Weekly Status Report – Niles Guo Oct 29, 2017

This week's activity:

1. Created another draft of the literature review based on your feedback. Completely reworked the Introduction and Literature review sections and pivoted the research as a guide to help analysts assess the strengths and weaknesses of each technique. Created a sample decision tree for the techniques.
2. Based on the feedback from last week, reworked the MML1/2 rubric with Jay. Specifically:
    a. The problem statement is more explicit, and efficiency is defined as cost effectiveness in terms of financial cost, human impact cost, and freshwater usage. Those three outputs are also the three objective functions.
    b. The system boundary is redefined to the 14 well-pads with the 98 wells studied by Bartholomew and Mauter in the Marcellus play.
    c. Instead of having maximizing waste water reuse as an objective, reworded to minimize freshwater re-use. While in this particular case, minimizing freshwater use happen to lead to a good financial outcome, this could act as an interesting policy objective if we expand the scenario and tweak some of the cost parameters.
3. Jay and I walked through this rubric and we decided the next step is to translate this into MML3. Started to map the variables identified here into the flow diagrams I presented last time. Next step is to map out the interactions between the variables and complete the MML3 model.

Revised MML1/2 Rubric for reference:

Level	Activities	Output
MML1	- Problem statement - System boundary defined - Input/output parameters defined - Key system constraints defined	Problem statement: Overall objective is to design a cost effective (in terms of financial cost, human health impact cost, and freshwater cost) wastewater management system for shell gas production in the Marcellus region. <u>System boundary:</u> - Gas production and gas revenue (through drilling and production schedules) are treated as constants and not modeled explicitly. - Only air emission is used to model human health/environmental impact. Water contamination, noise pollution, or other community impacts are not modeled here.

		- Both onsite and centralized water treatment options are considered. - Water disposal is included in the analysis. - Water transport, in terms of both volume and options, are modeled. - Different onsite water storage options are modeled. - Only considering the 14 well-pads with the 98 wells studied by Bartholomew and Mauter in the Marcellus play. <u>Global Parameters:</u> - Fracking schedule - Case study setup (locations of well-pads, centralized treatment facility, storage options, freshwater sources etc.) - Available waste water treatment technologies and their specifications - Marginal human health impact parameters associated with each activity. - Freshwater demand - Waste water production - Transportation layout and options <u>Key Input Parameters:</u> - Selection of freshwater source - Selection and sizing of water storage - Variable cost parameters - Selection of waste water treatment options - Selection of transportation options - Amount of reuse of waste water - Objective weighting <u>Key Output Parameters:</u> - Water management financial cost - Human health impact cost <u>Key Constraints:</u> - Mass balance constraints (water volume)

		- Regulatory constraints (water disposal option? Water reuse?) - Operator constraints (quality of water for reuse?) - Transportation constraints (trucking rates, piping connection, pipe size)
MML2	- Key objective functions defined - Relevance and viability of the study	<u>Key Objective Functions:</u> 1. For a set fracking schedule and set production schedule, the objective is to minimize waste water financial cost. 2. For a set fracking schedule and set production schedule, the objective is to minimize human health and environment impact cost. 3. For a set fracking schedule and set production schedule, the objective is to minimize the use of freshwater.

Issues/Agenda for next meeting

1. Go over the revised paper outline again and get your feedback based on the changes you suggested.
2. I had a quick chat with Paulina after her talk in Scott institute about potentially applying CADS to some of the work she was doing in Rwanda, so I just want update you guys on that.

Next week's activity:

1. Continue to build MML3 model.
2. Mocking up what the final CADS interface could look like (I want to move away from the google sheets implementation). How the study can be constructed.