European Union Renewable Energy policy and lessons on bioenergy through the implementation of the NREAPs (National Renewable Energy Action Plans)

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Institute for Energy and Transport
Renewable Energy Unit

IEA-FAO-IRENA Bioenergy How2Guide Workshop - Bangkok, 23-24 July 2014

Who are we?

JRC: the European Commission's in-house science service

As a Directorate-General of the European Commission, the JRC provides customer driven scientific and technical support for the conception, development, implementation and monitoring of European Union policies.

Institute for Energy and Transport

1 of the 7 scientific institutes of the JRC

Our mission: "*provide support to Community policies and technology innovation to ensure sustainable, safe, secure and efficient energy production, distribution and use and to foster sustainable and efficient transport in Europe*"

Main activities:

- Renewable energies
- Sustainable & safe nuclear energy
- Energy techno/economic assessment
- Hydrogen and fuel cells
- Clean fossil fuel
- Energy efficiency
- Security of energy supply
- Sustainable transport

European Commission

Energy and Climate Challenges

Keep global warming below 2° C, in comparison with 1990

- reduce GHG emissions by 20% by 2020
- reduce GHG emissions by 80 to 95% by 2050

The 2020 targets:

- **decrease energy consumption by 20%**
- **increase the share of renewables to 20%**
  10% renewable energy in transport

Low-carbon economy by 2050

- Several decarbonisation scenarios for the period until 2050
  Energy Roadmap 2050

EU 80% dependent on fossil fuels

A critical challenge: from 80% dependency on fossil fuels to 80% reduction in GHG emissions in 40 years

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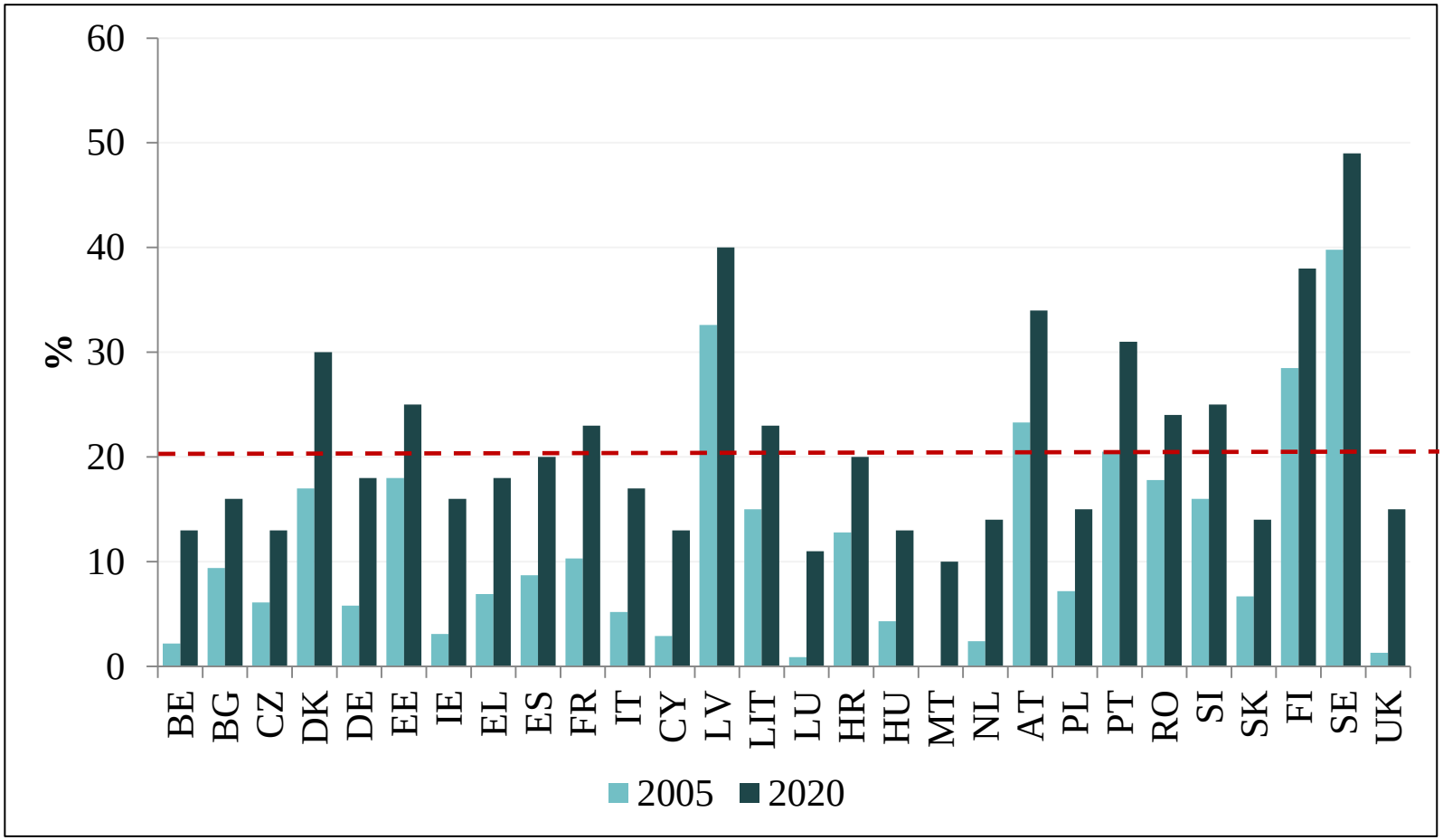
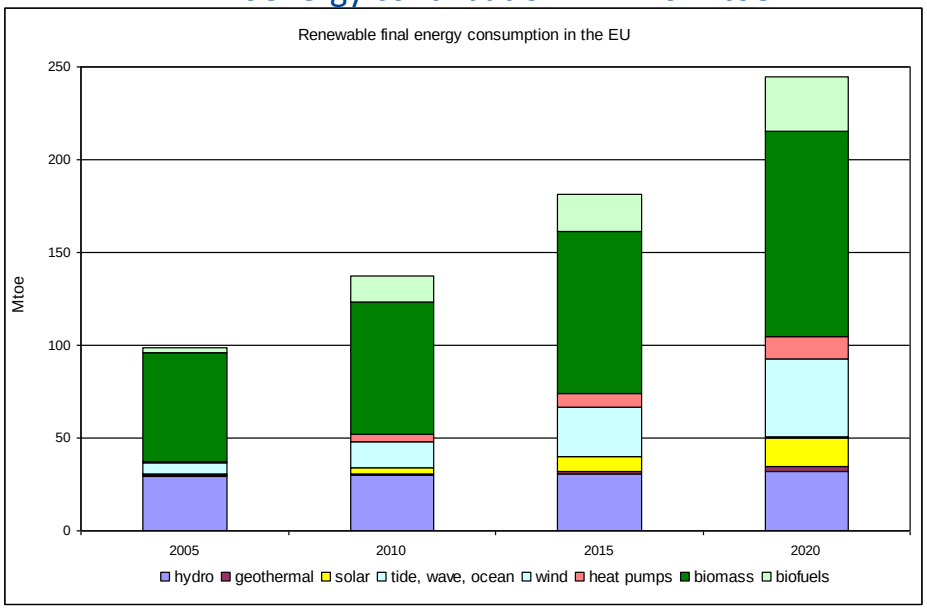
National Targets overall RES EU 28

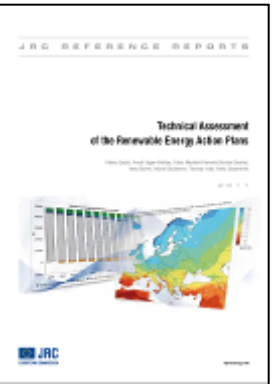


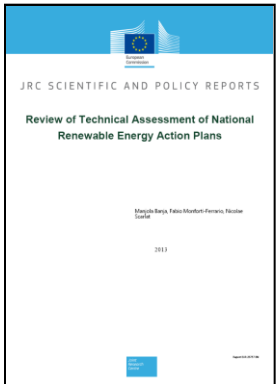
Source: Annex I, Directive 2009/2/EC

NREAP analysis
- renewable energy

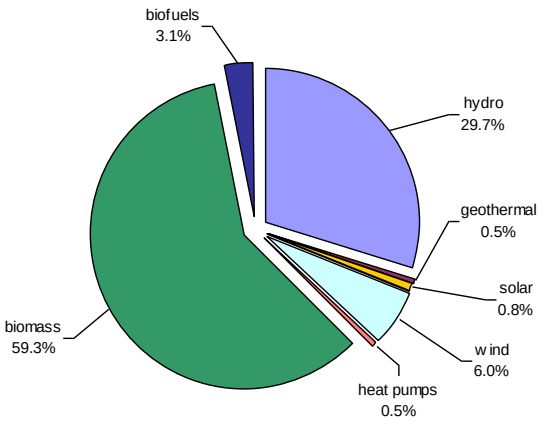
RES 2020 target level: ~ 250 Mtoe
Bioenergy contribution: ~ 140 Mtoe



