

# Climate finance gap: Case of Mangroves

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Perm Summer School 2024



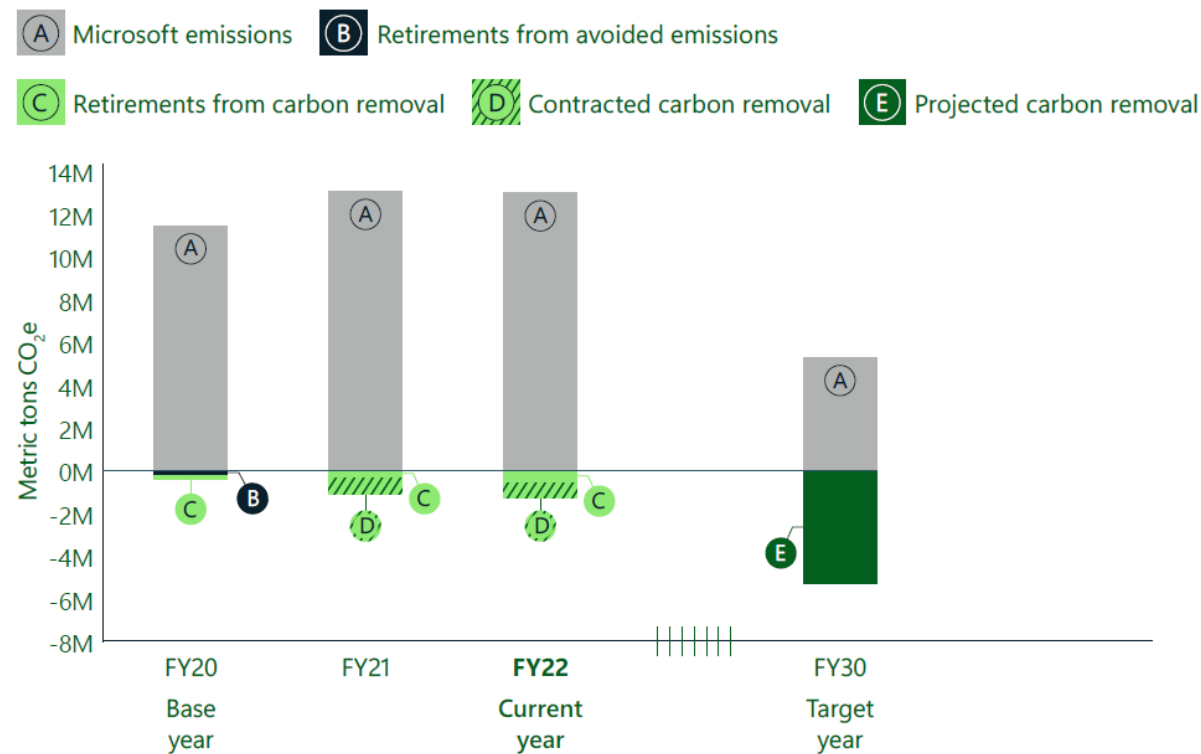
# Agenda

- Corporate demand for carbon credits and climate finance gap
- Mangrove restoration projects financing



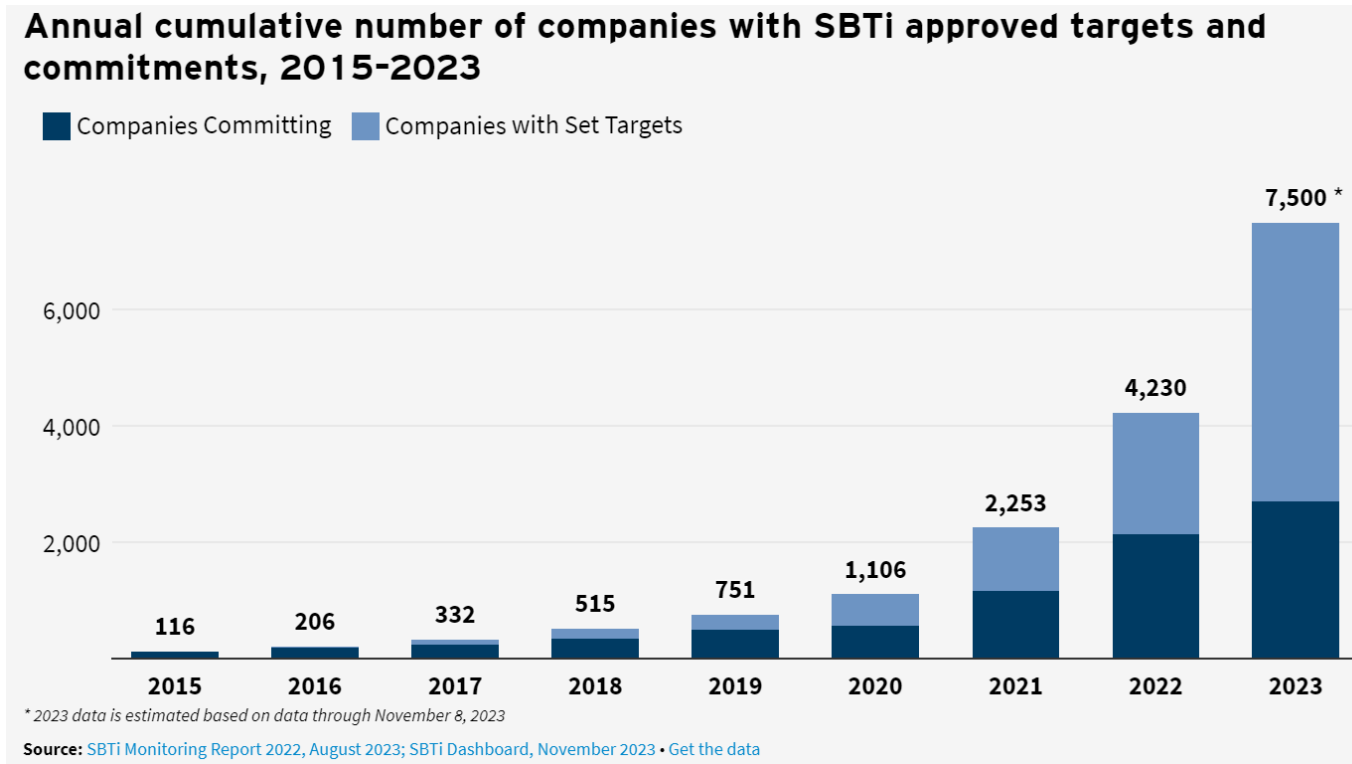
# Corporate climate action

- Climate information disclosures: TCFD, IFRS S2, CSRD, SEC rule, etc.
- Climate goals (“*Net Zero by ...*”) validated by Science Based Targets initiative (SBTi)



