BIOENERGY and the MEAs – energizing environmental services for development?

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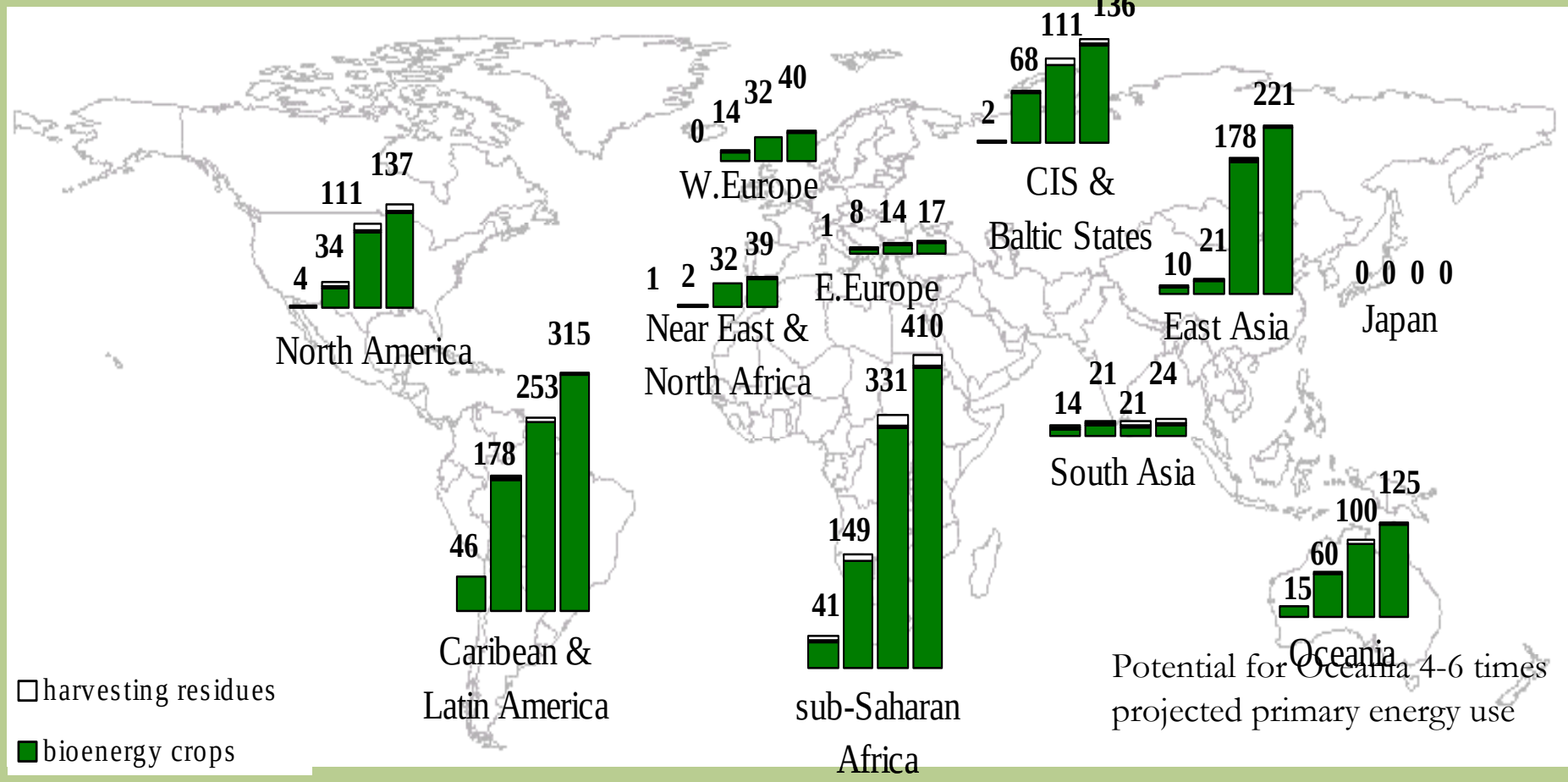
Structure

- **Why bioenergy and ES?**
- **Establishing potential ES from bioenergy**
- **How can they be measured and monetized**
- **Implementation of ES**
  - farmer vs. agency perspectives, implementation modes and opportunity costs/ competition with other services
  - Market/financial mechanisms
  - Policies