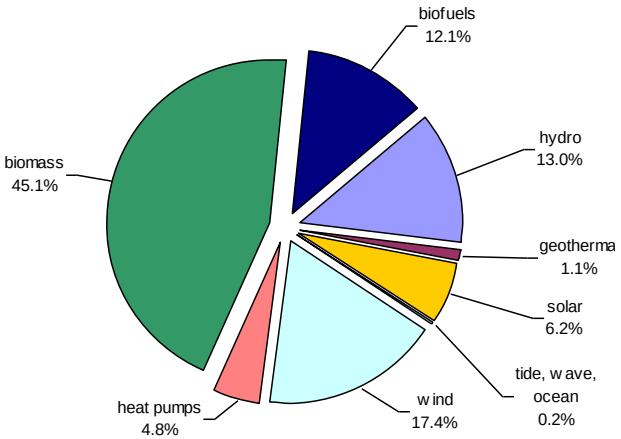




Final renewable energy consumption in 2005



Final renewable energy consumption in 2020



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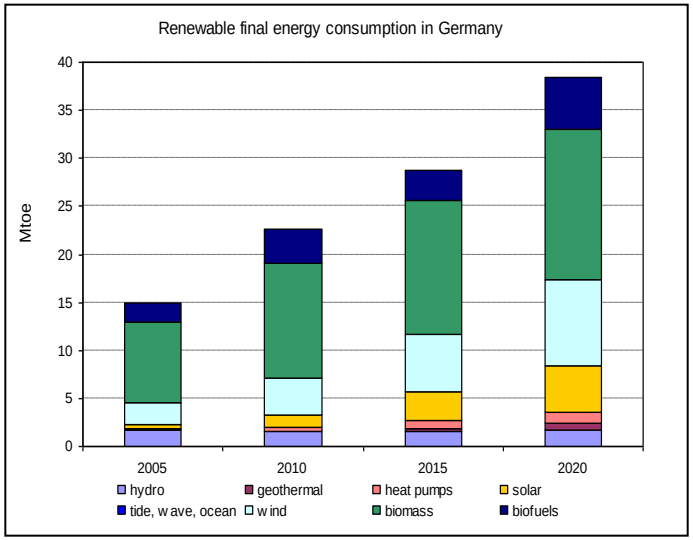
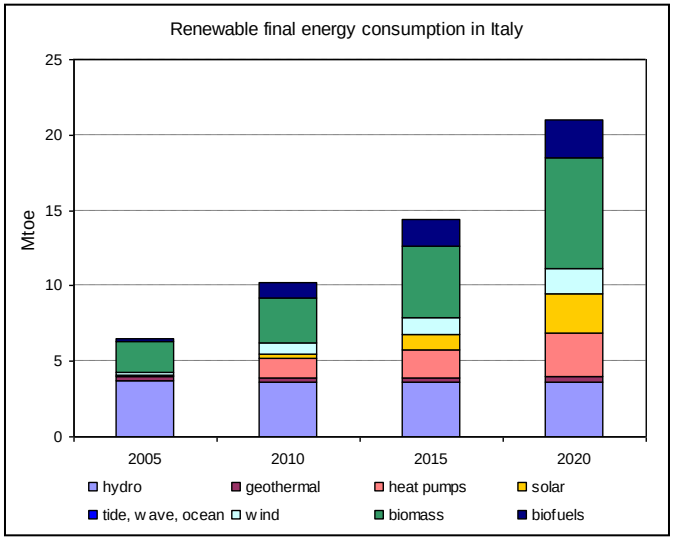
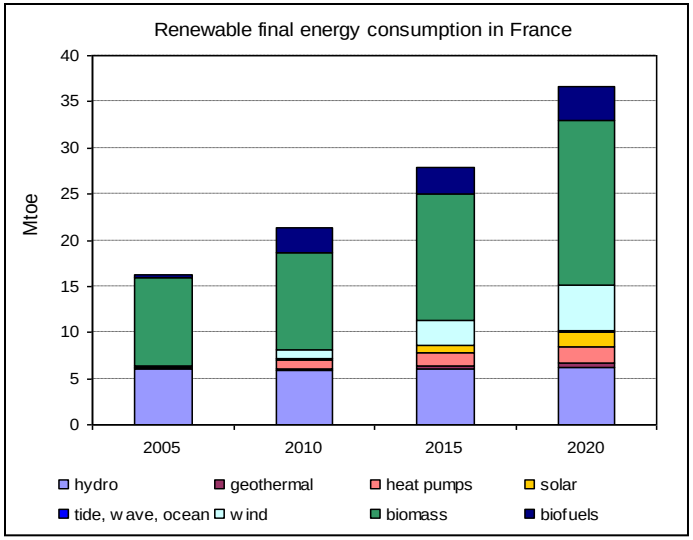
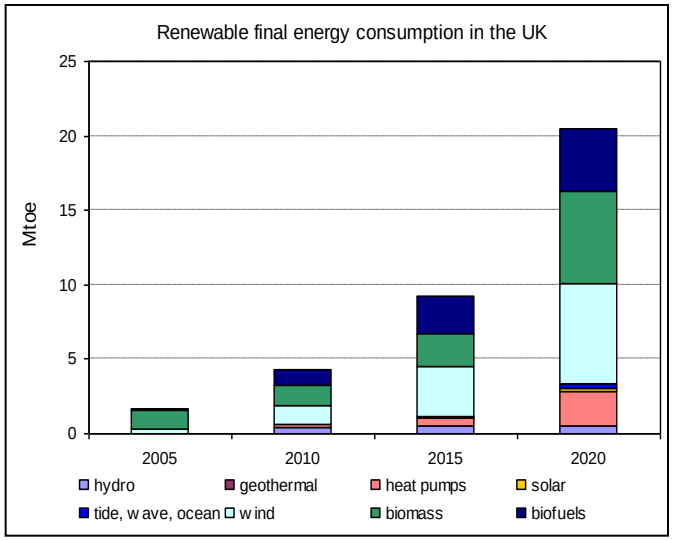
NREAPs - Some examples

