Potsdam Institute for Climate Impact Research

Presentation by Dr. Benjamin Leon Bodirsky
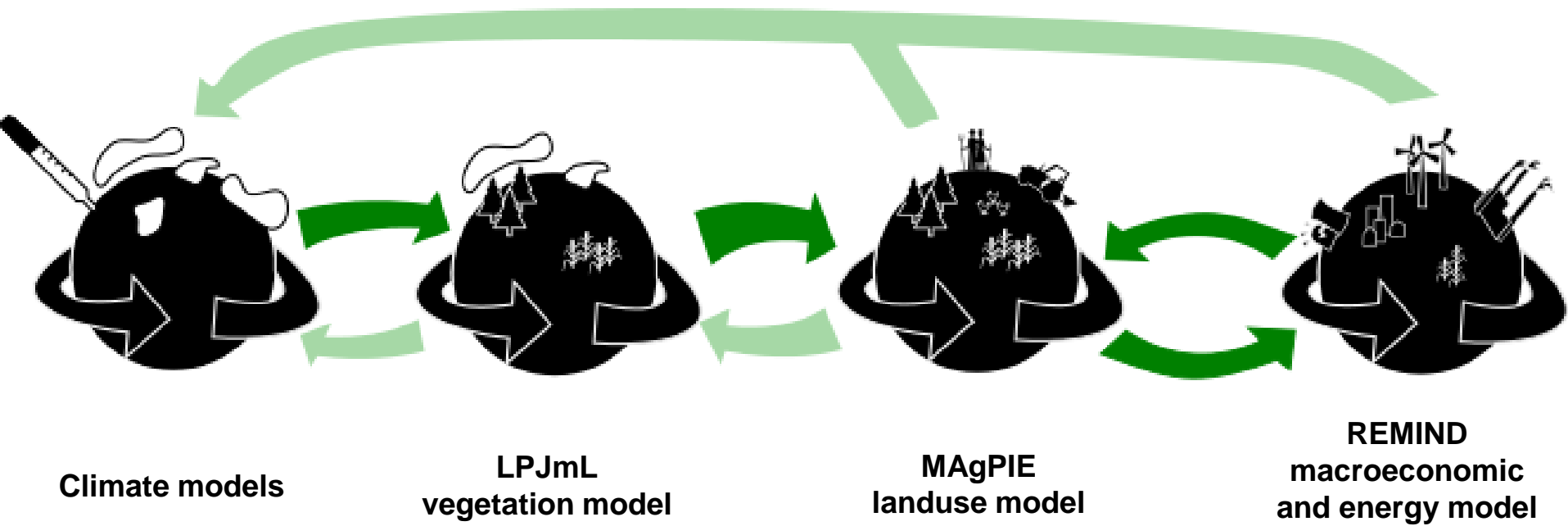
POTSDAM-INSTITUT FÜR KLIMAFOLGENFORSCHUNG

P I K

- **Integrated System Science (biophysical and social systems)**

- **Global Assessments (IPCC)**

- **Exploring Pathways & Policy Advice**

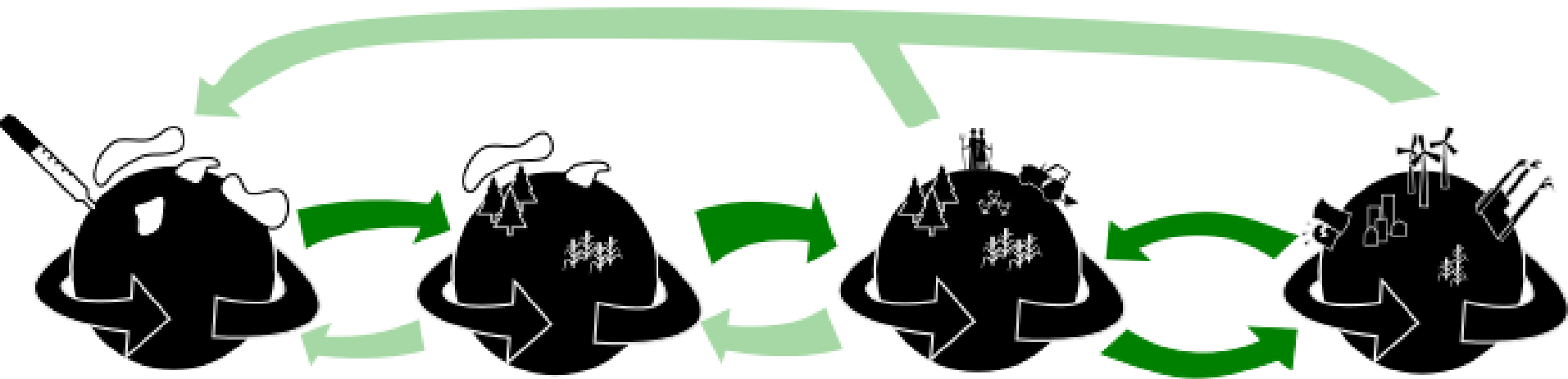- **Global Quantitative Modelling, Scenario Analysis**

