

ab^ewe

Implementing Advanced Concepts for Biological Utilization of Waste



Baltic Sea Region
Programme 2007-2013

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BIOMASS POTENTIAL AND CHALLENGES ITS UTILIZATION IN NORTH EUROPE AND GLOBALLY

**Above biorefinery final seminar, biorefining around the Baltic Sea and Global
Ecodevelopment**

Viikki Campus, University of Helsinki
Thursday 30.10.

M.Sc. Tuomas Huopana, University of Eastern Finland, tuomas.huopana@uef.fi

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INTRODUCTION

- Global biomass potential is huge and its usage will increase dramatically in becoming years
- World population in 2014 was 7.2 billion and is expected to increase close to 10 billion by 2050
- Global warming
- Non food and waste biomass utilization is seeing as one of the solutions for global challenges
- How much of this non food biomass could be utilized in sustainability point of view?



GLOBAL BIOMASS ENERGY POTENTIAL

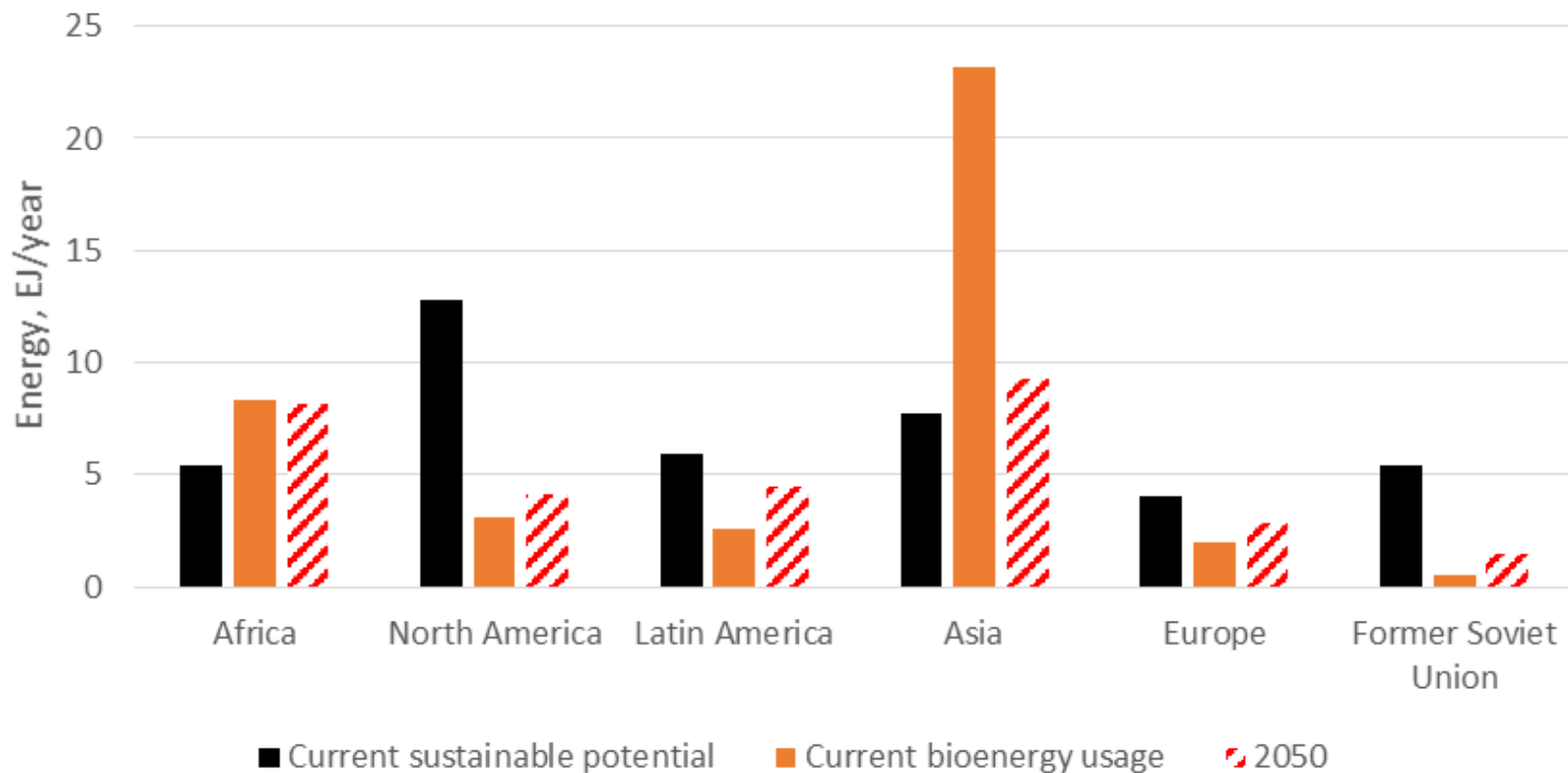
- It was estimated that current sustainable global bioenergy potential is 104 EJ/year. [1]
 - 72 000 times annual energy consumption in Finland.
 - 1 EJ = 278 000 TWh.
 - Bioenergy usage is still 38 % of sustainable energy potential.
 - Current average global energy consumption is about 490EJ/year.
- Global scenarios predict bioenergy potential from 120 EJ/year to 210 EJ/year By 2050 [2].

