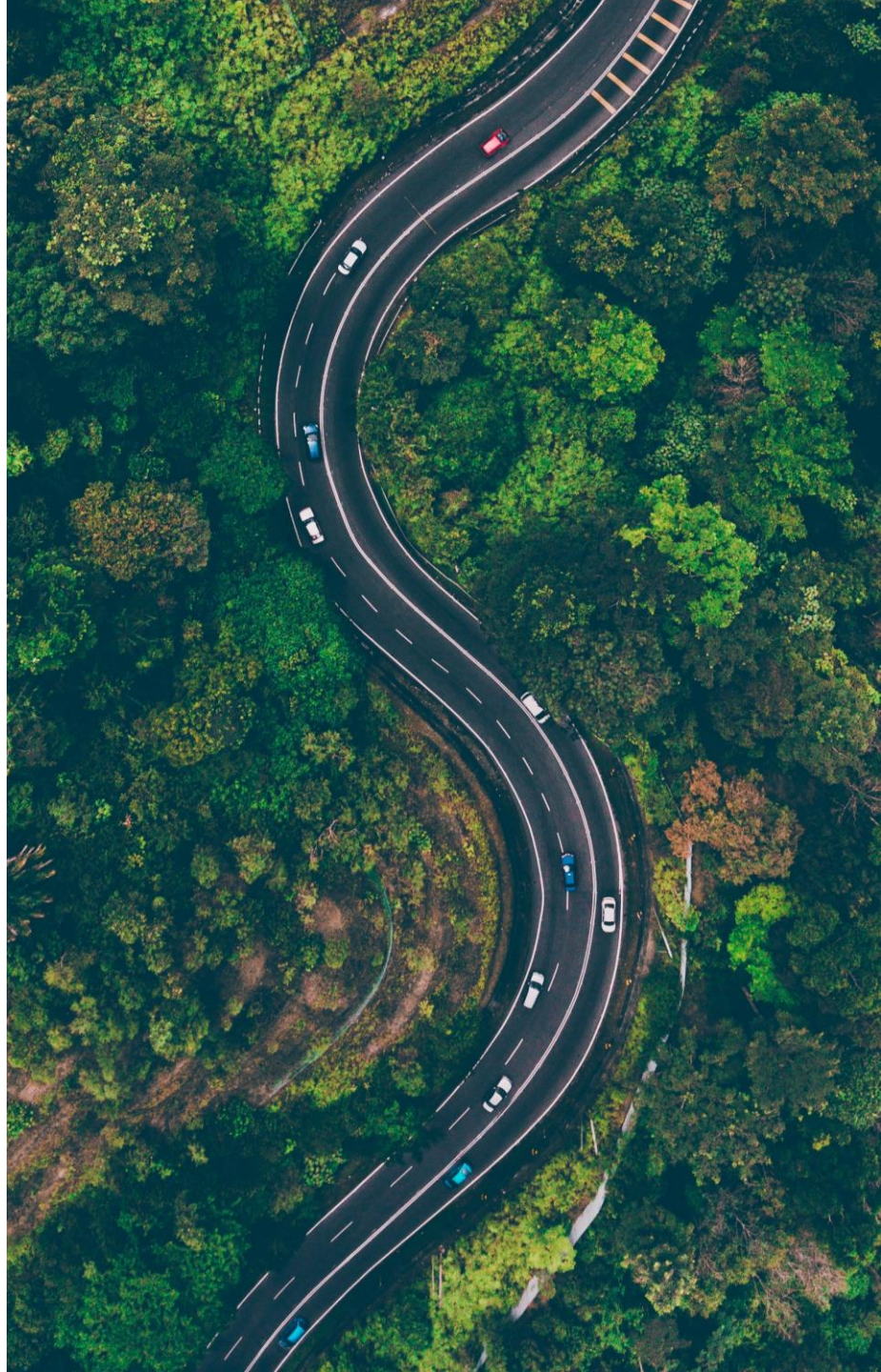
Forest carbon markets

How growing demand for forest carbon is shaping wood markets

25th Fastmarkets Forest Products Europe Conference, Prague

9 March 2023

O'Kelly Acumen



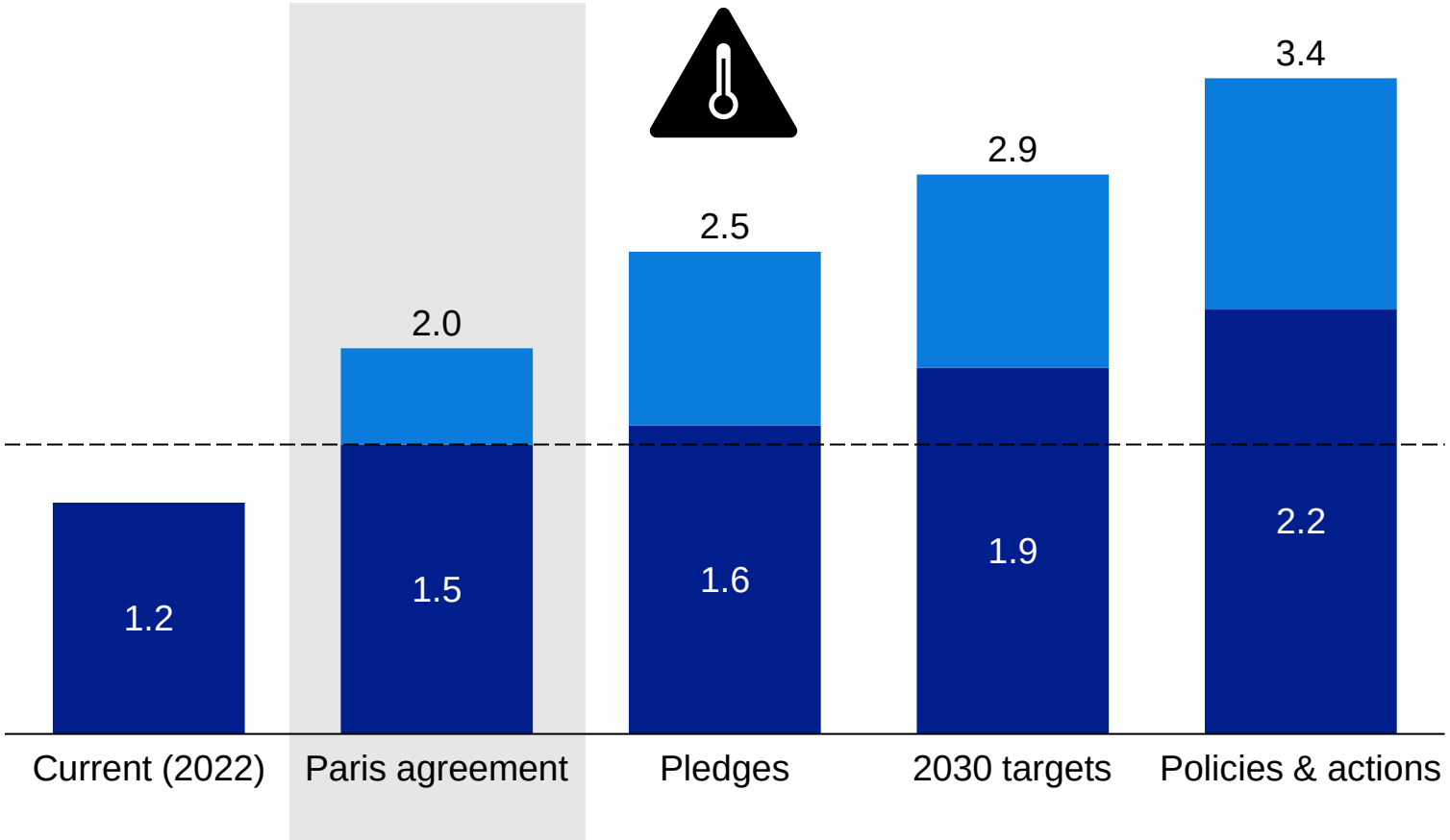
Agenda

1. Role of forests in tackling climate change
2. Rise of carbon pricing
3. Overview of forest carbon markets
4. Implications for wood supply

The path to limit global warming to 1.5°C is challenging

Effect of current climate pledges and policies

Global temperature increase by 2010 vs. pre-industrial level; °C

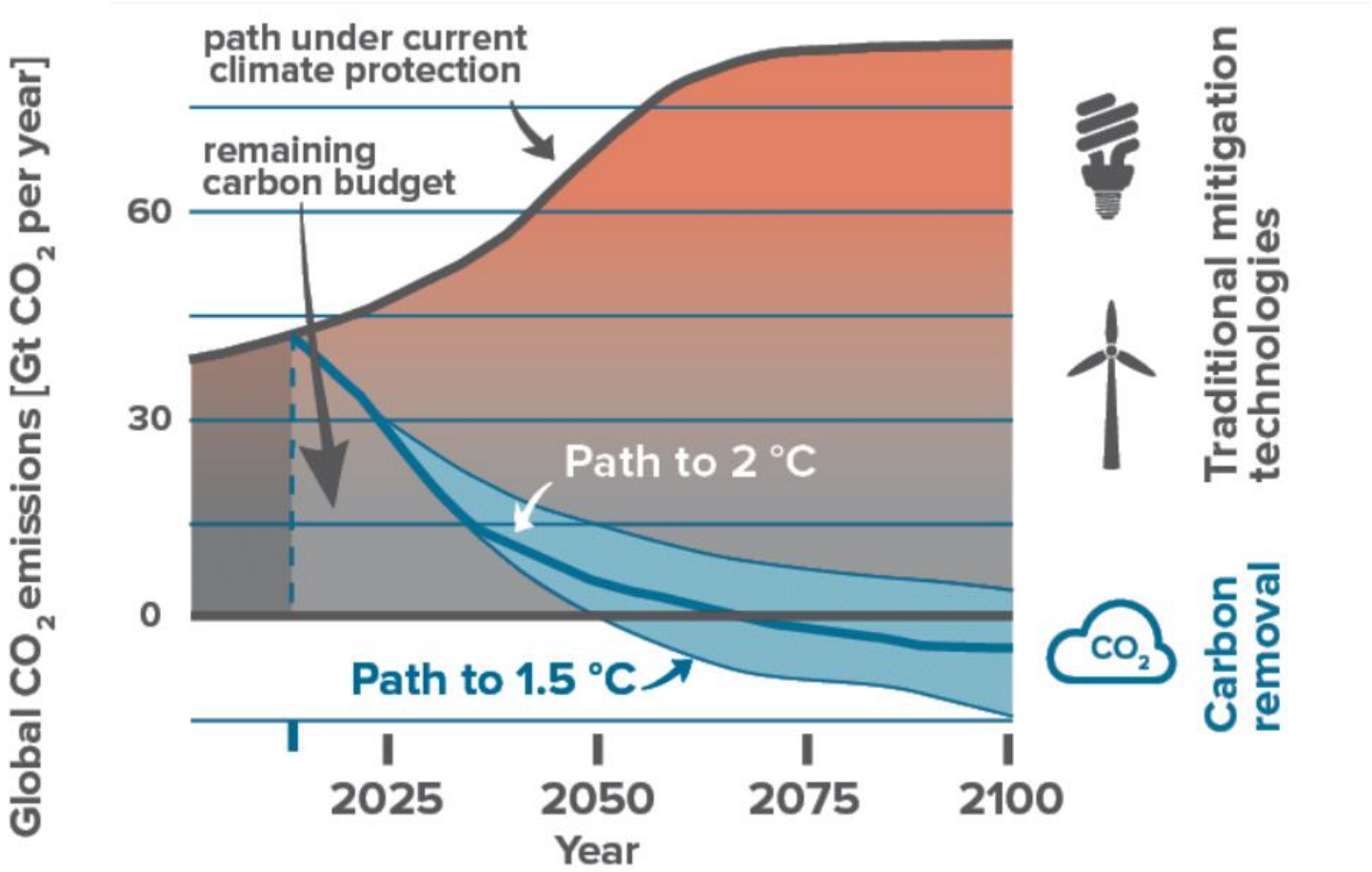


- Paris Agreement: 196 countries signed in 2015, to limit the rise in mean global temperature to <2.0°C (preferably <1.5°C).
- Current policies are not enough:
  - Pledges made could limit warming to 1.6-2.5°C by 2100
