

On the civilizations **collapse** road



The (ILE) and Treatment Group Guideline

Portrait of a Civilization Flight Simulator

Overview

Is the use of ILEs will enhance systems thinking skills development during participatory modeling workshops?

The main objective of this study is to investigate the impact of Interactive Learning Environments (ILEs) on existing methodological frameworks in participatory workshops using System Dynamics (SD).

As it is evident from the research map in figure 1, the main learning objective is identifying the Causal Loop Diagram (CLD), in other words, the causal relations in the given system through the GMB sessions. The ability to identify interconnections and feedback processes is one of the key concepts for developing systems thinking skills. Systems Thinking (ST) is a methodology used to explore and understand the interrelationships within complex systems. The study investigates how the ILE helps the participants to develop ST skills and to build a lateral understanding of feedback loop processes.

Age:

Higher education students

Time:

- 95 min (See Timeline in the Support Material)

Materials:

- Access to digital devices and internet
- Facilitators
- Simulations are available on [iseesystems.com](https://exchange.iseesystems.com)

Simulation Access:

<https://exchange.iseesystems.com/public/vir011/overshoot-collapse>

Learning objectives for the session

- Introducing the generic structure of collapse.
- Learning about how increasing and/or decreasing different variables effect the system behavior.
- Assessing students to predict the general direction and magnitude of changes in the system due to specific change.
- Learning about carrying capacity and limit to growth of the system.
- Introducing the consumption and recourse management concept, and the consequences of bad management
- To expand their learning outcomes from civilization collapse simulation to contemporary life and chose a similar issue from our experienced life to discuss the relations and mental model development.

Preparation (For facilitators)

The experiment is designed for higher education students who have a basic knowledge of environmental science and ecosystem services.

Following the checklist would make the session easier both for the facilitators and participants.

The experiment contains different stages, documents and the ILE which is published and available online.

The steps are as follow:

1. **Introducing the problem, which is a short story of the hypothetical civilization story (will be hand out as flyers online or hard copy).**
2. **Now they are challenged to introduce and discus the BOT (behavior over time) for the given problem.**
3. **Group discussion over the choice of BOT and individual tasks to complete which will be recorded and evaluate as pre-test knowledge of mentioned objectives.**
4. **Briefing session.**
5. **Simulation**
6. **Debriefing session**
7. **Post test**
8. **Application of knowledge test**
9. **Takeaway Message**

	Pre-test	Simulation	Post-test
Age			
Level of English Basic-good-fluent-native			
Year of the program you are in (your semester number)			
Similar Experiences (ILE)			

Pre-test

Systems consist of groups of interacting components which together form a unified system. In the environment, systems tend to be large with many interrelated components and it is those interactions among the components which leads to complexity. To deal with the complexity, we need to learn about and study the system by understanding the interactions between components.

	ID number
Age	
Level of English Basic-good-fluent-native	
Year of the program you are in (your semester number)	
The program you are enrolled in	
Similar Experiences (group model building/ILE)	

Please answer the following questions based on your choice of BOT.

1. Which BOT did your team chose? Why?

..... Can't be determined

2. Identify the main variables in the presented civilization system.

..... Can't be determined

3. Identify causal relationships among the variables.

..... Can't be determined

4. Identify feedback loops in the civilization system.

..... Can't be determined

5. Can you identify a contemporary system with similar behavior to Tsuna civilization? Identify at least one.

..... Can't be determined

The ILE learning objectives (Facilitators' guideline)

The civilization simulation is an interactive tool which allows the participants to simulate the collapse within the system. The participants are going to experience the civilization collapse in a simplified structure of the resources to provide the basic needs of a society to grow and survive. The simulation is based on primitive society development and uses forest as a main source, where forest is used for food production, urban development material, fuel, and its ecosystem services to maintain sustainable climate and life.

The simulation aims to help understanding the causal relations and the concept of feedback process within the system through further discussion and groupwork.

