6. Assembly
7. Pressing and curing
8. Cutting, marking, and packaging

Product Size:
Up to 7" thick x 18" deep x 80' long

Application:
Beams, columns, and trusses

Trees Used:
Douglas-Fir, Larch, Pacific Silver Fir, Southern Yellow Pine, Western Hemlock, and Poplar

Fun Fact:
PSL utilizes waste materials from LVL and plywood manufacturing.

NAIL-LAMINATED TIMBER

NLT is created by stacking dimensional lumber together on its edge and fastening it together with nails. Plywood sheathing can be added to one side to allow the product to be used as a wall panel. It is cheaper than other heavy timber options and more widely accepted in building codes because it is simple to make and simple to understand.

Manufacturing Process:

1. Grading and selection of dimensional lumber
2. Fastening individual dimensional lumber, stacked on edge, into one structural element with nails
3. Installing the plywood sheathing (optional)
4. Finishing the underside

Product Size:
Up to 12" thick x 12' wide x 100' long. (width and length of panel only limited by shipping and erection constraints)

Application:
Floors, decks, walls, roofs, stair and elevator shafts

Trees Used:
Spruce-Pine-Fir, Douglas-Fir Larch, Alaska Yellow Cedar, Port Orford Cedar, Southern Yellow Pine, and many other species

Adhesive:
Nails

Fun Fact:
Nail-laminated timber has been used to build warehouses and factories for the past 150 years. It was previously referred to as heavy timber or mill decking.

GLU-LAMINATED TIMBER

Glulam is an engineered product made of two or more layers of lumber glued together with the grain of all layers running parallel to the length. Its composition enables the production of a variety of sizes and shapes, including curves. Glulam's size is limited only by the manufacturing and transportation capabilities. Glulam has many advantages over sawn lumber, such as greater size and strength.

Manufacturing Process:

1. Selection of dimensional lumber
2. Splicing and joining with staggered finger joints
3. Adhesive application
4. Pressing
5. Sanding
6. Cutting, marking, and packaging

Product Size:
Up to 20" thick x 7' wide

Application:
Beams, columns, arches, trusses, and walls

Trees Used:
Douglas-Fir, Larch, Southern Yellow Pine, Hem-Fir, and Spruce-Pine-Fir

Fun Fact:
Glulam's earliest use can be traced to a bridge built in Bavaria, Germany in the early 1800s. However, it wasn't until World War II that glulam flourished as a building material due to developments in waterproof glues and fabrication technologies.

CROSS-LAMINATED TIMBER

CLT consists of several boards stacked in alternating directions and glued together. To obtain specific structural capacities, consecutive layers may be placed in the same direction. A typical CLT cross-section contains three to seven boards.

Manufacturing Process:

1. Lumber selection (each piece is up to 2" deep and 9.5" wide)
2. Lumber grouping and planing
3. Adhesive application
4. Panel lay-out and pressing
5. Cutting, marking, and packaging

Product Size:
Up to 15" thick x 10' wide x 64' long

Application:
Walls, floors, roofs, stair and elevator shafts

Trees Used:
Douglas-Fir, Spruce-Pine-Fir, Southern Yellow Pine, Black Spruce, and Alaska Yellow Cedar

Fun Fact:
To fabricate CLT, some wood manufacturers utilize lumber from trees killed by the Mountain Pine Beetle.

Mass Timber Products
National Building Museum
USA
Slide: Courtesy Galina Churkina