  - Current policies could limit warming to 2.2-3.4°C by 2100
- More aggressive interventions will be required to achieve targets, and limit climate change to safe levels.

SOURCE: Climate Action Tracker (2022). The CAT Thermometer. November 2022. Available at: https://climateactiontracker.org/global/cat-thermometer/

Carbon *removal* is needed to achieve (net) emissions targets

Pathway to 1.5°C with emissions reduction and carbon removal



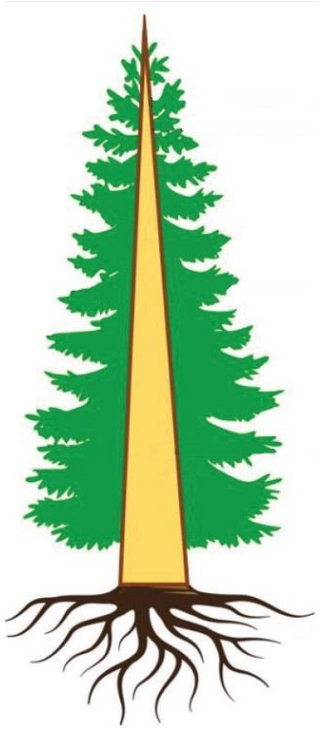
- Focus of climate change abatement policy is on emissions **reduction** (e.g., energy efficiency, renewable energy sources).
- Increasing focus on carbon **removal**, to reduce *net* emissions (e.g., biomass carbon capture and storage, forest sequestration).
- More carbon removal required to meet targets set in the Paris Agreement, which require **net zero emissions** by 2050.

