Value of biodiversity

Theo Thewys, dr.

Reseach group environmental economics

Center for Environment & Faculty Applied economics

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Overview

- Value of biodiversity
  - Species as *structural components of the* ecological system
  - Ecosystem services contributing to human welfare
- 'National Park 'Hoge Kempen'
  - Costs: investments and management
  - Benefits: = contribution to environmental quality
    - CO_2 capture
    - Water purification
    - Air 'filtering' (capture of particle matter)
  - Benefits les Costs : Net Present Value (30 years)
  - Sensitivity of NPV
- Conclusion

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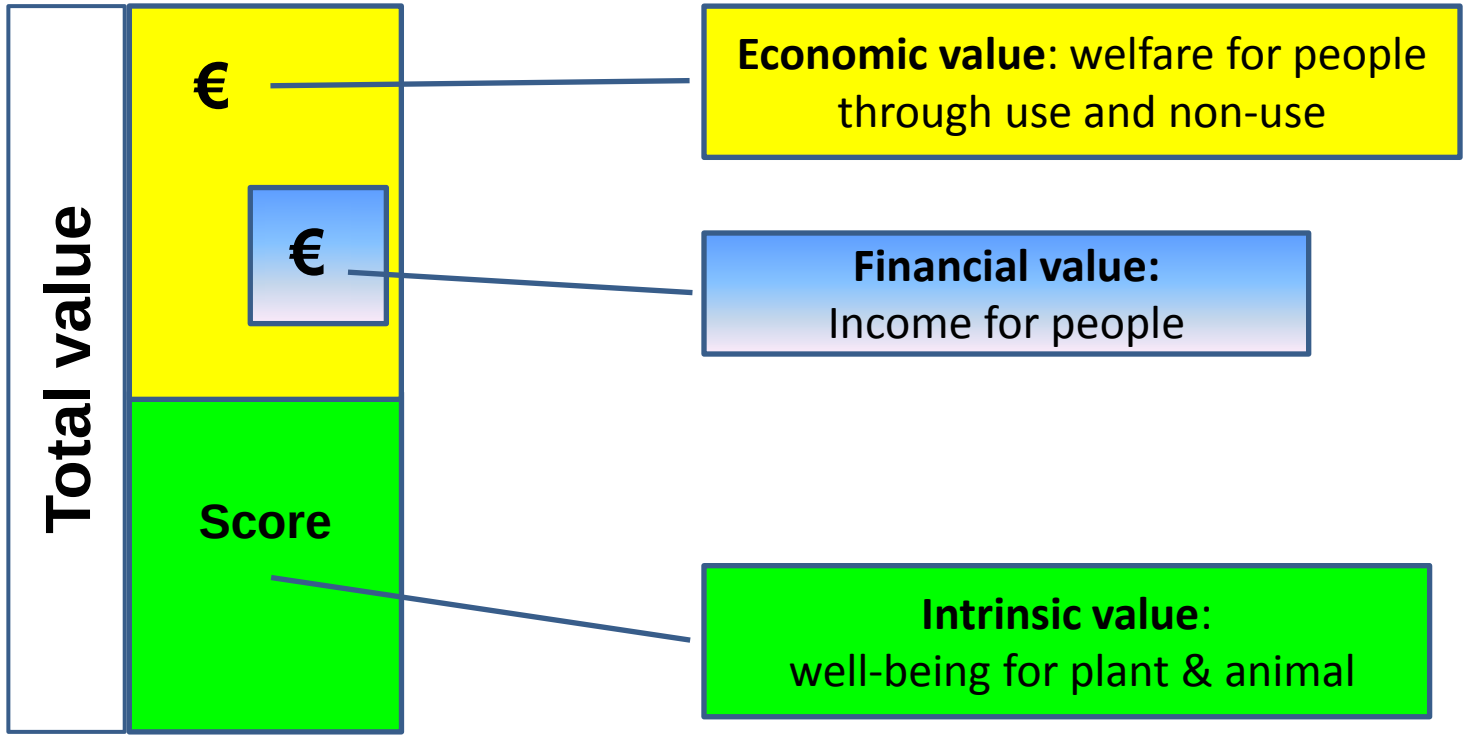
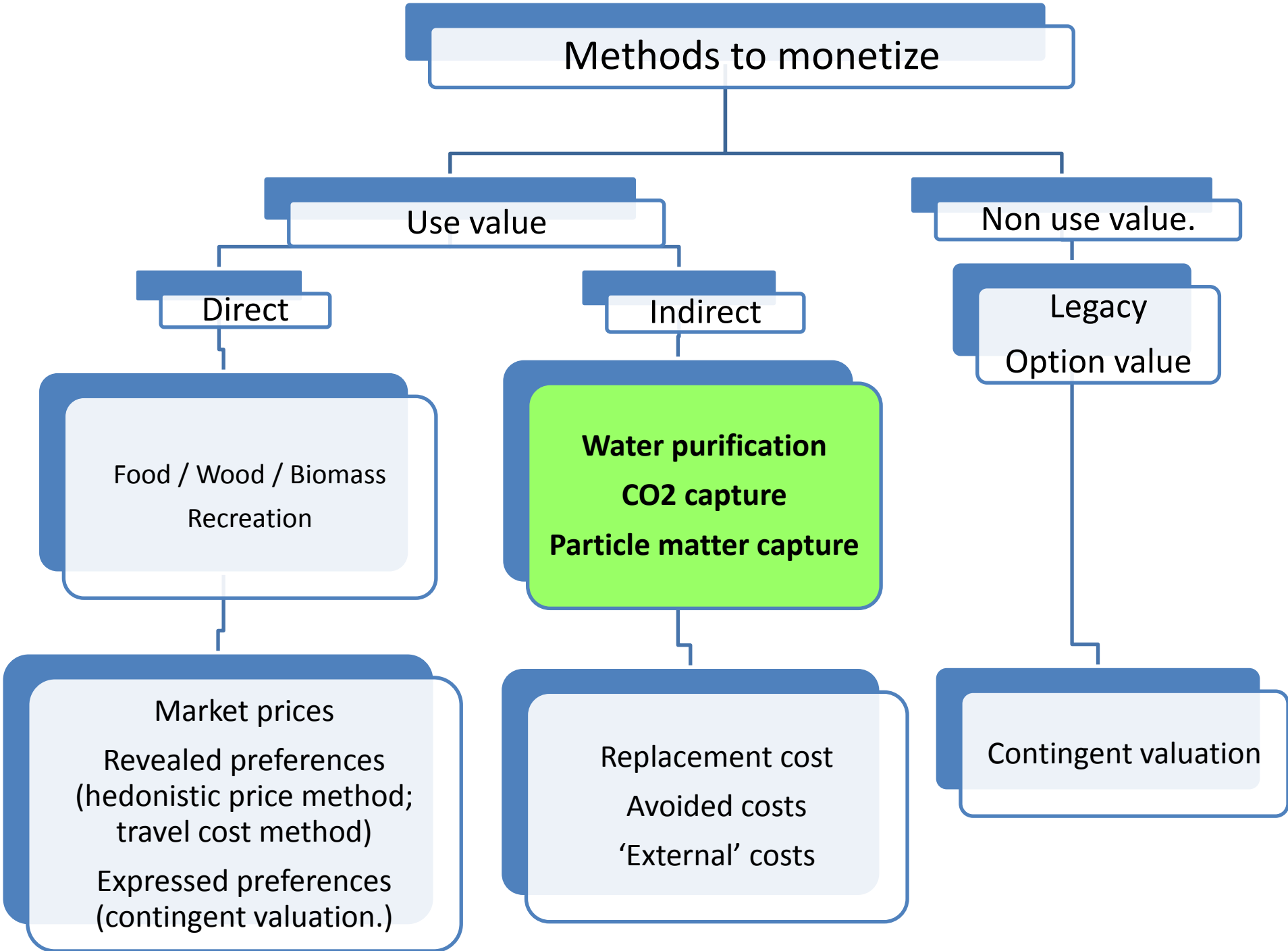
Three values of an ecosystem



