



Universidade de São Paulo
Escola Superior de Agricultura “Luiz de Queiroz”
Departamento de Engenharia de Biossistemas



LEB 244 – Aula 4

Diagrama de Linguagem Energética

Prof. Thiago L. Romanelli
romanelli@usp.br

O que é um diagrama?

Um diagrama é uma representação visual estruturada e simplificada de um determinado conceito, idéia, processo.

como vc representaria:

1. Uma floresta plantada
2. Uma cidade
3. Um ecossistema

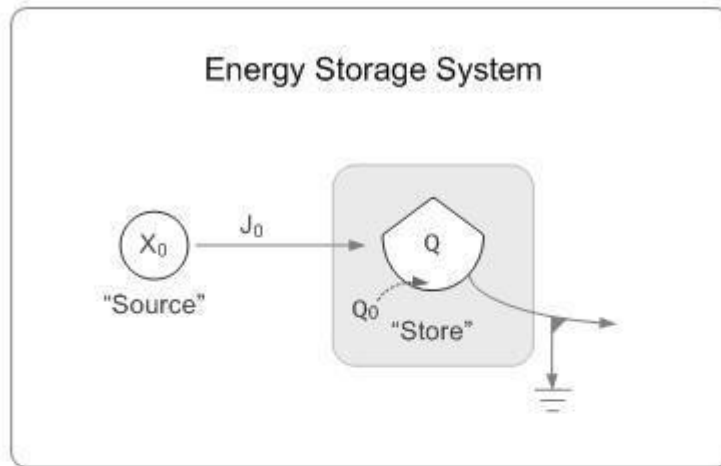
Howard T. Odum



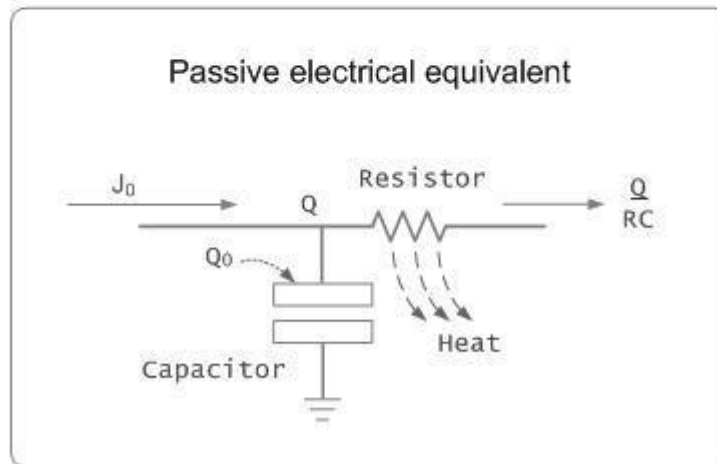
1924-2002

- Ecological modeling
- Ecological engineering
- Ecological economics
- General systems theory

Analogia ecológica da Lei de Ohm



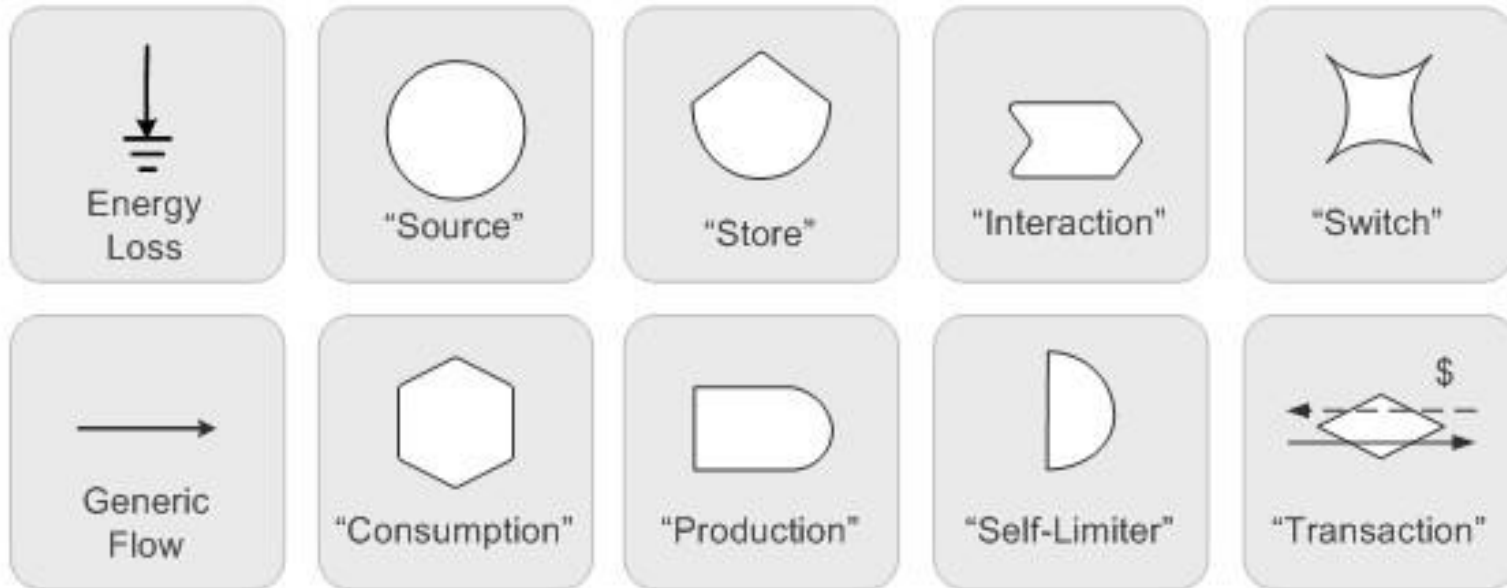
Fluxo (J) é proporcional à força termodinâmica (X) com a condutividade (C)



