
# Applications of Value Transfer in Ecosystem Accounting

## Monetary Accounts in the SEEA Webinar

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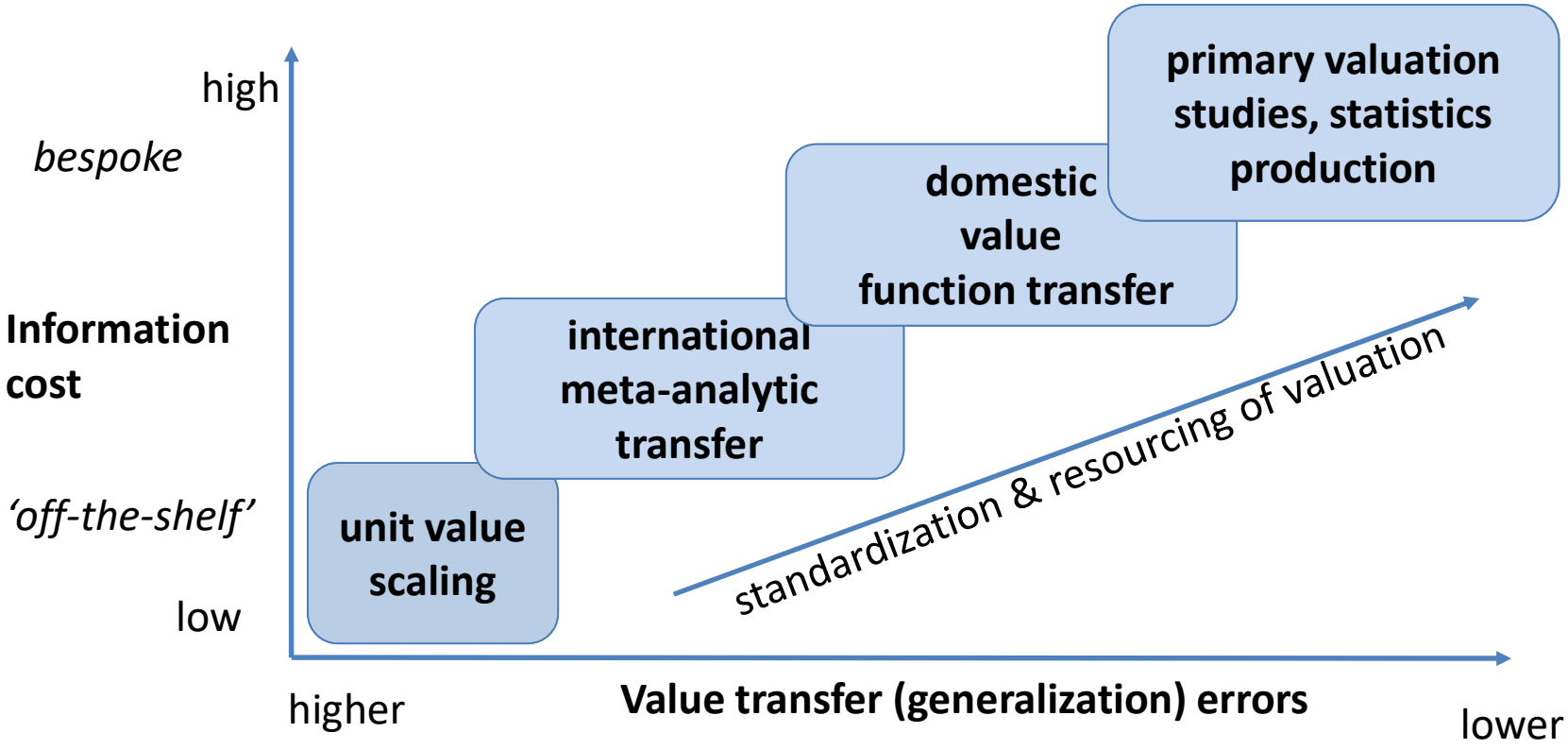
# Overview

1. **Tiered approach** to monetary valuation in accounting
2. **Definition value transfer / generalization**
3. **Unit value transfer example – US urban ecosystem accounts for trees** (M.Heris, K.Bagstad et al. 2021)
    1. Urban Heat Island energy use reduction
    2. Combined stormwater sewage treatment reduction
4. Take home **questions** about value transfer for EA

# Tiered approach to monetary valuation in accounting



# Unit value transfer & generalization

$p_a = p_a ( I_a/I_s )$

where:
p = accounting price
I = income at study site(s) and accounting area(a) locations

