

*Future Supply of Biomass for Energy:*

Sources, Quantities and Costs

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# Global biomass potentials are large - but need to be developed

Agricultural land: <100- >300 EJ

Marginal lands: <60- 150 EJ

Agri residues: 15-70 EJ

Forest residues: <30-150 EJ

Dung: 5-55 EJ

Organic waste: 5 - >50 EJ

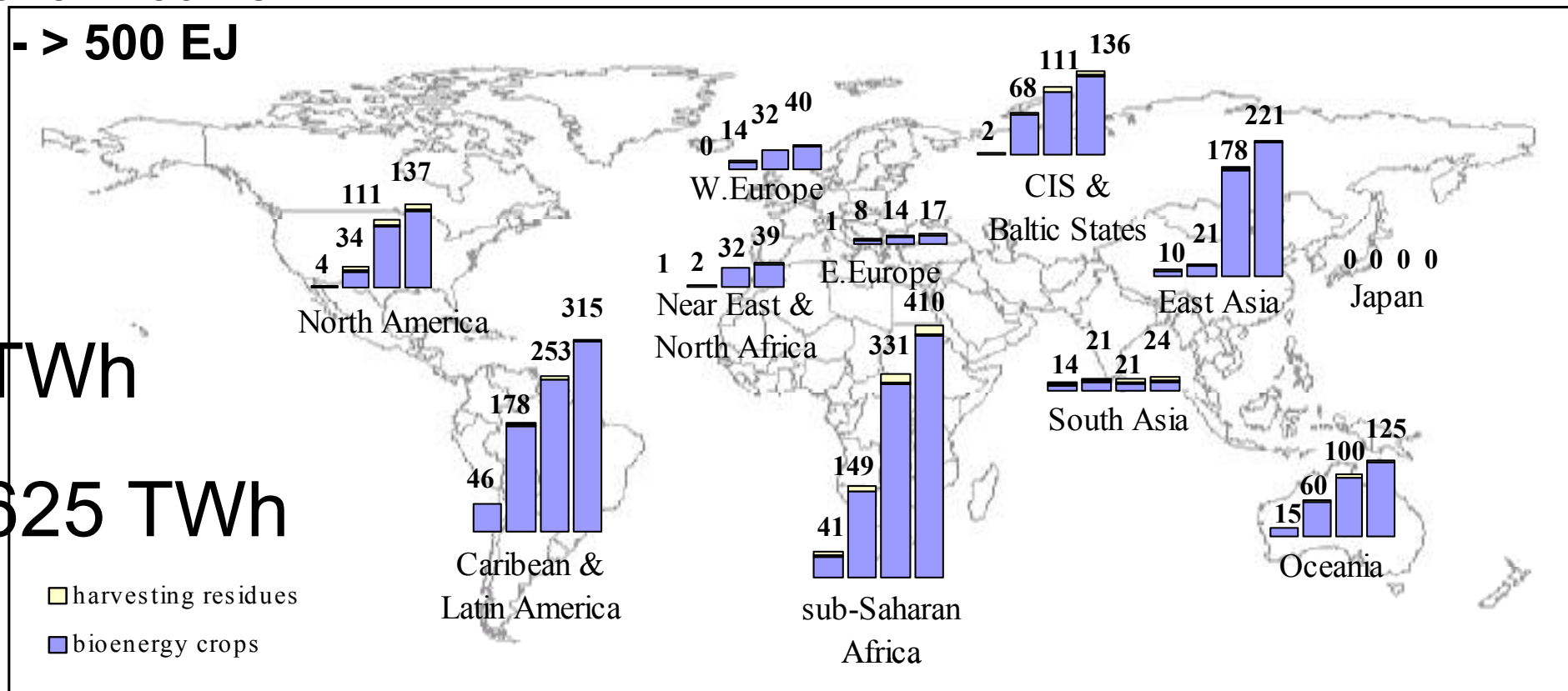
TOTAL: < 250 - > 500 EJ

From IEA Bioenergy Task 40

500 EJ ~

180 000 TWh

Sweden 625 TWh



# Agricultural land (1)

- Dedicated Energy Plantations
  - Single Purpose Plantations
    - Eucalyptus
    - Acacia (N-fixing species)
    - Salix
  - Multiple Purposes
    - Sugar cane
    - Sweet sorghum
    - Jatropha

## Agricultural Land (2)

- Agroforestry
  - Shifting fallow
  - Shelter belts
  - Shelter trees

# Marginal Lands

- Former forest land
- Depleted agricultural land
- Arid land

Can produce biomass +  
environmental values e.g. soil  
conservation/improvement, erosion  
control, flood control

