Ingmar Juergens, Environment and Natural Resources Service, FAO

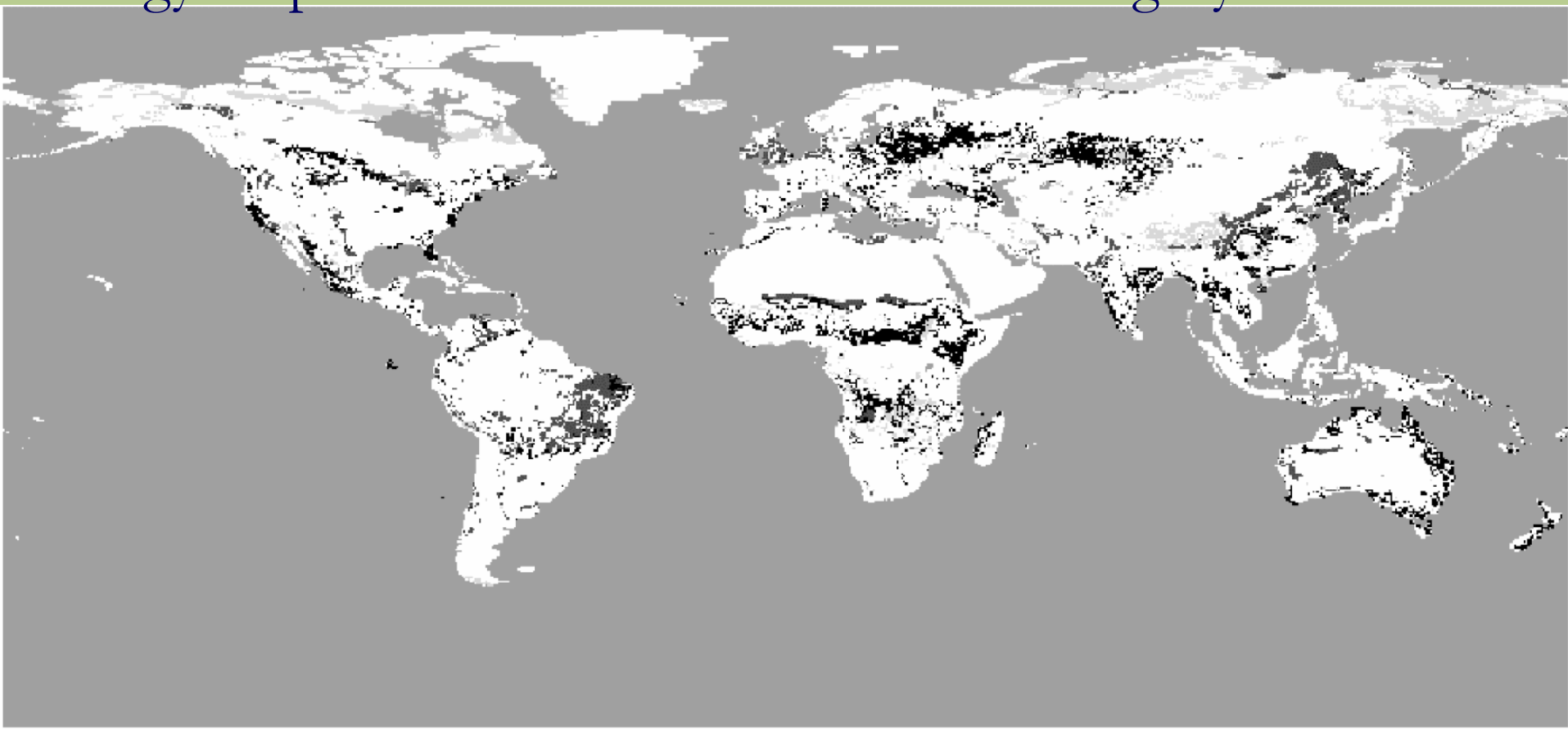
Scope

Bioenergy potential: different scenarios, year 2050 Exajoules/yr



Source: E. Smeets, A. Faaij, I. Lewandowski, *A (2004)*

Bioenergy Potential: Spatial distribution of production cost of energy crops for abandoned and rest land category in 2050



Source: Hoogwijk et al. (2005)

Environmental Services

Mutual benefits

- **Environmental Services (ES) to promote bioenergy through**
  - Additional Revenue Streams (Payments for ES)
  - Opening green market segment (Corporate environmental responsibility, standards)
  - Risk mitigation (environmental duel diligence)

- **Bioenergy to promote ES through**
  - Sustainable land management
  - Substitute fossil fuels
  - …

Drivers

- Millennium Development Goals (MDG)
- Multilateral Environmental Agreements (MEAs)
- Energy Markets
- Carbon Market
- Land-Use Markets

