COLUMBIA | SIPA
Center on Global Energy Policy

Green Industrial Policy for Tropical Forest Conservation

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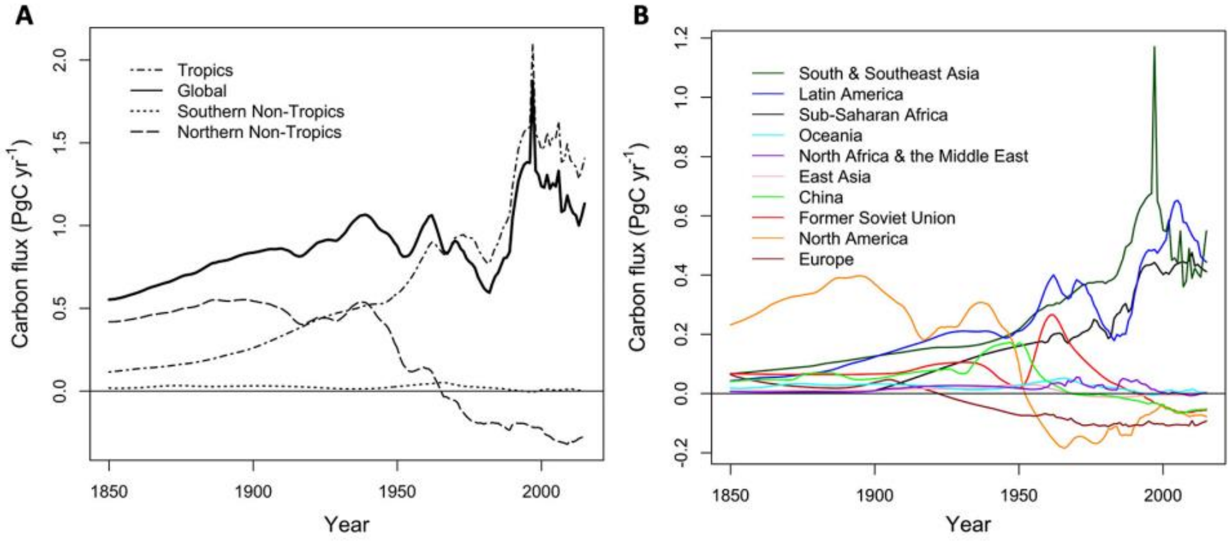
Today's agenda

1. **Why forests and why now?**
   - Tropical forests and emission trajectories
   - Emissions as an externality of land use
2. **Understanding forest-based carbon markets**
   - Carbon market typology
   - Carbon credit quality challenges
   - Market volume
3. **Challenges of developing forest-based carbon markets**
   - Potential scale of forest-based carbon markets
   - Transaction costs
   - The "Carbon tunnel vision" as an effect of the commodification of carbon
   - Land rights and human rights
4. **Industrial policy for forest-rich developing economies**
   - National Carbon Federations

Why forests and why now?

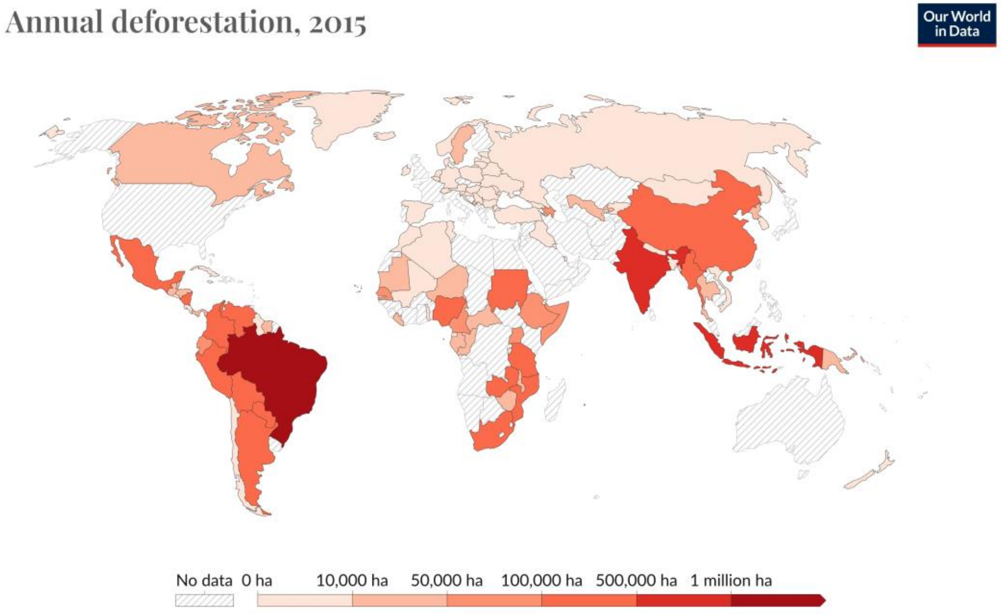
Emissions from the tropics account for most of land use and land cover change-associated greenhouse gas emissions

FIGURE 1. Annual net emissions from land use and land cover change (LULCC) globally for three latitudinal bands (A) and 10 global regions (B)



Note: Negative emissions represent removals of carbon from the atmosphere.

Source: Houghton and Nassikas, 2017.



Data source: UN Food and Agriculture Organization (FAO). Forest Resources Assessment. OurWorldInData.org/deforestation | CC BY
Note: The UN FAO publish forest data as the annual average on 10- or 5-year timescales. The following year allocation applies: "1990" is the annual average from 1990 to 2000; "2000" for 2000 to 2010; "2010" for 2010 to 2015; and "2015" for 2015 to 2020.

The expansion of agricultural and grazing land is the primary driver of present-day deforestation in tropical countries

