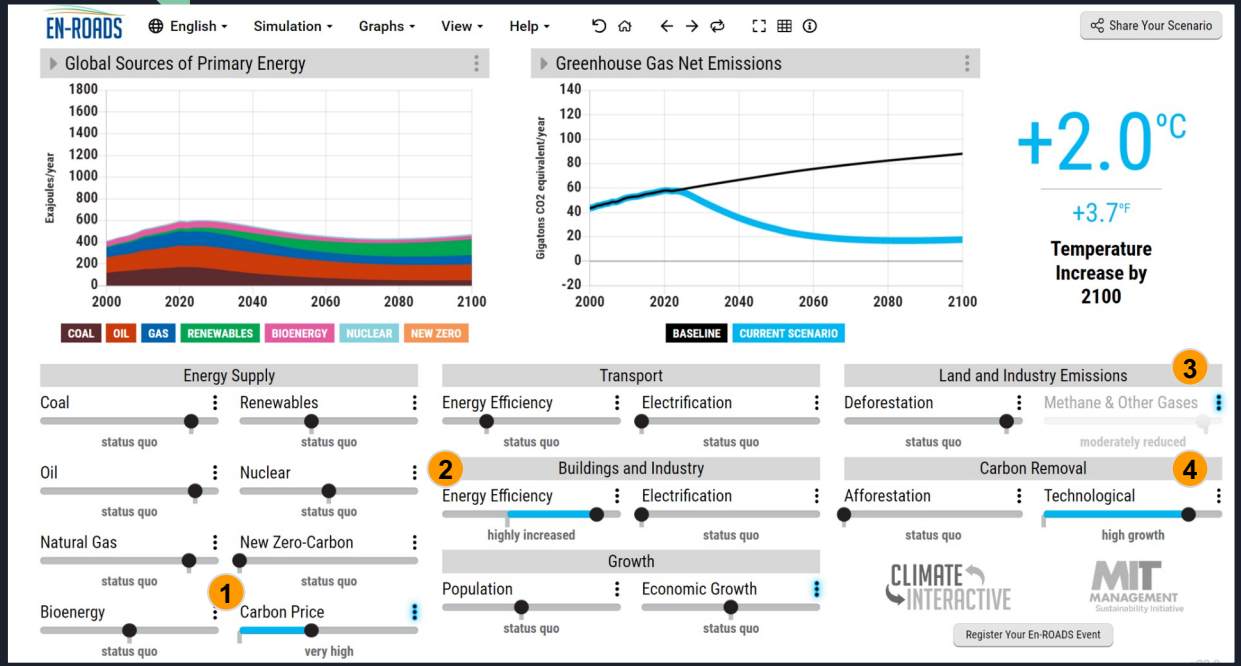
En-Roads Group 25

Tax and Fill the Cracks

Noor, Hemanth, Jeff, and Joby

Section 1: Summary Actions & Outcome

Decarbonization through disincentives and carbon capture tech



1. **Carbon tax = increase cost of dirty energy**
   - Carbon price = $100/ton CO_2
   - By stages = 30 years
   - Disincentivizes coal, oil, natural gas
2. **B&I efficiency = to avoid carbon tax**
   - Lower emission from higher efficiency in new buildings & industry = 4.2%/year
3. **Methane = to avoid carbon tax**
   - Lower emissions from
     - Agricultural & waste emissions = -30%
     - Energy & industry emissions = -30%
     - HFC phase-out: by 2050
4. **Carbon removal**
   - Tech advancement = 81%

https://en-roads.climateinteractive.org/scenario.html?v=22.9.0&p39=100&p40=2023&p41=30&p47=4.2&p59=-2&p209=1&p60=-30&p61=-30&p254=2050&p236=15&p67=81

ASSUMPTIONS:
Economic growth transition = 15 years (from 75 years)