# Corporate climate action

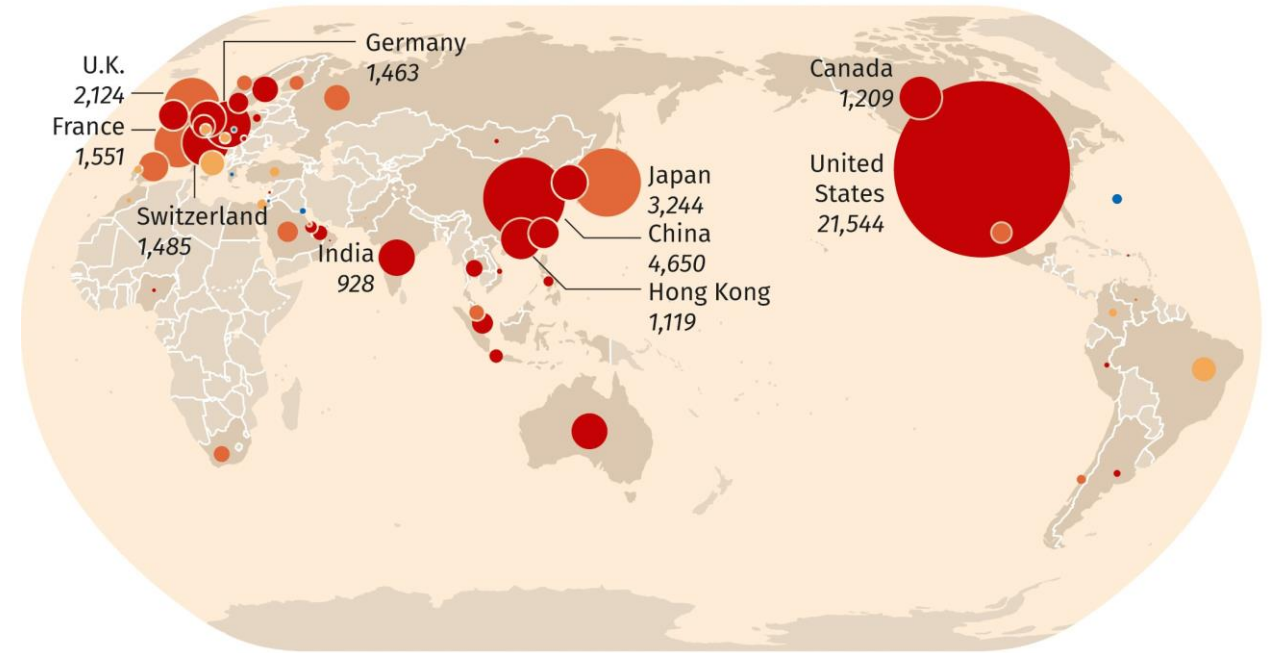
- **23k** report emissions to CDP, **8.4k** committed to SBTi, **4.3k** validated Net Zero
- **>50%** Forbes 2000 companies with **66%** revenue pledged Net Zero



# Forbes 2000

- **\$232T** assets, **\$50T** revenue, **\$4T** profits, **\$74T** market cap
- **50%** of the global economy
- **66%** of global equity

What is the level and structure of carbon credits demand for top global companies?



Market cap (2017), bln\$

# Data

Dataset on GHG Emissions of Forbes 2000 companies (Robert Höglund)

<https://docs.google.com/spreadsheets/d/19MQbZbrCu4HpAWe6NU92CioYQ7KE8FvD9vl-r9qSjJg/edit#gid=1986052149>

- Covers Top 250 companies from Forbes 2000
- Manually collected emission data from 2020-2022 reports
- 209 companies have Scope 1+2
- 163 companies have Scope 1+2+3

# Coverage

- 163 of 2000 companies (8%)
- Revenue \$14.5T of \$50T (28%)
- Profit \$1.7T of \$4.5T (37%)
- Assets \$73T of \$232T (32%)

>**50%** Forbes 2000 companies with **66%** revenue pledged Net Zero

*Scaling multiple =  $1 / 0.33 * 0.66 \sim 2$*

# Carbon Footprint

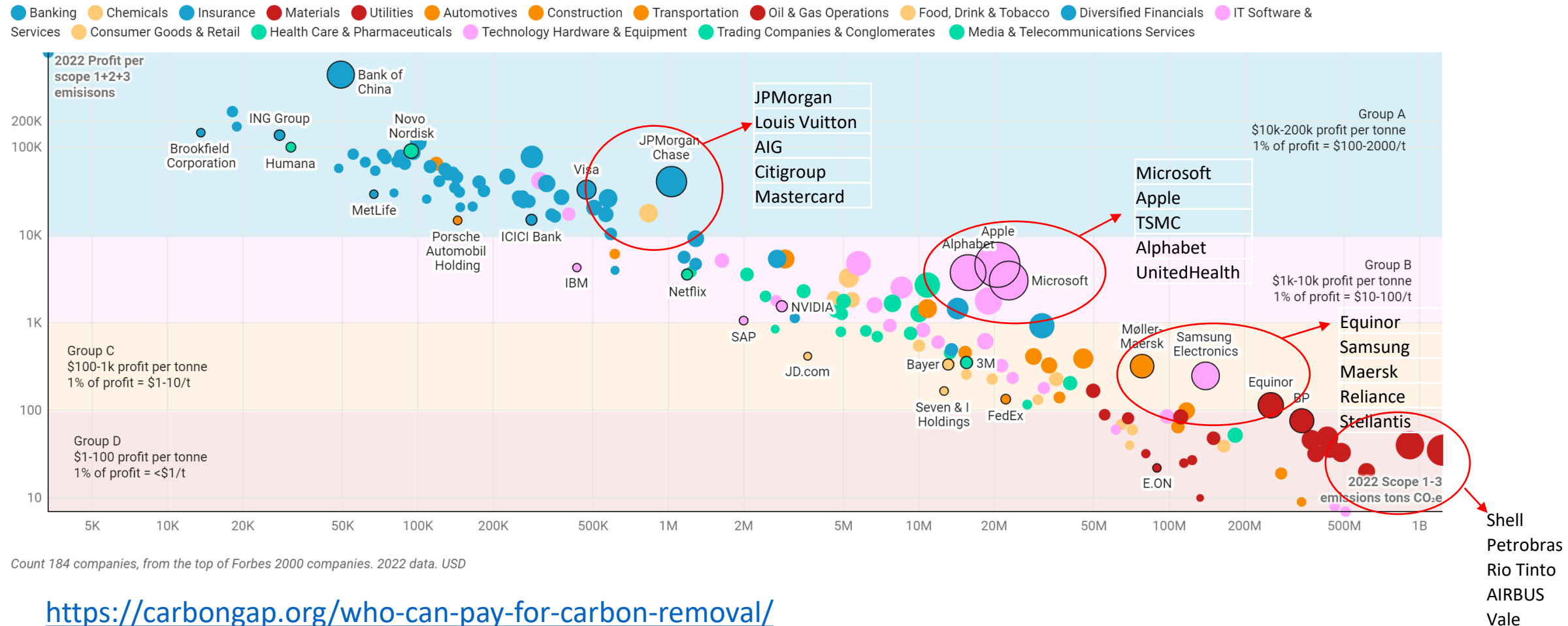
- Scope 1+2 of 0.97 GtCO<sub>2</sub>
- Scope 1+2+3 of 10.2 GtCO<sub>2</sub>
- Profit per 1 tonne Scope 1+2+3 = \$165
- 1% Profit per 1 tonne Scope 1+2+3 = \$1.65