Main Simulator

This page is the interactive animated simulator, which allows the participants to explore the system by controlling the main three variables (birth rate, urban development and resource management) and observe the impact of the changes primarily on the system collapse and followed by few given challenges in the journal. They are expected to learn about the relations between different parts of the civilization system. Also, the expand graph button is opening the window of the graphical data of stock (population) and recourse (forest) where they can see the dynamic of impacts over time.



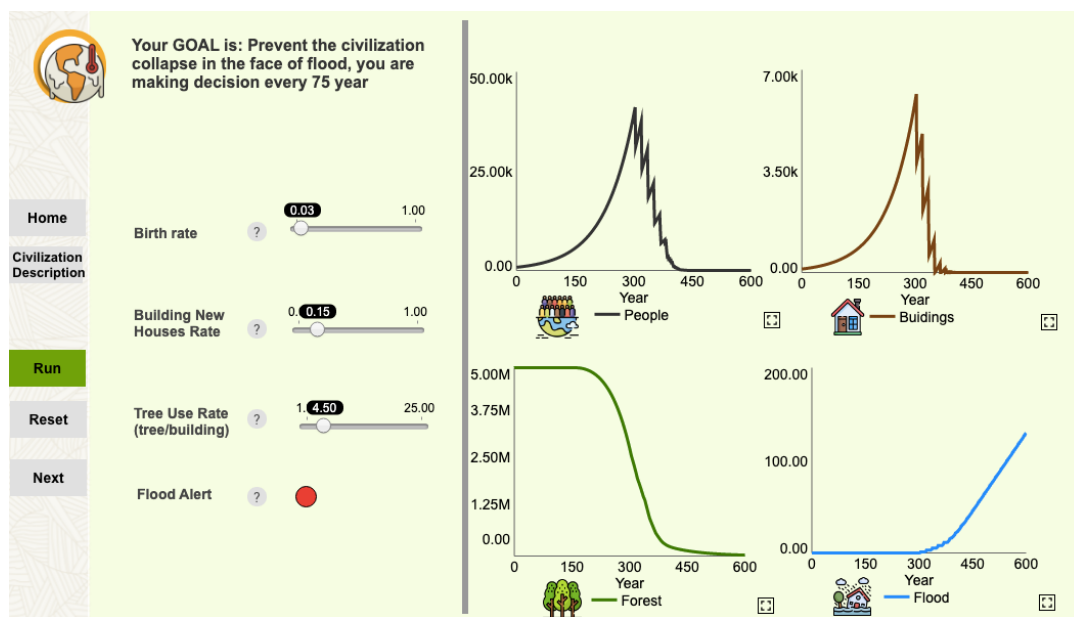
Learning objectives:

- Learning the systematic relations between different variables.
- Visualizing the system behavior over time.
- Ability to describe why different changes impact the system the way they do.
- Determine the most and least dominant changes.

System Resilience and Collapse Structure

This page is illustrating the data that participants have observed in animation form, they are provided with graphical behavior over time from main stocks and flows in the system. The participants can observe the relations between different variables at once. They are challenge to make descion every 75 years to avoid collapse while the sever flood alarm is red.

Its quite impossible to save the civilization after the severe and frequent floods season begins (around time 400), it will be a bit frustrating to do every possible change to save the system after the flood period, but the learning outcome is expected to flashed back on the **collapse** process is like an **iceberg**, and to be able to make change and safe the system one should not wait to see the crack on the surface.

