# Challenges to sustainable development during decarbonization: Lessons learned from research on the certification of carbon sequestration and decarbonization pathways

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Dr. Stephanie Arcusa is a climate scientist with a background in paleoclimatology (the study of Earth’s climate through time), who now focuses on decarbonization at various levels (company, municipal, state, and region). Her current research is on the development of standards for the certification of carbon removal.

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# Remarks on operationalizing sustainable development

- **Certification of carbon removal**
- **Decarbonization pathways**

# Carbon Sequestration Certification

# Standards, certification, verification – why?

**Safety**

- Enormous volumes of storage are anticipated
  - Affects everyone
- Today and in the future

**Performance**

- Only two actions possible: don't emit or emit and clean-up
- CDR is a promise to clean up emissions
- All removal activities must have the same result to hold that promise

**Trust**

- Odorless, colorless gas
- Successful CDR won't have a noticeable impact for years/decades (?)

**The role of certification is to provide direct (buyers) and indirect (public) assurance that a product, service or person meets certain claims – role of certification in carbon removal needs clarification**

# Potential consequences from failing to certify properly

**Waste of time and resource**

- Urgency of climate action
- Resources needed
- No time/resources for boondoggles

**Scams/Fraud**

- Undermine credibility
- Price tag

**Communities and environmental harm**

- Biodiversity loss
- Impacts on food/water
- Environmental destruction
- Human rights violations
- Carbon colonialism

**Fail to address climate change**

- If certification is inadequate, CDR will likely fail
- If CDR fails, limited options for 1.5°C commitments

**Some of these consequences are already evident - defining what a robust carbon removal certification program ought to contain would help**

# Critical challenges in carbon removal certification

## Unadressed and urgent

### Durable storage

Defining durable storage from a scientific basis; devising adequate business practice requirements

### Measurements

Devising protocols based on measurements; defining acceptable levels of measurement uncertainty

### Suitable reservoirs

Identifying what makes suitable reservoirs; what reservoirs need more research; what are the consequences of adding carbon to reservoirs

### Independent verification

Devising mechanisms to require independent verification

# Critical challenges for carbon removal in carbon markets

## Open questions

### Avoidance-reduction-removal

Determining if they should be treated equally in certification programs

### Additionality

Determining if this concept has a role to play in certification of removal

### Instrument choice

Clarifying the usage of certification

### Are carbon markets the right paths?

# Critical challenges: durable storage

**Durable storage left undefined by IPCC**

All sorts of interpretations of “durable” used by standards (10 years to 100 years)

**Why durable storage matters must be articulated better**

To uphold the principles of the polluter pays and intergenerational equity,

If carbon is released from storage, and it is not put back, the polluter gets off the hook and the future generations pay for it.

**Business practice must change to reflect this reality**

Currently no adequate treatment in certification programs

The failure to internalize the potential that storage will not be durable is an externality that neither the storage operator, nor the certification programs want to fix – **needs regulation**

Sources: Arcusa and Lackner (2022)

# Critical challenges: measurements

**Carbon removal must be measurable and must be independently verifiable**

- Currently standards either don't require measurements or use counterfactuals
  - Both options are unverifiable
  - Certification cannot happen before the activity has taken place e.g., students don't receive diplomas before passing final exams

**Measurement standards must reflect this reality**

- Almost anything physical is measurable – carbon removal and storage is a physical phenomenon

- Identify gaps in knowledge: what exactly don't we know how to measure adequately

**If we don't know how to measure, or measuring is costly:**

- Target research priorities to fill gaps

- Target tech development to lower cost

**In all removal activities, apply the precautionary principle**

# Decarbonization pathways

# Tremendous amount of planning of decarbonizaton underway at various levels

# Lessons to accelerate decarbonization

**Visions of a sustainable future are narrow, plans are misaligned or at odds, public understanding of what's coming is inadequate**

Deep stakeholder involvement, deep coordination across leadership/sectors/levels

**Planning an orderly, equitable transition is critical**

Defining start/end and mechanisms to ensure responsibility starting today to eliminate possibility of anticipatory emissions

Transdisciplinary research (interdisciplinary + stakeholders/practitioners)

Workforce education, including training the educators

Sources: I-WEST initiative

# Lessons to accelerate decarbonization

**Universal access to abundant, cheap, reliable clean energy is key to sustainable development**

Targeting reductions in energy use in developing countries will hinder sustainable development

Targeting behavior change will only work to some extent e.g., 1st year of pandemic when individual activities reduced dramatically in developed nations only reduced emissions by 9%

Target should be on actions that support the massive deployment of renewable energy worldwide by identifying and removing barriers

**Message ought to shift from "reduce" emissions to "don't produce or pay to dispose"**

Message of reducing emissions implies that some amount of emissions is fine

Message is at odds with understanding of root cause of climate change – stock, not flow

Viewing climate change as a waste management problem can help

Sources: Elk Coast Institute (2021); Lackner and Jospe (2017); Steckler et al. (2013)

# Lessons to accelerate decarbonization

**Regulate carbon, not emissions, and do so at the source of carbon extraction**

Match carbon extraction with carbon removal – e.g., Carbon Take Back Obligation

Unfair burden to place downstream (individuals, businesses, organizations) who do not have the capacity to make the changes to become carbon neutral/negative

Source is the last place carbon accounting is accurate

- Everything downstream becomes carbon neutral
- Eliminates need for Life Cycle Assessments in carbon accounting
- Eliminates uncertainty in attribution of emissions

Not a punishment, simply a responsibility e.g., tire manufacturers charge for downstream end of life product management upfront

Much simpler to regulate a few than many

Sources: Lackner and Wilson (2008); Lackner et al., (2000); Allen et al., (2008)

# Summary

**Standards, certification, and verification of carbon removal**

- To certify is to provide guarantee an activity/product/service is as expected, the goal of certification of carbon removal ought to be clarified.
- Consequences of poor standards and certification programs will undermine CDR as a decarbonization solution.
- Critical challenges for certification and carbon markets must be urgently answered to support the deployment and scaling of CDR

**Decarbonization pathways**

- Identify ways to regulate carbon, not emissions, at the source to accelerate transition.
- Identify ways to shift and amplify messaging from “reducing” to “don’t produce or pay to dispose”
- Planning an orderly transition is critical

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