Three Prongs for Prudent Climate Policy

Joseph E. Aldy and Richard J. Zeckhauser
Harvard Kennedy School
Resources for the Future Webinar
June 4, 2020
“Unless drastic measures to reduce greenhouse gases are taken within the next 10 years, the world will reach a point of no return.”

“Time is running out, so we must capitalize and build upon solutions available today.”

2006

2018
Three Prongs for Prudent Climate Policy
Next 10 Years Are the Last Chance

Jim Hansen

“We have at most 10 years—not 10 years to decide upon action, but 10 years to alter fundamentally the trajectory of global greenhouse emissions.”

“Earth is not lost today, but time for action is short.”

2006

2019
Three Prongs for Prudent Climate Policy

Next 10 Years Are the Last Chance

European Leaders

“But the agreement… represents the last chance to bring climate change under control before it is too late.”

“That is our goal, to ensure that one-fourth of the budget goes toward climate change mitigation, and this is going to be a paradigm shift.”

2008
Stavros Dimas, DG Environment

2019
Jean-Claude Juncker, EC President
Basic Argument

- Emission mitigation has served as principal instrument of climate policy since 1990
- The last clear chance has already been passed
- Three unhappy facts
  - $\text{CO}_2$ emissions have climbed rapidly for 60+ years
  - $\text{CO}_2$ concentrations have climbed rapidly for 60+ years
  - Global temperatures have increased since 1890
Major UN Climate Conferences and Global CO$_2$ Emissions (gigatons)
Atmospheric CO₂ Concentrations, 1959-2018 (parts per million)
Global Land and Ocean Surface Temperature Departure from Average, July, 1880-2019
Prospects for Reversing these Trends

- **Paris Agreement:** “well below 2°C” & 1.5°C goals
  - Notes that countries’ pledges are inconsistent with goals

- **Global CO₂ emissions increased in 2018**
  - 85% of increase from U.S. and China

- **Climate Action Tracker:**
  “[M]ost governments are nowhere near taking the radical steps required, especially given that global emissions need to halve by 2030 in order to keep the goal of 1.5°C alive.”
Permissible Emissions for 50% Chance of Less than 2°C Warming by 2100

Historic CO2 Emissions

No New Climate Policy CO2 Emissions

Limiting Warming to 2°C Scenario CO2 Emissions
Likely Dates of Reaching 2°C of Warming

- **Average Decarbonization Rate**
  - 2000-2017: 0.4%/year
  - 2008-2017: 0.7%/year

- **No new policies:** 2052

- **2015 Paris + continued ambition:** 2061
  - Minimum decarbonization rate of 2%/year

- **2015 Paris + increased ambition:** 2067
  - Minimum decarbonization rate of 5%/year
Likelihood of a Climate Catastrophe is Extremely High
Resources Required by Policy Prong (billions USD)

<table>
<thead>
<tr>
<th></th>
<th>In 2030, for 2°C goal</th>
<th>In 2030, public finance</th>
<th>Estimated annual cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mitigation</td>
<td>2000</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>Adaptation</td>
<td>100</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>Geoengineering</td>
<td></td>
<td></td>
<td>Need exacting vision to see geoengineering cost of $4bn/year</td>
</tr>
</tbody>
</table>
Outline of Analysis

- Fable to Introduce Three Prongs of Policy
- The Moral Hazard Concern
- 0-, 1-, 2-, and 3-Prong Players
- The Infeasibility of the Feasibility Argument for 1.5°C and 2°C Targets
- Dynamic Three-Prong Strategy for Climate Policy
The Boy Who Cried for Three Prongs
“Fewer hybrid sheep, more crops.”
“Fewer hybrid sheep, more crops. Put up protective fences.”
“Fewer hybrid sheep, more crops. Put up protective fences.”
Fewer hybrid sheep, more crops. Put up more fences. Raise a posse.
Raise a Posse

• Villagers have no experiences:
  ▪ As Riders
  ▪ With Guns

• Villagers had not read: “The Economic Implications of Learning by Doing,” Kenneth Arrow (1962)

• No Posse!
Equilibrium

• Analyst observes:
  ▪ Too many hybrid sheep
  ▪ Not enough crops
  ▪ Too few fences
  ▪ No posse, though desirable