SOURCE: Climeworks / Mercator Research Institute on Global Commons and Climate Change (2019) and data from IPCC (2018)

Forests store a lot of carbon – in trees, soil, litter and dead wood

CO_2 stored in a typical production forest – Nordic example

Typical tree



Tree volume
m^3 / hectare

Stem is 40-45% of total tree volume

250 | 70 | 115 | 145 | 580

Stem | Bark | Branches, foliage | Stump, roots | Total tree

Wood composition
dry tonnes / ha

Dry mass of pine is ~0.4 tonnes per m^3

About half of dry mass is C

350 | 115 | 115

Water | Other elements | Carbon

CO_2 in tree
tonnes CO_2 / ha

Molecular mass of CO_2 is 3.67x higher than carbon

305 | 420

O_2 | CO_2

CO_2 in ecosystem
tonnes CO_2 / ha

280 | 60 | 760

Soil | Dead wood | Total forest

A lot more carbon is stored in the soil, litter and dead wood

SOURCE: Skogforsk; FAO FRA; Academic papers; OA analysis

Forests represent a large source of carbon emissions, and an even larger carbon sink

Forest carbon emissions and sequestration, 2001-2018; $GtCO_2$ / year

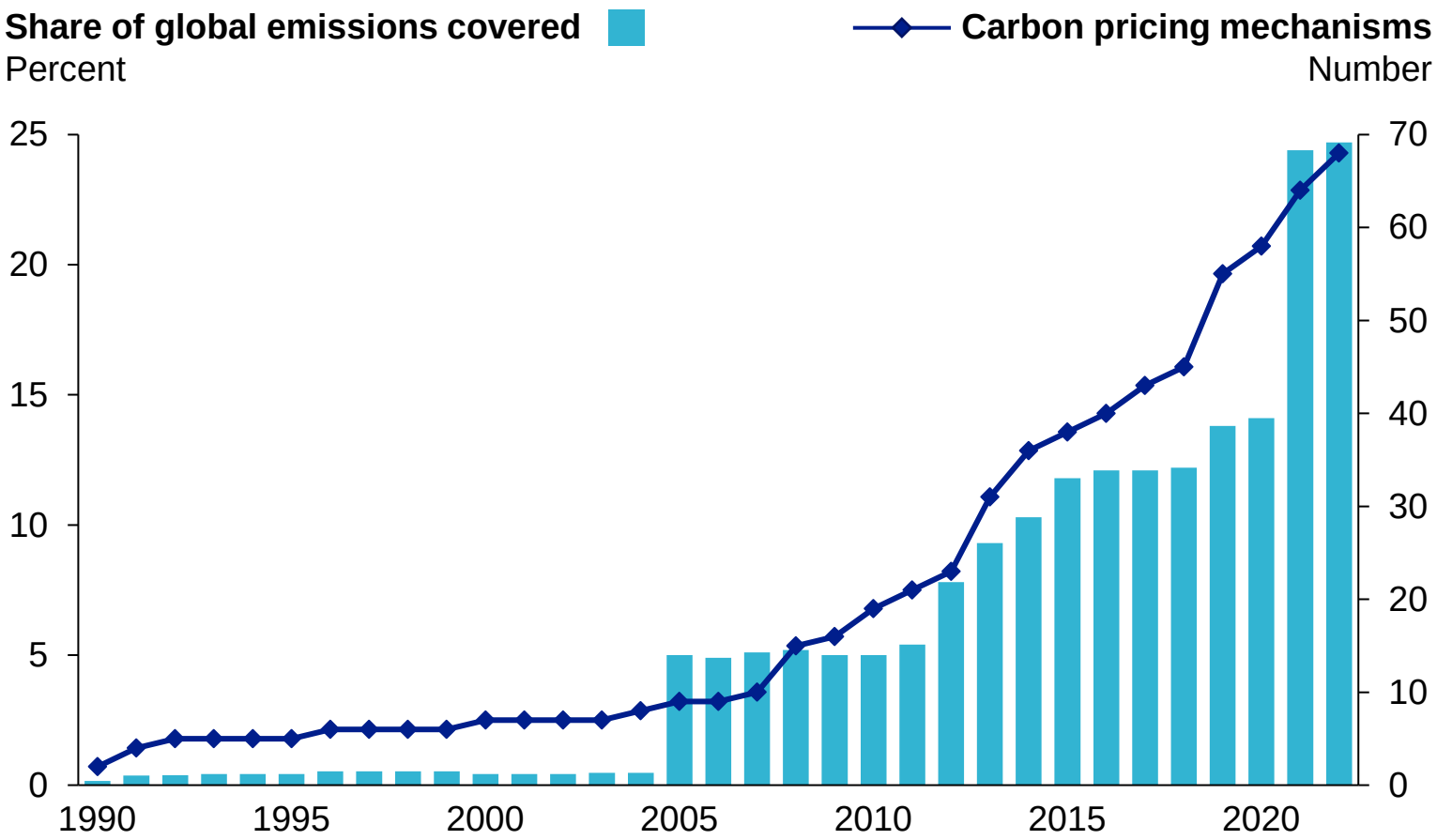
Forest types	Emissions	Sequestration	Net sink
 **Tropical** e.g. Brazil, Congo, Indonesia	5.3	7.1	1.7
 **Subtropical** e.g. Mexico, India, Australia	1.0	1.6	0.7
 **Temperate** e.g. W.Europe, US, Japan, China	0.9	4.4	3.6
 **Boreal** e.g. Russia, Nordics, Canada	0.9	2.5	1.6
Global total	8.1	15.6	7.6

- Forest carbon emissions and sequestration are not evenly distributed.
- Emissions mainly in tropical forests.
- Sequestration in most regions – increased forest area and stock.
- Implications for where and how to do forest carbon projects.

SOURCE:Harris et al (2021). "Global maps of twenty-first century forest carbon fluxes" in Nature Climate Change