[1]: Matti Parikka. Global biomass fuel resources. Biomass & Bioenergy.

[2]: VTT Energy visions 2050.



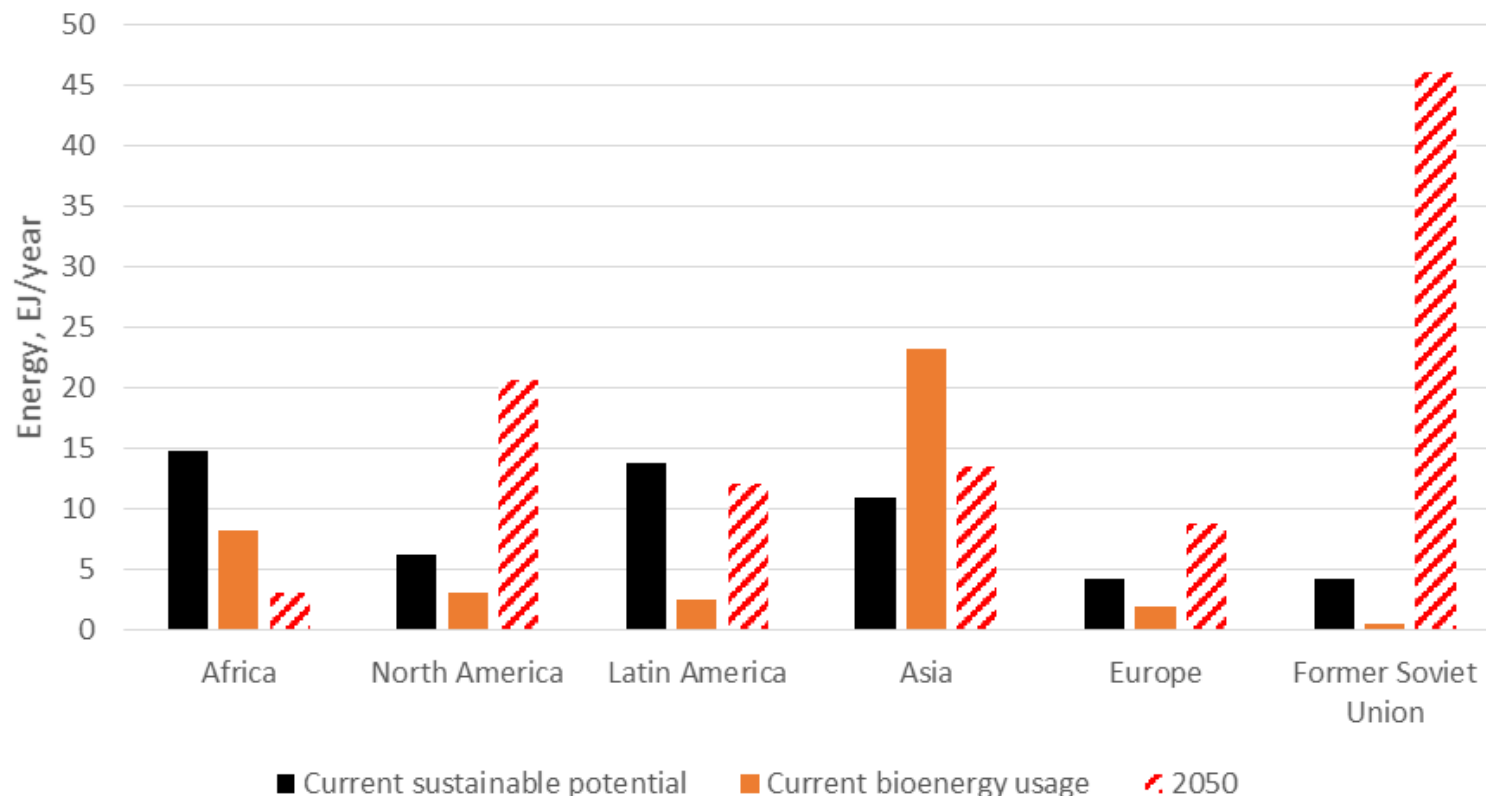
FOREST BIOMASS POTENTIAL & USAGE



- Current global sustainable forest biomass energy potential is about 42 EJ/year.
- It is predicted that global forest biomass potential can be 30 EJ/year by 2050.