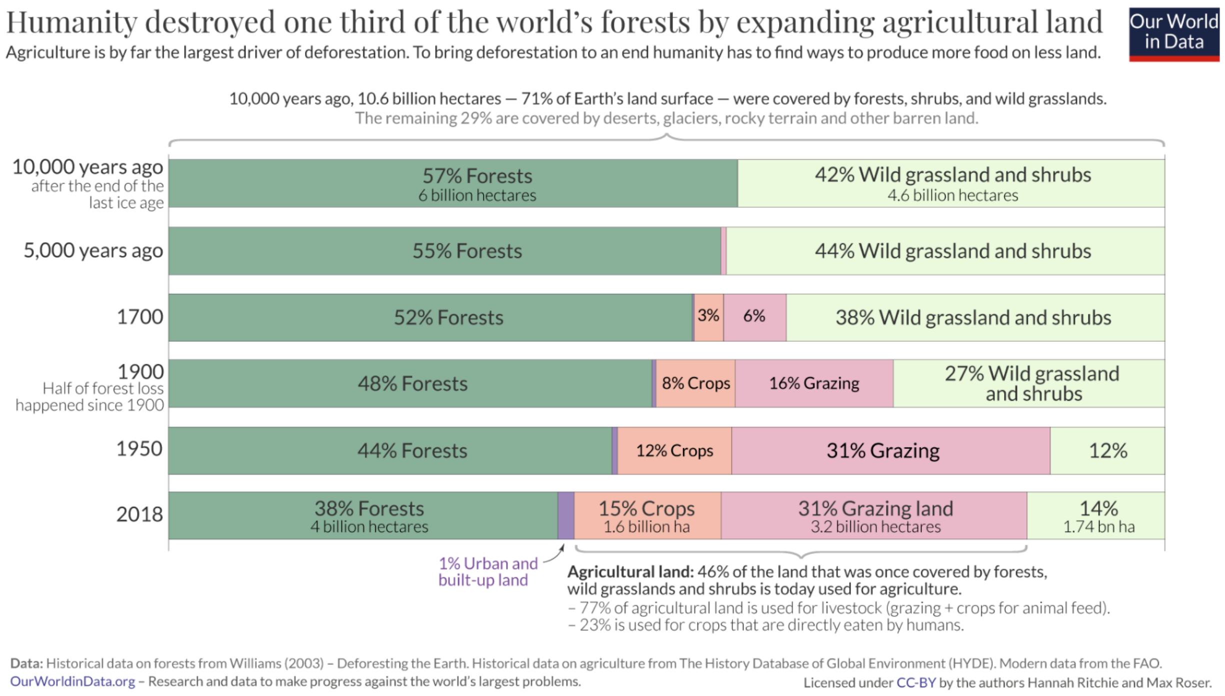
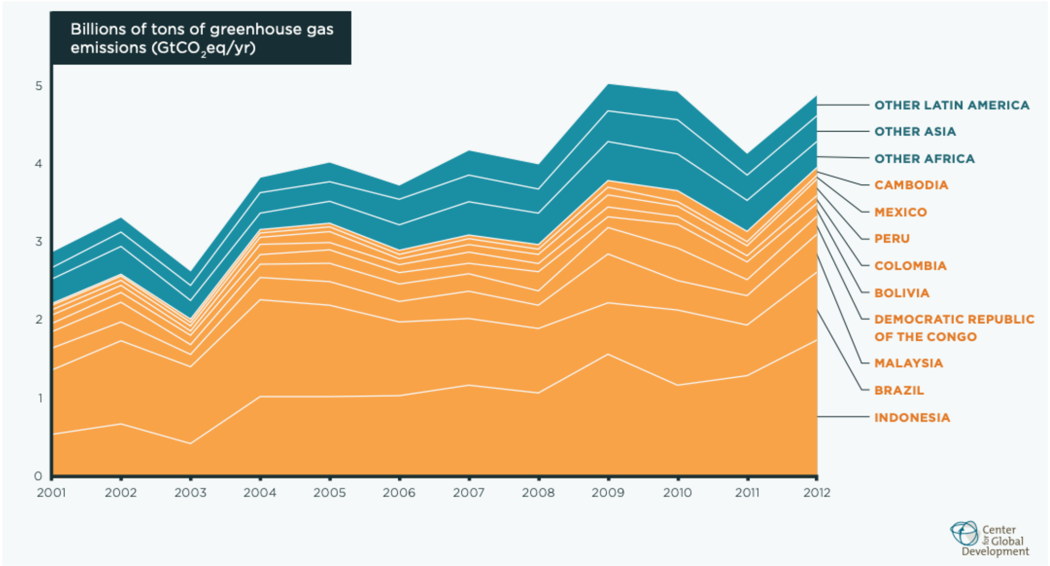


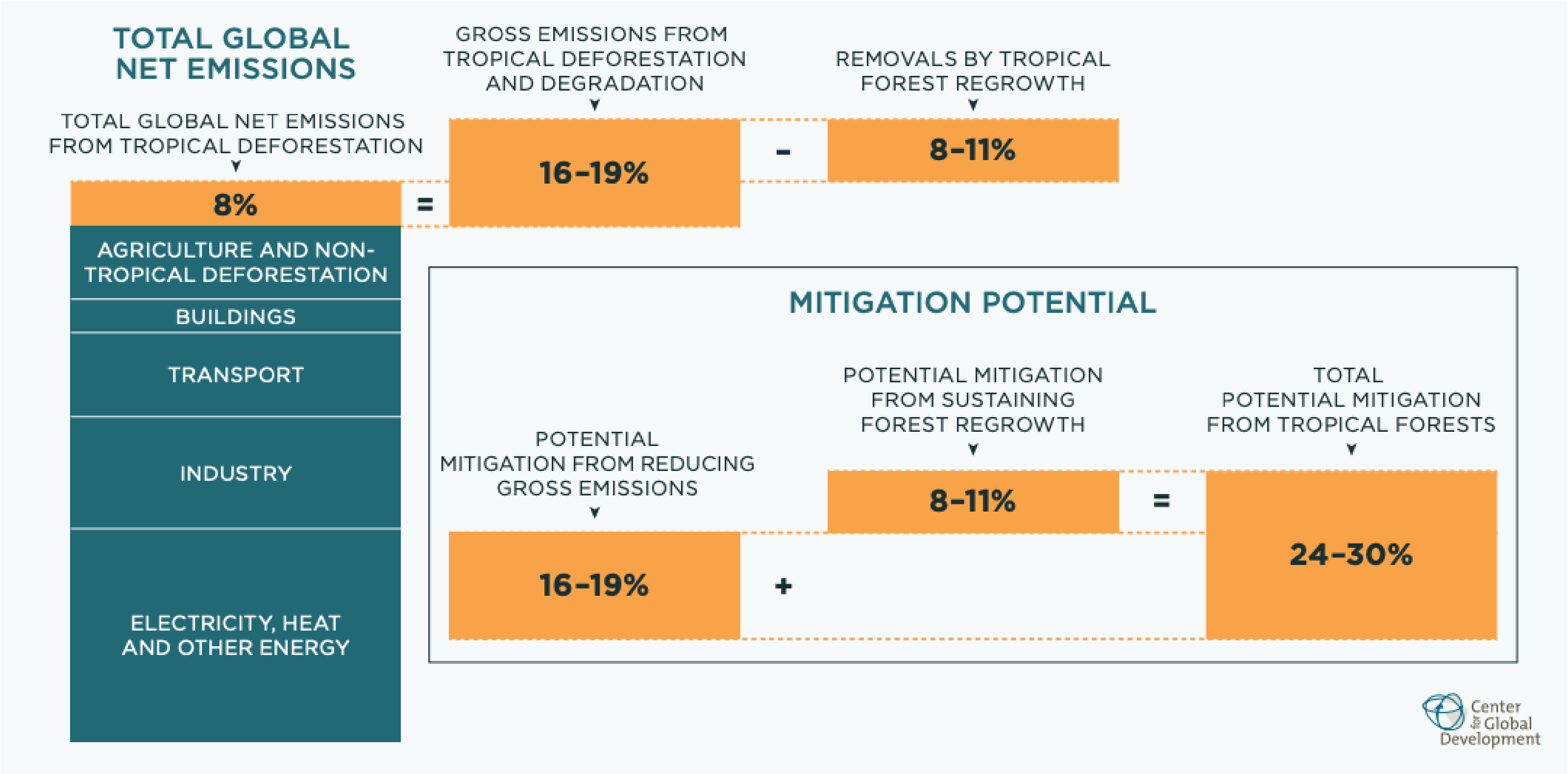
Figure 2.8: Nine countries produced 77 percent of emissions from deforestation from 2001–12.



