Systems and Feedbacks

Intro to Environmental Science

DartmouthX

System:

any set of interacting components that influence one another by exchanging energy or materials

Open system:

exchanges of matter or energy occur across system boundaries

Closed system:

matter or energy is not exchanged across system boundaries

Inputs - Outputs = Net Flux

System analysis:

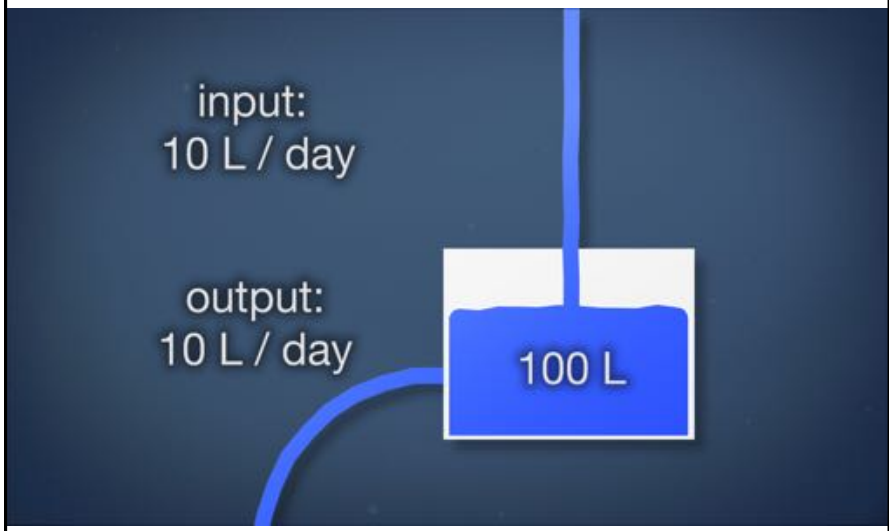
study of the inputs, outputs
and changes in a system
under various conditions

Steady state:
when a system's
inputs and outputs
are equal
(net flux = 0)

Mean Residence Time:

average time a typical
molecule remains in the system

$$MRT = \frac{\text{volume of pool}}{\text{flux}_{\text{in or out of a system}}}$$

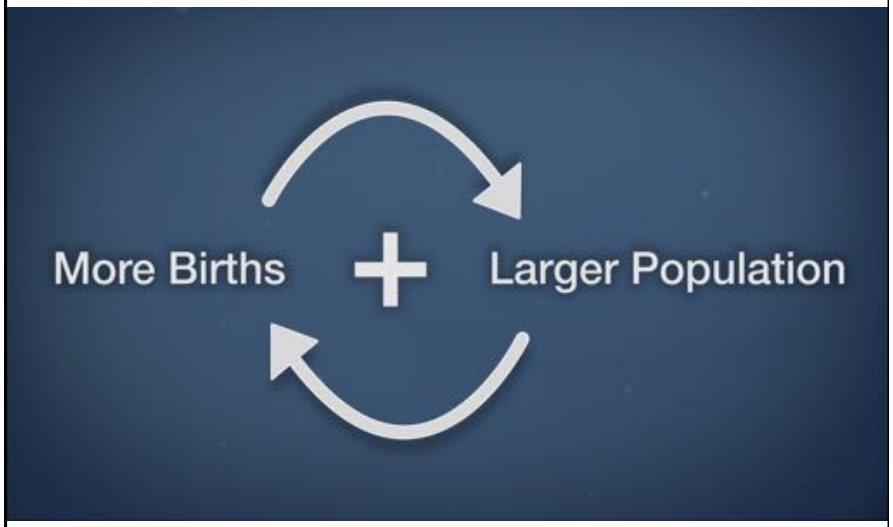


$$MRT = \frac{100\,L}{10\,L\,/\,day} = 10\ days$$

Feedback:

adjustments in input or output rates caused by changes to a system

Positive feedback:
amplifies change in system by causing further increase or decrease



Negative feedback:
resists change by returning to original state or slowing rate of change

Negative feedback loops help to stabilize environmental systems