# Profit per Tonne Scope 1+2+3

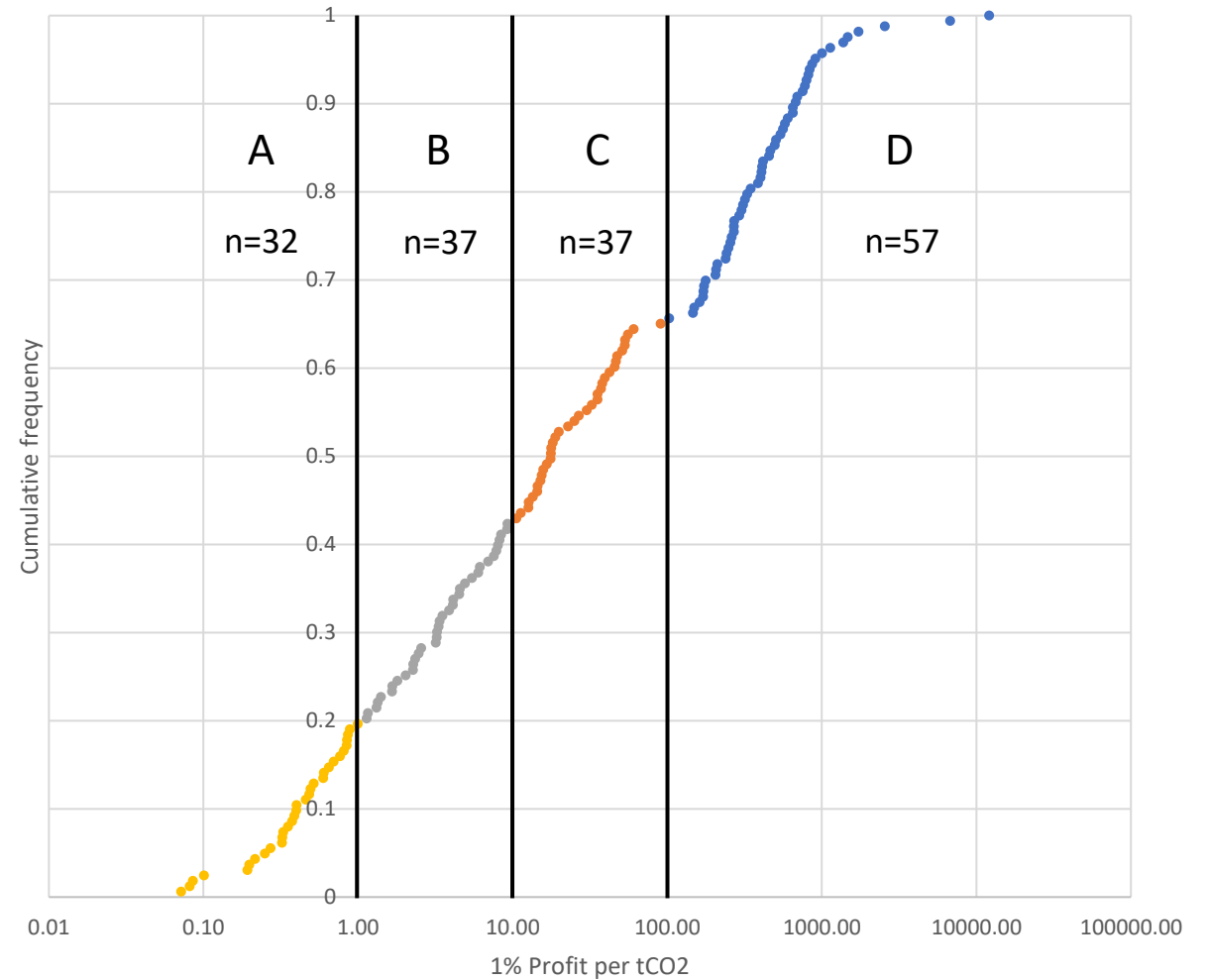
## Profit per tonne Scope 1-3 versus Total emissions

Profits divided by GHG emissions in all scopes.