Note: Emissions from deforestation refers to gross emissions from tropical forest cover loss and peat conversion.

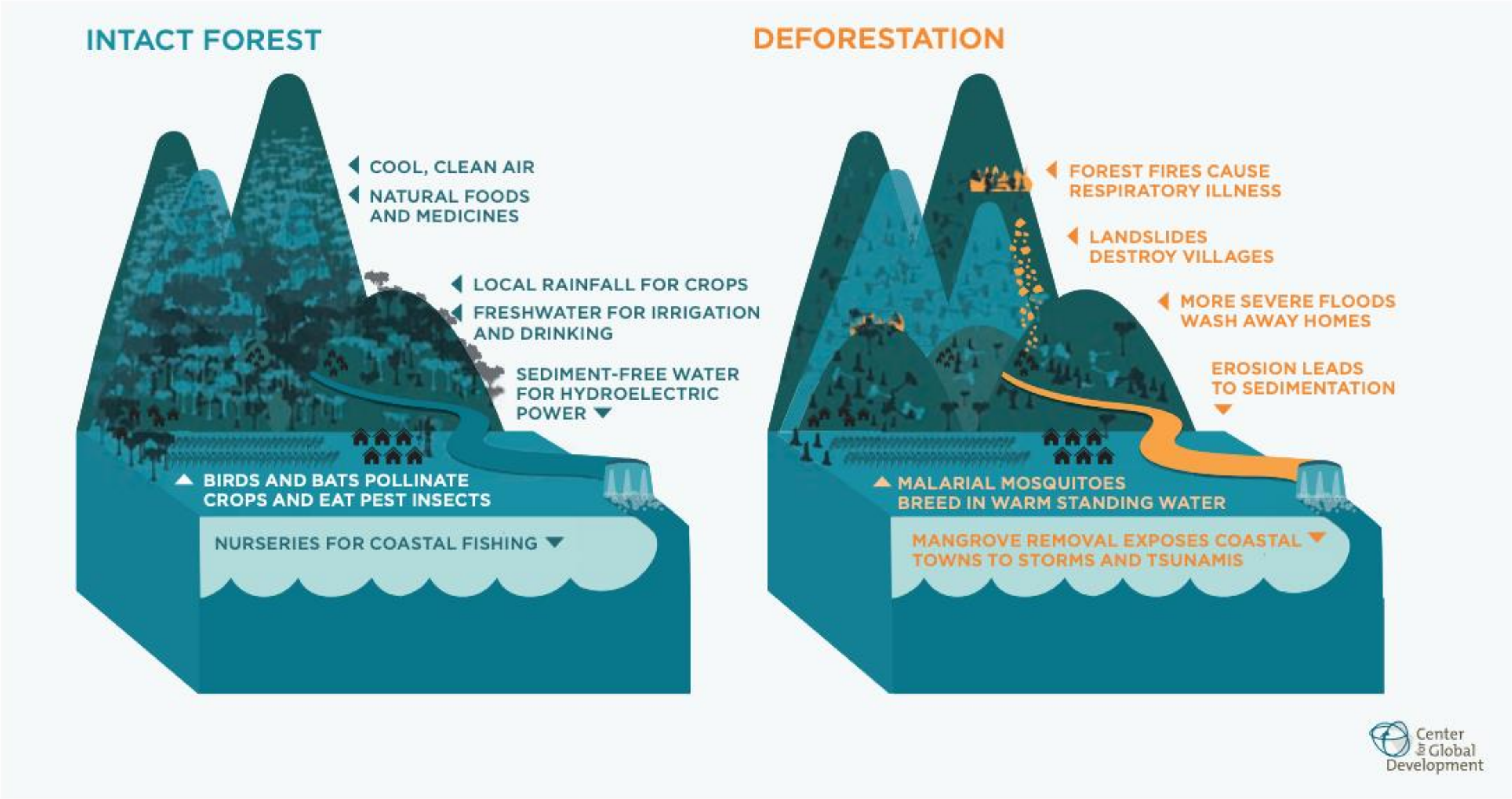
Source: Busch and Engelmann (2015).

Tropical deforestation produces 8% of net emissions, but halting and reversing deforestation could reduce emissions by 30%



Source: Y. Pan et al., "A Large and Persistent Carbon Sink in the World's Forests," *Science* 333, no. 6045 (2011): 988–93; A. Baccini et al., "Estimated Carbon Dioxide Emissions from Tropical Deforestation Improved by Carbon-Density Maps," *Nature Climate Change* 2, no. 3 (2012): 182–85.

