

Estimation and prediction of pollutant emissions from non-road machinery: A Case Study in Shanghai

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Supplementary Material

Table S1 The change rates of the numbers for different types of machinery in 2025.

Table S2 Uncertainty analysis of emission estimations for different mechanical types in 2021.

Figure S1 The numbers of each type of non-road machinery sampled.

Figure S2 The proportion of national standards of each type of non-road machinery sampled.

Figure S3 The proportion of power of each type of non-road machinery sampled.

Figure S4 The air pollutant emission from non-road machinery in 2025 under different prediction scenarios.

Table S1 The change rates of the numbers for different types of machinery in 2025

Type	Low	Normal	High
In-plant machinery	-10.81%	-12.72%	-14.62%
Agricultural machinery	-4.15%	-4.89%	-5.62%
Construction machinery	5.11%	6.01%	6.91%
Harbor machinery	3.61%	4.25%	4.88%
Other machinery	6.67%	7.85%	9.02%

Table S2 Uncertainty analysis of emission estimations for different mechanical types in 2021.

Type	Sub-category	Uncertainty (95% confidence interval)					
		PM ₁₀	PM _{2.5}	HC	NO _x	CO	SO ₂
In-plant machinery	Forklift	[- 65.60%,109.39%]	[- 65.80%,108.87%]	[- 63.16%,105.89%]	[- 64.92%,109.18%]	[- 64.51%,109.63%]	[- 39.73%,41.25%]
	Motor tractor	[- 30.09%,42.08%]	[- 30.31%,44.74%]	[- 28.13%,32.42%]	[- 27.69%,31.54%]	[- 27.69%,31.44%]	[- 40.39%,42.31%]
	Other	[-64.10%,108.33]	[- 64.83%,107.59%]	[- 62.32%,88.05%]	[- 63.89%,108.37%]	[- 64.19%,106.36%]	[- 40.34%,40.34%]
Agricultural machinery	Tractor	[- 46.23%,83.96%]	[- 47.00%,83.00%]	[- 39.17%,86.25%]	[- 44.55%,84.08%]	[- 41.73%,86.60%]	[- 42.86%,57.14%]
	Harvester	[- 46.15%,80.80%]	[- 45.83%,83.33%]	[- 39.51%,85.19%]	[- 43.78%,85.07%]	[- 40.54%,85.59%]	[0.00%,100%]
	Other	[- 47.06%,82.35%]	[- 43.75%,81.25%]	[- 38.46%,87.18%]	[- 43.78%,85.07%]	[- 41.04%,87.28%]	[-50.00%,0.00%]
Construction machinery	Excavator	[- 38.76%,86.05%]	[- 39.83%,85.59%]	[- 30.86%,50.35%]	[- 30.88%,51.42%]	[- 37.17%,83.98%]	[- 40.00%,45.00%]
	Road roller	[- 40.91%,90.91%]	[- 45.46%,81.82%]	[- 36.00%,77.33%]	[- 44.42%,84.60%]	[- 41.18%,86.10%]	[- 42.86%,42.86%]
	Loader	[- 33.61%,71.43%]	[- 34.55%,75.45%]	[- 30.89%,50.20%]	[- 37.77%,83.83%]	[- 34.87%,77.23%]	[- 39.22%,43.14%]
	Crane	[-	[-	[-	[-	[-	[0.00%,100.00%]

		44.44%,77.78%]	37.50%,87.50%]	36.11%,80.56%]	43.87%,84.91%]	35.34%,76.69%]	
	Other	[-	[-	[-	[-	[-	[-
		30.16%,41.27%]	31.61%,52.30%]	32.55%,62.53%]	40.47%,86.34%]	31.25%,50.60%]	42.11%,42.11%]
	Carrying	[-	[-	[-	[-	[-	[-
	machinery	47.04%,83.51%]	47.32%,83.38%]	36.73%,83.32%]	42.71%,85.39%]	42.62%,86.03%]	36.84%,42.11%]
	Motor	[-	[-	[-	[-	[-	[-
	tractor	28.71%,34.17%]	29.36%,37.81%]	29.81%,40.70%]	35.30%,78.55%]	29.23%,36.60%]	41.38%,41.38%]
Harbor	Crane	[-	[-	[-	[-	[-	[-
machinery		37.38%,84.61%]	38.77%,85.15%]	35.60%,80.07%]	44.04%,85.10%]	34.87%,77.01%]	39.13%,39.13%]
	Container	[-	[-	[-	[-	[-	[-
	machinery	29.08%,36.99%]	30.17%,43.30%]	30.85%,50.71%]	38.13%,84.37%]	29.86%,41.24%]	41.38%,37.93%]
	Other	[-	[-33.23%70.71%]	[-	[-	[-	[-
		31.01%,52.67%]		34.40%,75.85%]	43.43%,85.20%]	32.58%,64.63%]	36.36%,45.45%]
Other	/	[-	[-	[-	[-	[-	[-
machinery		38.99%,86.16%]	39.87%,87.84%]	33.15%,67.92%]	38.58%,85.54%]	38.54%,84.57%]	41.18%,41.18%]