Adapted from H.T.Odum (1994) Fig. 3-8, p. 35

Linguagem energética

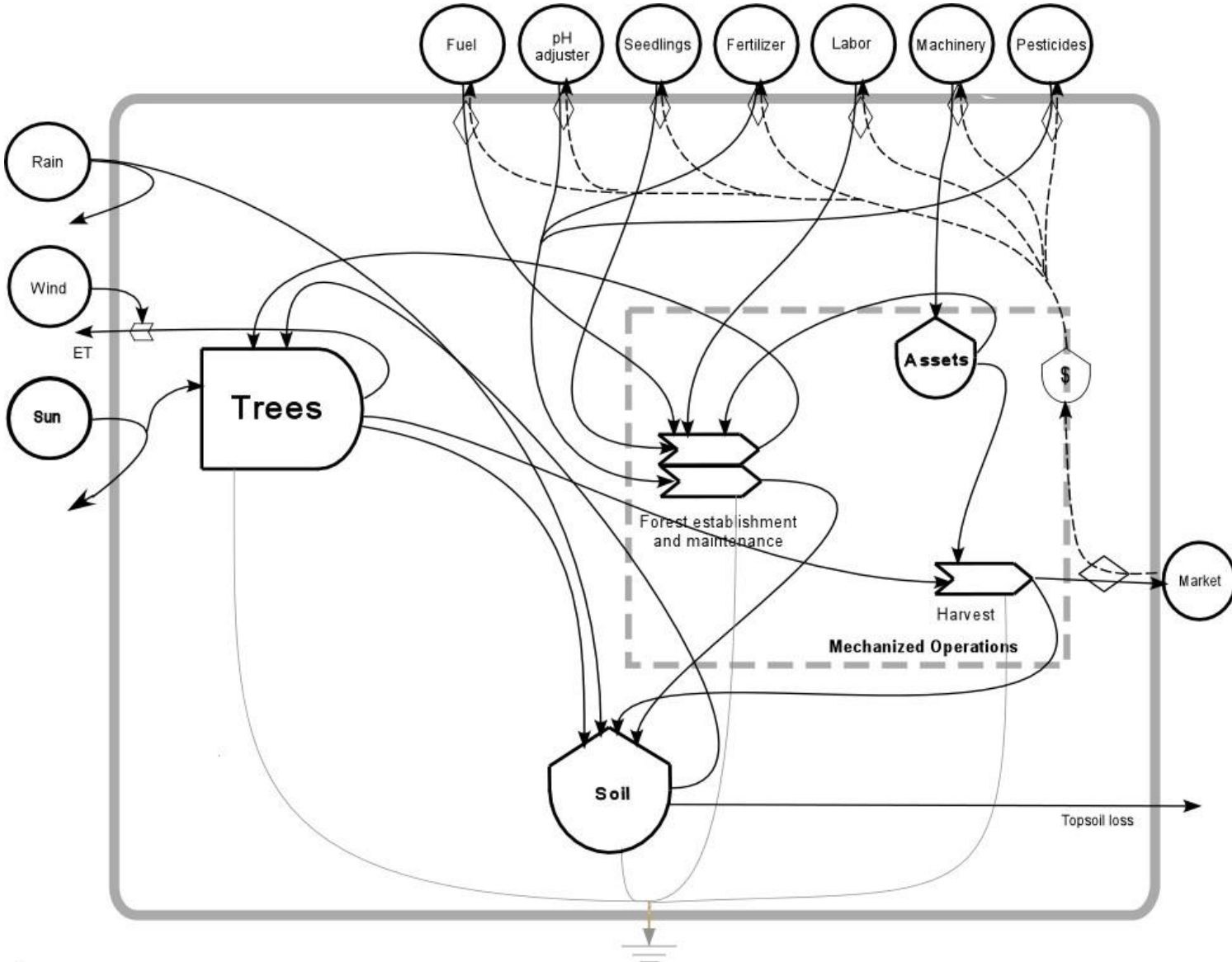
“Energese”



