Cybernetic planning and climate change reversal

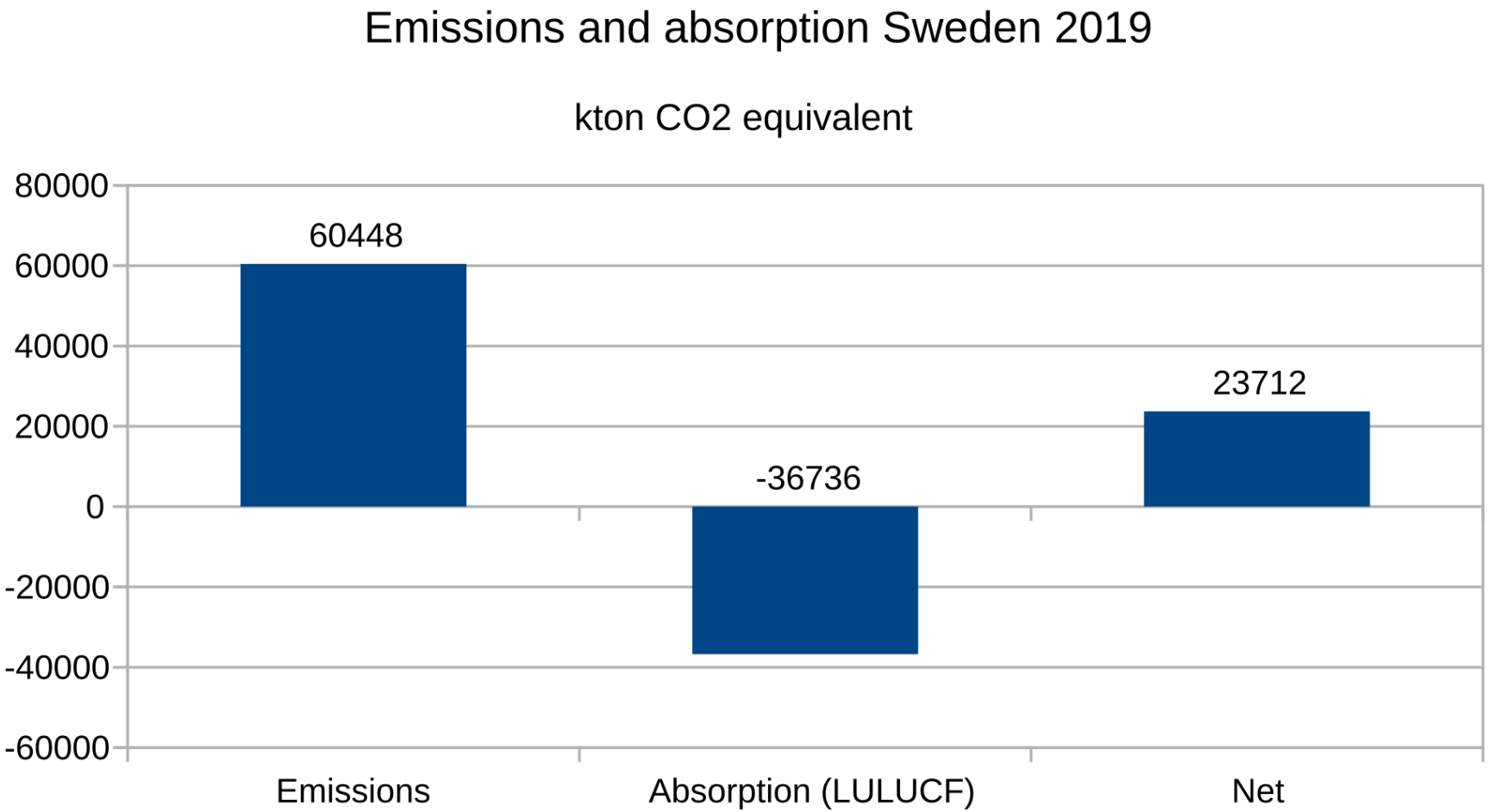
Presentation at Marx 2022

ABF Stockholm

October 31, 2022

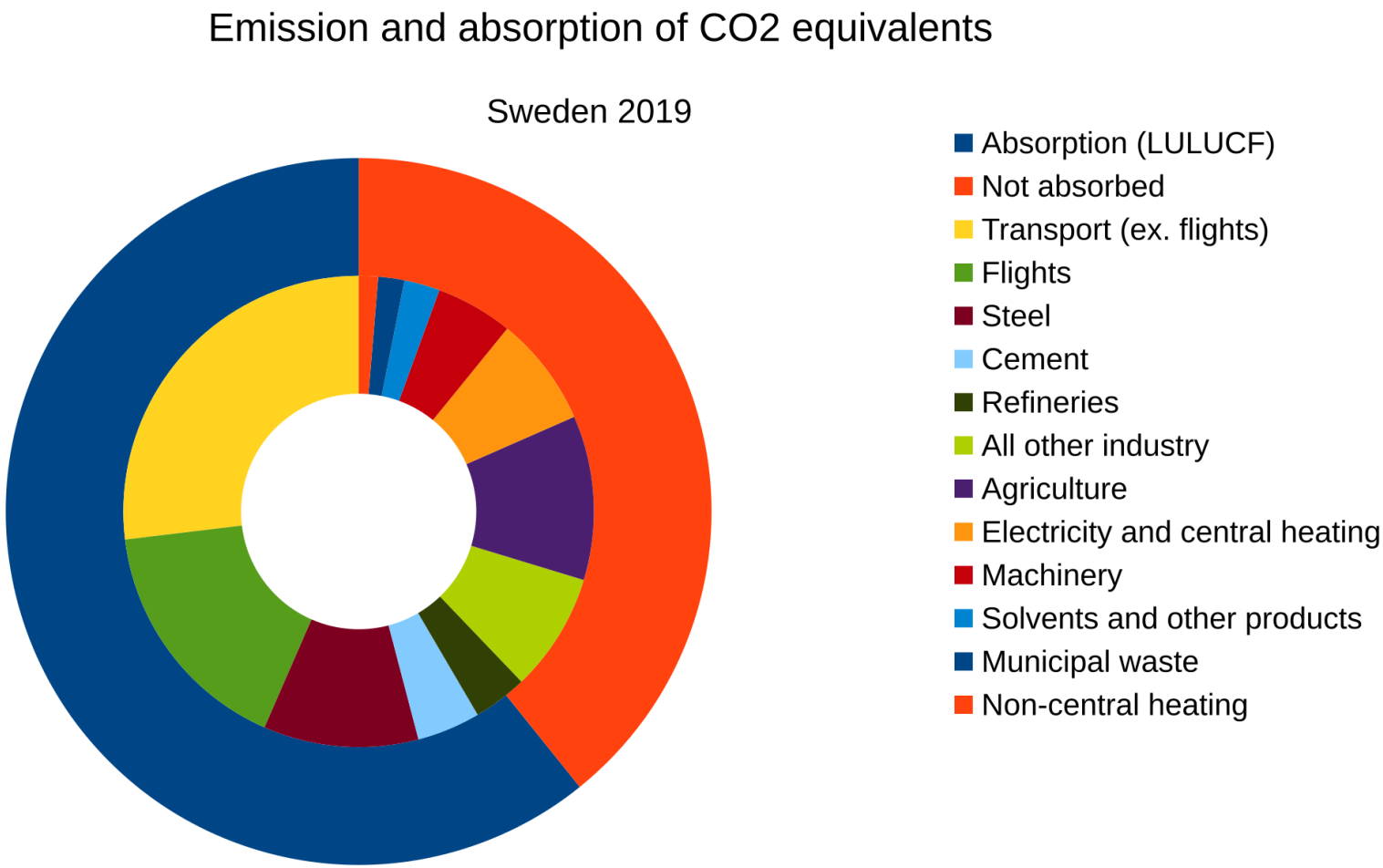
Planning climate reversal

The situation



- A reduction by 40% is needed to reach net zero.

The situation



Sources: https://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START__MI__MI0107/TotaltUtslappN/

https://www.sverigesnatur.org/aktuellt/de-slappte-ut-mest-koldioxid-2021/

Motivation

- Climate situation requires physically sequestering CO_2
- CO_2 is an 'externality' in market economies
- Large-scale investments and technical exploration needed

