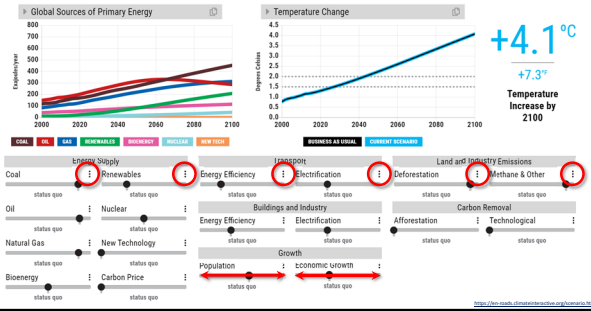
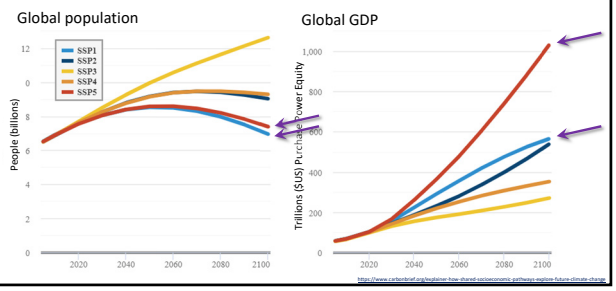
Simulating Climate Futures in En-ROADS, a Climate Change Solution Simulator

built by the Sloan Sustainability Initiative at the Massachusetts Institute of Technology

En-ROADS uses systems dynamics to model greenhouse gas emissions (and incorporates ≈14,000 equations).



Shared Socioeconomic Pathways (SSP) examine how global society, demographics, and economics, might change over the next century, and therefore affect greenhouse gas emissions.



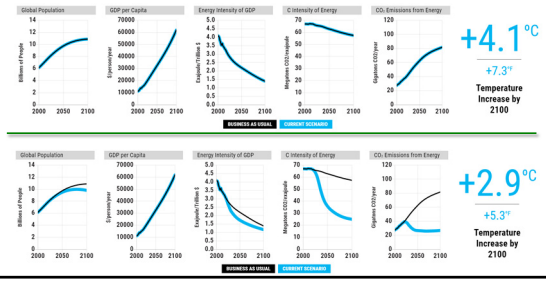
Five SSPs are used to model future society.

SSP1 and SSP5 are relatively optimistic trends for human development, with substantial investments in education and health, rapid economic growth, and well-functioning institutions.
SSP1 assumes an increasing shift toward sustainable practices.
SSP5 assumes an energy-intensive, fossil fuel-based economy.

SSP2 represents a middle of the road scenario where historical patterns of development are continued throughout the 21st century.

SSP3 and SSP4 are more pessimistic in their future economic and social development, with little investment in education or health in poorer countries, coupled with a fast-growing population and increasing inequalities.
SSP3 assumes nationalism, domestic conflicts, lack of environmental concern.
SSP4 assumes income and knowledge disparities, and carbon intensive fuels.

En-ROADS also incorporates Kaya graphs to represent the total emission level of carbon dioxide expressed by: population, GDP per capita, energy intensity, and carbon intensity.



Learn about the climate crisis and the choices we have to make by running simulations. Illuminate the conversation with information. Model the situation to provide context and remove sloppy thinking, illogical thinking, and poor understanding of basic science.

Start by looking for positive and negative feedback loops, delays, and the long lifetime of capital (i.e. divestment from industry takes decades to retire the infrastructure, therefore alternatives take a long time to kick in).

Consider the cost of energy drops – so use goes up.

Note that the price for energy, and the demand for energy, are linked in a feedback loop.

↖ negative or positive?