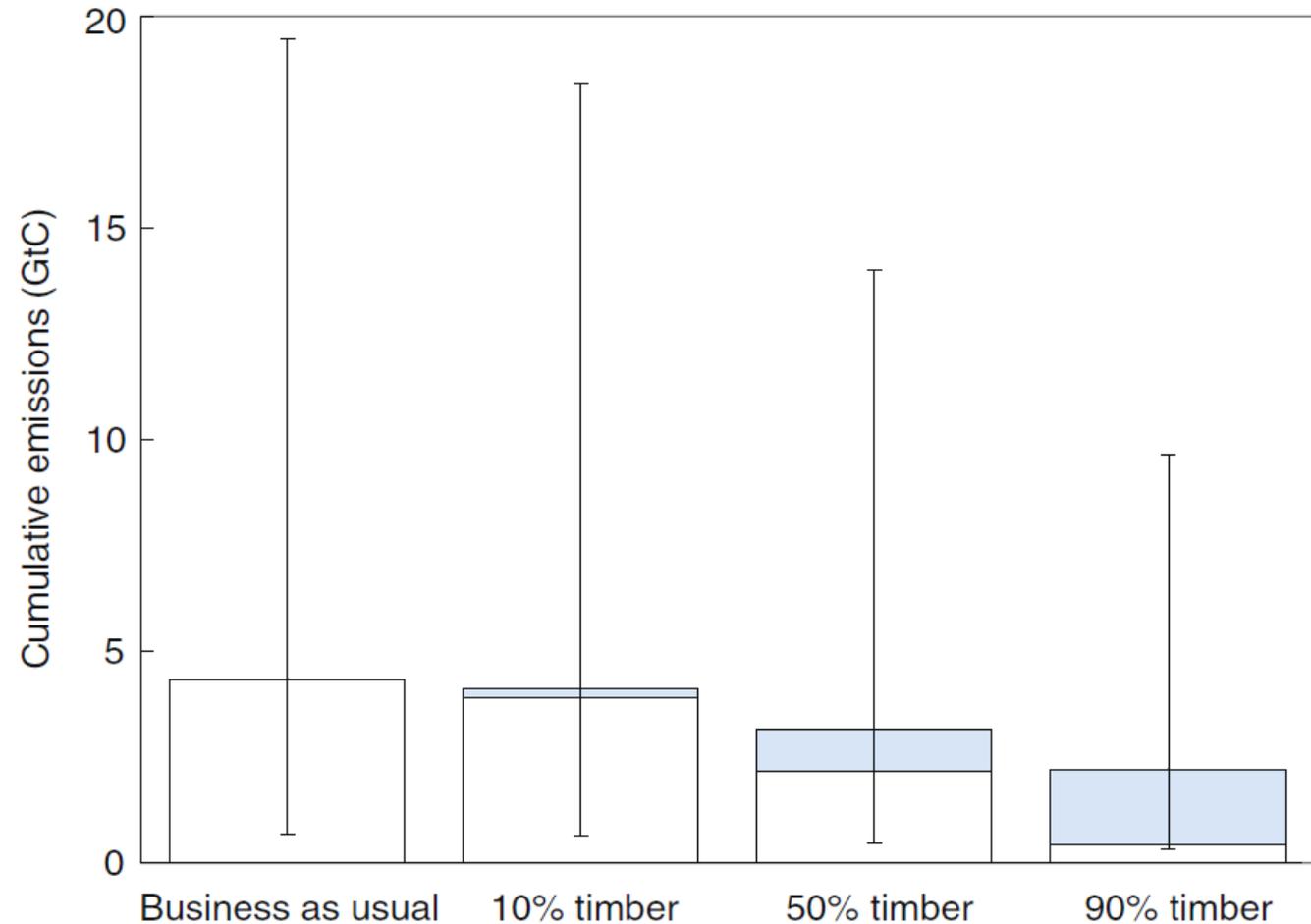
Holzbau reduziert die Emissionen die bei der Herstellung von Primärstrukturen und Einfassungen entstehen

Wachstum der urbanen Bevölkerung von 2020-2050

Continent	People (*1000)	%
Africa	901182	39.2
Asia	1117595	48.6
Europe	42173	1.8
Latin America and the Caribbean	145643	6.3
Northern America	81929	3.6
Oceania	12241	0.5
Total	2300763	100

Nicht beachtet:

- Emissionen durch Holzernte usw.
- Reduzierte Kohlenstoffaufnahme durch “fehlendes Wachstum”
- Kohlenstoffaufnahme durch Wiederaufwuchs