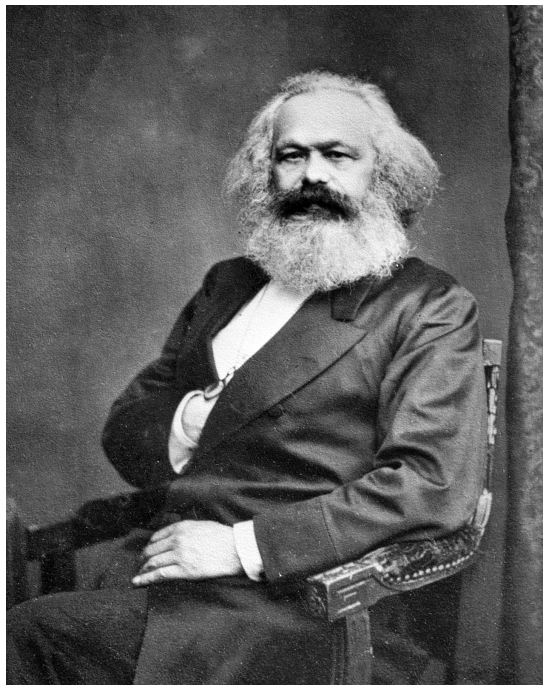
Planning and worker participation essential

Ideas on economic planning

History of ideas: 1860s

Let us now picture to ourselves, by way of change, a community of free individuals, carrying on their work with the means of production in common [...] Labour time would, in that case, play a double part. Its apportionment in accordance with a definite social plan maintains the proper proportion between the different kinds of work to be done and the various wants of the community.

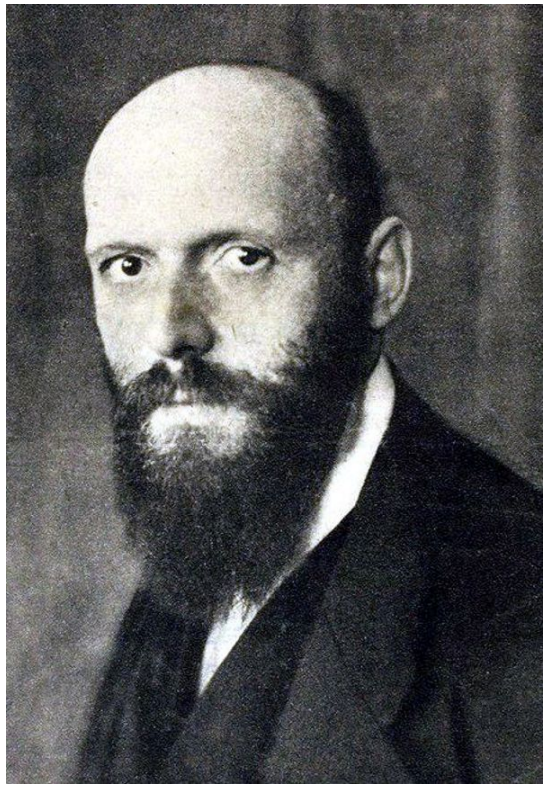
Marx, K., *Capital*, vol. I, ch. 1, sec. 4, 1867.



