

# Future forests, timber supply & the bioeconomy

Yale Forest Forum

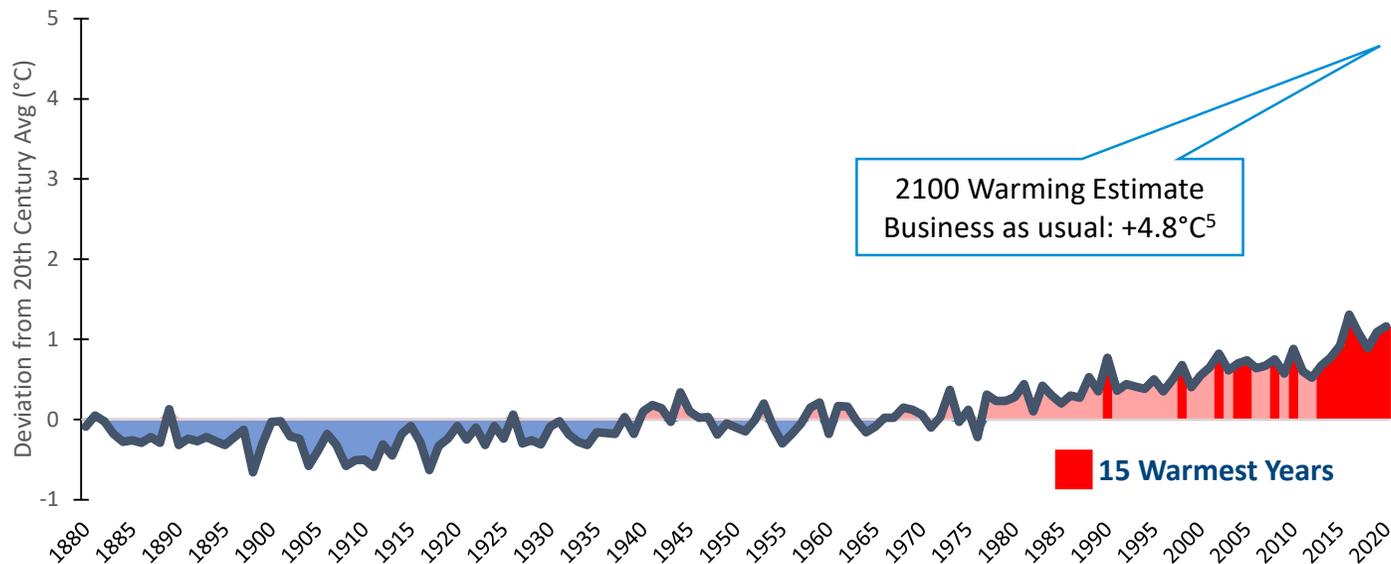
September 2021

# Climate Change: The world's most urgent challenge

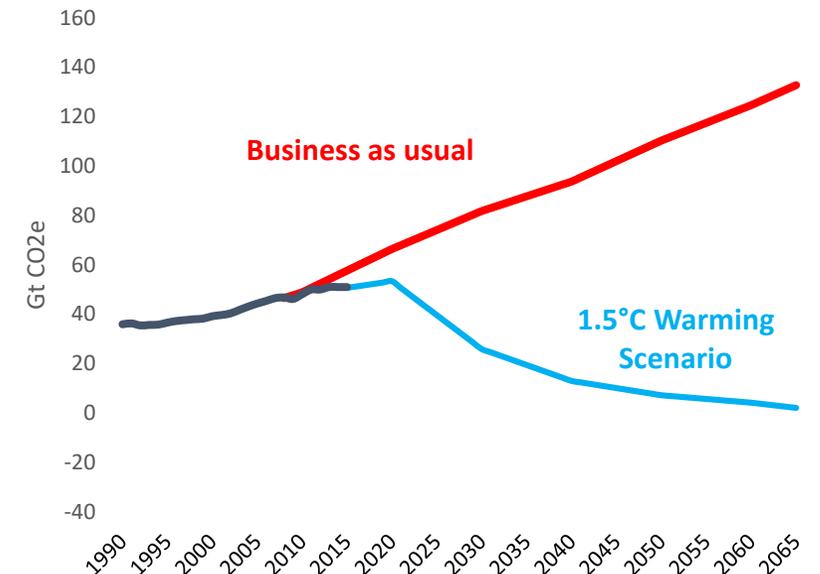
Business-as-usual warming projected to severely impair the global economy and cause irreversible damage to natural systems<sup>1</sup>

- The world is on track to surpass a 1.5°C rise in global temperatures by 2040; **2013-2019 are among the warmest years ever recorded**<sup>1,2</sup>
  - Temperature rise cause by increased greenhouse gas emissions from human activity<sup>3</sup>
  - **Emissions must fall by 7.6% p.a.** through 2030 to remain below the 1.5°C mark; today we are on track to overshoot this by 38%<sup>4</sup>
- Business-as-usual emissions projected to cause **7.2% reduction in Global GDP** per-capita by 2100<sup>5</sup>; observable impacts to human and natural systems already occurring (e.g. increased frequency of heatwaves)<sup>6</sup>