PIAM
Potsdam Integrated Assessment Modelling Framework

Climate models

**LPJmL
vegetation model**

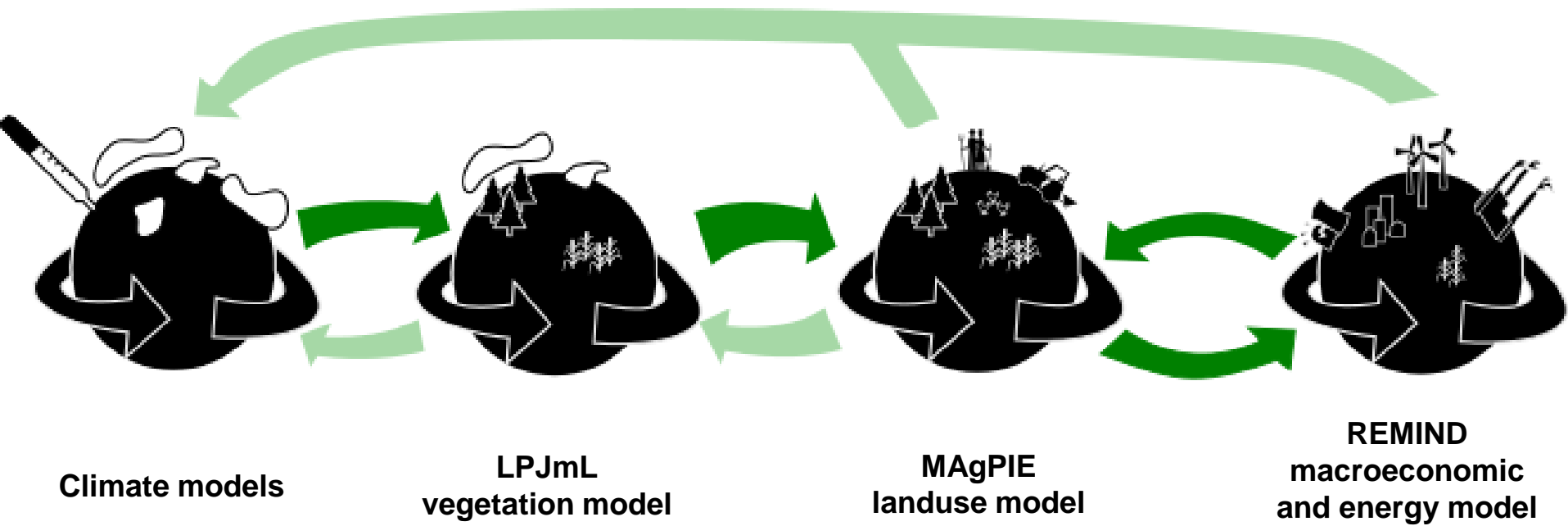**MAgPIE
landuse model**

**REMIND
macroeconomic
and energy model**