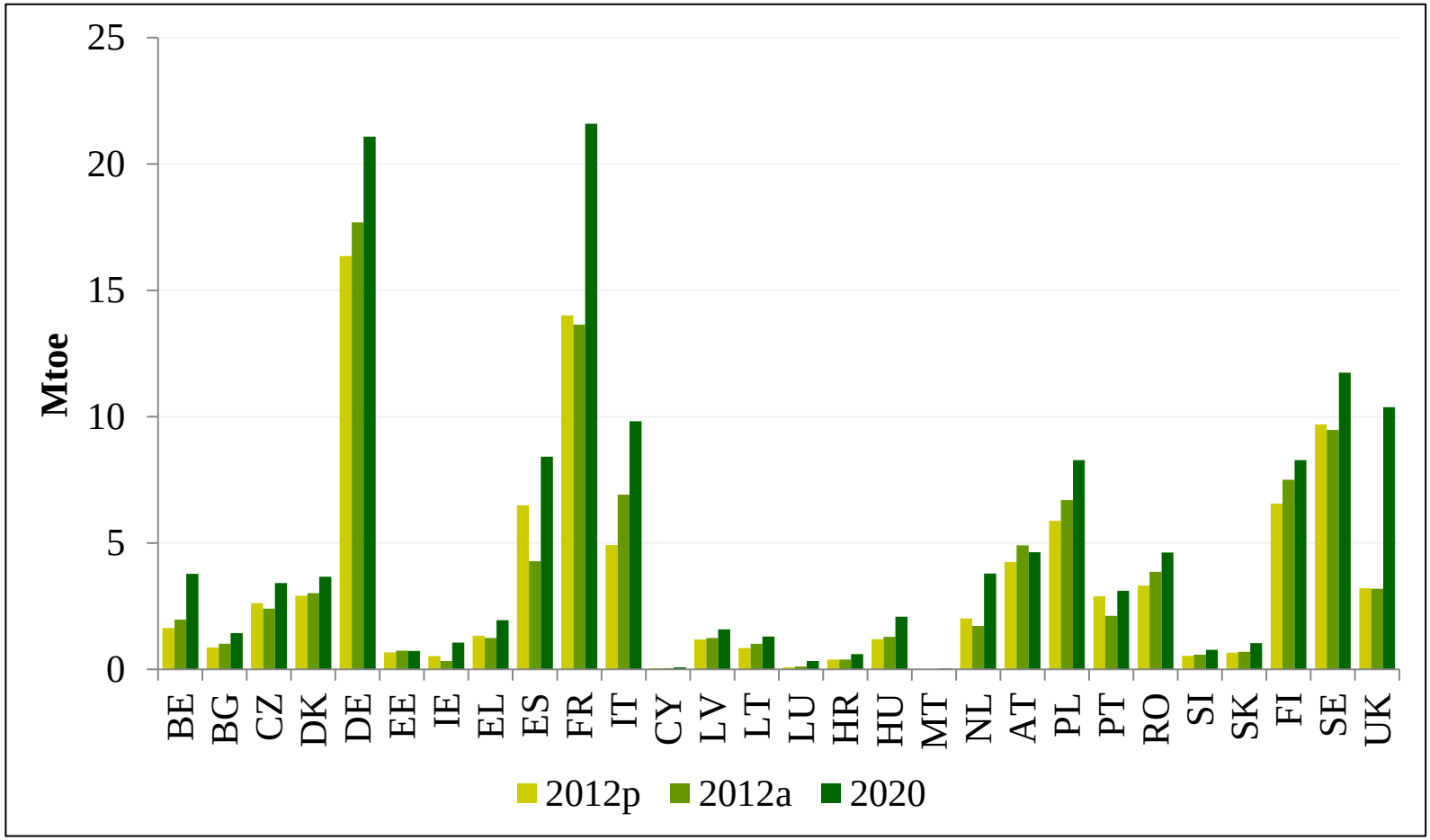






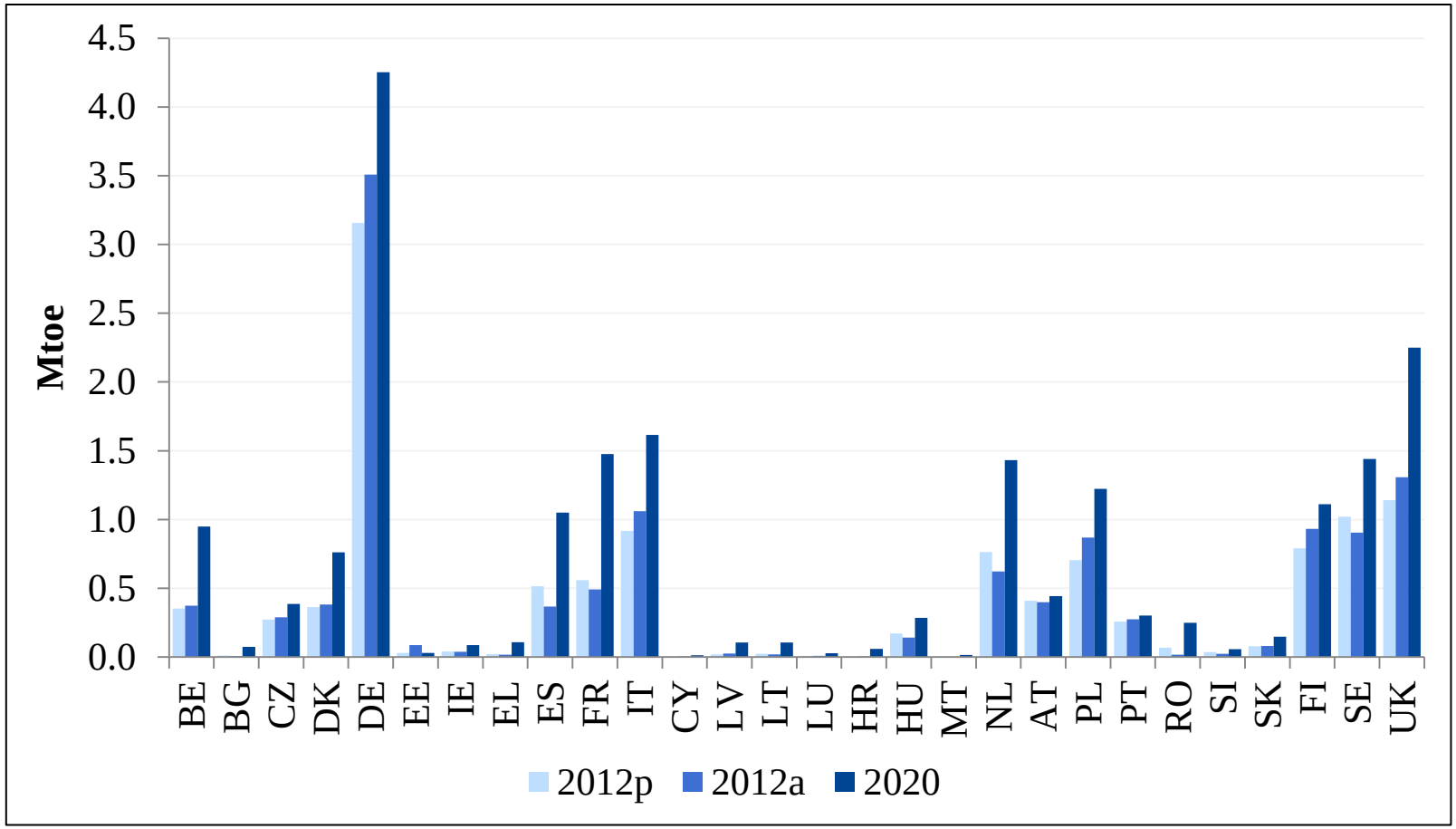


Bioenergy 2012 and 2020



Source: 2013 progress reports and NREAPs
DE - bioenergie.fnr.de

Bioelectricity EU 28, years 2012 and 2020



Source: 2013 progress reports and NREAPs
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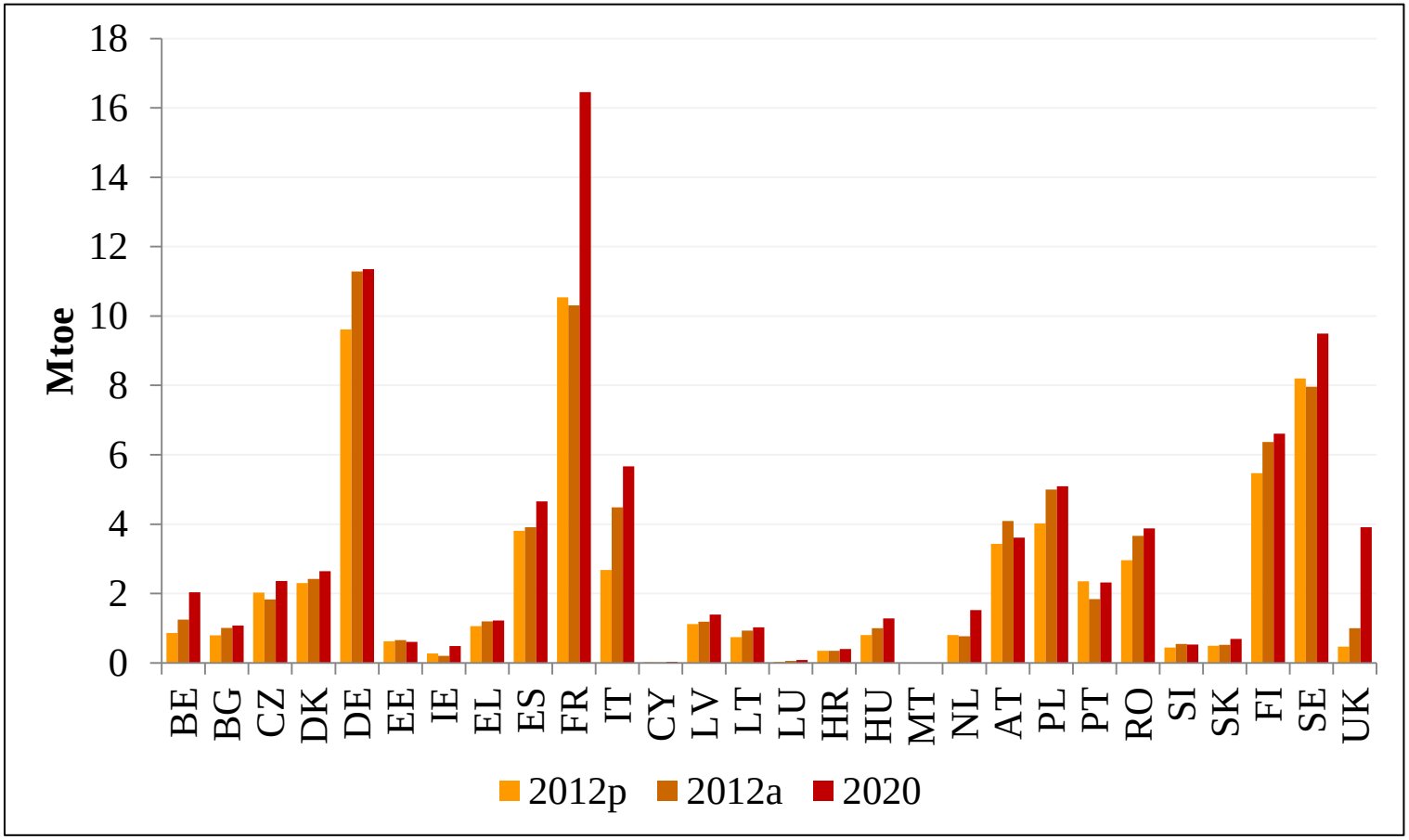
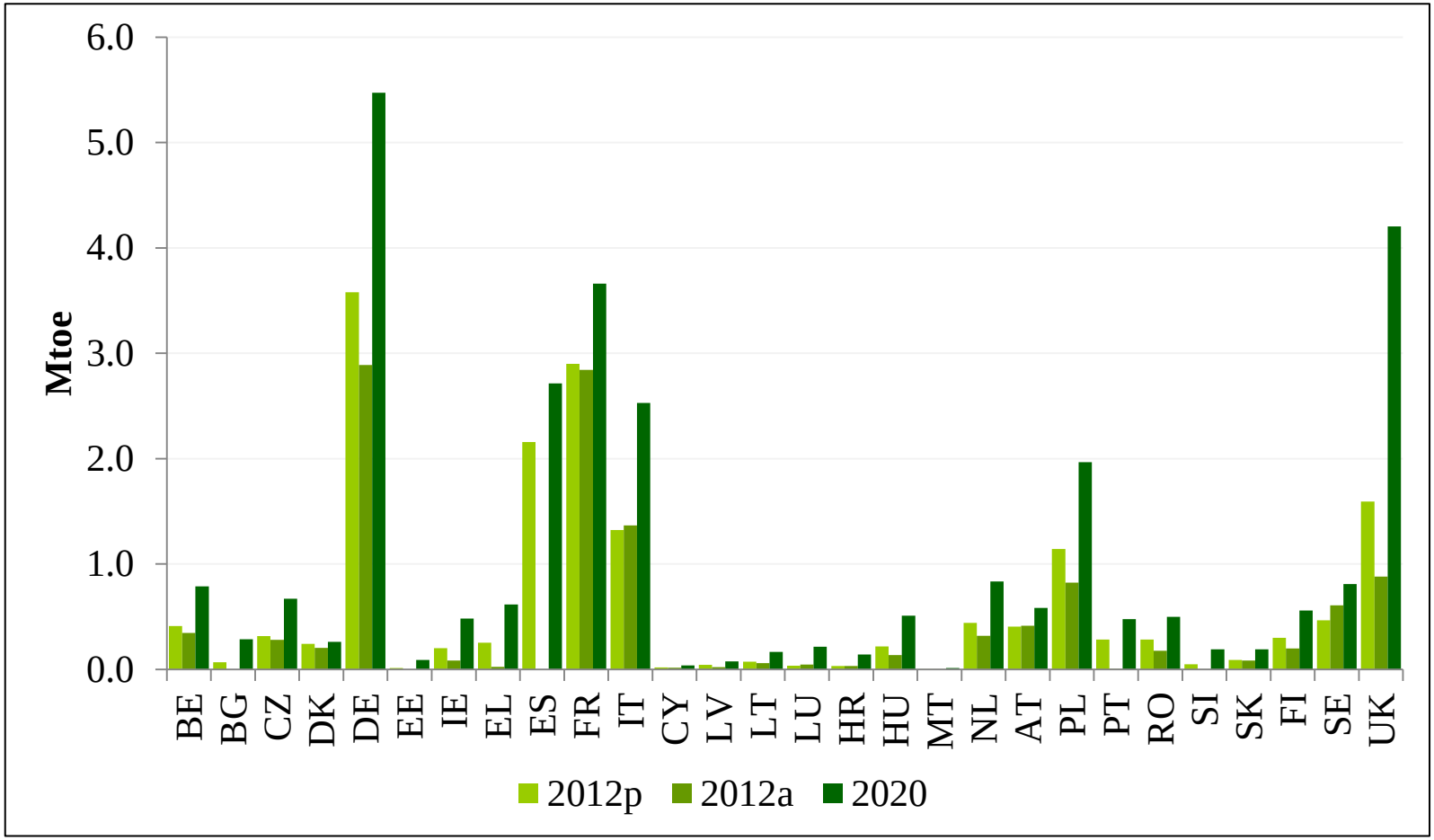
Bioheat in EU 28
2012 and 2020