### Historic global surface temperature anomalies<sup>2</sup>



### Projected global CO<sub>2</sub>e emissions<sup>7</sup>



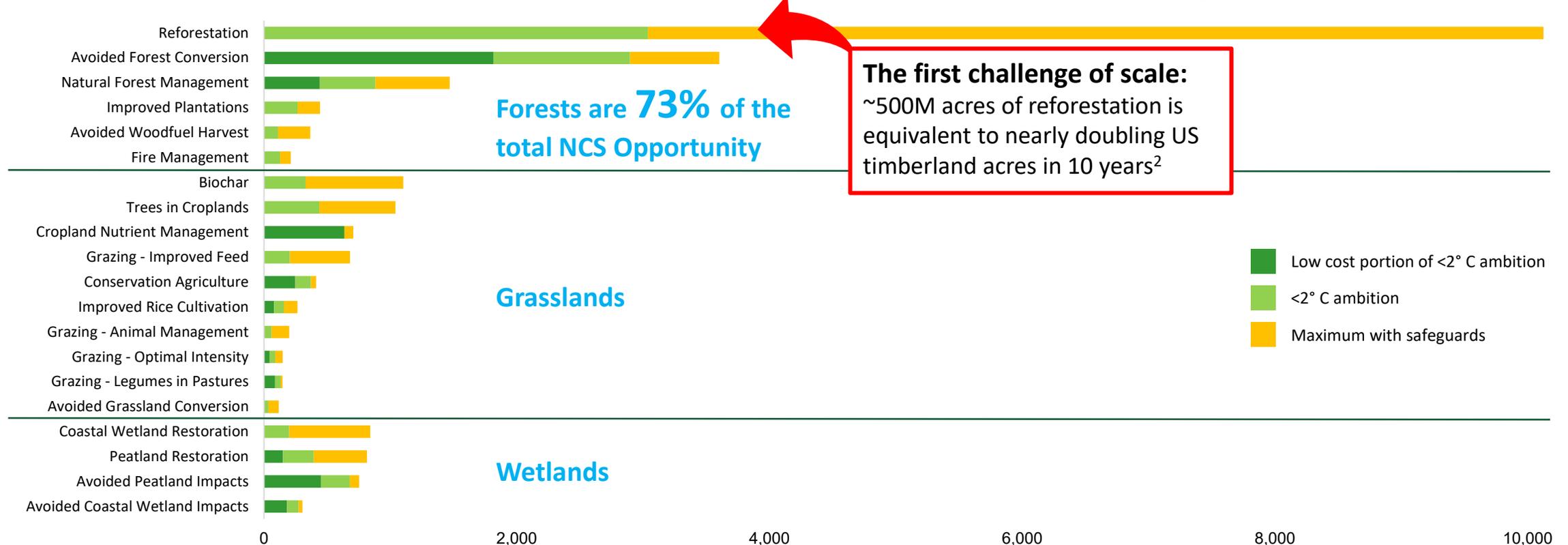
Notes: (1) Natural Climate Solutions: The Business Perspective, WBCSD; (2) NOAA, Global Land and Ocean Temperature Anomalies Data and TIG Analysis, 2020; (3) NASA, NOAA Analyses Reveal 2019 Second Warmest Year on Record; (4) Emissions Gap Report 2019, UN Environment Programme, NOAA/NASA – Annual Global Analysis for 2019; (5) Kahn et al, Long-Term Macroeconomic Effects of Climate Change: A Cross-Country Analysis, 2019; (6) IPCC Special Report on Global Warming of 1.5C, 2018; (7) Climate Analytics and NewClimate Institute, 2019

# Natural Climate Solutions (NCS)

Natural climate solutions are 30% of the solution, 10% of the conversation, and only 3% of the finance<sup>1</sup>

- Better management of forests, grasslands, and wetlands can provide significant climate benefits through sequestration and avoided emissions<sup>1</sup>
- Reforestation offers the single greatest opportunity to deliver climate mitigation at the landscape level<sup>1</sup>

## Potential contribution of the land sector to climate change mitigation through 2030 (millions of tCO<sub>2</sub>e per year)<sup>2</sup>