History of ideas: 1910s

Otto Neurath

- Advocated total socialization, in-kind calculation
- Worked at the Department of War Economy
- "War headquarters" (Kriegszentralen) organized Austro-Hungarian war production
- Bavarian Soviet Republic
  - Kranold-Neurath-Schumann plan



History of ideas: 1920s

Gosplan

- USSR, 1921
- Strategic planning
- Pen and paper (initially)
- Partly computerized

History of ideas: 1970s

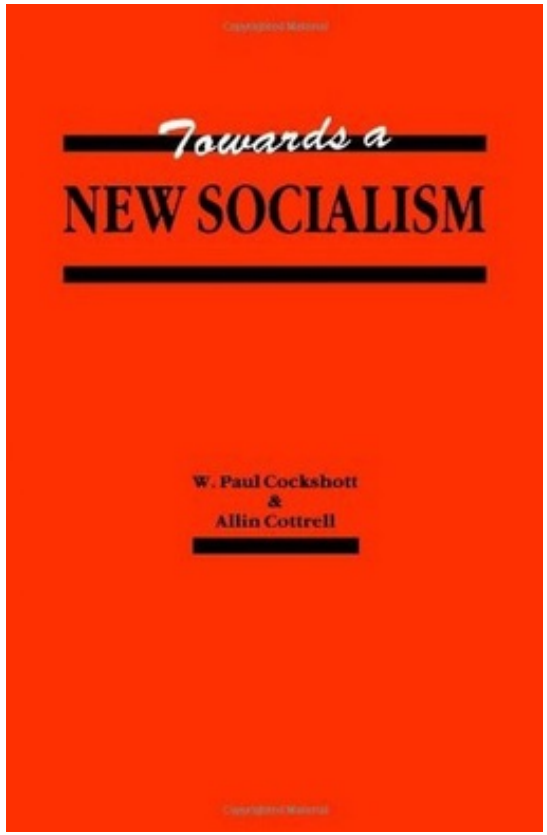
Project Cybersyn

- Chile under Allende, 1971
- Stafford Beer's VSM
- Tactical and strategic planning
- Networked
- Computerized

History of ideas: 1990s – present

Towards a New Socialism, Cockshott & Cottrell, 1993

- Linear programming
- Modern computer technology
- Radical democracy, sortition
- *Cybernetic socialism* emerging

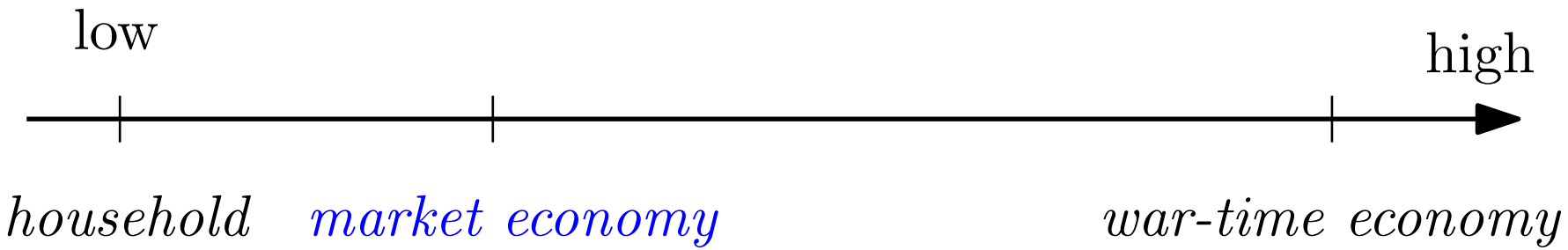


Cybernetic planning

What is cybernetics?

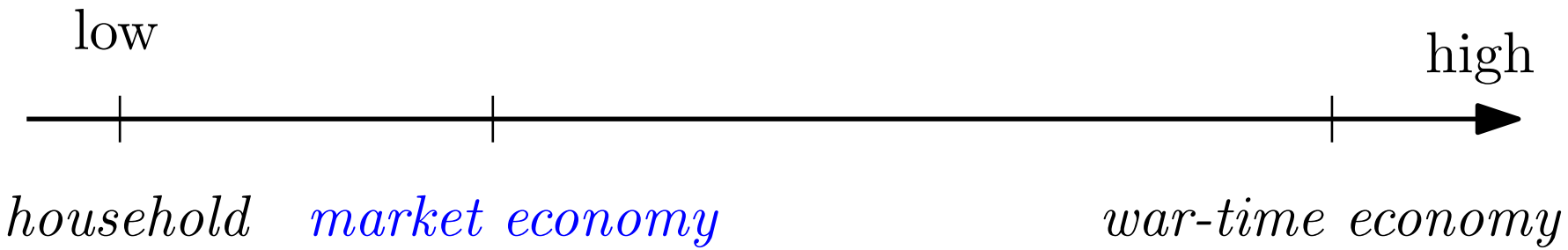
Study of systems that steer with feedback signals in an uncertain environment

Degrees of coordination in capitalism



- Market economies adapt through local interactions by undershooting targets and overshooting constraints.

Degrees of coordination in capitalism



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- Climate change reversal requires much higher degree of coordination.