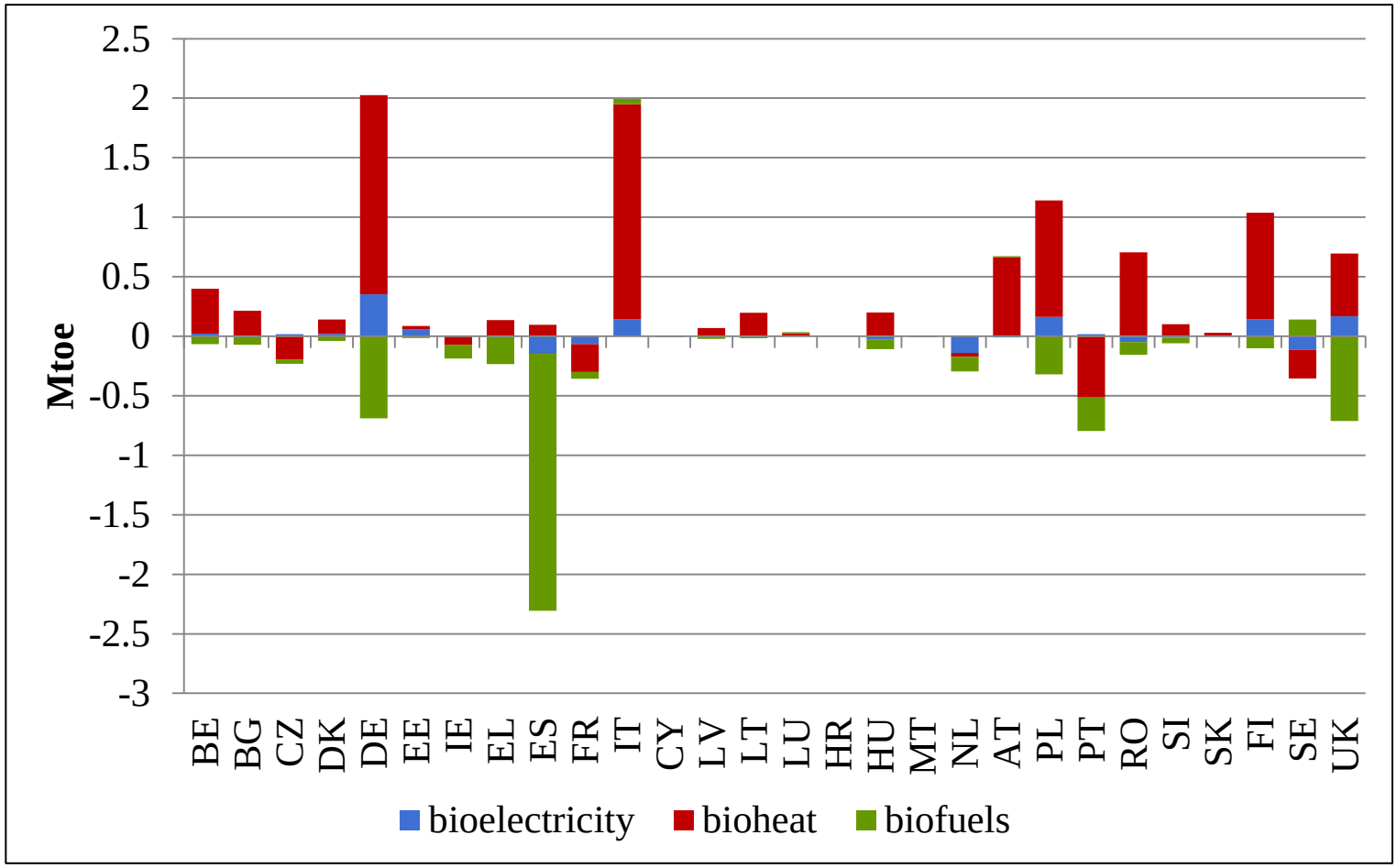
Source: 2013 progress reports and NREAPs
DE - bioenergie.fnr.de

Biofuels in EU 28, years 2012 and 2020



Source: 2013 progress reports and NREAPs
DE - bioenergie.fnr.de

Deviation from NREAP bioenergy -2012



Source: 2013 progress reports and NREAPs
DE - bioenergie.fnr.de

Progress in bioenergy – EU 28

Bioelectricity 13 MS (BG, IE, EL, ES, FR, LT, LU, HU, NL, AT, RO, SI and SE) missed the 2012 NREAPs planned value

Bioheat 8 MS (CZ, IE, FR, CY, MT, NL, PT and SE) missed the 2012 NREAPs planned value

Biofuels Only Italy, Austria and Sweden exceeded the 2012 NREAPs planned value

Total bioenergy 11 MS (CZ, IE, EL, ES, FR, CY, MT, NL, PT, SE and UK) missed the 2012 NREAPs planned value

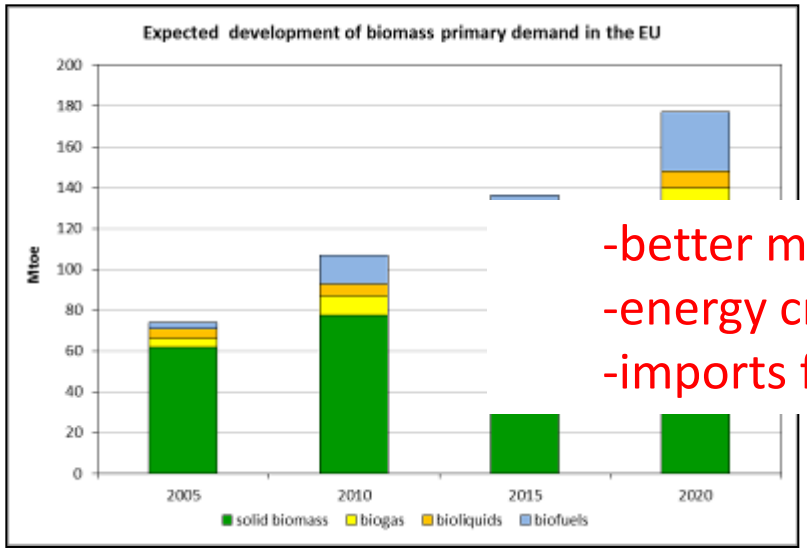
In 2012

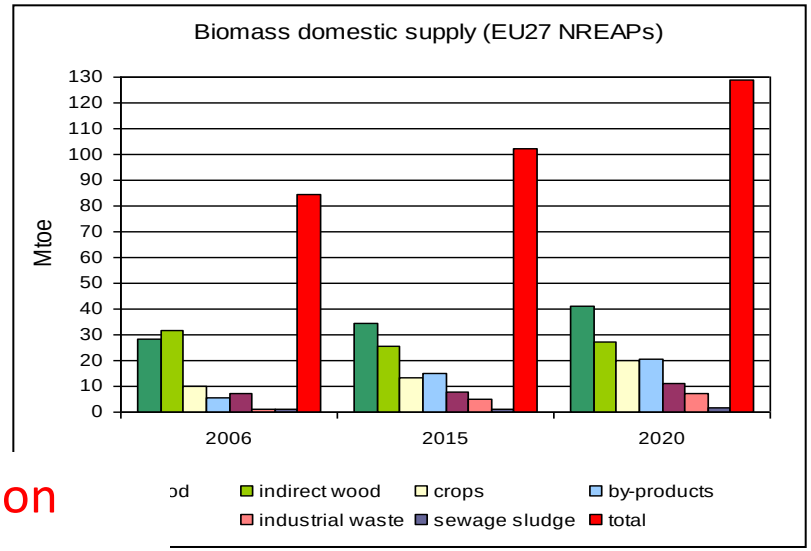
Estonia exceeded 2020 target for bioelectricity

Estonia, Austria and Slovenia exceeded 2020 targets for bioheat

NREAPs – Biomass domestic supply

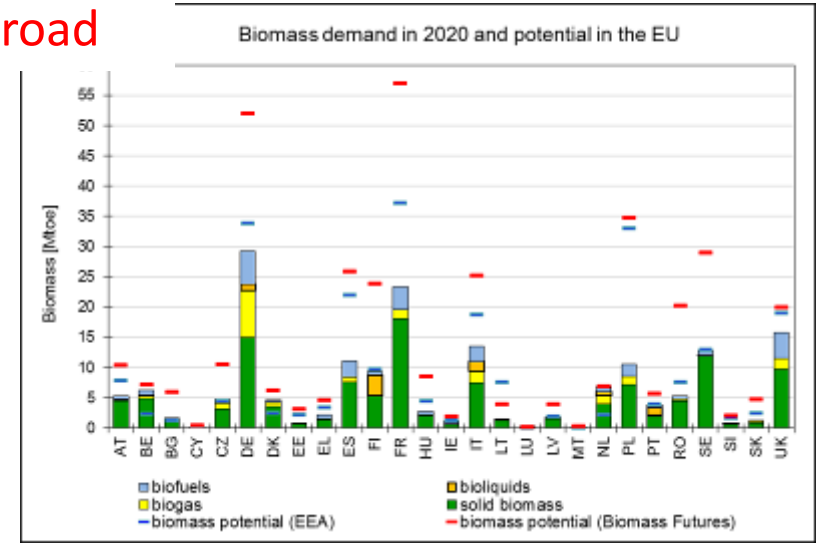
- expected bioenergy production–solid biomass, biogas, bioliquids
- conversion technologies
- domestic supply and import
- feedstock mix





-better mobilisation
-energy crops
-imports from abroad

Is there enough biomass to reach these targets?



