

Personal Resources Use

SOHO Conceptual Model

SELF-ORGANIZING SYSTEM

CONTEXT

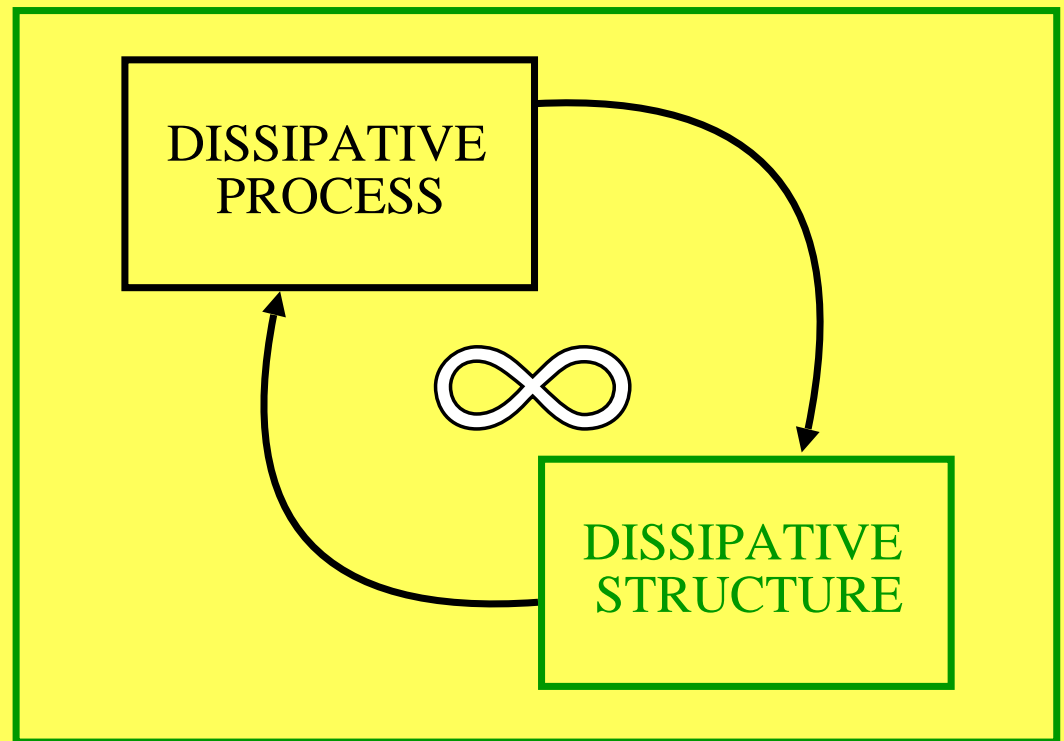
Physical Environment

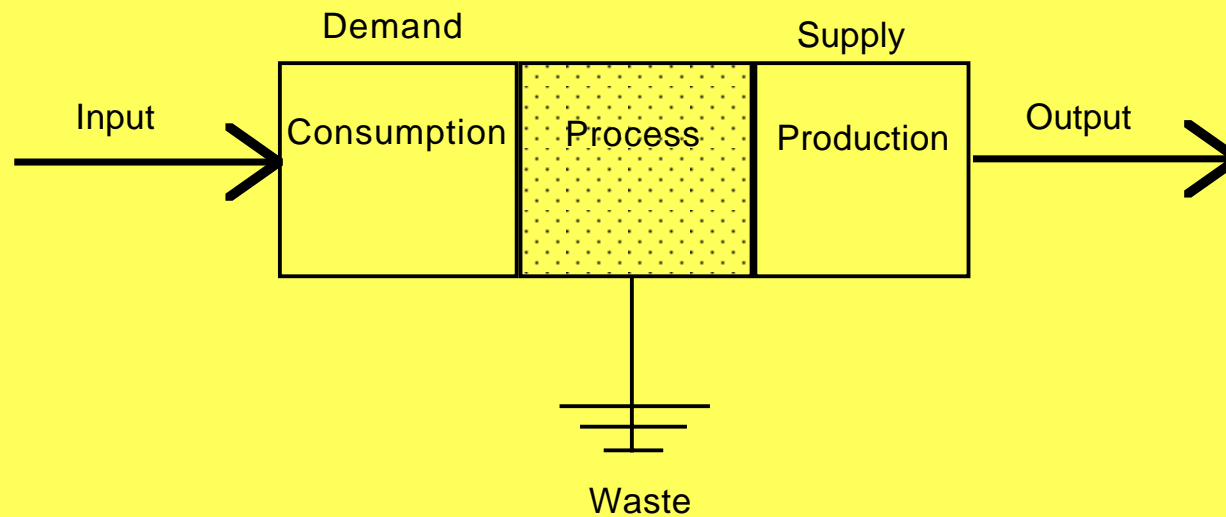
Flows:

Exergy (energy)

