1. May briefly introduce the concept of “tragedy of the commons” the day before, and may assign the short readings to be read before this module. (Or, make time in class.)
2. **(5 min)** Gets class started, any announcements
3. **(10 min)** In small groups, discuss the short readings. Be prepared to report back to the class:
   1. *(5 min)*Discuss in small groups
      1. What was the “commons” in your case study?
      2. What was the “tragedy”? In other words, whose interests were being damaged?
      3. Who likely paid for changing the way things were done?
   2. *(5 min)*Report to class
4. **(12 min) Go to Powerpoint.** We have a current example of the “tragedy of the commons” in global warming.
   1. What is the “commons”?
      1. The atmosphere: it’s very thin
      2. Greenhouse gases trap heat in the earth system
      3. GHGs have increased dramatically in the last 200 years, faster than “natural increases” of the past
      4. The air is like a free landfill! You have to pay a garbage hauler, have to pay for sewage treatment; don’t hav eot pay to burn gasoline or coal and put that waste into the air! (Well, we *do* “pay” for keeping particulates out of the air (cost of emissions controls), Pb out of air (cost of unleaded gasoline and better engines).) Just don’t pay for carbon right now.
         1. Show animation of warming planet. Need to explain image and “anomaly”. Anomaly is difference from average. Just like you might show changes in gas prices; might “normalize” all prices, and just show how much the price is different from “average” in each place. But anyway, the animation is *temperature*.
         2. Describe changes they see. What questions?
      5. Other things can control climate too, but there is strong scientific consensus that human-emitted GHGs are warming planet.
5. What is the “tragedy” in the climate example? In other words, whose interests are being damaged?
   1. **(3 min)** Warming global temperatures are causing changed weather patterns. (Weather is short-term temperature, precipitation, storminess; climate is longer-term average of conditions.)
      1. For example, Minnesota’s climate is projected to be more like that of the climate in Kansas today. We know this from climate models.
         1. What’s a climate model? Like an economic model, although based on *physics* rather than *people (so, are more reliable! Sorry, Rita…)*. You put in the factors you understand; like, if price of product goes up, less people buy it. If increase greenhouse gas concentrations, less heat escapes to space.
         2. **(5 min)** Who would be impacted by that change of climate? (Perhaps give local or course-relevant examples)
   2. **(3 min) W**arming global temperatures are causing sea level rise because continental ice sheets are melting and ocean water expands a tiny bit when it warms. Demo sea level tool.
      1. Norfolk, Virginia is already underwater at certain times of day/month. U.S. Navy is anticipating huge costs for updating their infrastructure to accommodate higher sea level.
      2. Miami will have major problems. Additionally, can’t just build seawall (like you can in some places, e.g. New England) because in Miami the bedrock is “leaky” so water would just come up from below.
         1. **(5 min)** Miami contributes \_1.7% in to U.S. real GDP in 2013.
         2. Miami population in 2010 was 5.5 million people. Share of population in the US is 1.83% in 2012.Cost to displace? Loss of real estate?
6. **(5 min)** Types of solutions that have been successfully used to address tragedies of the commons
   1. **International treaties** were used to ban production of CFCs (solved the ozone hole)
   2. **Taxes** and **fees** areused to pay for sewage treatment plants (solved the Mississippi River pollution in Minneapolis)
   3. **Cap and trade** was used to solve acid rain problem in northeast U.S. caused by emissions of sulfur dioxide, nitrous oxide, etc. from smokestacks in Midwest