

Nitrogen balances in urban areas: purpose and potentials

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Overview

- The nitrogen cycle: why urban aspects
- Available study concepts
- Key elements of urban N cycles
- Outlook

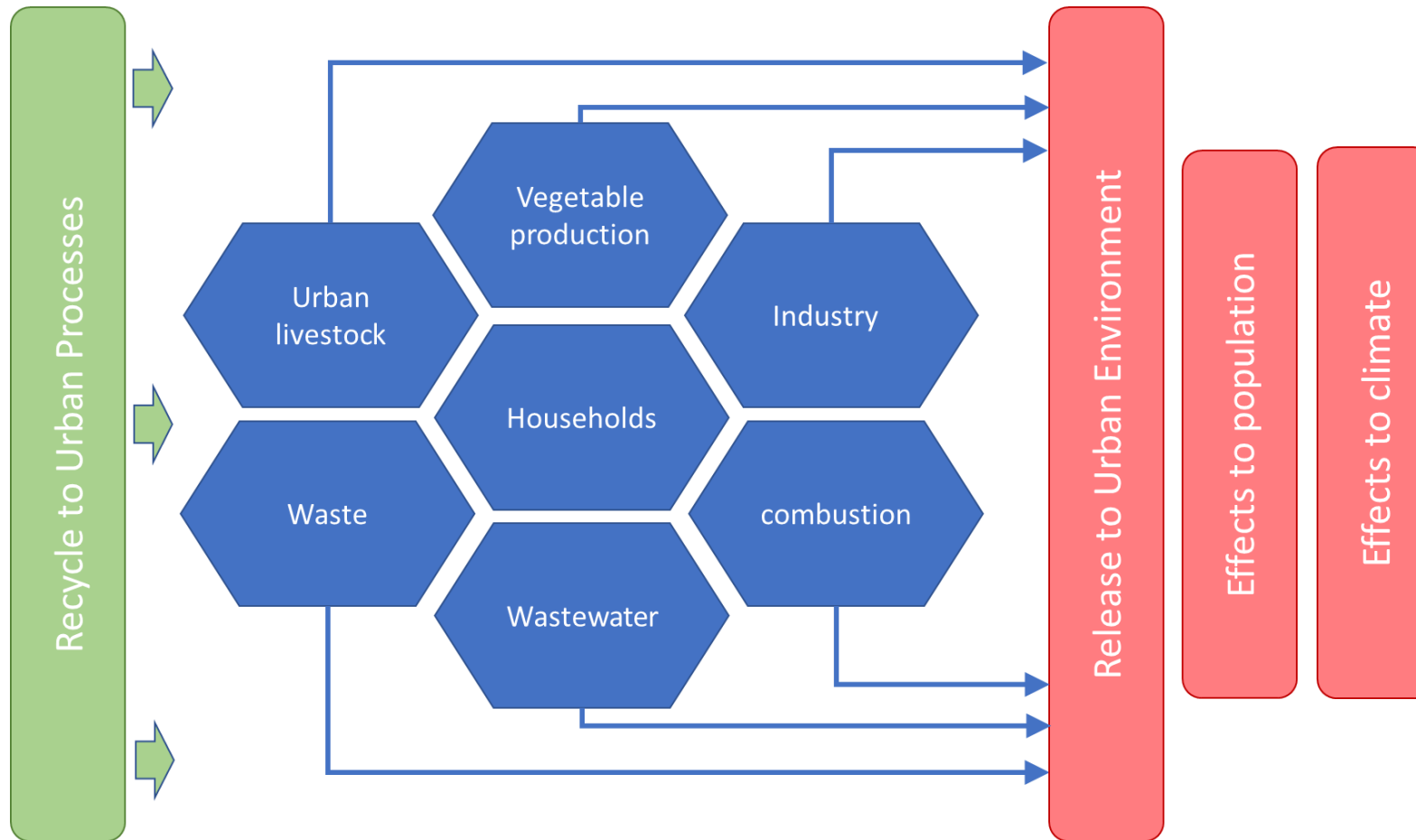


The urban aspects of N

- Industry to fix and convert N compounds
- Combustion (power plants and transport)
- Urban agriculture: high-value product farming (horticulture)
- Urban agriculture: peri-urban livestock farming
- High population density in cities concentrates local exposure to a large number of people