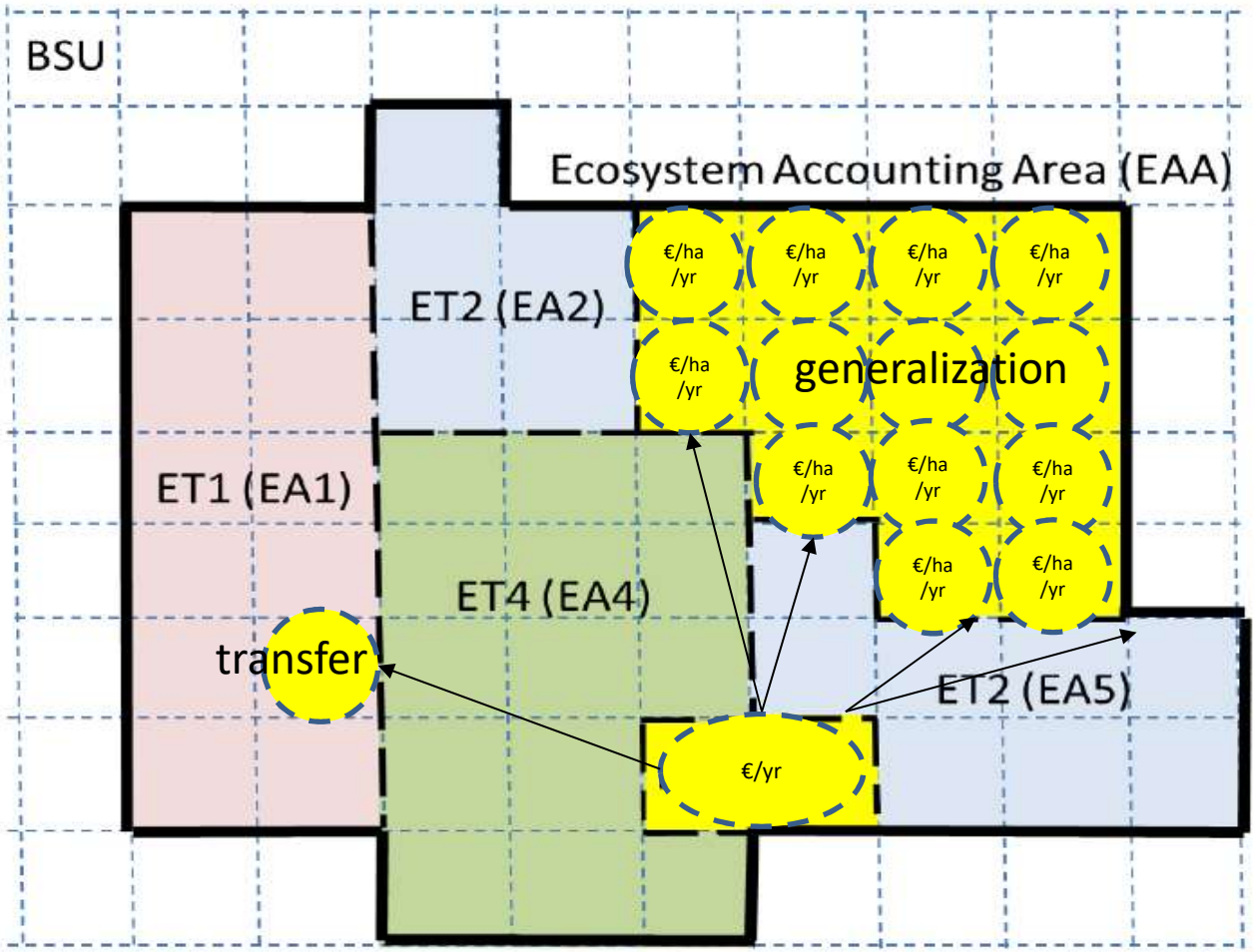



Figure adapted from UN(2017)

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# Piloting urban ecosystem accounting for the United States

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## Highlights

- Regulating services - stormwater, UHI mitigation for US cities
- Open source code; remote sensing; automated workflow for physical extent-condition-ES suppy-use accounts
- Uncertainty analysis and change detection for physical ES
- Value transfer & generalization examples across the accounting chain