• Falling short on:
  ▪ Mitigation – reducing hybrid sheep
  ▪ Adaptation – putting up fences
  ▪ Amelioration – raising a posse

• Too many wolves
• Too many sheep lost
Moral Hazard Concerns
Moral Hazard Concerns

- Mitigation, Adaptation, and Amelioration (Geoengineering) are substitutes from one another

- Investing in one diminishes value of another
  - Explains modest discussion of adaptation among enviros
  - Explains hostility to amelioration/geoengineering
  - Some might *mistakenly* think geoengineering is a “cure”
  - Adaptation merely reduces damages from emissions and can advertise the cost of climate damages
Possible Approaches to Substitute Instruments

- Benefits = damages avoided – costs of instruments
  - Given uncertainties, all outputs should be assessed using von Neumann-Morgenstern utilities

1. Simply optimize: select mix of instruments to maximize expected benefits

2. Support favored instrument and constrain other instruments
Actual Approach to Substitute Instruments

• Since 1990, global approach has been (2)
  ▪ Push for mitigation
  ▪ Gently acknowledge adaptation
  ▪ Shun solar geoengineering

• The world spends < $10 million/yr on geoengineering research (Keith et al)

• Finger on the scale approach risks locking in extreme expected damages
Instruments that Substitute for Each Other: Moral Hazard

- Doing more of one instrument reduces the value of each of the others

- Don’t pursue geoengineering
  - It will reduce emission control efforts
Instruments that Substitute for Each Other: Awful Action Alert

- Extreme danger of situation not widely recognized

- Pursuing an *awful action* indicates the extreme danger

- Public becomes more supportive of other instruments

- Would this apply to geoengineering and emission reduction?
Awful Action Alert in Different Context: COVID-19

<table>
<thead>
<tr>
<th>Date</th>
<th>S&amp;P500 Close vs. Previous Day</th>
<th>Key Policy Announcements</th>
</tr>
</thead>
<tbody>
<tr>
<td>March 12, 2020</td>
<td>-9.51%</td>
<td>President Trump announced a travel “ban” for travelers from Europe</td>
</tr>
<tr>
<td>March 16, 2020</td>
<td>-11.98%</td>
<td>Federal Reserve cut interest rates 100 basis points</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Federal Reserve announced new $700 billion in lending facilities</td>
</tr>
</tbody>
</table>
Instruments that Substitute for Each Other: Deleterious Deterrence

• Experts wish to promote instrument X

• Given moral hazard concern, they discourage use of instrument Y

• Significant delay in pursuit of Y

• Extreme danger not effectively confronted
Zero-, One-, Two-, and Three-Prong Players
Types of Climate Policy Observers

- Denier of human-cause climate change
  - Zero-prong policy strategy

- Climate control assurer
  - One-prong policy strategy: emission mitigation

- Climate policy realist
  - Three-prong policy strategy: emission mitigation + adaptation + geoengineering
0, 1, 2, and 3-Prong Players

Zero-Prong

One-Prong

Two-Prong

Three-Prong
The Infeasibility of the Feasibility Argument for 1.5°C and 2°C Targets
Infeasibility of 1.5°C / 2°C Targets

- Today’s capital stock – if used through the end of its economic lifetime – will result in $\geq 1.5^\circ$C

- “Overshoot” Scenarios: limiting warming to 2°C requires negative GHGs over 2050-2100
  - Electrify transportation, buildings, industry globally
  - Generate electricity from biomass + carbon capture and storage; wind and solar power insufficient
  - Alternative: major deployment of direct air capture
Political Economy of 1.5°C / 2°C Targets

- Last 30 years illustrates strong free-riding / cheap-riding incentives

- Domestic energy and climate policies reveal strong opposition to raising energy prices
  - Continuing fossil fuel subsidies
  - Carbon pricing that exempts energy-intensive sources
  - Preventing carbon price pass-through to energy prices
Dynamic Three-Prong Strategy for Climate Policy
Three Prongs for Prudent Climate Policy

- Economic Growth
- Technological Innovation
- Policy

Emissions → Temperature → Impacts
GHG Mitigation → Geoengineering → Adaptation

Uncertainties → act-learn-act approach to three-prong climate strategy
Time is a critical ingredient
Three Prongs for Prudent Climate Policy


And RFF Discussion Paper version available at: https://tinyurl.com/3climateprongs