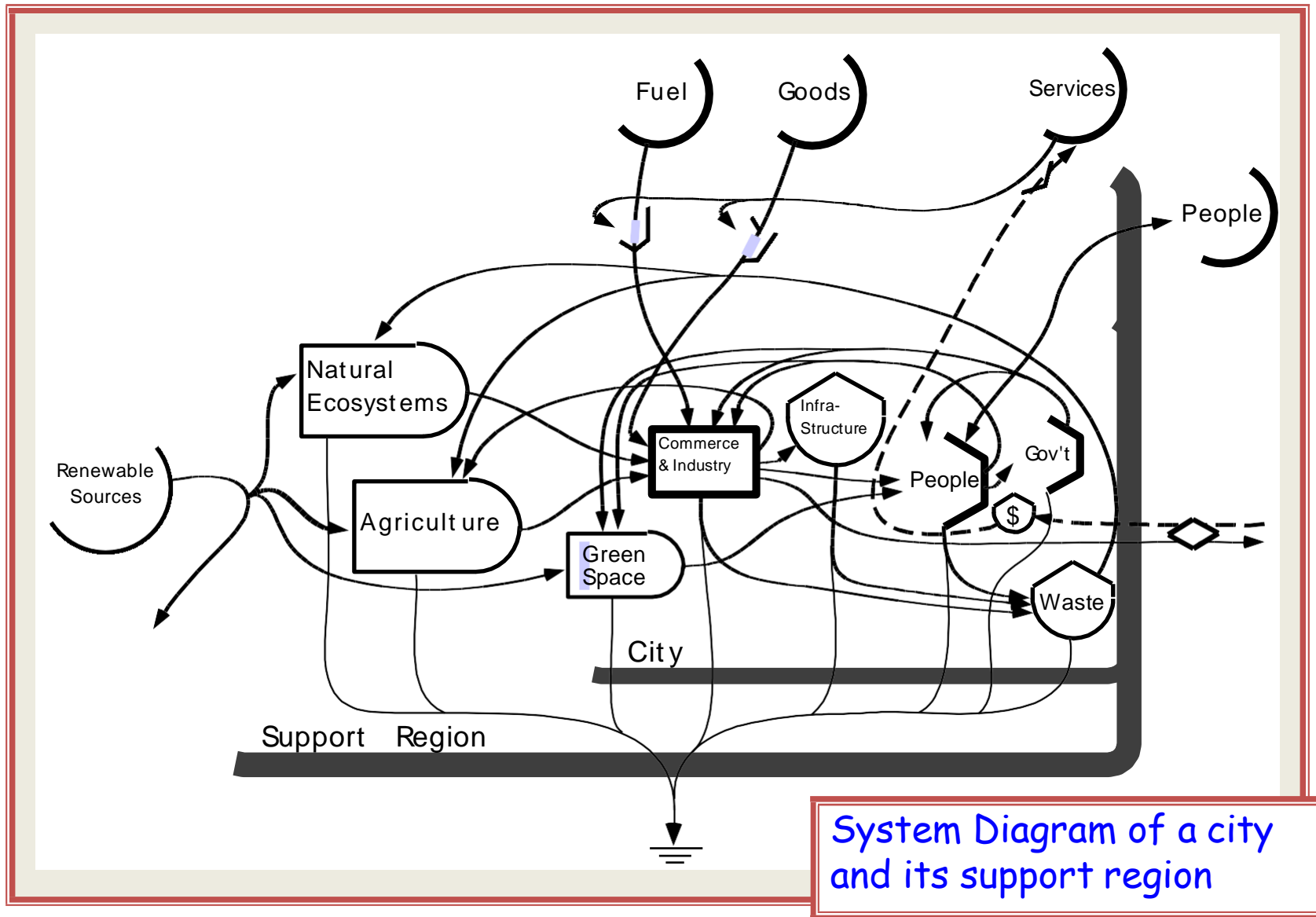
Produced by Sholto Maud using Microsoft VISIO™.
Symbols available from author as VISIO™ vss stencil

H.T.Odum's System of Generic Symbols (Energy Circuit/Systems Language Symbols)