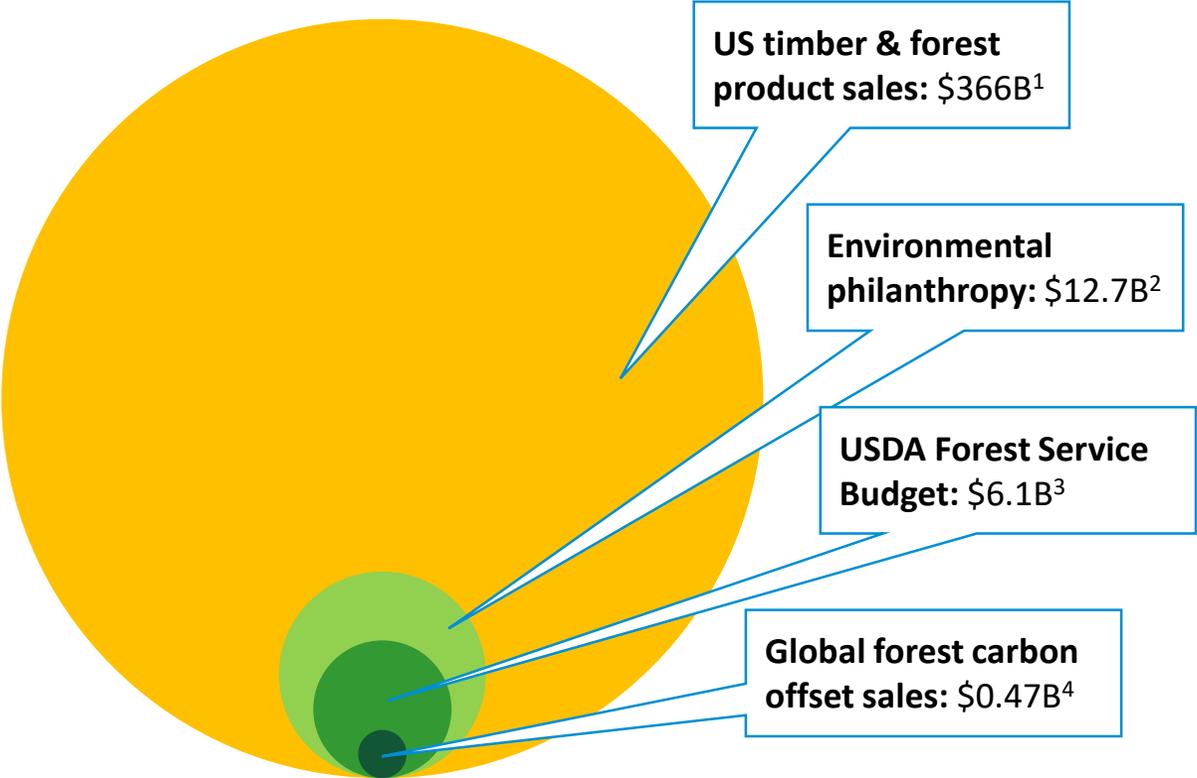


Notes: (1) Nature4Climate ([www.nature4climate.org](http://www.nature4climate.org)), as of May 2020; (2) Griscom et al. 2017. Natural climate solutions. Proceedings of the National Academy of Sciences. 114(44): 11645–11650. (2) Oswalt, Sonja N.; Miles, Patrick D.; Pugh, Scott A.; Smith, W. Brad. 2018. Forest Resources of the United States, 2017: a technical document supporting the Forest Service 2020 RPA Assessment. Gen. Tech. Rep. WO-GTR-97. Washington, DC: U.S. Department of Agriculture, Forest Service, Washington Office. xxx p.

# The role of demand-led climate strategies

Markets can provide sustained economic incentives for action on the ground

## Potential sources of funding for forest-related NCS



## Multiple climate impacts of forest products

Sequestration



Storage



Substitution



Circularity



Notes: (1) Value for all timber sales and manufacturing shipments, 2016 data, source: Forest2Market “The Economic Impact of Privately-Owned Forests in the 32 Major Forested States”, April 4, 2019; (2) Giving USA 2019, [www. https://givingusa.org/giving-usa-2019-americans-gave-427-71-billion-to-charity-in-2018-amid-complex-year-for-charitable-giving/](https://givingusa.org/giving-usa-2019-americans-gave-427-71-billion-to-charity-in-2018-amid-complex-year-for-charitable-giving/), accessed on 5/29/2020; (3) Congressional Research Service, In Focus, Forest Service: FY2019 Appropriations and FY2020 Request. 2 pages. April 4, 2019; (4) Includes all California ARB offsets issued in 2019 (source: ARB Offset Credit Issuance Table, through May 26, 2020, <https://ww3.arb.ca.gov/cc/capandtrade/offsets/issuance/issuance.htm>, accessed on 5/29/2020) at a weighted average price of \$14.13 / tCO2e (Source: World Bank Group, State and Trends of Carbon Pricing 2020) and global total voluntary forest offset sales in 2018 (Source: Ecosystem Marketplace, State of the Voluntary Carbon Markets, 2019); Image sources: Getty Images, Pollux Chung © / construction by Seagate Structures.

# Potential benefits of using wood in construction – illustrative example

Sustainable forest management and production of climate-positive forest products can multiply the carbon impact of reforestation

## Sequestration



**Sequestration** in protected areas & rapidly growing commercial tree farms

## Storage



**Storage** of carbon in long-lived wood products such as furniture, doors, and mass timber buildings

## Substitution



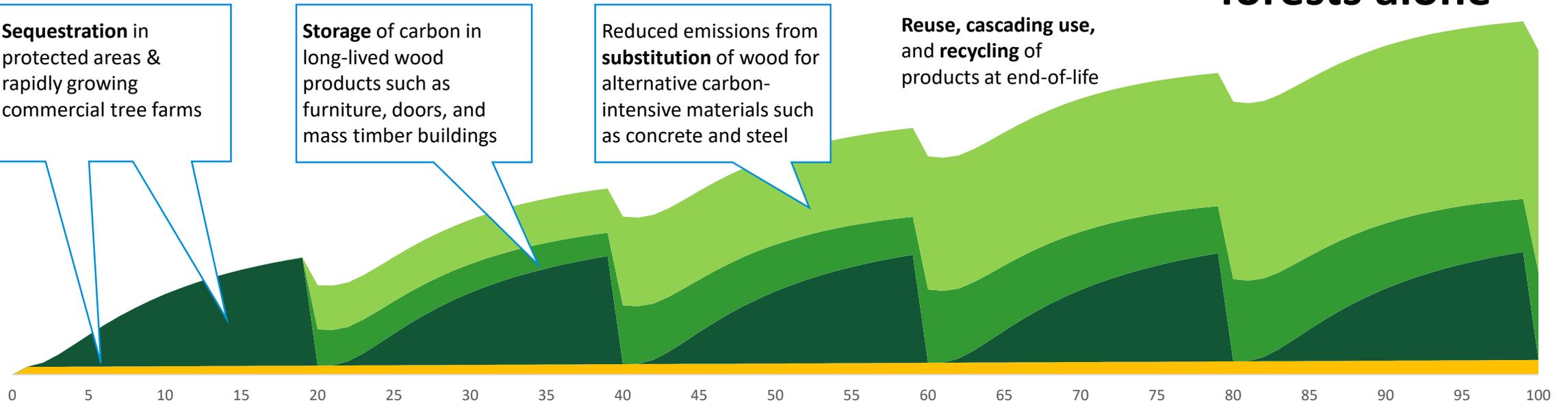
Reduced emissions from **substitution** of wood for alternative carbon-intensive materials such as concrete and steel

## Circularity



**Reuse, cascading use, and recycling** of products at end-of-life

Can deliver **2-3x** climate benefit of forests alone<sup>1</sup>



**Illustrative carbon impact over time from rotational management of *Eucalyptus urograndis* for use in long-lived applications<sup>1,2</sup>**

Notes: (1) Sources: "Substitution Effects of Wood-based Products in Climate Change Mitigation", Leskinen et. al, 2018, TIG Analysis; (2) TIG Analysis based on 18 year Eucalyptus sawlog rotation in Brazil; Image sources: Getty Images, Pollux Chung © / construction by Seagate Structures.

