Scaling up ecosystem service values for national level assessments

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Outline

- Demand for national level assessments of ES values
- Method:
  - Meta-analysis, value transfer and "scaling up" values
- Example Application:
  - Value of regulating services from wetlands
  - Data, value function and results for Asia
- Conclusions

Demand for national ES assessments

- GDP flawed indicator of human welfare
  - Includes only marketed services
  - ES are largely not traded in markets
- ES are therefore ignored in national accounts and public decision making
- "Addiction to GDP growth" distorts decision making
- Green national accounting to include ES values

Demand for national ES assessments

- Convention on Biodiversity "Aichi Target" 2:

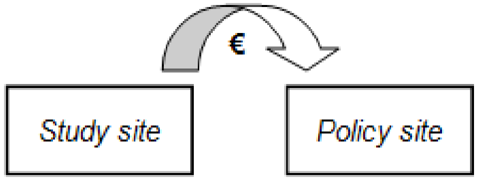
  "By 2020 biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting and reporting systems."

ES values for national assessments

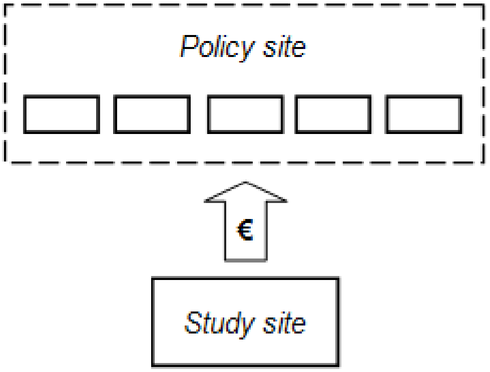
- ES value estimates are generally for small scale ecosystem sites/parcels/patches
- National assessments require ES values for all ecosystems within a country
- Not feasible to conduct primary valuation studies
  - Expensive
  - Takes time
- Transfer and "scale up" existing value estimates
- European Environment Agency: www.eea.europa.eu/publications/scaling-up-ecosystem-benefits-a

Scaling up values

- Value transfer: estimate the value of a ‘policy site’ using existing value information for a ‘study site’
- Need to account for differences in study and policy site characteristics and context (including socio-economic context)
- Scaling-up is value transfer across a larger geographic scale