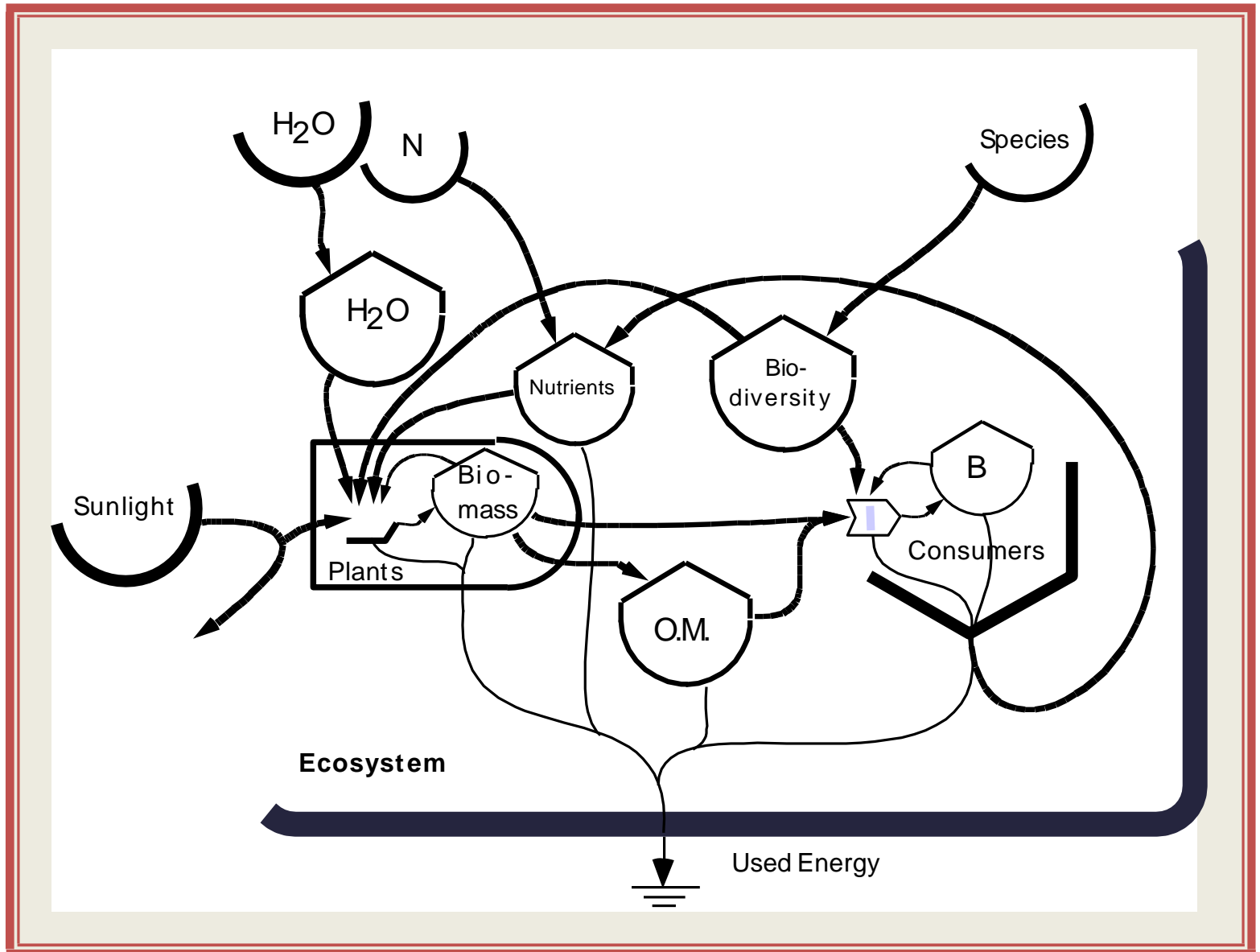
Floresta plantada



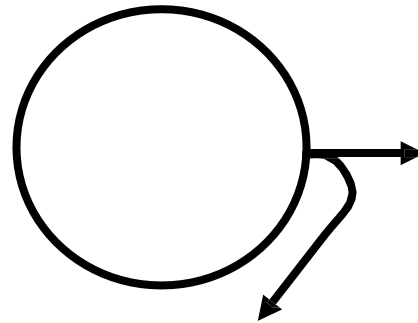
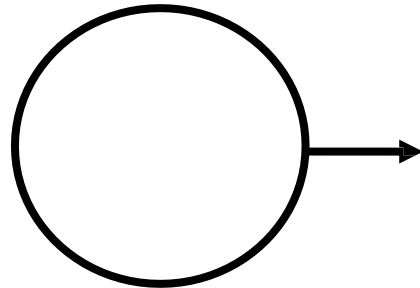
Cidade



