Cool Earth Case

- Claim: Cool Earth can reduce greenhouse gas emissions for around 79c/tonne of CO2
  - Recently, Cool Earth has been able to reduce atmospheric CO2 for around 79c/tonne, and future projects should be fairly similar to recent projects
    - Cool Earth has recently reduced atmospheric CO2 for less than around 52c/tonne
      - It has recently cost Cool Earth less than $206 to prevent an acre of rainforest from being cleared
        - It has historically cost Cool Earth less than $103 to prevent an acre of rainforest from being cleared locally
          - It typically costs less than $154 for Cool Earth to directly protect an acre of forest.
            - It costs Cool Earth less than $154 to protect an acre of forest on average
              - (@cost-of-an-acre) It costs Cool Earth around $100-155 to protect an acre of forest in recent and current projects
                - It costs around $100 to protect an acre of forest in the Ashaninka project
                  - Cool Earth says that in the Ashaninka Project in Peru it costs around $100 to protect an acre of forest.
                    Cool Earth
                  - It costs $92.16 on the Cool Earth website to protect an acre in the Ashaninka project
                    http://www.coolearth.org/store/uk/save-an-acre/ashaninka.html
                - It costs around $155 to protect an acre in the Awacachi project
                  - It costs $153.60 on the Cool Earth website to protect an acre in the Awacachi project, however this project is now fully funded
                    http://www.coolearth.org/store/uk/save-an-acre/awacachi.html
                  - This is probably not the precise cost

- Cool Earth plans to charge less than $122.02 to protect an acre of forest in upcoming projects
  - Cool Earth will initially charge £80 ($122.02) to save an acre in the Lubutu project
    Cool Earth
  - Cool Earth will initially charge £70 ($106.76) to save an acre in the Awajún project
    Cool Earth
- Total protected area and spending suggests a cost so far of roughly £10/acre = $15/acre, which is consistent with $100 - 150/acre in total, given long term running costs.
  - Cool Earth has protected around 352,091 acres of forest so far.
    Cool Earth website
    - Cool Earth has a good knowledge of how much forest is protected in its projects.
      Cool Earth
  - Cool Earth has spent at least £3m, and probably not more than £4m since its founding
    - Cool Earth was founded in 2007
    - Cool Earth spent £2,630,145 between the financial year ending 2008 and that ending 31 January 2012
      - According to the UK Charity Commission, Cool Earth reported the following spending:
        - 31 Jan 2012 £825,919*
        - 31 Jan 2011 £535,931
        - 31 Jan 2010 £619,238
        - 31 Jan 2009 £354,901
        - 31 Jan 2008 £294,156
        - Total £2,630,145
    - Cool Earth had spent just over £3m since its launch sometime in 2012
      Cool Earth Annual Report 2012

- Cool Earth's activities do not produce net damages to others that should be accounted for as an added cost.
  - Cool Earth's activities benefit local forest dwelling community members who would otherwise have received payment for the forests being cleared.
    - Research suggests selling forests to loggers produces a short term improvement in standard of living among communities living in the forest (measured by indicators such as health and literacy), followed by a deterioration to below starting levels in the longer term.
      Cool Earth
      - Counterargument: though communities may do worse, many people migrate to cities, which may lead to a better quality of life for them, not necessarily accounted for in this analysis.
    - Cool Earth provides much valuable infrastructure and many valuable services to local communities, which should be expected to benefit them.
      Cool Earth Annual Report 2012
    - The choice of communities to partner with Cool Earth indicates strongly that Cool Earth's activities benefit them.
      - Cool Earth projects are all started by communities contacting them requesting such help. This demonstrates many community members believe Cool Earth's activities will be a net benefit for them, which is strong evidence that it is, absent reason to expect them to be ignorant.
        Cool Earth Annual Report 2012
      - Members of communities partnering with Cool Earth should not be expected to be ignorant of the outcomes of partnering with Cool Earth or not, as they tend to be

in contact with other communities who have already taken both options.
- New communities tend to be recruited by communities who have been involved for longer.
Cool Earth Annual Report 2012

- Communities near but not part of Cool Earth's projects often become involved in the cocaine trade after their forest is felled, which has net costs.
Cool Earth

- Cool Earth's activities do not produce net losses in resources extracted from the area
  - The communities Cool Earth partners ultimately do better economically by keeping the forest standing than they would have by removing it. This suggests they are paid more for their new products than they would have been for the wood and land resulting. This suggests the new products are of higher economic value, though it is not obvious because the consumer surplus is not measured.
  - The value of the land produced by clearing forest is negligible
    - Within five years such land tends to lose most of its fertility and become scrubland.
Cool Earth