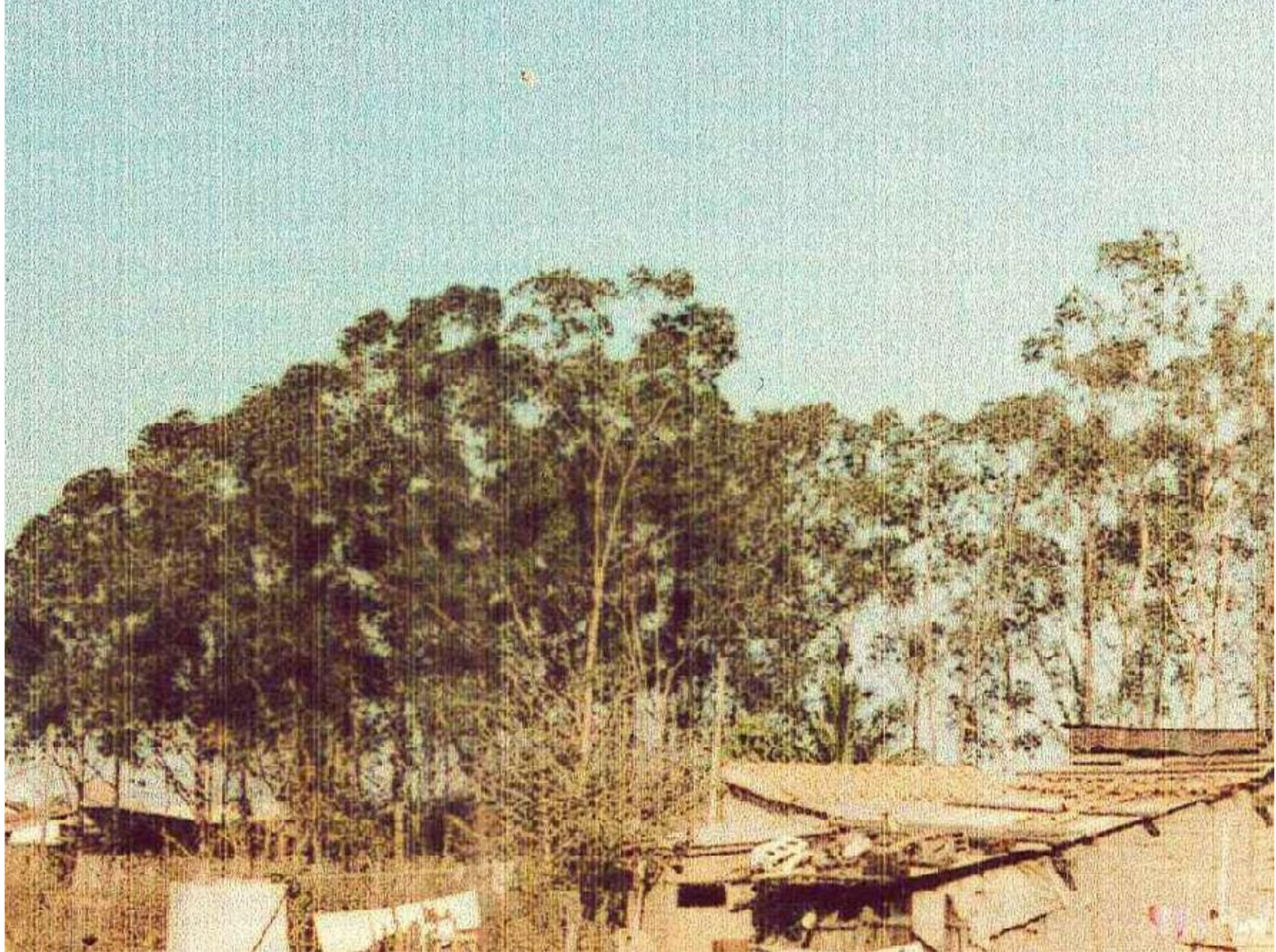














# Agricultural residues

- Straw
- Palm oil kernels, etc
- Olive kernels, etc.
- Rice husks, etc.
- Oil seed shells, etc.
- Pruning residues
- and a wide range of others