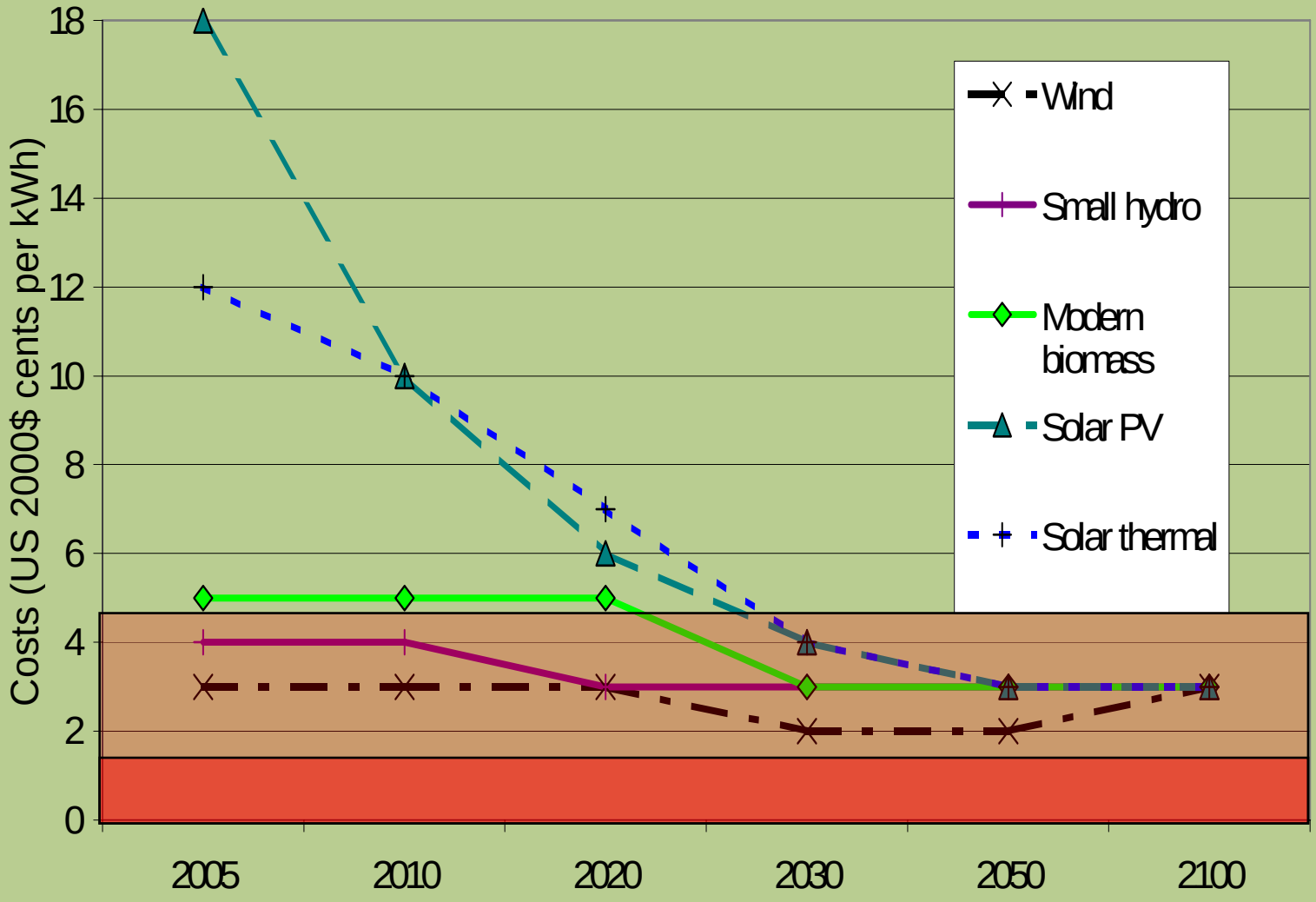
Determinants of Bioenergy Production

- Population growth and economic development
- Energy prices
- Food consumption
- Land use patterns
- Efficiency of food production
- Competing demands for wood and agriculture based bio-materials.
- Competing demands for ecosystems services: nature reserves, endangered/protected ecosystems, recreation, amenity

Potential Environmental Benefits of Perennial vs. Annual Crops

- Reduced emission of greenhouse gases (e.g. N2O)
- Removal of heavy metals (esp. Cd) from contaminated soils
- Reduced soil erosion,
- Municipal waste treatment: Willow is suitable as a vegetation filter for treatment of wastewater and sludge
- Humus conservation and thereby, increased soil fertility and C sequestration
- Extra capacities for manure usage
- Weed and pest tolerance higher than for food crops, highest for short-rotation coppicing plantations and hemp
- Reduced pesticide use due to self-regulation
- Increased biodiversity, due to reduced pesticide use
- Nitrate leaching decreased

Electricity Production Costs versus ES from Salix Plantation (excluding carbon payments)