Material

Information





- **First Law: $\text{Input} = \text{Output} + \text{Waste} + \text{Storage}$**
- **Second Law: There is always waste, that is reduction in overall quality in any real process**
- **Every flow should be in terms of **Quantity** and **Quality****

Demand (basic biological)

- **Physical Environment**
 - Climate
 - Shelter (housing, work place, communal)
- **Material Flows**
 - Air
 - quantity, quality: Clean (Breath), Combustion (O₂)
 - Water (2L, drinkable)
- **Exergy (cooking, heating)**
- **Information (Vitamins in food)**
- **Food (all three types, safe and variety (micronutrients))**

Demand (economic)

- **Physical Environment**
 - Climate
 - Shelter (housing, work place, communal, other)
 - Economic Infrastructure (roads, power grids, water supply...)
- **Material Flows**
 - Air
 - quantity, quality: **Combustion (O₂) for fuels (cars, heating etc.)**
 - Water (Toilets, Showers, Dishwashers, Cleaning, Clothes, Car Washing (each has a different quality need, grey water))
 - Materials: Paper, Packaging

Demand (economic).....

- **Exergy**

- Electrical (High Quality)
 - Lights
 - Computers
 - Appliances
 - Entertainment
- Heat (lower quality)
 - Heating, Ventilation, Air Conditioning (HVAC)
 - Domestic Hot Water (DHW)
- Transportation
 - Vehicle
 - Air

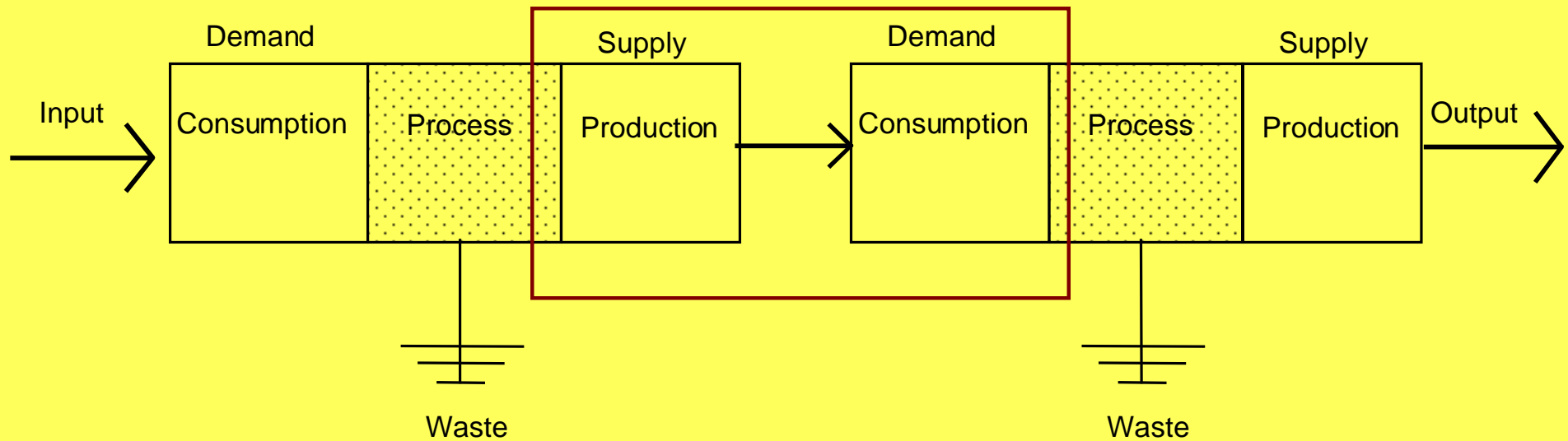
Demand (economic).....

- **Information**

- Data (Internet, paper flow)
- Video (Cable)
- Voice (Phone)

- **Waste**

- Heat
- Air pollution
- Solid
- Liquid
- Recycle
- Compost



- **Having identified the demands, how are they supplied? Where does the supply come from?**
- **Describe the system which provides the supply (Think of the "where does the electricity come from?" example.)**

Supply (energy)

- **Transportation**
 - Bike (1000-1500 km / year)
 - Car (22000 km / year, 2836 L \pm 144, 99 GJ)
 - Aircraft (15000 km/year)
- **Natural Gas (Kitchener Utilities.....)**
 - 2167 Cu M; 83 GJ (per year)
 - Heat
 - Hot Water
 - Clothes Dryer
- **Electricity (Kitchener Wilmont Hydro.....)**
 - 33 kw-hr/day \pm 2.2; 42 GJ/year
 - All other energy use

Supply (material & information)

- **Water (all potable) Regional supply**
 - 0.4 Cu M/day \pm 0.03 (400 liters)
 - 2 liters bottled water/day (Caledon Hills)
- **Food**
 - E.g. Meat: 6 kg beef, 15 kg chicken, Butcher in New Hamburg, Mennonite farm.
- **Paper and Packaging ????????**
- **Information: Rogers Cable, Bell Phone, Canada Post, UW ISP.....**