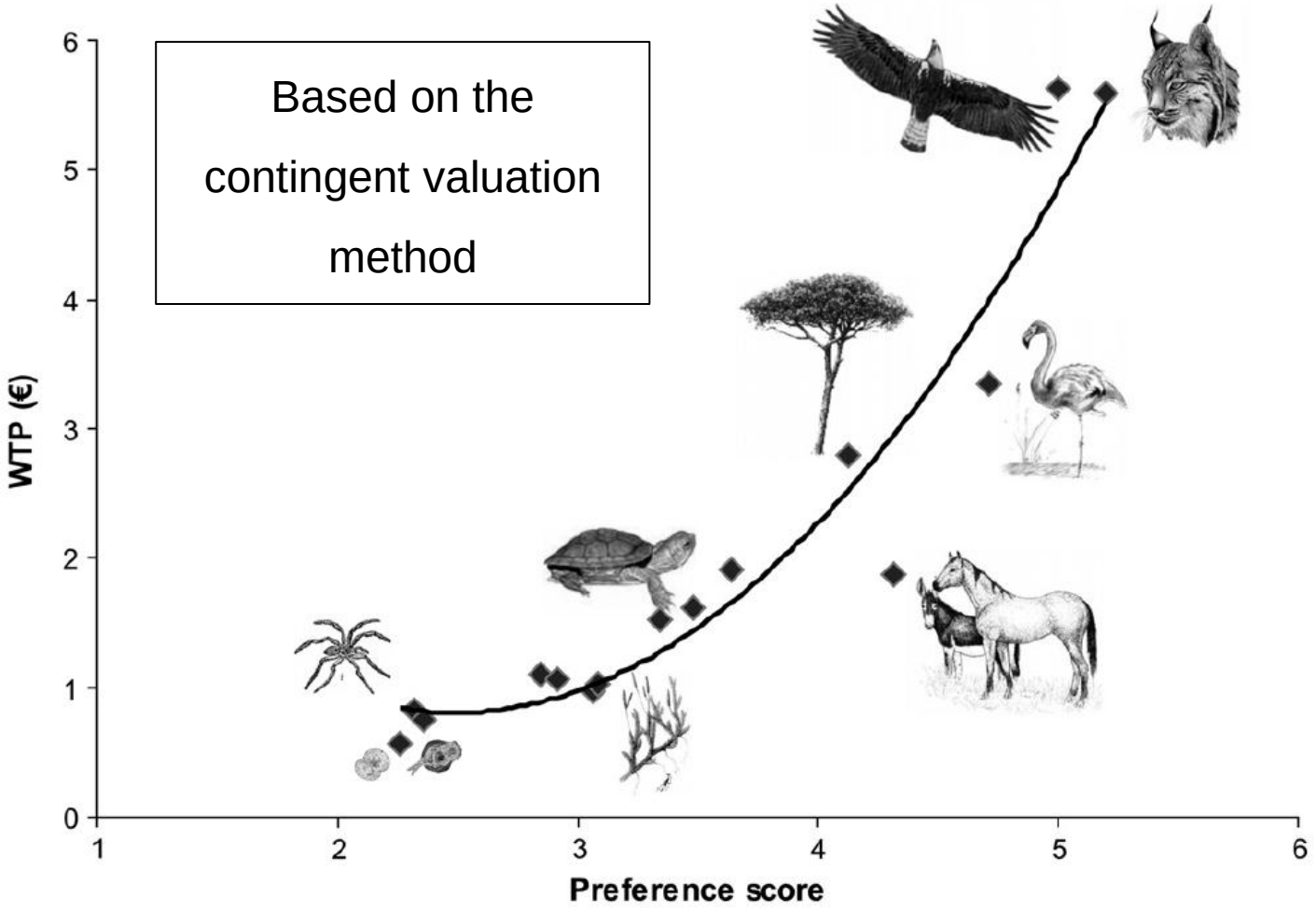
Source: www.fsd/naturevaluation.nl


Methods to monetize
Use value
Non use value.
Direct
Indirect
Legacy
Option value
Food / Wood / Biomass
Recreation
Water purification
CO2 capture
Particle matter capture
Market prices
Revealed preferences (hedonistic price method; travel cost method)
Expressed preferences (contingent valuation.)
Replacement cost
Avoided costs
'External' costs
Contingent valuation

One (defined) species: individual valuation

- Recreation and Existence value, contingent valuation method (CVM):
  - Significant willingness to pay (WTP) for popular anaimals or plants (ex: protection of the grizly bear: 15–24 $)
  - Low WTP for 'obscure' species.

Relation between the attitude w.r.t. species (preference score) and the Willingness to Pay (WTP) for the conservation



Bron: B-M. Lopez, 2007, *The non economic motives behind the willingness to pay for biodiversity conservation*, Biological Conservation.

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Species as *structural components of the* ecological system

- Single species are an *input for the production of* ecological *functions* of ecosystems.
- The economic relevance of these structural components finally only can be deduced from the ***economic value*** of the ecological **functions**,
- which again is a consequence of the fact that they are inputs for *the de* ***services used by mankind*** of the ecosystems.

"Willingness to pay"

for biodiversity and habitat services

Topic	WTP / person/year (€, 2006)	Countries
Protection endangered species	121	UK, N, D
Landscape	58	UK, NL, A, S
Marshes	35	UK, A
Preservation biodiversity	29	UK, N, D
Watercourses	27	UK, N
Forests	19	UK, NL, S, N
National parks & natural reserves	9	UK, H

Nijkamp a.o., 2008, Economic evaluati… …parative study

Uncertainty !

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‘National Park Hoge Kempen’ Costs: investments and management

Period 2001-2011	**(1.000 EUR)**
Acquisition forest- and nature reserve	500
Acquisition enclaves	4.500
De-fragmentation	5.700
Route structures	4.200
Total investments	**14.900**
Maintenance	1.200
Management and arrangement	3.600
Total management costs	**4.800**

Source: ‘Financiering- en beheerkosten van uitvoering Masterplan Nationaal Park Hoge Kempen’, (RLKM, 2001)

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Ecosystem services

contributing to human welfare

- Productive
- Regulating
  - CO_2 capture
  - Water purification
  - Air 'filtering' (capture of particle matter)
- Information
- Supporting
- Recuperation