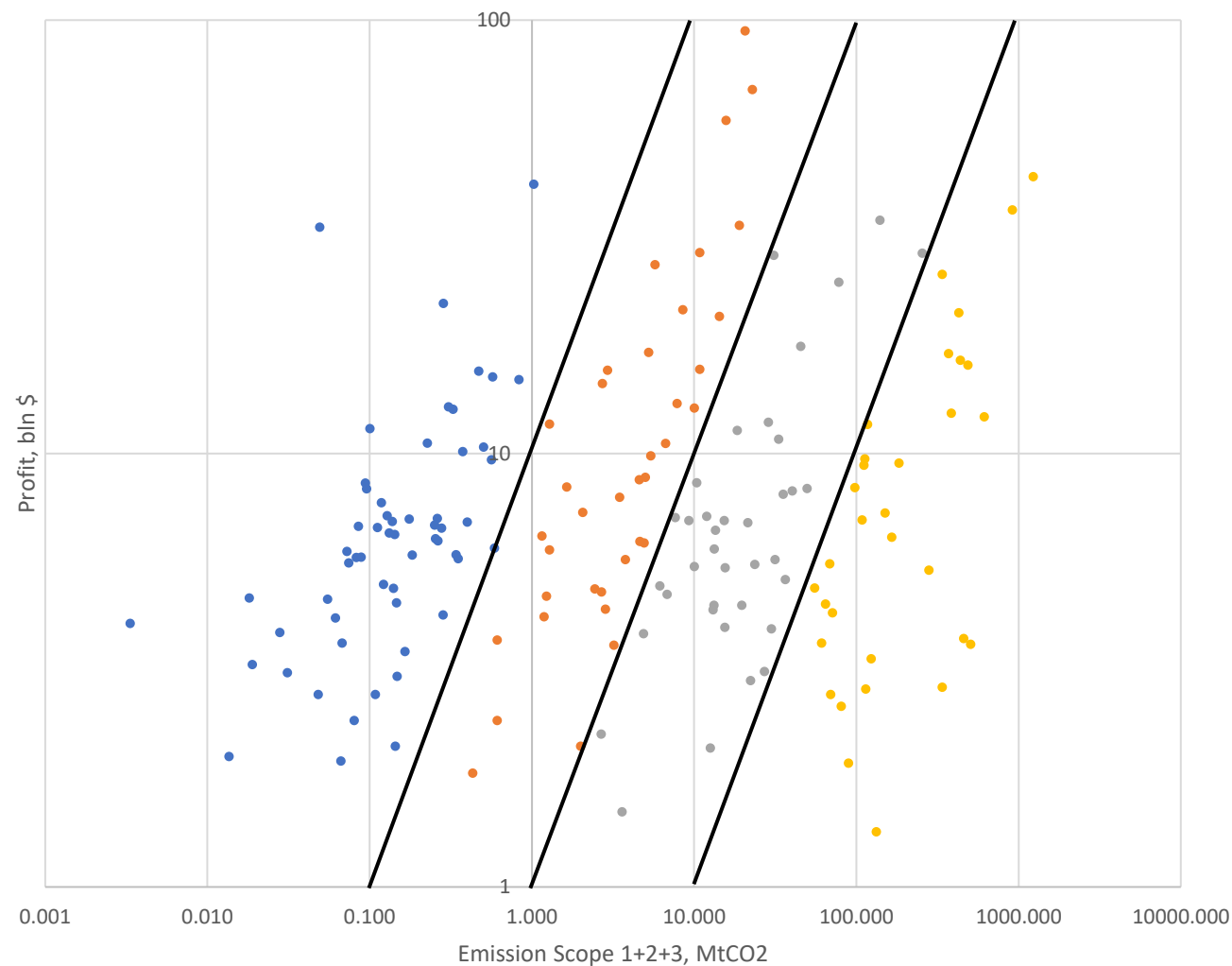


# Grouping

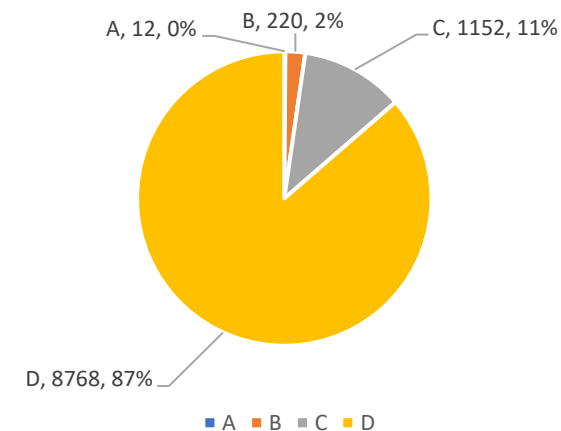
- Exponential distribution
  - linear in log scale
- 4 groups:
  - 1% profit per tonne S1+2+3:
    - A: >\$100
    - B: \$10-100
    - C: \$1-10
    - D: <\$1



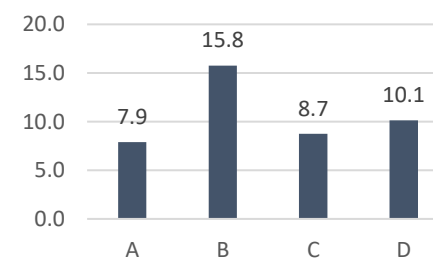
# Groups stats



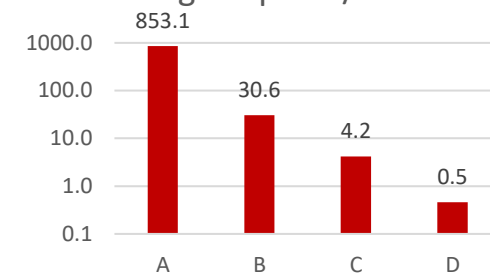
Group carbon footprint, MtCO2



Average profit, bln\$



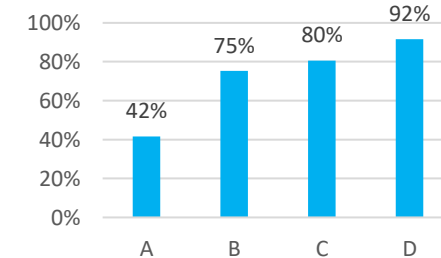
W.avg 1% profit/tCO2



Avg footprint, MtCO2



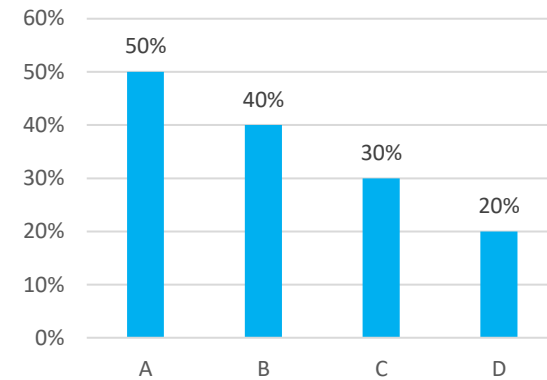
Scope 3 Share



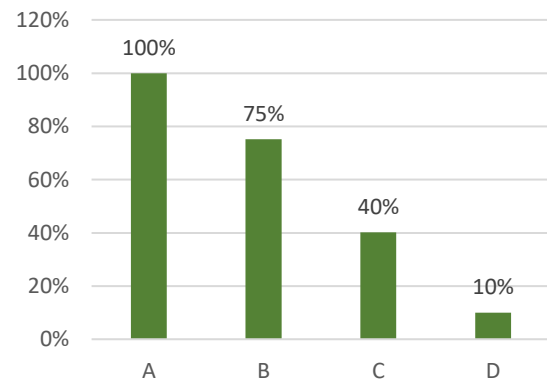
# Assumptions

- Profit YoY growth = 4%
- Profit allocation for compensation = 1%
- Scope 1+2+3 reduction target by 2030:
  - Group A - 50%
  - Group B - 40%
  - Group C - 30%
  - Group D - 20%
- Compensation of residual emissions in 2030:
  - Group A - 100%
  - Group B - 75% (100% of Scope 3)
  - Group C - 40% (50% of Scope 3)
  - Group D - 10%