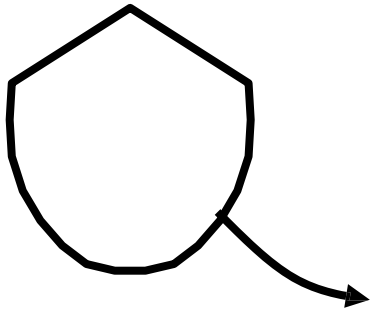
Ecosystem



Fonte externa

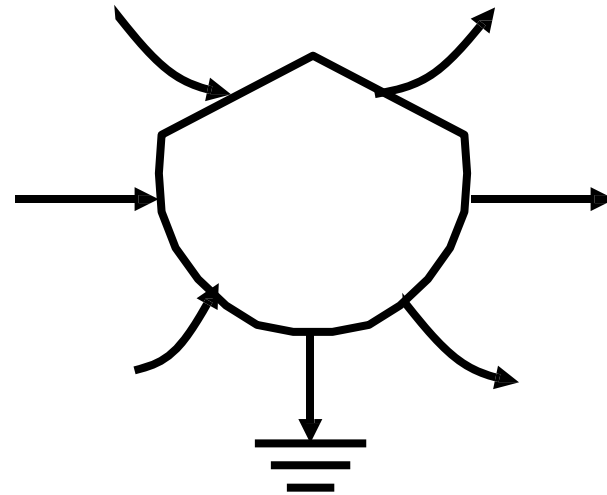


Estoque

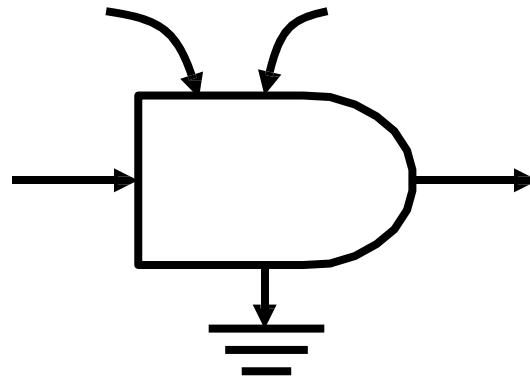


Fonte externa
não renovável

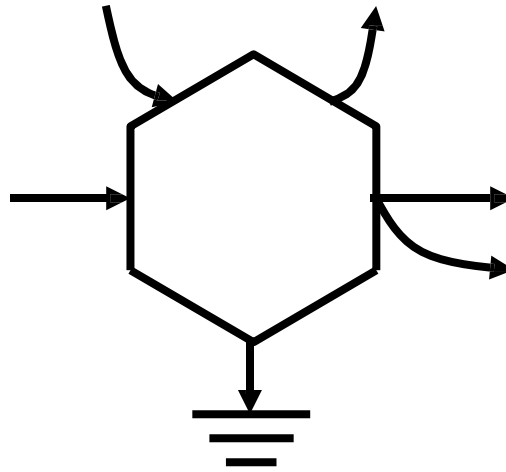
Estoque interno



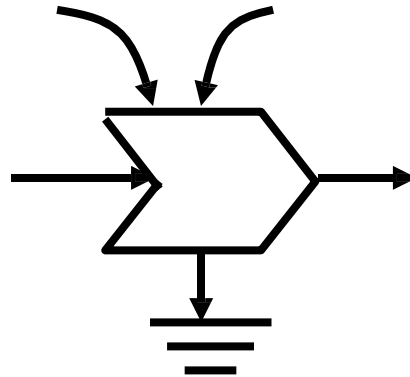
Produtor primário



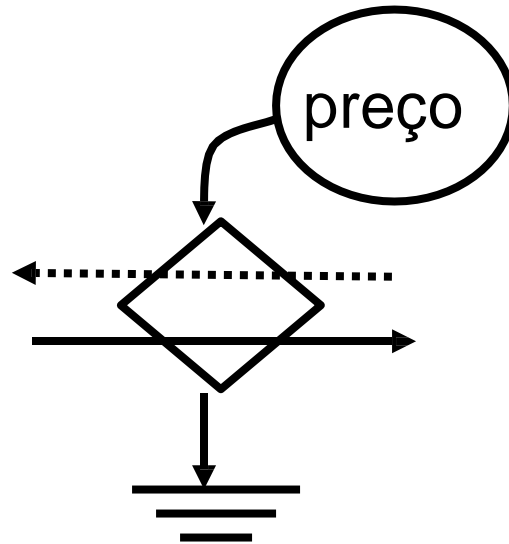
Consumidor



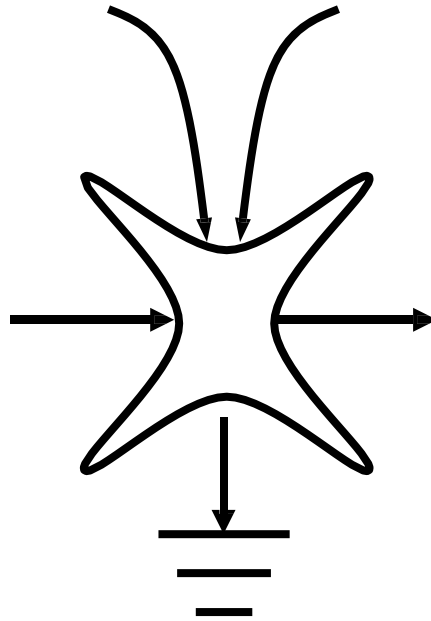
Interação



Transação



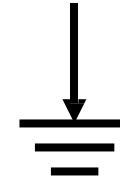
Interruptor



Fluxo de Energia

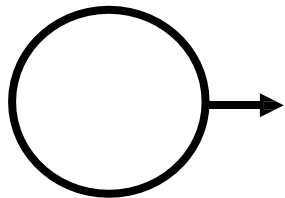


Sumidouro de Energia

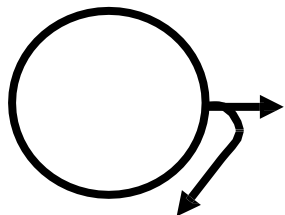


Sistema ou subsistema

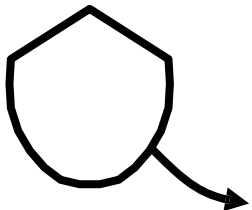




Fonte externa
ilimitada



Fonte externa
renovável
limitada



Fonte externa
não renovável
limitada

Símbolos com conexões

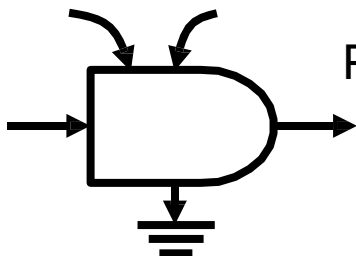
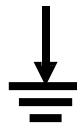