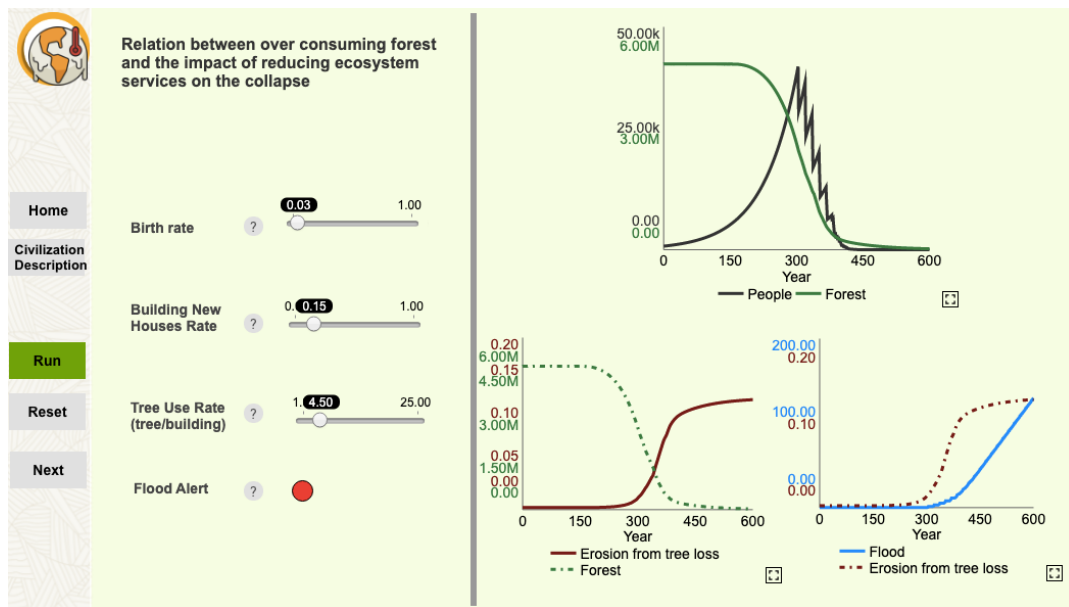


Learning objectives:

- Responsible decision-making and follow-up discussion.
- Climate feedback and human impact.
- Learning about the definition and the impact.
- Learning the relation between two important stocks (forest and population).
- The dynamic of the behavior over longer period.

Climate Change/Ecosystem Services

This page is illustrating the relation between stock and resource as well as how the lose of ecosystem services from the forest will cause climate change, such as soil erosion and frequent floods. Here the participant is given the chance to apply the gained knowledge from other sections and try to save system from collapsing by right decision-making.



Learning objectives:

- Learn about Resource management.
- The complexity of collapse process and system knowledge to avoid it.
- To understand that the goal is maintaining the balance.
- Avoid overshoot is a necessary step to avoid collapse.

Journal (Student's guideline)

Please keep your journal open while exploring the ILE, there are few tasks which the purpose is to help you get through the ILE. Log your experience and answers in this same file.

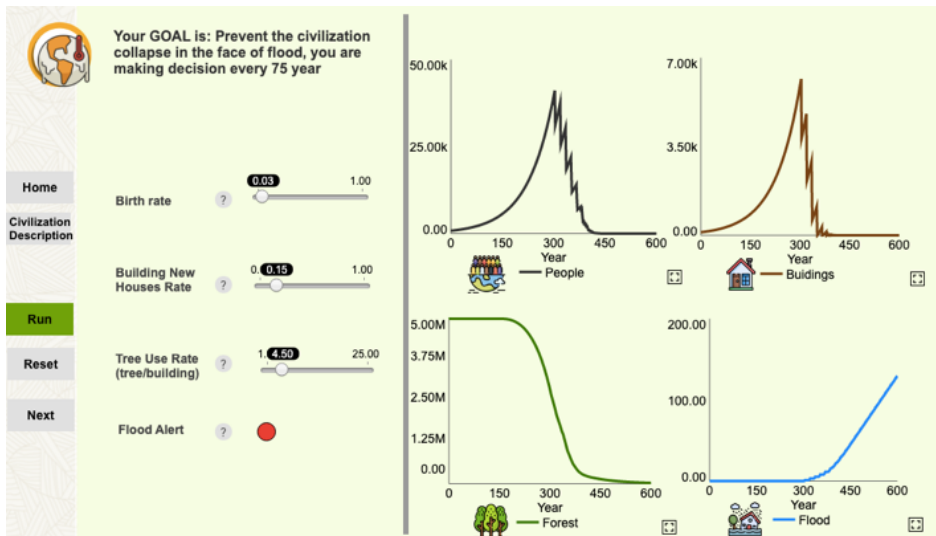
Main simulator



1. in the left-hand side, you have the list of the three main variable which we are experimenting and exploring their impact on the civilization collapse. They show their initial values, however by turning the knobs you can change the initial values.
2. **Run** the simulation, and meanwhile observe the animation and remember the changes which are happening over time.
3. When the population is less than 100, the simulation will stop which means your civilization has collapsed.
4. **Reset** the simulation and change the initial values for different variables and re-**Run** the simulation.
5. **Recommendation, change values one by one, that you have control over understanding each individual impacts on the system. Pay attention to, how each change will postpone or and avoid the collapse to happen.**
6. **Record** your observation about each change and its impact in relation with collapse in the box.