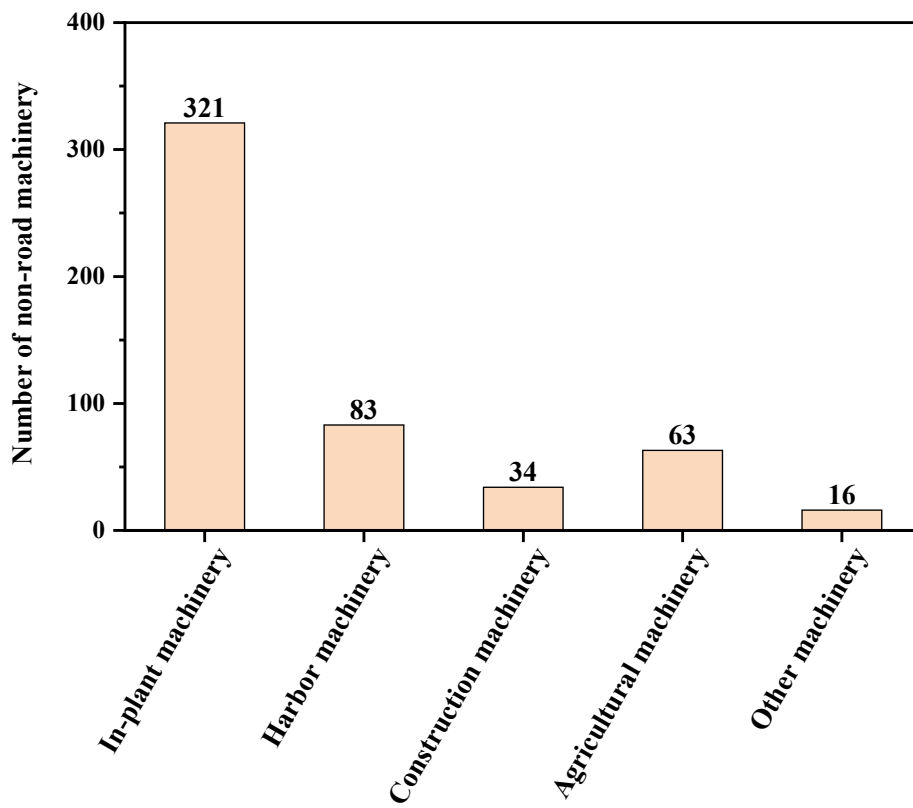


Fig.S1. The numbers of each type of non-road machinery sampled.