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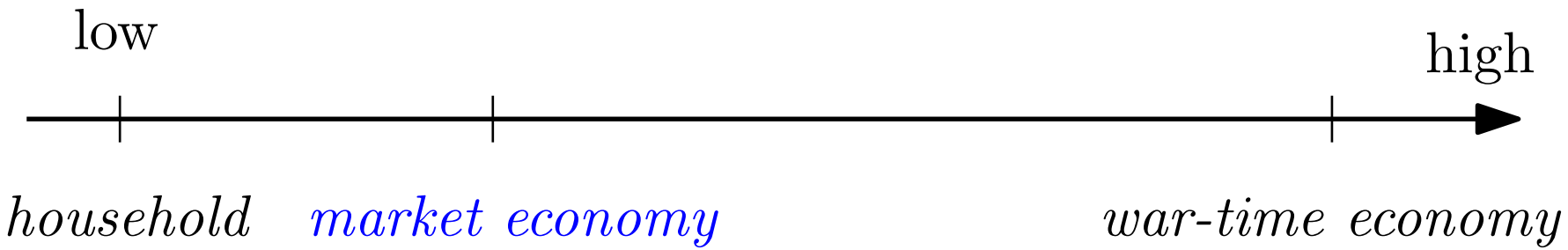

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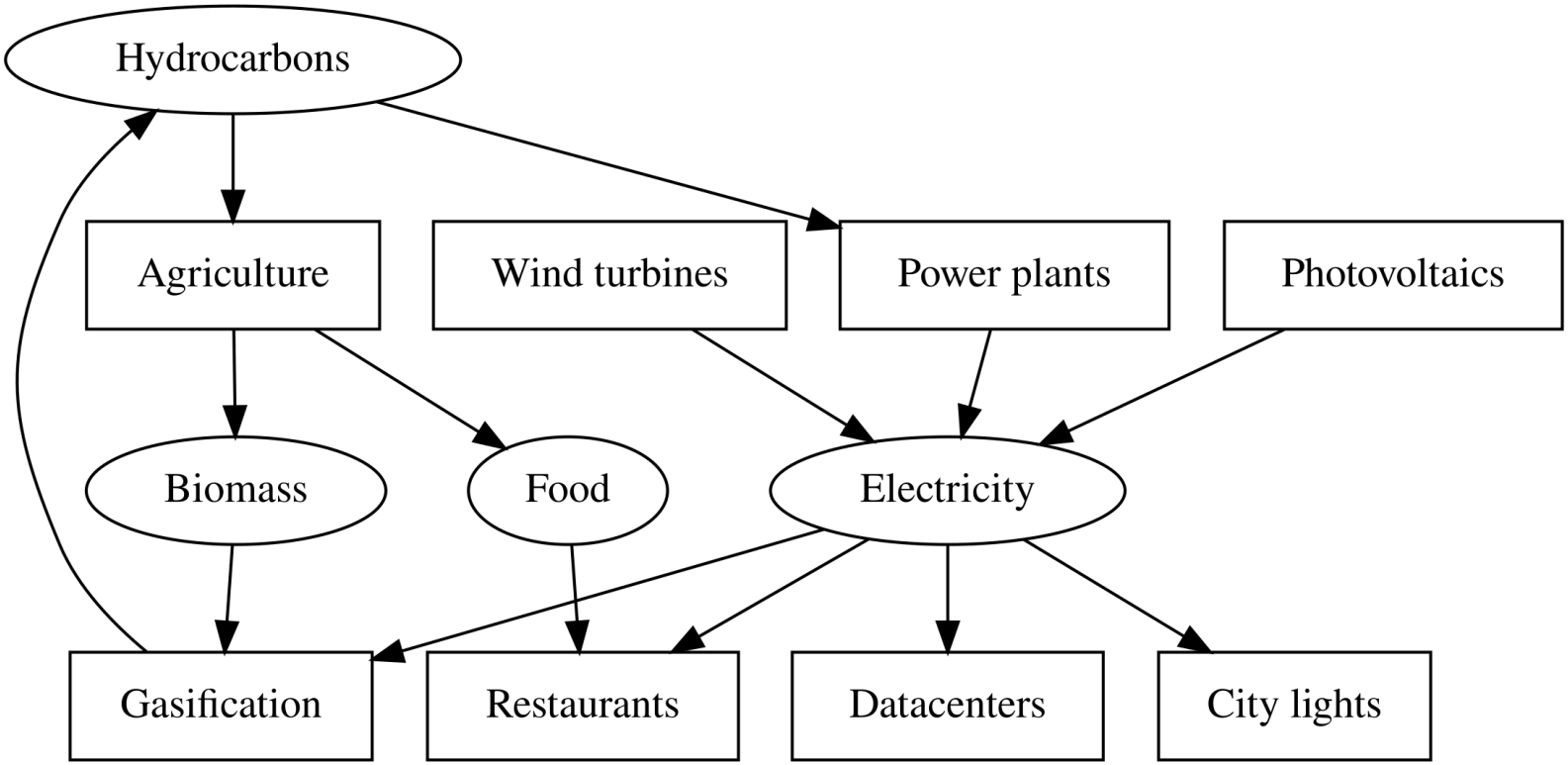
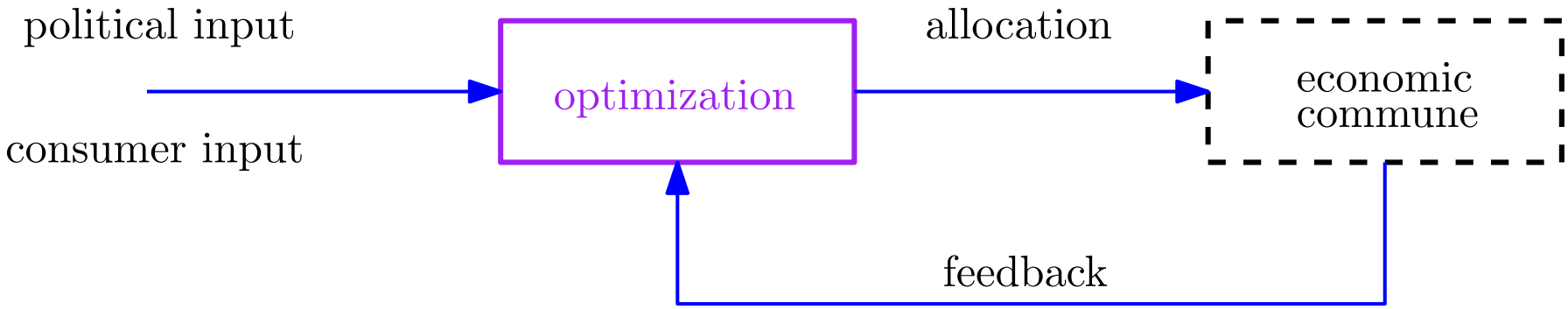
- Climate change reversal requires much higher degree of coordination.
- Estimated effort larger than in WWII

