

Introduce Metaphor:

Engine
Organism
Garden

Metabolism

6 Aug 2013
Tue MKH

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Part I - material flows

The metabolic Economy:
A model for
material and
energy flows

Blue notes
from 7 Aug
2013

PERKS

~~KRAPS~~ diagrams like figs 7.1, 7.2

Do for Examples A-C
Link to KLEMS database?

Issues:

Why include?

- Economy's material
- Introduce examples A, B, C
- Introduce Auto industry production as a case study.

- Oil and coal: \dot{S} , \dot{R} or \dot{E} ? I think \dot{R} at this point
Switch to \dot{E} later!
- Include \dot{Q} (waste heat)? No \rightarrow not a material flow
 $\text{CO}_2 \rightarrow \dot{S}$ flow to environment
 \dot{S} into sector from env. (free O_2)
- Write material balance eqns? No. Not helpful. Maybe 1 or 2.
Say masses balance.
- What about \dot{E}_{34} (and others)? Bundle into \dot{R}_{34} or \dot{S}_{34}

Intro
material
flows
some don't
accumulate,
some do.

Classification
based upon
use!
Context is
everything.

Part II - Energy Flows

- Energy flows like Fig 5.1, 6.1, etc.
- Extract energy flows from mat'l diagrams.

Energy becomes the focus. Direct Energy assoc. w/ ~~all~~
all of mat'l flows. Only
some is numerically significant.

- Add \dot{Q} \rightarrow from part I

- Some \dot{S} , \dot{R} are \dot{E} flows.

- ^{derive} 1st Law, Total Energy, embodied energy eqns

- Don't link to X yet

- Link to ~~SEA~~ ^{KLEMS} data from Becky?

- Do for Examples A, B, and C.

- Include Society (2) in the eqns.

- ~~FF~~
- Electr.
- waste heat

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Part III Currency and value flows.

- Leverage MKH notes from 24 July 2013
- Do for Examples A, B, C
- Link to BEA and Becky's work
- Address value creation (value add)
 - Inflation (Fed) and need for ~~inflation~~ ^{inflation} - adjusted currency flows
- Include both X and C diagrams.
exposes assumptions
- Issue:
 - If BEA already accounts for upstream inputs, is that compatible with matrix inversion approach?

Part IV - Energy Intensity ~~calculations~~

- link Part II (energy) with Part III (currency and value) to derive energy intensity formulation (E_s)

~~Issue Accumulation of embodied energy vs. E_s . Can't distinguish~~

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Part II - Implications

- Accumulation of embodied energy vs. Σ .
Can't distinguish.
- dB/dt is an error term.
- Energy Quantification (thermal, exergy, useful work)
- Boundaries
- etc.

- Use Example of auto production throughout

- What of knowledge?

- increase efficiency?
- decrease waste?

- reduce material in P to accomplish same ends?