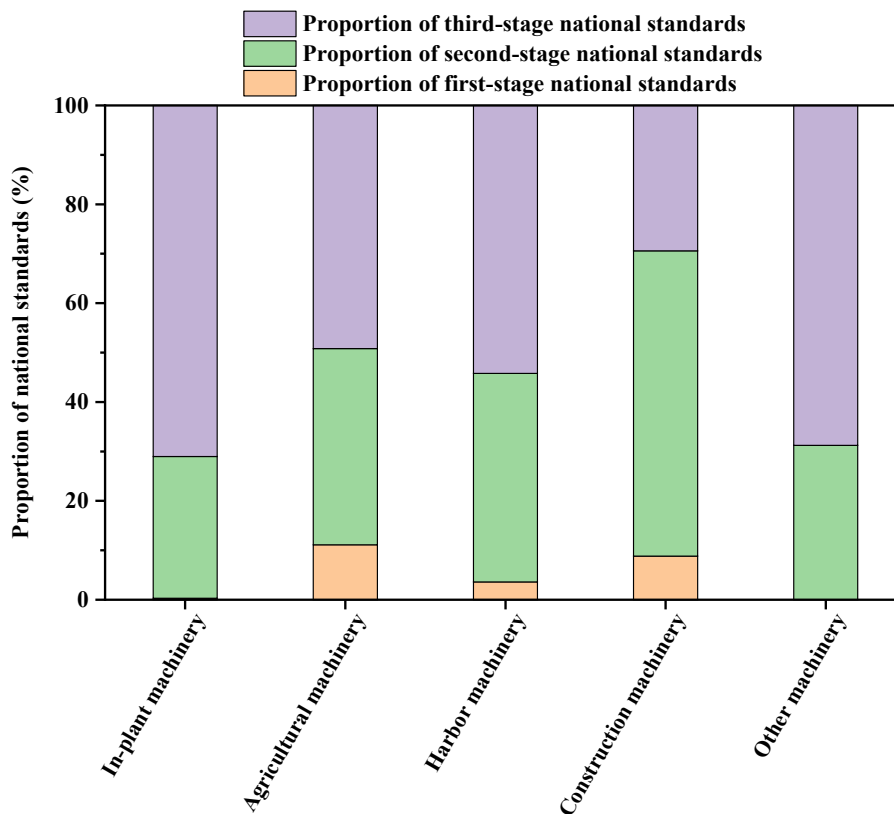


Fig.S2. The proportion of national standards of each type of non-road machinery sampled.