# Context of Heri et al. 2021 urban accounts for US cities

**USERS:**

International agencies

National governments

Finance sector

Industry bodies

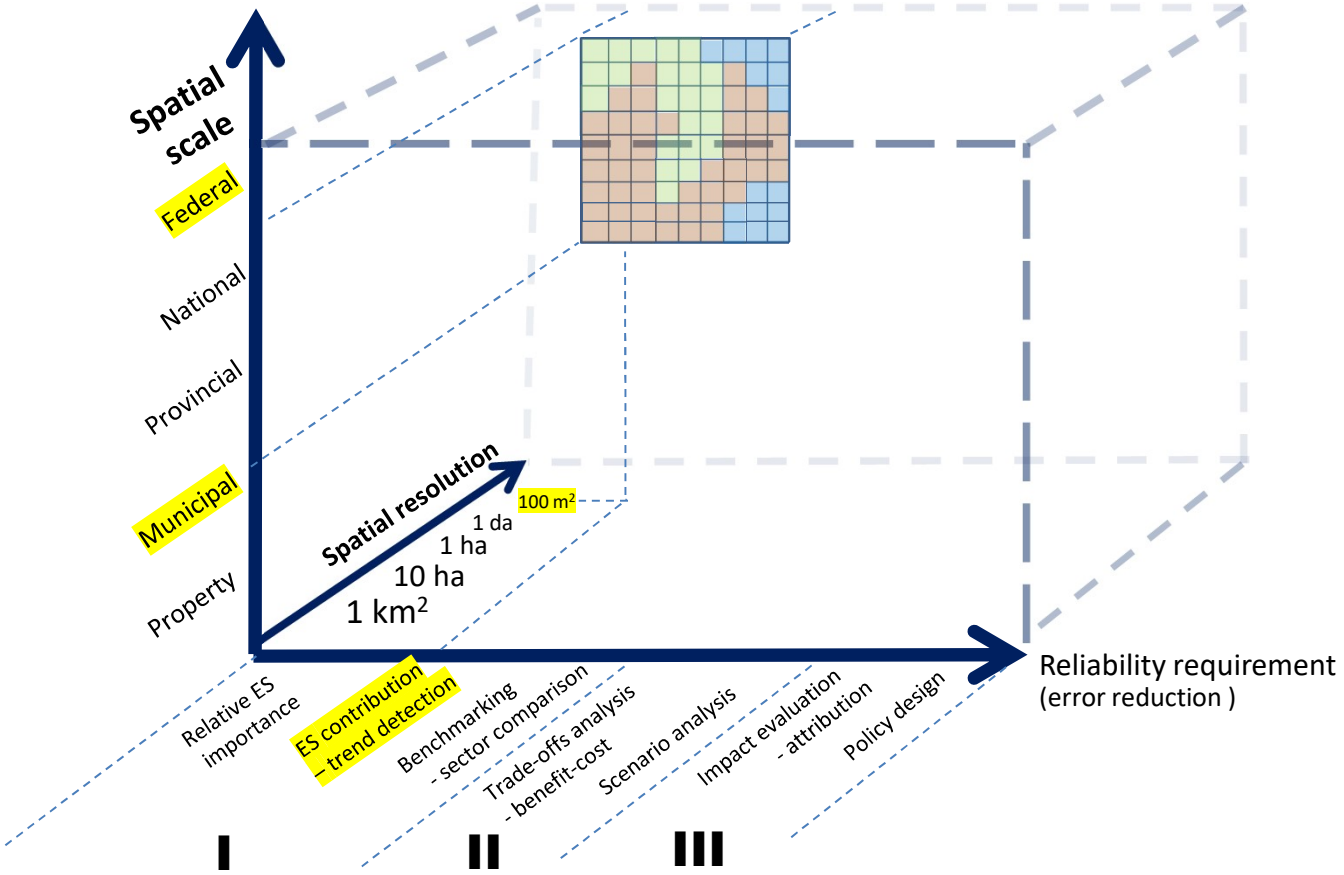
Land & water authorities

Local governments

Primary producers

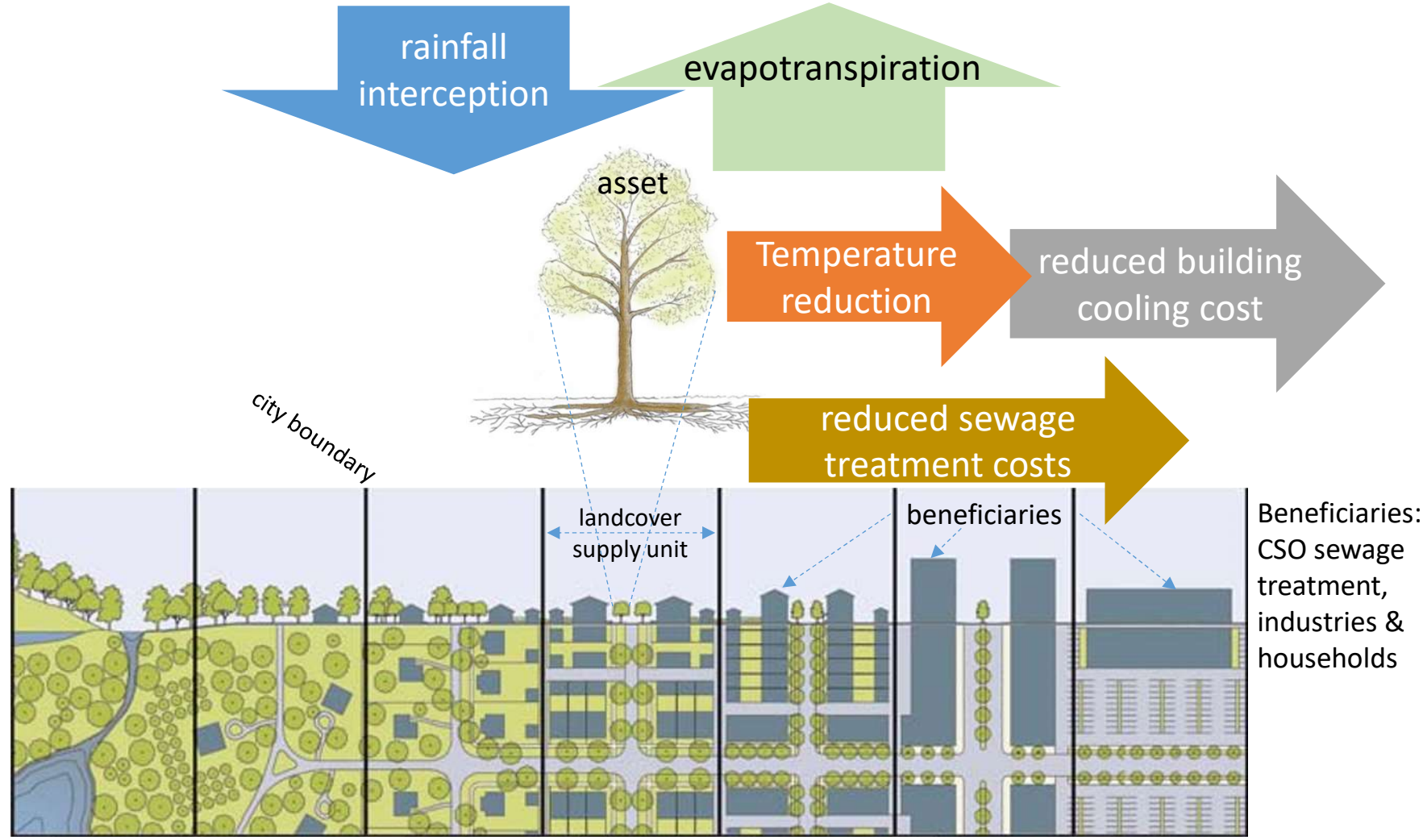
