

Production of energy from multifunctional and nature forests in the Netherlands

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Joop Spijker
Alterra, Wageningen UR

International Workshop "Woodfuel Supply Chain – Sharing Experience



Bioenergy at WAGENINGEN UR



Contents

- **Introduction**
- Availability biomass from nature/landscape elements
- Opportunities and Bottlenecks
- Conclusions

The Netherlands, a small country in Europe



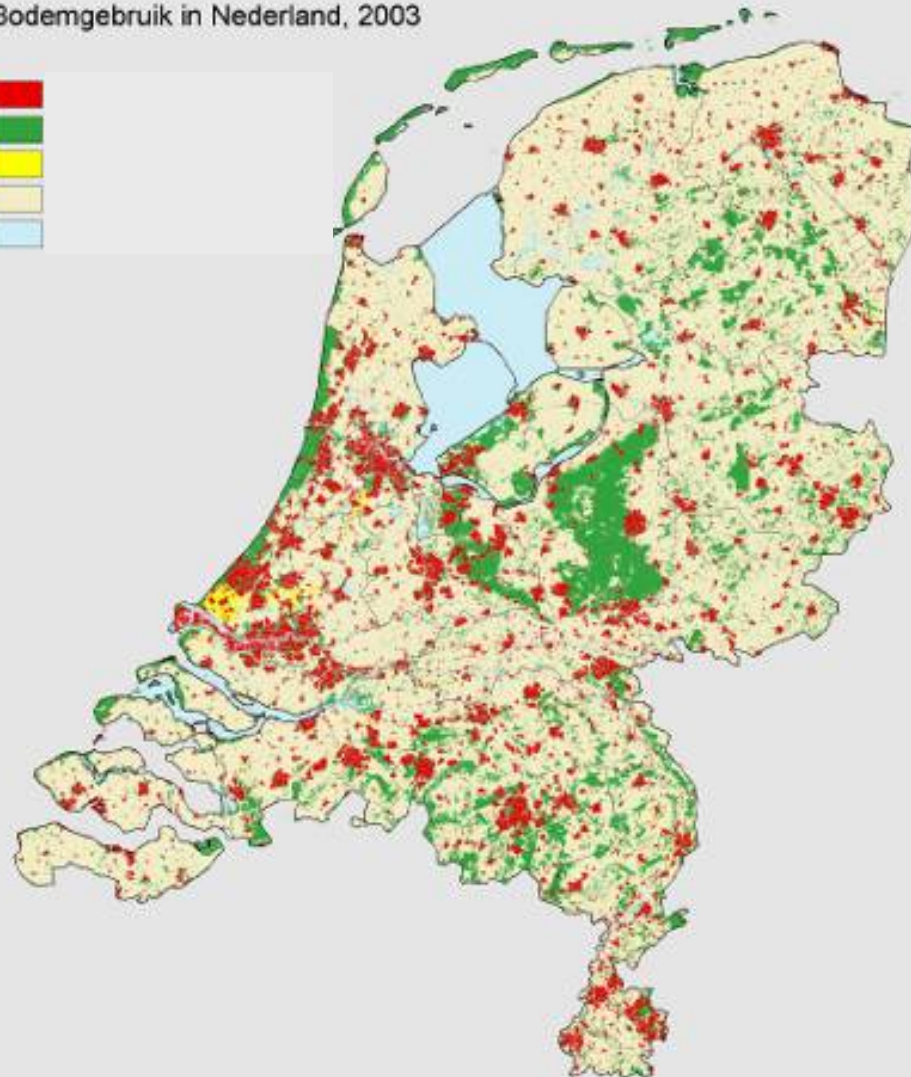
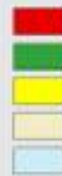
Surface area 41,500 km²