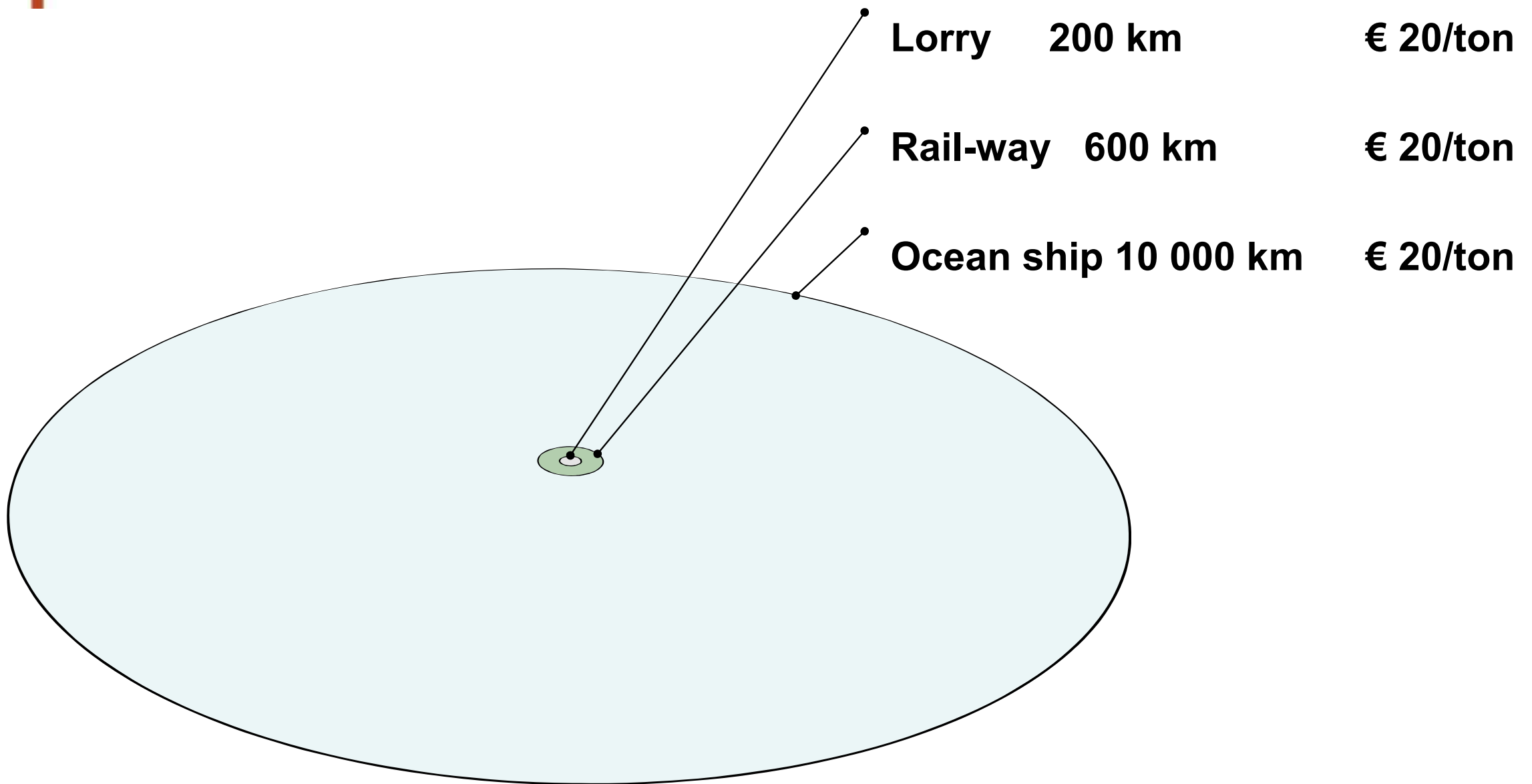
# Organic waste and Dung

- (not covered in this presentation)



# Transport Costs

(general example)





# Prediction

- Therefore,
  - Biomass fuels will be traded in a global market
  - Tropical countries will (within 15-25 years time) be the dominant large scale suppliers of biomass fuels in the markets; also local markets will co-exist where conditions permit
  - A wide range of biomass fuels will become available in the market.



## Winners

- Those, who can integrate efficient combustion technology with acquisition of cheap, reliable fuels.
- Those, who can master system analyses and implementation of integrated solutions (business/technology)



## Wood versus Oil Principal Calculation

- 1 barrel oil (70 \$) 6,12 GJ
- 1 ton wood substance (odt) 17 GJ
- 0,47 ton wood(+bark)substance = 1 m<sup>3</sup>s
- 1 m<sup>3</sup>s(+bark) 8 GJ
- 1 m<sup>3</sup>s/1 barrel oil 1.3
  
- Energy value of 1m<sup>3</sup>s 91\$
  
- **Price of pulp wood 1m<sup>3</sup>s 34 \$**



Thanks for your Attention!

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