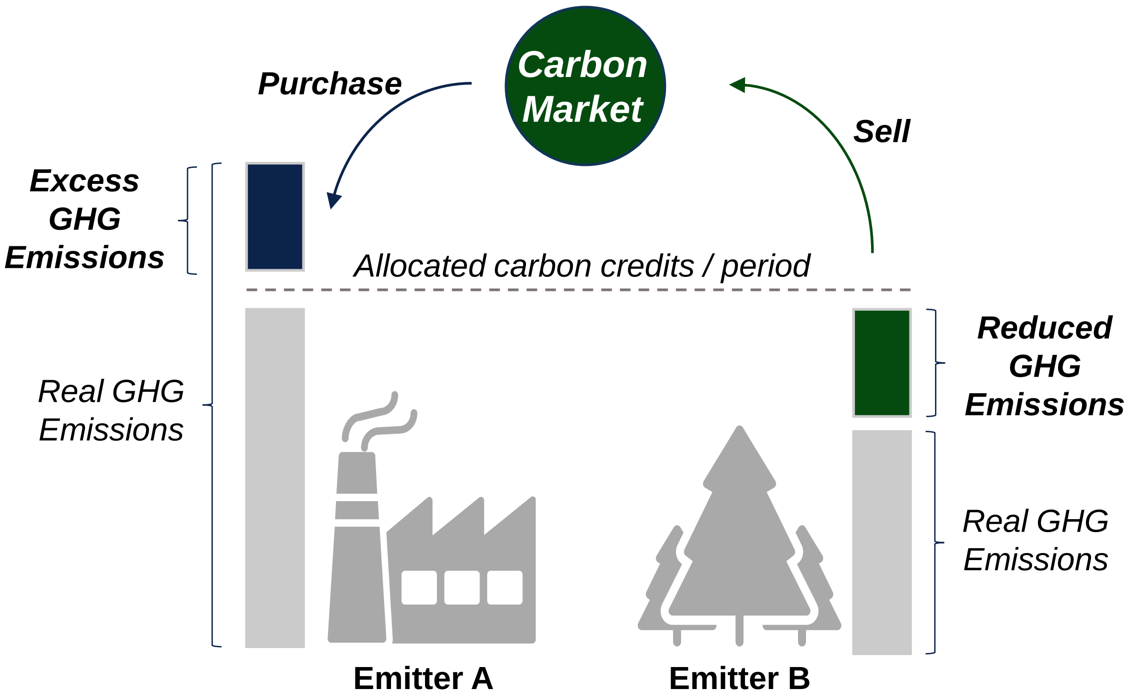
Beyond emissions, forests provide valuable ecosystem services



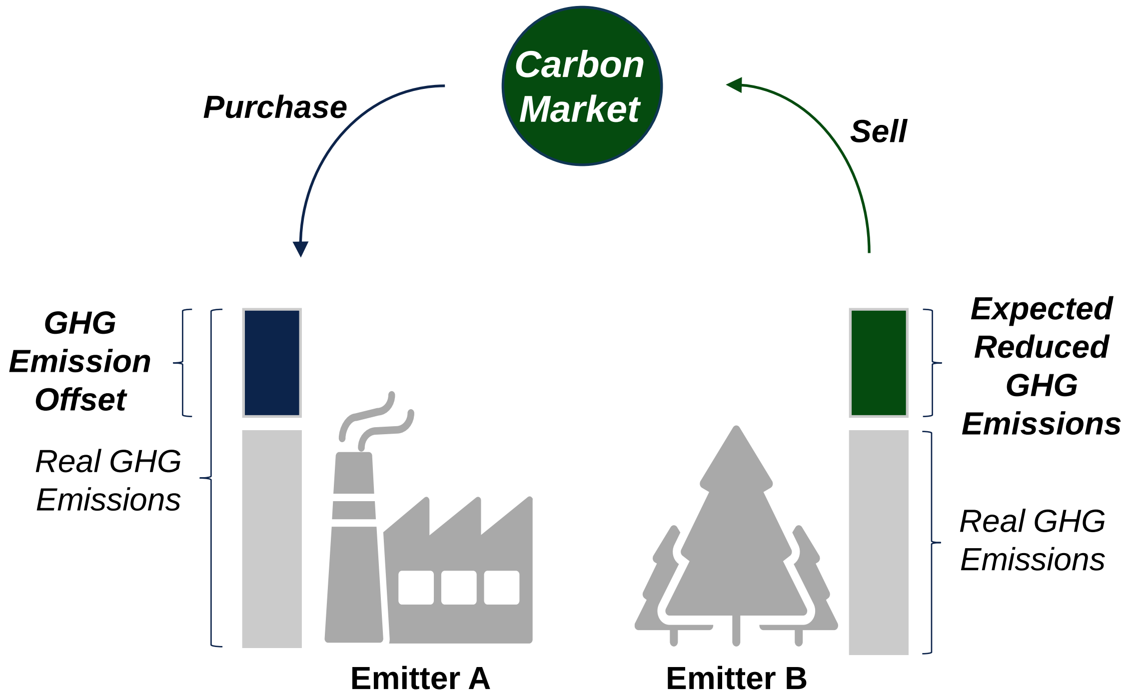
Understanding forest-based carbon markets

Carbon markets create incentives to preserve and restore forests by pricing carbon

