

# **“The city as a complex system: Challenges to sustainable planning”**

**Introduction to the session**

**“ Managing Risk and Resilience in Urban Supply ”**

**Transport Research Arena (TRA)**

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# URBAN METABOLISM AS A NEW PARADIGM OF URBAN ANALYSIS AND POLICIES



# Inputs

Local extraction,  
production and  
space

- minerals, biomass,  
water, space, etc.

## Imports

- raw materials, fossil  
fuels, products, etc.

*Indirect flows  
associated with  
imports*

## Urban System



**Mineral accumulation**



# Outputs

To nature:

- emissions to air
- emissions to water
- waste to landfill
- dissipation flows

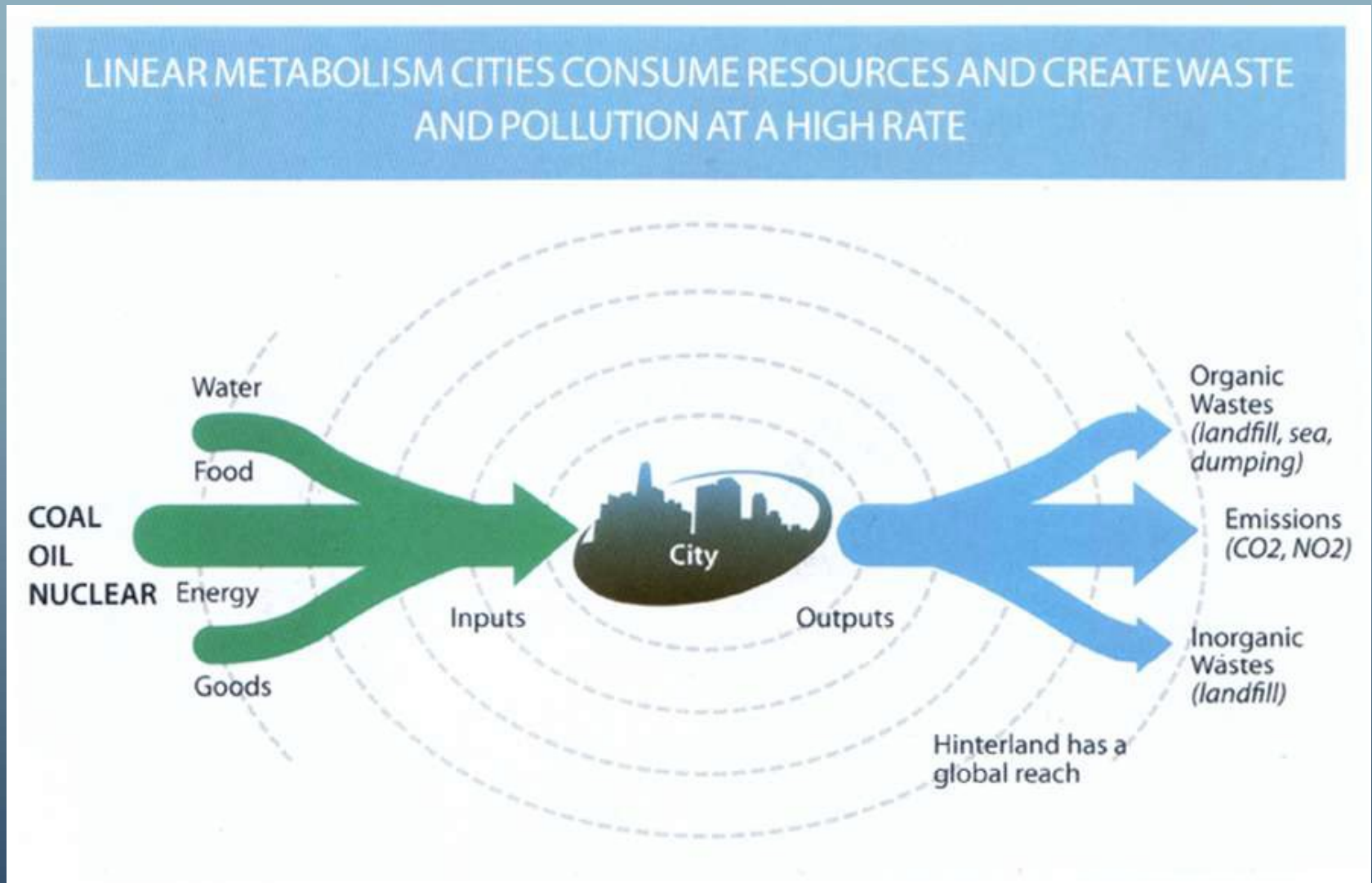
## Exports

- waste, emissions, etc.