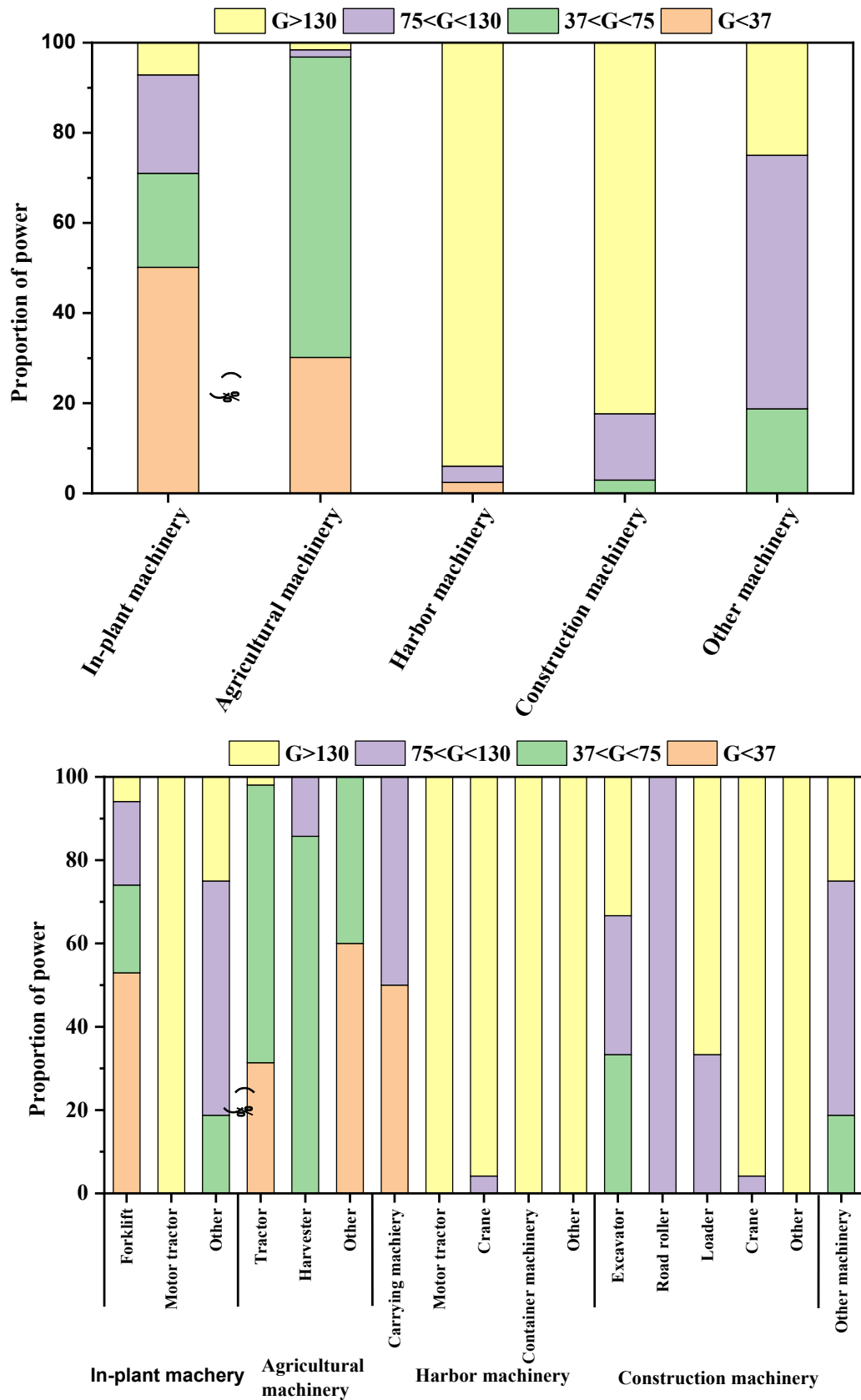
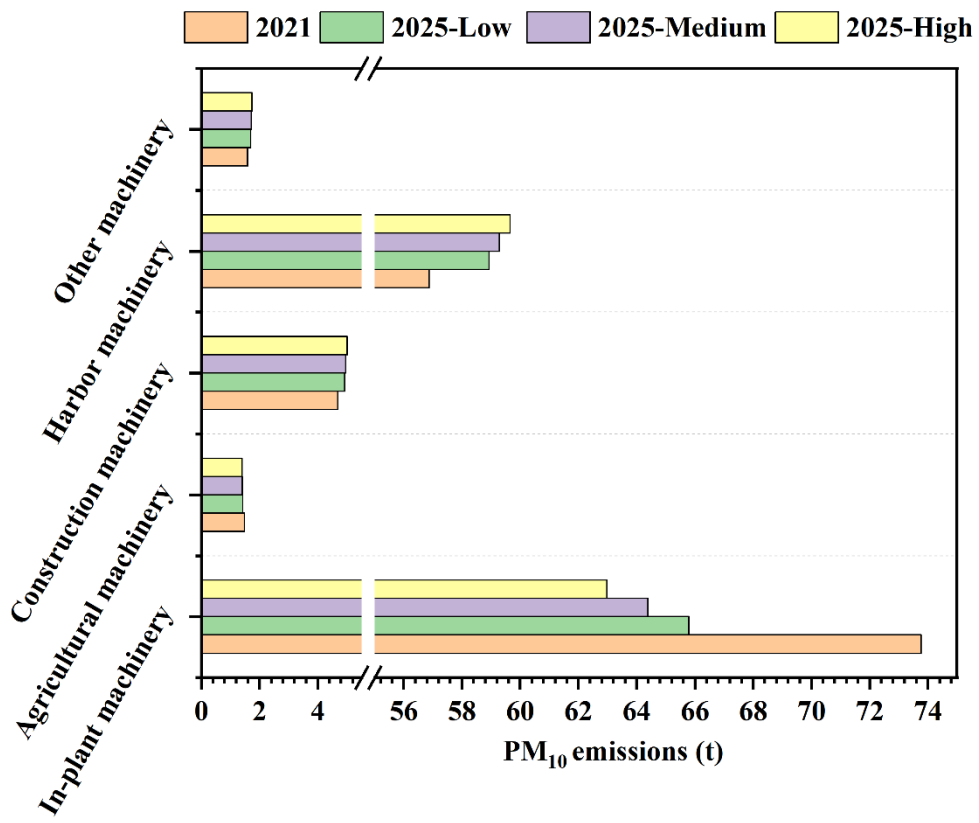