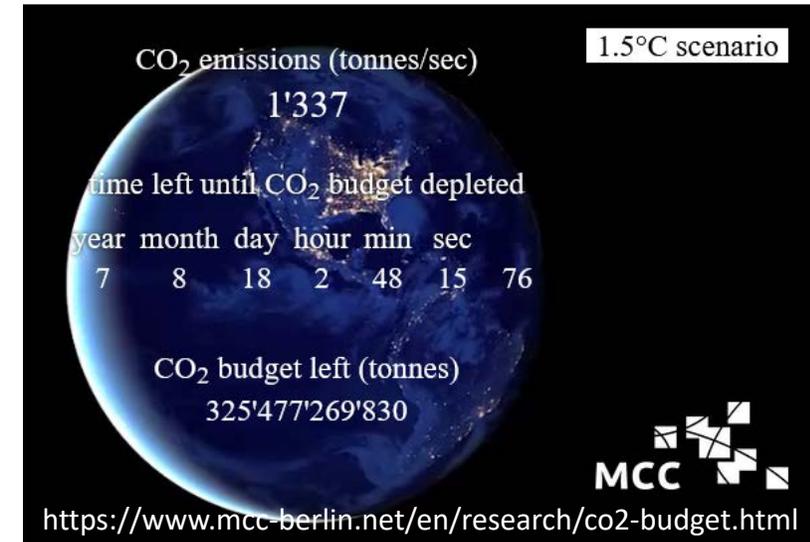
Holzbauten aus innovativen Holzprodukten könnten zwischen 10-700 Millionen Tonnen Kohlenstoff pro Jahr speichern wenn genügend Holz verfügbar ist

Für 2020-2050:

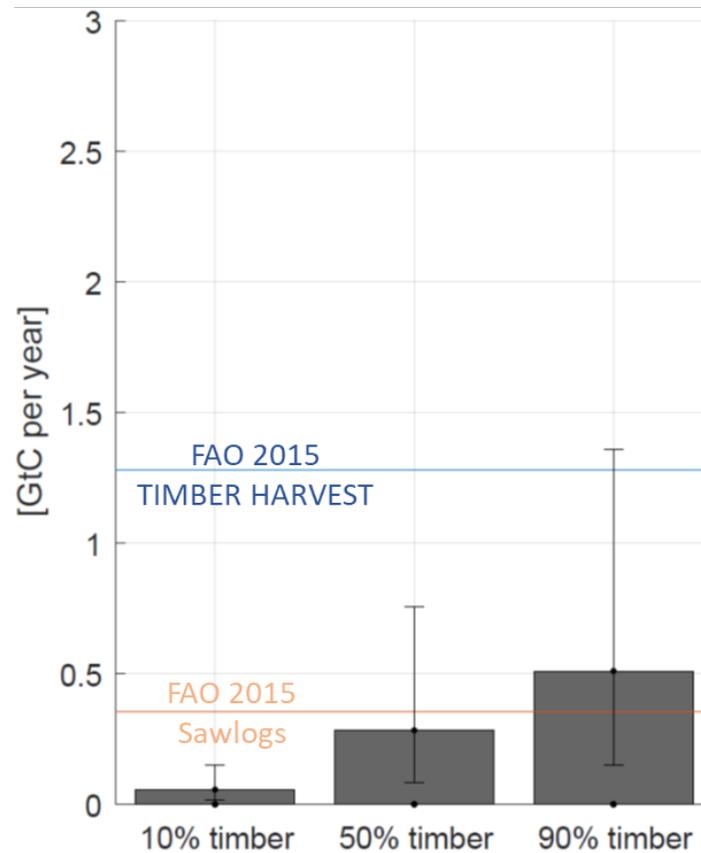
90%: 2–20 GtC

50%: 1–11 GtC

10%: 0.25–2.3 GtC



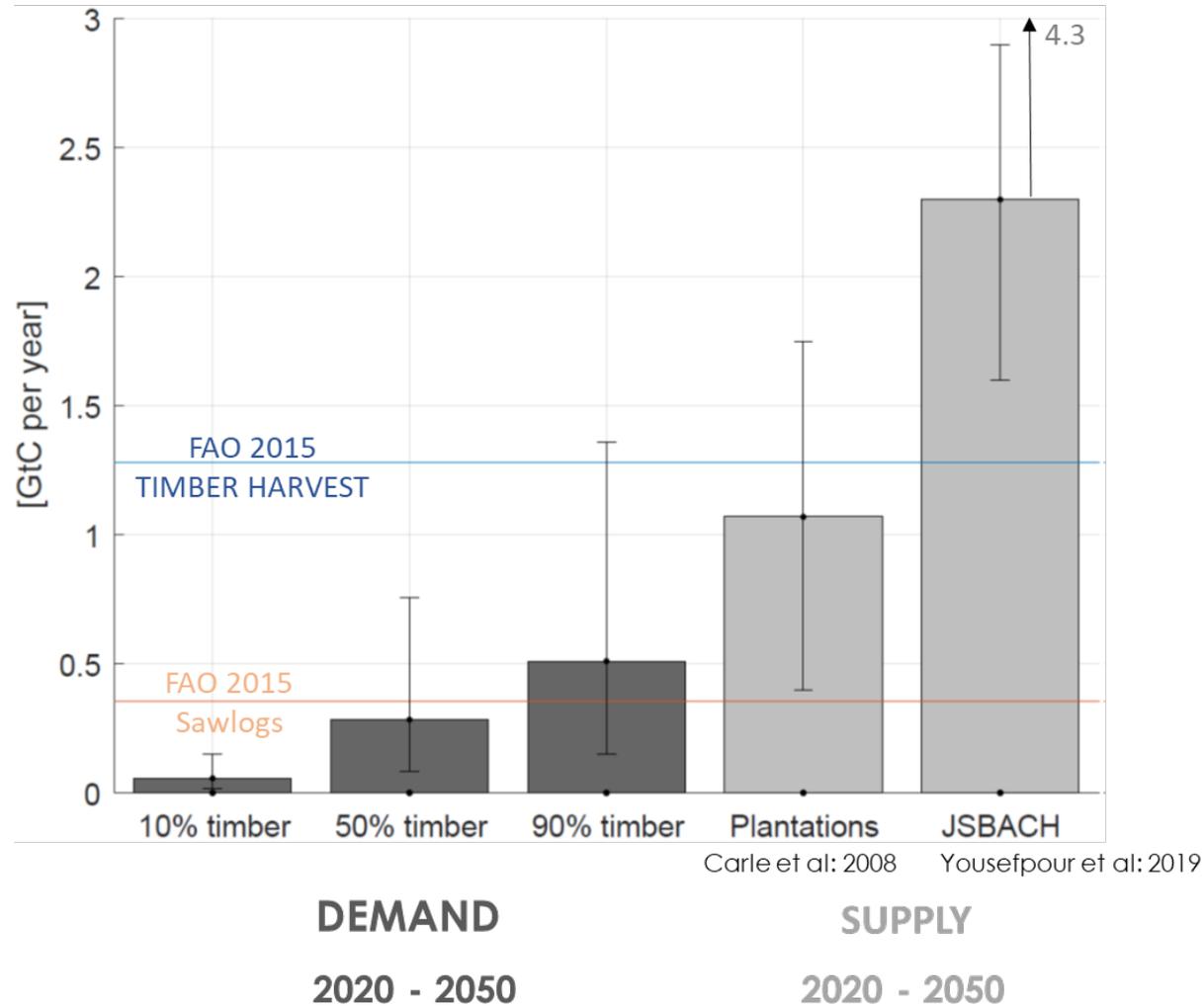
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DEMAND
2020 - 2050

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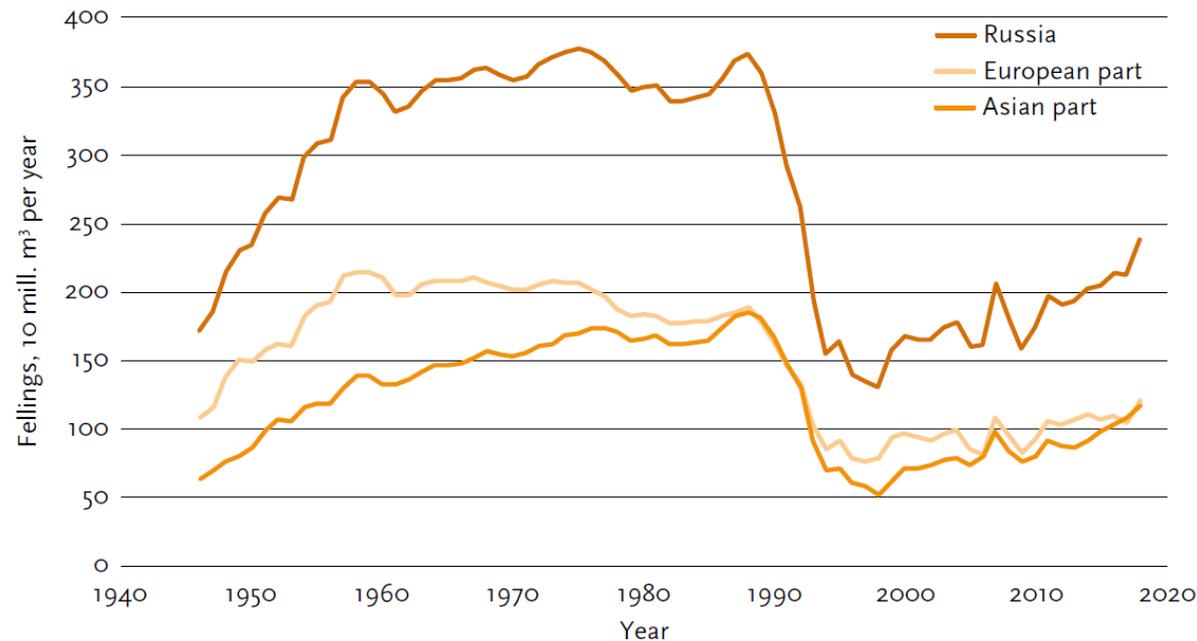
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Diskussion:

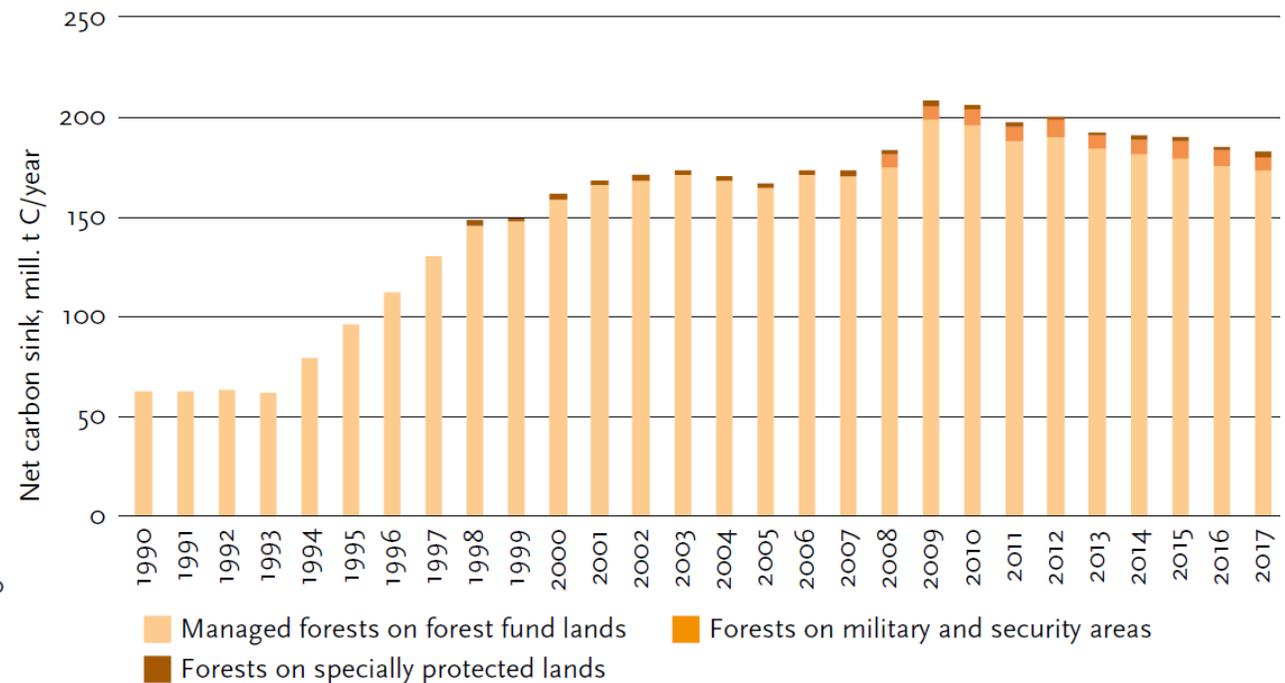
- Mehr ernten?
- Anders nutzen / umleiten?