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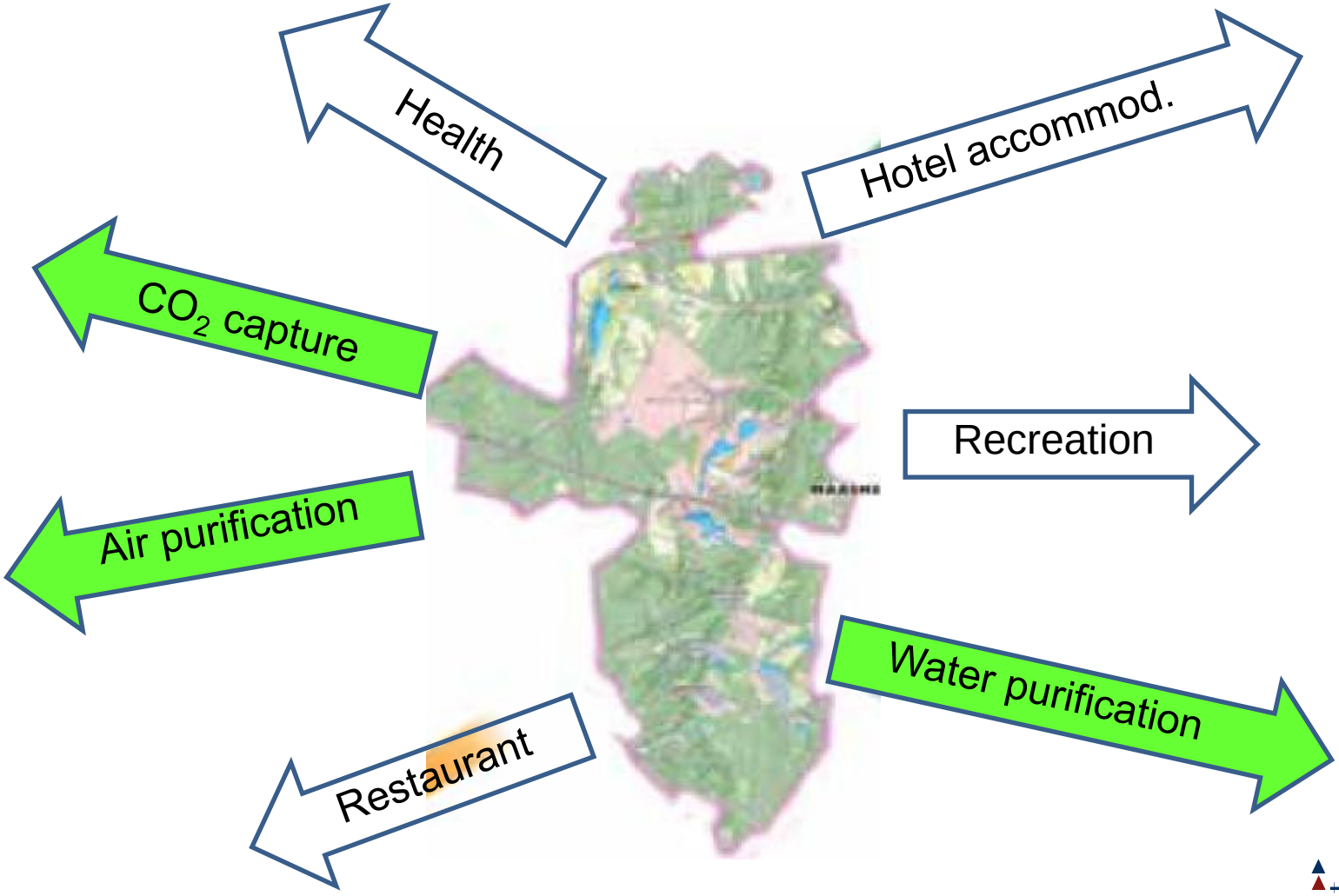
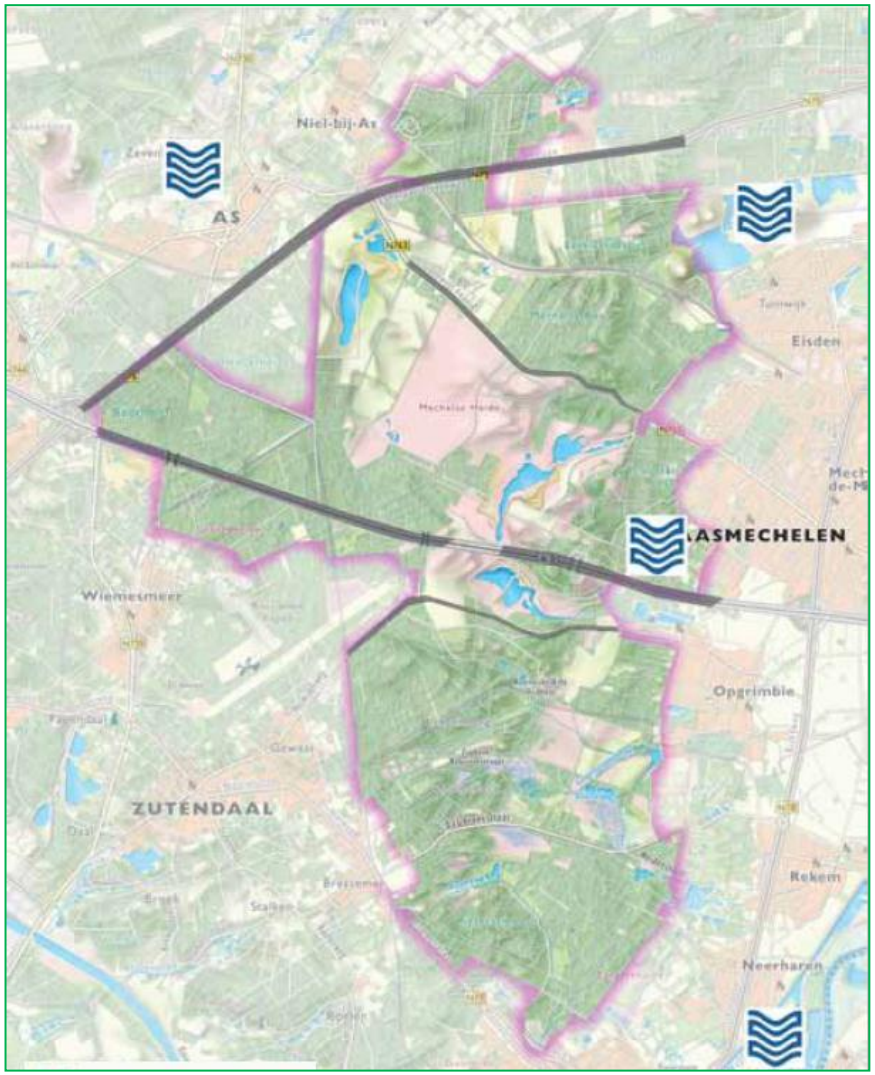
Benefits of the 'National Park Hoge Kempen'