Section 2: Meeting the Goals

Long-lasting positive impact with reasonable trade-offs

	Climate	Economy	Equity	Environment	Realism
1 Carbon Tax	😍	😍	😍	🙂	😕
2 B&I Efficiency	😍	😍	🙂	🙂	🙂
3 Methane	😍	🙂	🙂	🙂	😕
4 Carbon Removal	😍	🙂	🙂	🙂	🤭
Overall	Limit temp increase to 2 Celsius by 2100	Long-term, balanced focus on intergenerational equity	Finance transition in developing economies against higher tax revenue	Lower air pollution; Lower sea level; Better crop yield;	Reasonable, gradual changes (yearly increase of $3 carbon price)

Climate

	Climate
Carbon Tax	
B&I Efficiency	
Methane	
Carbon Removal	

- We model temp increase to 2 Celsius by 2100
- Focused on actions that could drastically reduce CO2 emissions.
- Will have global challenges to adhere to carbon tax, methane capture, and global investment in carbon capture.

Economy

	Economy
Carbon Tax	
B&I Efficiency	
Methane	
Carbon Removal	
Overall	Long-term, balanced focus on intergenerational equity

- We have a lot of uncertainty on how to model and measure economic progress.
- Currently, we don't account for the social cost of carbon (externalities).
  - This might affect RGDP
- Believe there are other positive economic impacts
  - For instance, B&I efficiency could reduce the energy burden often placed on disadvantaged communities and would reduce global inequality.

"[GDP] measures neither our wit nor our courage, neither our wisdom nor our learning, neither our compassion nor our devotion to our country, it measures everything in short, except that which makes life worthwhile." - Robert F Kennedy

Environment - just hang in there!

+2%	-80%	-73%	-7.5%	-3%
Ocean Acidification kept in control	$PM_{2.5}$ emissions reduction from baseline	Reduction in probability of ice-free arctic in the summer	Reduction in decrease in crop yield from temperature	Reduction in additional deaths from extreme heat

Realism over Cynicism - Change we can expect!

$3.3 per year

Increase in carbon taxes over 30 years

4.2% per year

Increase in building efficiency

-30%

Reduction in methane and other greenhouse gases

81%

Technological carbon removal incentivized by carbon taxes

15 years

To reach stable GDP per capita growth rate

Equity

	Equity
Carbon Tax	😍
B&I Efficiency	🙂
Methane	🙂
Carbon Removal	🙂

- We propose a carbon tax paired with a lump-sum rebate (revenue neutral) that would increase the global tax code's progressivity significantly
  - ~$2T in tax revenue could theoretically be used to give $200 to every human by 2050
- Building and industrial efficiency initiatives must focus on investing in disadvantaged communities (i.e. Justice40 Initiative)
- We are unclear how significant methane emissions and a jump in carbon capture technology would have significant equity impacts

Section 3: Reflections

Winners	Losers
Disadvantaged communities	Fossil fuel companies
Green Tech	Countries with large reserves of fossil fuels
Environment	
Our children	

- **Group Surprises**
  - We need to make big assumptions above the status quo/trend lines in order to limit warming to 2°
  - Carbon price = universal lever
- **Emotional Feelings** - uncertainty, scared, hopeful
- **Hope & Personal Action** - all of us here today taking a week of summer vacation to focus on the critical issue of our lifetimes

Appendix

Actions

Carbon Pricing and Energy Standards

- Carbon Price = 100 $/ton CO2
- Year carbon price starts to phase in = 2023
- Years to achieve initial carbon price = 30 years

Buildings and Industry Energy Efficiency

- Energy efficiency of new buildings and industry = 4.2 %/year

Economic Growth

- Transition time = 15 years

Methane & Other Gases

- Agricultural and waste emissions (CH_4 & N_2O) = -30 %
- Energy and industry emissions (CH_4, N_2O, & F-gases) = -30 %
- HFC phase out start year = 2050 year