Planning in-kind



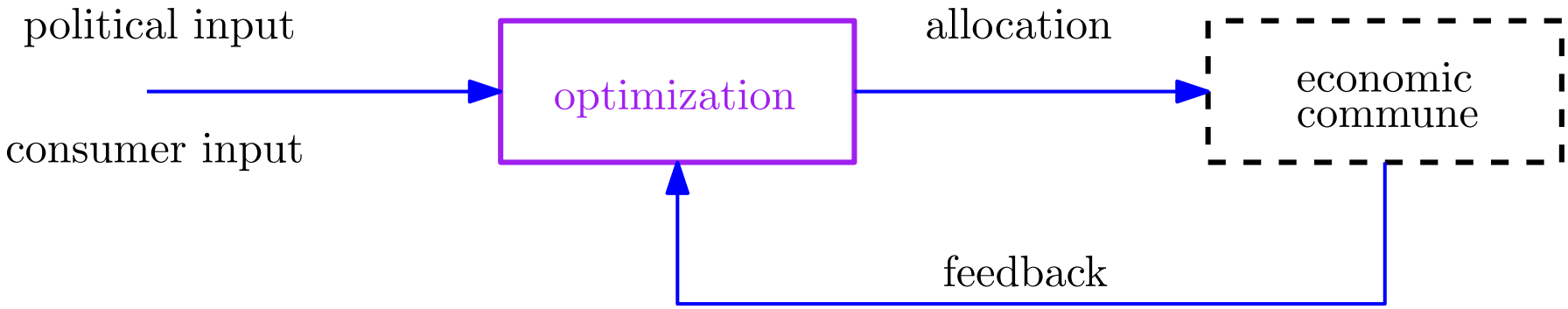
- Economic development subject to explicit constraints
- Physical rather than monetary terms
- Incorporation of climate change models

Coordinating an economic commune



Economic commune with large number of productive units:

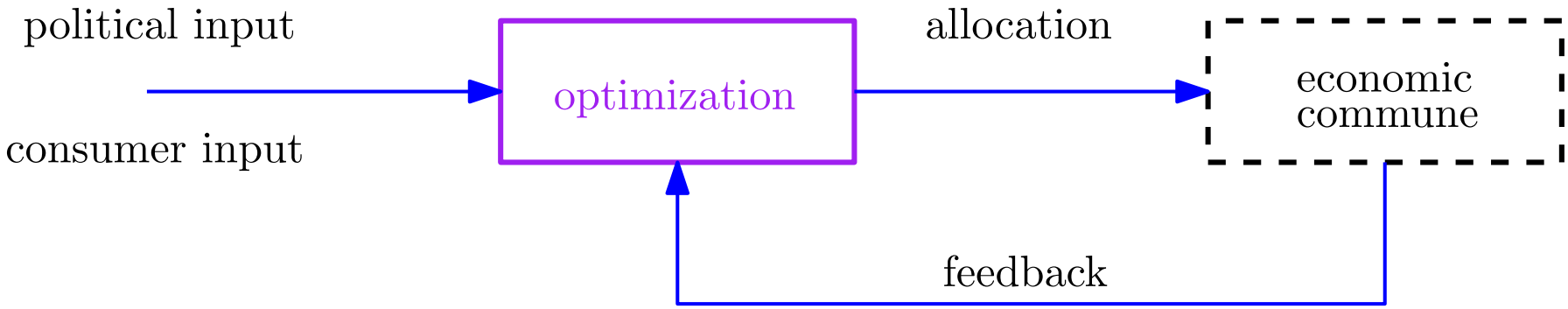
Coordinating an economic commune



Economic commune with large number of productive units:

- *citizen and consumer input* determines final targets

Coordinating an economic commune



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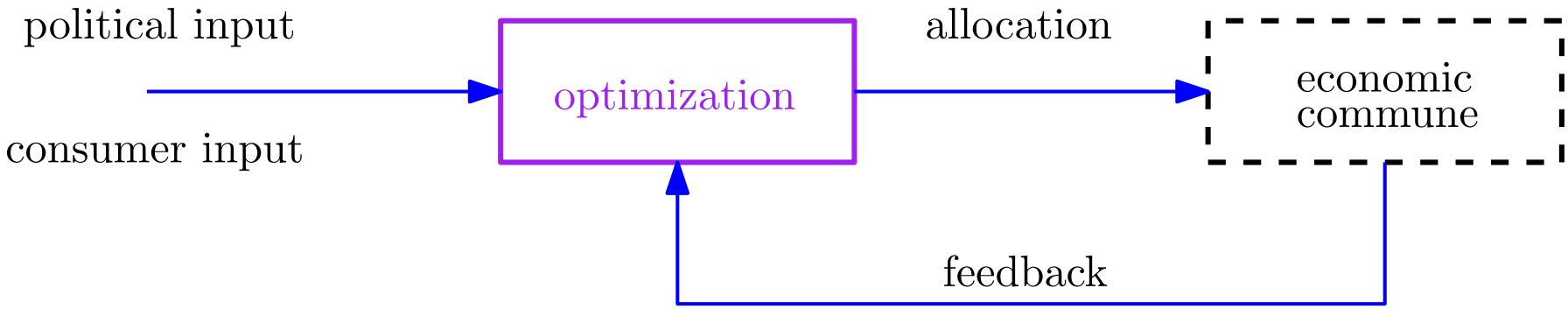