Compliance Markets

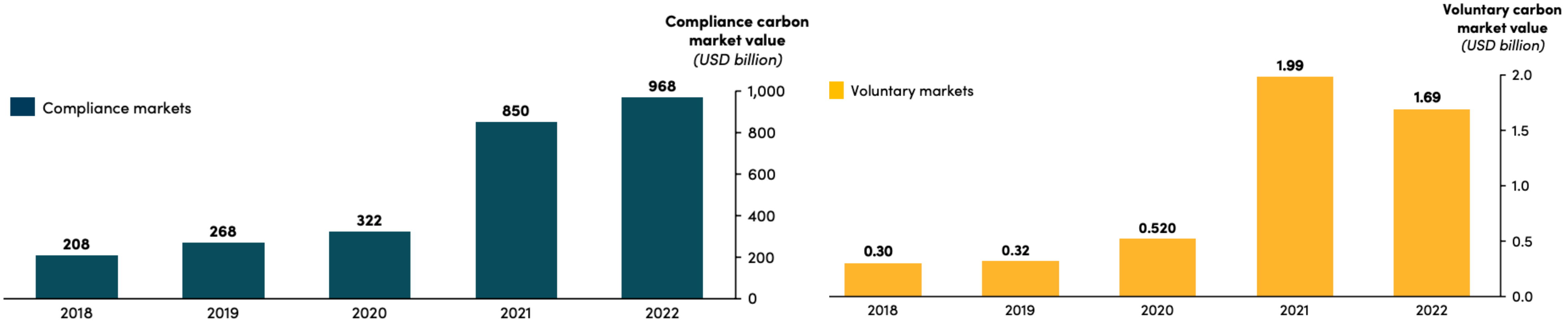


Voluntary Markets



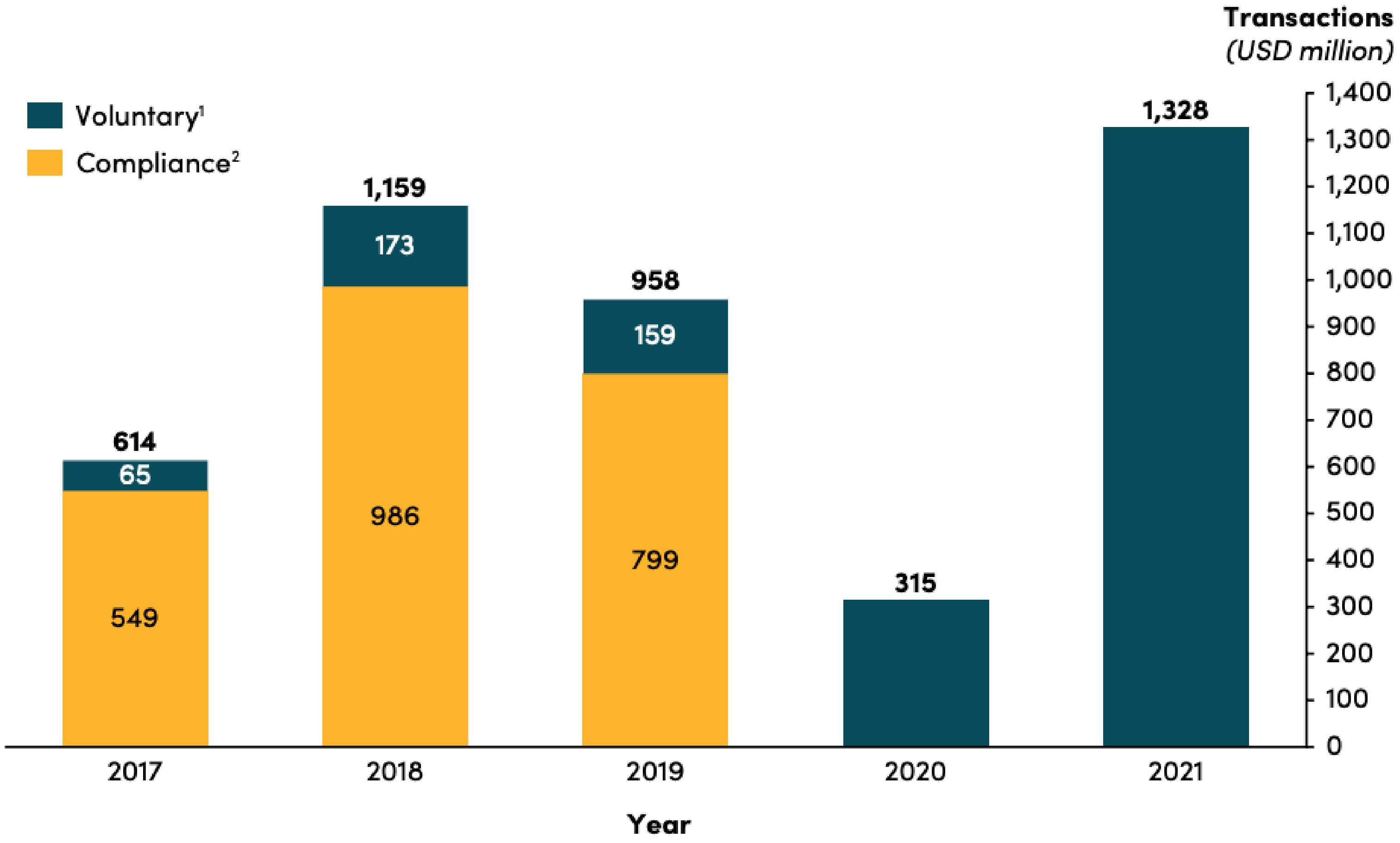
Note: Compliance markets tend to reduce total allocated carbon credits after each period (usually a year) to gradually reduce total emissions.

Compliance markets are orders of magnitude larger than voluntary markets



Source: Authors based on available data from Refinitiv (2022) for the period 2018–2022 for world compliance markets, Donofrio et al. (2022) for the period 2018–2021 for world voluntary markets, and Trove Research (2022) for 2022 forecasts in world voluntary markets.

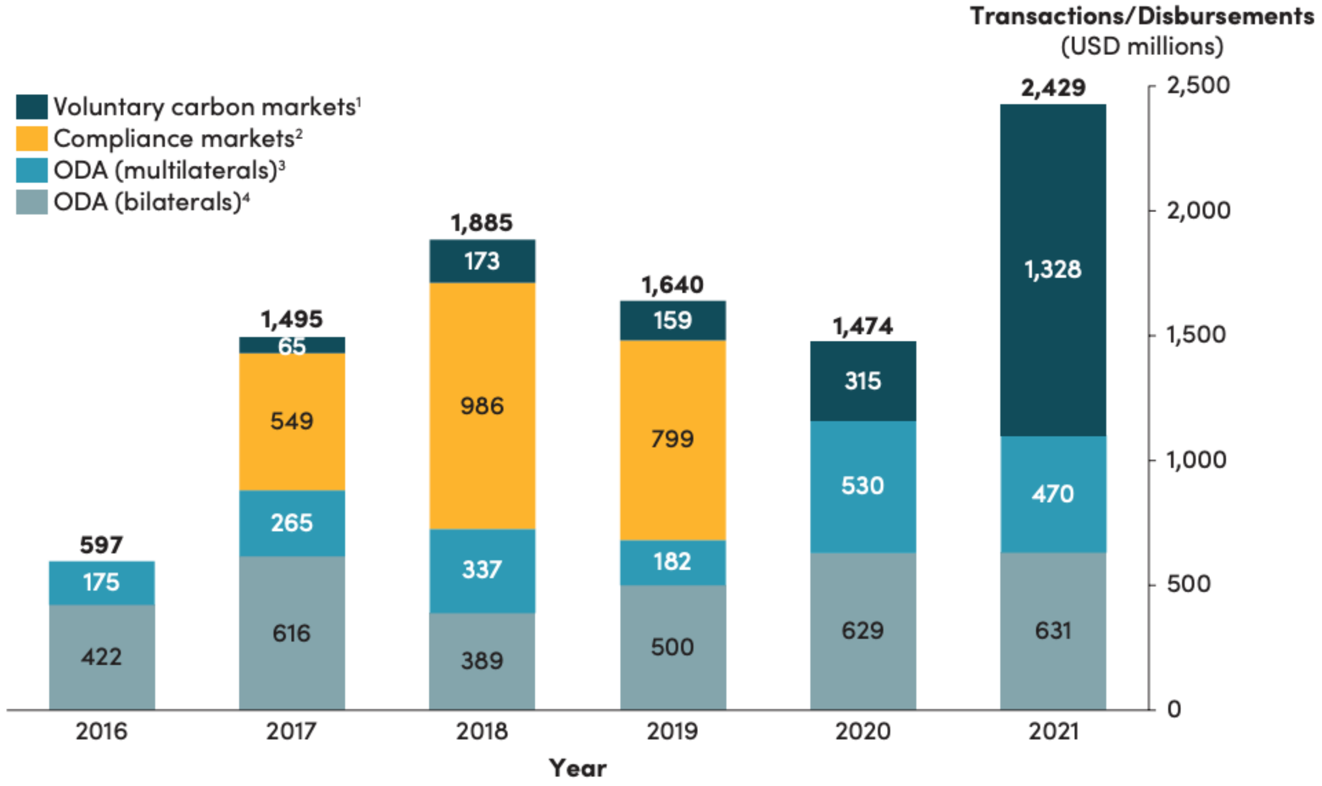
Forest-specific compliance and voluntary market transactions



Source: Maguire et al. (2021) for compliance and voluntary forest-specific carbon markets for the period 2017–2019 and Donofrio et al. (2022) for voluntary forest-specific carbon markets for the period 2020–2021.