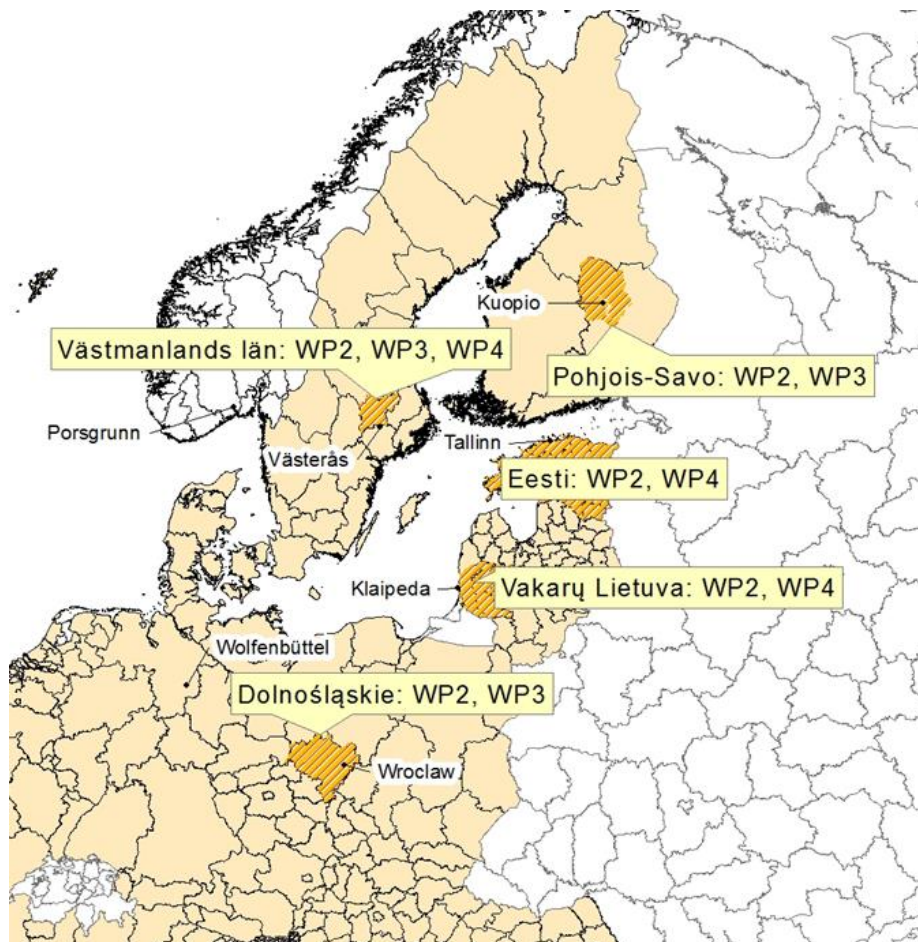
AGRO BIOMASS POTENTIAL & USAGE



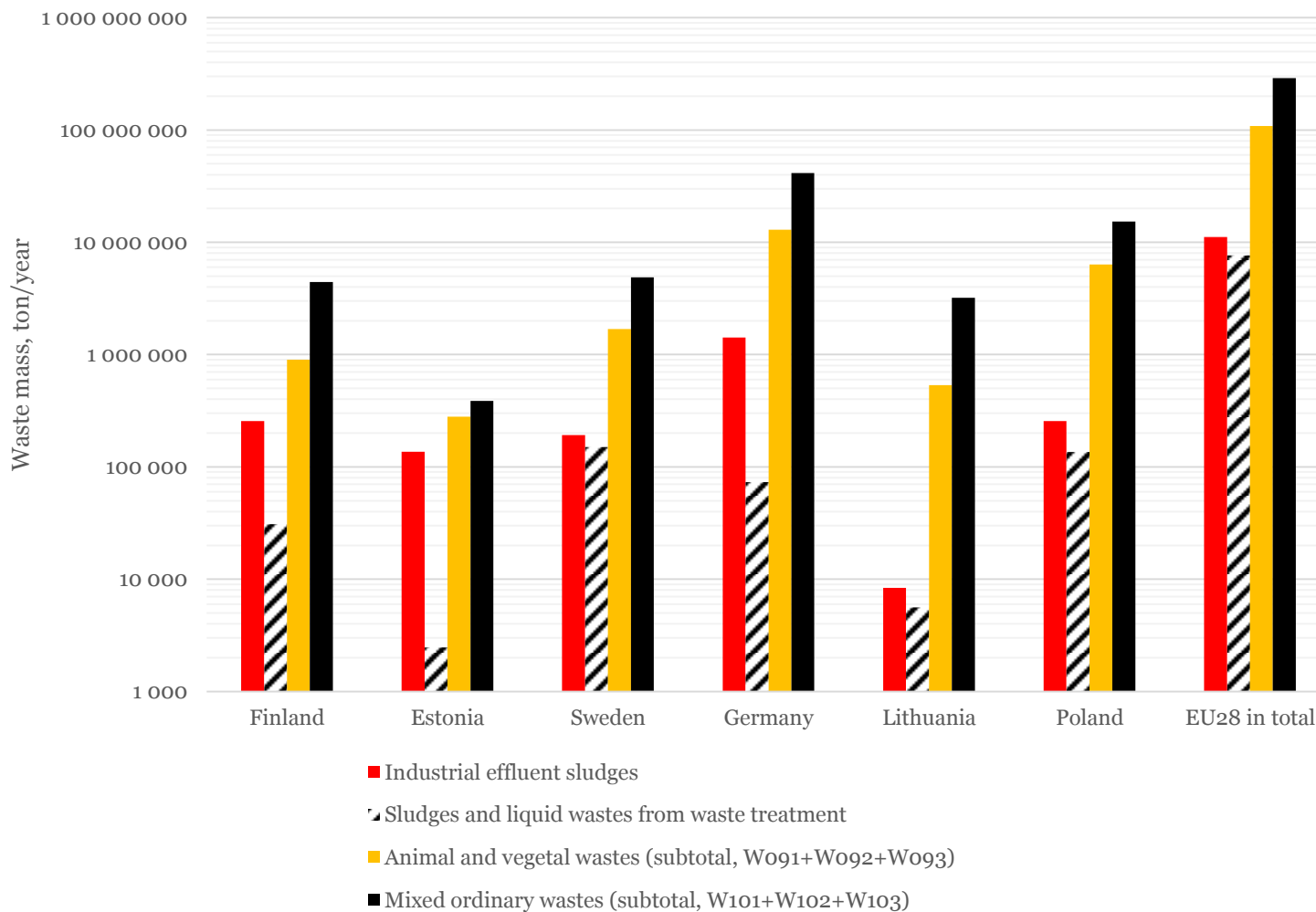
- Current global sustainable agro biomass potential is about 54 EJ/year.
- It is predicted that global agro biomass potential can be 104 EJ/year by 2050.