Carbon pricing has grown to cover almost 25% of global emissions

Growth of carbon pricing mechanisms

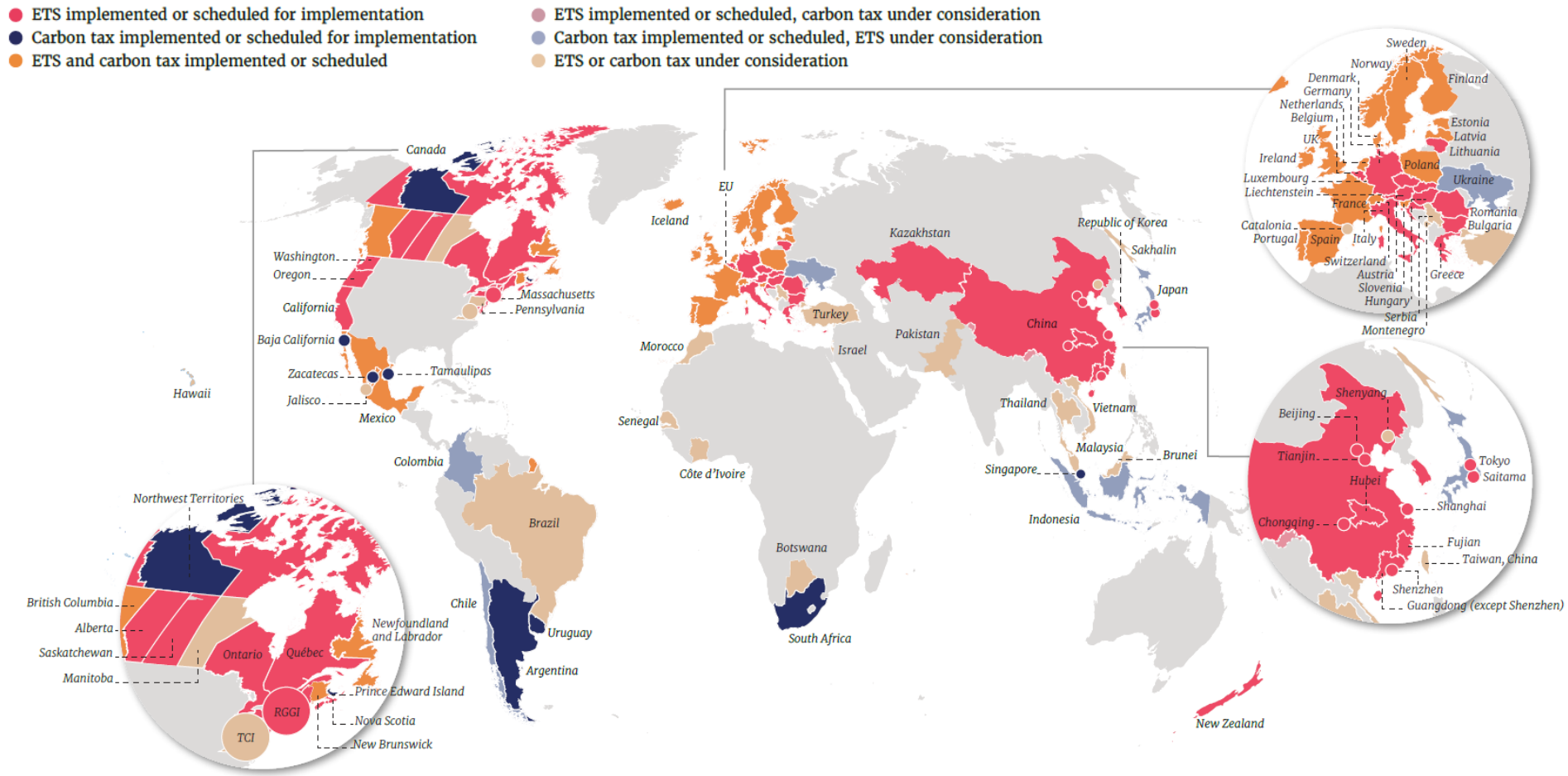


- Pricing carbon = highly effective tool for reducing emissions.
- Cap-and-trade + carbon tax.
- Imposes cost on emitters and rewards those that reduce emissions (or remove carbon from atmosphere).
- Rapid growth in carbon pricing mechanisms and share of global emissions covered.
- Between 2000 and 2022:
  - From 7 to 68 mechanisms
  - From <1% to 25% emissions

SOURCE: World Bank (2022)

Most regions now have carbon pricing mechanisms – either carbon taxes or emissions trading schemes

Carbon pricing mechanisms globally

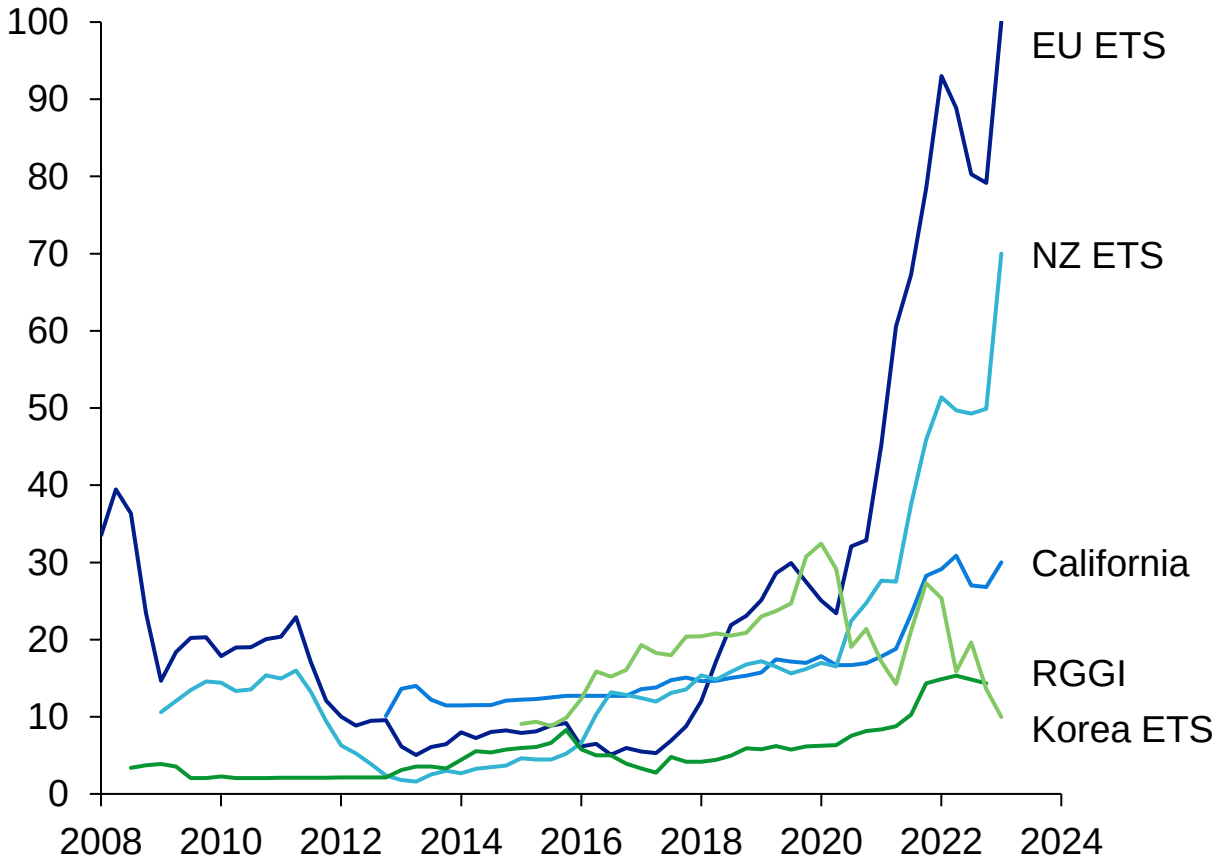


- Almost 70 mechanisms now in place.
- Concentrated in North America, Europe, Asia and Latin America.
- Emissions Trading Schemes (ETS) are most popular – and growing faster.

