FSNA153 Final Project

Your final project is to apply systems thinking and systems approach to design suitable management policies to manage the release/emission of greenhouse gases and hence the climate change to ensure a long-term sustainability. Specific tasks to be accomplished include:

1. Develop a complete model describing the effects of deforestation and fossil fuels burning on the global warming (change in the temperature of the Earth's surface
2. Calibrate the model by using historical data to estimate all model parameters.
3. Translate the model into a computer (MATLAB) code ready to perform scenario analysis through simulation experiments. Perform model verification to ensure that the model is built "right"—i.e. the code is correctly written without any syntax errors. (A basic MATLAB model will be provided that you can refine and calibrate.)
4. Perform model validation to ensure that the "right" model is built. That is run the model for 60 years using the current parameters which are estimated from historical data. Then observe the changes of carbon in various reservoirs particularly the atmosphere to see whether they make senses. Also observe whether the temperature change up to now is close to the value estimated by the experts.
5. Use the well-validated model to perform scenario analysis to investigate (i) the effect of increasing (e.g. doubling) and decreasing (e.g. 30%, 50%, 70% etc.) the rate of deforestation or fossil fuel combustion or both on the temperature change and (ii) the effect of various policies to reduce the emissions of CO_2 into the atmosphere (such as those which are being currently discussed or agreed upon) on the change in temperature. Do some research or design your own policies here.
6. Write a report consisting of the following sections:
   - Introduction: (10%)
     - Provide a brief background of the Global Warming problem.
     - State succinctly the problem(s) to be addressed, and
     - Express clearly the objective(s) to be accomplished by the project.
   - Methodology and Model: (30%)
     - Describe how systems thinking and systems approach are used to tackle this problem
     - Draw an appropriate influence diagram and provide a brief description of how the diagram is developed and its systems archetype
     - Provide a complete mathematical model with a brief description of how each equation (or group of equations representing each submodel) is developed. A complete MATLAB code of the model should be included as an appendix.
   - Model Validation: (24%)
     - Provide a brief description of various validation tests
     - Show the results in graphical forms of each validation test with a brief description of the results.
     - Provide conclusions that can be drawn from each test pertaining to the quality and validity of the model.
   - Scenario Analysis (24%)
     - Describe policy scenarios to be tested by the model
     - Conduct simulation experiments for each scenario and show the results
     - Propose the best management strategy to reduce Global Warming that you can deduce from the results of scenario analysis above.
   - Conclusions and Recommendations (10%)
   - References (2%)
   - Appendices (part of the above)

The project report (one for each group) is due December 10th by 4:00pm. Each group will also make an oral presentation of the project on Thursday December 3rd.

References:
   - See references in the handout given