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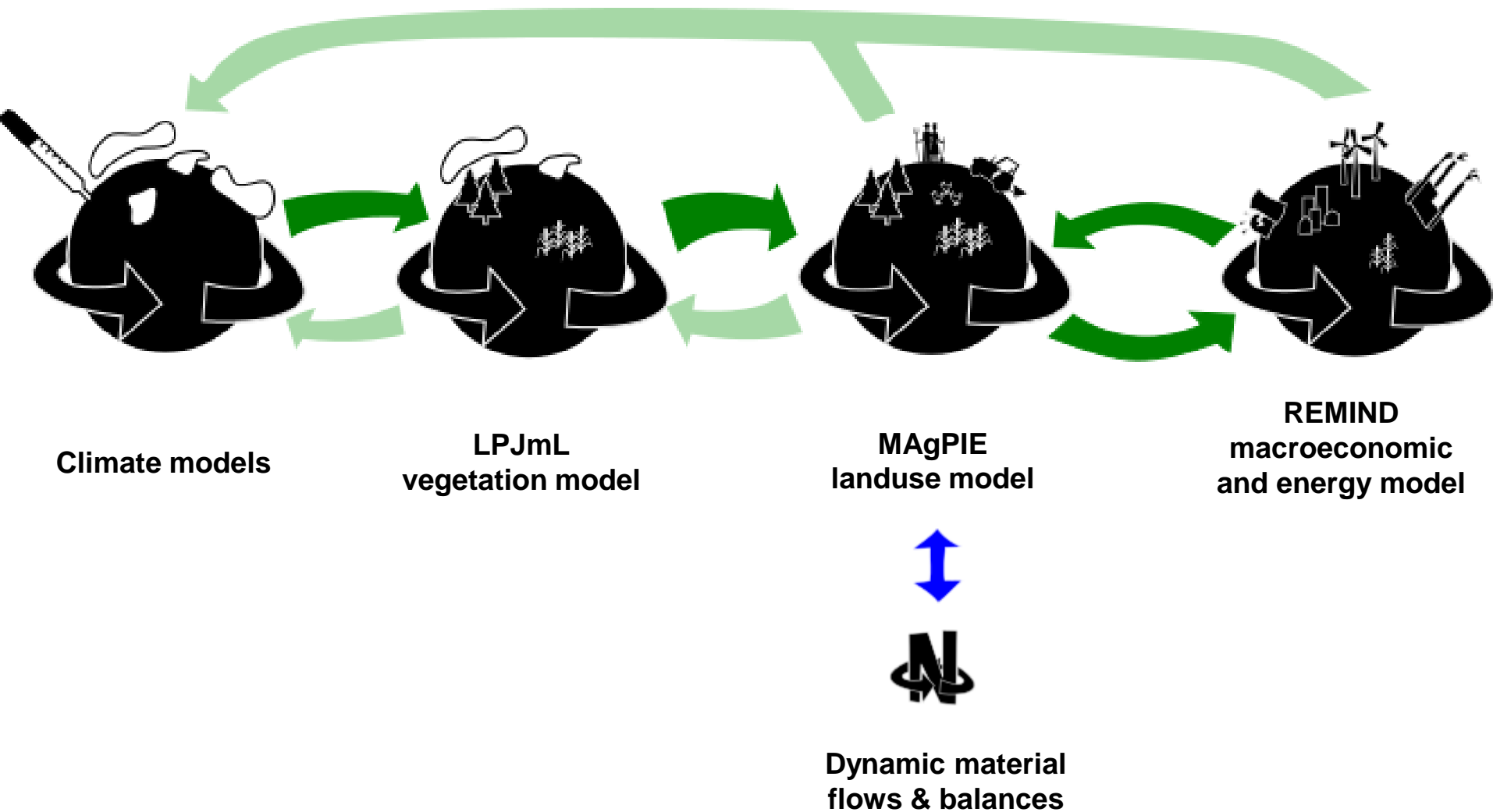MAgPIE
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PIAM
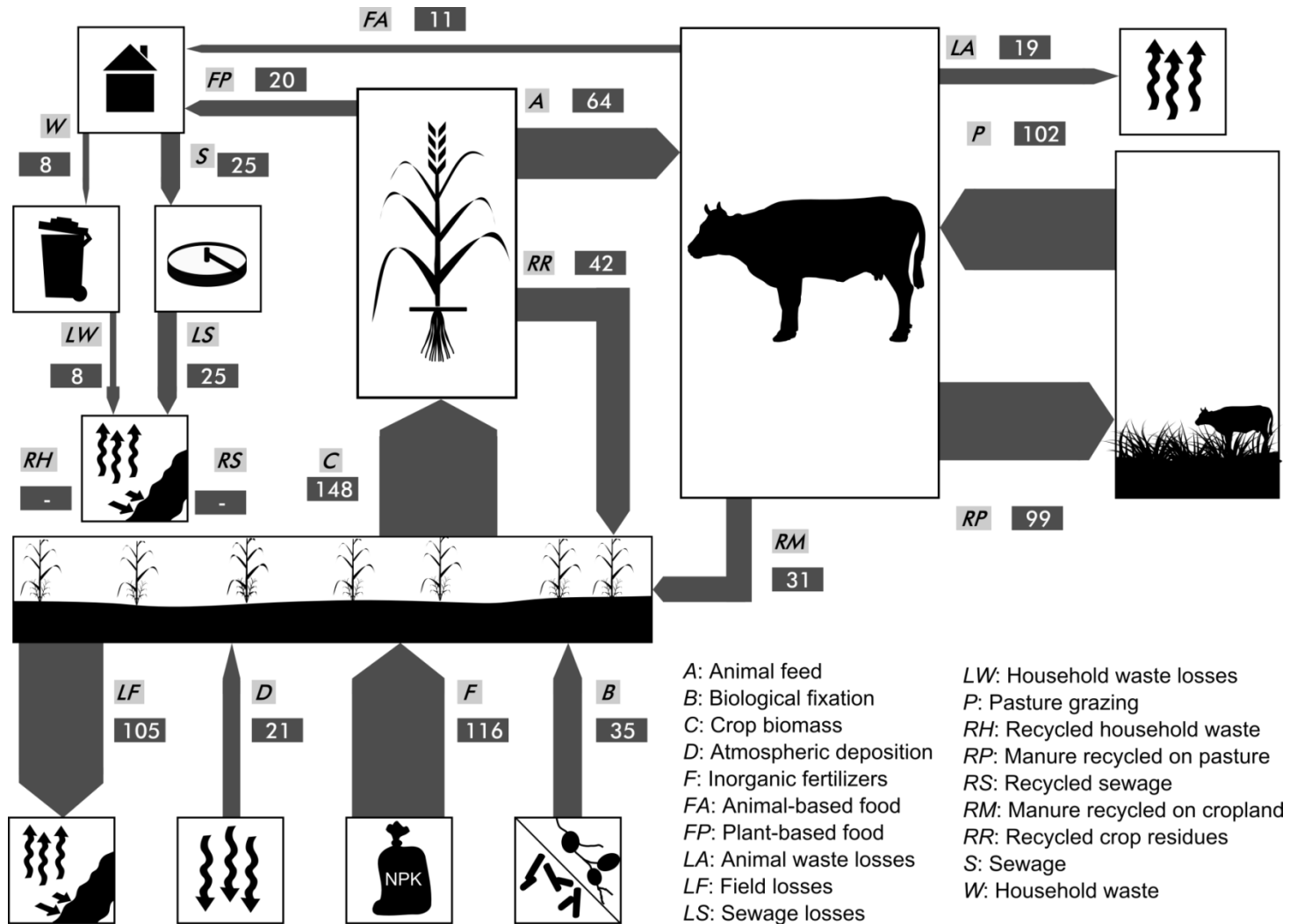## Potsdam Integrated Assessment Modelling Framework