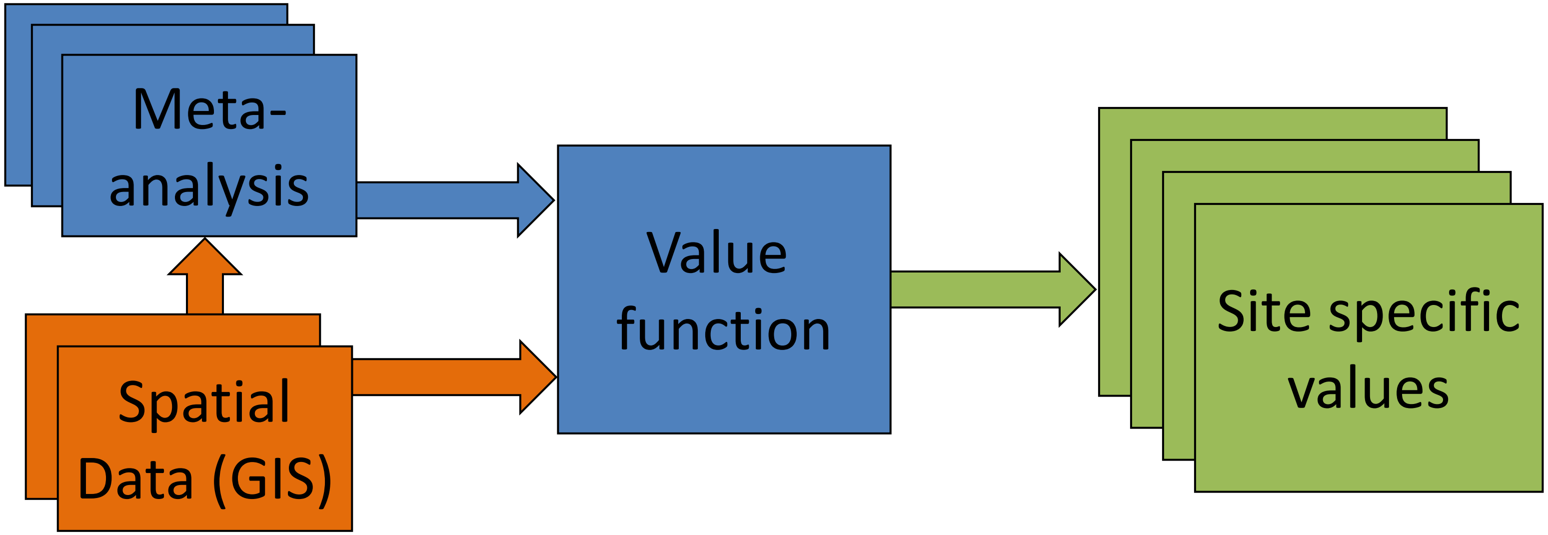
Value transfer



Scaling up

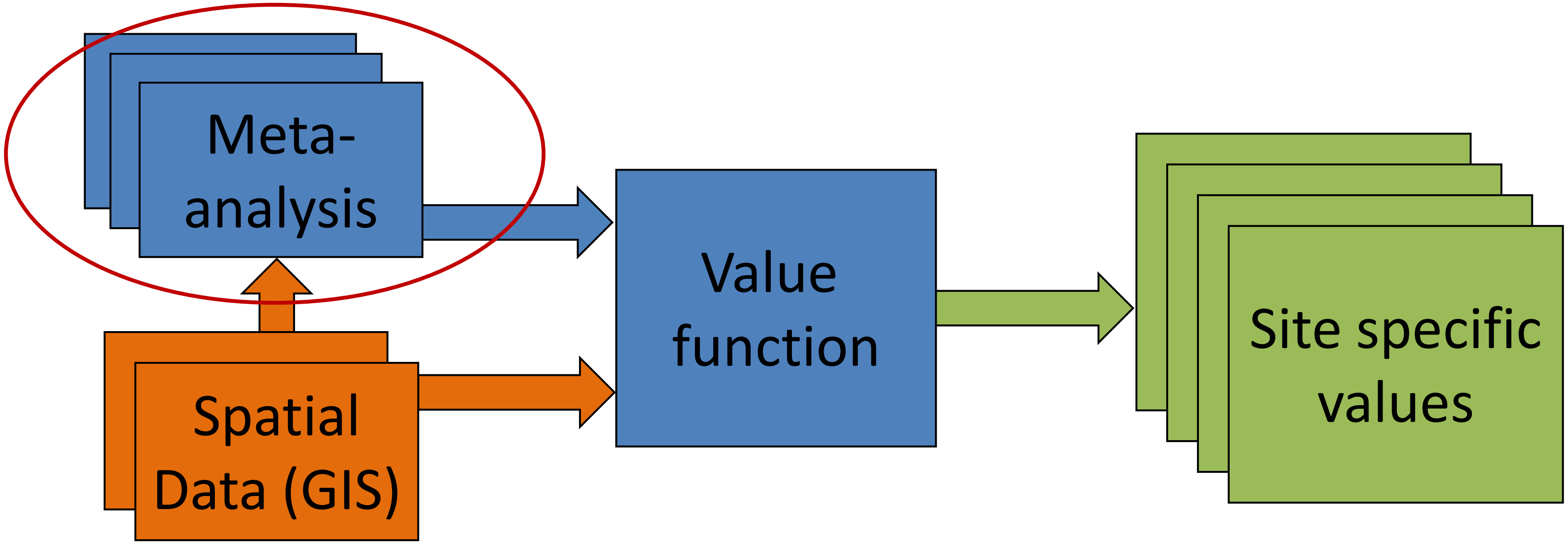
Method for scaling up values

1. Meta-analysis of ecosystem service values
2. Estimate value function (site and context variables)
3. Obtain policy site data (site and context)
4. Estimate site-specific values and aggregate