Urban metabolism of N

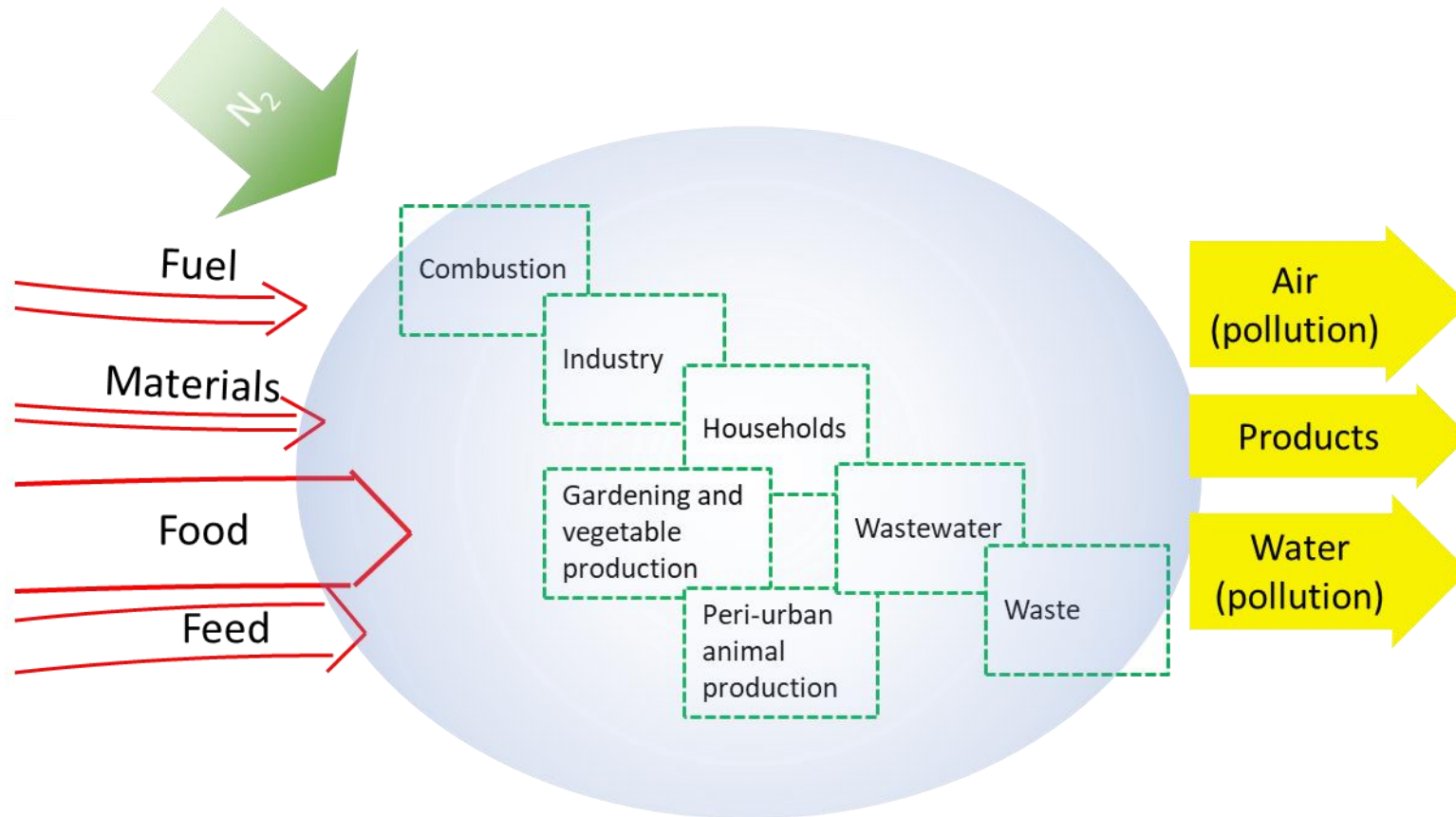


Review of scientific literature

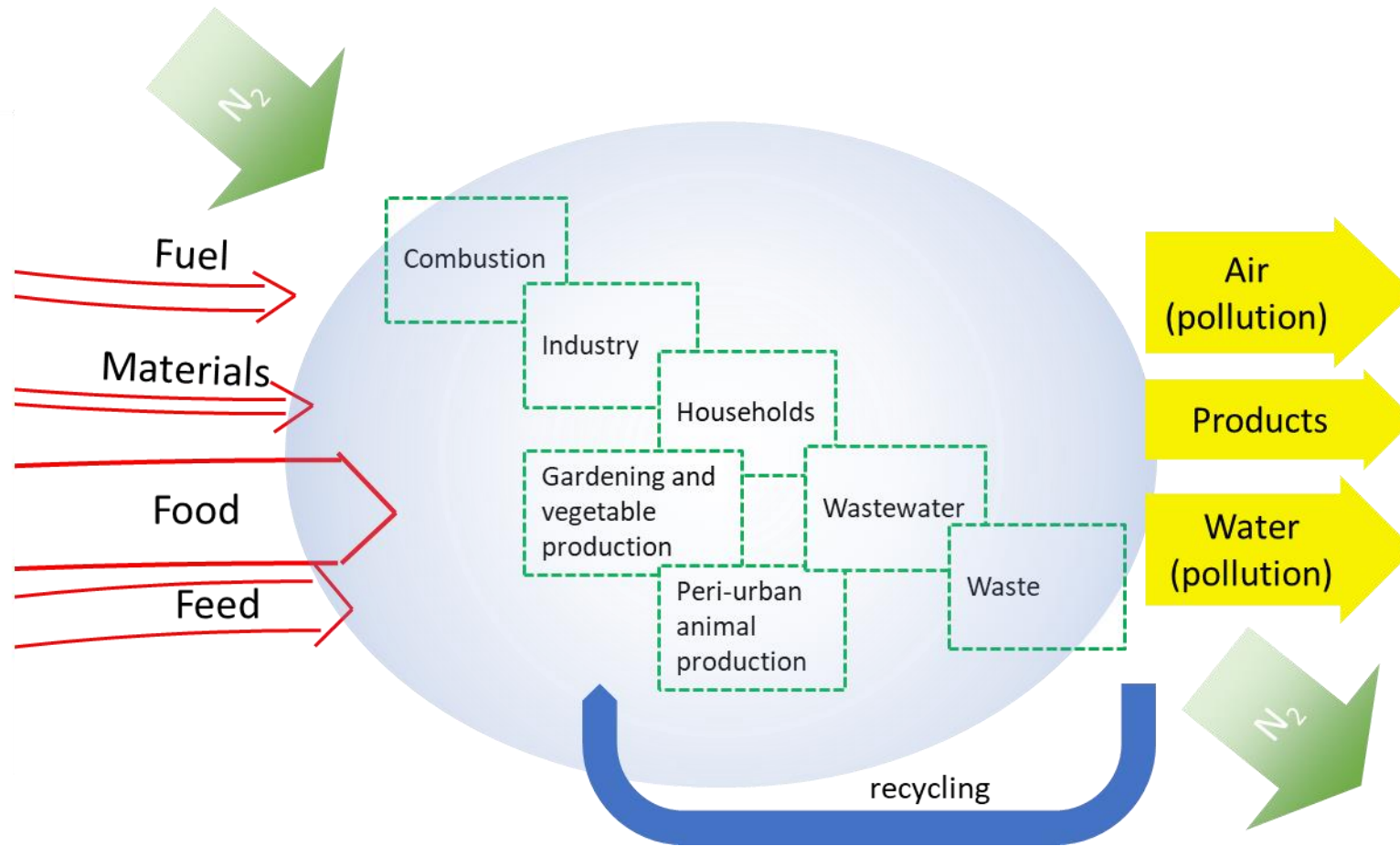
- Common approach: using N mass balance
- Sectoral approaches
 - Soil N budgets – high input vs. deficit situation
 - Water – N budgets from upstream and downstream situations
 - Atmosphere – relation to ozone or PM formation
 - Food systems – linear connection of food imports towards wastewater treatment
 - Waste and wastewater – relevant for N₂O release, with potential of N reclamation for agriculture
- Complete urban flows
 - Urban N metabolism
 - Full description of urban cycles based on very limited information
 - Majority of studies on East Asia / China
 - Temporal trends as very clear signals