NGOs

Landowners




**TIERED PURPOSES:**

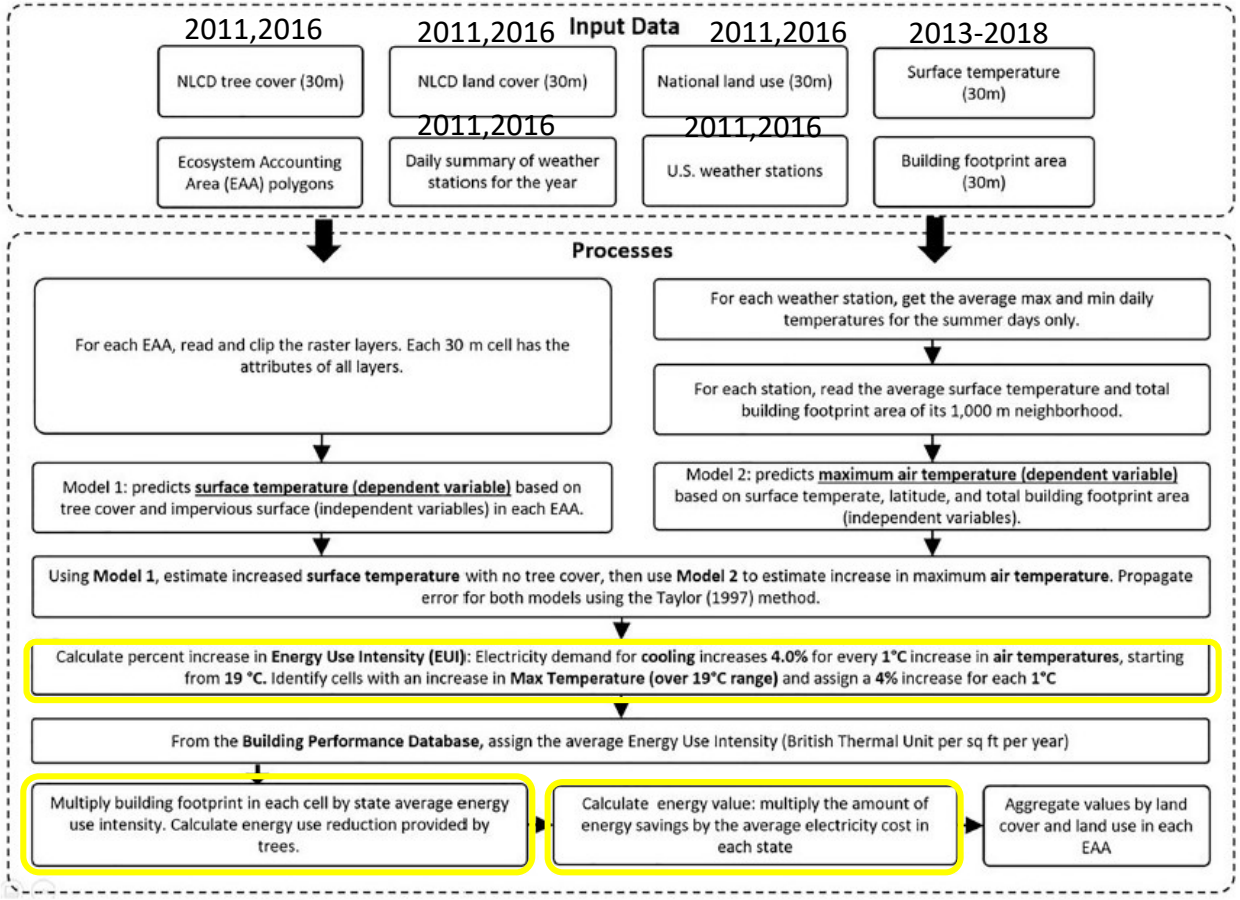
Source: adapted from Zulian, G. et al. (2017)



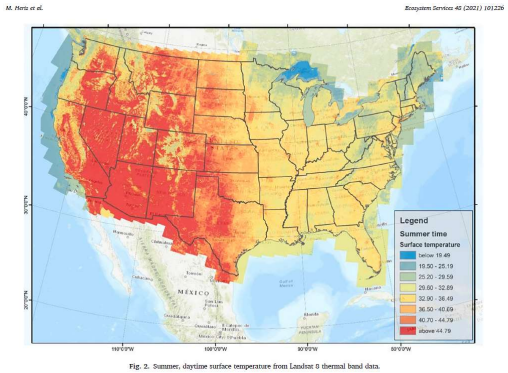

Source illustration tree : BYM(2012) Arbeid nær

Source illustration landscape : 