# Growing commitments to climate action

Government, corporate and investor commitments are growing and gaining momentum

## International commitments to restoration and climate mitigation

- **200+ governments, companies, others** committed to halving deforestation and restoring 350M hectares of forests by 2030<sup>1</sup>
- 189 countries committed to **limit warming to 2°C**<sup>2</sup>

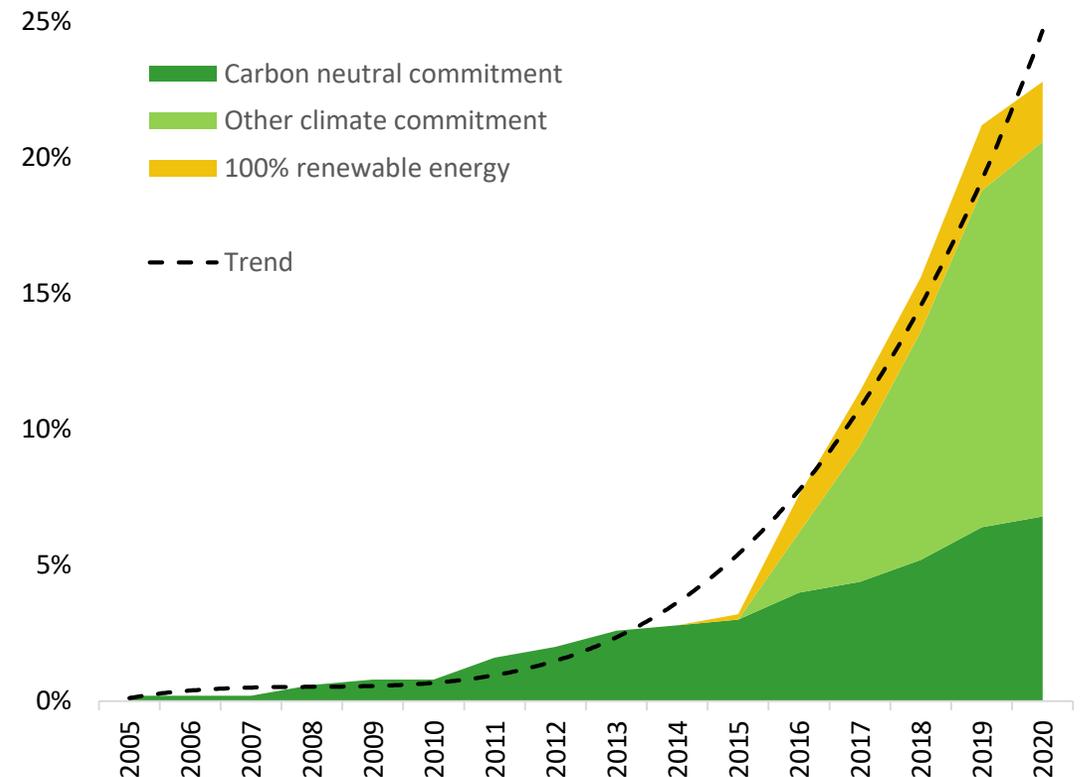
## Large investor and corporate commitments to climate mitigation

- US\$ 43T in AUM committed to **net-zero emissions by 2050**<sup>3</sup>
- **23% of global Fortune 500** committed to reduce/eliminate emissions by 2030<sup>4</sup>

### Example Commitments

<b>Large Emitters</b>	BP committed to net-zero by 2050 or sooner <sup>5</sup> ; Shell committed to reduce carbon-intensity of products by 65% by 2050 <sup>6</sup>
<b>Technology Companies</b>	Microsoft committed to be net negative by 2030; <sup>7</sup> Amazon committed to be net neutral by 2040 <sup>8</sup>
<b>Pension funds</b>	CalPERS, Nordea Life and Pension, PensionDanmark committed to net-zero emissions across their portfolios by 2050 <sup>3</sup>