Reduction target by 2030



Compensation level in 2030





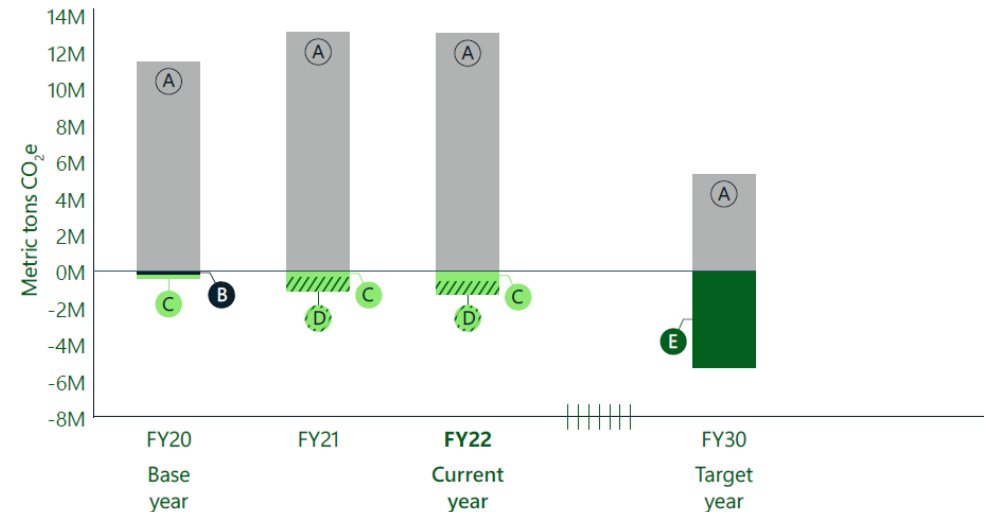
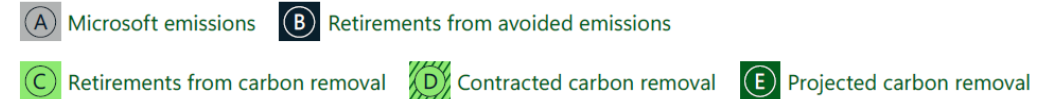
# Microsoft

- Scope 1+2+3 = 13 MtCO<sub>2</sub>
- Profit = 69 bln \$
- Profit per 1 tCO<sub>2</sub> = \$5310
- 1% profit per 1 tCO<sub>2</sub> = \$53.1
- Reduction target by 2030 = 50%
- Residual emission = 6.24 MtCO<sub>2</sub>
- Profit in 2030 =  $69 * 1.04^8 = 91$  bln \$
- 1% profit per 1 tCO<sub>2</sub> in 2030 = \$146

## Carbon Table 1

### Tracking our yearly progress toward carbon negative by 2030

In FY22, we procured 1.44 million metric tons and retired 514,156 metric tons of carbon removal as part of our effort toward achieving our annual carbon commitment to be carbon neutral. Carbon removal contracted each year includes credits retired in the same year and to be retired in future years.



# Microsoft

	2022	2030
Profit, bln \$	69	91
Scope1+2	0.52	0.00
Scope3	12.48	6.24
Scope1+2+3	13.00	6.24
Compensation	0.514	6.24
Compensation, %	4.0%	100%
1% profit per tCO2	53	146

Durable CDR		
price	400	400
share	9%	29%
volume, mt	0.045	1.83
budget, m\$	18	732
NbS removals		
price	20	40
share	91%	71%
volume, mt	0.469	4.4
budget, m\$	9	176

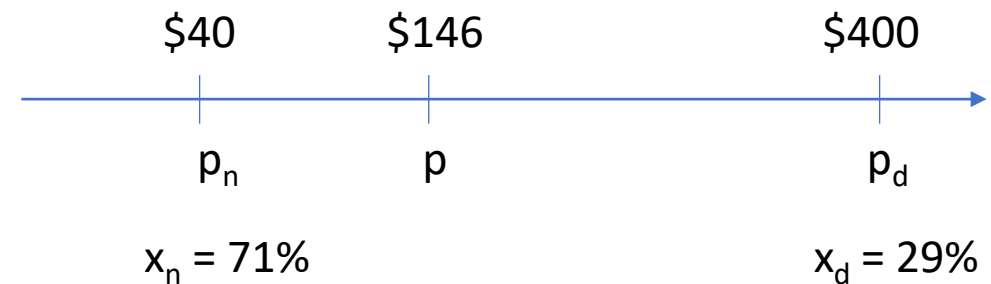
$$x_d = (p - p_n) / (p_d - p_n)$$

$x_d$  - share of durable CDR

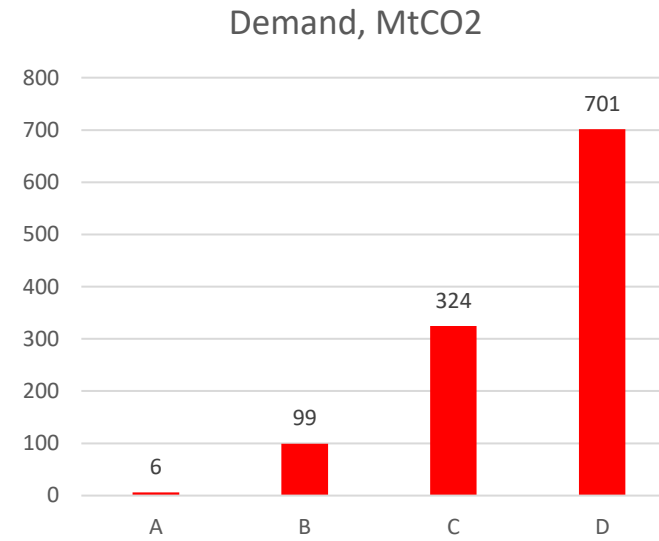
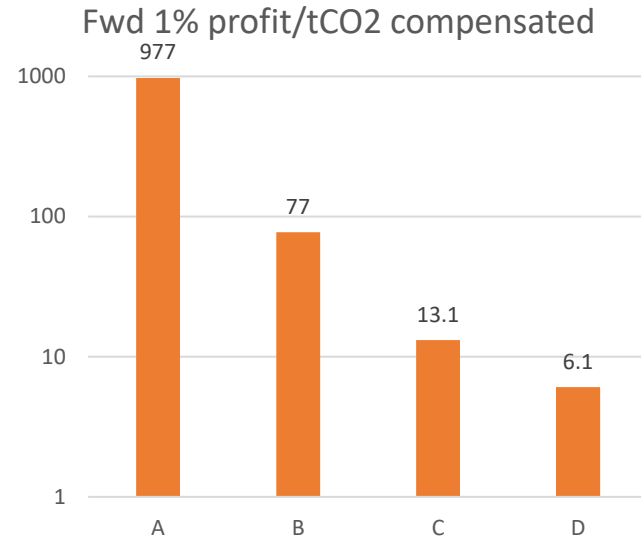
$p$  - 1% profit / tCO2