# Urban Heat Island energy use reduction

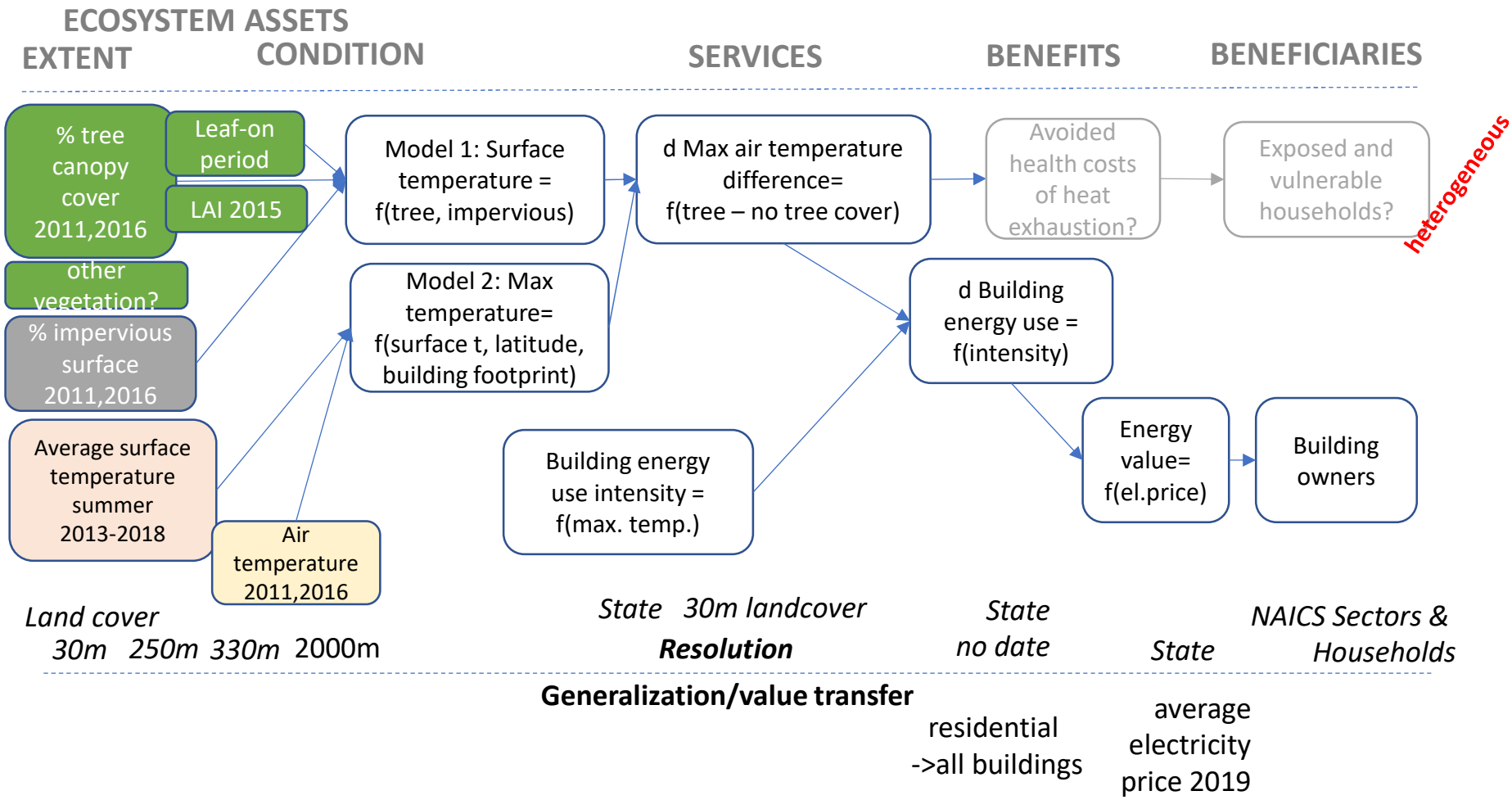



Value transfers

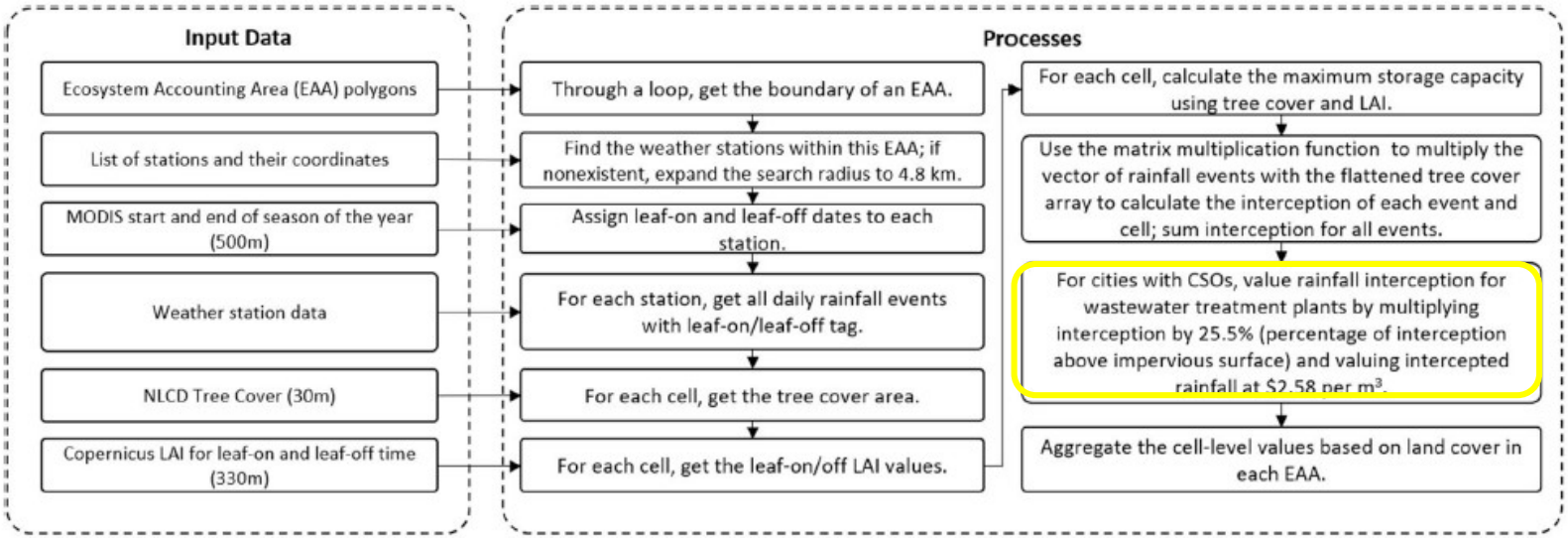


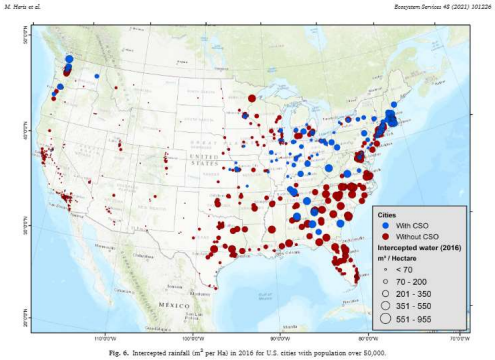

Source: Heris et al. Ecosystem Services 48 (2021) 101226

# Urban Heat Island energy use reduction



# Combined stormwater sewage treatment reduction

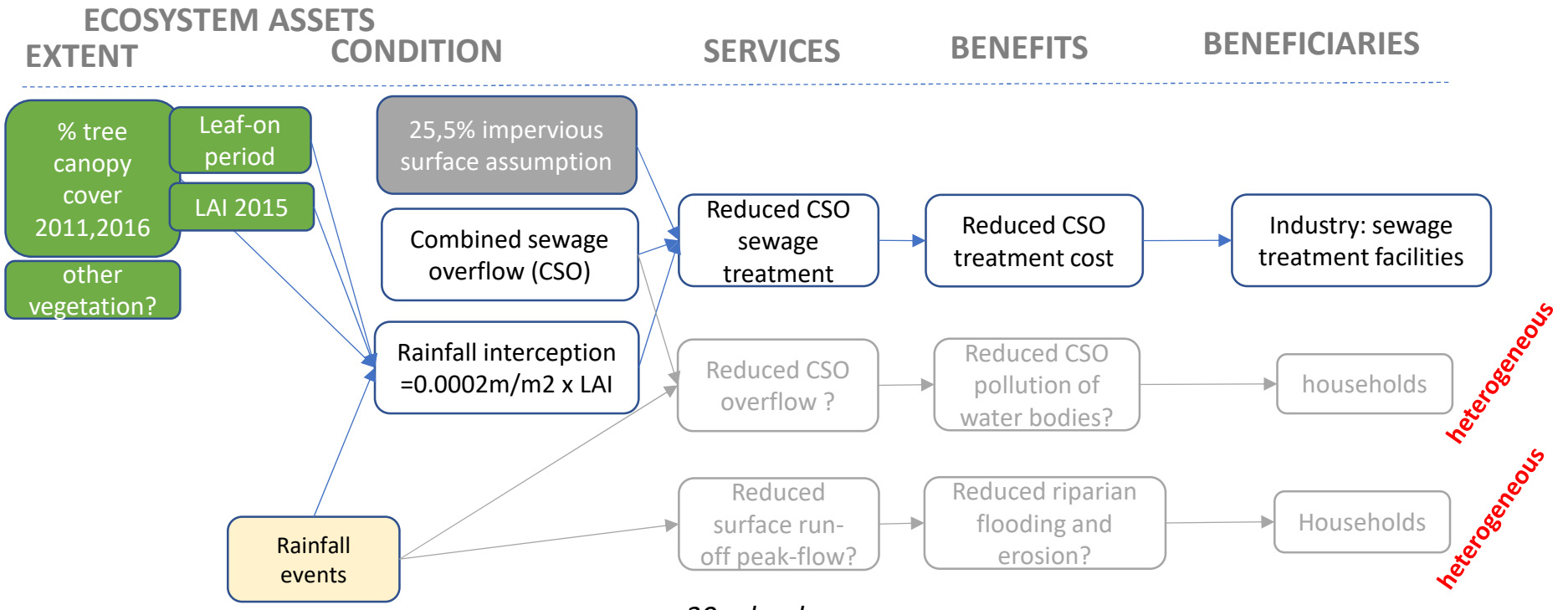



Value transfers

Source: Heris et al. Ecosystem Services 48 (2021) 101226

# Combined stormwater sewage treatment reduction




**Generalization/value transfer**

homogeneous
tree composition
other landcover excl.

impervious % average US

0% CSO overflow

average
sewage treatment
costs $2.58/m3 (16 cities)

