**What IS IT?**

This model explores the stability of an urban environment that is structured in such a way as to be robust to the ‘interruption’ of these networks. Such a system is called interruption if it tends to not follow another route to reach its junction when a pipeline/circuit breaks. In contrast, a system is robust if it tends to find an alternative route to reach its junction or another station will be able to carrier more work since one of the pipelines/circuits broke.

**How IT WORKS**

There is one main model.

In this version, there are multiple stations such as water, electricity and sewage stations that are structured in a way to be robust. If one of the stations break down another station will do double the work so all the buildings and houses will get what they need or if the circuits/pipeline gets destroyed, the water or electricity will be able to find an alternative route to reach its destination, Interruption like this will happen randomly. When all stations get destroyed and don’t cool down or the pipeline doesn’t get fixed on time all the residential and commercial buildings will stop collecting energy and water.

Each house and building will the same amount of income. If it uses more than the income that was given it will show a minus since indicating the houses are in debt/overdraft if it’s not on minus it will be normal. In this variation, the house will be able to generate income to lose some of the debt that they owe but won’t happen rapidly.

The city will be running on a weekly basis, and you will be to see how much energy and water is being consumed and produced depending on the time of day. (Morning, afternoon, evening, and night)

**How TO USE IT**

1. Adjust the slider parameters (see below), or use the default settings
2. Press the setup button
3. Press the go button to begin the simulation
4. Look at the monitors to see house much electricity and water is produced, how much the commercial and residential building generating income and how much it is in dept
5. Look at the INTERRUPTION plot to watch how many interruptions occurred over time, how much energy and water commercial and residential buildings consumed over time. To look at income and losses fluctuate over time.

**Parameters:**

Initial-number-commercial-income: How much income the commercial building will start with

Initial-number-residential-income: how much income the residential building will start with

House-gain-from-water: the amount of water a commercial and residential building gets for every water being consumed

House-gain-from -electricity: the amount of electricity a commercial and residential building gets for every water being consumed

Income-regrowth-time: how long it takes for the buildings to regrow income once it is spent.

Cost-of-water: how much it cost to buy water (might remove this since at different times of the day the cost of water stations will fluctuate)

Cost-of-electricity: how much it cost to buy electricity (might remove this since at different times of the day the cost of electricity stations will fluctuate)

Notes:

* When running the model once each house consumed any amount of water or electricity, one unit of income is deducted.
* There are monitors to show how much water and electricity is produced, how much left of income does each building have or if it runs into minus.
* There are graphs to show how many times there was an interruption, how much income was produced and deducted over time for each commercial and residential building.
* If the interruptions are not fixed on time the model run stops.

THINGS TO NOTICE

When running the urban environment robust system, watch as the interruptions and income spent and regrow fluctuate. Notice, that increases and decreases bounce back and forth due to the number of times the buildings need some water or electricity.