$P_d$  - price of durable CDR

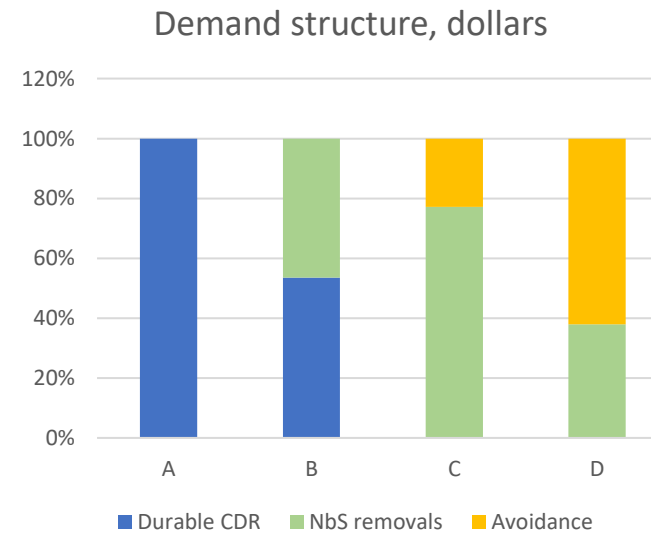
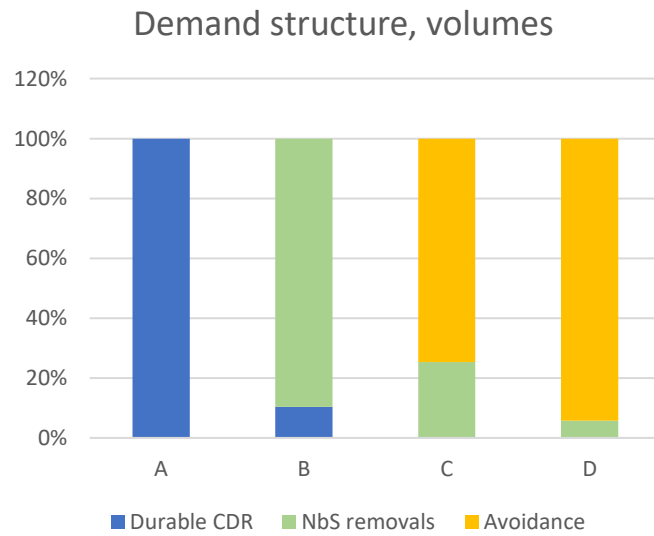
$P_n$  - price of NbS removals