# Trend detection confidence – sources of uncertainty and variability

| City | Population | Average Cooling Energy Use (KBTU) | Electricity Cost ($/ KWh) | Energy Savings (million $) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 2011 | | | 2016 | | |
| | | | | Lower CI (95%) | Mean | Upper CI (95%) | Lower CI (95%) | Mean | Upper CI (95%) |
| New York, NY* | 8,175,133 | 17 | 0.18 | 1.1 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 |
| Los Angeles, CA | 3,792,621 | 14 | 0.20 | 14.4 | 16.5 | 18.6 | 14.5 | 16.6 | 18.7 |
| Chicago, IL* | 2,695,598 | 15 | 0.13 | 2.3 | 2.4 | 2.5 | 2.3 | 2.4 | 2.5 |

Source: Heris et al. Ecosystem Services 48 (2021) 101226

Time period is not long enough to **detect significant change** in monetary value of ES in most cities

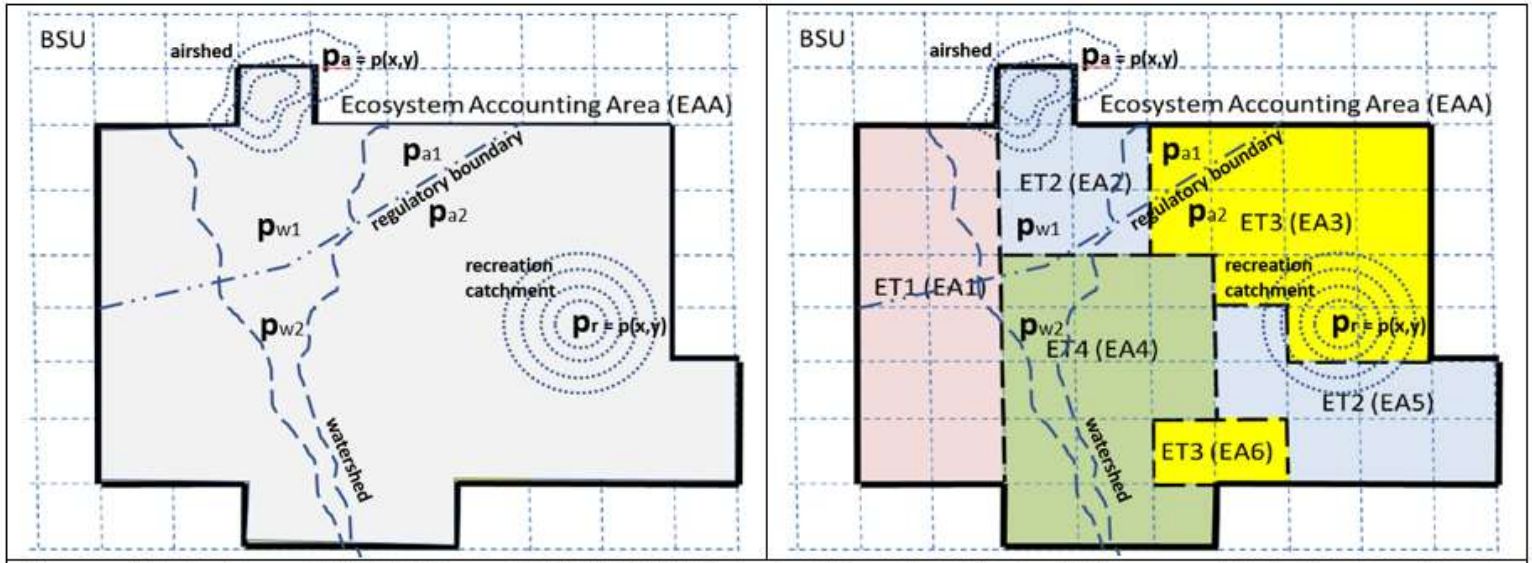
Significant trend in ecosystem service is a function of:

1) Change in extent-condition (accounted for)
2) Change in summer temperatures (accounted for)
3) Change in building extent and energy efficiency (no time stamped data)
4) Change in electricity prices (not considered, but feasible)

-> average unit value electricity price across accounting period is a **scaling constant**

# Take home questions

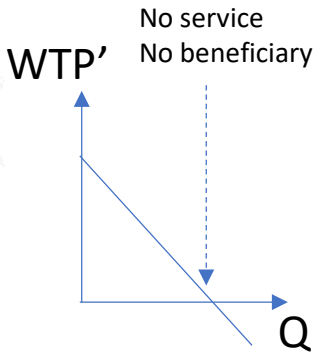
# Do accounting prices reflect spatial patterns of use of the ecosystem services by beneficiaries?



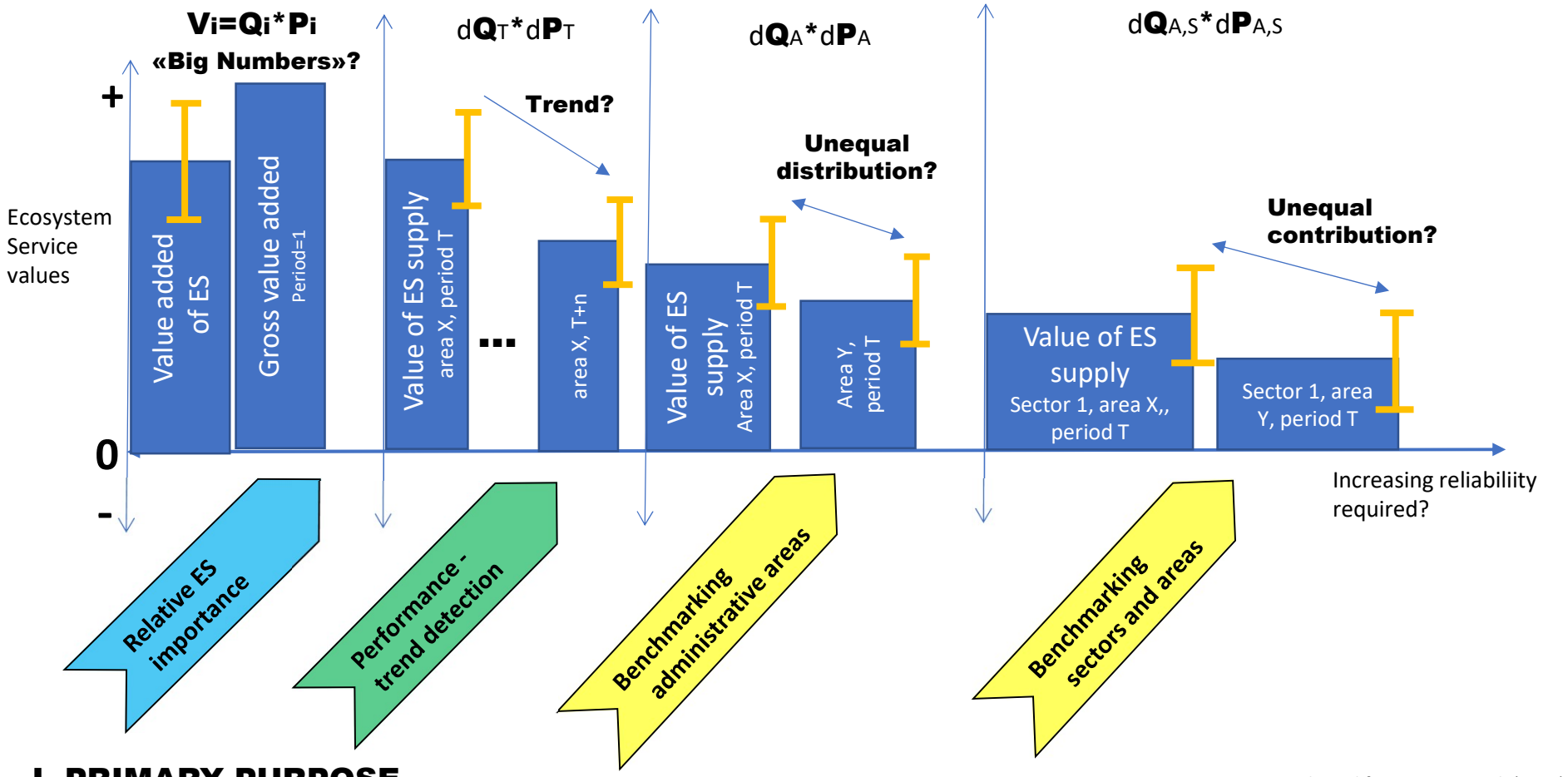

Source: Adapted from SEEA EEA Figure 2.4 (UN 2017). Note that Ecosystem Assets (EA) represent individual, contiguous ecosystems. Ecosystem Types (ET) are EA of the same type