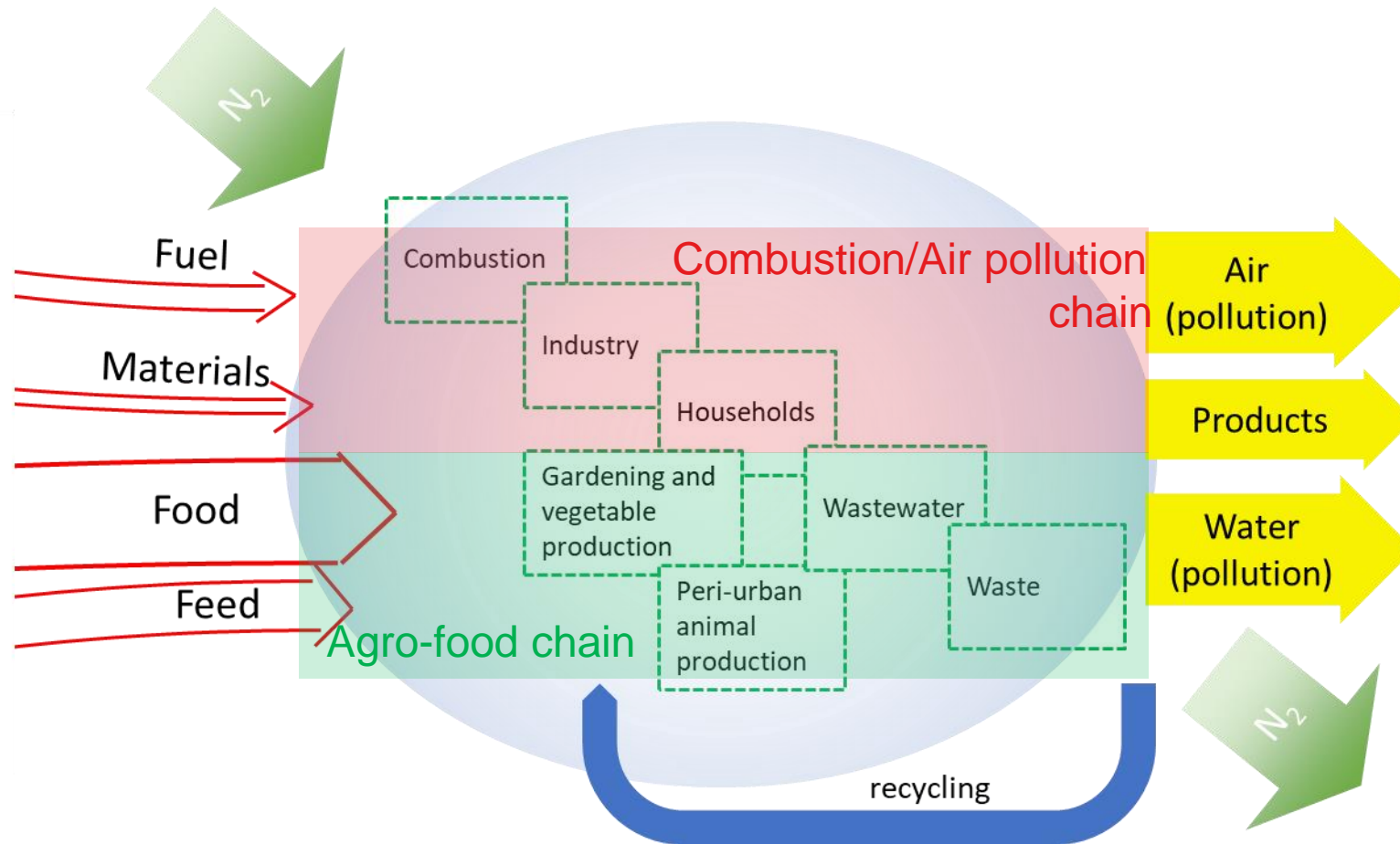
Quantifying N fluxes



N reclamation and recycling



Flow stratification



Successful strategies

- Temporal trends
- Comparison per person, per area
- Consistency evaluation becomes possible with higher data availability (sectoral analysis, gap-filling)
- “Stratification” of N flows (simplifying N cascade or N web)
- Recycling rate vs. loss of N to the environment