# Results

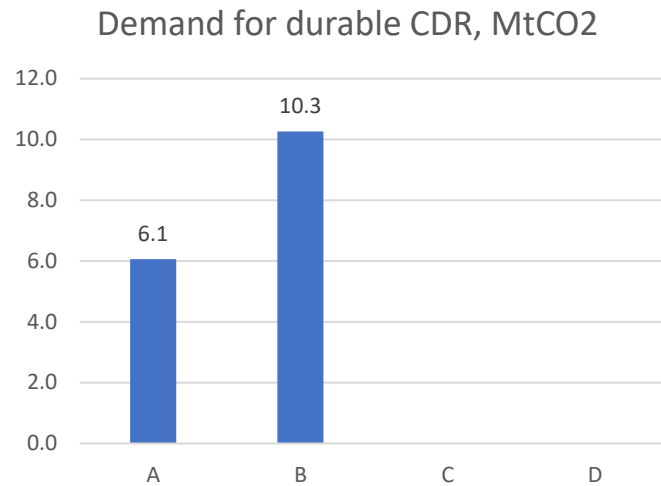


1130 Mt  
\$22.1B

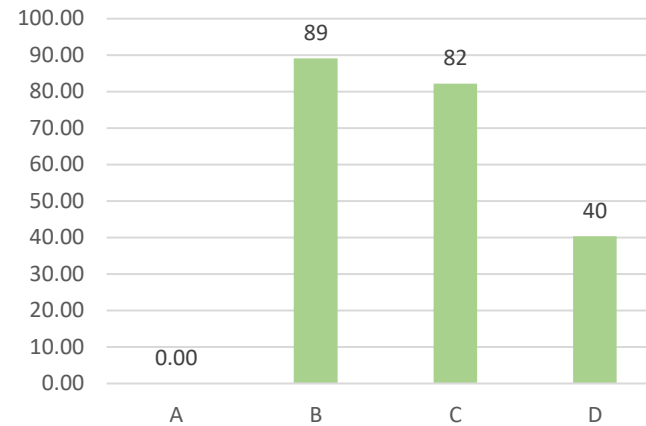


# Results

16 Mt  
\$6.5B

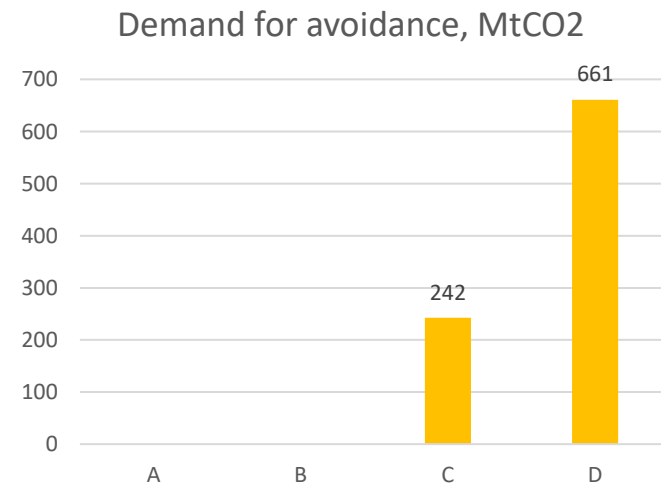


Demand for NbS removals, MtCO<sub>2</sub>

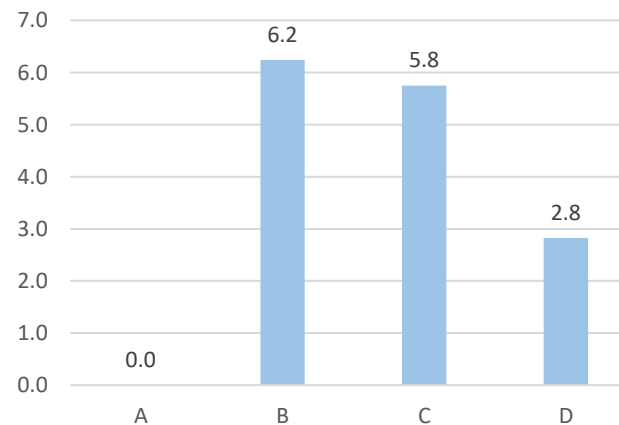


212 Mt  
\$8.4B

903 Mt  
\$3.6B



Demand for blue carbon, MtCO<sub>2</sub>



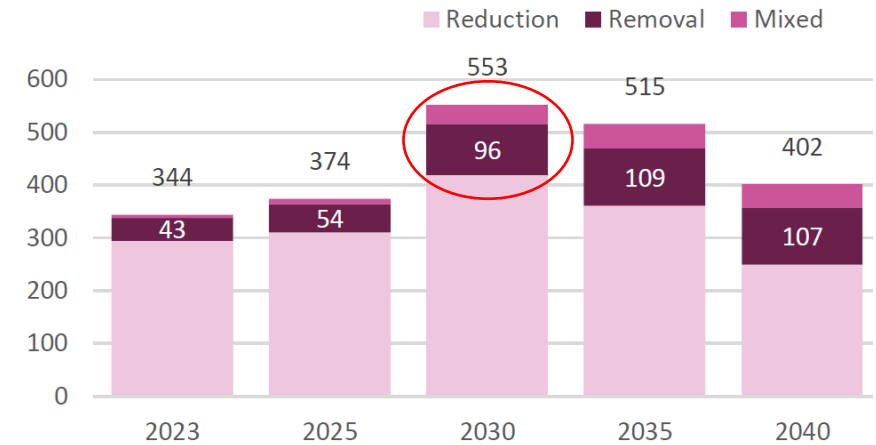
14.8 Mt  
\$0.7B



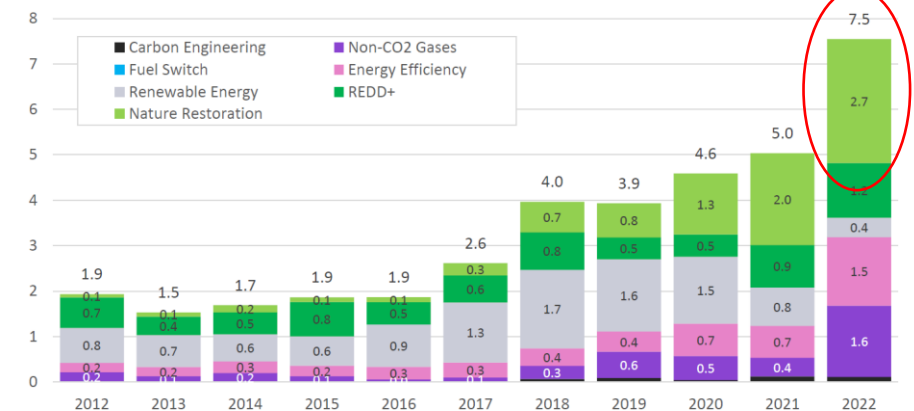
# Climate finance gap

- 160 of Top 250 companies => scaling ~2x to Forbes 2000 committed to Net Zero:
  - Projected demand for NbS removals 424 MtCO<sub>2</sub>, durable CDR 32 MtCO<sub>2</sub>, Blue carbon 30 MtCO<sub>2</sub> in 2030
- Total projected demand exceeds supply:
  - Projected supply in 2030 NbS removals ~110 MtCO<sub>2</sub>, Durable CDR ~15 MtCO<sub>2</sub>, Blue carbon ~13 MtCO<sub>2</sub>
- Investments to nature restoration needs to increase significantly to meet projected demand (~\$3B in 2022)

Projected issuance from registered & pipeline

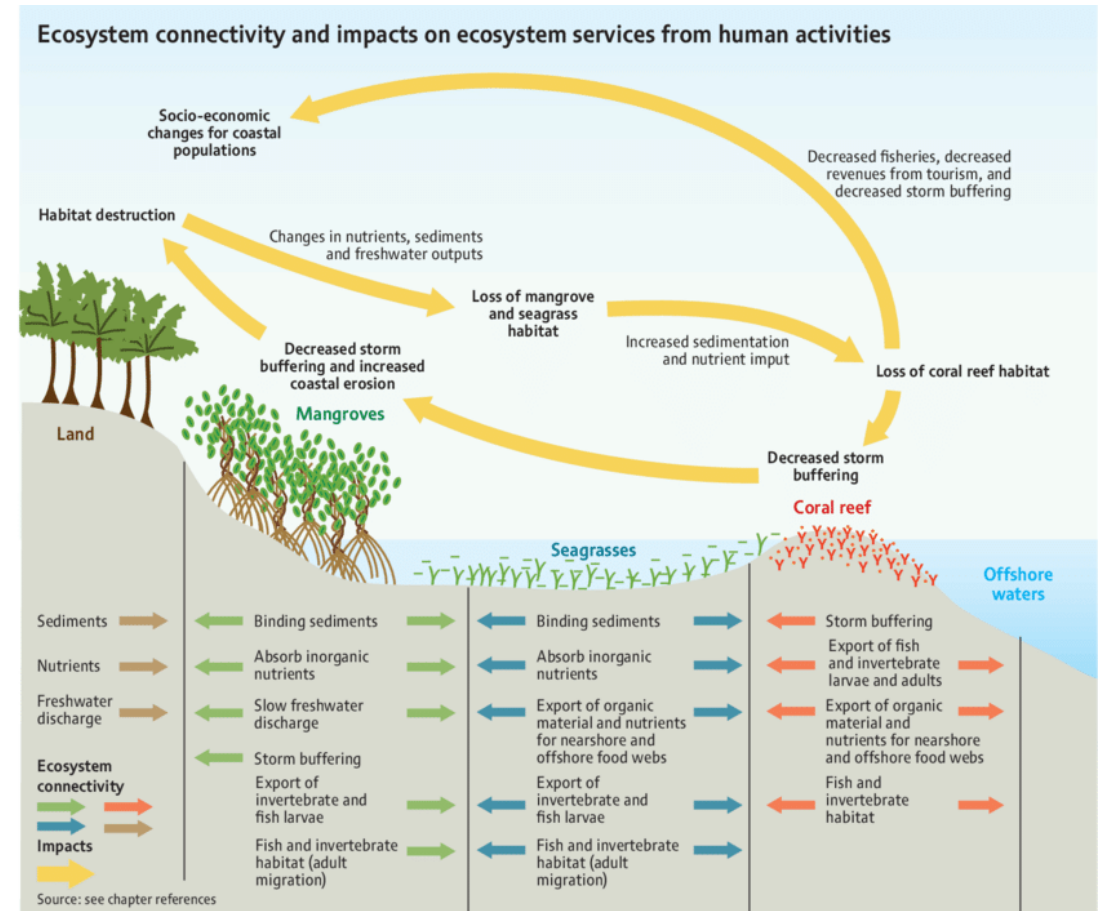


Project investment by project type (\$bn)



# Mangrove restoration

- 14 mln ha total cover
- 6 mln ha lost in the last 40 years
- 0.7-0.9 mln ha highly restorable
- 1k tC/ha carbon storage
- \$30-80k/ha/yr ecosystem services
- \$1.5k/ha direct restoration cost + overheads + opex \$20-30/ha/yr
- 75% of C storage recovers in 40 years: 0.4-1k tCO<sub>2</sub>/ha (valued at \$12-30k)