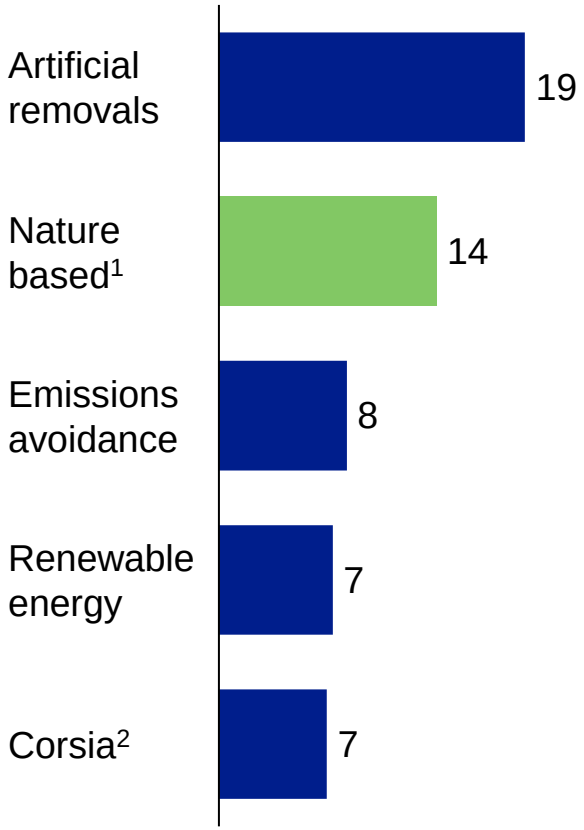
SOURCE: World Bank (2022)

Prices are rising for carbon emissions, and credits from nature-based projects sell at a premium

Global carbon prices on leading exchanges; USD / tonne



Prices by project type; 2022 Q1, USD / tonne



- Prices have risen sharply on most exchanges in 2021-23.
- EU ETS now above 100 USD/t.
- NZ ETS and California cap-and-trade also record highs.
- Nature-based credits (like forestry) trade at a premium.

1. Including forestry (e.g. avoided deforestation, afforestation, improved forest management) 2. Mix of credits eligible for use in Carbon Offsetting and Reduction Scheme for International Aviation

SOURCE: ICAP Allowance Price Explorer; World Bank

Carbon credits are traded to help governments, companies and individuals meet legal obligations or voluntary committments

Carbon credit supply and demand landscape (simplified)

Supply – Carbon crediting mechanisms

Government

Based on **international treaties** (e.g. UN), or **government systems** at regional / national / subnational level

e.g. California COP

Independent

Non-government crediting agencies

e.g. Gold Standard

Demand – Carbon credit buyers

Compliance

To meet **legal obligations**

Buyers are nations and companies

e.g. NZ ETS

Voluntary

Voluntary offsets

Buyers are companies, organizations, individuals

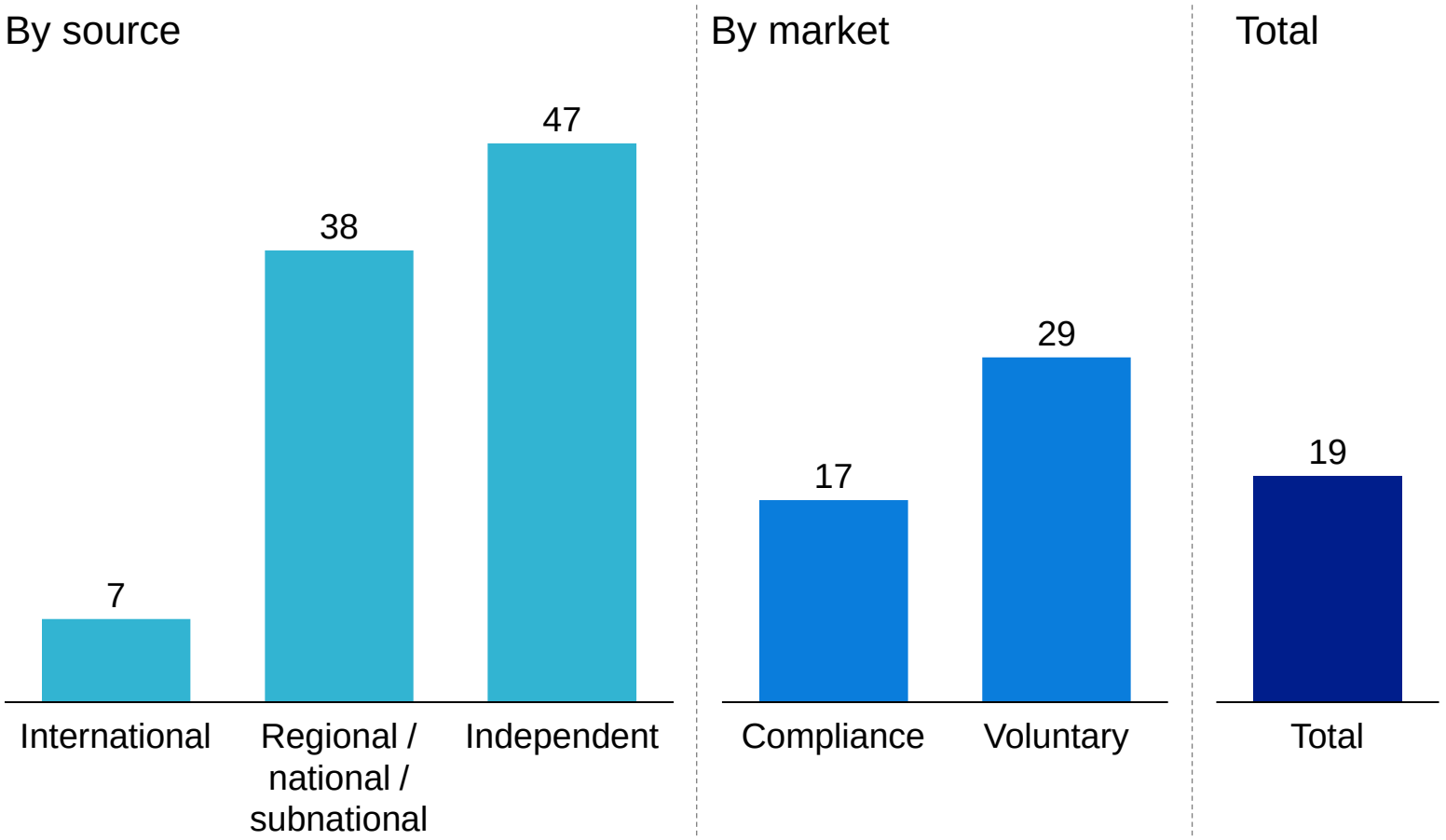
e.g. Carbon Trade Exchange

- Carbon credit markets consist of crediting mechanisms and buyers.
- Supply is from government mechanisms and independent agencies.
- Demand is from buyers that offset emissions to meet legal obligations (compliance) or voluntarily.