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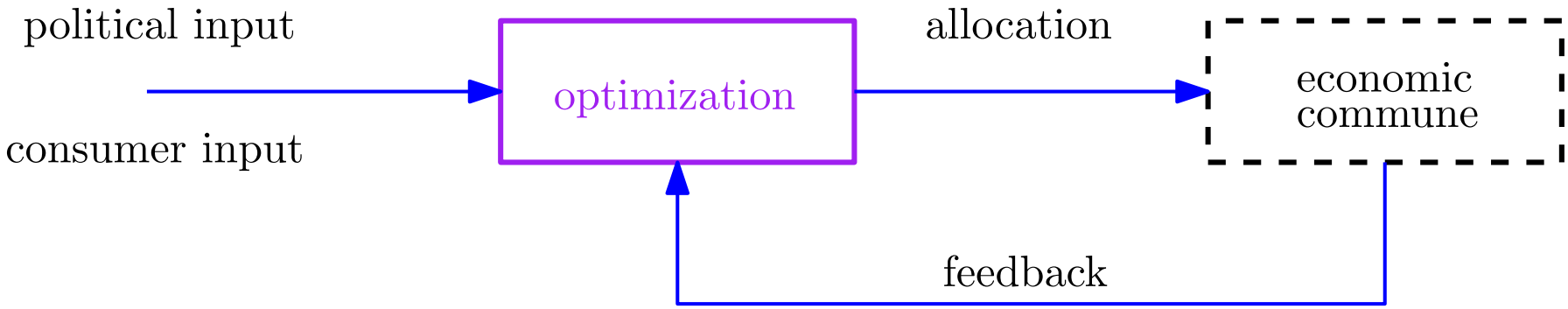
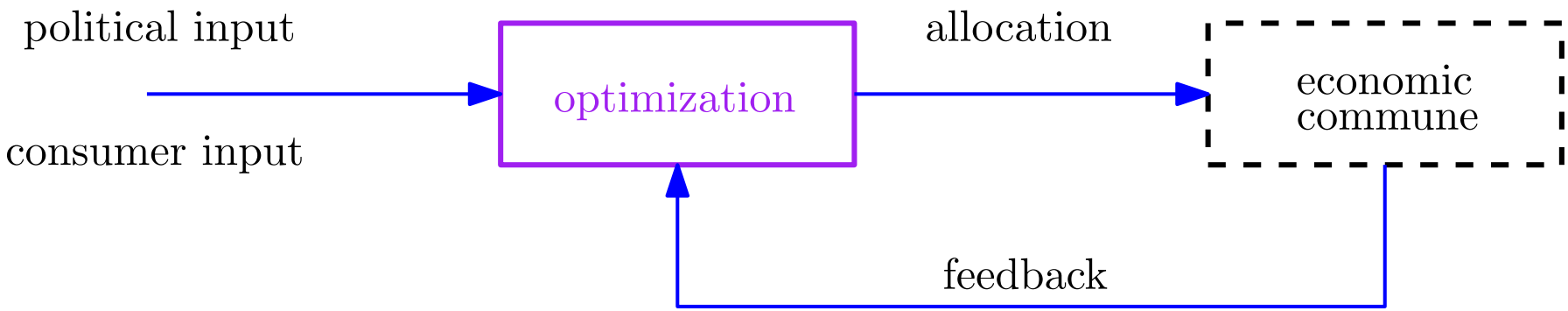


Economic commune with large number of productive units:

- *citizen and consumer input* determines final targets
- optimization procedures recommend allocation
- *workers* implement, explore and feed back
- coordination protocols to specify goals, implement, and feed back information.

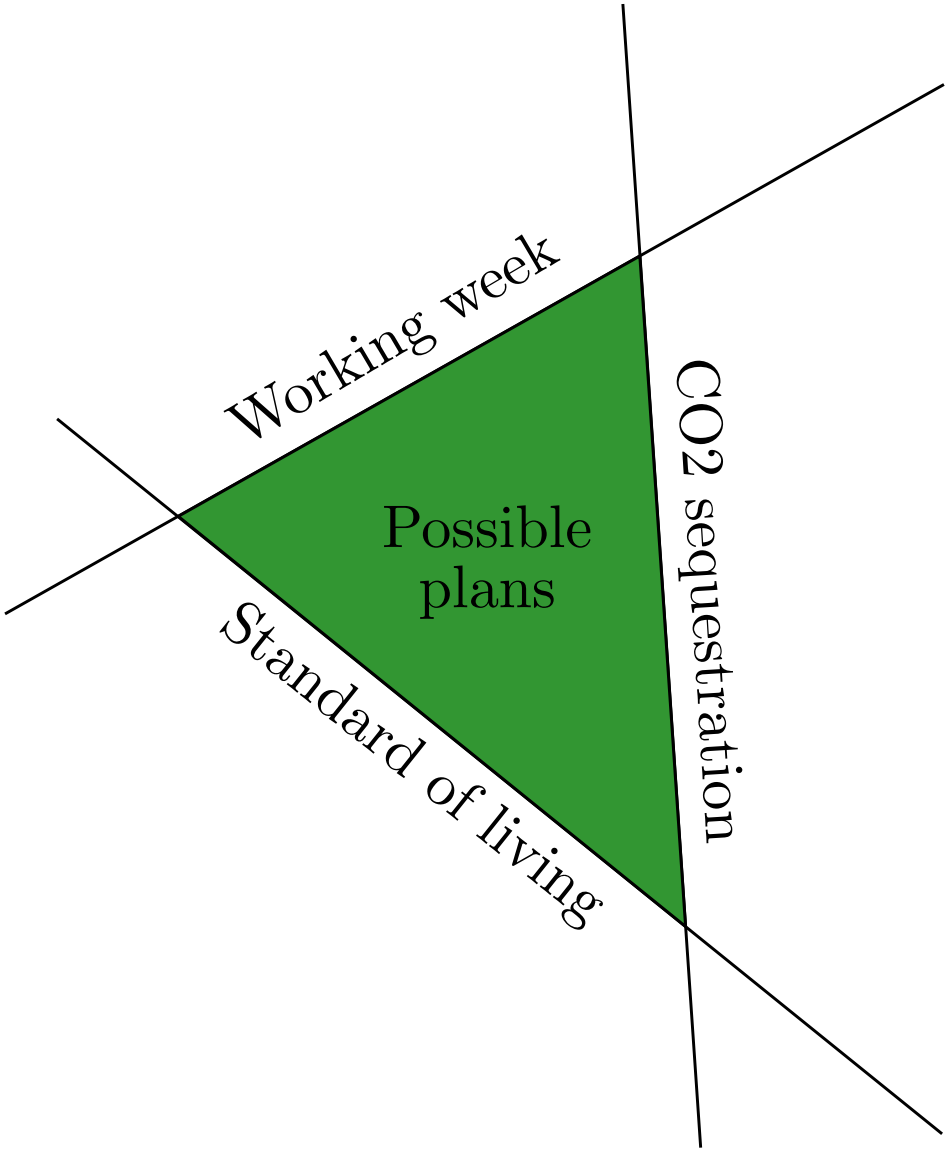
Where is planning?



