

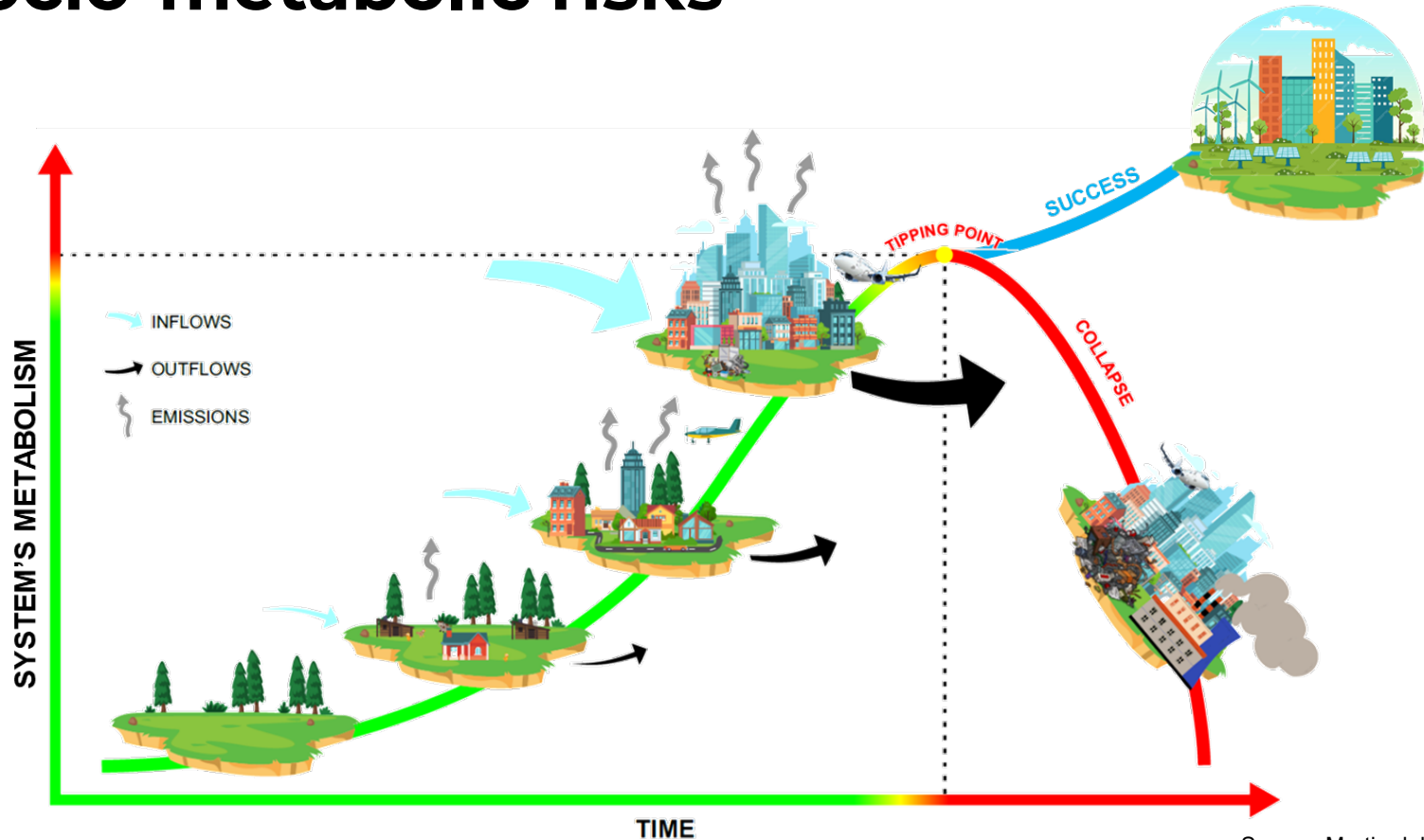
ENV 501 / GR A3 30

Exercise session 4 (interactive): EW-MFA and links to socio-metabolic risks

Teaching assistant:

Jair Campfens jair.campfens@epfl.ch

Socio-metabolic risks



Socio-metabolic risks

Need for a deeper understanding of the resource dynamics:
Resources **flows**, **drivers**, and **management**

Socio-metabolic Risks (SMRs): Systemic risks related to critical resource **availability**, material **circulation integrity**, **(in)equities** in cost and benefit distributions (Singh et al., 2022)

Specific resource-use patterns exhibit potentials for systemic risks and cascade effects, inhibiting progress towards:

Resource security

Self-reliance

Provisioning of societal services

EW-MFA and links to socio-metabolic risks

UN Comtrade database / World Bank: Trade data ([UN](#), [World Bank](#)) of **all commodities, import / export**, by country and by timestamp

FAOSTAT database: [Food Balance Sheets](#). Information on **biomass** (e.g., consumption, production, etc.), by country and by timestamp

Institute for Health Metrics and Evaluation database: [Disability-Adjusted Life Years \(DALYs\)](#)

Note: The burden of disease is calculated using the disability-adjusted life year (DALY). One DALY represents the loss of the equivalent of one year of full health. DALYs for a disease or health condition are the sum of years of life lost due to premature mortality (YLLs) and years of healthy life lost due to disability (YLDs) due to prevalent cases of the disease or health condition in a population.

The International disaster database: [EM-DAT](#). Information on natural / technological **disasters**, [by country and by timestamp](#)



EW-MFA and links to socio-metabolic risks

Dimension	Availability	Access	Consumption	Self-sufficiency
FOOD	Low resource productivity and competing land uses: • decline in arable land (less than 0.06 ha/cap) • decline in locally sourced food (less than 20%) • increased import dependency and food bills	Deficiencies in food security: • prevalence of undernourishment • impairing of human development • intergenerational cycle of malnutrition and poverty	Shift from healthier diets to nutritionally inferior diets: • higher levels of non-communicable diseases such as stunting, wasting or anemia • low work productivity • poor school performance • loss of healthy life	Deficiencies in the agri-food supply chain: • decline in domestic foodstuff production • higher food losses • increased food insecurity • increased foodborne hazards and diseases outbreaks

Low food productivity

- Narrow agricultural resource-base
- Land-use changes
- Deficiencies in the agri-food supply chain
- Climate change (flash floods, droughts)

Food nutrition and security

- 80% foods is imported
- Lower vegetables and higher processed foods intake
- Nutritionally inferior diets
- Increase in non-communicable diseases

EW-MFA and links to socio-metabolic risks

Dimension	Availability	Access	Consumption	Self-sufficiency
ENERGY	Damages during transport and extreme weather events: • oil spills and runoffs • shortages due to disruption on supply • degradation of marine and coastal ecosystems • impact on local development and economy	Frequent energy provisioning disruptions: • quality and stability of the supply (blackouts) • impacts on health, agriculture, drinking water, sanitation, and food • increased energy consumption	Deficiencies of affordable and clean energy supply: • increased consumption • transmission and distribution losses • elevated energy tariffs • pressure on grid and risk of destabilizing it • impacts on health and national energy security	Fossil-fuel dependent economies: • imports dependency is perpetuated • increased exposure to external shocks • delays in recovery responses in case of disasters

Caribbean region: fossil-fuel dependent

- Damage to ecosystems
- Long-term ecosystem collapse
- Impacts on tourism
- Impacts on health, water and food security

Energy system: overview

- High electricity tariffs
- Energy system losses
- Power outages
- Recurrent extreme weather events