Sistema ou subsistema

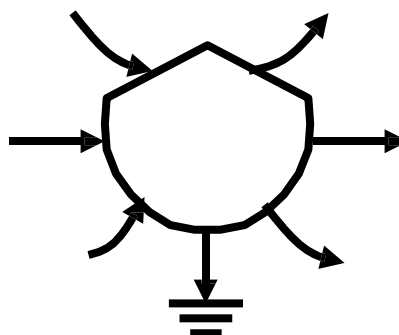
Fluxo de Energia



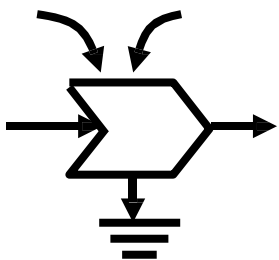
Sumidouro de Energia



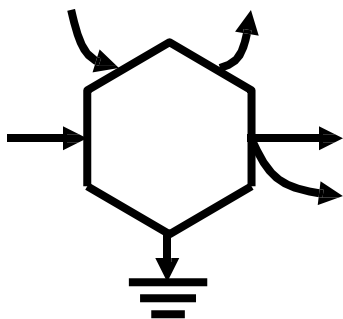
Produtor



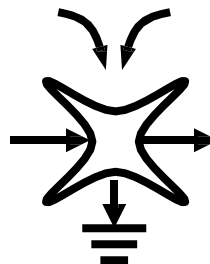