## 23% of the Global Fortune 500 have committed to reduce or eliminate emissions by 2030<sup>4</sup>

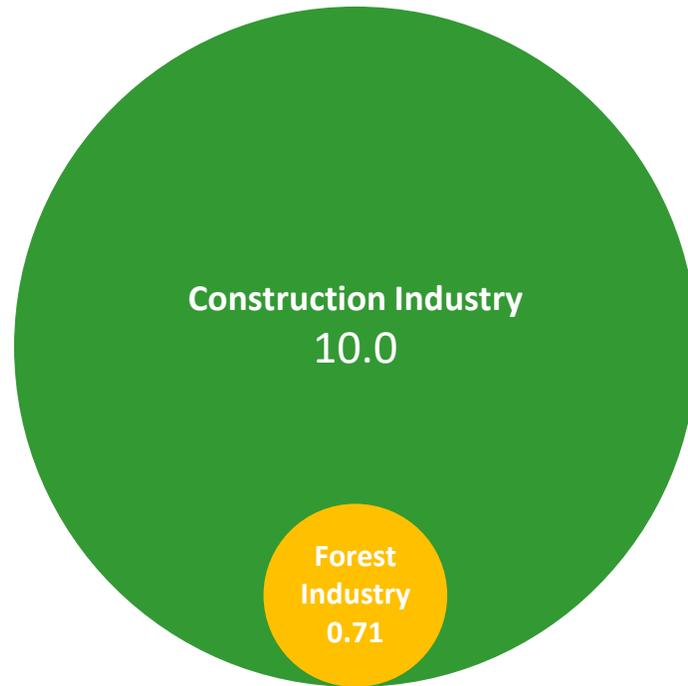


Notes: (1) Commitments under the New York Declaration on Forests and the Bonn Challenge; (2) United Nations Climate Change, Paris Agreement - Status of Ratification, 2020; (3) Net-Zero Asset Managers Initiative, <https://www.netzeroassetmanagers.org/>, accessed September 15, 2021; (4) Natural Capital Partners. September 2019. Deeds not words: The Growth of Climate Action in the Corporate World; (5) BP sets ambition for net zero by 2050, fundamentally changing organization to deliver, 2020; (6) What is Shell's Net Carbon Footprint Ambition?, 2020; (7) Microsoft will be carbon negative by 2030, 2020; (8) Amazon, Committed to a sustainable future, 2020.

# Why focus on wood in construction?

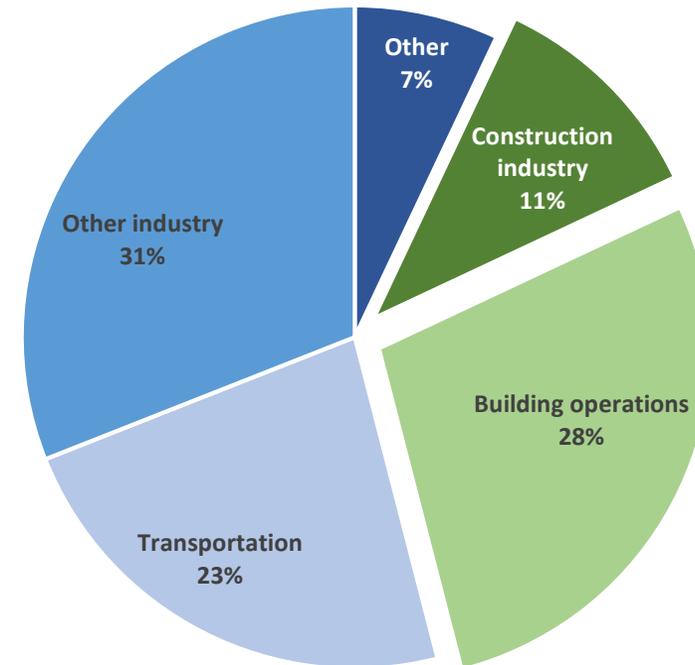
The construction sector is huge, growing fast, and generates more emissions than transportation or industry

Global industry size (US\$ trillions p.a.)<sup>2,3</sup>



- Global construction industry is c. 14x the forest industry<sup>4</sup>
- Drives activity in every municipality across the globe

Global CO<sub>2</sub>e Emissions (2018)<sup>1</sup>

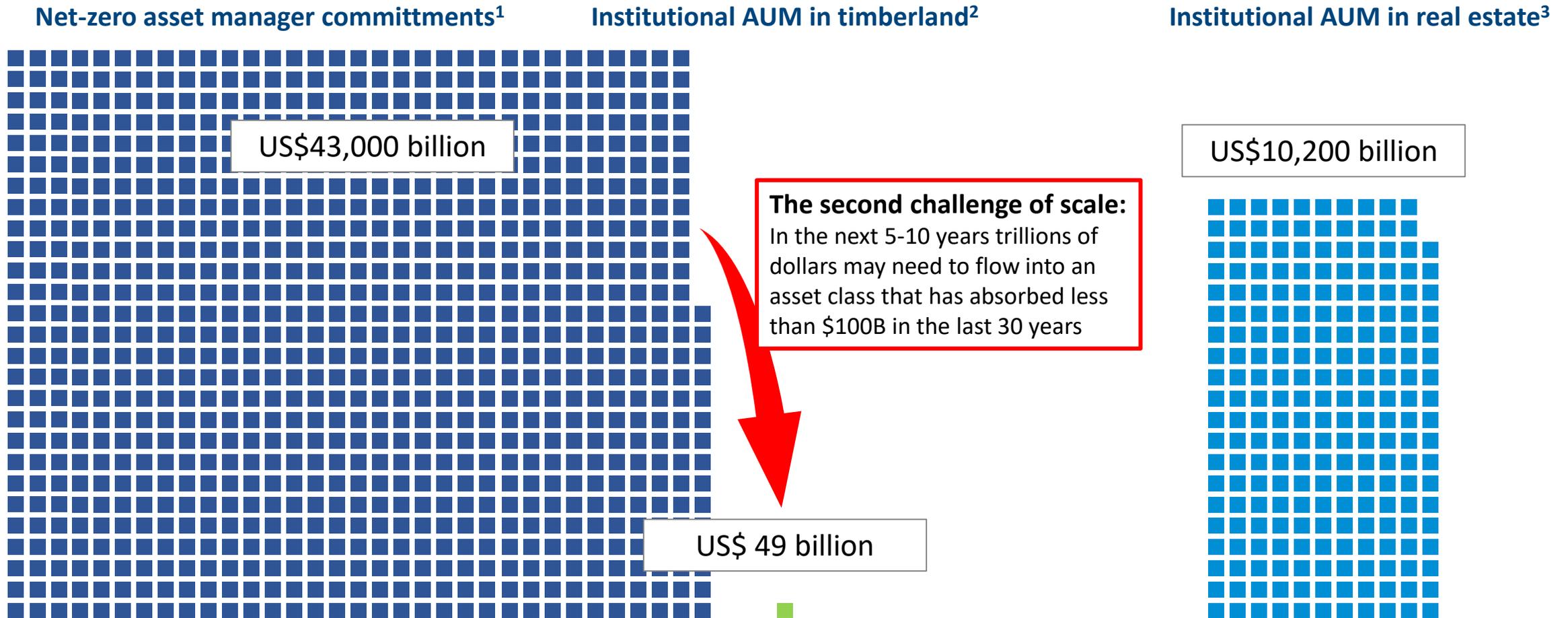


- Buildings are c. 39% of global emissions<sup>1</sup>
- Global floor area projected to double by 2050<sup>1</sup>