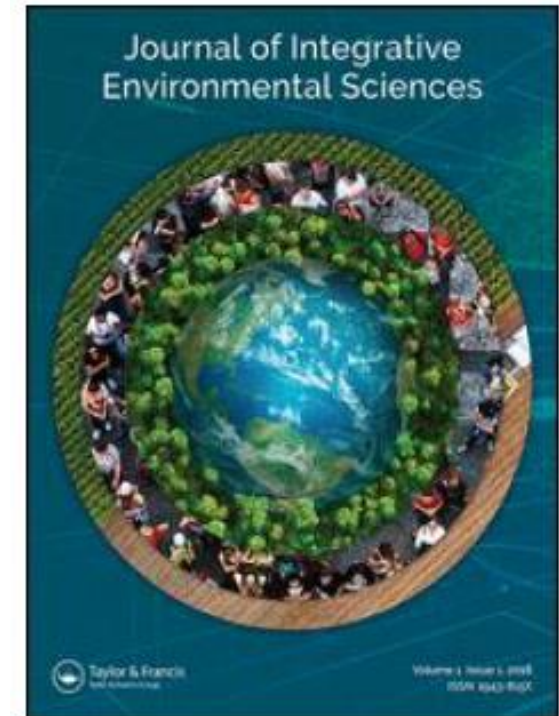


Full details

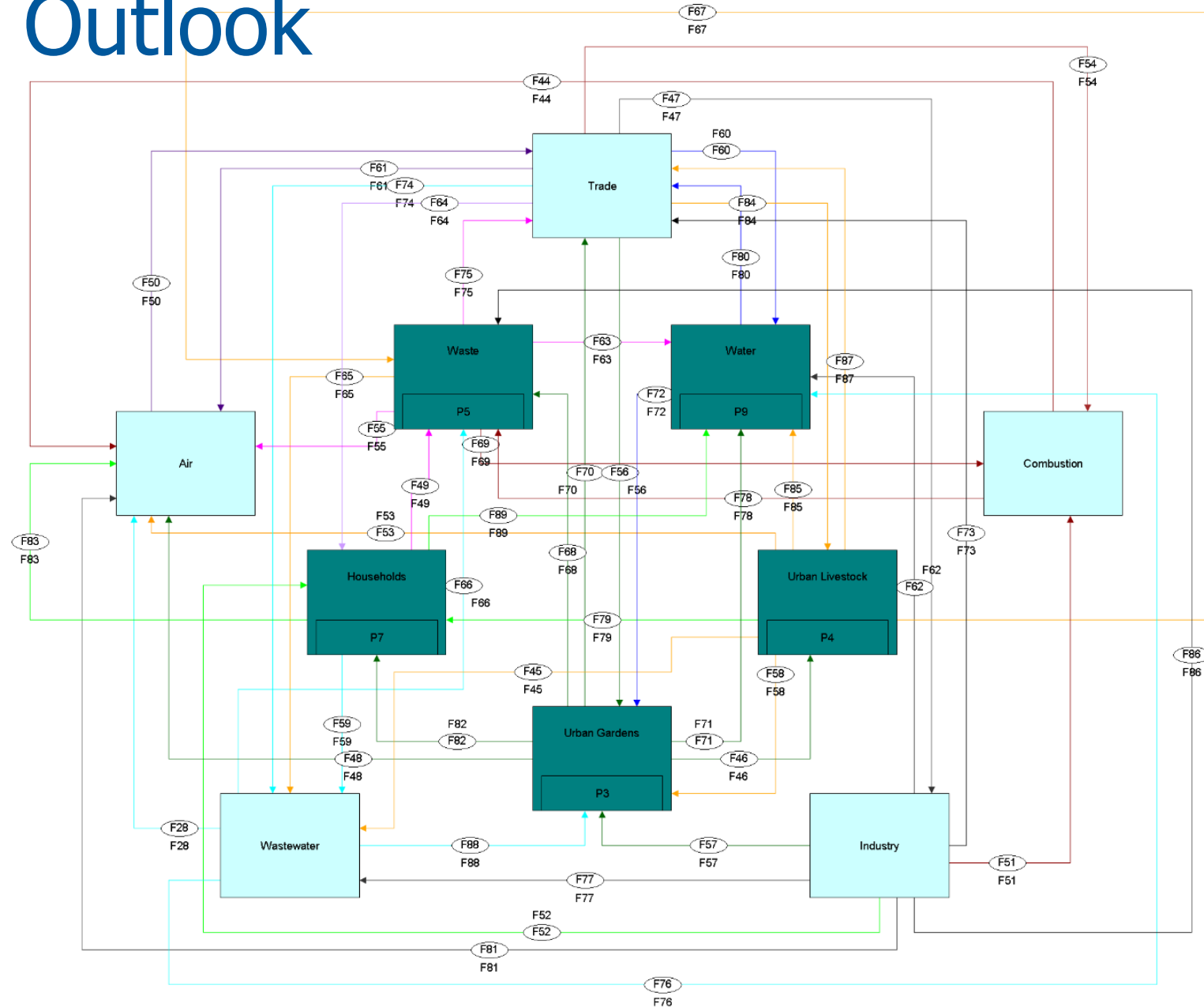
W. Winiwarter et al., 2020

Urban nitrogen budgets: flows and stock changes of potentially polluting nitrogen compounds in cities and their surroundings – a review

DOI: 10.1080/1943815X.2020.1841241



Outlook





UNCNET - Urban nitrogen cycles: new economy thinking to master the challenges of climate change

Europe – China joint call on Sustainable Urbanisation in the Context of Economic Transformation and Climate Change: Sustainable and Liveable Cities and Urban Areas

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