Market approaches are rapidly displacing ODA as the leading source of forest-specific financing

FIGURE 6. Forest-specific voluntary and compliance carbon market transactions and ODA disbursements



Source: Authors based on voluntary and compliance market data from Maguire et al. (2021) and Donofrio et al. (2022), and ODA data from OECD CRS (2022).

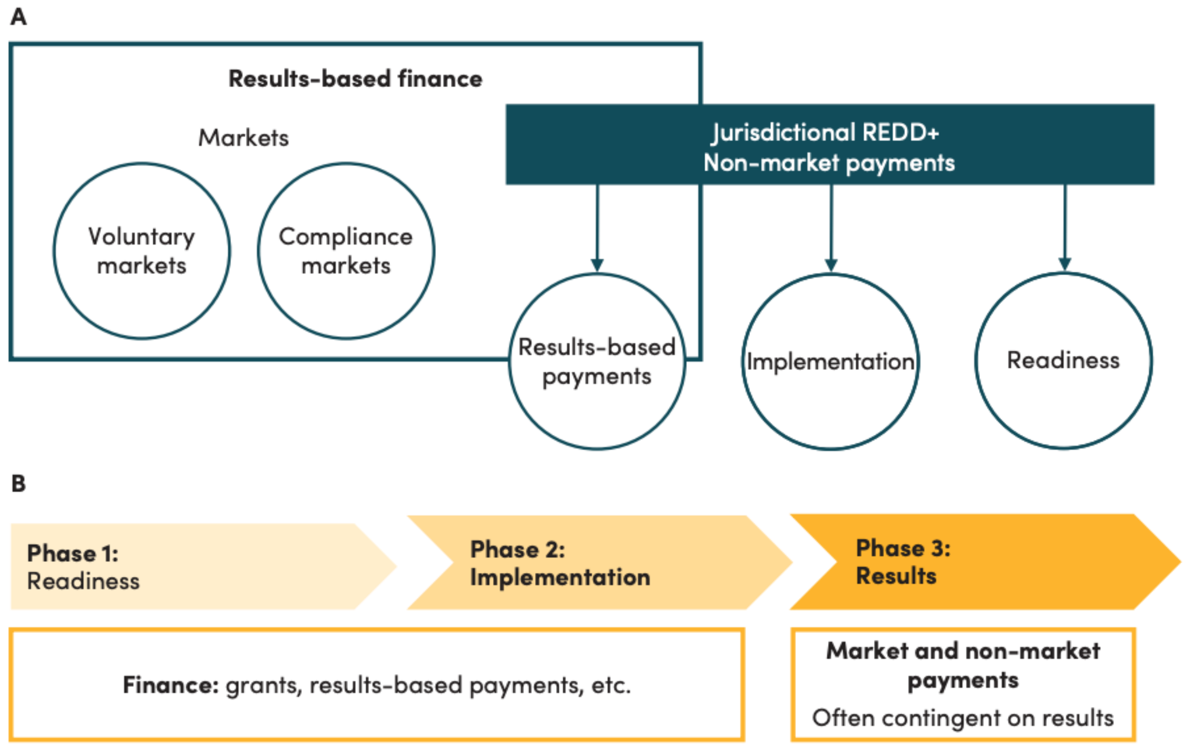
Quality problems for credits in carbon markets

Quality Concerns	Description
Additionality	Additionality refers to GHG emissions reductions that are additional if they would have not occurred in the absence of a carbon credit generating project. If a project or jurisdictional approach is not deemed "additional," resulting credit would not reflect real reductions in GHG emissions, and their compensatory function would be invalidated.
Permanence	Permanence refers to the challenge of a carbon credit reflecting a permanent reduction in GHG emissions. For land and forest-related carbon credit projects, there is a possibility that carbon is stored in "leaky" reservoirs, meaning a project's permanence in storage is dependent on the integrity of the reservoir. If the soil, forest, or land in question were to be altered, a partial or complete reversal of GHG reduction or removal would occur invalidating the issued credits.
Leakage	Leakage occurs when carbon-reduction projects displace emission-causing activities and produces higher emissions outside the project boundary.
Quantification integrity	Calculation methodologies and data used to estimate carbon stocks and flows from complex ecosystems such as tropical rainforests are highly diverse and heterogenous in their accuracy and robustness. Factors such as soil composition, inter-specie interactions, specie makeup and populations, as well as geochemical flows and biophysical variation between ecosystems and geographic locations make the quantification of carbon flows a challenging process for which there is no standard and perfect answer. The integrity of underlying calculations that support the issuance of carbon credits remains as a source of idiosyncratic risk for carbon credits.

Source: McKinsey, 2020 and authors.

A typology of forest-based carbon markets

FIGURE 2. Landscape of forest carbon finance markets, non-market payments, and results-based finance (A) and the three phases of REDD+ (B)



Source: Adapted from Donofrio et al. (2021).