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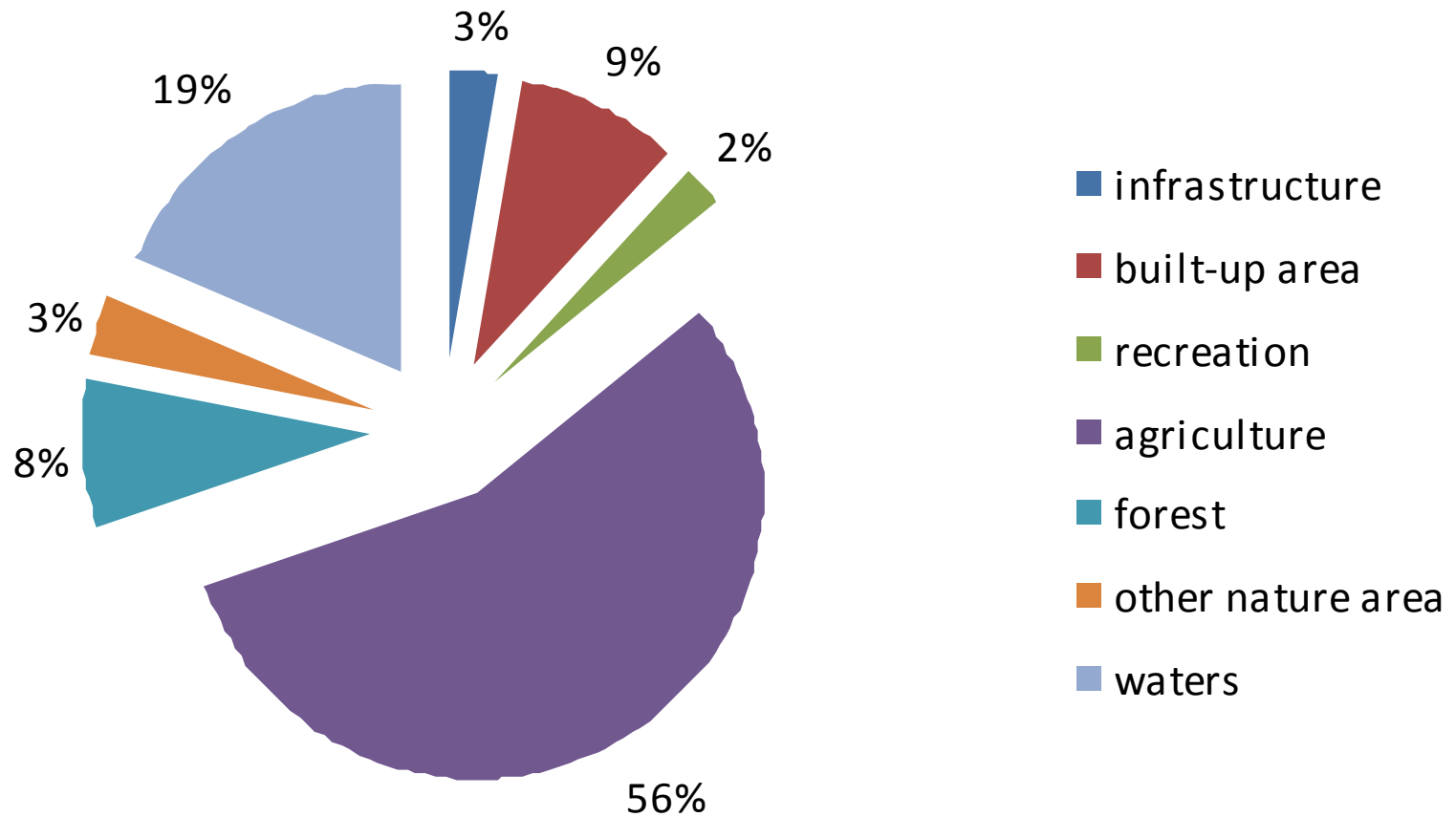
Land use in the Netherlands (2003)