Notes: (1) Global Alliance for Buildings and Construction, International Energy Agency and United Nations Environment Programme, 2019. Global status report for buildings and construction: Towards a zero-emission, efficient and resilient buildings and construction sector, 41 pages.; (2) McKinsey Global Institute, 2017. Reinventing construction: a route to higher productivity. 168 pages.; (3) FAO, 2014. State of the world's forests. 133 pages and World Bank (data.worldbank.org, accessed April 21, 2020); (4) TIG analysis.

# Trillions of dollars have recently committed to net zero

NCS offers one of the few opportunities to offset net emissions – but the investible opportunity is small



# What is the impact of wood utilization on climate?

Forest products can have multiple impacts on climate

	 <b>Sequestration (forest carbon stock)</b>	 <b>Storage (carbon in materials)</b>	 <b>Substitution (production emissions)</b>	 <b>Circularity (end-of-life)</b>
<b>Positive</b>	Reforestation Longer rotations	Carbon stored in products for short-long periods	Fewer emissions than functionally equivalent alternative materials	Materials can be reused multiple times, or in cascading uses
<b>Neutral</b>	No net change in forest carbon stocks	No storage (carbon emitted immediately)	Emissions equal to functionally equivalent alternatives	Building demolished; materials may be ground, separated, and reused/recycled
<b>Negative</b>	Shorter rotations Degradation & deforestation	N/A	Emissions exceed those of functionally equivalent alternatives	Anaerobic decomposition w/o methane capture

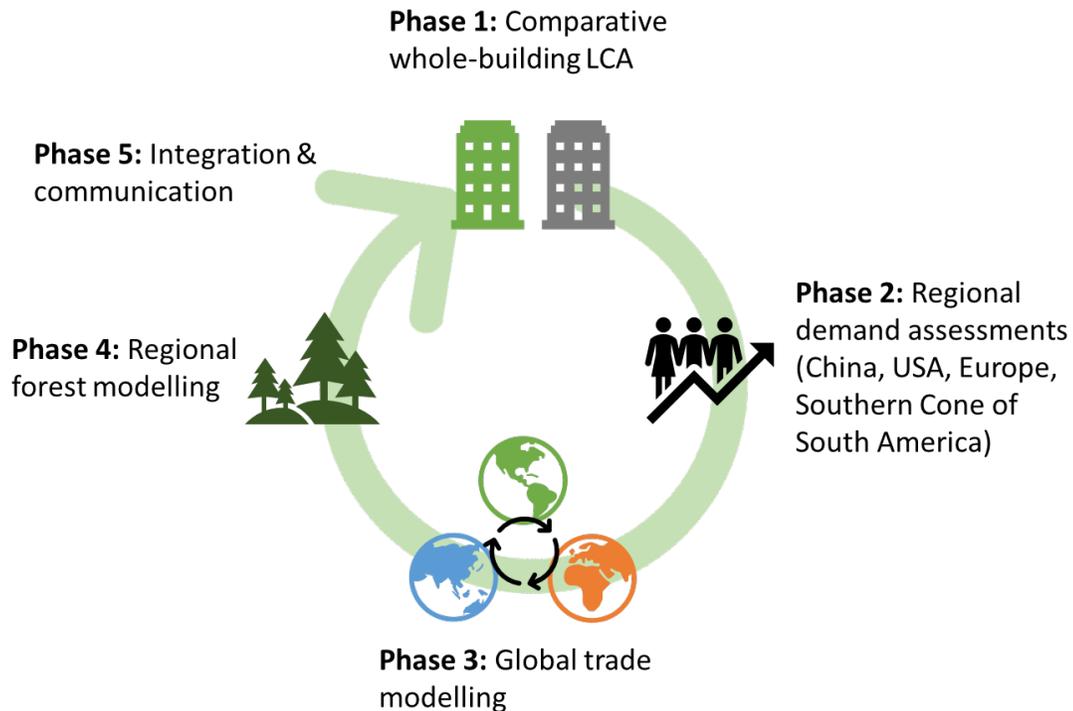
← Calculating climate benefit or detriment requires integration across ALL domains →