- The total rainforest protected as a result of Cool Earth's activities is probably at least five times as large as that protected directly by Cool Earth, due to the project areas 'shielding' harder to reach areas.
  - The total rainforest protected as a result of the Ashaninka project is ten times larger than that directly protected
    - In 2011 ONFI (the International Arm of the French Forestry Commission) surveyed Cool Earth's Ashaninka project and the surrounding forest. Among other things, they concluded that the project created a protective shield that secured some of the surrounding forest. This

forest is around ten times as large as that in the project.
Cool Earth

- Other projects are in expectation around half as successful at blocking access to surrounding forest as Ashaninka
  - Projects other than Ashaninka are also designed to block access to neighboring forest, and have appeared to do so.
  - If we suppose the Ashaninka project is particularly good at shielding surrounding forest, given its apparently high success (and use as an exemplar), it seems reasonable to guess the others are still half as successful
  - More detailed information is consistent with around half as large a factor of surrounding forest being protected on average as in the Ashaninka project.
    - The rainforest anticipated to be protected, or shielded, as a result of the new Awajún and Lubutu projects is 7.5 times as large as the projects alone
      - The new projects aim to protect 703,311acres of forest
        - The Lubutu project aims to protect 647,391 acres of forest
        - The Awajún project aims to protect 55,920 acres of forest
      - The new projects are anticipated to at least partially shield 4.6 million acres of forest
        - The Lubutu project is anticipated to restrict logging in over 600,000 acres of nearby forest
        - The Awajún project is anticipated to shield over 4 million acres of forest
      - (4,600,000 + 703,311)/703,311 = 7.54...
    - The new projects are unlikely to prevent logging in the surrounding forest to the

extent it is prevented in the Ashaninka project
- One of the areas protected by the Lubutu project is a national park, which may be less likely to be deforested than private land, or land without clearly defined title.
- The Awajún project is expected to restrict logging access, but it is unclear how strongly.

- Conservation in the Ashaninka project will be a small fraction of upcoming conservation work
  - The Ashaninka project aims to protect 137,031 acres of forest, and some substantial fraction is already protected
  - The new projects aim to protect 703,311acres of forest
    - The Lubutu project aims to protect 647,391 acres of forest
    - The Awajún project aims to protect 55,920 acres of forest

- Rainforest which is protected is cleared at least 30% less
  - The protected forests have seen zero deforestation
    - Measurements suggest zero deforestation in protected areas.
      - In 2011 ONFI (the International Arm of the French Forestry Commission) surveyed Cool Earth's Ashaninka project and the surrounding forest. Among other things, they concluded that Cool Earth ensures no illegal logging is taking place within the project.
        Cool Earth
      - In the 2005-2011 satellite imagery provided by Cool Earth, the Camantavishi region appears to have a tiny amount of forest lost since 2005, and net reforestation is evident in the Cutivireni region (these are both protected by Cool Earth, in the Ashaninka project).
    - Measurements are relatively reliable
      Cool Earth measures forest clearance

- inside and outside of their projects using a combination of on the ground surveys and satellite imagery
  Cool Earth

- The protected forests would have been at least 30% cleared otherwise
  - Comparison with nearby forests suggests around 30% of protected forests would have been cleared by now
    - In 2011 ONFI (the International Arm of the French Forestry Commission) reported on a survey of Cool Earth's Ashaninka project and the surrounding forest. Among other things, they concluded that the surrounding areas suffered 30-40% forest losses.
      Cool Earth
    - Cool Earth's own measurements in 2012 suggested similar clearance rates to ONFI's measurements in 2009/2010
      - Cool Earth measures forest clearance inside and outside of their projects using a combination of on the ground surveys and satellite imagery
        Cool Earth
  - The protected forests were 'slated to be cut'.
    - Cool Earth has a good understanding of when forests are likely to be cut, and they predict those they protect are likely to be cut within a year and a half
  - The protected forests were not likely to regrow again soon if they were cut
    - Forests take a long time to regrow
    - Cleared forests tend to quickly become infertile scrubland.
      Cool Earth
  - No one else is doing comparable preservation work which would have spared those forests if Cool Earth had not been involved, and who will not move to other similar forests given that Cool Earth is involved.
    Given that the surrounding forests have

