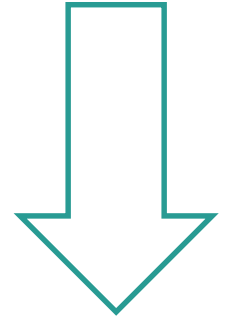


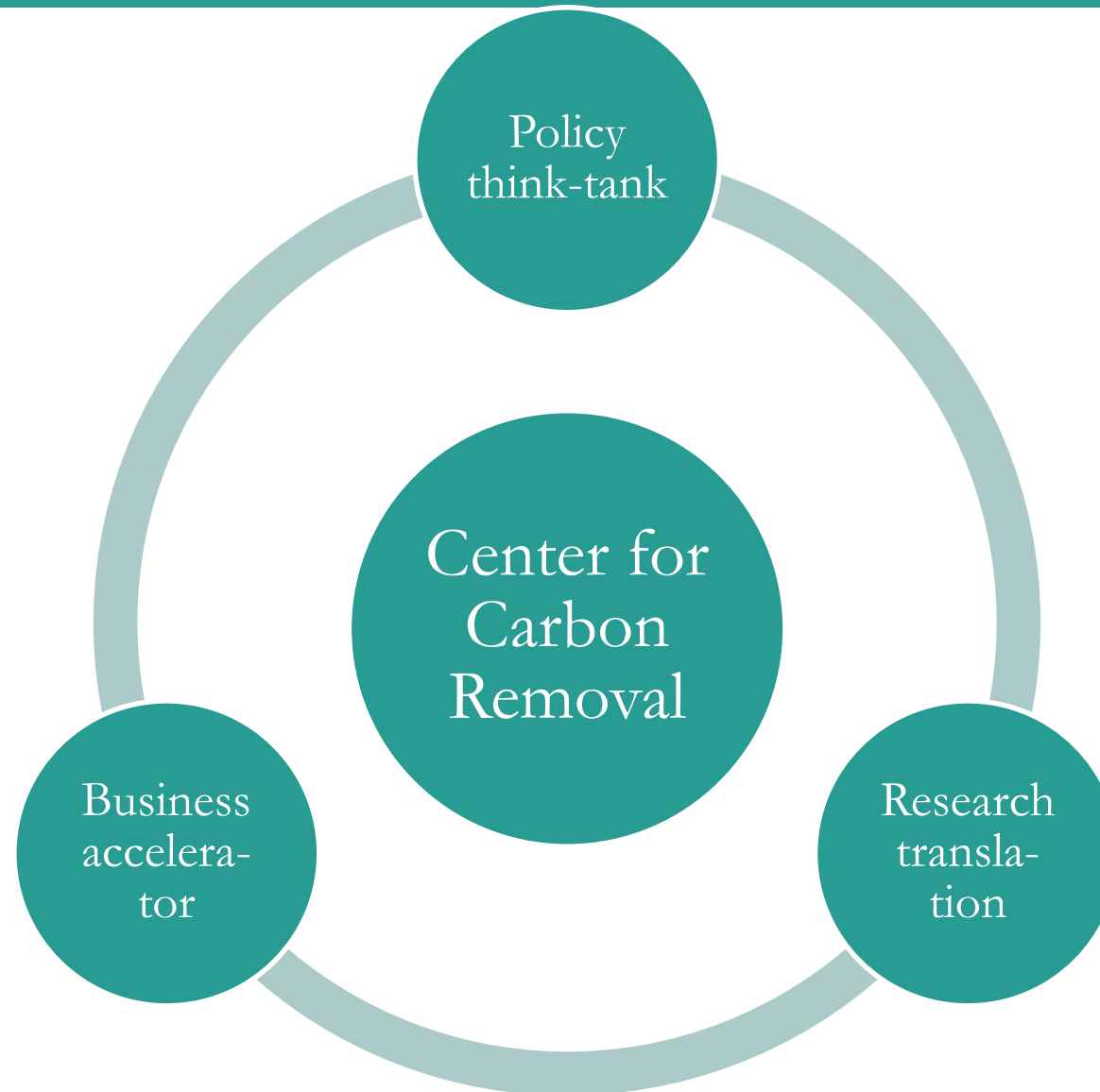
# R&D Agenda for the New Carbon Economy



July, 2018  
Center for Carbon Removal

[www.centerforcarbonremoval.org](http://www.centerforcarbonremoval.org)  
[@CarbonRemoval](https://twitter.com/CarbonRemoval)

# Center for Carbon Removal: NGO on a mission to champion carbon removal solutions through science and innovation



# New Carbon Economy: vision

1. **Today:** advance systems to turn carbon waste → value
2. **Future:** an **economy that sequesters more carbon than it emits**