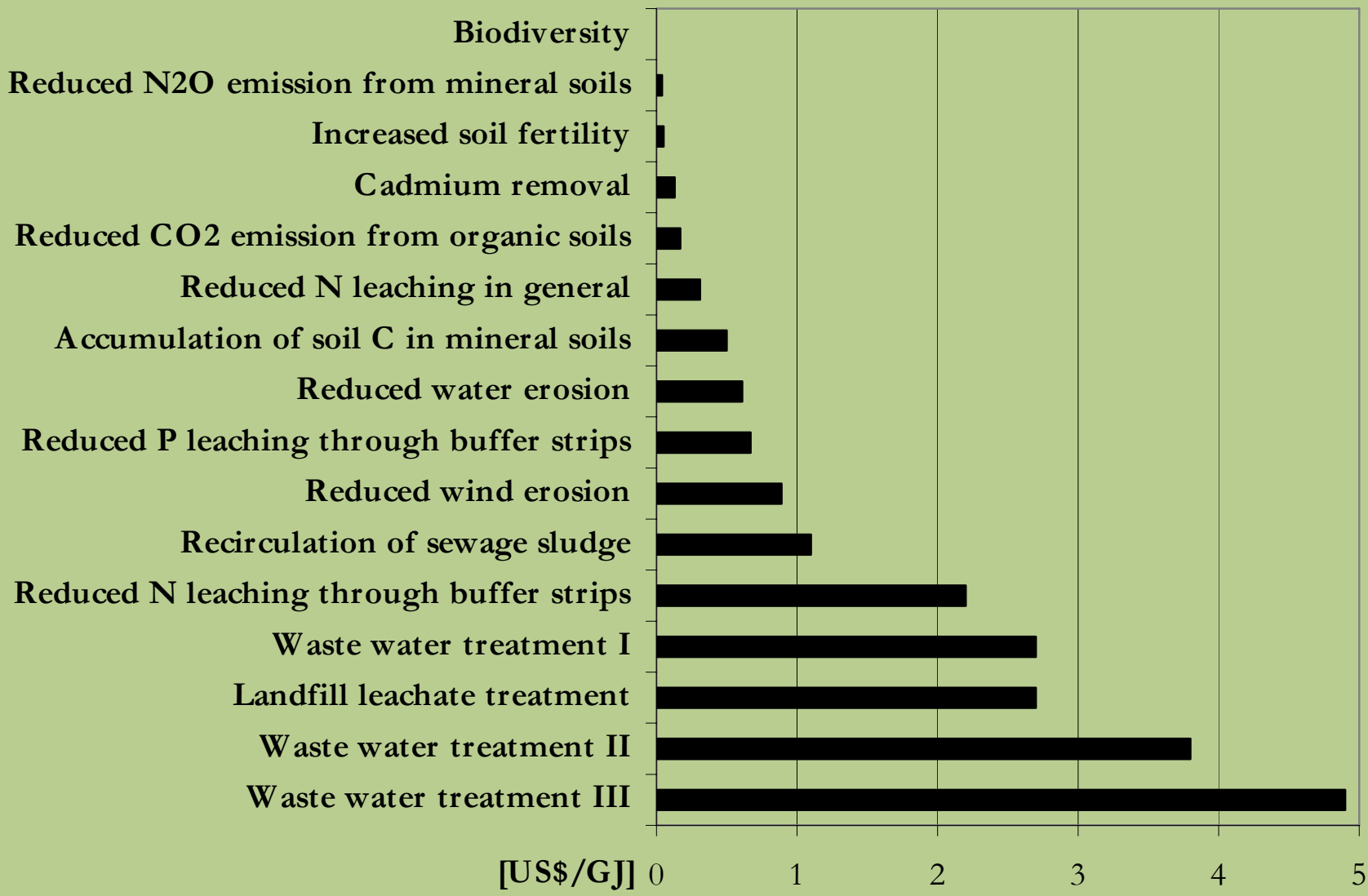


Red area = range of ES

4.8 = Sum of all ES

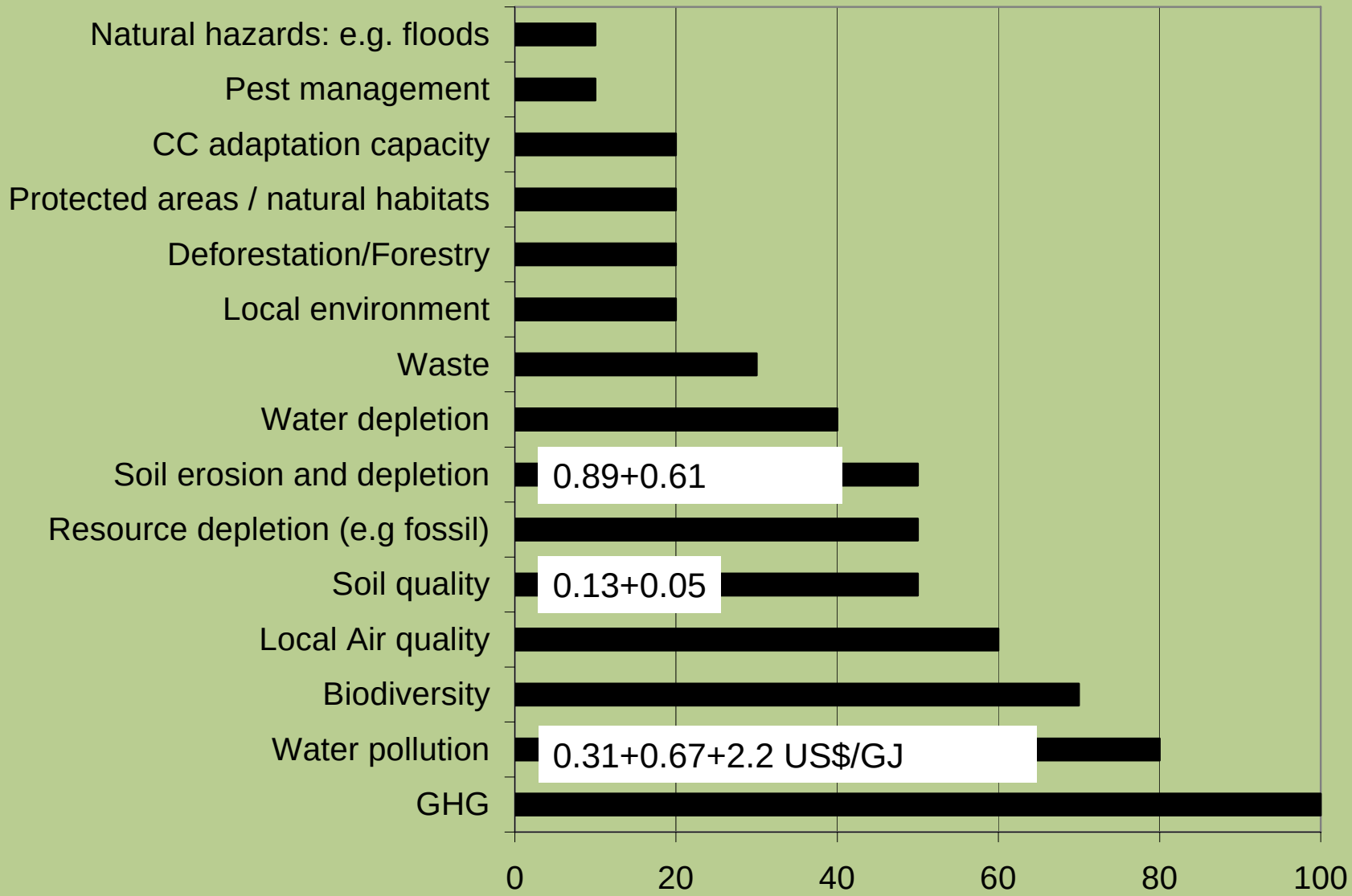
1.8 = highest single ES

Economic value of Environmental Services of Perennial vs. Annual Crops