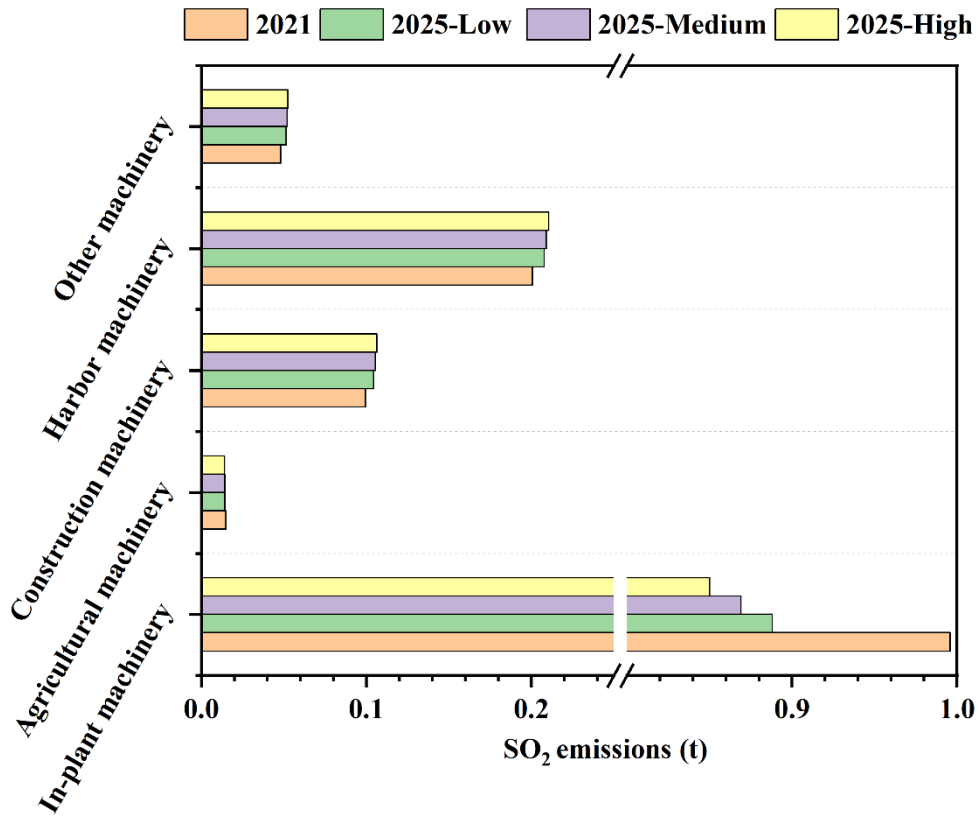