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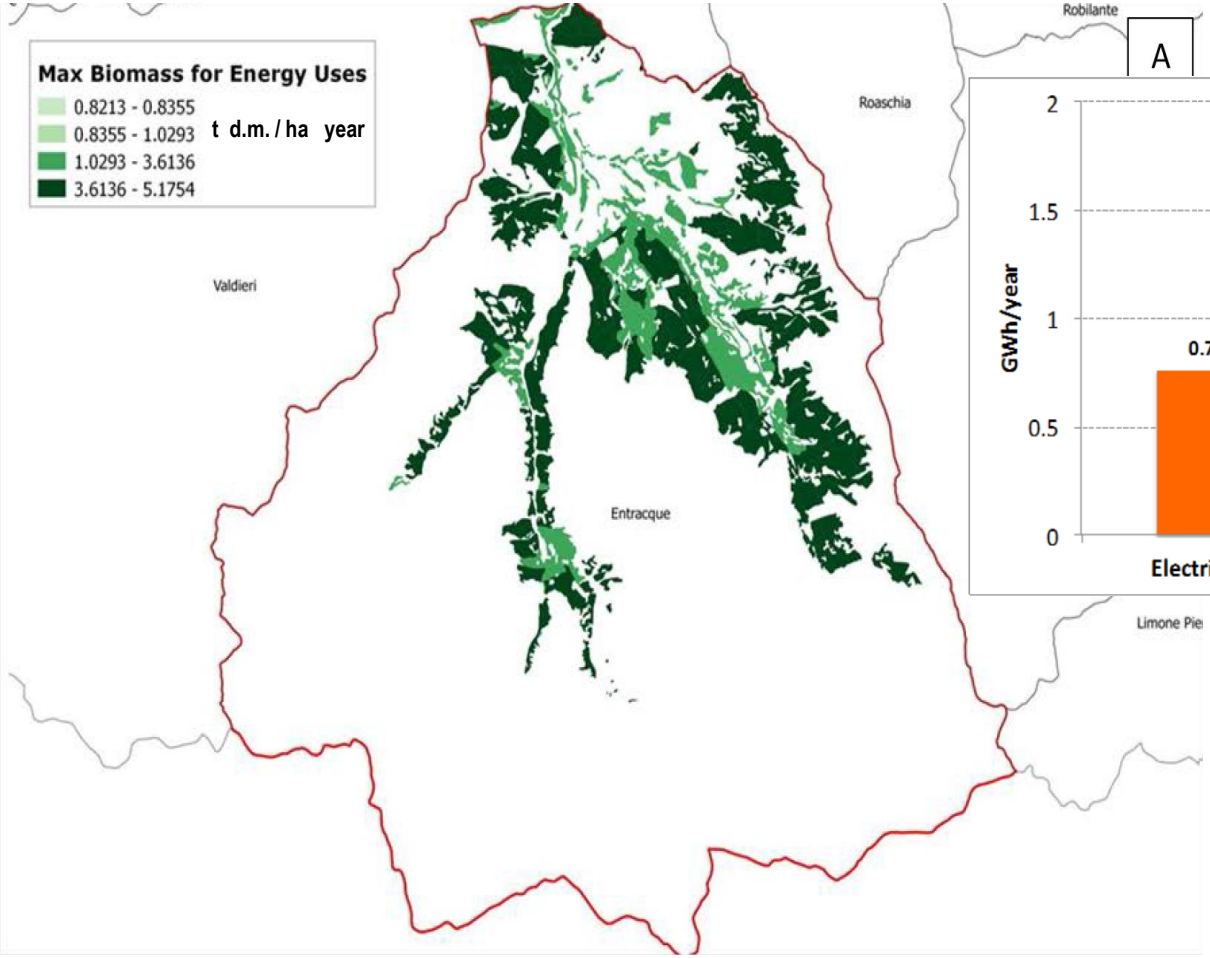
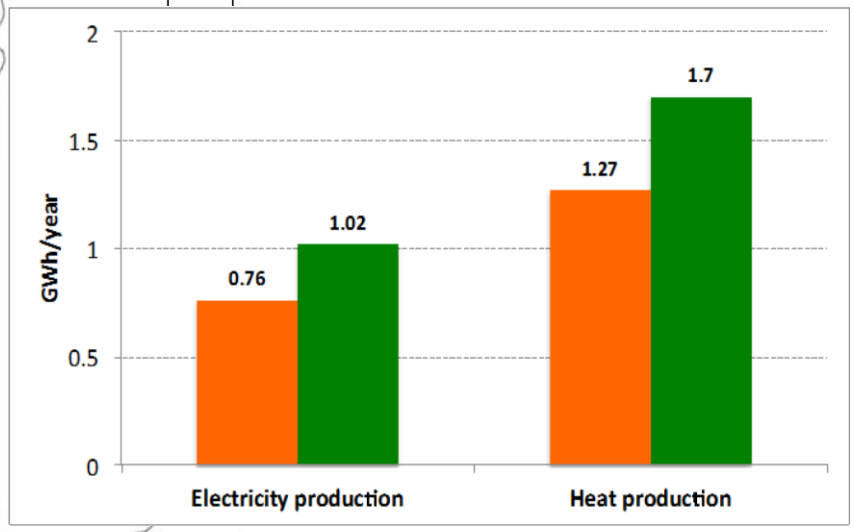
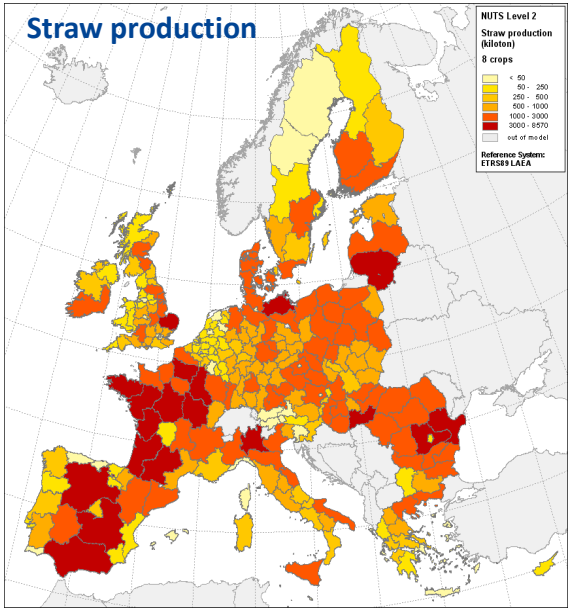


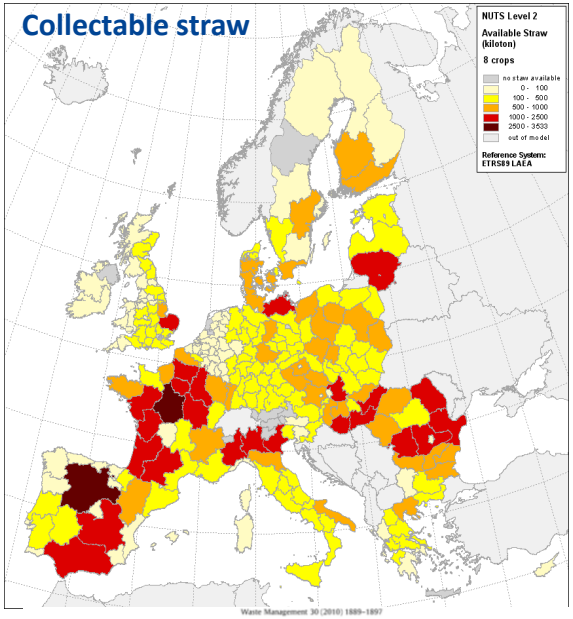


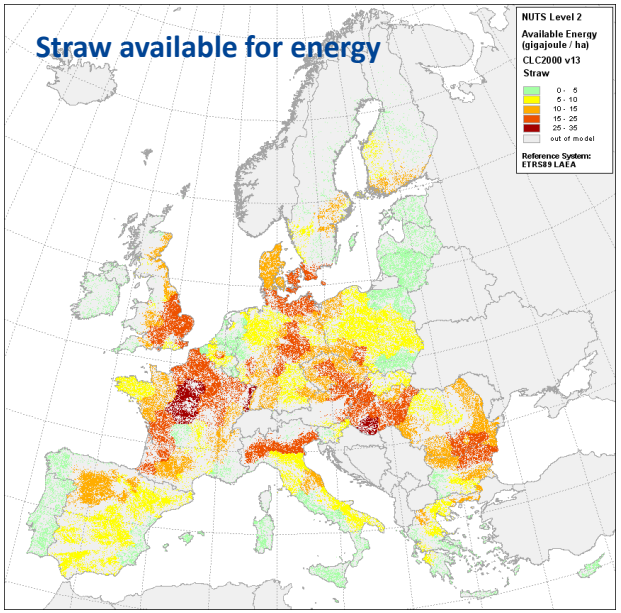
Sustainable collectable wood from 9545 t/year to a maximum of 12192 t/year

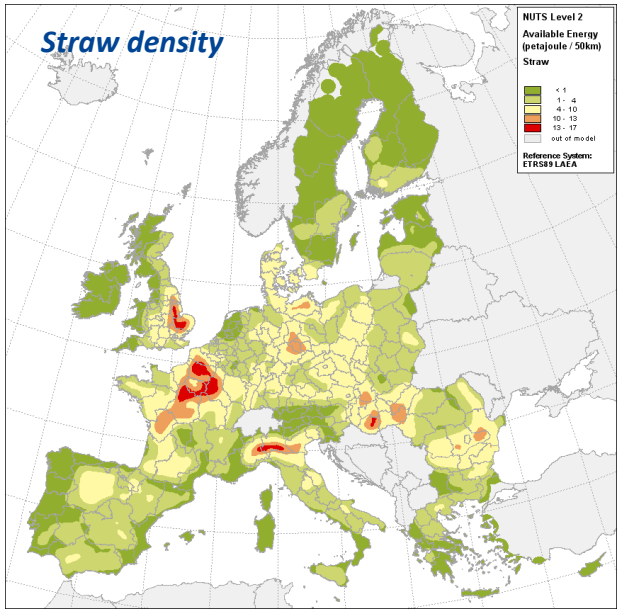
European Commission

GIS-based assessment of EU crop residues









Actual production
- crop production, area and yields
- residue to yield ratios

Environmental constraints
- organic matter content
- sensitivity to erosion

>> sustainable removal rates

Competitive use

Straw available for energy production


Waste Management 30 (2010) 1889–1897

Contents lists available at ScienceDirect

Waste Management

journal homepage: www.elsevier.com/locate/wasman

Assessment of the availability of agricultural crop residues in the European Union: Potential and limitations for bioenergy use

Nicolae Scarlat [a,*], Milan Martinov [b], Jean-François Dallemand [a]

[a] European Commission, Joint Research Centre, Institute for Energy, Via E. Fermi 2749-TP 450, 21027 Ispra (Va), Italy
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Suitability map for localization power plants