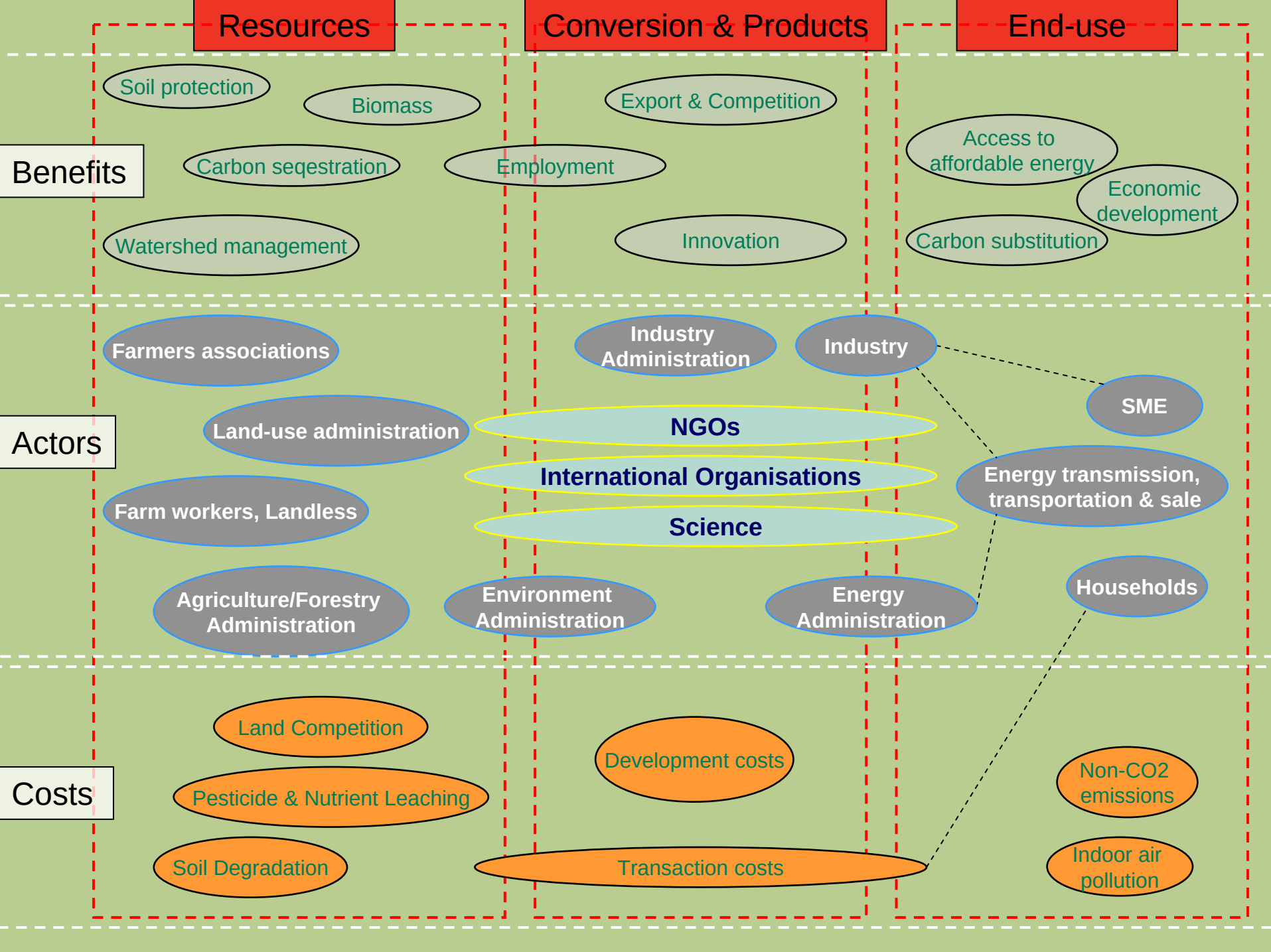


Source data: Börjesson 1999

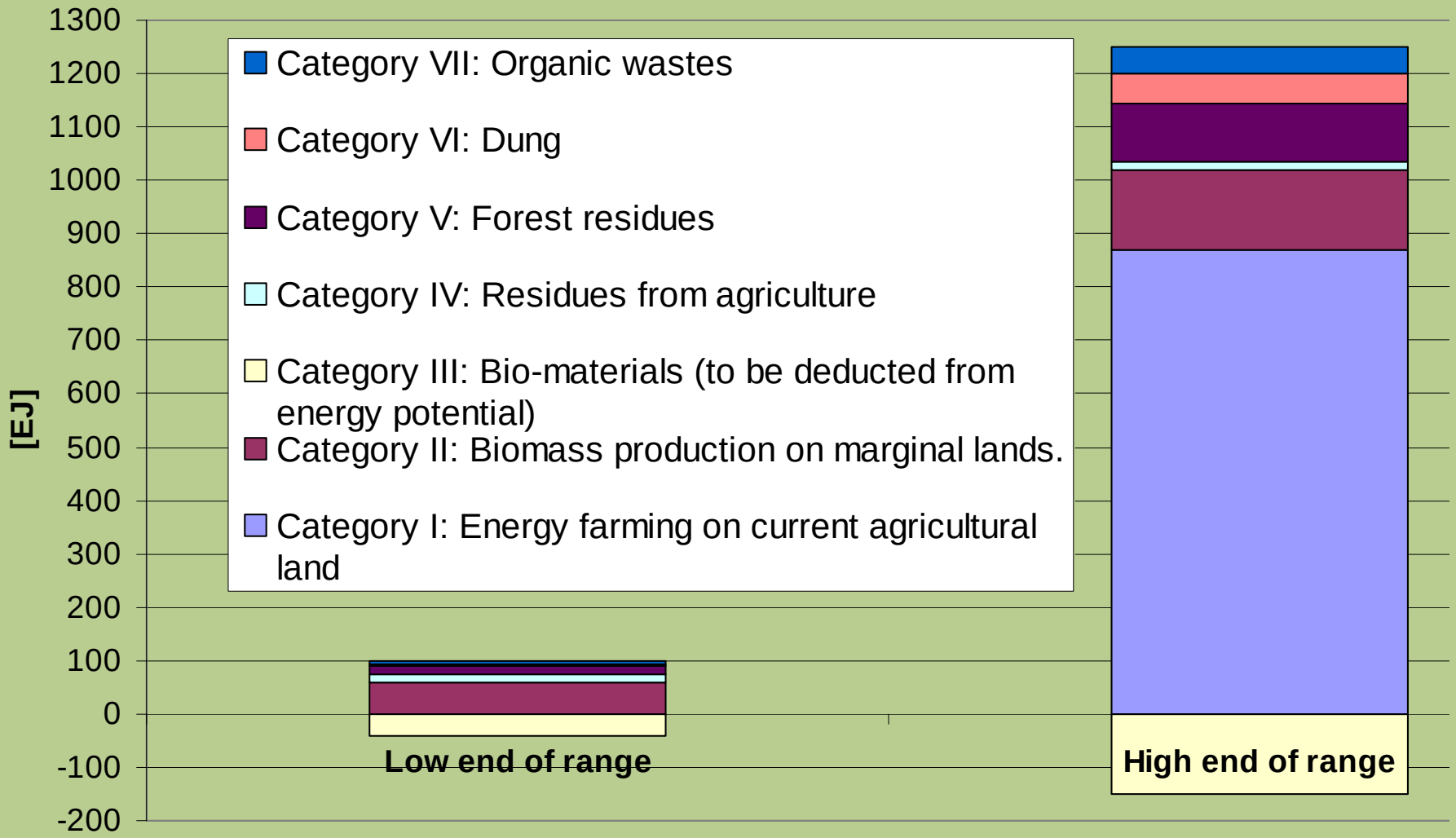
Coverage of environmental factors in 10 sets of criteria (literature, standards, funds)