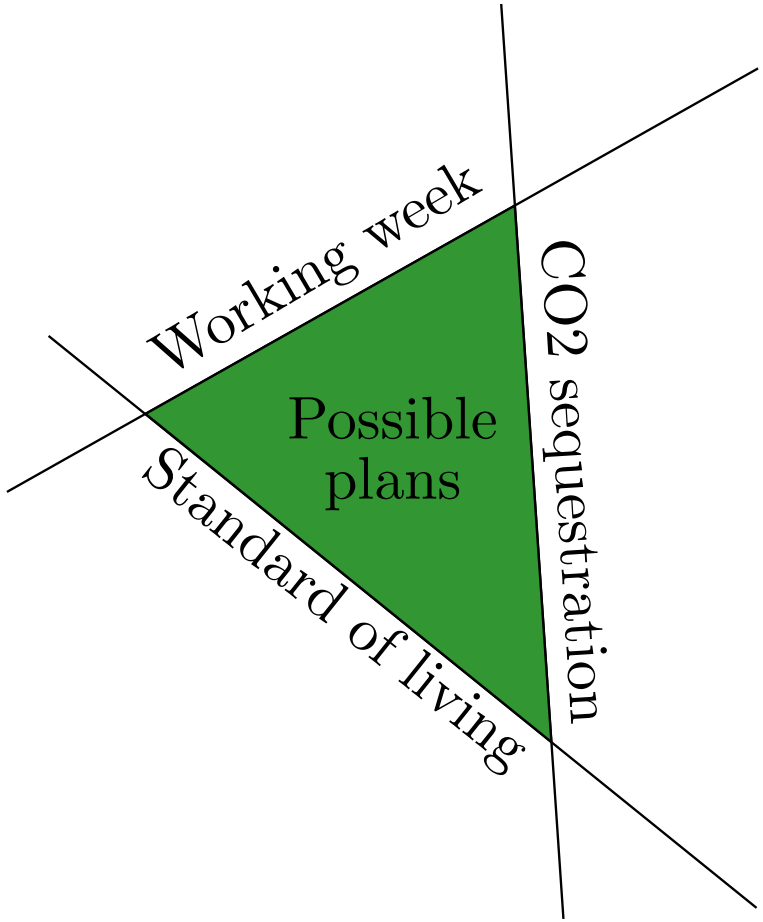
plan = recommended allocation of resources between units

Finding efficient plans?

Conflicting social objectives

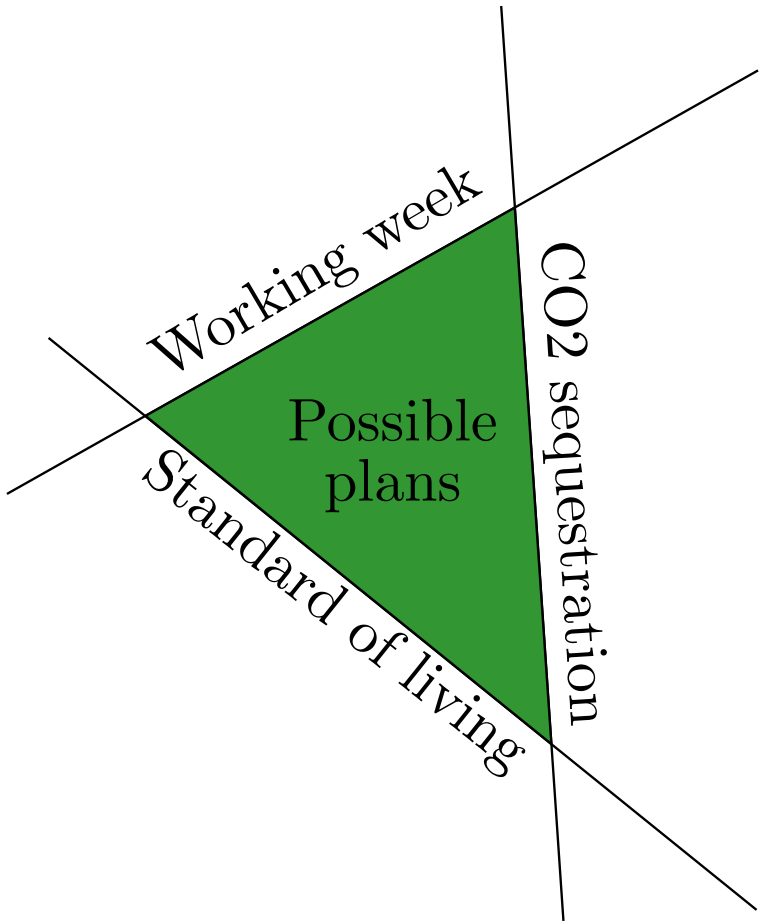


Dilemma



- Constraints define region of possible plans
- Attempting to optimize all goals may threaten viability