Built-up area
Nature and recreation
Glasshouses
Agriculture
Inland water

Bodemgebruik in Nederland, 2003



Land use in the Netherlands



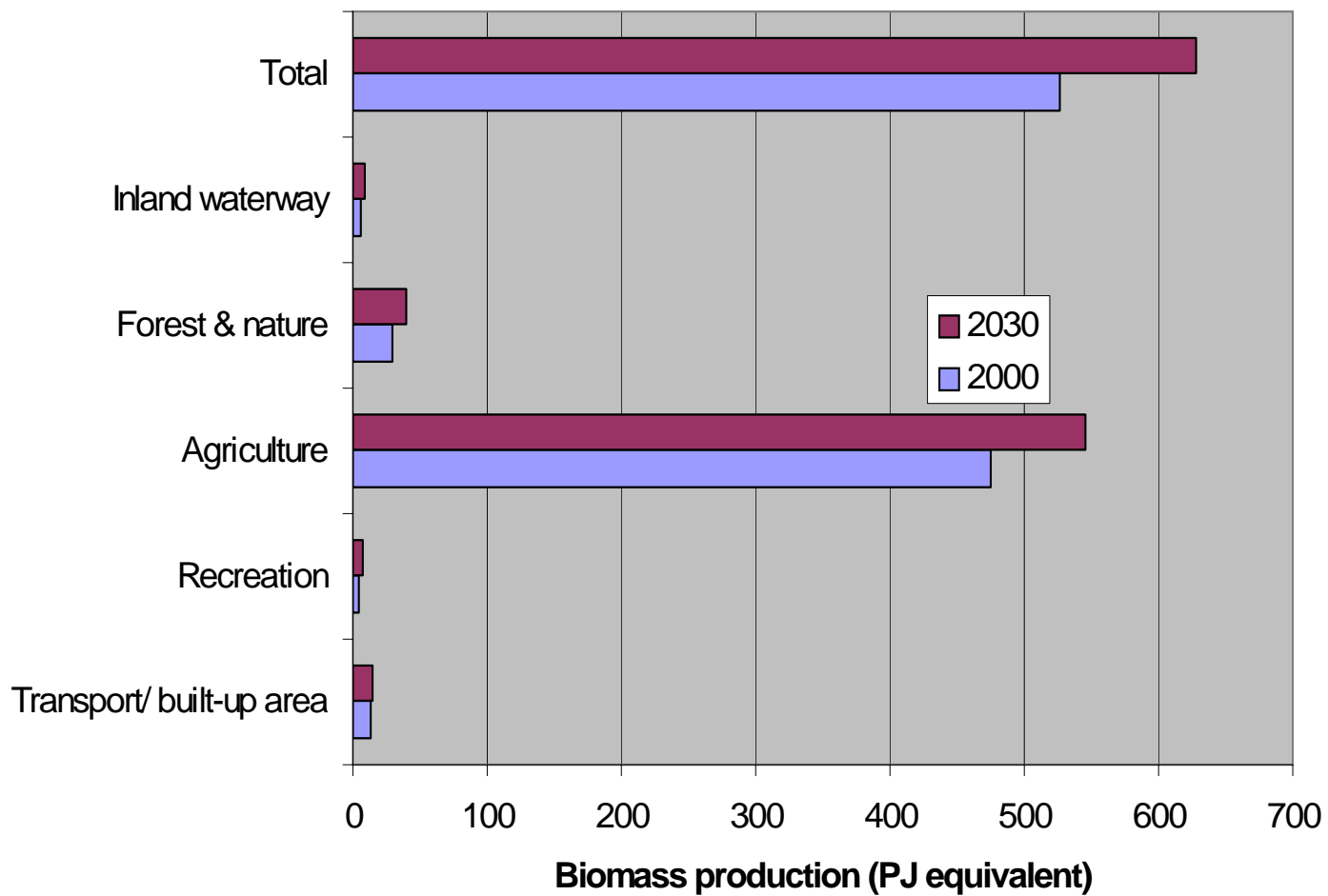
Policy NL on sustainable energy

(Work programme Clean and Efficient 2007)

- 30% reduction emission CO₂ in 2020
- 20% sustainable energy in 2020
- 2% annual reduction energy consumption



Biomass production by land area



Research

- Two research projects (2007/-08) on available biomass for energy
 1. From forest and protected nature areas
 2. From countryside (agriculture not incl.)
- Research institutes: Alterra and AFSG, Wageningen UR
- Principal: Department of Agriculture, Nature and Food Quality

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Different types of biomass from nature and landscape

- Wood, grass, reed, turf (heather)



Surfaces forest & nature in the Netherlands (ha)*

■ Forest	369,000
■ Green landscape elements	91,000
■ Grasslands	270,000
■ Heath land	66,200
■ Production reed land	5,600
■ Water	n.a.
■ <i>Total</i>	<i>658,360</i>