SOURCE: OA analysis

Forest carbon credits are popular among developers and buyers

Forestry and landuse share of all credits issued[1]; Percent



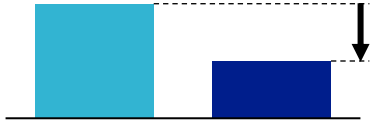
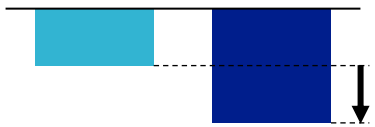
- Forestry projects are popular with project developers and credit buyers.
- Visible and tangible.
- Offer significant co-benefits:
  - Biodiversity / forest habitat
  - Reduced erosion and soil loss
  - Improved water quality
  - Improved air quality, less dust
  - Social benefits for local communities (e.g. jobs, firewood).

1. Until year-end 2019

SOURCE: OECD; World Bank; OA Analysis

There are three main types of forestry projects that generate carbon credits

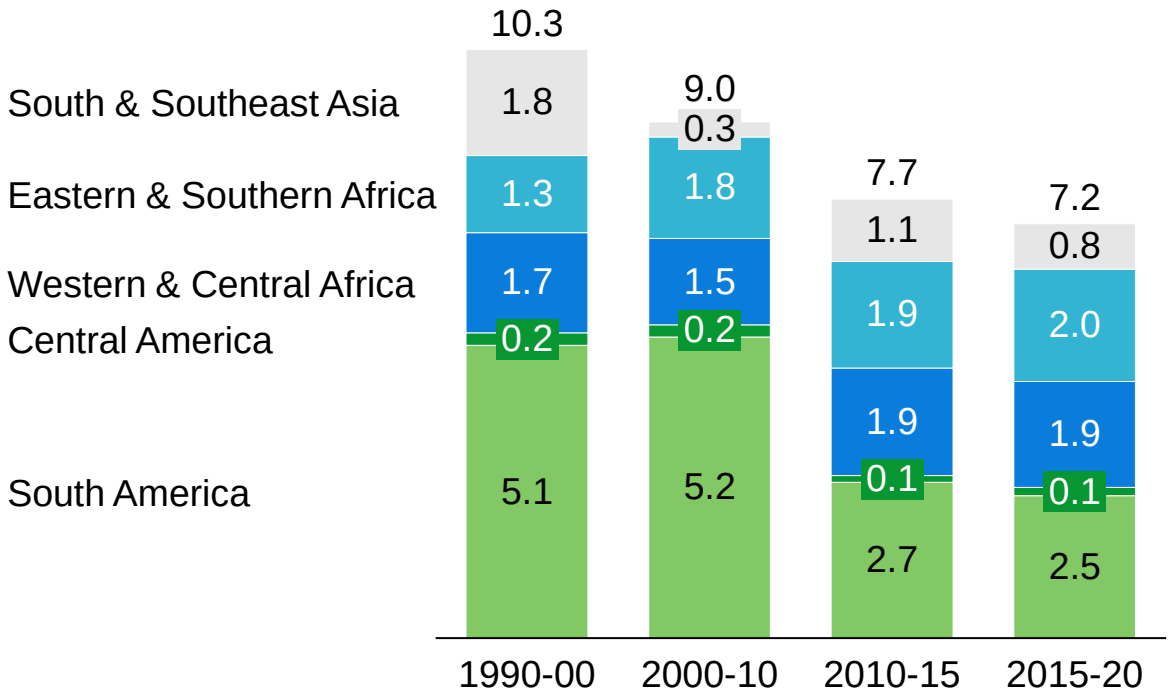
Baseline Project Volume of credits

Type of forest carbon projects	Description	Change in emissions
 **REDD** Reduced Emissions from Deforestation and forest Degradation	Reduce loss of forest carbon stock, e.g. slash and burn agriculture conversion, logging Involves surveillance and working with communities to provide alternative sources of income.	Reduced emissions 
 **A/R** Afforestation / Reforestation	Establish forests on land with low carbon stock, ecological and economic value (e.g. scrubland). Other values, e.g. erosion control, sustainable timber supply.	Sequestration 
 **IFM** Improved Forest Management	Changes in management of established forests to increase their carbon stock, e.g. improved growth, longer rotations, and reduced damage from fire, pests and diseases.	Increased sequestration 