Estoque
interno



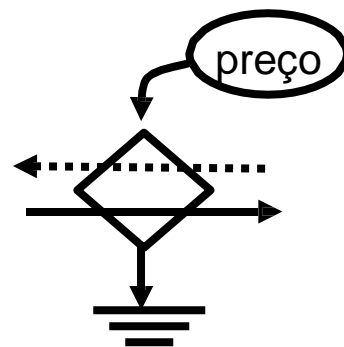
Interação



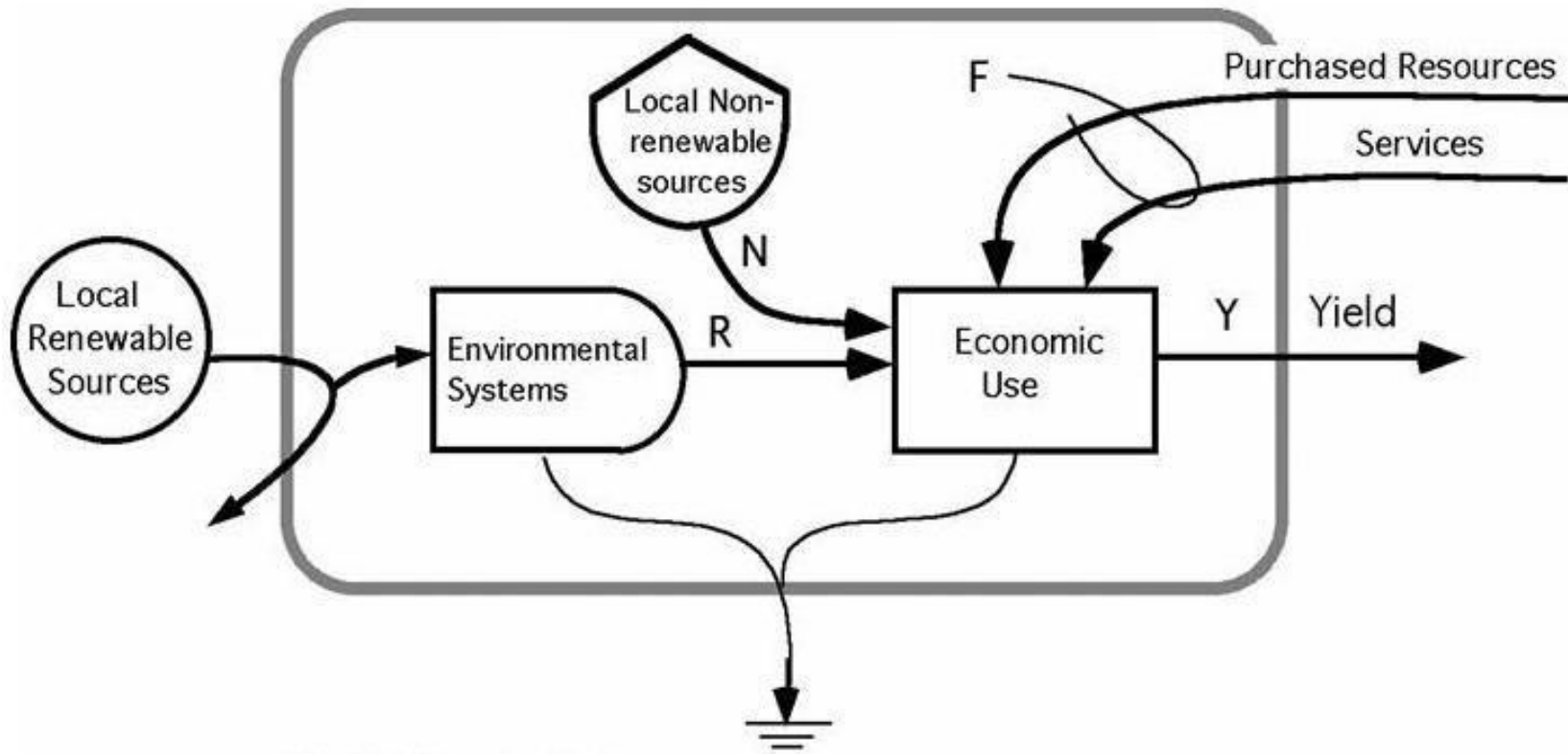
Consumidor



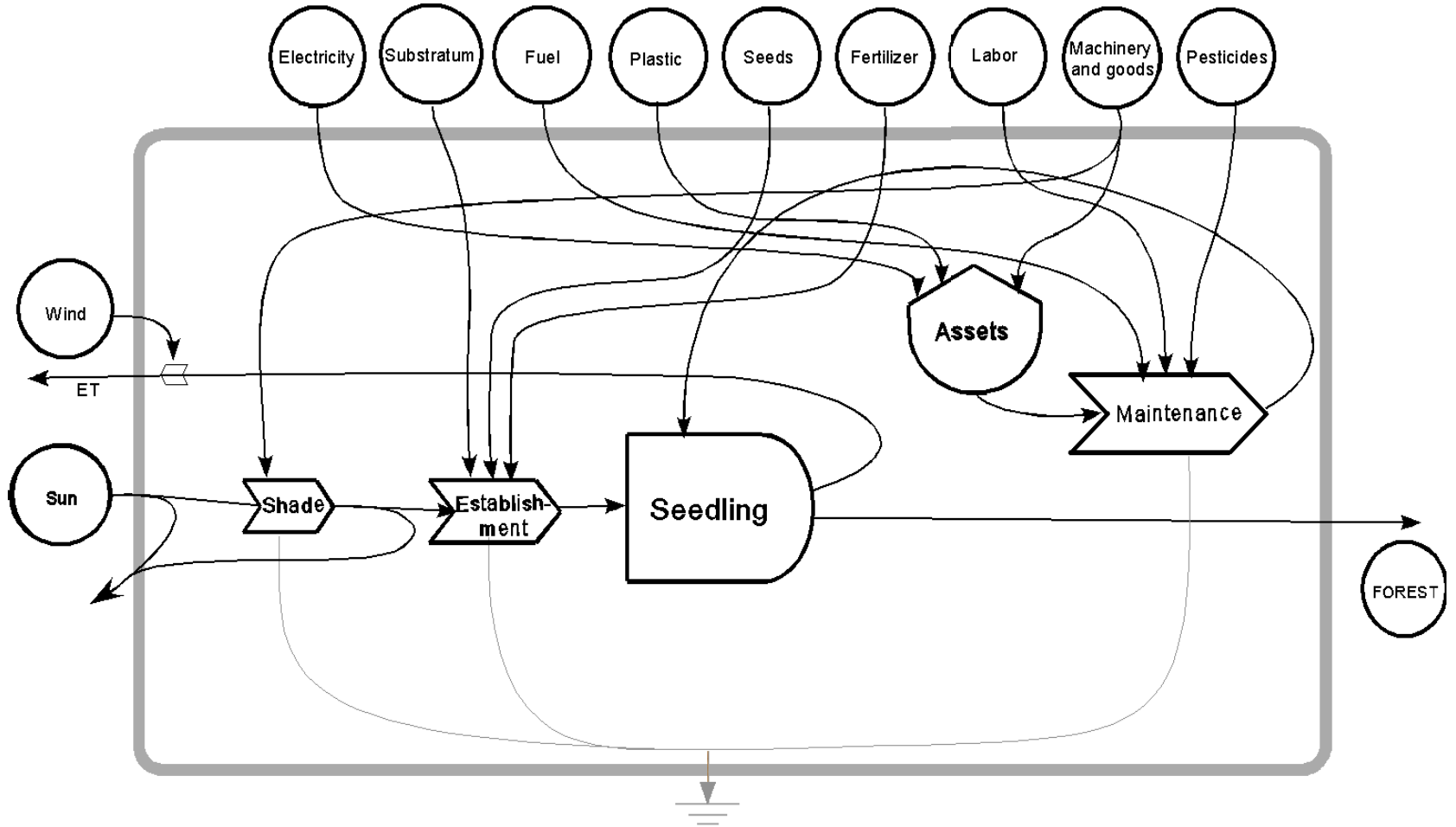
Interruptor



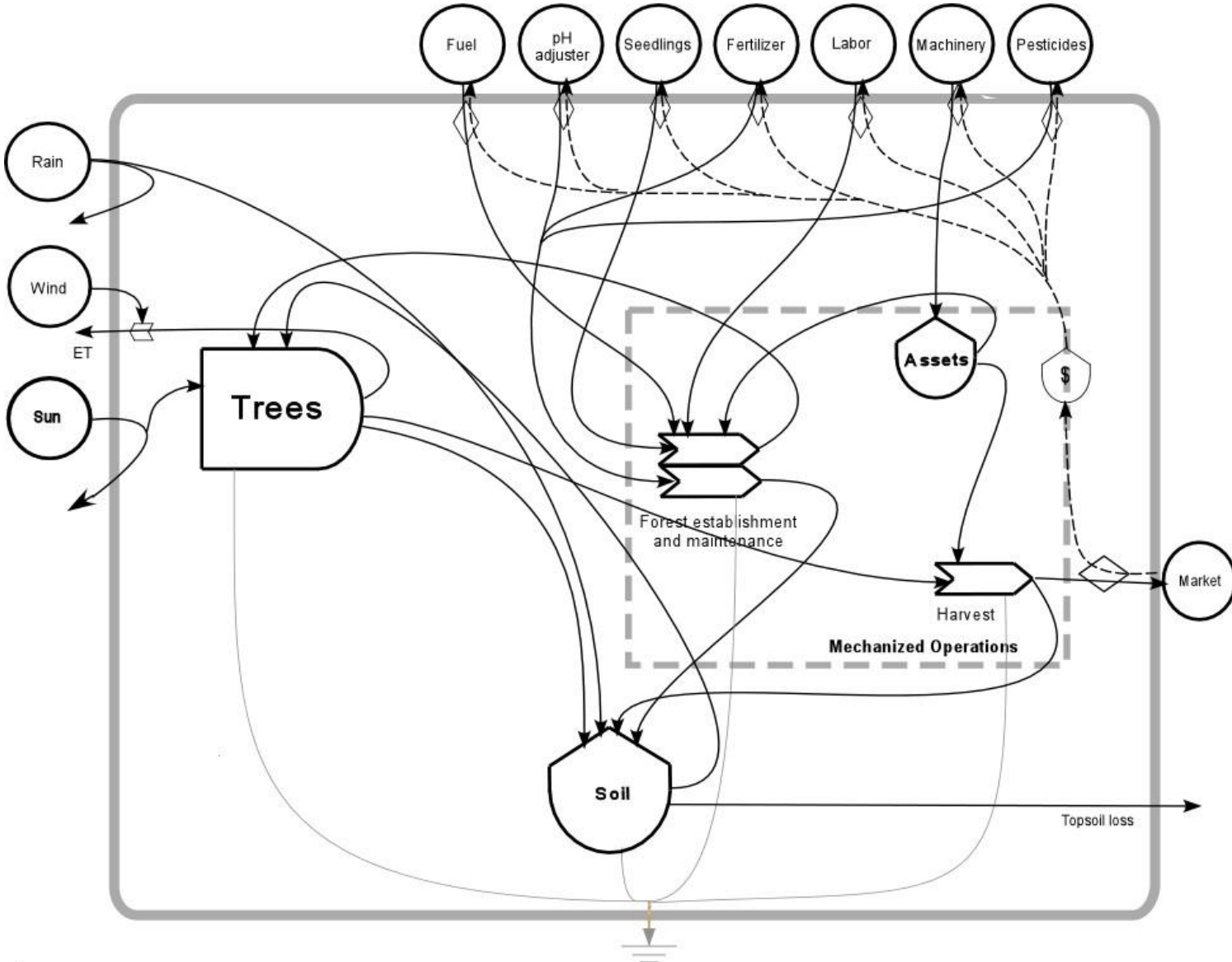
