
System Dynamics for Understanding Climate Change Webinar Q&A with Chris Soderquist

Q: With the increase of systems models embedded throughout the web and social networks, will the scientific integrity of these models be compromised or at least questioned by the general public?

A: There is always questioning of models. This will definitely heighten that. However, the onus is on the modelers to develop models where the assumptions are clearly represented, and where the purpose of modeling is well known: not to predict an actual future but to suggest likely future(s) given the best assumptions we have! So we need to make sure this is all communicated!!

That said, if done well, I assume that the understanding of the purpose and process of modeling will become greater, and that the quality of thinking about issues among the public will also increase along the systemic continuum.

Q: Where is the atmospheric CO2 for year 1990 entered?

A: I didn't enter the actual concentration (i.e. the stock). The model does have historical data for emissions, which when I entered a % of any year, it can access. I don't currently show that number, but could. You can back calculate by seeing what the emissions are at the end of 2100 and use a multiplier.

Q: What software did you use to create the sample dashboard in Ning?

A: Ning comes with tools to build and customize the look and feel. I used STELLA/*iThink* to build the dashboard. I then published it to Forio using isee Netsim. When the sim comes up in a browser, there's an embed link which includes the source code...which I copied and pasted into a text box in Ning. The whole export/import process takes less than 3 minutes!

Q: What is the expected commitment of the USA for the Copenhagen Summit?

A: This answer comes from Beth Sawin of Sustainability Institute. "We don't have any special insight into what the USA might commit to in Copenhagen. For the purposes of our tracking of possible scenarios we have been relying on the World Resources Institute's analysis of the Waxman-Markey legislation which has been passed by the US House of Representatives. See: http://pdf.wri.org/usclimatetargets_2009-06-25.pdf".

Q: What do you think about Cap and Trade policy?

A: This answer comes from Beth Sawin of Sustainability Institute. "We found the World Resources Institute's analysis of Waxman Markey, which contains Cap and Trade provisions, very helpful." (See above.)

Q: We understand that local food sources are not always less ghg intensive from a life-cycle view. Production far away can be more efficient than nearby. Greenhouse production near us in Canada might be an example. I'm just saying the solutions you have listed are not obvious.

A: Sure. Types of food consumed/produced and where done have an impact on the efficacy of various solutions.

Q: In the presentation you talked about fossil fuel consumption as one of biggest problems. To replace fossil fuel consumption there must be an alternative, have you thought about what that would be?

A: We'll talk more about this issue in upcoming webinars. But if you think about emissions/year as being driving by energy demand/year * emissions per demand then to reduce emissions/year we will need to reduce annual demand and/or emissions per unit of demand. This means there is both a technology component (cleaner energy sources) and reduction in demand. I tend to think that there is just as much creativity we'll be doing on the reducing demand side in the future. Rearranging our lives to require less transportation (e.g. telecommuting and web meetings) can be one component.

There are much smarter folks out there than I who have thought more deeply about this. Does anyone reading this have more info to share?

Q: The isee NetSim simulations you have displayed today are quite slick and visually pleasing. Approximately how long did it take you to construct them?

A: There are two parts to developing these types of models: 1.) Building the underlying simulation model, and 2.) Creating an effective interface for people to interact with them.

The first, building these particular models have taken years. They were based on Tom Fiddaman's dissertation (in the 1980s) and have been updated since then. However, if someone were to start today and need to build a model of similar sophistication, it would be possible to build something in 2-4 months...but then it would be a much longer process to get scientific acceptance/validation.

In terms of building the interfaces to the two models here, I built both in the course of two weeks. The isee systems software makes interface development surprisingly simple that even a non-programming type like me can develop them with ease. And then the isee Netsim software allowed me to quickly upload the models "just as I had developed them in STELLA/iThink" in seconds. I did this repeatedly to test how they looked.

Q: For a student looking to create some simple system diagrams to help demonstrate some of these ideas in a thesis on this topic, what are some good sources to get realistic, raw data?

A: This answer comes from another webinar participant. "The student who called in about data for his model should reference a recent report by Graham Turner of CSIRO who reran all the limits to growth models against the last 30 years data."

A: Tom Fiddaman's dissertation is a great place to start in terms of the types of data you need. After that, it becomes harder, because no one source seems to have it all. The Climate Interactive models are probably the most accessible in terms of having collected and synthesized the most useful data out there.

Q: Your commitment to getting the word out is inspirational. Are there success stories of people who have spoken to schools, churches, etc.? What made these efforts successful?

A: I don't have specific success stories where I've been able to trace meetings/presentations/etc to having an impact on peoples' actions. Although I'm sure there are thousands of people around the world who have had a major impact through their efforts! In my experience, what makes the transition for urgent need to action work is having both a "burning platform" (i.e. we must move!) and a compelling vision (i.e. this is place we can go)...and clear first steps in that direction!