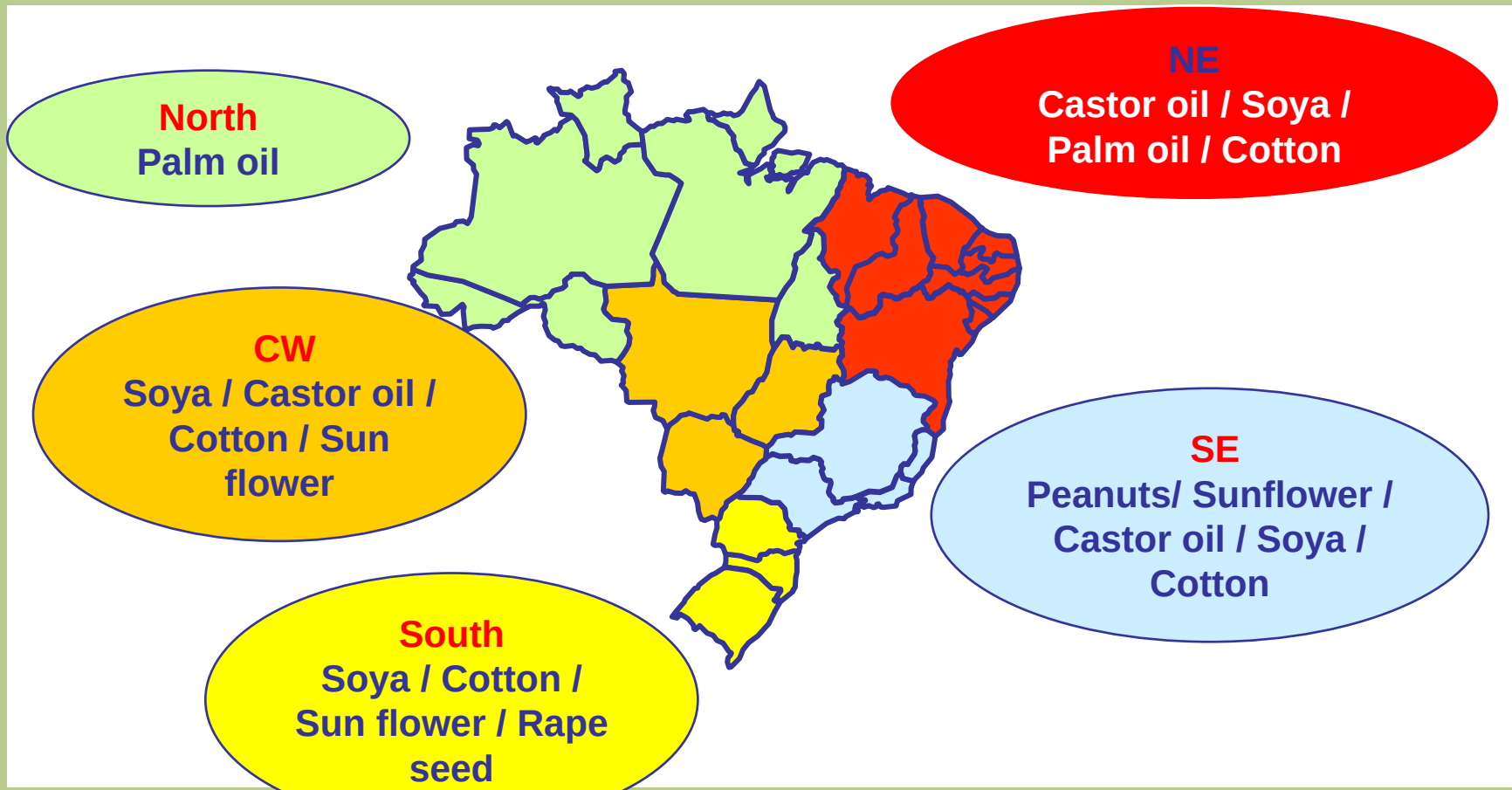
Implementation


Resources
Conversion & Products
End-use
Benefits
Soil protection
Biomass
Export & Competition
Access to affordable energy
Carbon seqestration
Employment
Economic development
Watershed management
Innovation
Carbon substitution
Actors
Farmers associations
Industry Administration
Industry
SME
Land-use administration
NGOs
International Organisations
Energy transmission, transportation & sale
Farm workers, Landless
Science
Agriculture/Forestry Administration
Environment Administration
Energy Administration
Households
Costs
Land Competition
Development costs
Non-CO2 emissions
Pesticide & Nutrient Leaching
Soil Degradation
Transaction costs
Indoor air pollution

Different Bioenergy Sources with different land requirements



Regional distribution of biomass sources in Brazil (Amaral 2005)



Opportunity costs/competition

Resource	Alternative Use
Animal dung	Soil conditioner and fertilizer
Bagasse, sugar cane tops and leaves, molasses	Animal feed, paper and board industries, road cover
Cereal straw	Animal feed, soil conditioner, paper & board industries, roof thatching
Maize stalks	Cattle feed, soil conditioner
Rice husk	Cement and brick industries
Wood chips, bark, sawdust	Construction material
Wood logs, branches	Construction material, paper industry, handcraft

Perspectives on ES scheme implementation (KfW 2004; FAO)

	farmer's perspective: new land use is…	agency's perspective: adoption should be promoted through…
A	of immediate commercial interest	technical advisory services
B	self-sustaining after short adoption period	financing of adoption costs through credits
C	self-sustaining after longer adoption period and/or in the absence of functioning capital market	financing of adoption costs through subsidies
D	permanently requires subsidies to remain competitive (e.g. protection of primary forests)	caution advisable – will agency have permanent sources of funding?

- Risk averseness
- Private benefit
- Local/national public benefit
- Global public benefit

- ☞ Community risk fund
- ☞ (Loan)
- ☞ Government instrument
- ☞ International mechanism

Different Implementation Modes

- Bioenergy industry
- Capital investments
- Community infrastructure
- Rural Energy Service Companies
- Retail appliances

Source: ESMAP 2005

Following slides → SOURCE: Joshua Bishop, IUCN, Presentation at COP-11, 28/11/2005

Adapted from: Gutman, Pablo (ed.) 2003. *From Good will to payments for Environmental Services: A survey of Financing Options for Sustainable Natural Resource Management in Developing Countries*. WWF/MPO: Washington, D.C.