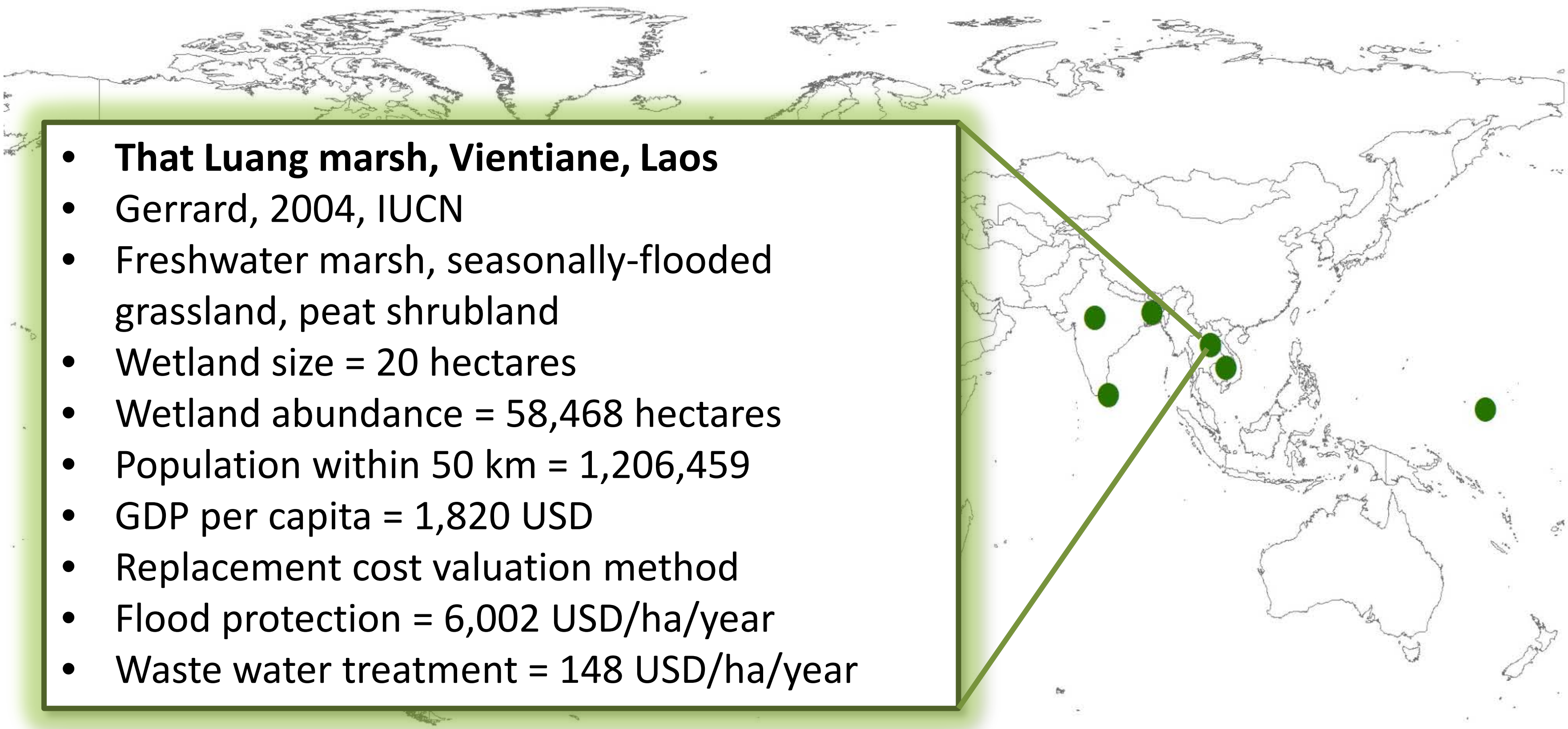
Example application for wetland regulating services

- Meta-analysis of 66 value estimates for wetland <u>regulating services</u>
  - Flood control: 25
  - Water supply: 28
  - Water quality: 26



Location of wetland study sites

Location of wetland study sites



- **That Luang marsh, Vientiane, Laos**
- Gerrard, 2004, IUCN
- Freshwater marsh, seasonally-flooded grassland, peat shrubland
- Wetland size = 20 hectares
- Wetland abundance = 58,468 hectares
- Population within 50 km = 1,206,459
- GDP per capita = 1,820 USD
- Replacement cost valuation method
- Flood protection = 6,002 USD/ha/year
- Waste water treatment = 148 USD/ha/year

Standardisation of values

- Values standardised to:
  - USD (PPP adjusted)
  - Hectare
  - Annual
  - 2007 price levels
- Mean (and median) values:
  - Flood control: 6,923 (427)
  - Water supply: 3,389 (57)
  - Water quality: 5,788 (243)

Explanatory variables

- Variables from study reports:
  - Type of wetland
  - Service
  - Area of wetland
  - Valuation method
- Variables added using GIS:
  - Area of wetlands within 50 km
  - Population within 50 km
  - Gross Cell Product within 50 km

Value function

$$y = \alpha + \beta^S X^S + \beta^C X^C + \beta^E X^E + \mu$$

y = Value (USD/ha/year)

X^S = Site characteristics (wetland type, service, size)

X^C = Context (area of other wetland sites)

X^E = Socio-economics (population, GCP)

μ = error term

Value function

Values (per unit of area) are lower in larger wetlands

Variable	Coefficient
Constant	3.567*
Man-made wetland	0.450
Water supply	-1.309**
Water quality	-0.786
Wetland area	-0.367***
Wetland abundance	-0.299***
Population	0.449***
Gross Cell Product per capita	0.259*
N	66
Adjusted R^2	0.583