Main areas with important available straw resources

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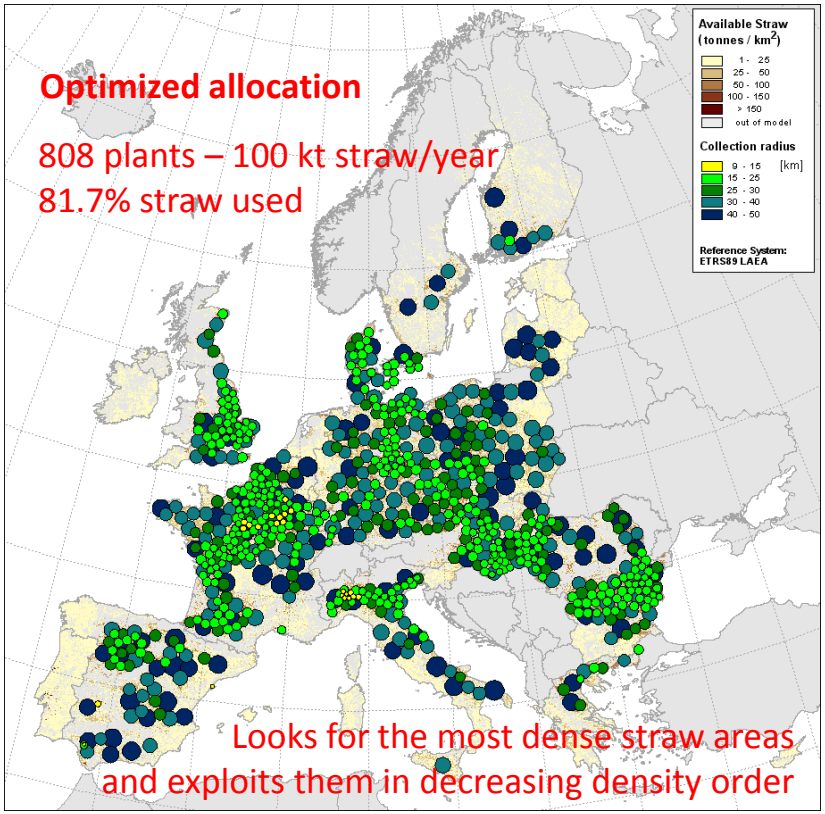
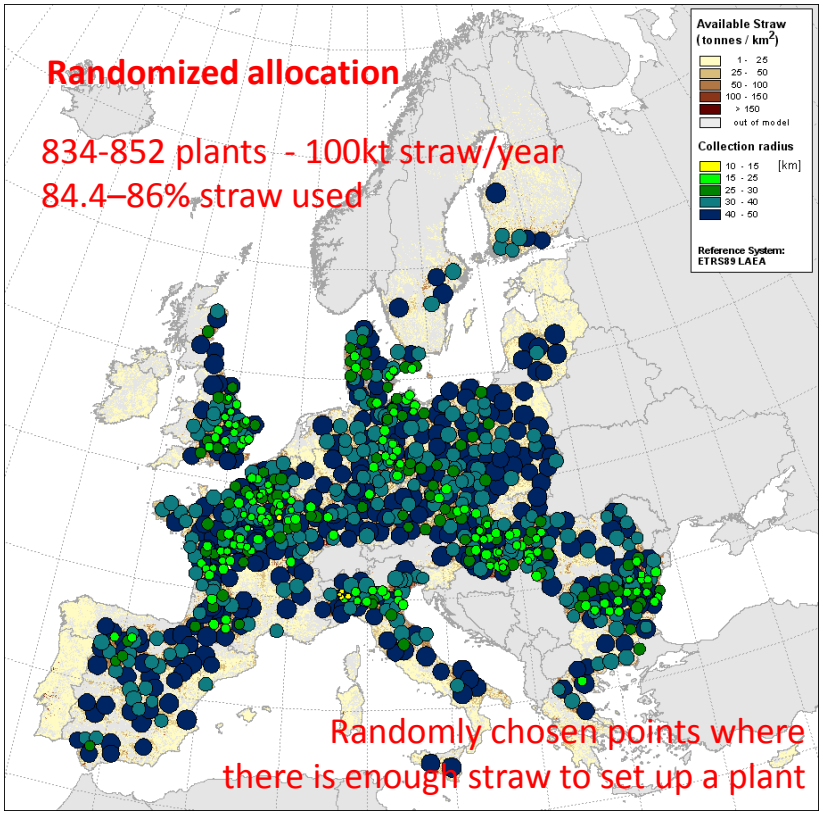
Localization of straw-based power plants





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Renewable and Sustainable Energy Reviews

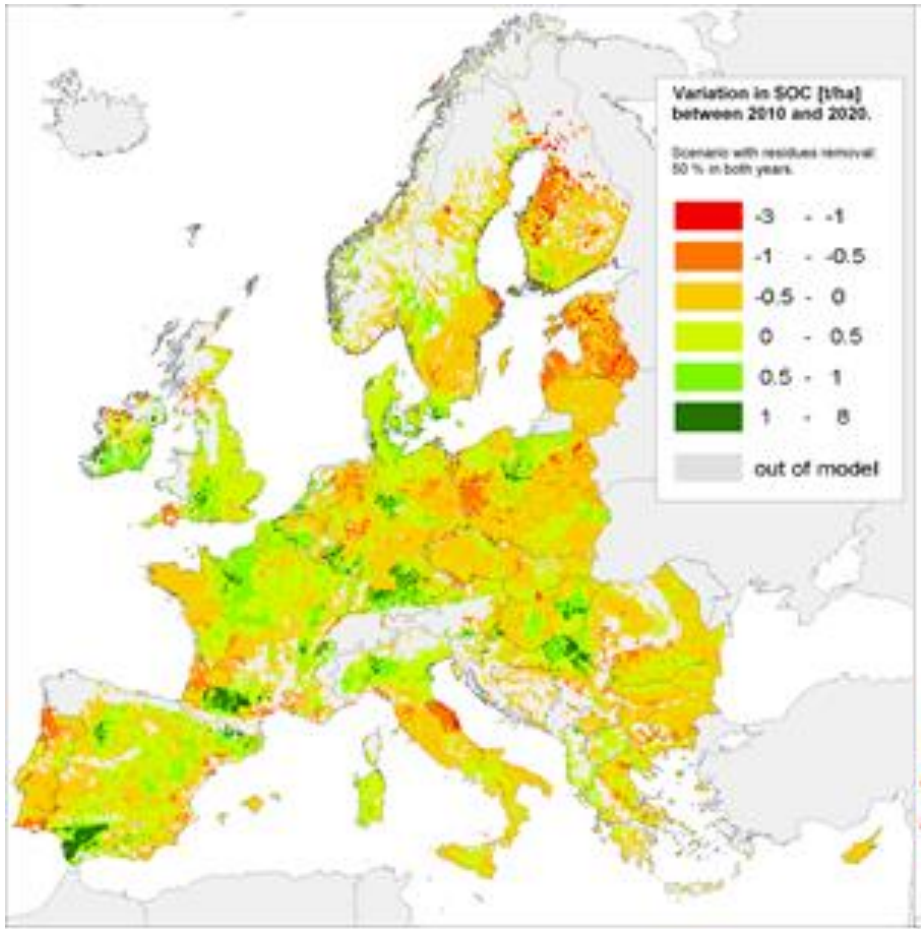
journal homepage: www.elsevier.com/locate/rser

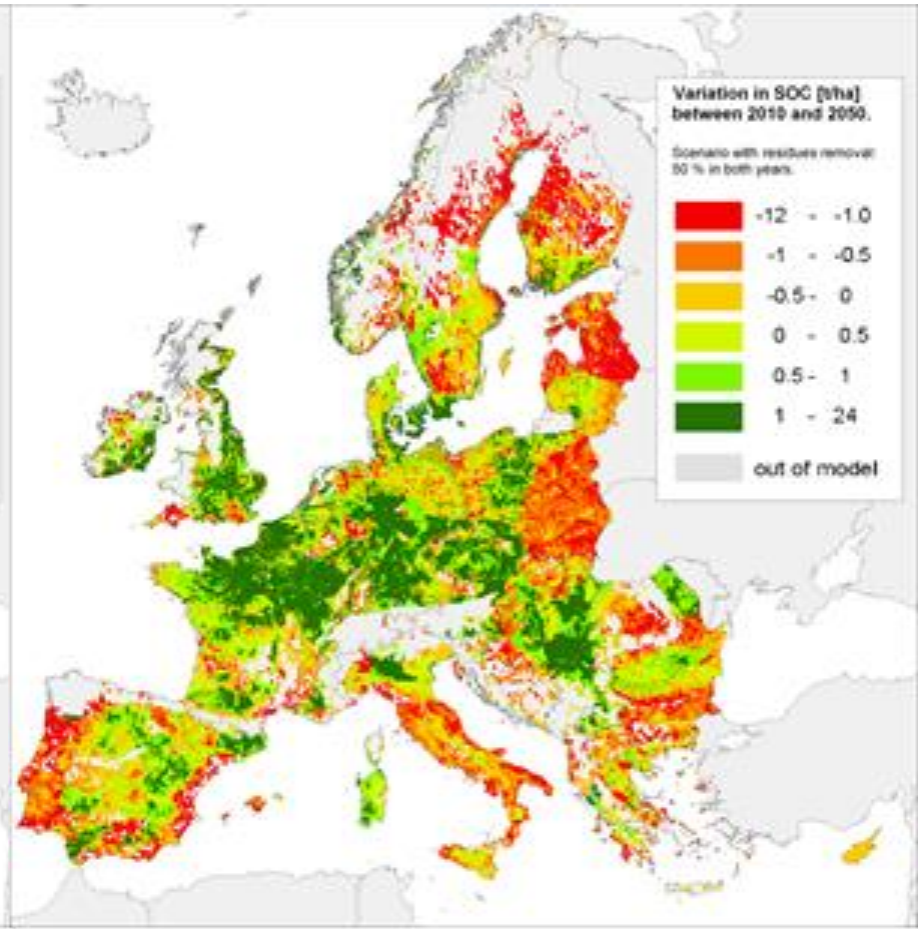
The possible contribution of agricultural crop residues to renewable energy targets in Europe: A spatially explicit study ☆

F. Monforti *, K. Bódis, N. Scarlat, J.-F. Dallemand

European Commission, JRC, Institute for Energy and Transport, Renewable Energy Unit, Via E. Fermi 2749, TP 450, I-21027 Ispra (VA), Italy