- not been preserved, it seems unlikely others are doing anything similar to what Cool Earth does, in the same areas.
- Counterargument: Cool Earth's projects are initiated by communities living in rainforests, which suggests without Cool Earth's help they may have been more likely to protect their forests than the surrounding communities.
  - Cool Earth's projects are initiated by communities living in rainforests
    Cool Earth Annual Report 2012
  - Counterargument: the activities carried out by Cool Earth to protect the forests are far too expensive for impoverished native communities.
    - Cool Earth spends substantial money on legal proceedings.
      Cool Earth
- Counterargument: The Peruvian government is beginning a conservation initiative explicitly modeled on Cool Earth, suggesting such activities will be done by others at least soon. And the Peruvian government is one group unlikely to move its consevration activities outside of Peru.
  - Counterargument: if it is modeled on Cool Earth, it seems more likely that without Cool Earth's activities, this project would not have happened, or would have been substantially different. Thus Cool Earth's activities so far have been more effective than they seem, not less.

- $154/(1 acre x 5 x 0.3) = $103/acre

- When Cool Earth prevents an acre of rainforest from being cleared locally, indirect effects result in less than half of that amount of forest being cleared elsewhere
  - 'Leakage' via market mechanisms produces less than half as much extra logging elsewhere
    - 'Activity shifts leakage' (those who would log moving

to other forests) is likely to be low
- The logging itself tends not to be done by career loggers, so when the community moves to income from other sources, those who would log tend to also do something else
  Cool Earth

- 'Market effects leakage' (in particular, increased logging elsewhere due to wood prices rising) is likely to cancel less than half of the gains
  - wood price rising
    - Supply and demand elasticities of wood suggest that removing some wood from the market should result in less than half of that much wood being harvested elsewhere.
      - Data on supply and demand elasticities from one FAO study and three other studies they report on suggests extra logging caused should be less than half that prevented
        http://www.fao.org/docrep/w4388e/w4388e0y.htm
        - If we match similar supply and demand elasticities (for different times, places, types of wood, and target markets) in this dataset, the average extra logging caused should be around 47% of that prevented, and for 8/14 pairs, this figure is less than half.
      - A review of studies regarding 'leakage' from developing world conservation projects suggests leakage is mostly thought to be less than half of the quantity conserved (4/15 estimates predict more than half)
        Jonsson et al (2012), Leakage Implications for European Timber Markets from Reducing Deforestation in Developing Countries, Forests
    - wood price is the appropriate issue

(rather than say land price), as it is the wood that is sold generally, not the land.
Cool Earth

- Export hardwood and domestic hardwood are the main relevant categories.
  - The high quality hardwood, such as mahogany, capirona and walnut, are largely shipped overseas (mainly to China and South Korea) for furniture. The lower value hardwoods are used in country, such as for packaging, cheap composite building materials (ply etc.) and even matches
    Cool Earth

- different types of forest contain different levels of carbon, and rainforest is particularly carbon-dense, so the effective forest logged as a result is likely to be less if anything.
  - Counterargument: high carbon-density forests may also produce more wood however, canceling this effect.

- Preventing an acre of rainforest from being cleared in the areas where Cool Earth operates abates at least the equivalent of 260 tonnes of CO2 in expectation
  - Carbon dioxide stored above the ground in an acre of forest typically equates to around 260 tonnes of CO2.
    - In the Ashaninka Project in Peru, carbon stored in an acre of forest equates to around 260 tonnes of CO2.
      - Cool Earth estimates this from their measurements (based on periodic transect sampling) and other research on the areas in which they work.
        Cool Earth
      - Cool Earth has a good knowledge of stored carbon in the forest it deals with.
        Cool Earth
    - The Ashaninka Project is typical in terms of forest carbon
      - The Awacachi project is also estimated to protect 260 tonnes of CO2 per acre
        Cool Earth website
      - The upcoming African project(s) are in forest which

is more carbon-dense
Cool Earth

- Carbon dioxide from above ground carbon is an underestimate for total greenhouse gasses held in the forest
  - Forest also protects soil carbon
  - Deforestation also produces greenhouse gases other than CO2
- The alternative use of the land don't sequester significant carbon
  - "Once land has been cleared, it either lies unused, turns into plantations, e.g. coca or citrus, or used for small scale cattle ranching. However, within five years the soil will have lost most of its fertility and will turn into scrubland. "
    Cool Earth
- Wood extracted from the forest doesn't sequester significant carbon
  - This appears to be assumed by most discussion of the topic
  - Counterargument: this seems unlikely
- Saving rainforest doesn't alter atmospheric carbon dioxide significantly aside from causing that contained in the trees and ground to remain so.
  - Reducing CO2 emissions doesn't substantially alter the amount of CO2 sequestered by plants via atmospheric levels changing
- The possibility of forests being eventually felled does not substantially reduce the expected abatement
  - Most climate change interventions are impermanent (arguably such things should be measured in tonne-years not tonnes), and conserving forest doesn't seem like a particularly short-lived one.
  - Many decades of greenhouse gas abatement in the short term appears to buy much of the benefit of permanent greenhouse abatement
    - Humanity should be much better prepared for climate change in many decades than in the short term, due to technological improvement and greater wealth
    - In worlds where climate change is particularly bad, people are much more likely to continue to take the option of preserving the forests when they later have