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Dynamic material flows & balances

MAgPIE landuse model

A: Animal feed
B: Biological fixation
C: Crop biomass
D: Atmospheric deposition
F: Inorganic fertilizers
FA: Animal-based food
FP: Plant-based food
LA: Animal waste losses
LF: Field losses
LS: Sewage losses

LW: Household waste losses
P: Pasture grazing
RH: Recycled household waste
RP: Manure recycled on pasture
RS: Recycled sewage
RM: Manure recycled on cropland
RR: Recycled crop residues
S: Sewage
W: Household waste

**Agricultural nitrogen cycle in the year 2010
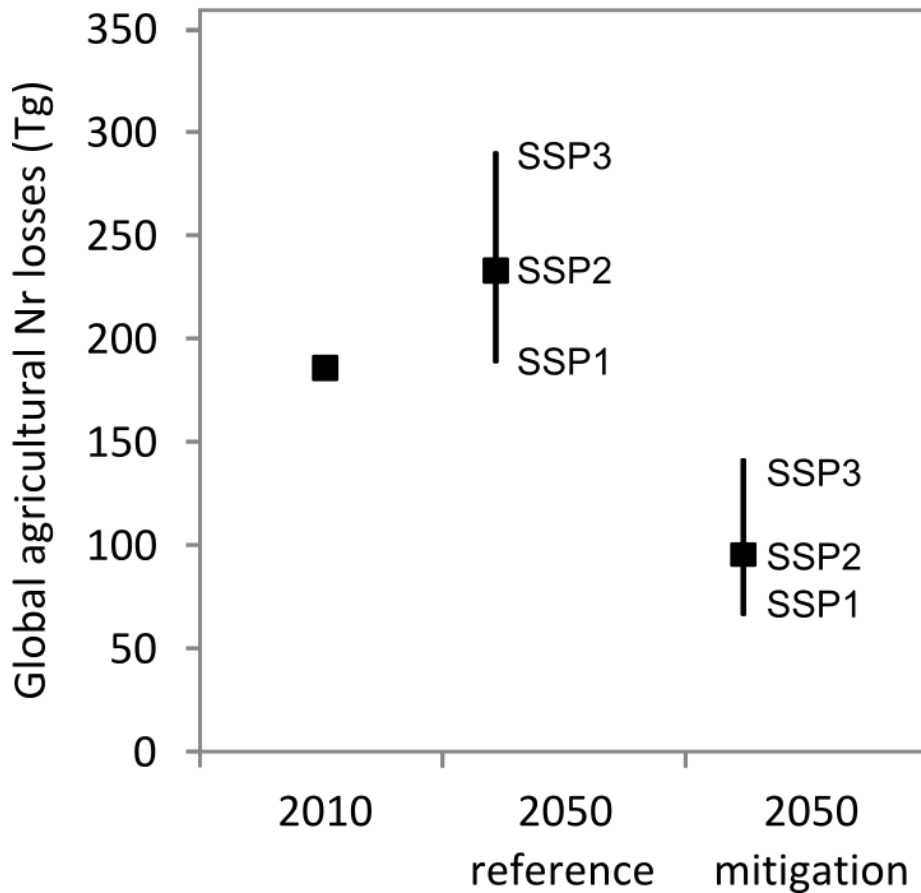(Bodirsky et al 2014)**

MAgPIE landuse model
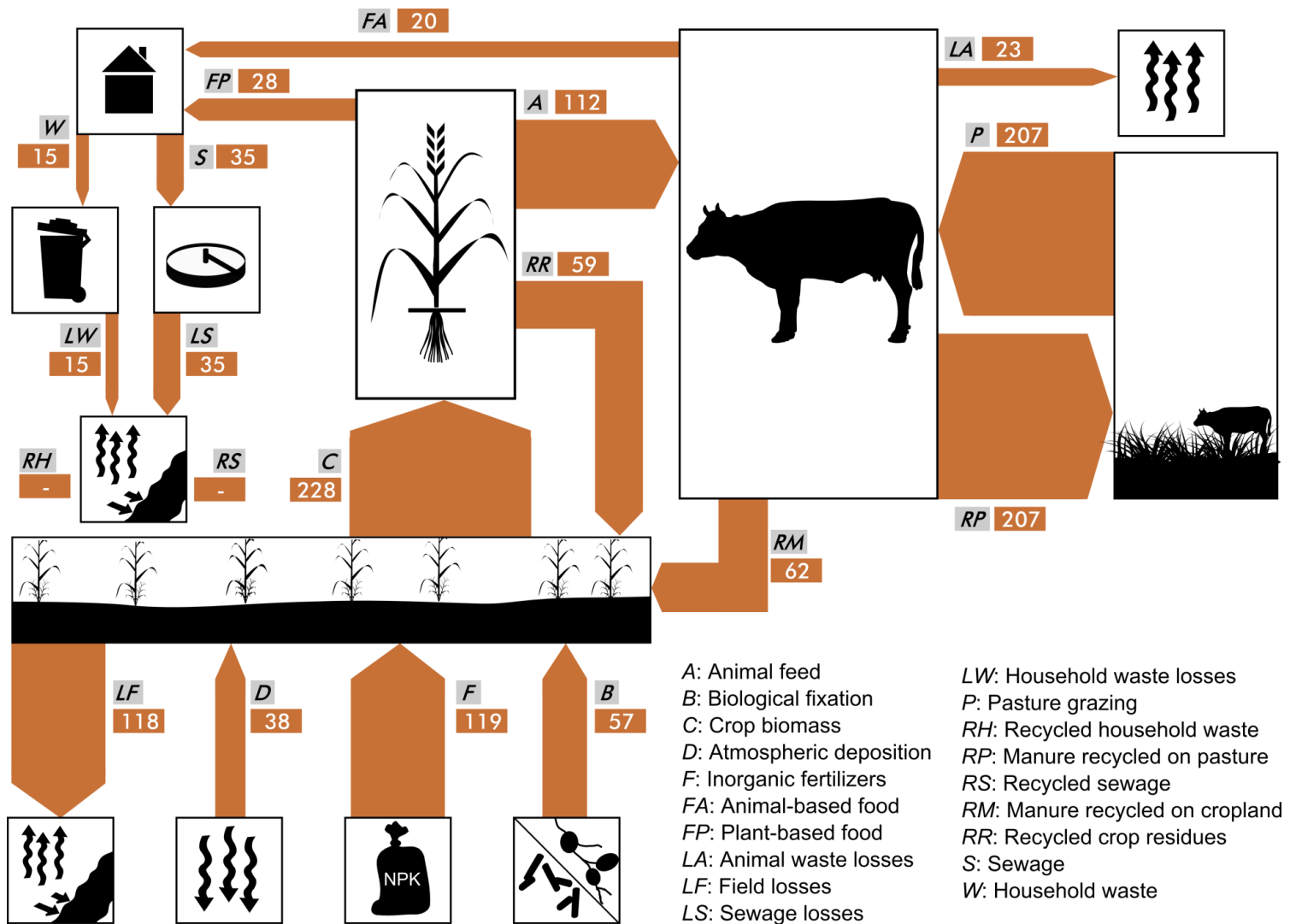
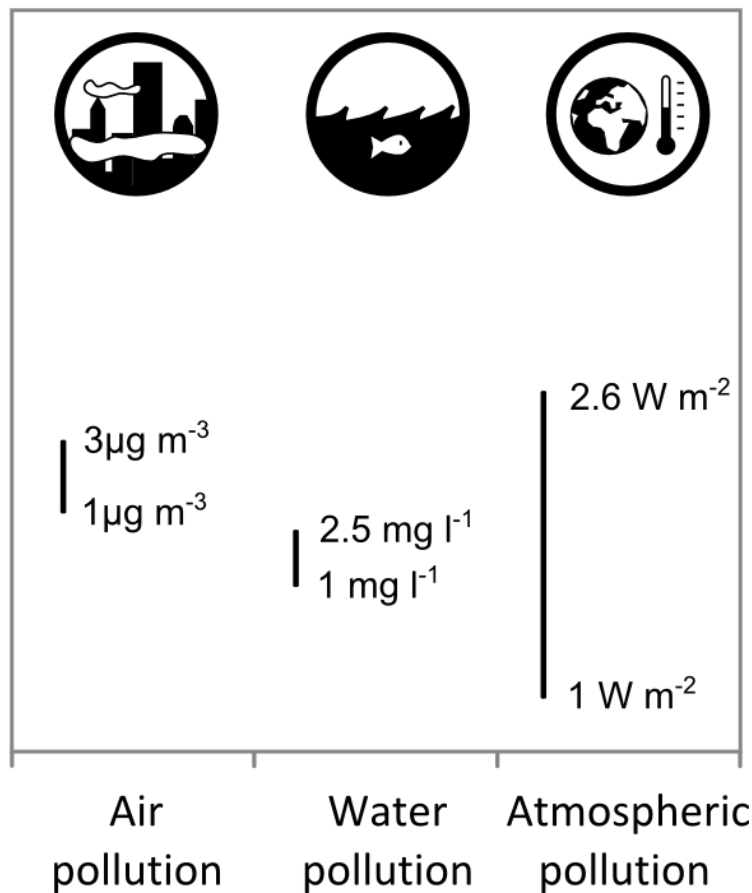**Agricultural nitrogen cycle in the year 2050, SSP2 (Bodirsky et al 2014)**
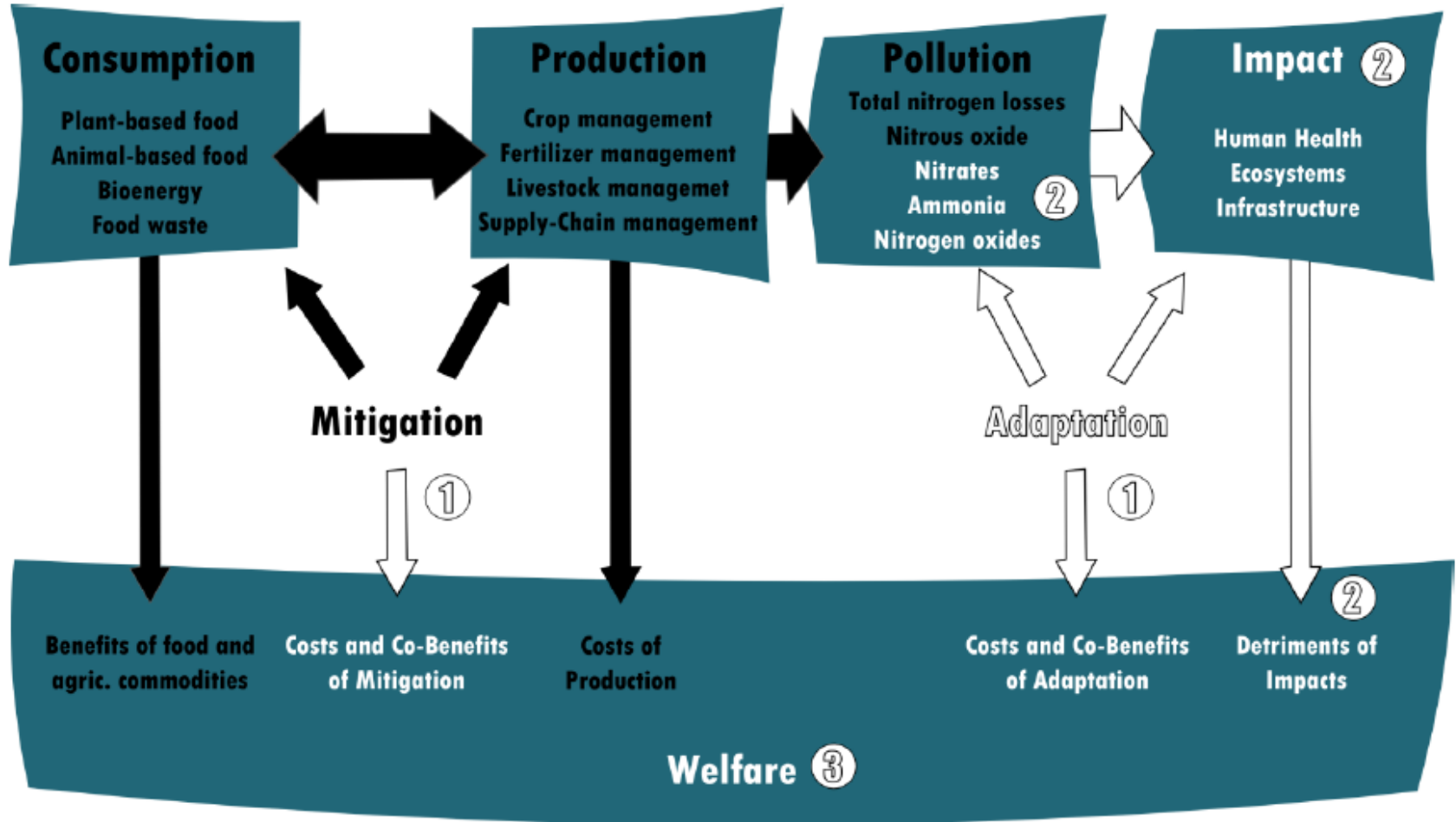
MAgPIE landuse model