Sustainability of residues collection - soil carbon preservation





Collection “standard” 2010-2020

Collection “standard” 2010-2050

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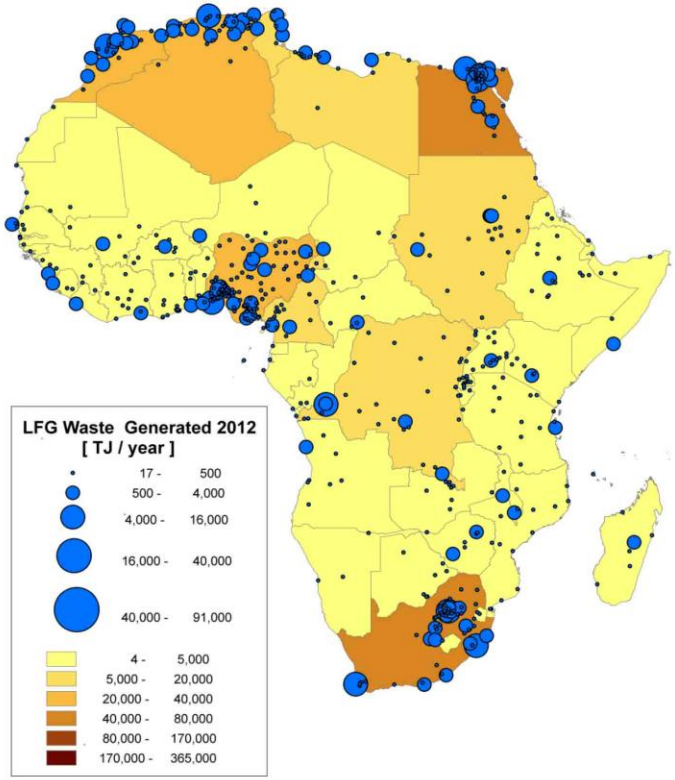
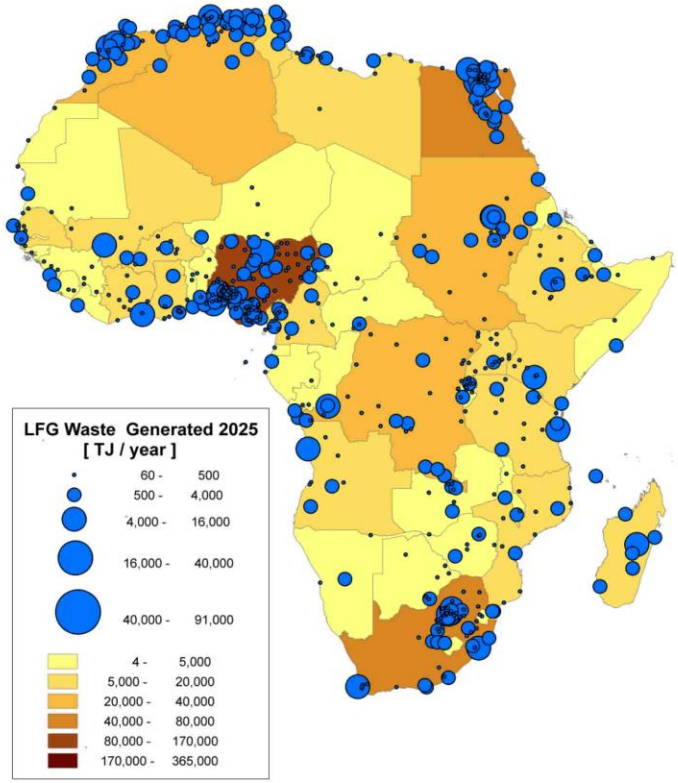
Assessment of energy theoretical potential from Municipal Solid Waste (MSW) in Africa (LFG = Land Fill Gas)





Danube Bioenergy Nexus

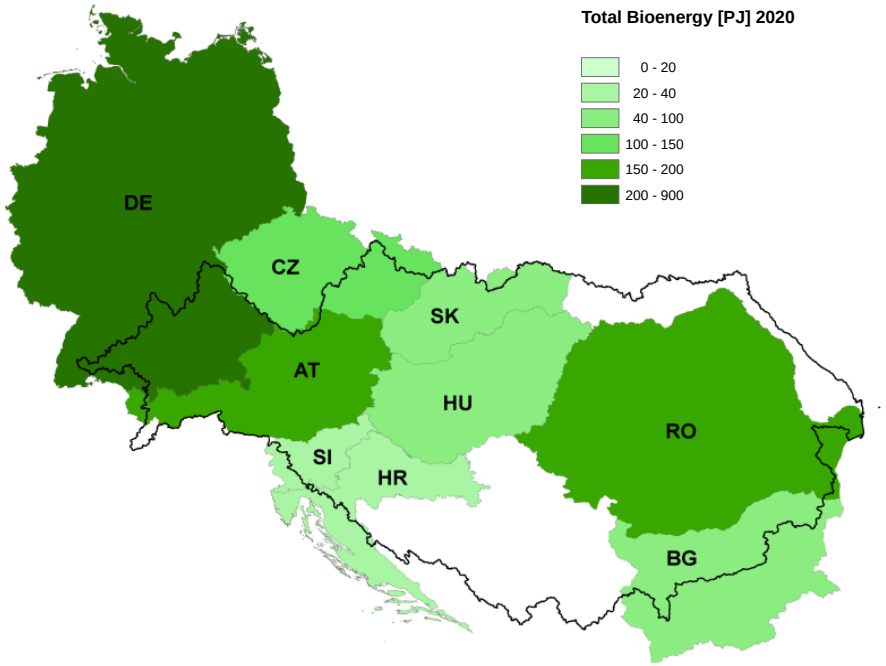
Aim: to address the challenges and opportunities of bioenergy in the Danube Region through activities of Scientific/Technical Networking + Joint Projects of Research & Development

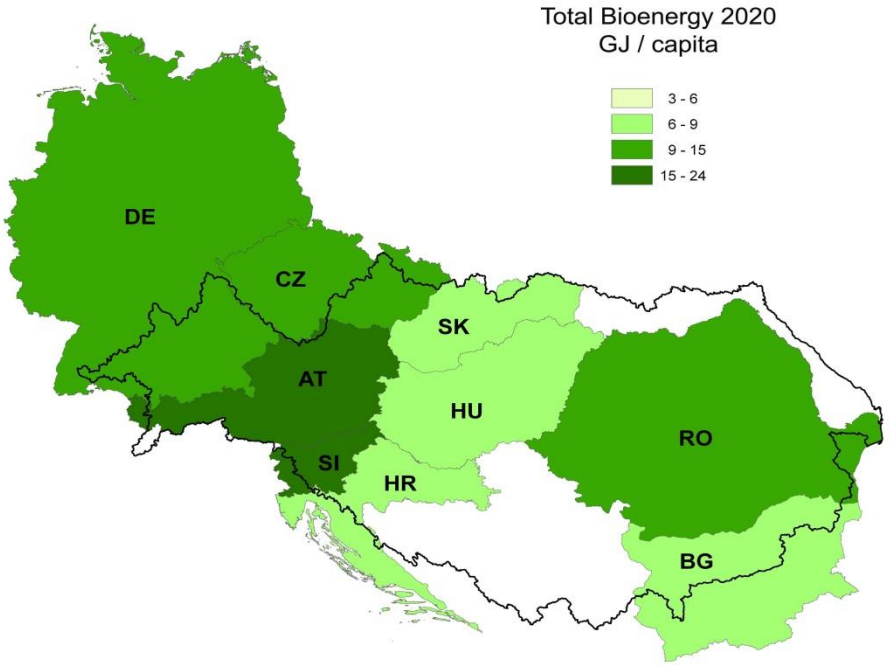
Proposed activities

- Biomass mobilization: present and future role of the Danube River.
- Statistical assessment of Bioenergy status & Progress in Danube Countries
- Assessment of forest biomass potential for energy
- Assessment of agricultural crop residues availability
- Local use of Biomass feedstock for biogas and bio-Heat
- Public support schemes & Funding mechanisms for bioenergy

Expected growth of bioenergy in Danube Region

In 2020 bioenergy is expected to cover 57.8% of total RES in EU Danube Countries





Source: Bi-annual progress reports and NREAPs
DE- bioenergie.fnr.de

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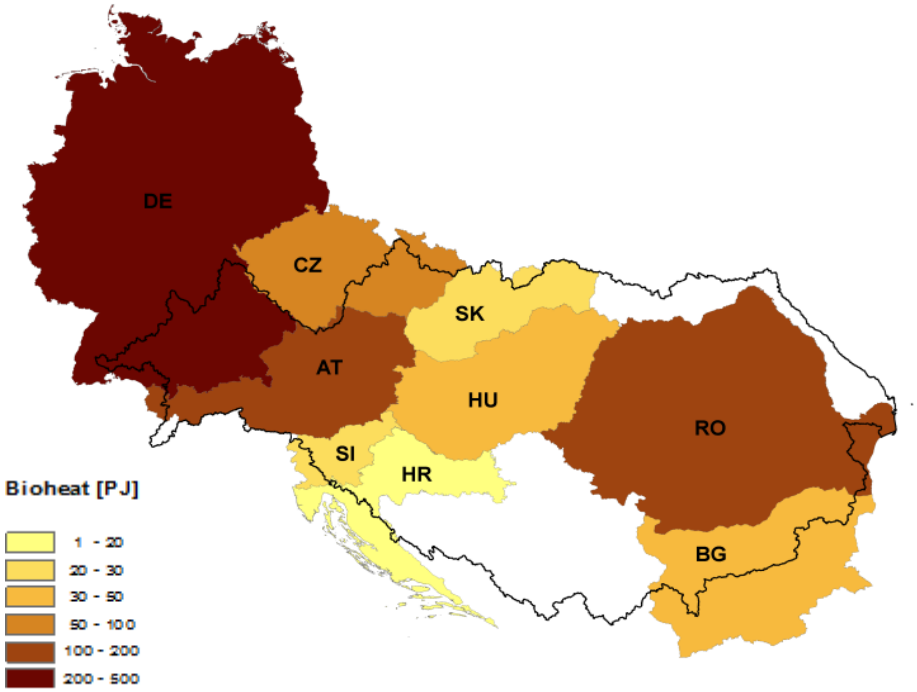
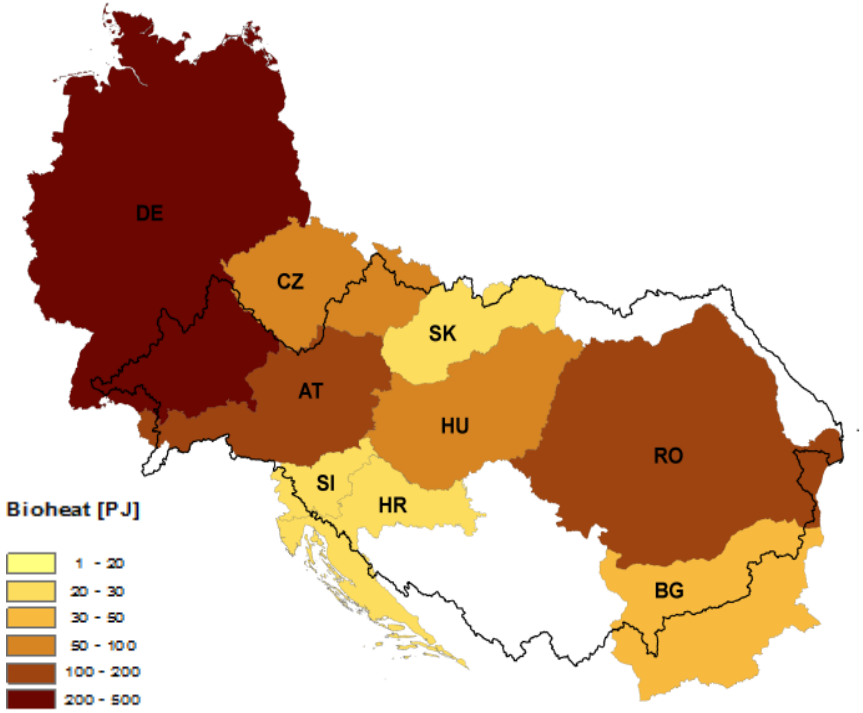
Bioheat in EU DC's
Current(2012) and expected development