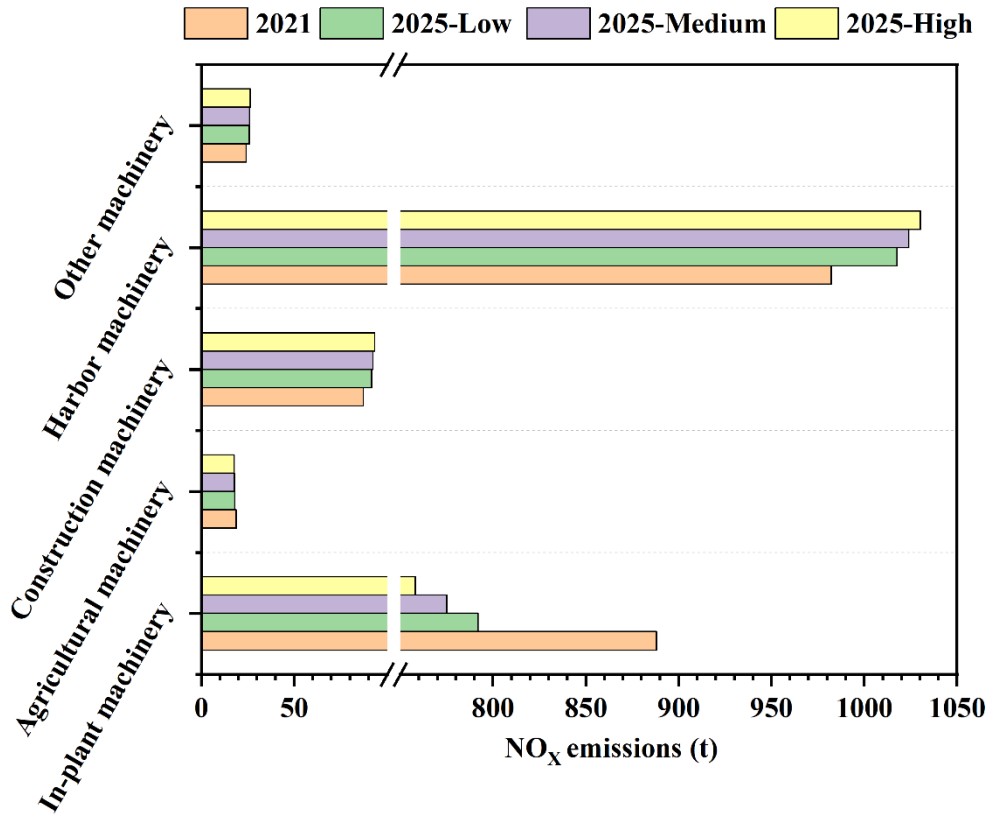
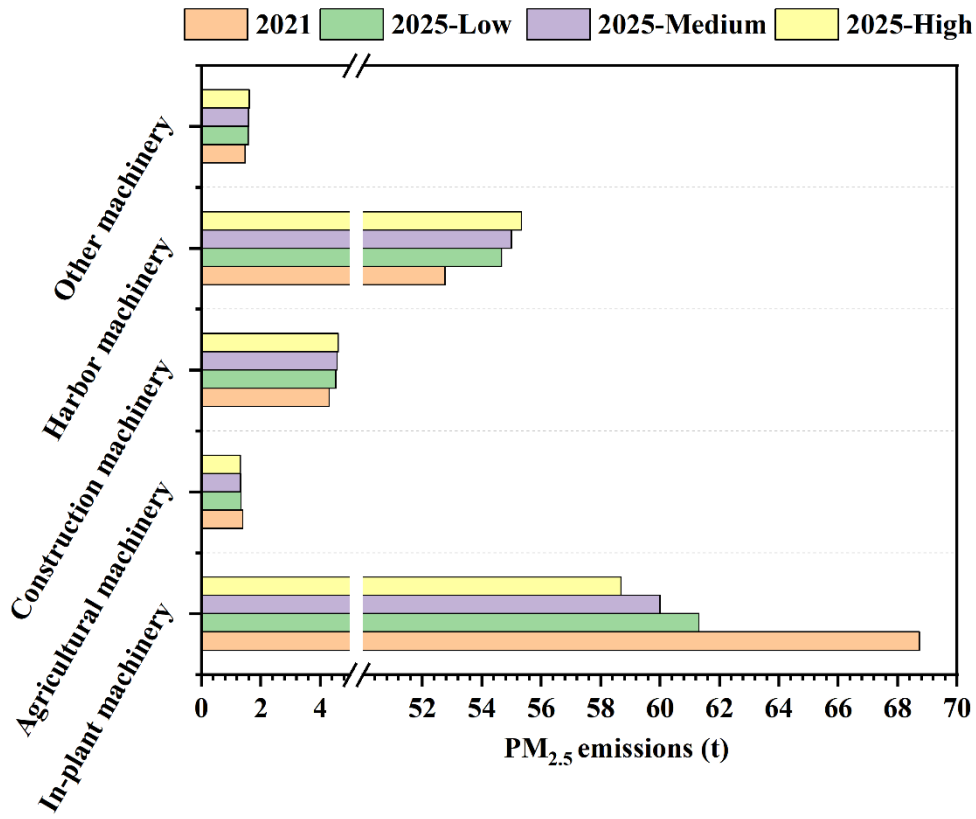