Ecoservices National Park Hoge Kempen



Drinking water collection

Source of particle matter

Drinking water purification

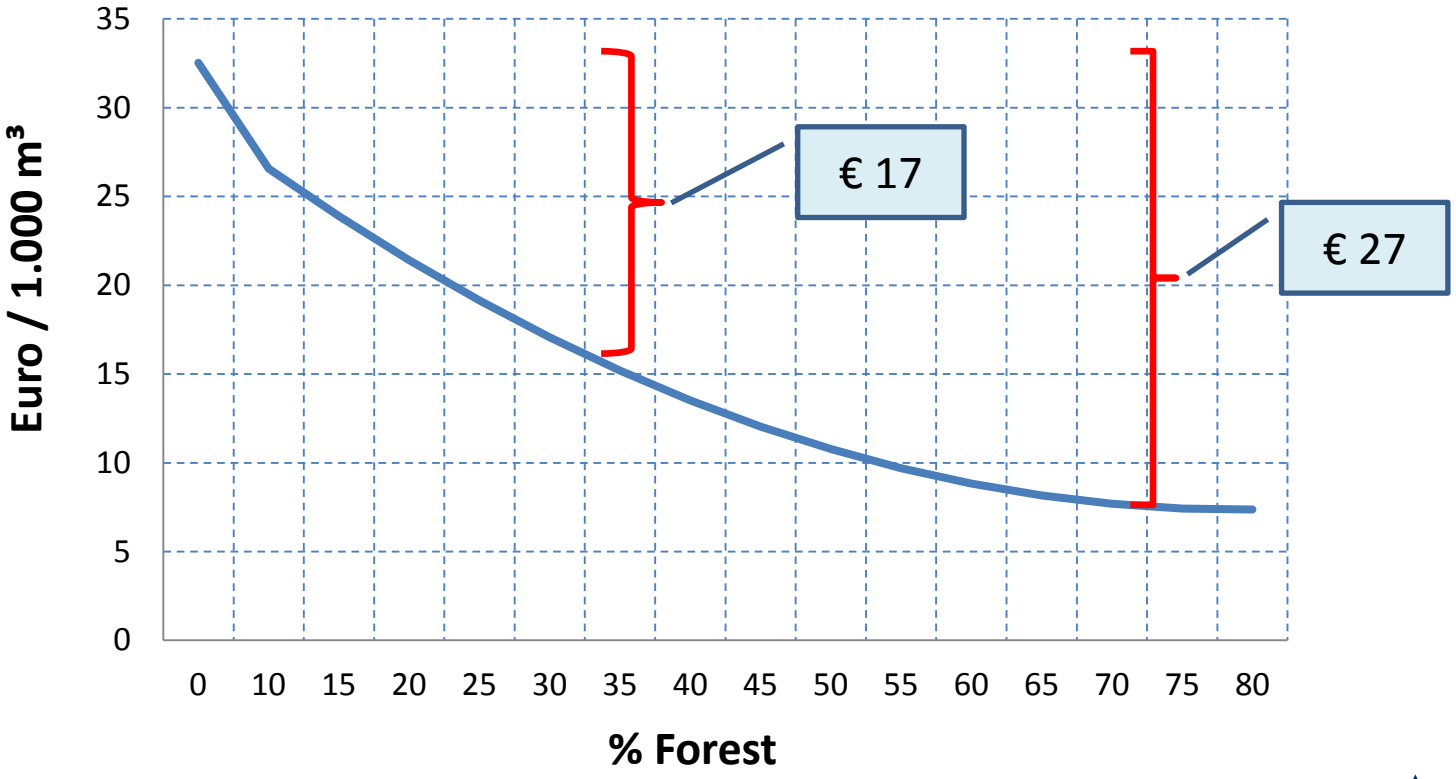
Particle matter capture

CO_2 capture

Source: Tom Bade a.o., Hoge Kempen, hoge baten, Arnhem, Triple E, 2011, Fig. 5.1 p.52

Benefits example: water purification: avoided costs

Water treatment costs: lower with higher % afforestation



Source: own calculated actualization for the year 2010 based on : Ernst C., Protecting the source, Land Conservation and the Future of America's Drinking Water, 2004

"Benefits": quantities & prices used

= "avoided costs"

	Eco service	Min	Most likely	Max
(1a)	Quantity CO2 capture (ton/year)	39.600	44.000	48.400
(1b)	Price CO2 capture (Euro/ton)	16	17	20
(2a)	Quantity drinking water (1000 m^3 / year)	18.540	20.600	22.660
(2b)	Price water purification (Euro/1000 m^3)	17	23,2	27
(3a)	Quantity PM capture (kg /year)	72.000	80.000	88.000
(3b)	Price PM capture (Euro/kg)	2	2	4
(4)	Discount rate (%)	3,5%	4,0%	4,5%