Technological Carbon Removal

- Technological carbon removal (% of max potential) = 81 %

Outcomes

Temperature Increase in 2100

2.0 ºC / 3.7 ºF

CO_2 Concentration in 2100

451 ppm

Sea Level Rise in 2100

0.6 m / 1.9 ft

Cumulative Avoided CO_2 by 2100

3,124 gigatons CO_2

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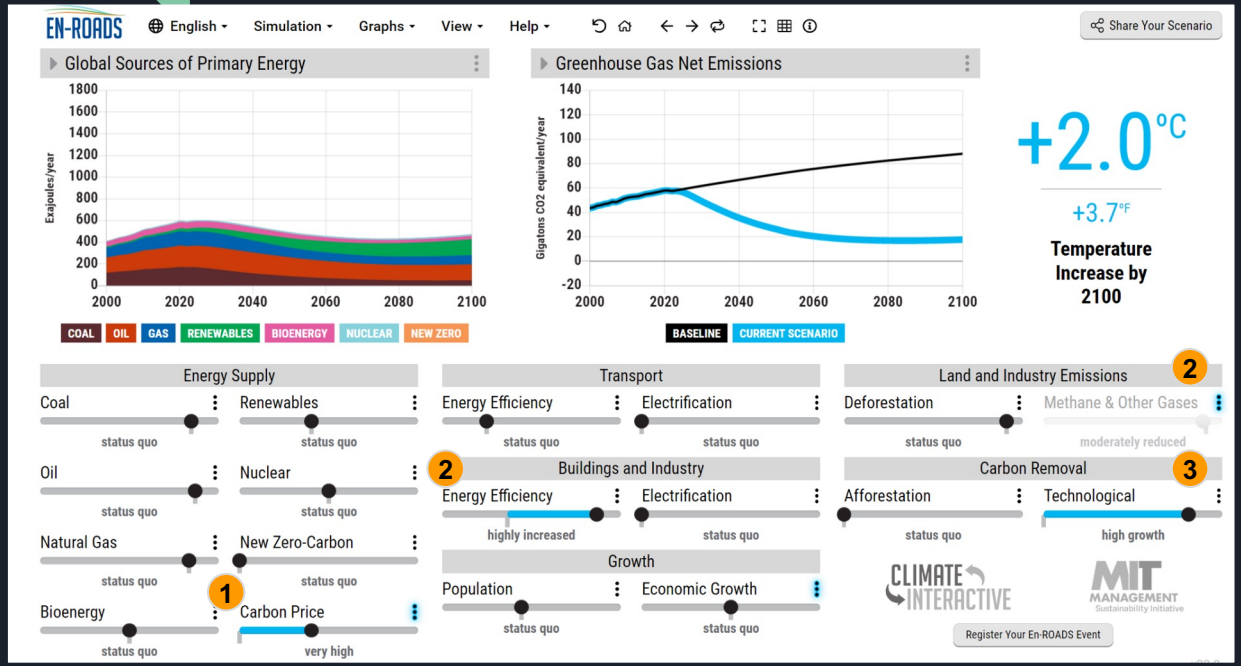

1. **Increase cost of dirty energy supplies**
   - Carbon price = $100/ton CO2
   - By stages = 30 years
   - Disincentivizes coal, oil, natural gas
2. **Reduce GHG footprint**
   - Efficiency improvement in new buildings & industry = 4.2%/year
   - Lower emissions from
     - Agricultural & waste emissions = -30%
     - Energy & industry emissions = -30%
     - HFC phase-out: by 2050
3. **Remove CO2 in air to bridge the remaining gap**
   - Tech advancement = 81%

ASSUMPTIONS:
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1	Carbon Tax	😍	😍	😍	🙂	😕
2	B&I Efficiency	😍	😍	🙂	🙂	🙂
3	Methane	😃	🙂	🙂	🙂	😕
4	Carbon Removal	😍	🙂	🙂	🙂	🤭