*Indirect flows  
associated with  
exports*

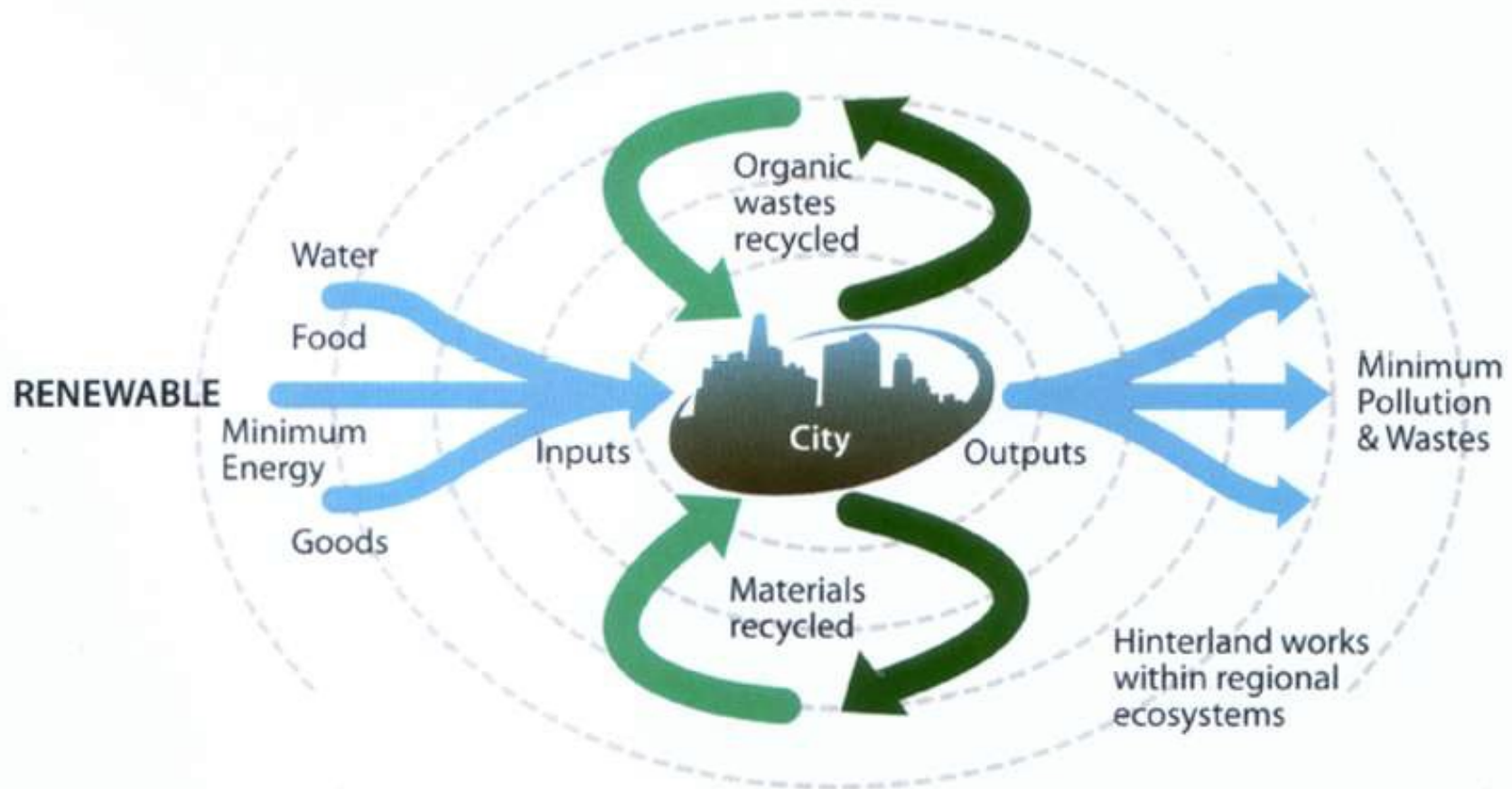


# The metabolism of cities: from linear to circular

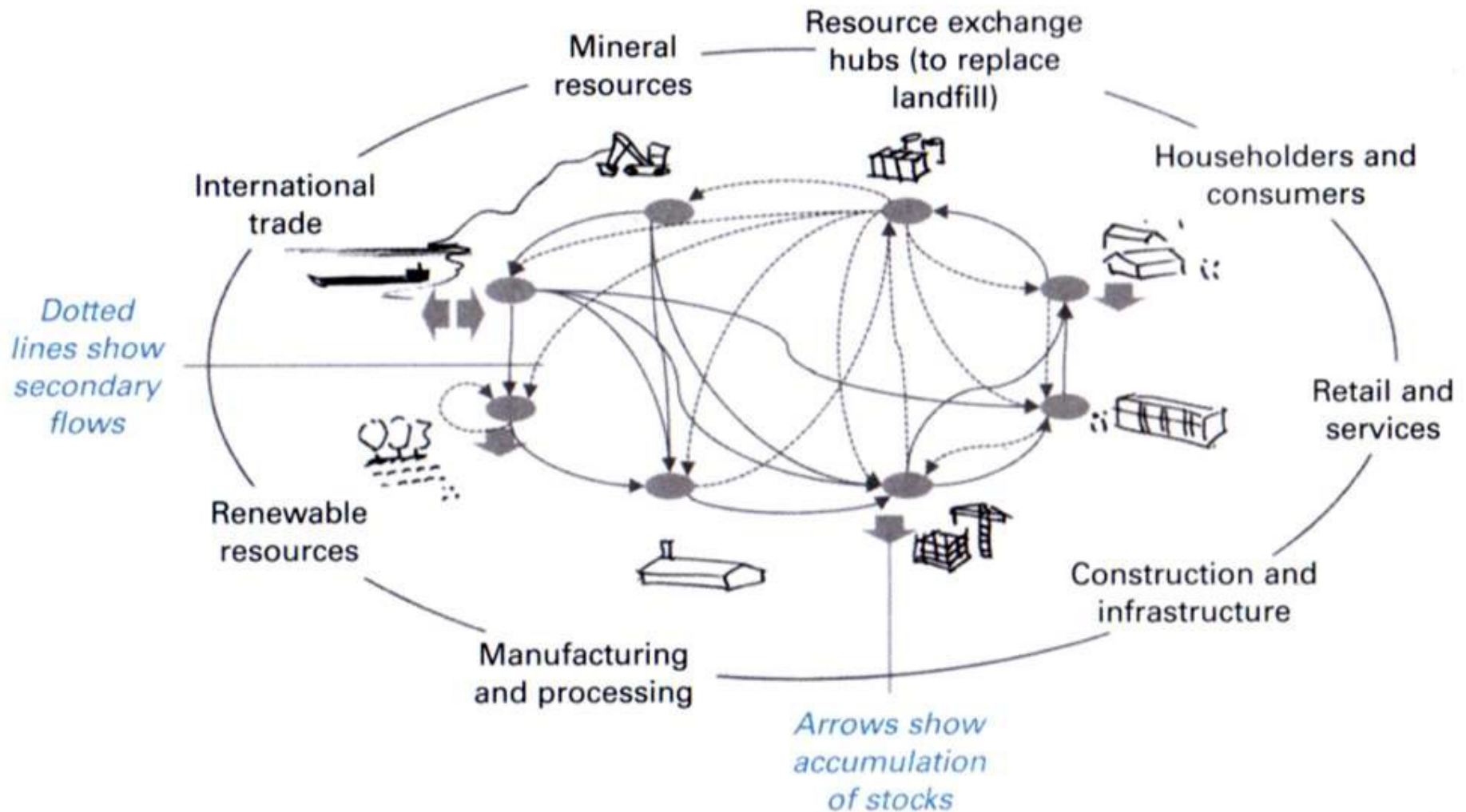


- The open-loop approach is unsustainable in an urbanising and finite world

# CIRCULAR METABOLISM CITIES REDUCE CONSUMPTION AND POLLUTION, RECYCLE AND MAXIMIZE RENEWABLES



# Resource flows in the circular urban economy



Source: Ian Douglas, Nigel Lawson, Joe Ravetz  
"Urban Metabolism – changing flows and planning agendas"  
Town & Country Planning, October 2013.