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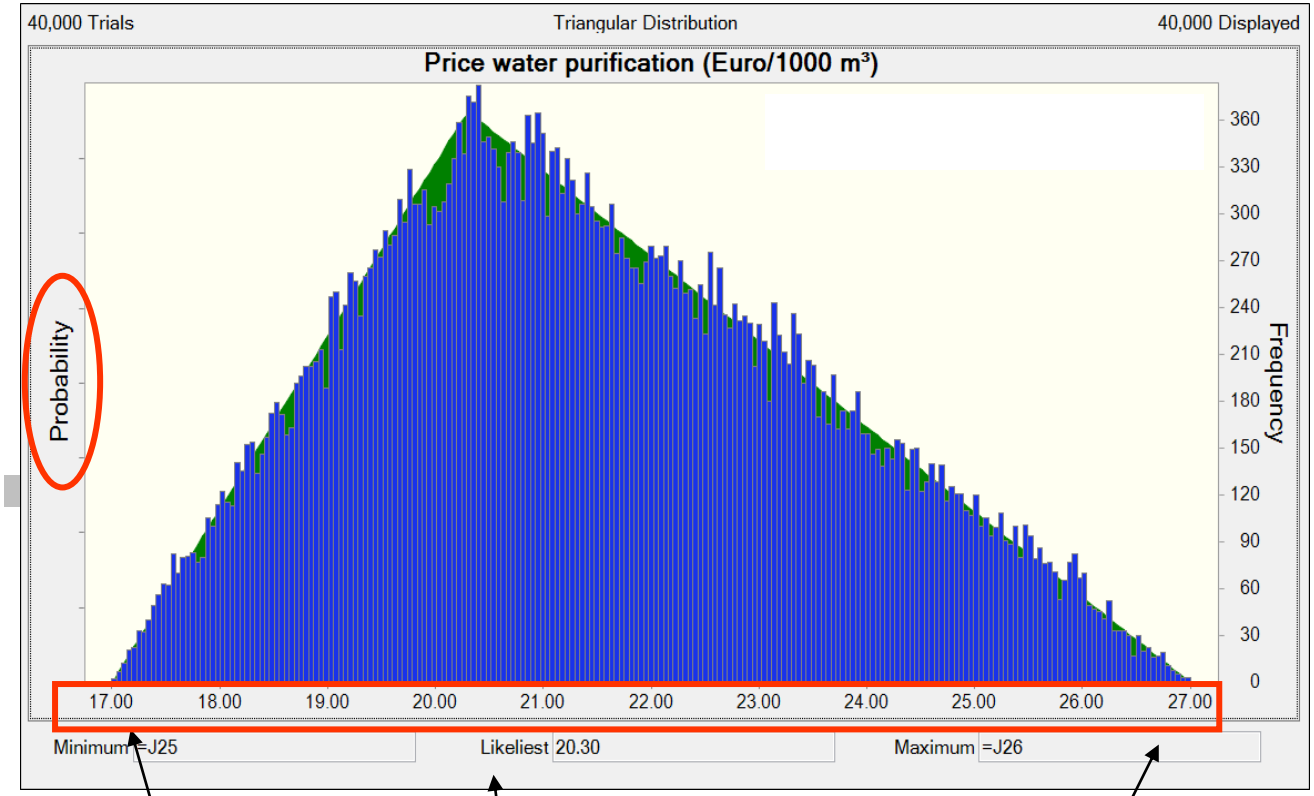
Uncertainty
example: cost water purification (€/1000 m³)



minimum

Most likely

(€ 20,3 / 1.000 m³)

maximum

- Assumed triangular distribution
- Values: most likely, min., max.
- 'Monte Carlo' simulations to calculate NPV