**Figure S4 – Ecosystem accounting area with different accounting prices**

Source: Barton, D.N. 2020 adapted from SEEA EEA (UN 2017)



# Do accounting purposes determine requirements of value transfer?




**I. PRIMARY PURPOSE**

Source: adapted from Barton et al. (2019)

# Precision differential between biophysical and monetary accounts?

**USERS:**

International agencies

National governments

Finance sector

Industry bodies

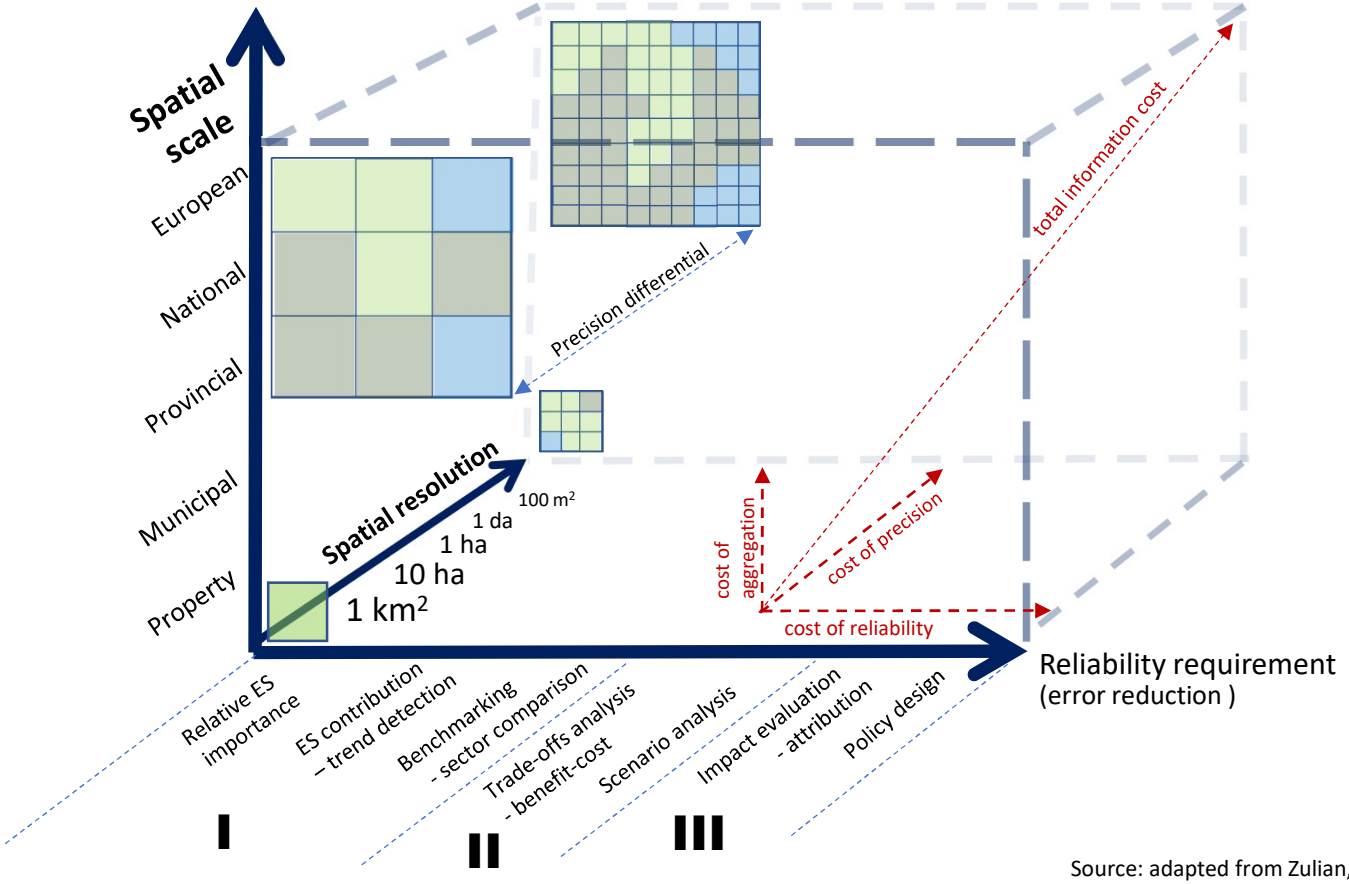
Land & water authorities

Local governments

Primary producers

NGOs

Landowners




Source: adapted from Zulian, G. et al. (2017)

# Summary of take home messages

1) Value transfer approaches are part of a **continuum of methods** to generalize from a few observations or a sample to the whole accounting area
2) **Purpose of monetary accounts** determines required reliability of valuation method
3) Value transfers for accounting tend to work as **scaling constants** -> accounting prices are not usually conditional on spatial variation in ES
4) Value **generalization applies across 'accounting chain'**, not just for monetary unit values
5) Transfer/generalization **errors are cumulative**, determining **change detection** reliability (for a given periodicity and rate of change)
6) Ecosystem accounting **periodicity** depends on speed of change, accuracy and sensitivity to change (value transfers are not generally sensitive, reducing the information value of e.g. annual ecosystem accounting)
7) Accounting for year-to-year changes at high resolution may be expensive and not yield **significant information** for decision-support


MAIA
Mapping and Assessment for Integrated ecosystem Accounting

# Thanks & acknowledgement:

## Mehdi Heris and Ken Bagstad for comments

*Mapping & Assessment for Integrated ecosystem Accounting*
*http://maiaportal.eu/*

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