Transação



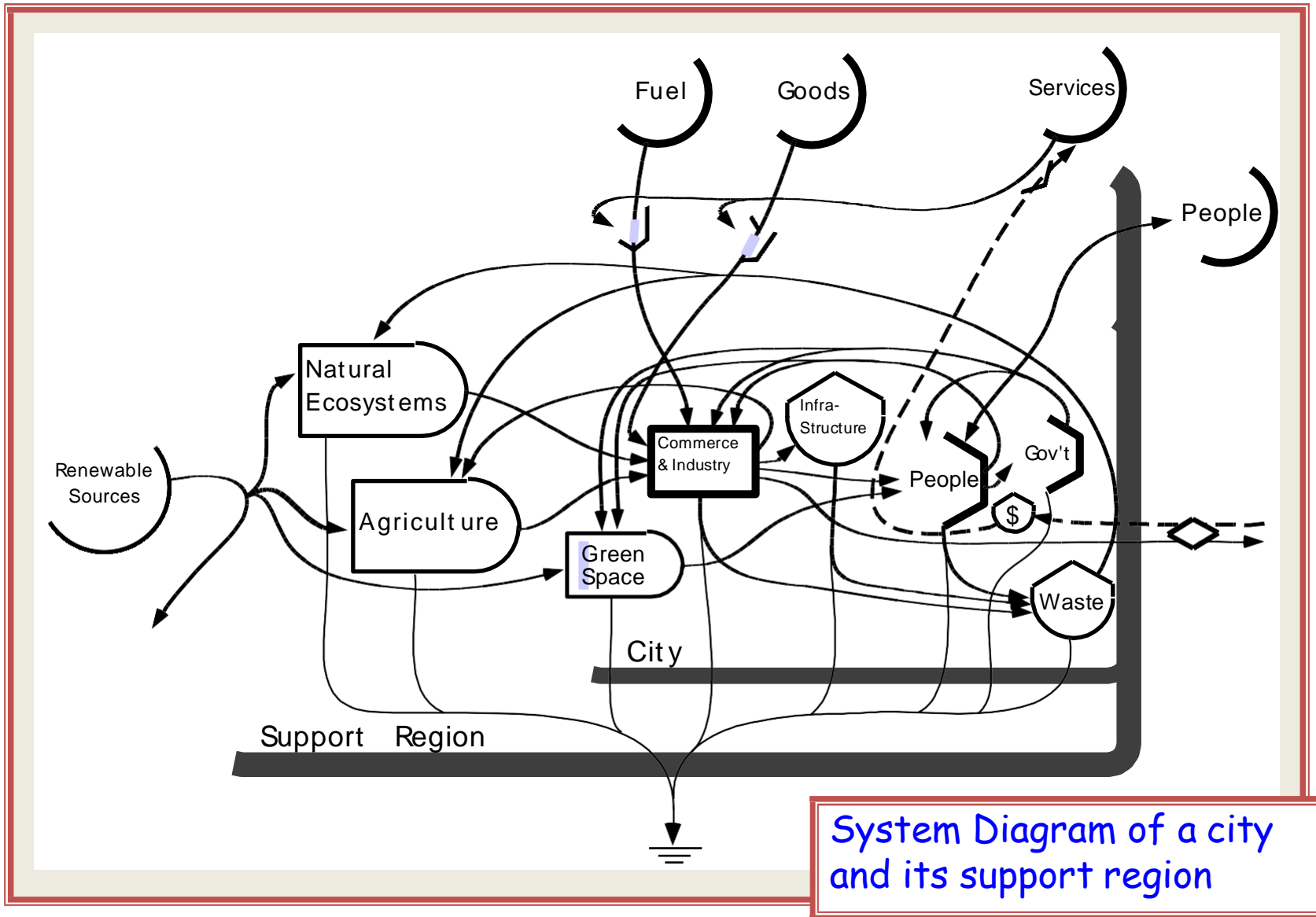
Produção de mudas



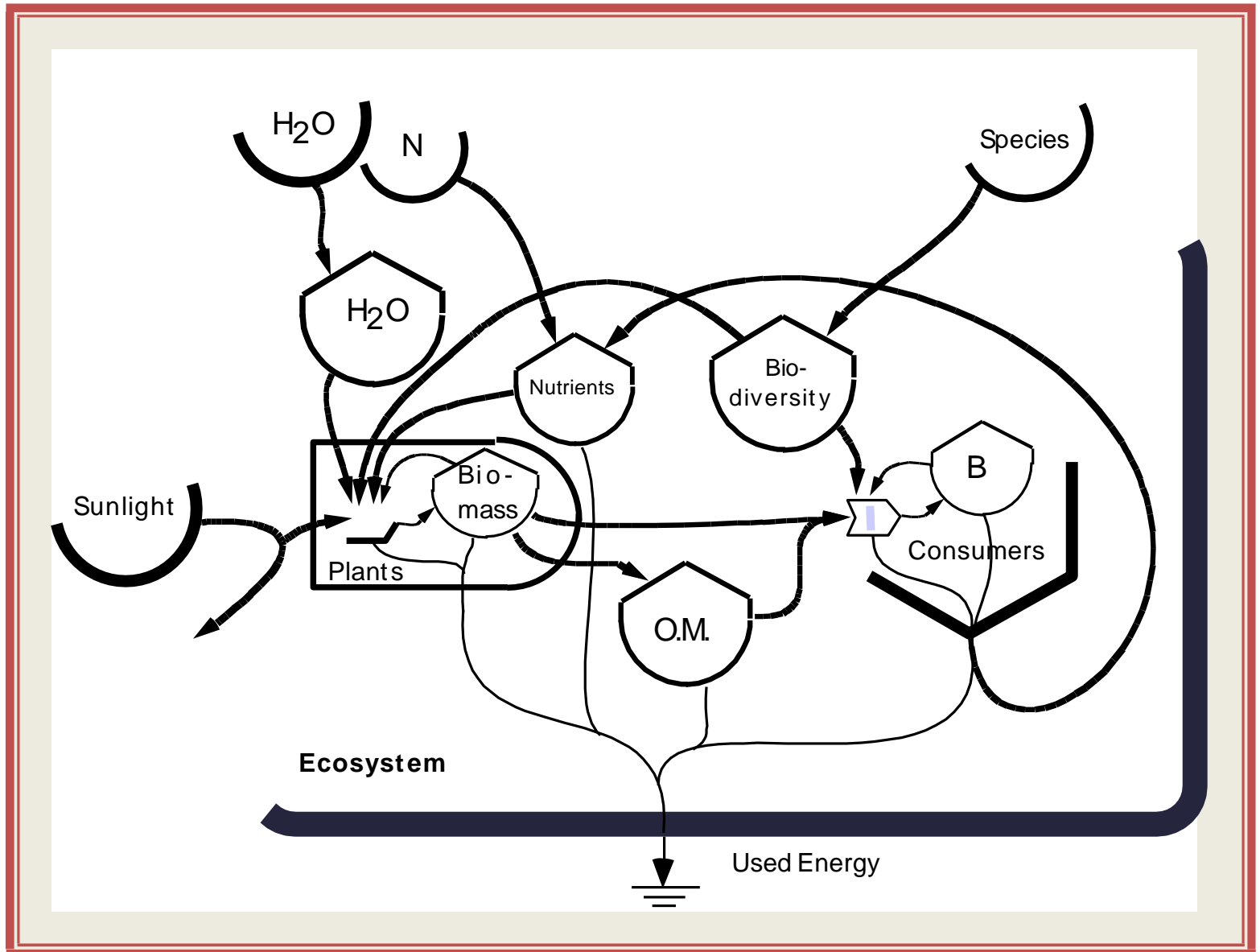
Produção de eucalipto



Cidade



Ecosystem



Exercício

Desenhe o diagrama de um sistema de produção.