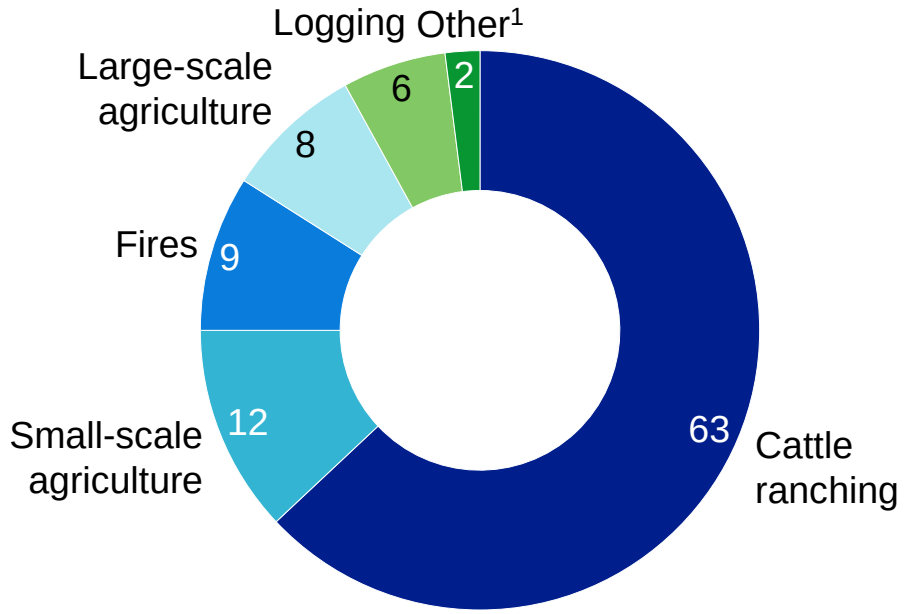
SOURCE: OA analysis

Tropical deforestation is declining, and is seldom for wood supply

Annual deforestation in tropical regions; Million ha / year



Drivers of deforestation, Brazilian Amazon, 2001-13
Percent



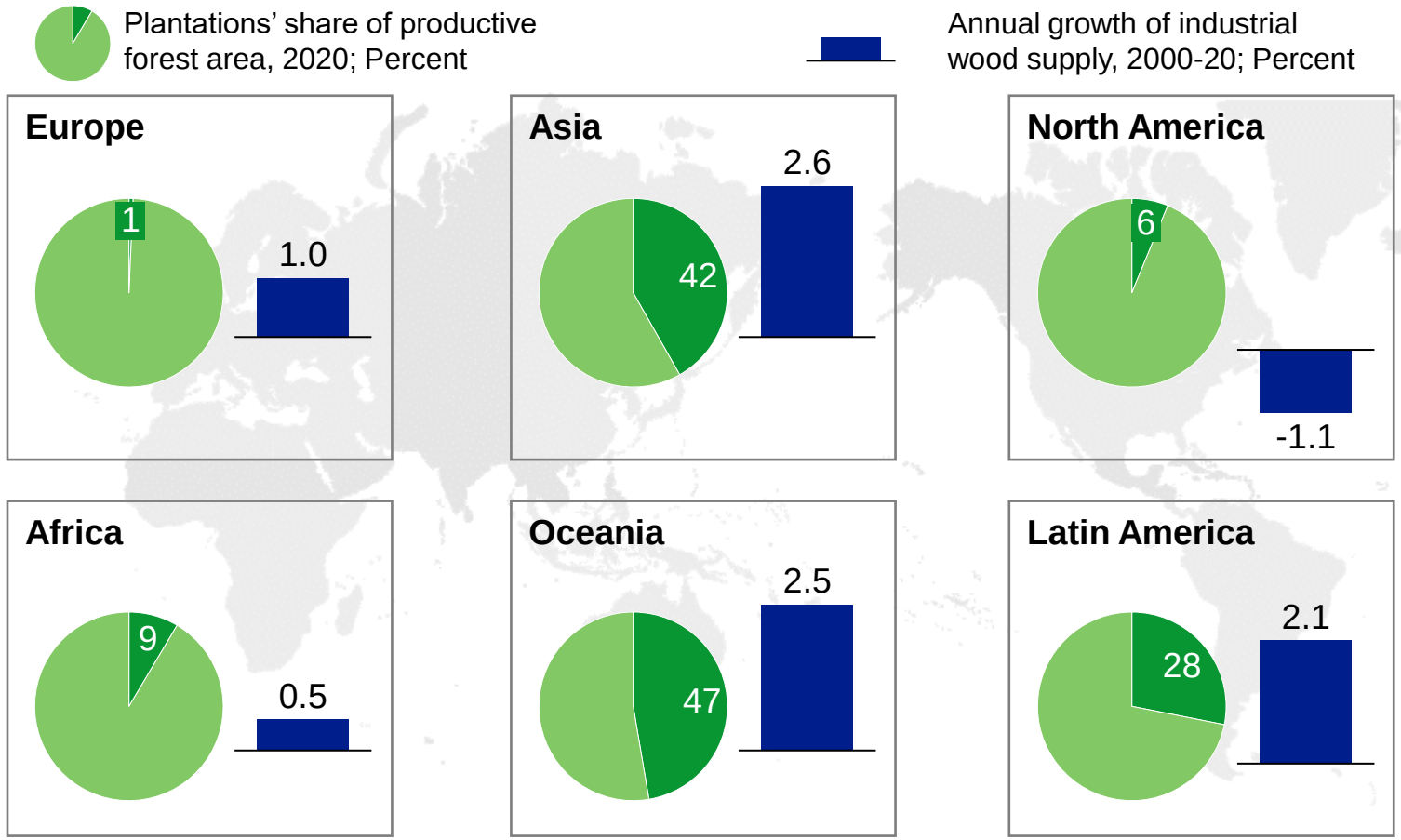
While still a large problem, tropical deforestation is in decline. Also, deforestation is usually not driven by logging, nor linked to wood supply. Most often it is due to conversion to grazing and agriculture.

1. Including mining, urbanization, road construction, dams

SOURCE: UN FAO Forest Resource Assessment 2020; World Resource Institute

Some regions are more suitable than others for A/R projects

Plantation forestry share and industrial wood supply growth[1,2]



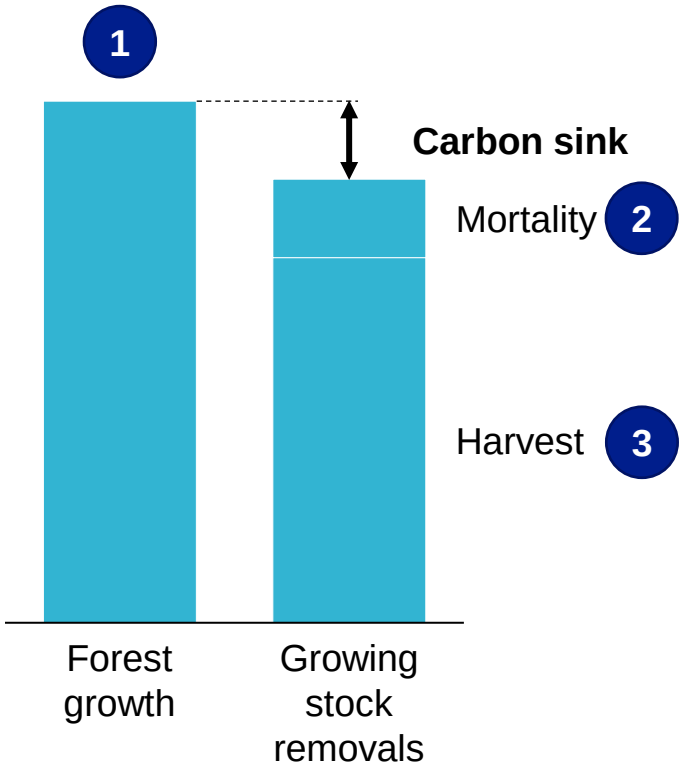
1. Planted forests: predominantly composed of trees established through planting or deliberate seeding
2. Plantation forests: Planted forests that are intensively managed, consisting of no more than 2 species, with even age class and regular spacing

- **Plantations mainly in Asia, Latin America and Oceania**
  - Planted forests[1] that are intensively-managed "tree farms"[2]
  - Grow wood supply with expanded forest area and productivity
  - Wood supply growing 2-3% p.a.
- **Managed natural forests in Europe and North America**
  - Balance wood supply with ecological and social objectives
  - Static area, productivity constraints
  - Flat / declining wood supply

SOURCE: UN FAO Forest Resource Assessment 2020; FAOSTAT; OA analysis

In managed natural forests, reducing harvest is often the quickest way to increase forest carbon sinks

Carbon sinks in natural forests



Levers to increase forest carbon sinks

	Scope	Speed
1. Increase forest growth • Good for forest owner, industry and climate • Requires investment e.g. improved regeneration, pest and weed control • Takes a long time to get results		
2. Reduce natural mortality • Another win-win • Few easy steps to e.g. avoid loss from fire, storms, insect outbreaks • More challenging with climate change		
3. Decrease harvests • Can be implemented immediately, but with huge cost to forest owner and industry		
Other levers: re-wetting peatlands, treatment to increase soil carbon		

- Forest carbon sinks are (mainly) the difference between growth and removals of timber.
- In the short-term, reducing harvest is mostly likely lever, but at large cost to forest owners.
- Soil carbon represents an additional sink, large but poorly understood.

SOURCE: OA analysis

Forest carbon markets can impact wood supply in different ways – the net impact will vary by region

Summary of implications of forest carbon markets on wood supply

	REDD	A/R	IFM
Abatement lever	Reduced emissions from **deforestation and forest degradation** – mainly tropical	Increasing forest area through **afforestation and reforestation**	**Improved forest management** to achieve larger carbon stock (e.g. longer rotations, faster growth).
Impact on wood supply	**Small negative impact** Most deforestation due to landuse change (e.g. conversion to agriculture) not wood supply Only a small share of global industrial wood supply is linked to deforestation/ degradation	**Large positive impact:** New plantings are often productive forests that will contribute to future wood supply **Long horizon**: Depending on location, plantations typically take 10-40 years to mature	**Significant short-term decline:** Longer rotations, forests “locked up” **Some potential up-side long-term:** If better-managed forests lead to better growth, and if some of increased productivity is allocated to wood supply.

