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Nature-Based Solutions: an illusion or a key strategy to tackle climate change?

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Uptake in Nationally Determined Contributions



Seddon, Science, 2022

Voluntary carbon market as a tool to implement NbS

Figure 2. Voluntary Carbon Market Transaction Volumes, Prices, and Values by Category 2020 - 2021

		2020			2021	
	VOLUME (MtCO2e)	PRICE (USD)	VALUE (USD)	VOLUME (MtCO2e)	PRICE (USD)	VALUE (USD)
FORESTRY AND LAND USE	57.8M	\$5.40	\$315.4M	227.7M	\$5.80	\$1,327.5M
RENEWABLE ENERGY	93.8M	\$1.08	\$101.5M	211.4M	\$2.26	\$479.1M
CHEMICAL PROCESSES / INDUSTRIAL MANUFACTURING	1.8M	\$2.15	\$3.9M	17.3M	\$3.12	\$53.9M
WASTE DISPOSAL	8.5M	\$2.69	\$22.8M	11.4M	\$3.62	\$41.2M
ENERGY EFFICIENCY / FUEL SWTICHING	30.9M	\$0.98	\$30.4M	10.9M	\$1.99	\$21.9M
HOUSEHOLD / COMMUNITY DEVICES	8.3M	\$4.34	\$36.2M	8.0M	\$5.36	\$43.3M
TRANSPORTATION	1.1M	\$0.64	\$0.7M	5.4M	\$1.16	\$6.3M
AGRICULTURE	0.5M	\$10.38	\$4.7M	1.0M	\$8.81	\$8.7M

Source: ecosystemmarketplace.com

Example of controversy



Revealed: more than 90% of rainforest carbon offsets by biggest provider are worthless, Investigation into Verra carbon standard finds most are 'phantom credits' and may worsen global heating

www.theguardian.com

A buzzword to recycle "old solutions"?



Girardin et al., Nature, 2021

Nature-based Solutions are actions to protect, sustainably manage and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human wellbeing and biodiversity benefits (IUCN)

 Approaches to tackle synergistically biodiversity loss, climate change and SDGs Outline

1) NbS for mitigation

2) NbS for adaptation

3) Conclusions

Limited mitigation potential of forests "rewilding"

 By removing human intervention, existing global forests could increase their above-ground biomass by 15-16% over current levels, amounting to about 4 years of current anthropogenic CO₂ emissions



Additional carbon storage potential in forests

"Protecting" over "restoring"



> Emerging evidence that protecting ecosystems should be prioritized

"Protecting" over "restoring"



- > Emerging evidence that protecting ecosystems should be prioritized
- > Carbon markets are likely less effective at "protecting" than "restoring"

Risk of greenwashing

- Net-zero emission claims relying mainly on NbS are problematic because:
- NbS can contribute to decreasing current CO₂ emissions by 1/3 at most (optimistic! ~15% avoided and 15% negative emissions)

NbS mitigation potential

- NbS include emission reductions as well as negative emissions (CDR)
- Restoration only 20% of the mitigation potential although it gets more attention (e.g. tree planting)
- Almost 1/3 of current anthropogenic CO₂ emissions, but large uncertainties, risk when upscaling and climate change effect not considered



Girardin et al., Nature, 2021

Forestation scenario including biodiversity and food security safeguards



Forestation scenario including biodiversity and food security safeguards



Climate change (RCP4.5)





Forestation scenario including biodiversity and food security safeguards



Reforestation







Forestation scenario including biodiversity and food security safeguards





Meier et al., Nature Geo., 2021

Restoration with water bunds, Northern Kenya

- Small barriers to surface runoff
- Slow down surface water flow; encourage infiltration (groundwater recharge) and soil moisture
- 5173 half-bunds dug so far in Naibunga Conservancy in collaboration with JustDiggit NGO





Urban trees for heat wave adaptation: Risk analysis



- Population density

- Employee density

- Elderly/Youth

- unemployment
- House size per head
- Education level
- Income
- Capital
- Social welfare

Koopmans et al., in prep

- Landsat LST

Risk mapping with and without trees



Risk difference without trees

Koopmans et al., in prep

Conclusions

- NbS have the potential to foster synergies between climate and biodiversity objectives and between climate mitigation and adaptation
- Overfocus on NbS for mitigation combined with the booming of carbon markets and net zero claims represent a risk
- Accounting for adaptation benefits when implementing NbS locally has the potential to increase win-win effects