Fig.S3. The proportion of power of each type of non-road machinery sampled.





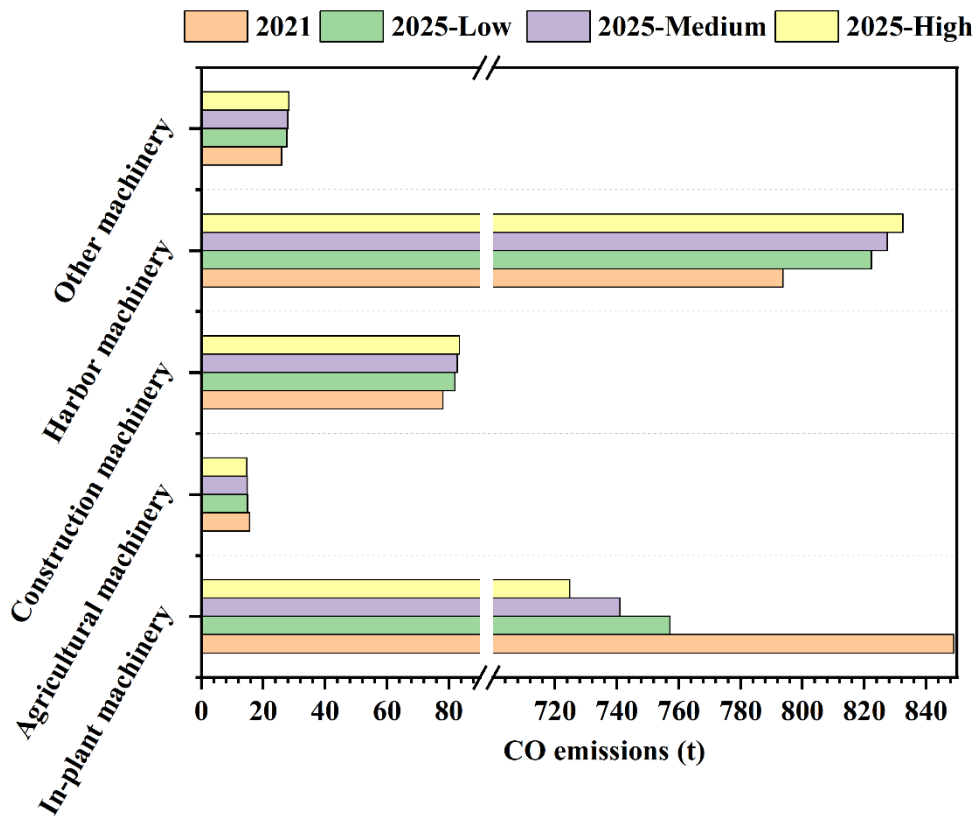
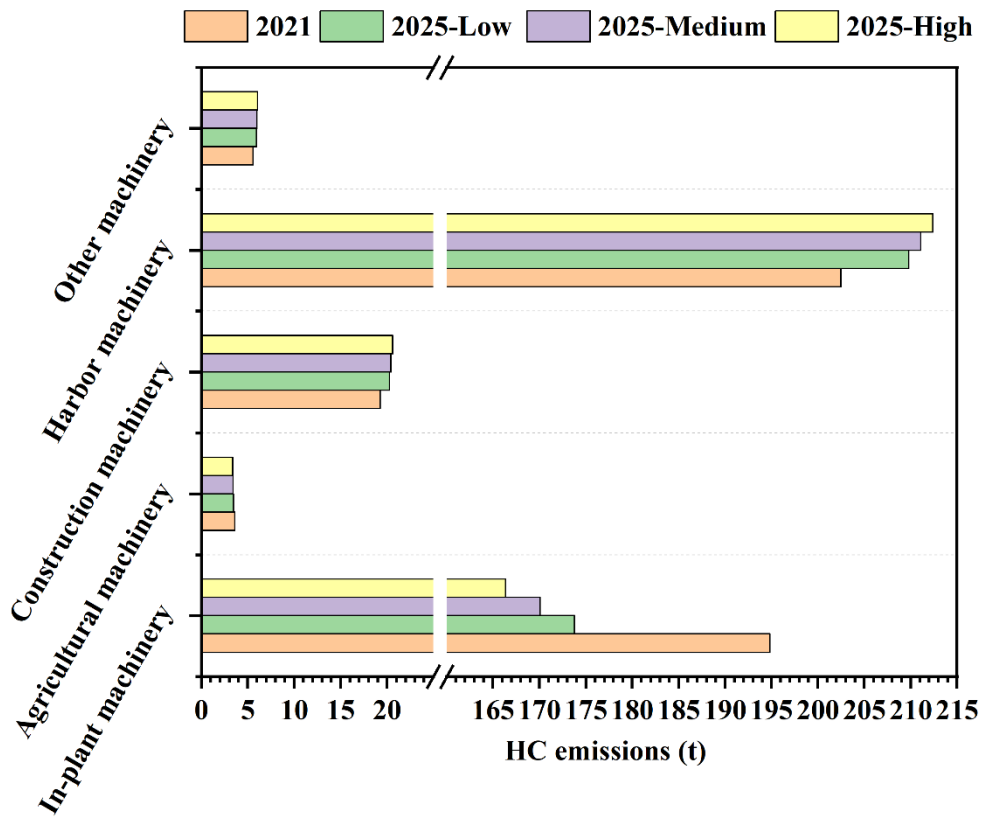


Figure S4 The air pollutant emission from non-road machinery in 2025 under different prediction scenarios.