Historisches Beispiel: Holzernte und Kohlenstoffsenke im Wald sind gekoppelt

Holzernte in Russland



Kohlenstoffsenke in bewirtschafteten Wäldern Russlands (ohne CH4 und N2O Emissionen aus Feuern und Dränagen)



UNECE Forest Sector Outlook Study: Jedes 10te neue Haus in China aus Holz zu bauen führt zu carbon leakage

	Biomass	Harvested Wood Products	Avoided emissions	Balance
EU-26	-10.2	2.8	-1.6	-9.0
N America	-10.6	5.5	-1.0	-6.1
Russian Federation	-7.3	2.9	-0.4	-4.7
South America	-7.7	-0.1	-0.3	-8.2
Central America	-9.5	0.3	0.3	-8.9
Asia	-204.3	73.1	143.7	12.4
Oceania	-4.9	0.8	-0.1	-4.2
World	-258.8	86.7	139.7	-32.2

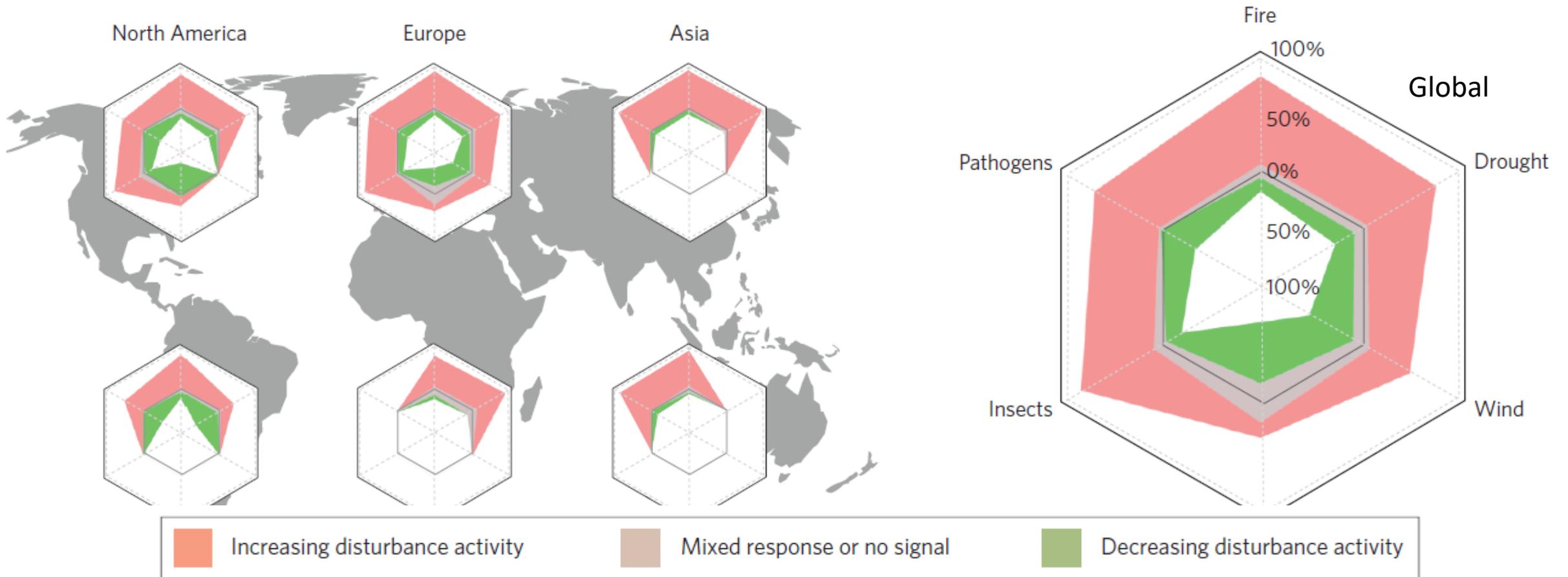
Global Forest Product Model

- Geringe Ernteeffizienz
- Unsichere, statische Substitutionsfaktoren (keine Steigerung von Produktionseffizienz, keine neuen Technologien)
- Integrierte Holzproduktkette → z.B. Sägeindustrie nutzt bereits "Abfälle" für Energie und Papier
- Keine Klimafolgen betrachtet