**Scenarios of pollution**

Safe thresholds for pollution

Global agricultural Nr losses (Tg)

SSP3 — SSP2 — SSP1 (2050 reference)

SSP3 — SSP2 — SSP1 (2050 mitigation)

3µg m⁻³ / 1µg m⁻³ — Air pollution

2.5 mg l⁻¹ / 1 mg l⁻¹ — Water pollution

2.6 W m⁻² / 1 W m⁻² — Atmospheric pollution

Bodirsky et al (2014), _Nature Communications_

MAgPIE landuse model

Bodirsky (2014)
Inspired by Brink et al (2011)

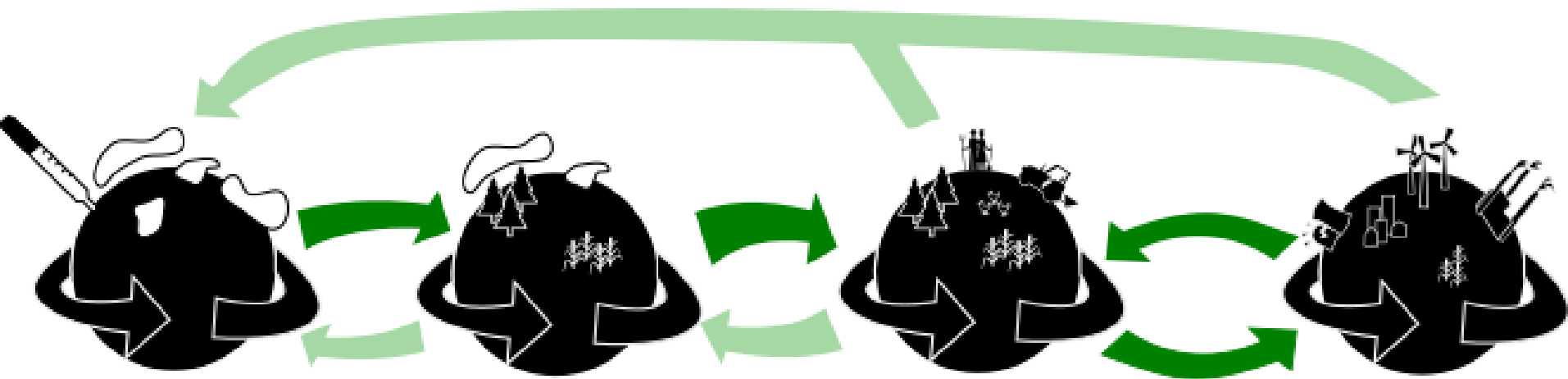# PIAM
Potsdam Integrated Assessment Modelling Framework
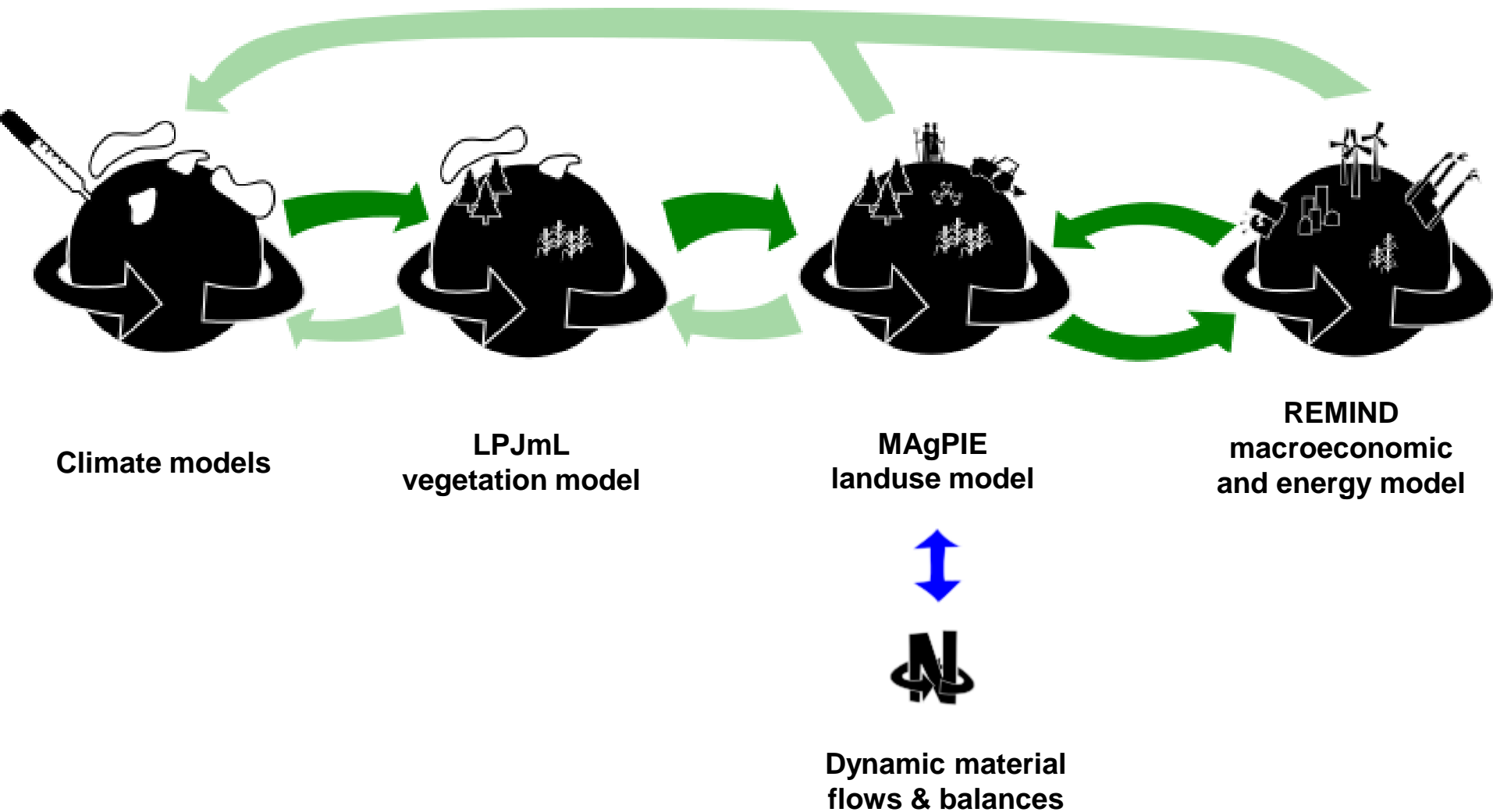
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**Dynamic material
flows & balances**

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Dynamic material flows & balances

NO_x NH_3 N_2O

Dynamic emission inventories
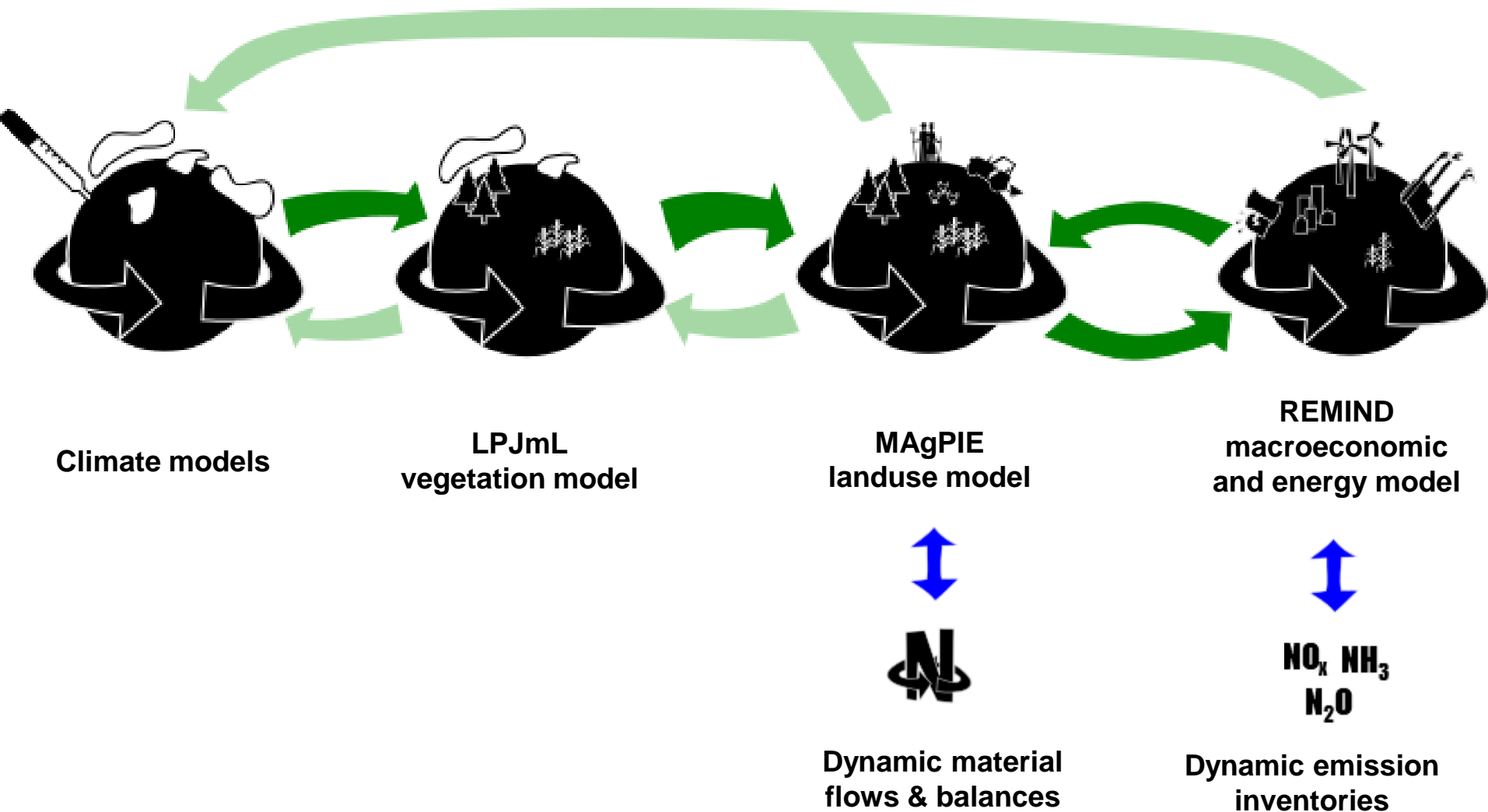
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NO_x NH_3
N_2O