Value function

Ecosystem service values are lower in areas with abundant wetlands

Variable	Coefficient
Constant	3.567*
Man-made wetland	0.450
Water supply	-1.309**
Water quality	-0.786
Wetland area	-0.367***
Wetland abundance	-0.299***
Population	0.449***
Gross Cell Product per capita	0.259*
N	66
Adjusted R^2	0.583

Value function

Ecosystem service values are higher in areas with more people

Variable	Coefficient
Constant	3.567*
Man-made wetland	0.450
Water supply	-1.309**
Water quality	-0.786
Wetland area	-0.367***
Wetland abundance	-0.299***
Population	0.449***
Gross Cell Product per capita	0.259*
N	66
Adjusted R^2	0.583

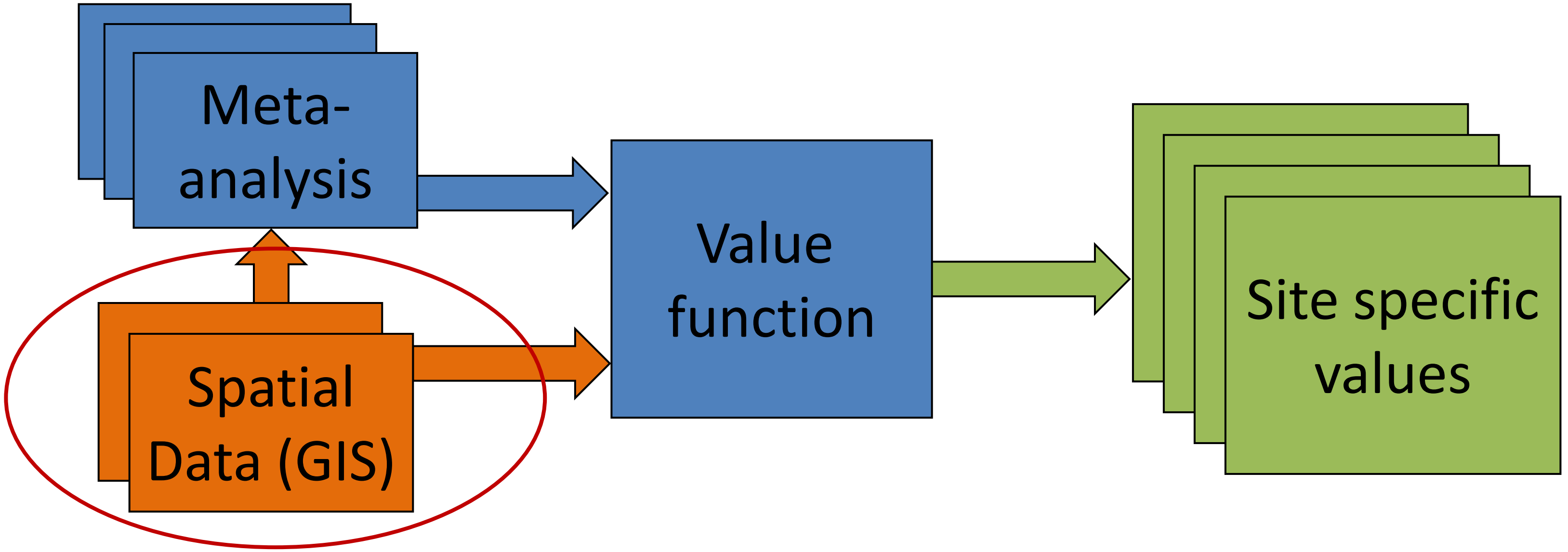
Value function

Ecosystem service values increase with income

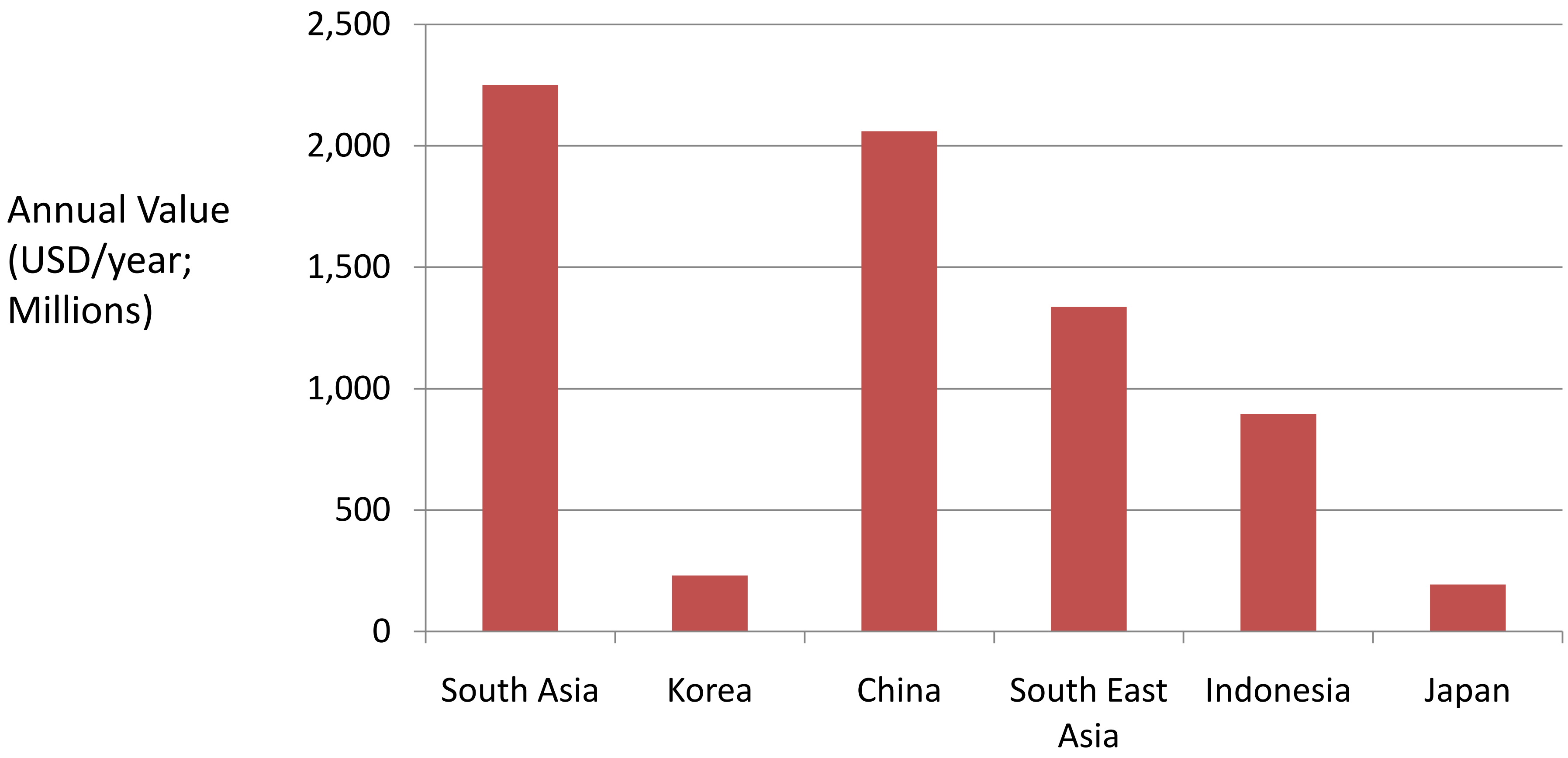
Variable	Coefficient
Constant	3.567*
Man-made wetland	0.450
Water supply	-1.309**
Water quality	-0.786
Wetland area	-0.367***
Wetland abundance	-0.299***
Population	0.449***
Gross Cell Product per capita	0.259*
N	66
Adjusted R^2	0.583

Scaling up for wetlands globally

- 166,101 wetlands (Global Lakes and Wetlands database)
- GIS used to obtain site, context and socio-economic characteristics for each wetland
- Plug "policy site" variables into value function



Annual wetland ES values



Annual wetland ES values

	Area (ha; millions)	Total Value (USD/year; millions)	95% Confidence Interval
South Asia	2	2,252	2,071 – 2,451
Korea Region	0.32	231	53 – 822
China	7	2,061	1,714 – 2,457
South East Asia	8	1,338	662 – 2,528
Indonesia	17	896	388 – 2,215
Japan	0.10	193	123 – 284

Conclusions

- Scaling up values to a large geographic scale:
  - Site specific value transfer
  - Scale, scarcity, population, and income effects
- Limitations to methodology:
  - Limited number of studies for some regions
  - Reliability of primary valuation estimates
  - High uncertainty
- Uses in public decision making:
  - National assessment of ES values (Green Accounts; TEEB follow up for Europe)
  - Marginal changes under policy scenarios (e.g. TEEB Quantitative Assessment)