# What gaps do we need to fill?

Better tools for understanding the marginal impact of utilization on forests

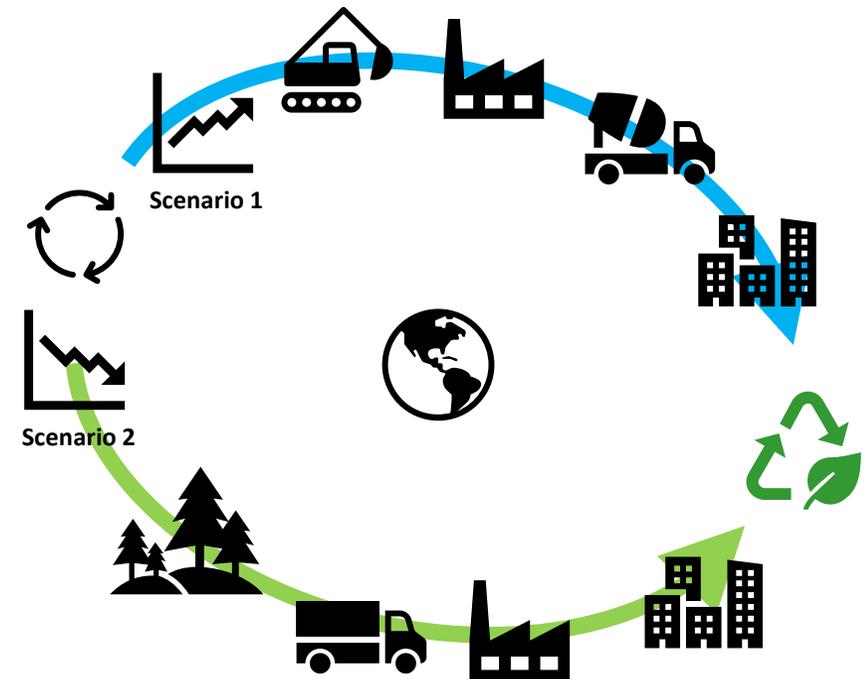
## Global assessment of the impact of mass timber on climate and forests

- Led by The Nature Conservancy, in collaboration with more than two dozen researchers on 4 continents



## “3-S” framework (sequestration, substitution, storage, end-of-life) to integrate impacts from the forest to end-of-life

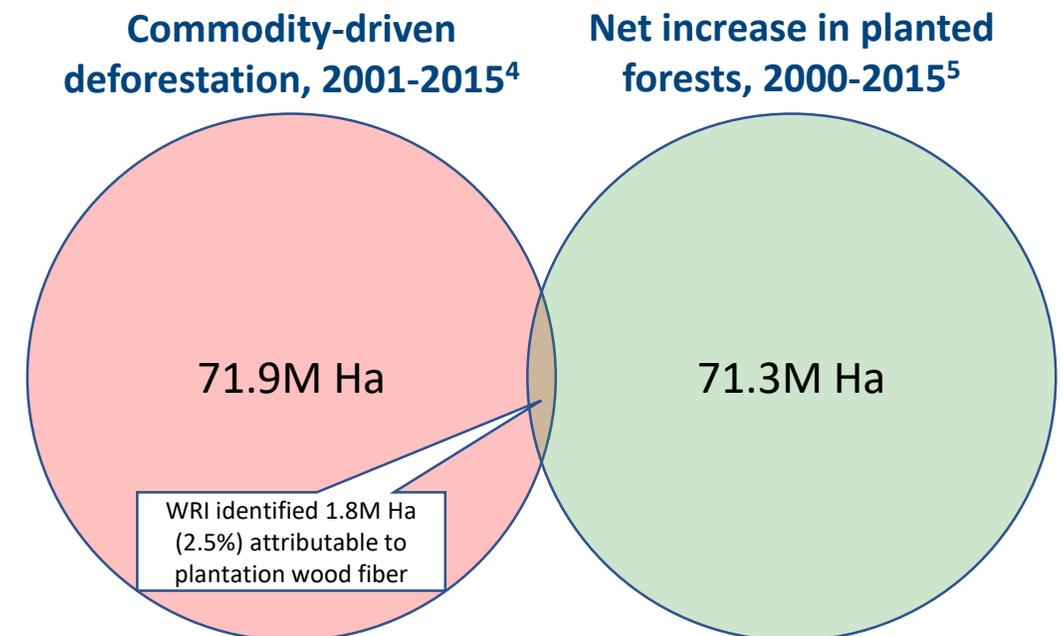
- Led by EIT Climate-KIC, World Resources Institute, The Nature Conservancy and collaborators



# Where does wood come from?

Planted forests are 7% of total global forest area<sup>1</sup> and 49% of global wood production (as of 2013)<sup>2</sup>