Landscape elements



Forests

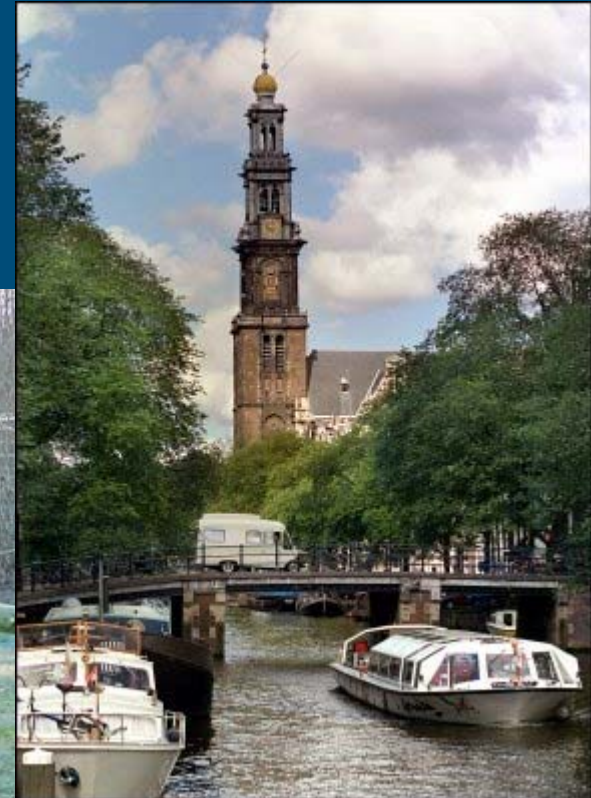


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Urban green in the Netherlands

- Ca. 70,000 ha urban green (municipal)
- Ca. 7 million urban trees (municipal)
- + gardens, company grounds, etc.



Annual increment of woody biomass and the current yearly harvest of wood

Nature type	Area (ha)	Increment (ton/a)	Current Harvest (ton/a)
Multifunctional forest	315,000	1,228,500	624,000
Nature forest	45,000	175,500	
Logging residues		287,820	-
Forest (planned 2020)	9,000	35,100	-
Green Landscape elements countryside	90,600	440,220	n.a.
Urban green	?	?	n.a.
<i>Total</i>	459,600	2,167,140	>624,000

Use of Dutch stem wood

(Platform Wood Nederland & LNV 2005)

■ Sawmills	63%
■ Paper	24%
■ Stakes	2%
■ Wooden shoes	2.5%
■ Energy	7%
■ Preservation	1.5%

Total 520,000 ton/a
(excl. wood used in hearths private houses)

Autarky of the Netherlands on wood is very low (<10%)

Use of Dutch wood for energy

- Wood chips and chunks (300.000 tons/a)
 - from landscape elements, urban green
 - Residues from saw mills
- Wood fuel for hearths/stoves (very approx. *600.000* tons/a)
 - Various sources
- Wood pellets
 - Production capacity in NL ≈ 0