Dilemma



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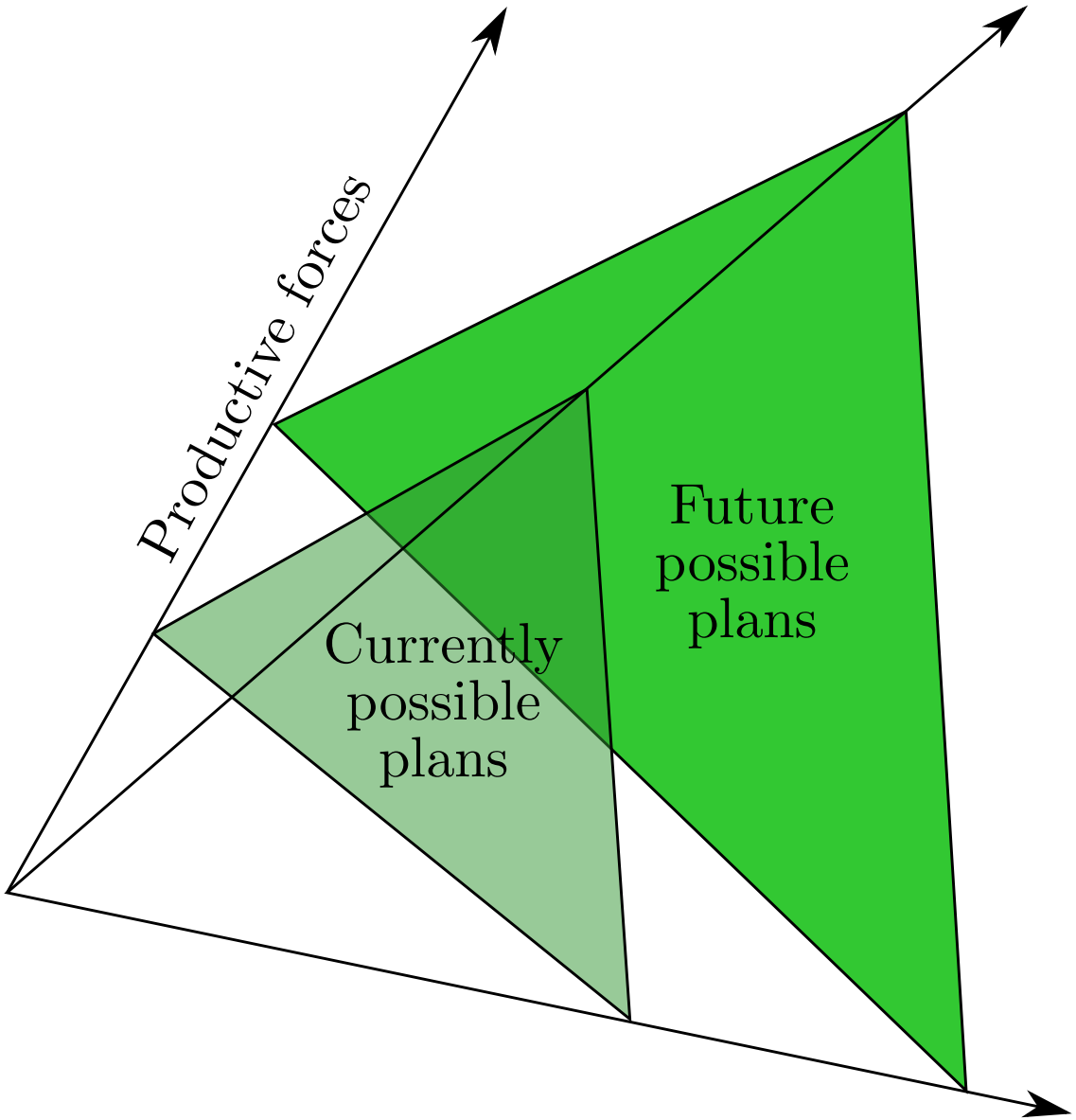
How to resolve dilemma?

Resolution: explore efficient techniques



Which plan should we pick?

- Maximize GDP?
- Minimize emissions?
- Minimize labour time?

"Work is the spice of life"

What is to be done?

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- Develop independent economic theory and policy
- Popularize and disseminate alternatives
- Trial projects, experiments and evaluation

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Experimental code for optimization and scenario simulations using real data:

https://github.com/lokehagberg/rhp

Questions and discussion

Alternative approaches

- Green growth
  - Economic growth cannot be decoupled from resource use
- Degrowth
  - Low QoL, does not guarantee sequestration
- Green New Deal
  - Keynesian dependence on private investments

Technological exploration

- Green steel (SSAB)
  - $\mathrm{Fe}_x\mathrm{O}_y + \mathrm{H}_2 \longrightarrow \mathrm{Fe} + \mathrm{H}_2\mathrm{O}$
- Gasification (GoBiGas)
  - biomass $\longrightarrow$ hydrocarbons + charcoal
- Cement
  - Concentrated sunlight + limestone $\longrightarrow$ quicklime
  - Use limestone as-is where possible
- Higher-voltage HVDC (estimate 7 MV to reach half Earth circ.)
- Raise ocean pH by chloralkali process
- More rail, public transport
- Fossil fuel rationing
- Nuclear power

Everything affects everything $\rightarrow$ *need planning*

Computational aspects

- $Ax \geq b$
- Solving LP to L bits precision is $O(Lm^{\omega})$ where m is the number of constraints and ω is the matrix multiplication constant
- If A is sparse then $O(\text{nnz}(A)L\kappa\sqrt{m})$ where κ is the condition number of A
- In practice $< 10^4$ sparse matrix-vector multiplications