ABOWE PROJECT TARGET COUNTRIES



SELECTED WASTE POTENTIALS IN ABOWE COUNTRIES IN 2010



BIODEGRADABLE WASTE UTILIZATION

- Waste properties for utilization
- Regulations that have effect on waste utilization consider:
 - Waste management
 - Environment protection
 - Sustainability
 - Finance policy
- How much waste can actually be utilized?



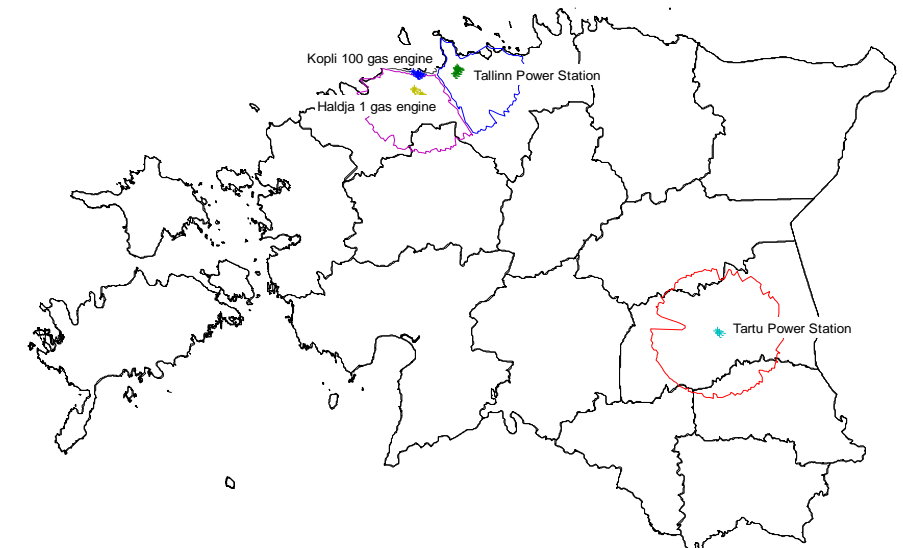
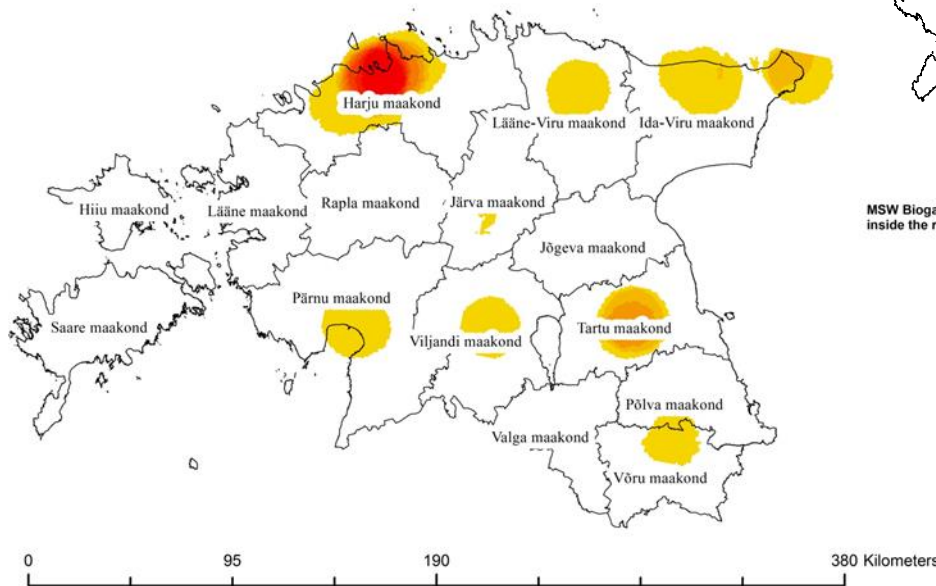
EXAMPLE, UTILIZATION OF HOUSEHOLD BIOWASTE (1)