Import chips / pellets via port Rotterdam
Export chips → Denmark

Export (slightly) polluted wood → Germany

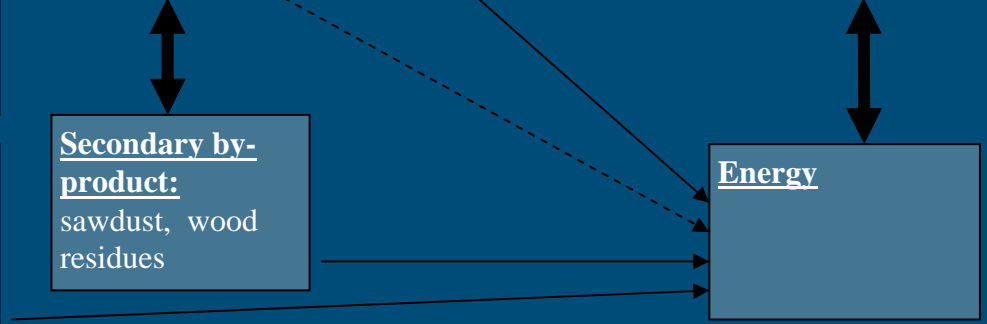
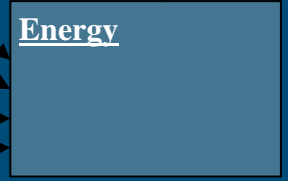
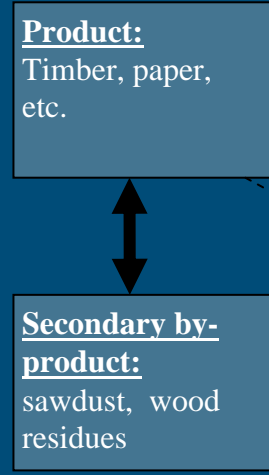
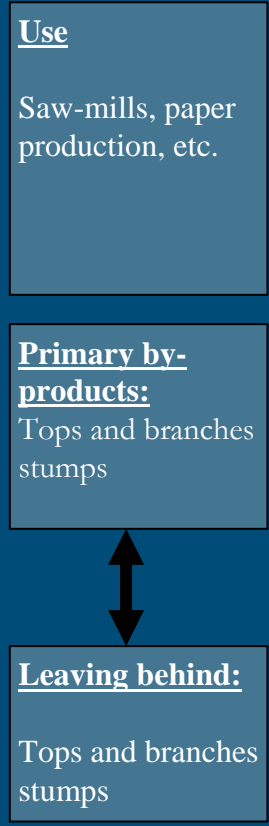
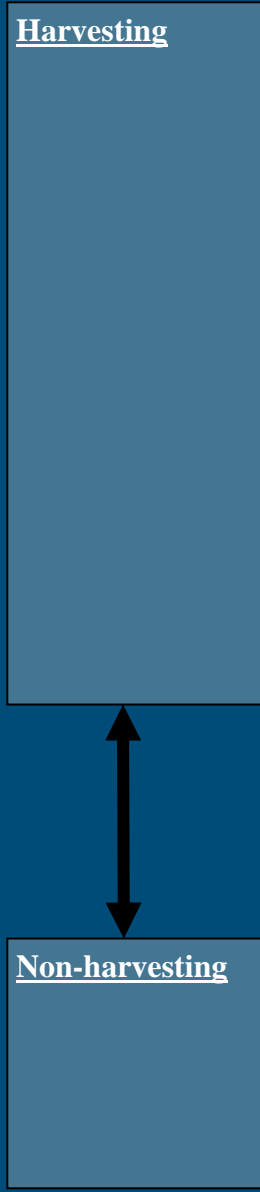
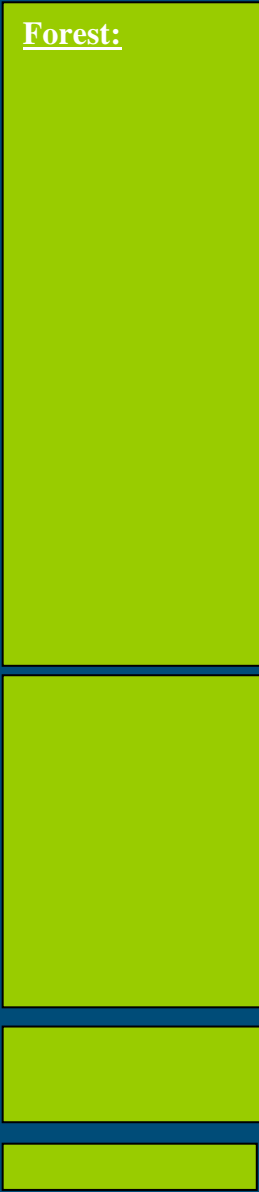
Biomass energy plants

- Cuijk: 240.000 woodchips (tons/a) gfe=30%
 - 50% Dutch origin; electricity
- Lelystad 22.000 (tons/a) (CHP) gfe=76%
- Berlikum Frl. 18.000 tons/a (CHP) gfe=95%
- Beetsterzwaag 2.500 tons/a (Heat) gfe=90%
- Hearths (Heat)
 - Open hearths 70.000 tons/a split wood gfe≈10%
 - Built-in hearths 262.000 tons/a gfe≤60%
 - Freestanding hearths 239.000 tons/a gfe≤70%

gfe = gross fuel efficiency

Primary en secondary by-products





Standing volume wood in forests (m³/ha)

■ Netherlands	208
■ Germany	268
■ Belgium	210
■ France	175
■ UK	141
■ Denmark	121