Process-based

Dynamic material
flows & balances

Dynamic emission
inventories

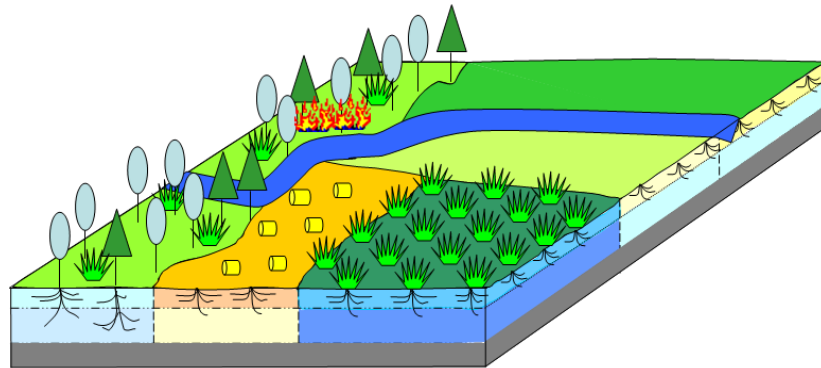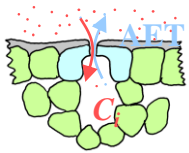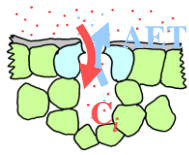# The LPJmL model

A dynamic global vegetation, crop growth and hydrology model

Inputs:
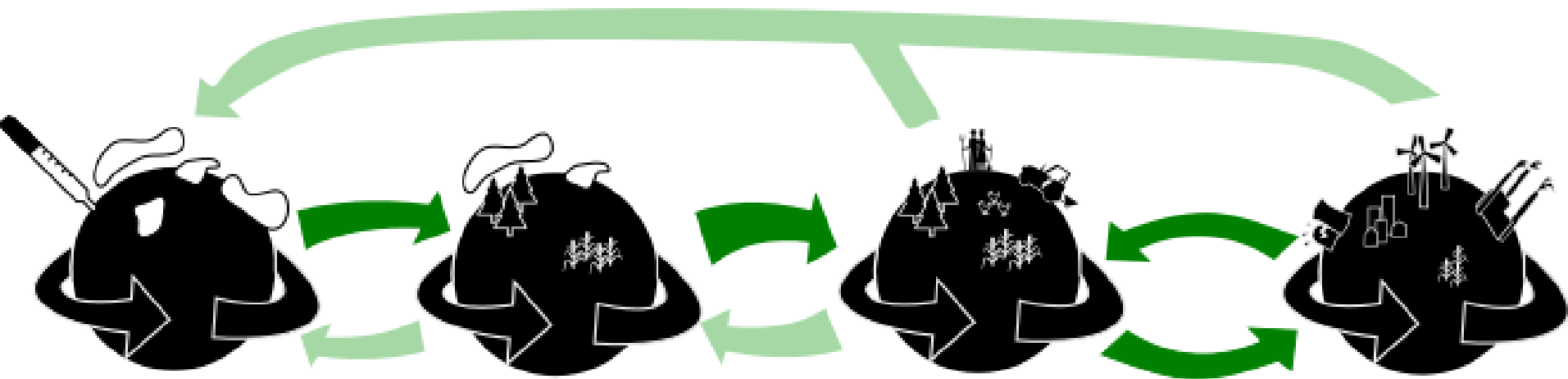- climate
- soil
- land-use fractions
- fertilizer
- N-deposition
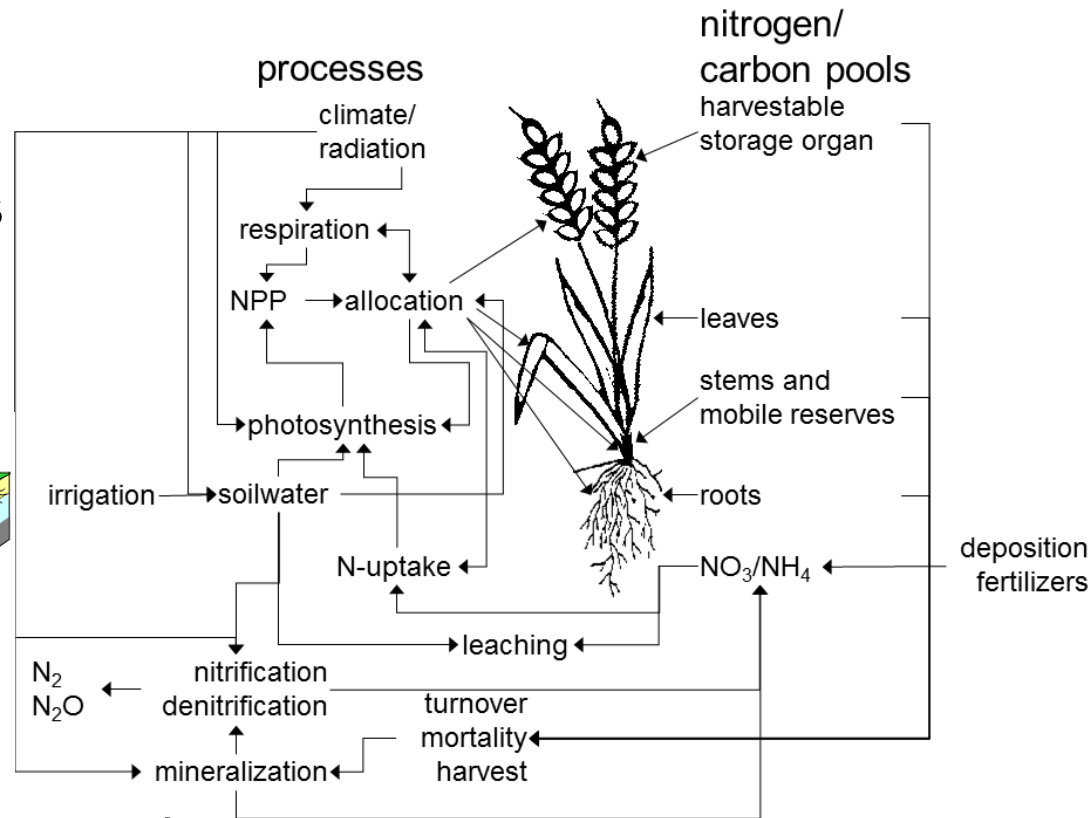
Consistent simulation and interaction
of natural and managed ecosystems,
as well as carbon, water, nitrogen
and vegetation dynamics