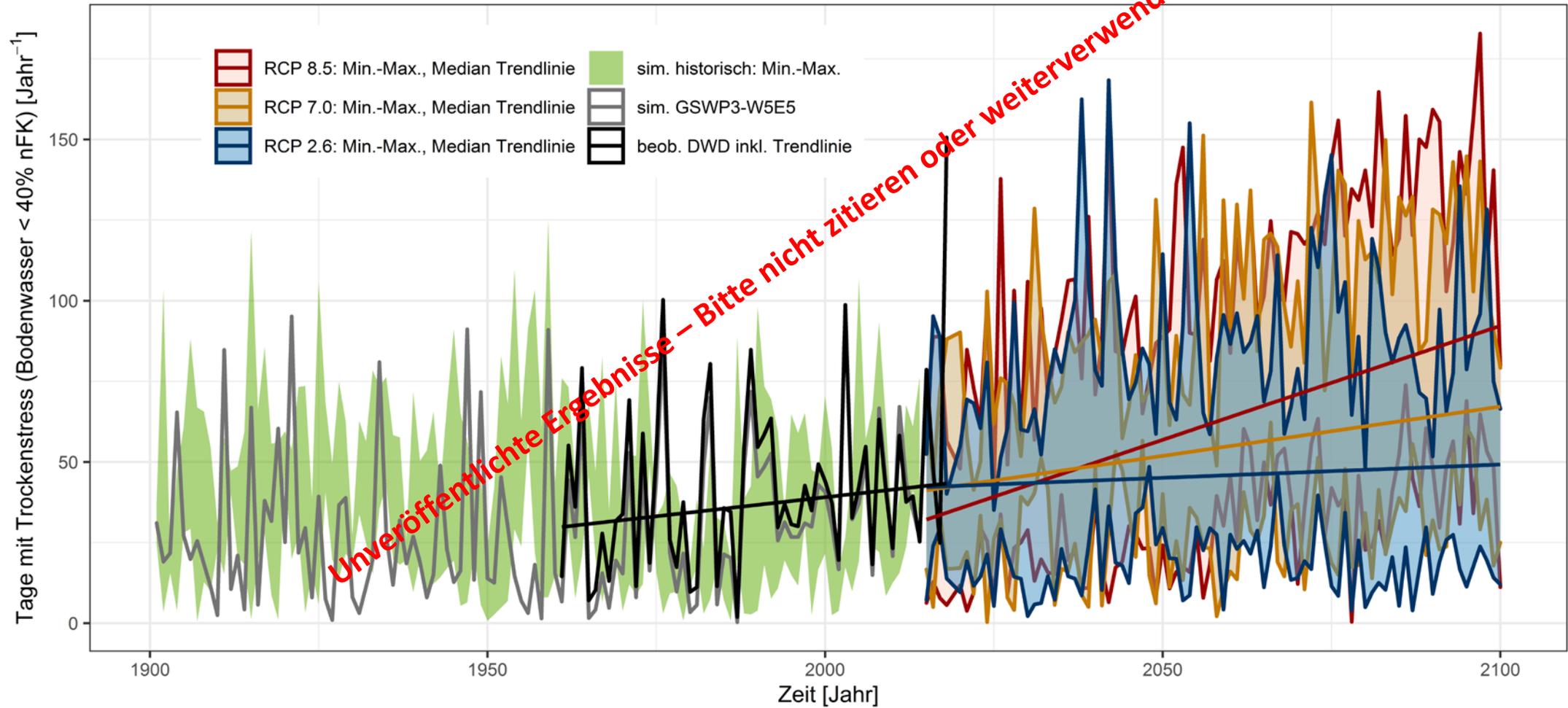
In Millionen t CO₂-aqu Jahr⁻¹, gemittelt über 2015-2040, verglichen mit einer SSP2-angetriebenen Simulation. Kohlenstoffspeicher von Holzprodukten werden dem "holzproduzierendem" Land gutgeschrieben, wohingegen vermiedenen Emissionen dem "holznutzenden" Land gutgeschrieben.

In einer trockeneren und wärmeren Welt nehmen Waldstörungen zu

Systematische Analyse von Klimawandeleffekten auf Störungen
674 paper, 1,669 Datenpunkte



2018 war eine Warnung



Fazit

- Gebäudesektor muss dekarbonisiert werden
- Holzbauten können einen wichtigen Beitrag liefern wenn Verweildauer maximiert werden kann
- Zielkonflikte mit...
 - Kohlenstoffspeicherung im Wald & Biodiversitätsschutz
 - Produktion anderer Holzprodukte / momentane Holznutzung
 - Klimafolgen insb. Störungen... müssen quantifiziert und einbezogen werden
- ganzheitliche Betrachtung auf internationaler Ebene nötig

Danke



CC Julian Trampitsch