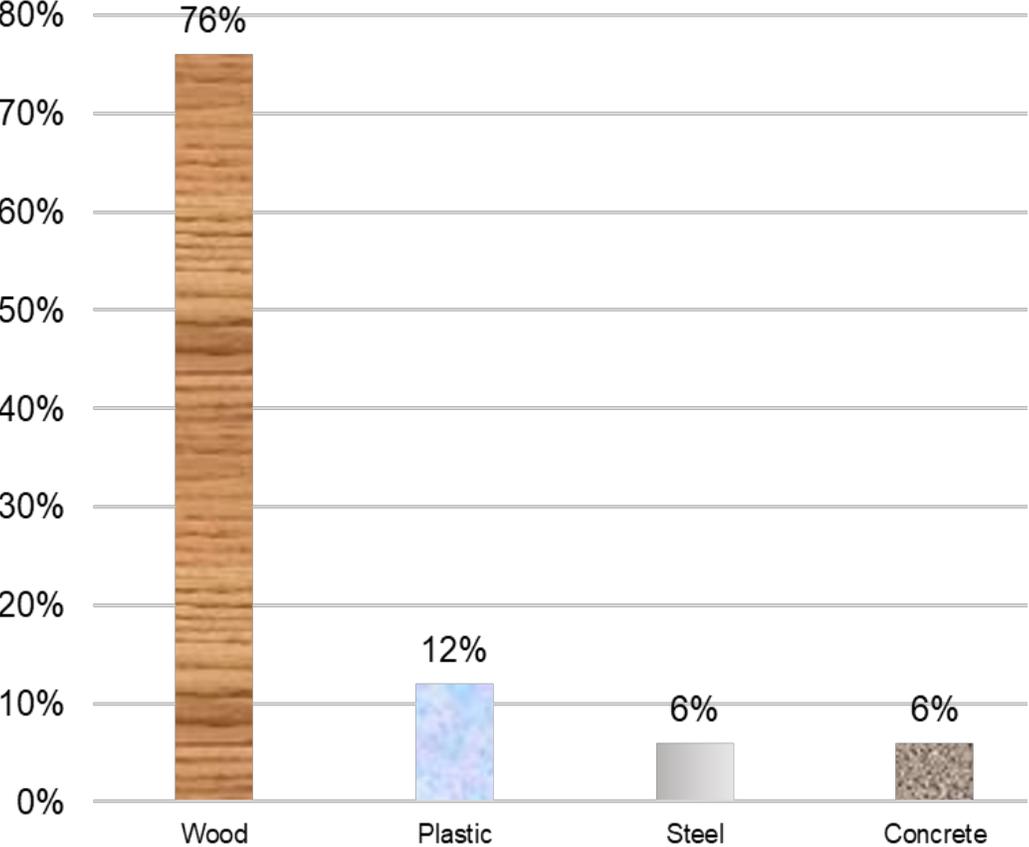
- Global area of planted forests increased by 33% from 2000-2015<sup>1</sup>
- Planted forests often established for specific products and markets; one study identified rise in timber net returns as the most important factor driving the increase in forest areas in the United States between 1982 and 1997<sup>3</sup>
- Reforestation should:
  - Comply with all applicable laws and regulations
  - Include FPIC, execute in accordance with community rights and interests, and provide local benefit
  - Exclude conversion of natural ecosystems or forest types, or conversion of forest to other uses
  - Integrate commercial production and other positive ecological/social impacts
  - Reforest / restock following harvest
  - Protect streams, wetlands, ecologically sensitive areas, areas of high ecological or cultural value
  - Apply other appropriate sustainability standards (forest certification standards, BMPs)



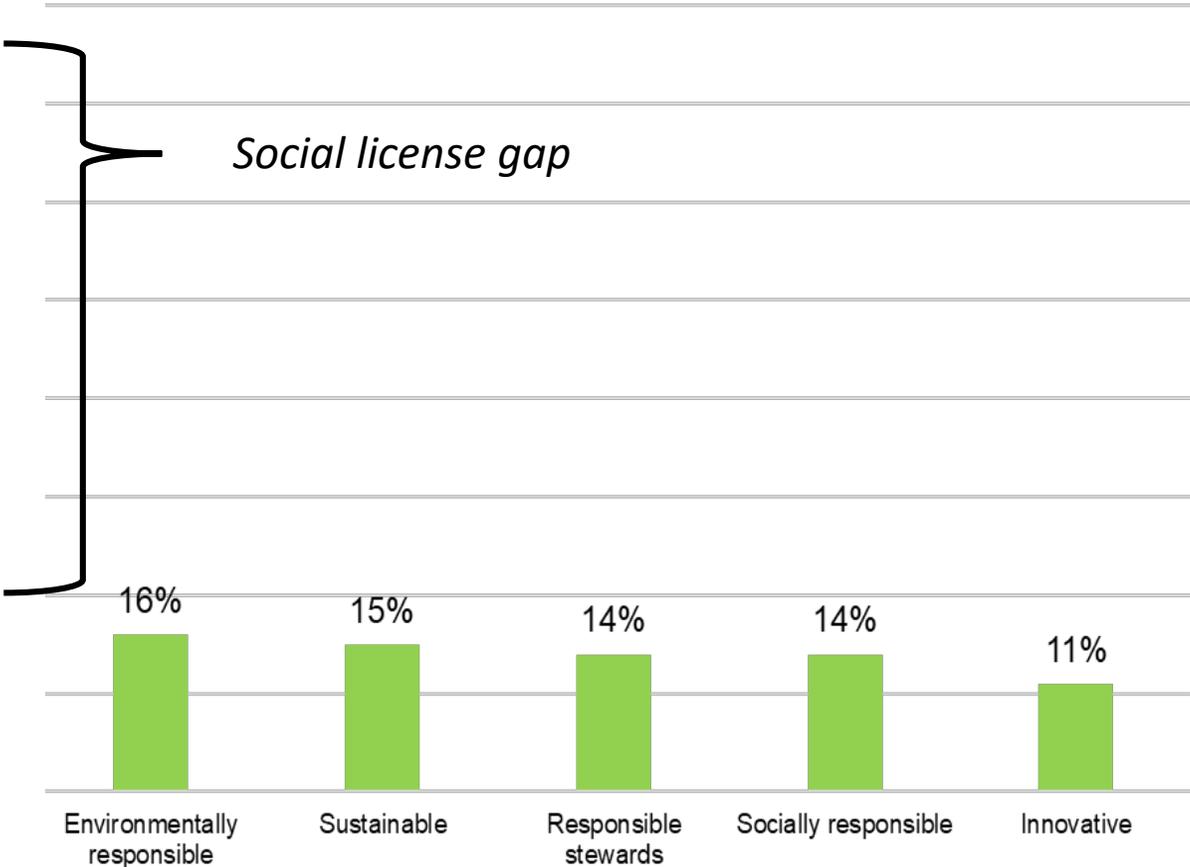
# Social license

Forest products still gaining acceptance as a climate solution

Which is the most renewable material?<sup>1</sup>



Does this phrase describe the forest sector?<sup>1</sup>



Notes: (1) Source: 2017 Stakeholder Perceptions Survey conducted by Ideas in Focus on behalf of the North American Forest Partnership. Survey of 1,300 environmentally aware adults in North America.

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