7. Which variable had the most impact on delay or and preventing the collapse?

System Resilience and Collapse Structure



Now you oversee the decision-making to achieve a sustainable civilization, you can manipulate the following:

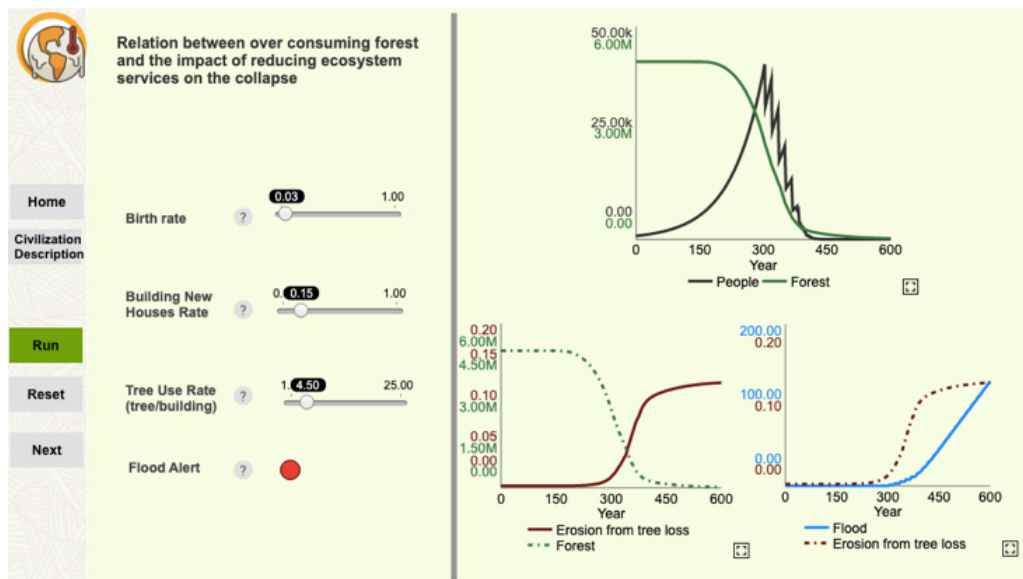
- Birthrate, which controls population growth.
- Tree use, which will affect both flooding and your ability to build buildings.
- Rate of building, which will determine both trees use and the number of buildings your city will contain.

You will make decision every 75 years, discuss your decision within your group before hit the **Run** button.

In each round of decision-making practice, you decide about birth rate, urban development rate, and rate of natural resources consumption rate for the development.

1. **Set** your initial value for all the variable, by turning the knobs.
2. **Run** the simulation.
3. **Repeat** 1 & 2 until the year 600 (end of the simulation) you finish the simulation.
4. When have you reached your goal? What variables did you change?

Climate Change/Ecosystem Services



This section is a follow up on the previous one, here you can see the dynamics behavior over time for the flood as well as soil erosion which caused by flood. This will help you to build more understanding of how elements of the system are related to each other.

Same as before you can make different choices to manage the system, in addition to the experience from previous stage, you have extra graphical data in this control room, which might help you to change your decision-making strategies.

1. You make decision every 150 years means 4 round of decision-making.
2. Make your mind, discuss it with your group.
3. Run the simulation.
4. Repeat the steps.
5. Did the comparative graphs give you any extra insight? If yes briefly explain.

6. When did you reach the goal? What was your strategy?

7. Were your decision-making strategies very different than the first exercise?

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Post-test

CLD building for the civilization collapse system