the opportunity to log them.
- The worst climate outcomes involve feedback loops, which cause near future emissions to trigger larger far future emissions.

- The next few decades may see policies changing to better protect rainforests, such that protecting a forest now will buy a long period of protection.
  - Cool Earth predicts this
    Cool Earth
    - Peru's Ministry of Environment recently launched its own National Forest Programme which they have publicly based on Cool Earth's model, suggesting growing interest in government protection of forests.

- $206/260tonnes = $0.79/tonne

- Future activities will be similarly effective to recent activities
  - Future work in the Ashaninka project should be similarly effective
    - The Ashaninka project has substantial room for more funding
      - The unsponsored forest in the Ashaninka project will cost £1.22 million for the next three years
        Cool Earth
    - Further work in the Ashaninka project is likely to be quite similar to past work
  - New projects should be roughly similarly effective to recent projects
    - New projects are planned to be similar in cost per acre to recent projects
      - Cool Earth plans to charge $107-122 to protect an acre of forest in upcoming projects
        - Cool Earth will initially charge £80 ($122.02) to save an acre in the Lubutu project
          Cool Earth
        - Cool Earth will initially charge £70 ($106.76) to save an acre in the Awajún project
          Cool Earth
      - Recent and existing projects have cost $100-155 to protect an acre
        - @cost-of-an-acre
    - New projects are likely to have similar indirect effects to recent projects
    - New projects are somewhat different to old, which weakens

inductive evidence for their promise
- One new project is in Africa, whereas past projects have been in South America

- New projects are not anticipated to be as cost-effective as the Ashaninka Project initially, as they will be in their infancy.
  Cool Earth
- Cool Earth's previous work has been selected as surprisingly effective, which suggests regression to the mean will make future projects less successful
- Cool Earth's skills develop over time, suggesting future projects should be more successful than recent ones

- Cool Earth will continue to have room for more funding in the next years
  - There are communities who would like to avoid deforestation with Cool Earth, but for whom there is not yet funding do a full project.
    Cool Earth
  - Both new projects can scale up according to funding
    Cool Earth

- Several lines of weak evidence suggest Cool Earth's approach should be relatively cost-effective, which confirms a low price such as 79c/tonne
  - Forest-based interventions are often thought to be cost-effective
  - Much research suggests that community-led conservation is a more effective approach to conservation than more top-down approaches.
    Cool Earth.
    - Cool Earth can provide examples of this literature
      Abstracts available at the following link:
      https://docs.google.com/file/d/1l5yENglpt7C50rjSyig_vnM9MhiFs_B_LT4xdvpcwCH_UuV1M4_Npckv_Zg3/edit?usp=sharing
      - Community managed forests and forest protected areas: An assessment of their conservation effectiveness across the tropics by Luciana Porter-Bolland, Edward A. Ellis, Manuel R. Guariguata, Isabel Ruiz-Mallén, Simoneta Negrete-Yankelevich , Victoria Reyes-García
      - Effectiveness of Strict vs. Multiple Use Protected Areas in Reducing Tropical Forest Fires: A Global Analysis Using Matching Methods by Andrew Nelson, Kenneth M. Chomitz in Americ (PLoS Public Library of Science)
      - Parks and Peoples: The Social Impact of Protected AreasAuthor(s): Paige West, James Igoe, DanBrockingtonReviewed work(s):Source: Annual Review of Anthropology, Vol. 35 (2006), pp. 251-277Published by: Annual Reviews

    - Innovations for conservation and development KATRINAB ROWN School of Development Studies, University of East Anglia, Norwich NR4 7T] E-mail: k.brown@uea.ac.uk This paper was accepted for publication in November 2000 The Geographical Journal, Vol. 168, No. 1, March2 002, pp. 6-17
    - Leader-Williams N, Harrison J (1990) Designing protected areas to conserve natural resources. Science Progress 74: 189–204.

- That the model involves correcting a market failure rather than paying directly for people to do something not in their interests suggests larger than usual leverage should be possible.