Lab Activity – Systems Analysis and Simulation

A system is an organization that is bounded and contains elements that are said to interact with one another. In the process of a working system like our ecosystem, there are corresponding inputs and outputs that come into play however, this contributes to the complexity of what constitutes a system. Sometimes the interactions or interplays of the different factors reacting on the system and the aspects that pertains to number, and spatial and temporal dynamics makes our representations of an ecosystem abstract. Systems analysis lend us a helping hand particularly in accounting for specific components making up a system including the interplays of the components and in defining a particular behavior that occurs on a system. Systems analysis likewise provides an orderly and logical organization of data and information into models. The relation of diagram and the series of equations we used enable us in providing solutions for complex problems. The art of building the mathematical models or representations and the study of the properties in reference to those of our ecosystems or systems in general make us appreciate how systems analysis and simulations can bring about desirable courses of actions and predict outcomes. The process of undertaking systems analysis through model development is shown in Figure 1.

Real Events

Model

Abstract

Conclusions & Predictions

Figure 1. The Process of Model Construction

Systems analysis is a tool in resource management that allows us to understand the processes and relationships between components of the system as it generates extractable information necessary in the identification of data needs and information gaps for research and management. Systems analysis follow an algorithm (Figure 2) that guide us in translating out our problems to frameworks of learning providing us with approaches enabling us to understand the problem, create predictions, make interpretations and build inferences necessary in managing the problem and subsequently fill in the information gaps we created at the start of the problem development.

Formulate problem, and hypothesis

Qualitatively describe the system, with the aid of a sketch

Define relevant components and sub system, Show connectors by means of a component diagram

Define relevant (key) variables

Describe input-output relations of sub-system. Draw input-output diagram

Represent pattern of relations. Construct signal flow graphs

Augment input-output diagram with necessary conceptual components

Develop model equation

Test data, study behavior of system and each solution to a problem

Figure 2. Algorithm in Systems Analysis and Simulation

Instructions:

1. Based on the proposed project described below, develop a sustainable development model integrating biophysical and socio-economic aspects. Note: you may add necessary accessory variables that you may expound the scenario for a better understanding of the problem.
2. Develop a relational diagram with the objective of determining the dynamic interaction of pollution with crop production, fishing and human health. Discuss your model by using conceptual diagrams.
3. Prepare a ZOOM presentation and submit a narrative report of the presentation.

Proposed Project scenario:

Power Ranger Corporation, a company proposed to construct a cement kiln and power plant in Barangay Macaboboni, Agno, Pangasinan. A pier (port) will also be constructed in a cove, immediately below the cement factory, because 80% of the cement to be produced will be exported while the remaining 20% will be for the domestic market. The plan is to quarry the high quality limestone deposits which are mostly outcrops along the coastal area. Phased stripping and open pit mining will be done. The cement kiln will use electrostatic precipitators, bag filters and sealed conveyors to minimize air pollution. With all its pollution control devices, the company projected that there will be 99.5% reduction of air pollution. The company expects to mine 1.5 million metric tons of limestone per year and it is projected to last for at least 50 years. The total area to be used is about 1,300 hectares. In terms of employment, about 400 jobs will be created.

People in the community were divided. Those who are in favor of the project say “No to poverty, yes to progress, yes to cement plant factory; development and environment can go together.” The cement plant factory is perceived by this group to bring progress and industry to the town of Agno.

The opponents contend that once they sell their agricultural lands for quarrying, there will be no more land for them to till. They cannot all be employed because the population of the Barangay alone is around 5000 belonging to 500 households. Assuming that there is enough jobs to be created, farmers are not trained to do technical jobs in the plant. In fact, many of the farmers are illiterate.

Some farmers whose farms will not be affected by quarrying are also opposing the project. They contend that the fine dust particles emanating from the cement kiln will be deposited in the leaves of their crops and will affect photosynthesis, hence lower production. Dust particles in the ambient air also causes respiratory illness.

The cement kiln also will require large amount of water for cooling. If they will pump the water from the Lasud River, the remaining water flow in the riverbed will be reduced significantly and cease completely during dry season. If the water will come from deep wells, excessive pumping will make the water table deeper, resulting to scarcity of water supply for domestic use at least in the upper settlement areas. Worse, is that there may be salt water intrusion. Furthermore, fishermen oppose the project because the pier (port) in the cove and the frequent sailing of ships for loading cement will destroy (physically or mechanically) their fishing grounds. They foresee that fish catch will decline and worse, they may be forced to spend more energy and effort to fish farther away from the shore. The opponents’ platform is “No to Environmental construction, No to Cement Plant factory.”