Private for–profit sources

- Commercial banks and export credit
- Direct foreign investment
- Venture &/or private capital
- Public-private-community partnerships
- Portfolio investors (e.g. “green” funds)
- Community-enterprise (formal / informal)
- Local self-financed business investment

Existing Markets I

Biodiversity-friendly products and services

- Organic agriculture
- Sustainable non-timber forest products
- Certified forest and fisheries products
- Eco-tourism enterprise

Existing Markets II

Eco-tourism

- "the fastest growing sector of the largest industry on earth"
- annual exports up to US$100 billion (estimated from data reported at www.world-tourism.org and www.ecotourism.org)

Organic foods

- market value of organic products reported as US$25 billion in 2004 (www.ifoam.org

Certified "sustainable" products

- Worldwide certified forest area is approaching 5% of total forest area (www.unece.org)

Existing Markets III

Biodiversity offsets and mitigation

- 72,000 ha of wetland and endangered species habitat in over 250 approved "banks" selling habitat "credits" in the USA (two-thirds of banks are privately owned)

Incentives for watershed protection

- Over 7 million ha of fragile cropland re-forested in China, under the US$40 billion Sloping Land Conversion Program (www.cifor.cgiar.org)

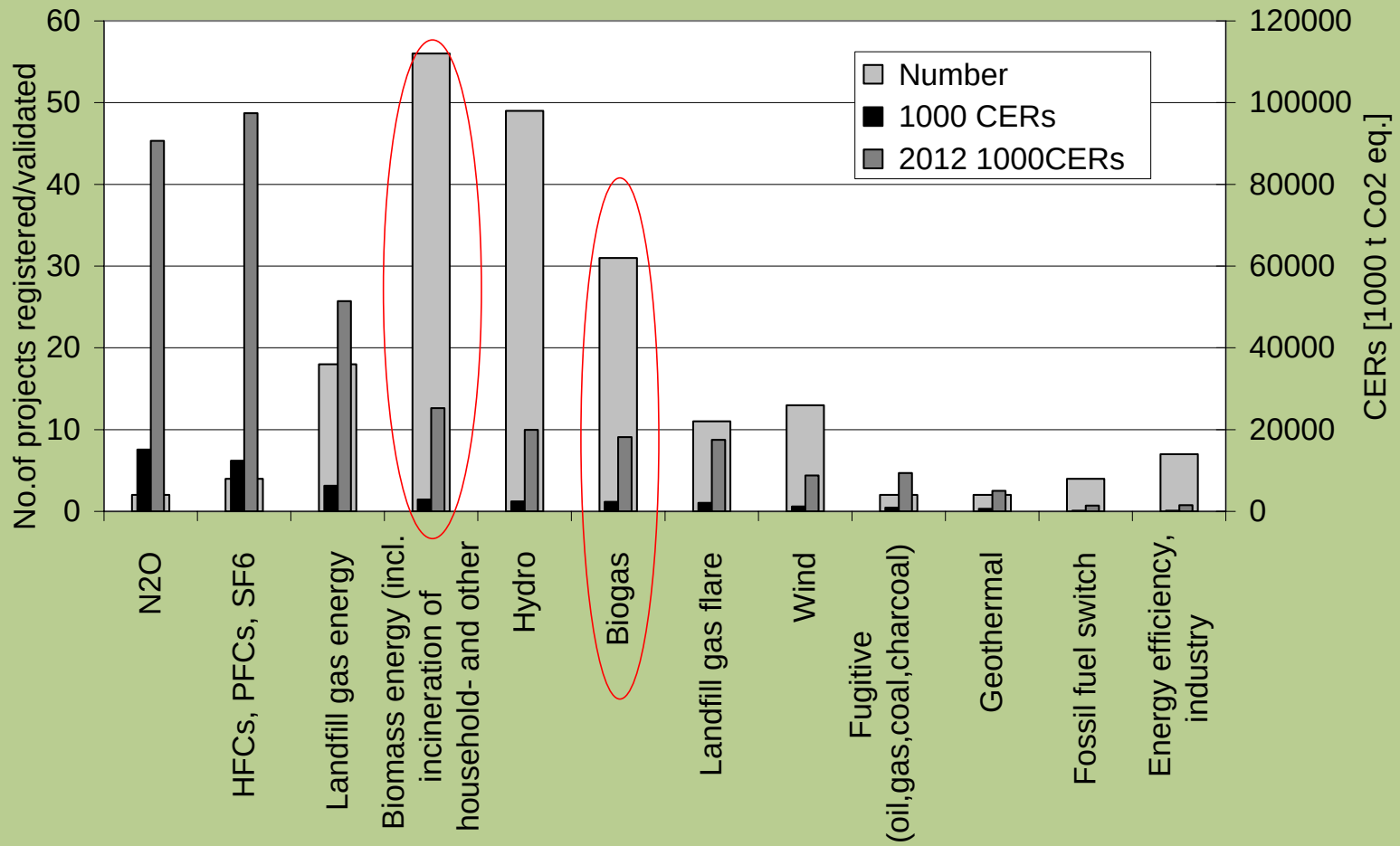
Biodiversity-friendly carbon storage

- 18 percent of approved PCF emission reduction projects are LULUCF or biomass-related, as of 2003/04 (www.prototypecarbonfund.org)

And on the Carbon market?

- **The existing bioenergy projects do meet some sustainability criteria identified as relevant, by having to comply with the specific requirements of the funding arrangements under which they operate, i.e.:**
  - General requirements for World Bank projects, for example the environmental safeguard policies
  - Fund specific requirements, for example small-scale and community benefits under the CDCF
  - Simple limitation in size: small scale projects, as separate category of project types
- **Participation in voluntary certification schemes is a possibility**
  - The Gold Standard
  - The Community and Biodiversity (CCB) standards

In terms of CERs, the three main categories comprising non-CO2 GHG (N2O; HFCs, PFCs, SF6; and landfill gas energy) generate more than bioenergy



Conclusions

- **Overall scope:**
  - ➔ Large potential for bioenergy in developing countries; as energy source, bioenergy is becoming increasingly competitive