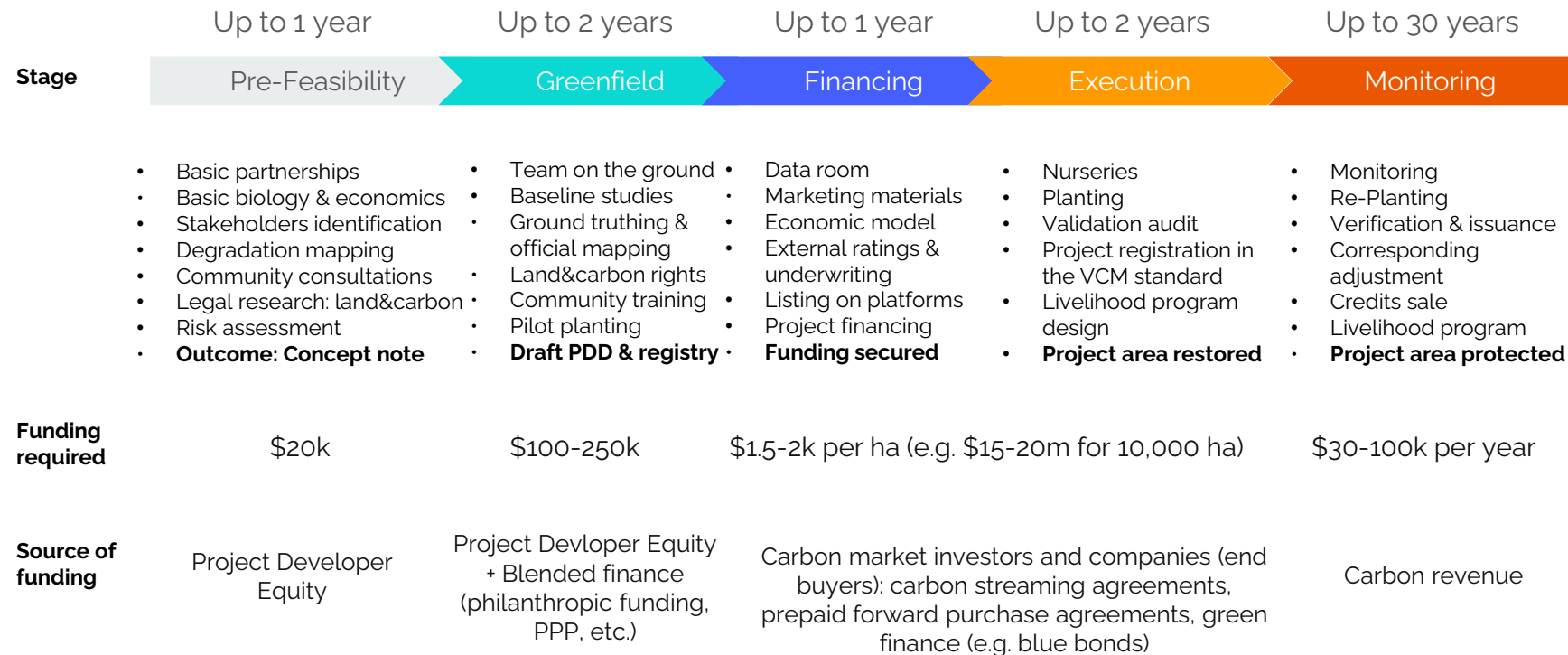






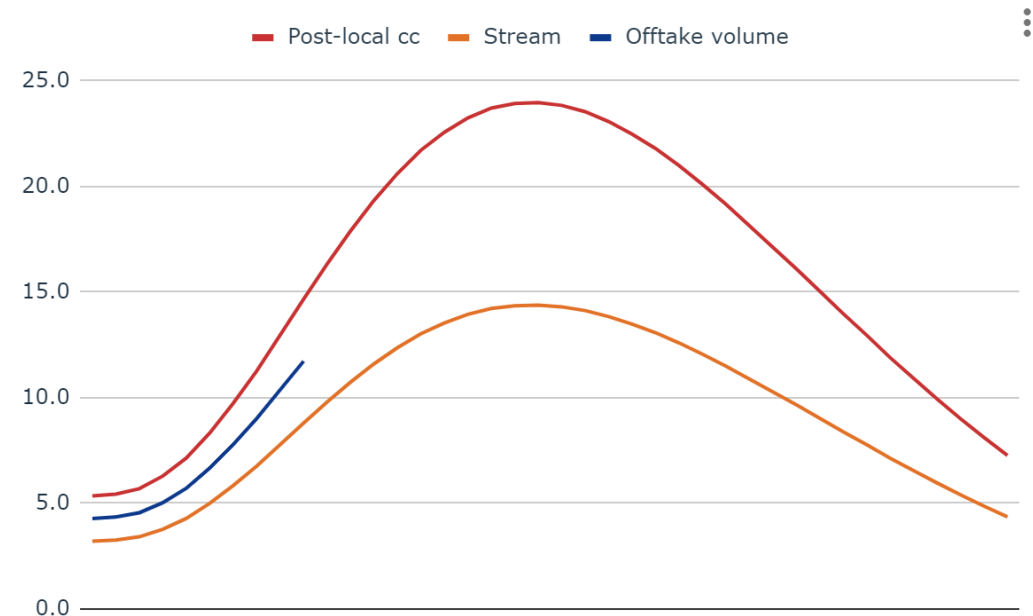


# Mangrove restoration



# Climate finance instruments

- Streaming deal
  - Allocation of carbon share to investor (25-50%)
  - Typically 15%+ IRR threshold
- Prepaid offtake
  - Offtake first 7-10 years of credits (80 to 100%)
  - Guaranteed delivery (replacement)
  - Discount to spot (20-40%)
- Offtake + loan + carbon sharing
  - Forward agreement first 7-10 years of credits
  - Bank loan (or similar instrument)
  - Sharing of the remaining part of the curve
- Prepaid offtake with profit sharing
  - Offtake for 100% of credits with a discount
  - Profit sharing of the difference



# Climate finance instruments

- 1 ha unit model
  - Indonesia curve, 15% buffer
  - \$1500 direct cost
  - \$33/t spot
  - Project dev NPV @ 10%
- 
- Prepaid offtake is best, but hardest to get
  - Streaming deal is second best if consider risk of under delivery

100% delivery

	Flat spot	Px 4% spot	Baseline	Avg
Stream	\$1,603	\$2,771	\$4,025	<b>\$2,800</b>
Prepaid offtake	\$2,728	\$5,377	\$7,702	<b>\$5,269</b>
Offtake w/profit sharing	\$1,002	\$2,462	\$4,029	<b>\$2,498</b>
Offtake + loan + carbon sharing	\$1,634	\$2,931	\$4,400	<b>\$2,988</b>

80% delivery

	Flat spot	Px 4% spot	Baseline	Avg	
Stream	\$1,282	\$2,217	\$3,220	<b>\$2,240</b>	-20%
Prepaid offtake	\$1,926	\$3,992	\$5,689	<b>\$3,869</b>	-26%
Offtake w/profit sharing	\$801	\$1,969	\$3,224	<b>\$1,998</b>	-20%
Offtake + loan + carbon sharing	\$1,110	\$2,117	\$3,184	<b>\$2,137</b>	-28%