As for inspiration, I take my inspiration from many places, but I have two quotes that inspire me most. The first is from my favorite book, The Lord of the Rings...

'I wish it need not have happened in my time,' said Frodo.

'So do I,' said Gandalf, 'and so do all who live to see such times. But that is not for them to decide. All we have to decide is what to do with the time that is given us.'

The second is from Donella Meadows. "We have just enough time, starting now."

Q: Is it possible to focus in a specific region like the Amazonian basin?

A: Yes. One could build models of varying levels of specificity, such as looking at the Amazonian basin. There is a version of the model that has broken out emissions into more than the 3 categories I demonstrated.

Q: Is it possible to break emissions down by source, say transportation, power generation, industrial, etc.?

A: It is possible to do so, and a worthy goal, particularly when being used as a strategy testing model. We've explored getting funding for some of this work. One of the more interesting sources of emissions that has been rapidly increasing is data centers (think Google searches). Internet searches take an immense amount of energy!

Q: The model does not seem to include runaway effects, for example the melting of the north polar icecap in summer or the release of methane from permafrost and clathrates. Nor does it show the fall in the rate of CO2 sequestration by natural systems as we damage them. A key element of the communication is that we do not have 50 years to fix this, that we may already be past the point of no return, but if not we are in an emergency which must be addressed in not more than ten years.

A: I agree with this concern. There is little time to waste. And yes, the model doesn't include some of the more recent evidence about reinforcing loops that are likely to accelerate climate change (e.g. the albedo effect). These effects could be added, but currently have not been.

Q: How reliable are removals in the long run? Don't carbon sinks have finite capacities? If so, don't emissions eventually need to approach zero?

A: The model I demonstrated, based on the work of Tom Fiddaman and other MIT researchers, includes a sophisticated “ocean sinks” component, as well as different regions for carbon (e.g. in Humus, Biomass, Sequestered, Mixed Layer) to accumulate. There is never an infinite sink, but since carbon originates in these regions, they have the capacity to accept it all back.

That said, your point is important. Removals do not remain constant into the future. It is based on percentages (concentration) of carbon in the atmosphere. As that concentration goes down (i.e. as we become more successful!) the ability to capture carbon will also go down. If you run any of the simulations I demonstrated today, you'll see that as emissions does successfully decrease, the removals line also decreases (although much less).

Q: How is this conversation & issue related to the "Tragedy of the Commons" archetype?

A: It seems that it is related in that the commons are the fossil fuel finite resources we are currently burning and spewing into the atmosphere. And the “away” that these impacts go into are often distant in space (e.g. the ice caps) and time (e.g. 20-50 years out). There is little incentive to give up local optimization of these resources' benefits in order to address commons issues.

Q: How does national or ethnic culture factor into climate change? or Your models certainly address the subject from a rational perspective...what about cultural issues? i.e.: developing nations can argue about not being able to improve (locally) without FFE and not having funds for accessing "clean" technologies... how would you include this into the model?

A: This must be a globally negotiated deal, of course. See Andrew Jones' TEDx talk on YouTube for more about this: http://www.youtube.com/watch?v=CTS9RY1z_i8

In terms of including in the model, you can include such assumptions by building sectors associated with some of the economic or social factors. You'd need a team of experts who would have the “best current assumptions” to assist in building. One of the challenges is that the further you get away from physical modeling, the more likely folks are to reject the modeling exercise – because they confuse testing the implications of assumptions with predicting the future.

Q: Have you had any experience with modeling results from comparative GIS data using STELLA for interactive policy conversations based on regional mapped data?

A: I've not personally done this, but know of others who have...and know how it can be done. There is a description of a simple problem, modeling watersheds, on the isee systems blog. <http://blog.iseesystems.com/>

Q: Do you have examples of cities using these kinds of dashboards to track the implementation of their sustainability strategies?

A: There are many cities/communities, even larger geographic areas, using dashboards to track implementation of sustainability strategies.

<http://sf.urbanecomap.org/#/explore>

Massachusetts Regional Greenhouse Gas Initiative

http://www.mass.gov/?pageID=eoeaterminal&L=3&L0=Home&L1=Air%2c+Water+%26+Climate+Change&L2=Climate+Change&sid=Eoeea&b=terminalcontent&f=doer_rggi_rggi_doer&csid=Eoeea

What I've observed about dashboards are the following:

- They have way too much information to be useful. They are data overload. Rather than being examples of high level strategy, they are in the weeds of detailed implementation.
- They do not provide the observer with the ability to peel back the mental model behind why a given indicator is important
- Nor do they allow for testing of strategies...as can be done in simulation

Q: Do you have any models/sims for payment for REDD and other mechanisms (e.g. to reduce consumption of fossil fuels)?

A: I do not. The C-Learn and C-ROADS models I've shown here do have a "deforestation" policy to see what the impact of reducing deforestation would have on emissions. They do not have any payment sector included, although with appropriate experts, such a sector could be developed.