- **Scope for ES:**
  - ➔ Externalities can be significant: large potential benefits but opportunity costs regarding competing land uses are of concern
  - ➔ ES can have a significant impact on bioenergy costs
  - ➔ Most developed: GHG emission reduction through Fossil Fuel Substitution and avoided residue burning in the field

Conclusions

Limitations:

- Substitution costs: As a source of CERs bioenergy cannot compete with projects targeting high GWP gases
- The continued demand for credits from bioenergy CDM projects will depend on the total size of the market and/or the reflection of externalities → high quality-(relatively) high(er) price segment

Implementation:

The delivery of SD co-benefits is not automatic. It would be strengthened by

- an institutionalization of externalities valuation in the energy and CDM/Carbon market.
- Target the financial sector: financial tools, advocacy and awareness raising
- ES are very case specific → bottom-up analysis required

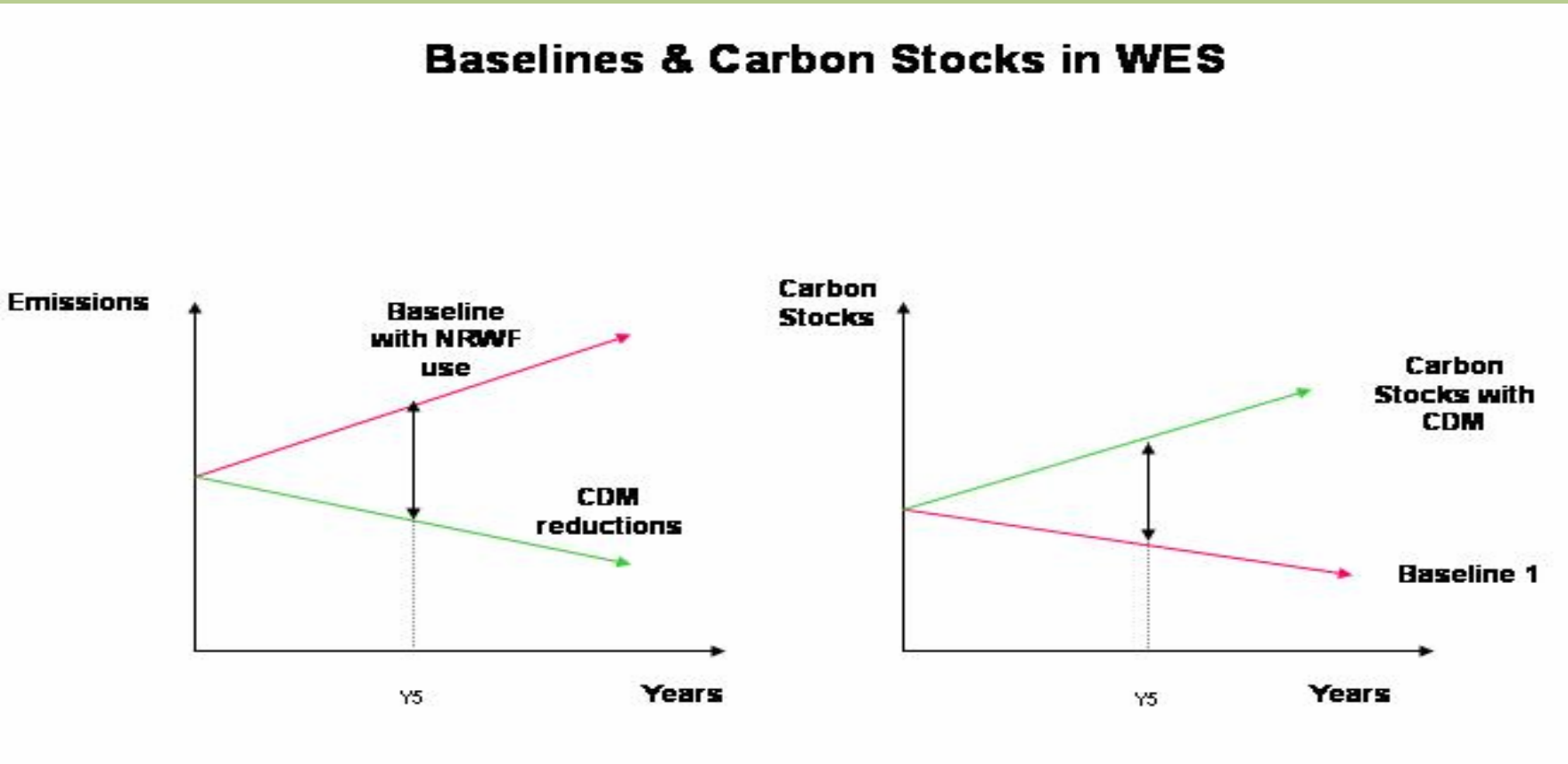
Other drivers might be more important in the future (ex.: oil prices)

Recommendations for (further) analysis

- **Re ES:** A comprehensive review of existing research on the environmental implications and economic performance is recommended. FAO should contribute by assessing implications for food security in particular.
- **Re measuring ES:** The economic valuation and LCA literature specific to bioenergy could be synthesised. Carrying out comprehensive LCA for all major environmental factors might be unrealistic. Rather than that it would be a worthwhile approach, to try to establish evidence that would support a more generic categorisation of bioenergy systems into potentially beneficial, neutral and detrimental, including the design of safeguard policies specific to bioenergy projects, which could trigger more in depth analysis and considerations of environmental and economic and social factors when indicated.
- **Re CDM:** A study could focus on those systems (and their environmental and economic features) that are currently in the pipeline and have been registered and/or validated.

DANKE

Baseline and project scenario for improving non-renewable biomass systems



Source: FAO 2005 (based on Schlamadinger and Juergens 2004)

General remarks

- Distributional defects have to be addressed, i.a. through capacity building, but bringing down the (perceived) investment risk is a long term process
- ODA should be monitored but it is a market mechanism and thus about leveraging private direct investment
- CLEAN Development Mechanism: would it be just fine if instead of a net development dividend in the short run sustainable energy systems for the future are strengthened and developed?
- The CDM is a deal between Annex I and II: You get the low hanging fruits – but we get development (UNFCCC, not OECDFCCC)