# New Carbon Economy Consortium

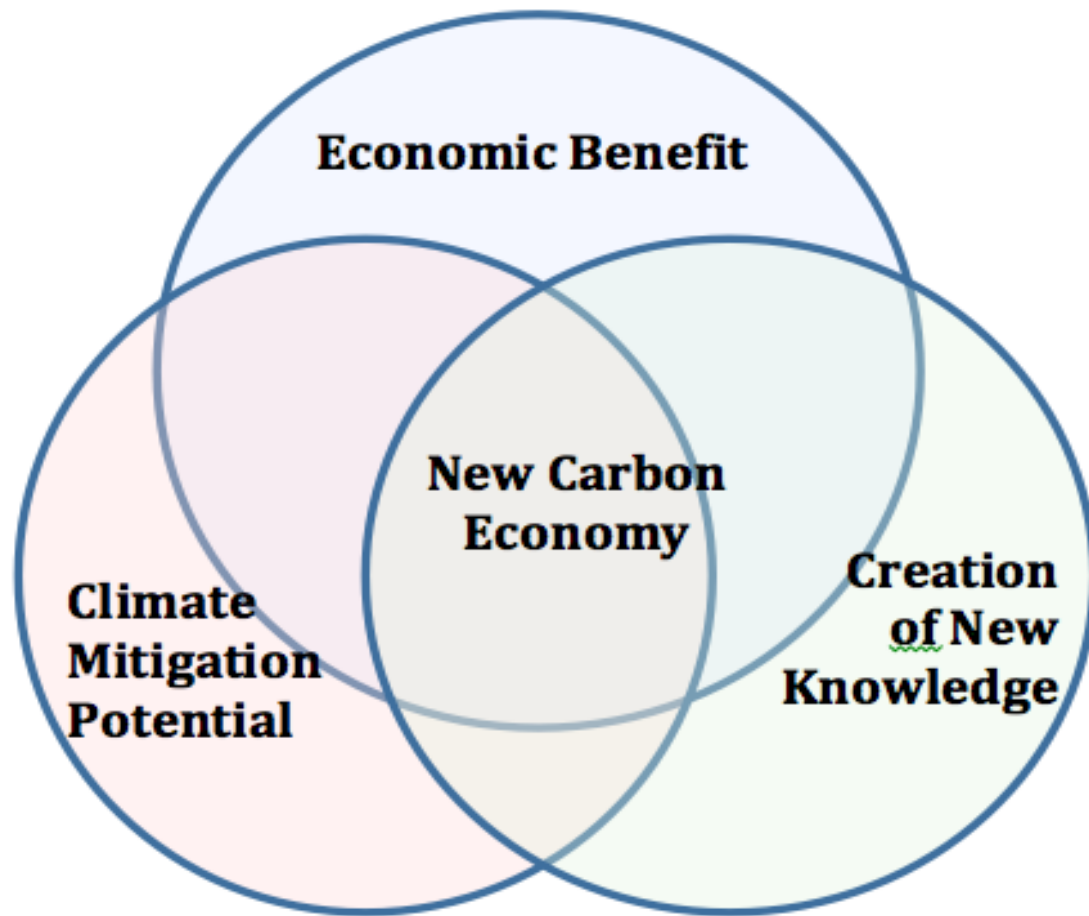
Roadmap for a New Carbon Economy:  
expected publication in Sept. 2018.



## Roadmap Partners



# New Carbon Economy Roadmap: scope



## Solutions:

- Engineered
- Biological
- Hybrid systems

## Domains:

- Science
- Engineering
- Economics
- Social sciences

# Draft Recommendation #1: ANALYSIS

**A**ssess the  
**N**atural/engineered/hybrid  
**A**pproaches  
**L**andscape  
**Y**eti!  
**S**coping  
**I**nformation  
**S**ystems

# Draft Recommendation #1: Analysis

**Budget cross-cut:** what is the Federal Government funding level today related to New Carbon Economy (directly and tangentially)?

## **Mapping:** where are our opportunities?

1. Soil carbon sequestration opportunity sweet spots
2. Direct air capture, carbon use, and mineralization mapping
3. Forest expansion on marginal/degraded land



# Draft Recommendation #1: Analysis

## Answering questions to **inform additional policy**

1. Optimizing biomass resources for carbon management (energy, materials, and nature v. only energy alone)
2. Designing carbon manufacturing around variable and abundant clean energy
3. Land carbon: business model for doing more (yield, carbon sequestration, environmental services) with less (land, water, fertilizer, etc.)

# Draft Recommendation #2: STANDARDS

**S**ystem

**T**echno-economic

**A**ssessment

**N**ormalization

**D**emands

**A**ccounting

**R**eform and

**D**ocumentation

## Lifecycle Assessment:

1. **Carbon use:** fuels, building materials, etc.
2. **Full chain biomass conversion:** land use change + soil carbon storage + process carbon capture and storage + displacement of fossil-intensive alternatives

**G**lobally  
**R**elevant  
**A**dvancements,  
**N**othing  
**D**iminutive

**C H A L L E N G E S**

Direct air capture at  $< \$100/\text{ton CO}_2$  captured and compressed.

- Material science and engineering innovation
- System design and engineering support
- Pilot and demonstration cost-share

Carbon sequestering built environment at cost parity

1. Cement/aggregate
2. Engineered wood products
3. Frontier technologies (e.g. carbon fibers, etc.)

Measuring biological carbon storage everywhere, with accuracy and precision, at low cost.

- Technology for remote sensing + connected sensors + soil models
- National network of field-scale test beds
- Social science about decision support tools + technology adoption

Soil amendment systems to boost yield, carbon storage, and ecosystems at cost parity with existing fertilizer treatments.

- Algae
- Biochar
- Compost
- Microbes



## Biological engineering

- Perennialization
- Breeding for deeper roots
- C3 to C4
- Building better microbes

**T**echnology

**2**

**M**arket

# Draft Recommendation #4: Commercialization assistance

1. SBIRs
2. ARPA-“Carbon”
3. Partnership and support for technology acceleration from lab-to-market (e.g. Cyclotron Road, grants for accelerators like DOD-backed Energy Excelerator, Carbon Recycling Labs)

# Conclusion

1. Need “moonshot” scale ambition and funding
2. Need inter- and intra-agency collaboration around carbon management as the goal
3. Learn from past success and failure:
  - Avoid technology lock in by setting ambitious technology-agnostic performance goals
  - Provide full suite of support to bring innovations to market

Thank you!

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