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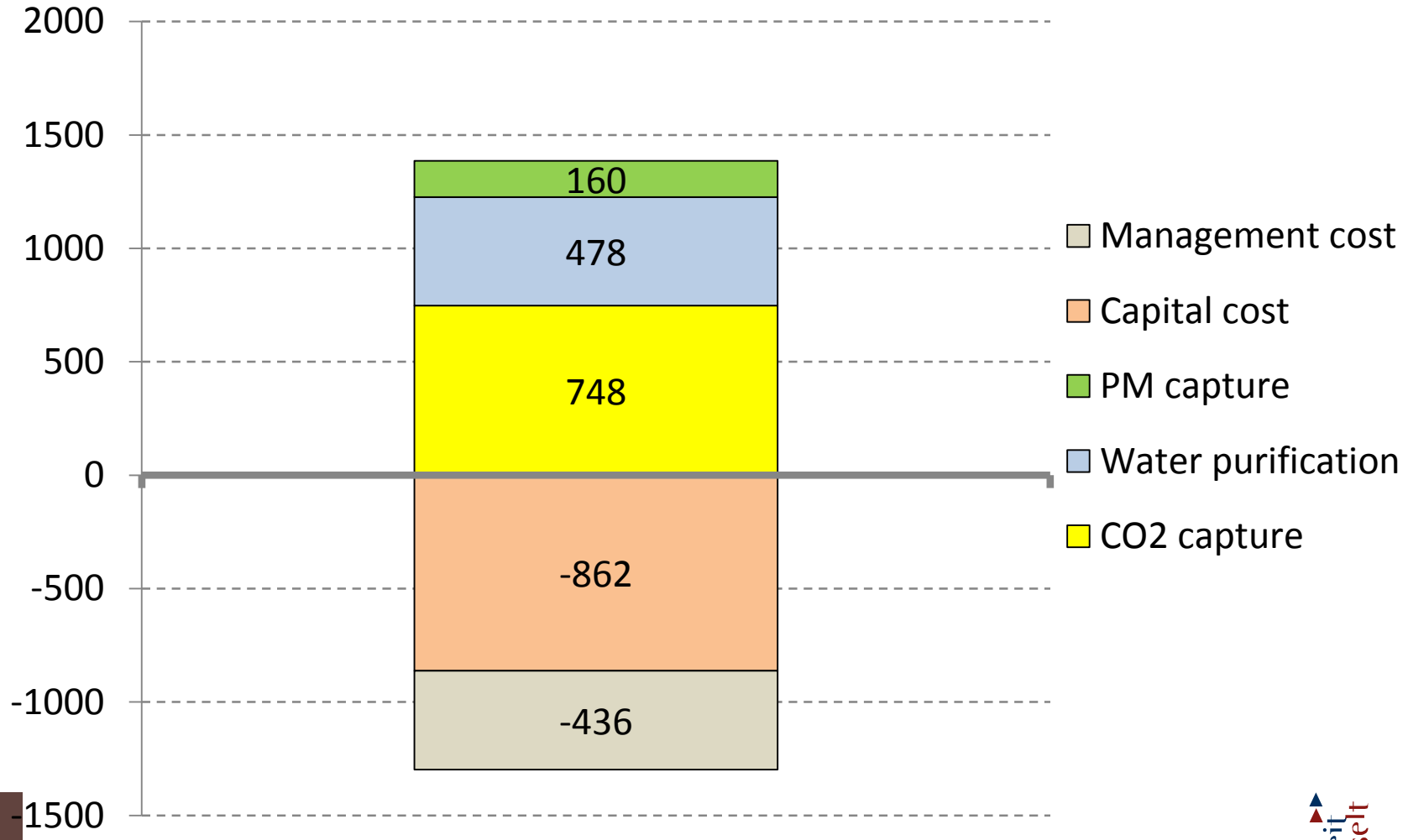
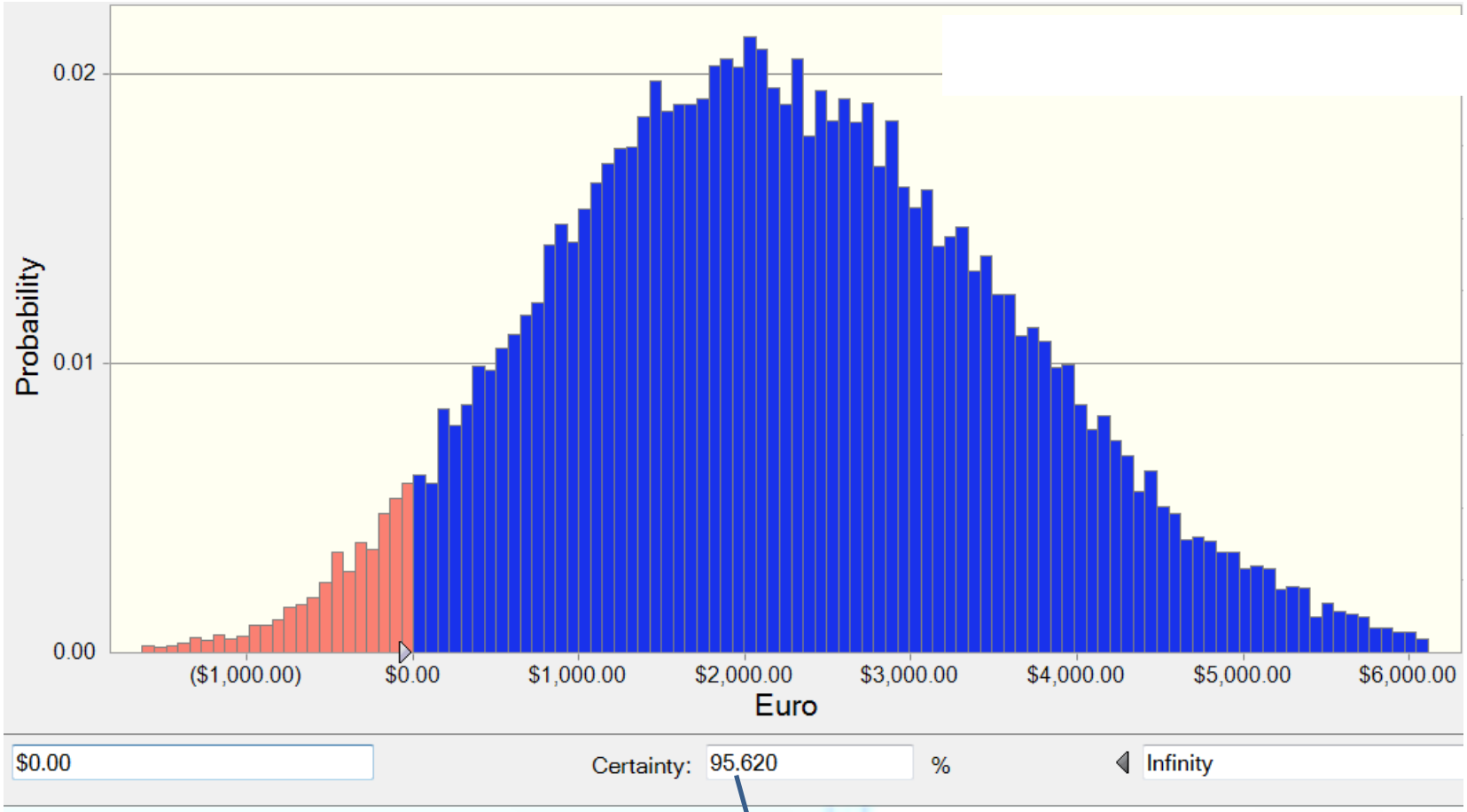
Yearly Benefits & Costs (1.000 Euro)