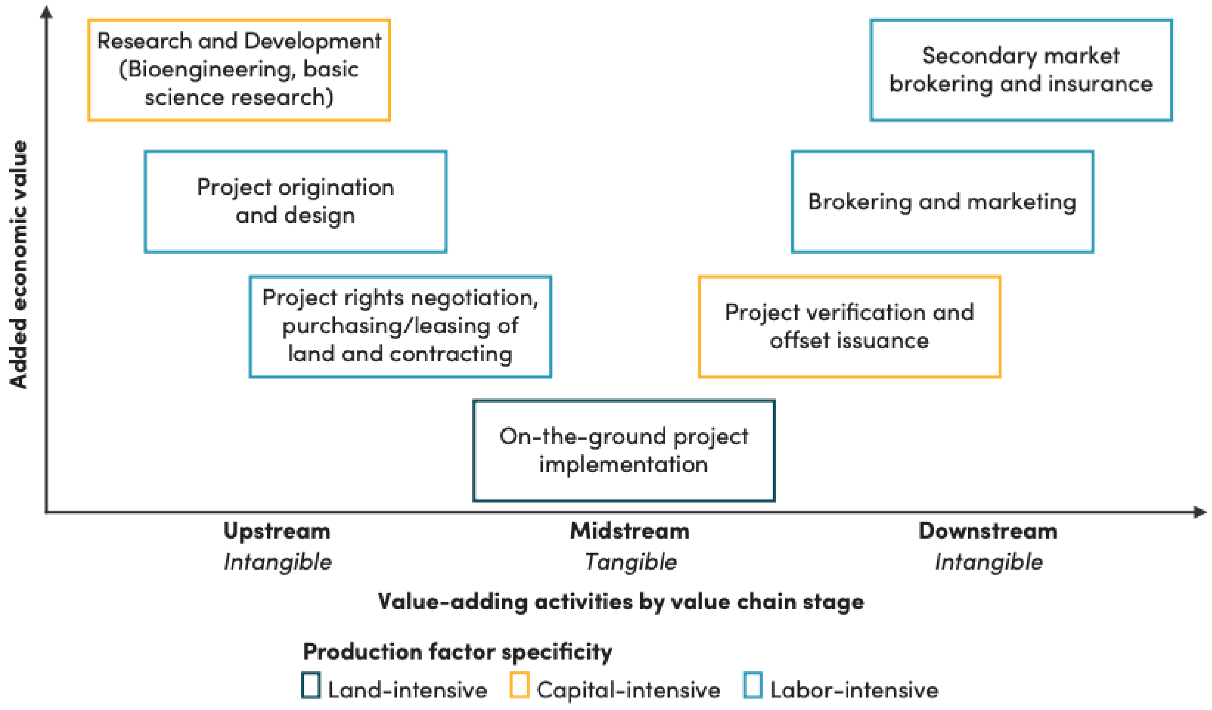
Financing type	Markets vs. REDD+	Operation *(Transaction vs. Grants)*	Activities receiving financing
Results-based finance *(Verified emissions reduction)*	Compliance Markets	**Market-based transactions**	Implementation and verification
	Voluntary Markets		
	Results-based REDD+		
Jurisdictional REDD+	Implementation	**Grants** *(Mitigation outcomes are not transferred between parties)*	
	Readiness		Project readiness

Challenges of developing forest-based carbon markets

Value addition occurs at the tail ends of the forest-carbon value chain, while high transaction costs limit the potential of project-based scaling of carbon markets

Forest-carbon value chain

FIGURE 7. Location of value addition and production factor specificity in the forest carbon value chain



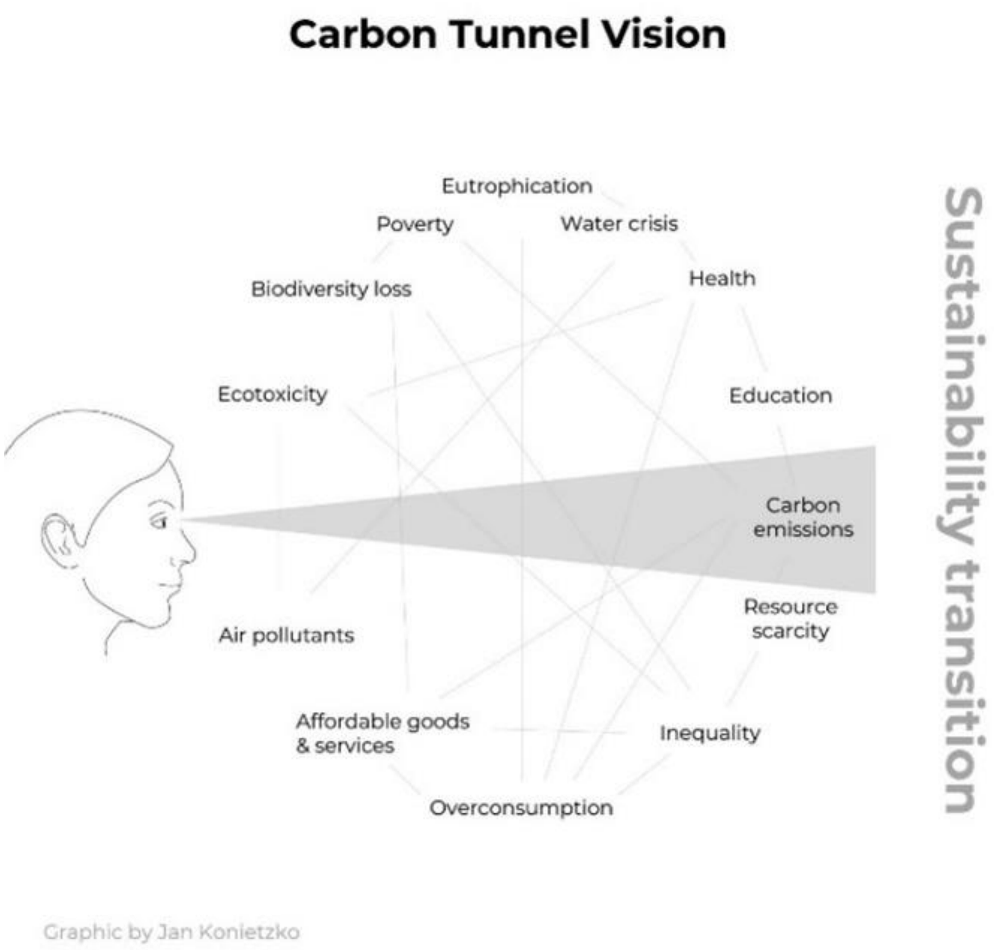
Source: Authors adapting from the Smile Curve conceptual framework (Mudambi, 2008).

Transaction costs

- Origination
- Design
- Negotiation
- Approval
- Implementation
- Insurance
- Verification
- Enforcement

- **0.3% - 270% of the anticipated income** of landowners of forest-based projects (Pearson et al., 2014)
- Largest cost categories are
  - **insurance** (41–89% of total costs in voluntary markets)
  - **monitoring** (3–42%)
  - **regulatory approval** (8–50%).