Possible production wood for energy

Assumptions:

- Current functions nature, recreation, silviculture are leading (*nature forest stays nature forest; most forests in NL are multifunctional*)
- High-quality use of products (saw-timber >> fire wood)

- 80% harvest of yearly increment forests (now ca. 55%)
- Thinnings of young stands is possible (now unusual)
- 10% harvest of tops and branches (yet ≈0%)
- 80% harvest of yearly increment landscape elements
- Cascading:
 - tree trunks → saw-mills, etc;
 - Primary and secondary by-products → energy

Potential harvest of wood for bioenergy

Type of nature	Annual increment (tons/a)	Use for energy (Actual harvest)* (tons/a)	Use for energy (high harvest)** (tons/a)	Energy (high harvest)** (PJ)
Multifunctional forest	1,288.5	217	327	5.6
Nature forest	175.5	-	-	-
Landscape elements	440	176	176	3.0
Urban green	510	200	200	3.5
total	2354	593	703	11.9

*) actual harvest: \approx 55% of yearly increment; **) high harvest: 80% of yearly increment

Assesment potential harvest of wood for energy

Kuiper & de Lint (2008)

Potential harvest	(tons/a)	PJ
Current use of energy wood	275	5,0
40% of extra opportunities forest/landscape	100	1,8
Current use waste wood and 1°/2° residues	383	6,9
Current export of Dutch waste wood	330	5,9
TOTAL	1.088	19,6

≈ 0.6 % total energy use NL;
≈ 10 % of biomass target NL 2020

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Opportunities wood for energy

- Good perspectives for sustainable recovery of energy
 - Using primary, secondary and tertiary by-products
- Driver for maintenance of valuable landscape elements and urban green
- New (market) perspectives for urban green, protected landscapes, forests
- No negative effects on food supply, forest products
- Rising awareness of problems with future energy supply; climate change
- Rising prices for fossil fuels
- Good opportunities for wood chips from landscape elements / urban green

Bottlenecks wood for energy

- Competition with other uses/ markets
 - Price for wood chips not attractive for forest owners
 - Cheap wood chips from urban green and landscape elements 'disturbs' the market for wood chips from forests
 - Cheap wood from overseas / Germany disturbs the market (housing market USA; storms in Germany)
- No large scale pelletizing factories in NL// Gasifying technique still in test phase
- Relative low harvest of yearly increment forests
- Effects harvesting logging residues on biodiversity unclear
- Forestry is unfamiliar with harvesting logging residues
- Strict regulations in the NL for use of contaminated wood in biomass energy plants (export → Germany)
- Organisation logistics of logging residues is difficult
- Only a few heat biomass plants in the NL
- In NL is a perfect natural gas network

Possible actions to raise use of wood for energy

- Communication with forest, landscape owners, green contractors, farmers potential buyers of heat
 - Possibilities for use of wood chips for production of energy
 - Possibilities of more harvest and harvesting logging residues
- Improve logistics and co-operation
 - Create a good energy-infrastructure
 - Guarantee amounts of bio-mass purchase/ supply
 - Develop regional 'green biomass yards'
 - Develop collecting service for logging residues
- Market
 - Energy projects; good and guaranteed prices for heat, electricity, gas
- Financial support
 - Forest owners: subsidize non-cost-covering harvests (logging residues)
- Develop framework for assessment on use of biomass for energy

Framework for assessment on use of biomass for energy

- Forest management; level of harvest (80% of yearly increment , assortments, logging residues;
- Effects of forest management on greenhouse gases (emitting, storage)
- Effects on biodiversity, recreation possibilities, etc.
- Forestry-measures
- Destination biomass (product; by-products; residues)
- Conversion technique and scale (biomass → energy)

Conclusions

- Wood is a good source in NL for production of heat and electricity
 - Possible in 2020 about 20 PJ/a from forests, landscape elements and urban green
- Using logging residues, the greenhouse gases balance is advantageous.
- But, there are a lot of practical problems to solve, before Dutch wood produces 20 PJ/a

Questions?



Contact address

Alterra, Wageningen UR

Team Management Forest, Nature and Urban Green

Joop Spijker

joop.spijker@wur.nl

Tel. ** 31 317 484990