SOURCE: Interviews; OA analysis

We have studied three forestry regions where carbon markets are impacting wood supply in different ways

Summary of case studies – Carbon markets in key productive forestry regions

		New Zealand **Established compliance market driving A/R**	United States **Emerging voluntary market with mainly IFM**	European Union **Latent market with large potential growth**
Market maturity		High	Medium	Low
Type of market		Compliance	Voluntary and compliance	Voluntary
Mechanisms		National government	Independent	Independent
Project types		A/R: productive forest plantations and permanent sinks	IFM: Improved forest management, especially deferred harvest	IFM: Improved forest management, esp. deferred harvest and protection
Impact on wood supply	**Current**	↑ Increased planting rate	↓ Limited direct impact so far, but a contributing factor	↓ Limited impact so far. Isolated examples of forests locked up.
	Potential	↓ Risk for reduced harvest (permanent sinks)	↑ Opportunity for increased supply through A/R in US South.	↓ Risk of significant reduction in supply, where carbon markets can be an instrument in EU policy.

SOURCE: OA analysis

Carbon markets barely exist in Europe but are seen as a core lever to achieve ambitious targets for forest carbon sinks

European forest carbon markets – status and outlook

Current state of carbon market

- Currently **no compliance market** for forest carbon
- Only a **handful of independent projects**
- **Isolated examples of voluntary offsetting** by large emitters

New EU forest policy

- **Forest Strategy (2021):** more protection, sustainable management, afforestation
- **LULUCF targets:** national targets for 2030 carbon sinks
- **3 billion trees pledge:** commitment for large-scale afforestation /reforestation

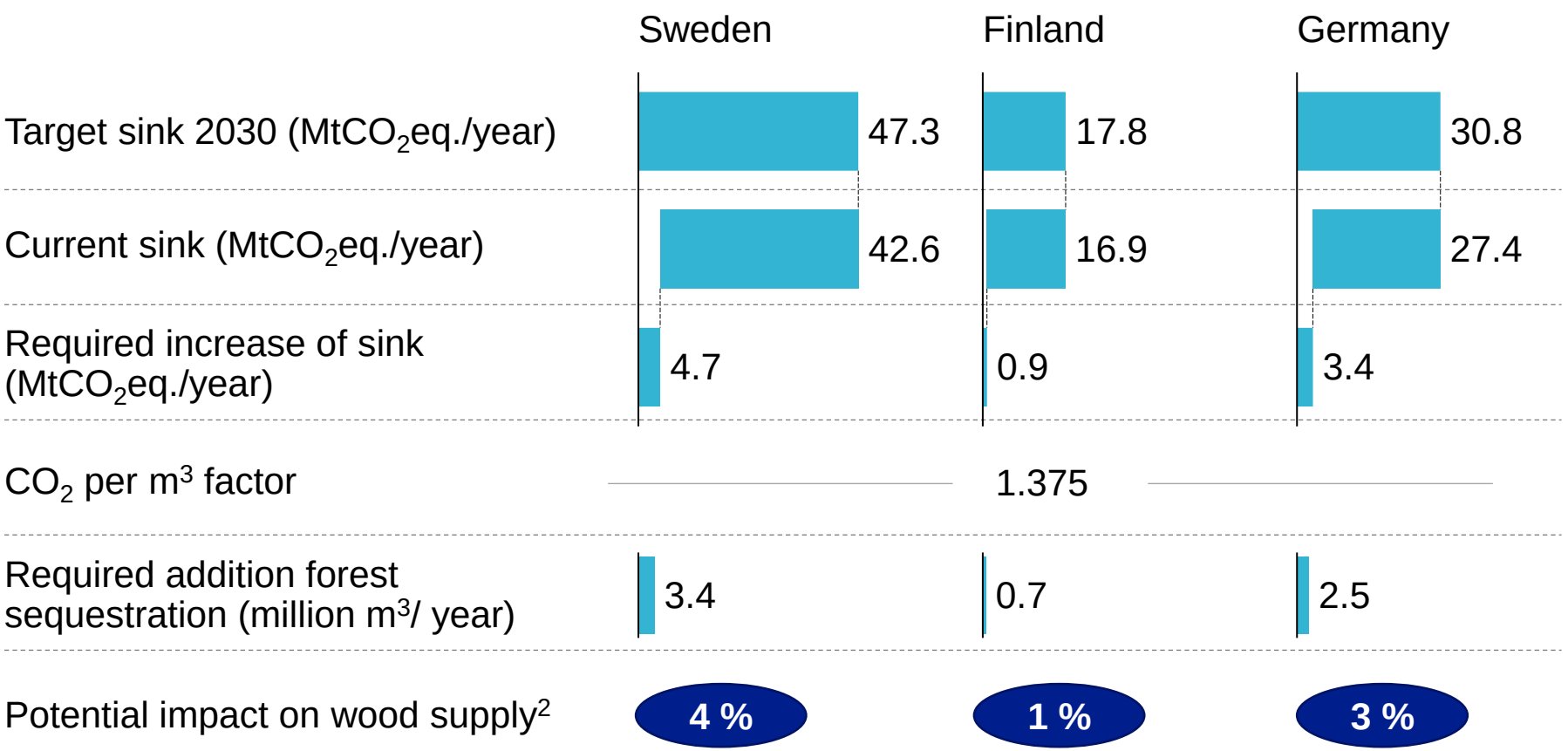
Potential for forest carbon credits

- Policy implies **additional cost or reduced income to forest owners**
- EC recognizes **need to incentivize forest owners**
- EC introducing a **European-wide system for forest carbon credits.**
- Member states could buy credits to meet LULUCF targets?

SOURCE: Press; Interviews; OA analysis

To meet LULUCF targets, some EU countries might need to reduce annual harvest by up to 4%

Potential impact of EU LULUCF[1] targets on wood supply (selected countries)



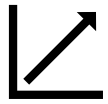
- EU's targets for higher carbon sinks will require forests to be managed differently.
- Potential 1-4% reduction in harvest (unless improved forest growth, reduced damage).
- Significant loss of income to forest owners – role of carbon credits to compensate.

1. Land use, land use change, and forestry
2. If full LULUCF target achieved by reducing harvests – i.e. no improvement in forest growth, forest damage, or soil carbon

SOURCE: European Commission; OA analysis

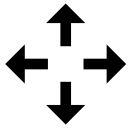
Key take-aways

Market will grow



- Carbon pricing is here
- Forests important for climate change
- Cost-effective
- Co-benefits

Impact will vary by region



- Mix of projects
- Current forest management systems
- Government policy
- Still lots of uncertainty

Challenging for Europe

- Risk of reduced harvest in short-term
- But investment in forest growth, reduced damage
- Forest owners: compensation, another option to capture returns

New report! *Forest Carbon Markets* – See Fastmarkets sales or www.okelly.se for details

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