Case: Estonia

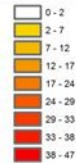
- Operational income is to be positive

Biowaste spatially distributed of 39 kt/year

- Biomethane potential: 35 GWh/year



MSW Biogas energy potential inside the radius of 15 km in GWh/year



Could be utilized: 19 kt/year

- Electricity: 6 GWh/year
- Heat: 6.5 GWh/year



EXAMPLE, UTILIZATION OF HOUSEHOLD BIOWASTE (2)

Case: Estonia

Closest heating plant	Tallinn Power Station	Tartu Power Station	Haldja 1 gas engine	Kopli 100 gas engine
Household biowaste, kt/year	5.7	4.1	6.3	3.2
Nitrogen potential, t/year	37	27	41	21
Phosphorus potential, t/year	7.5	5.4	8.3	4.2
Reactor volume, m ³	320	233	353	179
Sales:				
Electricity, GWh/year	1.8	1.3	2.0	1.0
Heat, GWh/year	1.9	1.4	2.1	1.1
Nitrogen fertilizer, k€/year	12,1	8.8	13,4	6.8
Electricity sales, k€/year	210	150	230	120
Heat sales, k€/year	110	80	120	60
Gate fees, k€/year	8.5	6.2	9.4	4.8
Incomes in total, k€/year	340	240	370	190
Overall costs, k€/year (inc. Operational & investment)	150	120	170	80
Digestate spread & transportation, k€/year	3.6	1.9	4.8	3.0
Feedstock transportation, k€/year	49	46	61	15
Plant costs, k€/year	97	75	105	61
Operational income, k€/year	190	120	200	110
Labor demands (160 hour/month)				
Plant site, man months/year	6.4	5.1	6.9	4.2
Feedstock transportations, man months/year	32	31	40	10
Digestate spread & transportation, man months/year	0.4	0.2	0.6	0.4
Labor demands in total, man months/year	39	36	48	15
Labor demands in total, in men	3	3	4	1
Saved GHG emissions in ETS, CO₂ t	1 000	700	1 100	600





Map layers

http://www.bioatlas.fi

Bioatlas

Ohjeet | Aineistokuvaus | Blog

Kartta-aineisto

- MML Peruskartta
- MML Taustakartta
- MML Ilmakuvat
- Google satelliitti
- Google kartta
- Google hybridi
- Open street map

Muu aineisto

- Natura 2000
- Syke
- Muinaismuistomerkit

Karttaikkuna

Karttatasot | Haku

Metsäbiomassa

Hakkuutapa: Harvennus
Päätehakkuu

Maatyyppi: Kivennäismaa
Turve

Kasvupaikkatyyppi: Lehtomainen
Tuore
Kuivahko
Kuiva
Karukka

Lähin tie (m): 150

Peltobiomassa

Lantabiomassa

Hae

Biomassaraportit:

Metsäbiomassa | Peltobiomassa | Lantabiomassa

Päätehakkuut:	Mwh	Harvennukset:	Mwh
Kannot	370	Kuusi	37
Oksat	340	Mänty	34
Latvat	370	Koivu	17
Keskimääräinen etäisyys	49 (km)	Keskimääräinen etäisyys	31 (km)

Tallenna raportti

Attribute selection

Reporting

OUTLOOK FOR BIOMASS POTENTIAL UTILIZATION

- Trends in biomass potential utilization:
 - Land use change from forest to agriculture
 - Due to climate change some regions cannot be suitable for agriculture
 - Accumulation of pollutants to air, water and biomass
- Need for biomass information tools:
 - End user friendly tools to estimate biomass potentials
 - Better quality data
 - Thanks to inspire directive, biomass data related information applications are increasing



Thanks for your attention!