Ecoservices: Benefits les Costs

Net Present Value (30 years, discount 3,5 % – 4,5 %)



Certainty of positive result : 95%

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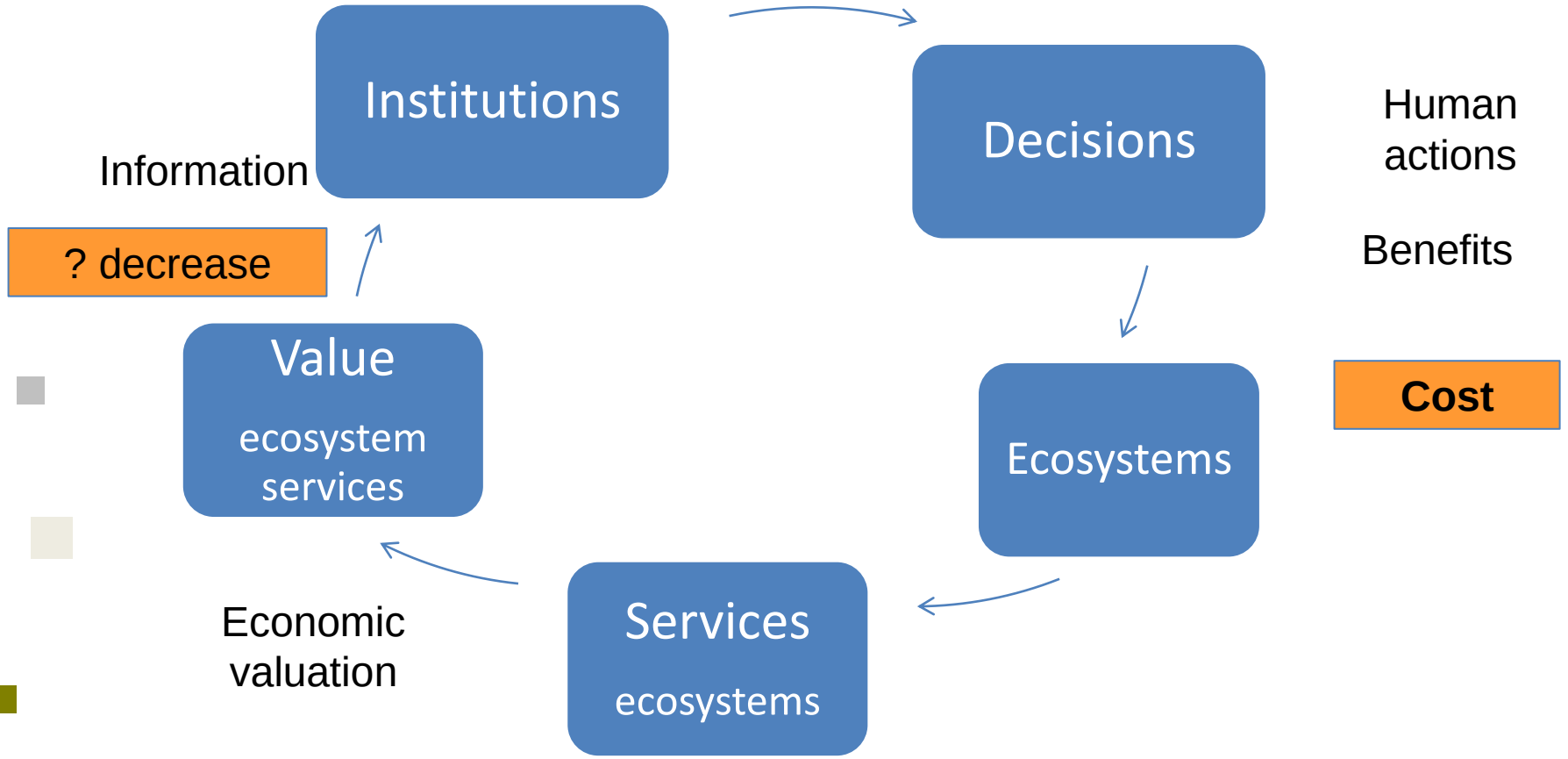
Benefits les Costs:

Sensitivity of Net Present Value

Eco service	Contribution To Variance	Value
Price water purification (Euro/1000 m³)	27,1%	23,2
Price PM capture (Euro/kg)	20,4%	2
Price CO2 capture (Euro/ton)	20,3%	17
Quantity CO2 capture (ton/year)	14,7%	44.000
Discount rate (%)	11,7%	4,0%
Quantity drinking water (1000 m³ / year)	4,7%	20.600
Quantity PM capture (kg /year)	1,0%	80.000

Decision support system
"What if not taking into account the value of ecosystems"



° Daily, 2009

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Conclusion: net value of ecoservices

'National Park Hoge Kempen'

- Considered: **only** three - '*regulating*' - ecoservices
  - CO_2 capture
  - Water purification
  - Air 'filtering' (capture of particle matter)
- 90% probability for positive net pres. value (30 yrs)
- Influencial: most important factors
  - Avoided cost water purification
  - Avoided cost particle matter emissions
  - Avoided costs CO_2 emissions
  - Quantity CO_2 capture

Conservative values were used

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theo.thewys@uhasselt.be

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