von Bloh et al. in prep.
Bondeau et al. 2007

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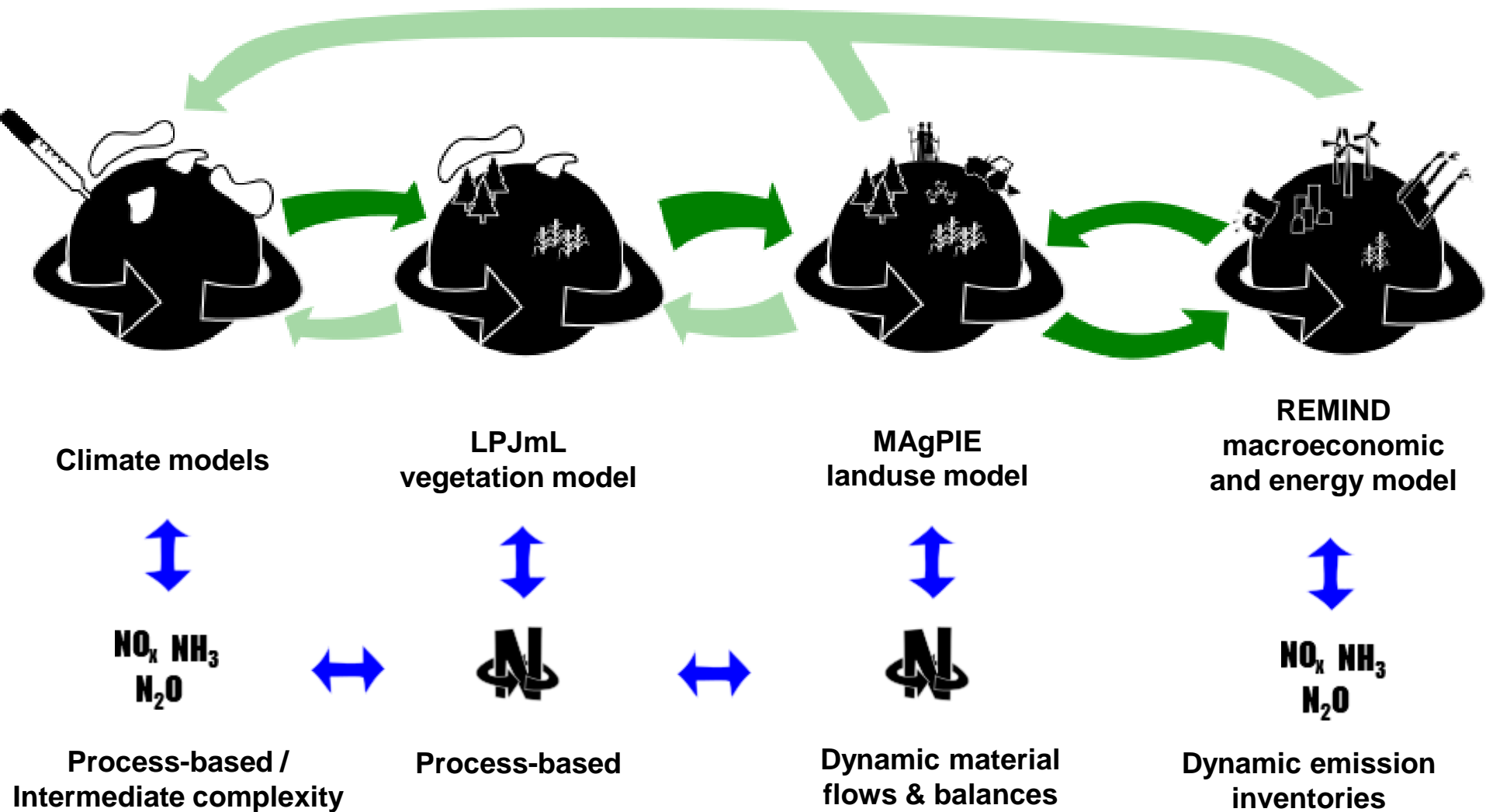NO_x NH_3
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Process-based

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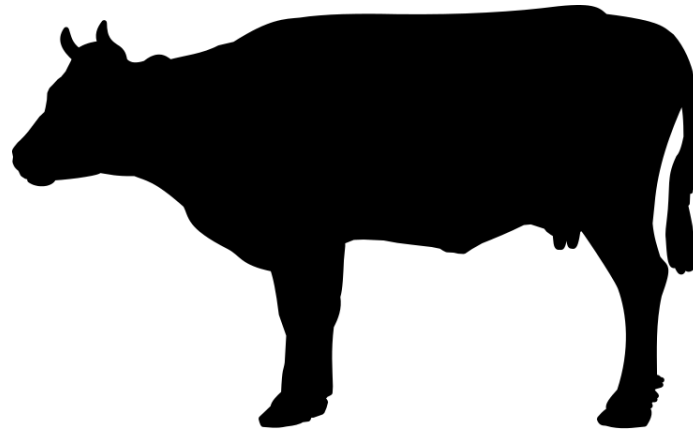## Potsdam Integrated Assessment Modelling Framework

Mario Herrero et al

Ruminant Model
(process based & herd model)