Carbon markets may suffer from the "carbon tunnel vision" effect, resulting in potential externalities

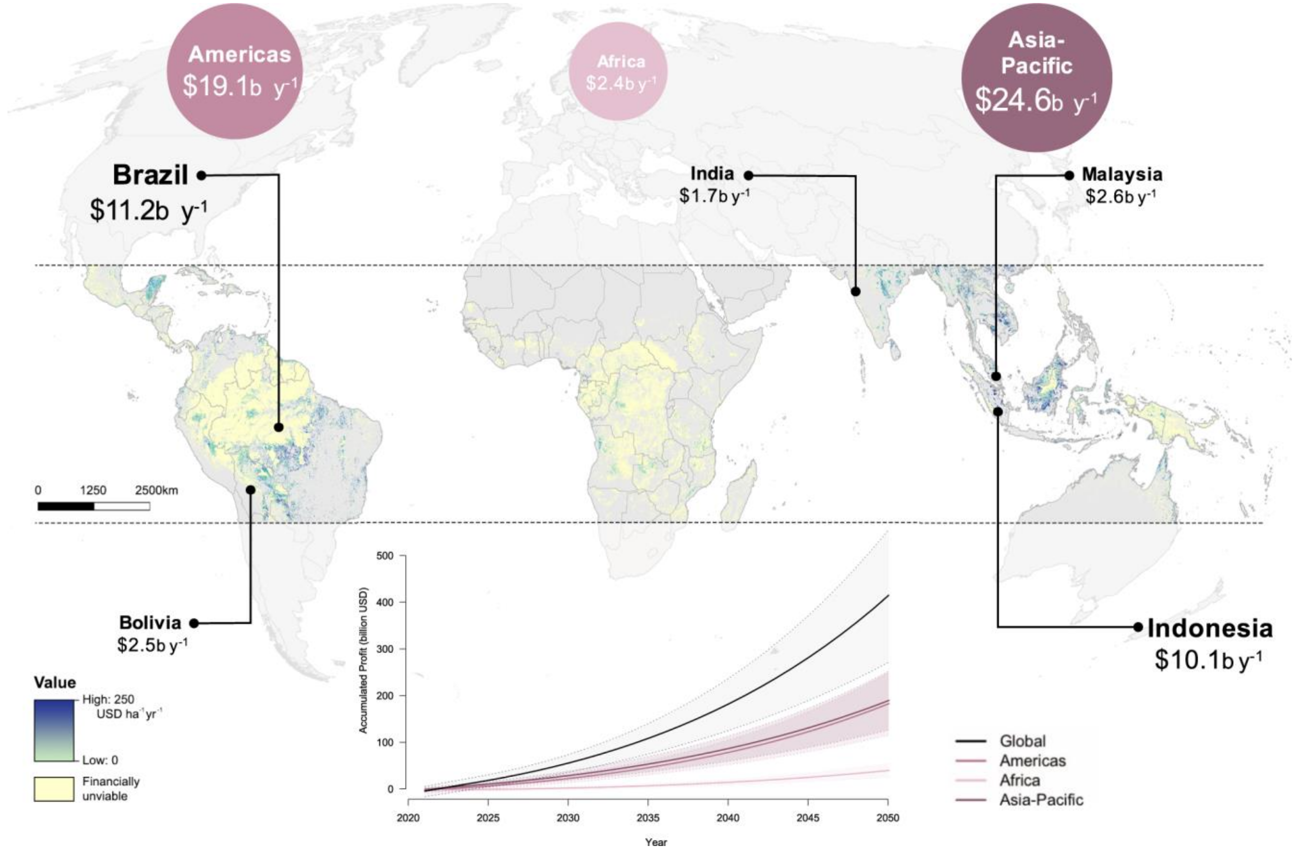


Consequences a carbon tunnel vision scenarios

Scenario	Outcomes
Optimization of carbon-rich species	Exotic species, such as eucalyptus trees in the Americas, may rapidly capture and store large amounts of carbon, but may result in water stress, tree monocultures and loss of biodiversity, affecting ecosystem service provision.
Land consolidation in project-based approaches	Economies of scale benefit large project-based approaches by reducing the relative cost of activities such as project design and origination, and measurement and evaluation. This creates an incentive for land consolidation in jurisdictions where land rights enforcement and governance is already weak.
Poor socio-environmental safeguards	Unregulated project negotiation procedures have resulted in human rights violations where carbon credit contracts modify land usage rights without prior and informed consent by landowners (e.g. indigenous peoples and peasants).

The viability of monetizing forest carbon is a function of project implementation costs, future risk of deforestation and the price of carbon (2/2)

Global forest carbon return-on-investment from financially viable sites



Source: Koh et al., 2021.

To calculate return on investments Koh et al. use the following simplifying assumptions:

1. Project establishment costs ($25/ha)
2. Annual maintenance costs ($10/ha)
3. Constant carbon price of $5.8/tCO2e and 5% price increase per year for 30 years
4. Opportunity cost based on rents associated with alternative land uses (18 crops)

*Areas where projected net present value (NPV) is lower than opportunity cost are categorized as financially unviable.

Industrial policy for forest-rich developing economies

Developing green industrial policy for carbon-rich tropical jurisdictions

Why industrial policy?

Developing economies in the tropics have a unique opportunity to:

1. Develop, grow and strengthen ”green” income streams derived from their natural endowment in the form of large at-risk carbon stocks in forests and land

2. Provide net-zero carbon alternatives for rural development

3. Diversify rural and periphery rent generation from high-carbon intensive activities aiding in broad economy transition efforts

4. Protect natural capital and the integrity of ecosystem services provided by forests

Why “green” industrial policy?

By introducing socio-environmental sustainability principles in industrial policy, governments can:

1. Address inequity in the distribution of revenues generated from carbon credit sales

2. Strengthen the market and bargaining power of local actors vis-à-vis foreign intermediaries

3. Prevent socio-environmental externalities such as biodiversity loss, displacement of vulnerable peoples and loss of local sovereignty

Productive development policies for forest-based carbon markets

Measures

1. Developing the domestic supply of carbon-specific skilled workers
2. Research and innovation for domestically-owned IP to improve the efficiency and accuracy of measurement and verification processes
3. Promote private or mixed ownership of enterprises that provide services to the production, issuance, and transaction of carbon credits
4. Encourage the development of a local market for carbon credits, including a role for SOEs as off-takers
5. Encourage the vertical integration and the network effects between different providers of services that are part of the value chain in carbon credits
6. Provide income security and prevent the displacement of jobs for groups of the population that could be impacted by the transformation of agriculture/livestock activities into land intensive carbon credit projects.

National Carbon Federations (NCFs)

Jurisdictional-level cooperatives aggregating small and medium-scale ”forest carbon” producers to access economies of scale high value-added value chain activities.

Potential roles of NCFs

- Centralized provision of technical assistance (origination, project development, certification, measurement and verification)
- Improvements in bargaining power (pooling large quantities of credits and selling in international markets)
- Provision of risk-management facilities for producers
- Channeling incentives and access to finance at scale

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Thank you