Supply (waste)

- **Waste**

- Heat (**total all energy**) into atmosphere and water
- Air pollution **??????**
- Solid (**1 green garbage bag per week**) (landfill)
- Liquid (**=water consumption**) (STP-Grand River-Lake Erie...)
- Recycle (**1 blue box per week**)
- Compost (**two composters on the go**)

CO₂ Emissions

www.climcalc.net

Appliances

(4% of your total carbon dioxide emissions)

Average Emissions:  0.38 t

Your Emissions:  0.33 t

Here are some suggestions on how to further reduce your carbon dioxide emissions:

- lower emissions 59%: Dry clothes on a clothes line
- lower emissions 13%: Install motion detectors for exterior floodlight security lighting
- lower emissions 9%: Install HPS lighting for exterior use (to replace 2 floodlights for security lighting)

Home Heating (8% of your total carbon dioxide emissions)

Average Emissions:  1.41 t

Your Emissions:  0.58 t

Here are some suggestions on how to further reduce your carbon dioxide emissions:

lower emissions 25%: Seal and Insulate Forced Air System Ducts

lower emissions 18%: Upgrade Wall Insulation to R-18

lower emissions 17%: Set thermostat temperature back 2 degrees

Hot Water (3% of your total carbon dioxide emissions)

Average Emissions:  0.46 t

Your Emissions:  0.21 t

Here are some suggestions on how to further reduce your carbon dioxide emissions:

lower emissions 42%: Wash clothes in cold water

lower emissions 38%: Install a condensing hot water heater

lower emissions 10%: Use the energy saving or light wash cycle 80% of the time

79% of emissions is travel

Local Travel (26% of your total carbon dioxide emissions)

Average Emissions:  2.08 t

Your Emissions:  1.96 t


Here are some suggestions on how to further reduce your carbon dioxide emissions:

lower emissions 6%: Reduce speed to below the speed limit

lower emissions 6%: Don't use air conditioning

Out-of-town Travel (53% of your total carbon dioxide emissions)

Average Emissions:  1.43 t

Your Emissions:  4.02 t

Here are some suggestions on how to further reduce your carbon dioxide emissions:

lower emissions 0%: Reduce speed to below the speed limit

lower emissions 0%: Don't use air conditioning

7.6 t vs 6.5 t

Recreation (0% of your total carbon dioxide emissions)

Average Emissions:  0.14 t

Your Emissions:  0 t

There are no suggestions on how to further reduce your carbon dioxide emissions at this point.

Waste (6% of your total carbon dioxide emissions)

Average Emissions:  0.60 t

Your Emissions:  0.46 t

There are no suggestions on how to further reduce your carbon dioxide emissions at this point.

An excellent ERS 218 systems assignment...

- **clearly identified the various systems on which you rely**
- **traced the resources you depend on for these systems from “source to sink”**
- **presented this information in a clear and concise way, using data when appropriate**
- **provided sources for any data/ideas which were not originally yours**
- **was presented neatly, type written and was on time**

Things to avoid in the future...

- **PENCIL / HANDWRITING** neither pencil nor handwriting are appropriate for university level assignments. Anything you hand in written in not typed in the future will not be marked. (neat diagrams are the only exception, but these are more effective in pen)
- **SPELLING!** You all have spell checks. Use them! Sloppy spelling takes away from good work.
- **GRAMMAR!** Read your assignment aloud to yourself or someone else. Does it make sense? Try to be clear and concise - you don't get extra marks for sounding complicated!

Things to avoid in the future...

- **PLAGIARISM** - failing to provide sources for information which is not yours, (including data, graphs, maps, charts etc.) constitutes plagiarism. This is also true for information you download from the web. **ALWAYS** cite your sources. The department rules are very clear about this issue, and they will be enforced.
- **GOLDEN RULE:** Consider this: Professors/TA's have dozens and dozens of assignments to mark. Don't make their lives harder by packaging your ideas (as brilliant as they may be) in a way that makes it difficult for us to comprehend them. Single spacing, handwriting, tiny font and no margins makes for grumpy markers!

Observations

- **The supply used to meet the demand is limited by the infrastructure and supply available. (No H₂ fuel, public transit (trains), non-potable or grey water system.) This determines your lifestyle!**
- **Match supply quality to demand as much as possible.**
 - Switch to NG DHW from electric
- **Be as efficient as possible:**
 - Compact flourescents
 - Low flush toilets
 - High effeciency gas furnace
 - Dishwasher and Fridge
 - Use bike
 - One car
 - 3R

NUMBERS

- **38.4 MJ/ CU M natural gas**
- **3.6 MJ/ Kw-hr**
- **34.8 MJ/ liter gasoline**
- **100 cu-ft = 2.83 cu m**
- **1000 L = 1 cu m**