74.1% of total bioenergy
decrease by 0.7% 2010-2012



2020
63.4% of total bioenergy



Source: Bi-annual progress reports and NREAPs
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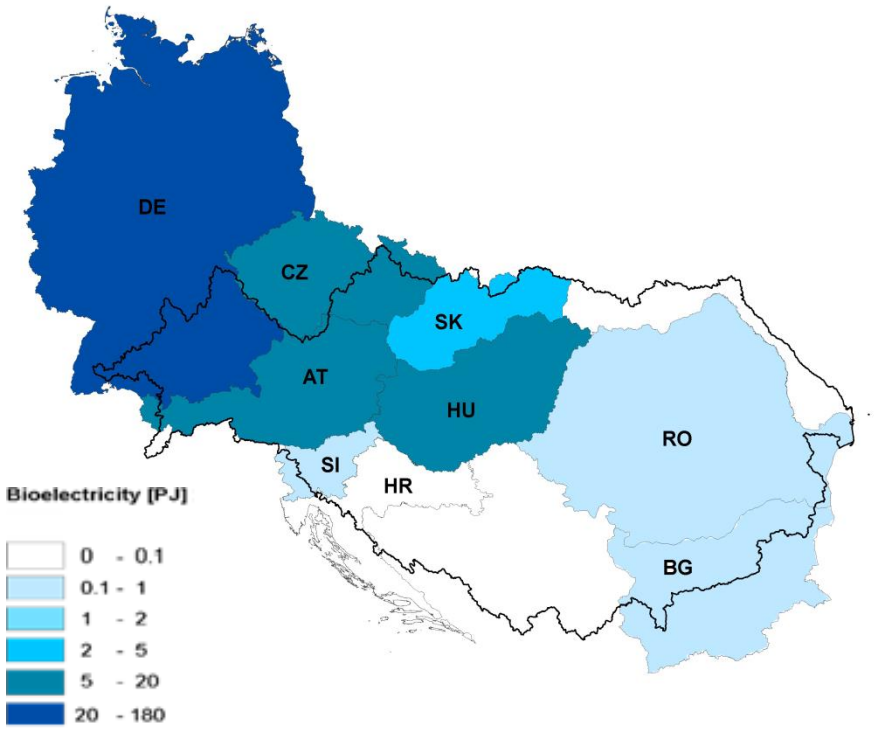
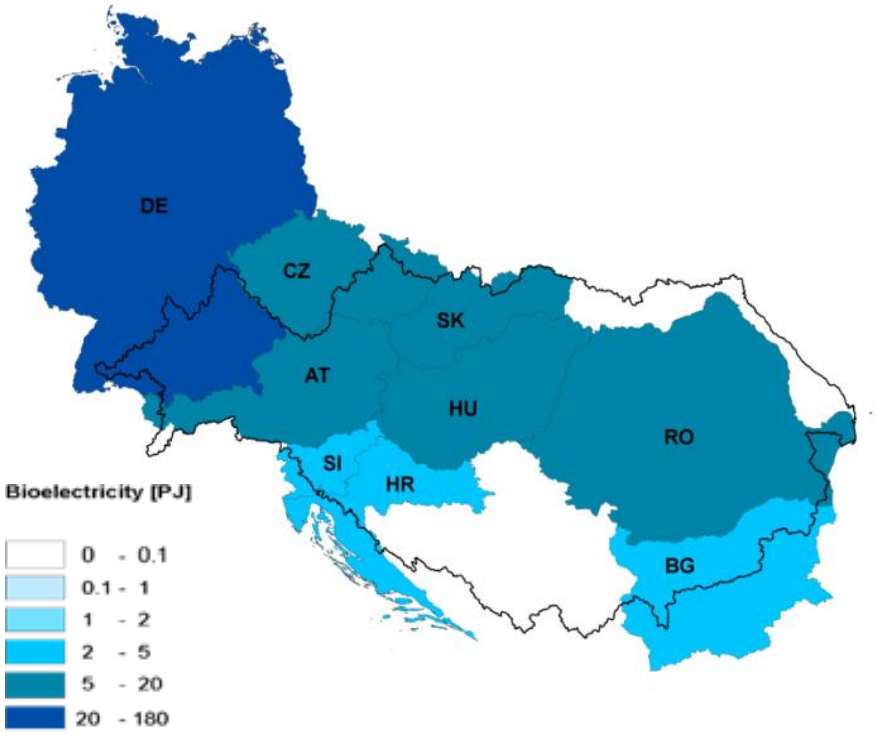
Bioelectricity in EU DC's
Current(2012) and expected development

11.7% of total bioenergy
Increased by 18.5% 2010-2012



2020
15% of total bioenergy



Source: Bi-annual progress reports and NREAPs
DE- bioenergie.fnr.de

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Monitoring Bioenergy development

European Commission

- Sectoral analysis of bioenergy development
- RES and bioenergy targets and perspectives
- Assessing biomass demand vs. potential
- Addressing sustainability

BIOMASS AND BIOENERGY 35 (2011) 1995–2005

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Assessment of the availability of agricultural and forest residues for bioenergy production in Romania

Nicolae Scarlat [a,*], *Viorel Blujdea* [b], *Jean-Francois Dallemand* [a]

Renewable Energy 57 (2013) 448–461

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Bioenergy production and use in Italy: Recent developments, perspectives and potential

N. Scarlat [a,*], J.F. Dallemand [a], V. Motola [b], F. Monforti-Ferrario [a]

[a] European Commission, Joint Research Centre, Institute for Energy, Via E. Fermi 2749, TP 450, 21027 Ispra (Va), Italy
[b] ENEA–Agenzia Nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile, Centro Ricerche Trisaia, S.S. 106 Jonica, 75026 Rotondella, Matera, Italy

Renewable and Sustainable Energy Reviews 18 (2013) 595–606

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Possible impact of 2020 bioenergy targets on European Union land use. A scenario-based assessment from national renewable energy action plans proposals

Nicolae Scarlat *, Jean-François Dallemand, Manjola Banja

Natural Resources Forum •• (2014) ••–•• DOI: 10.1111/1477-8947.12042

Extending the EU Renewable Energy Directive sustainability criteria to solid bioenergy from forests

Uwe R. Fritsche, Leire Iriarte, Johnny de Jong, Alessandro Agostini and Nicolae Scarlat

Energy Policy 39 (2011) 1630–1646

Contents lists available at ScienceDirect

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Recent developments of biofuels/bioenergy sustainability certification: A global overview

Nicolae Scarlat *, Jean-François Dallemand

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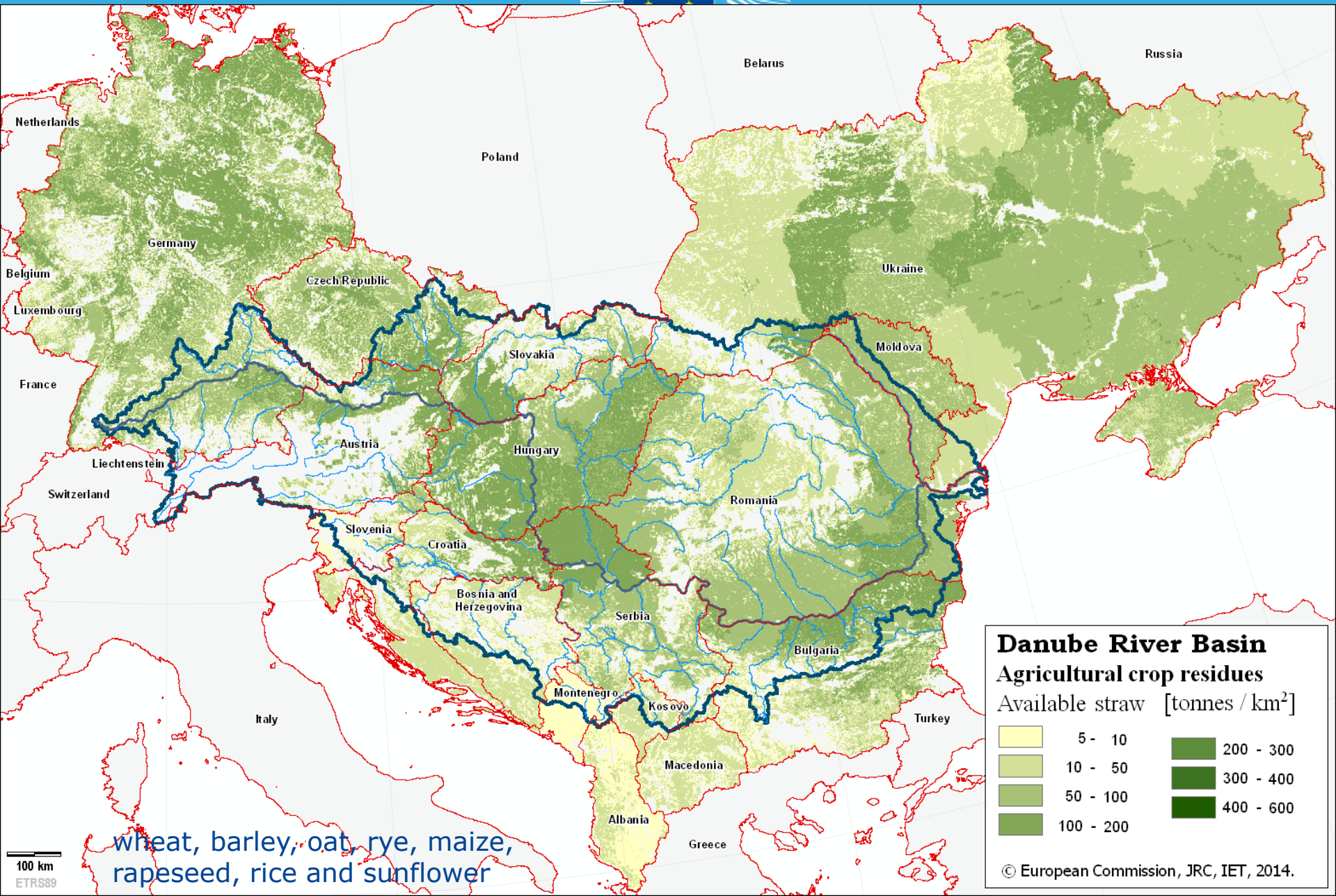
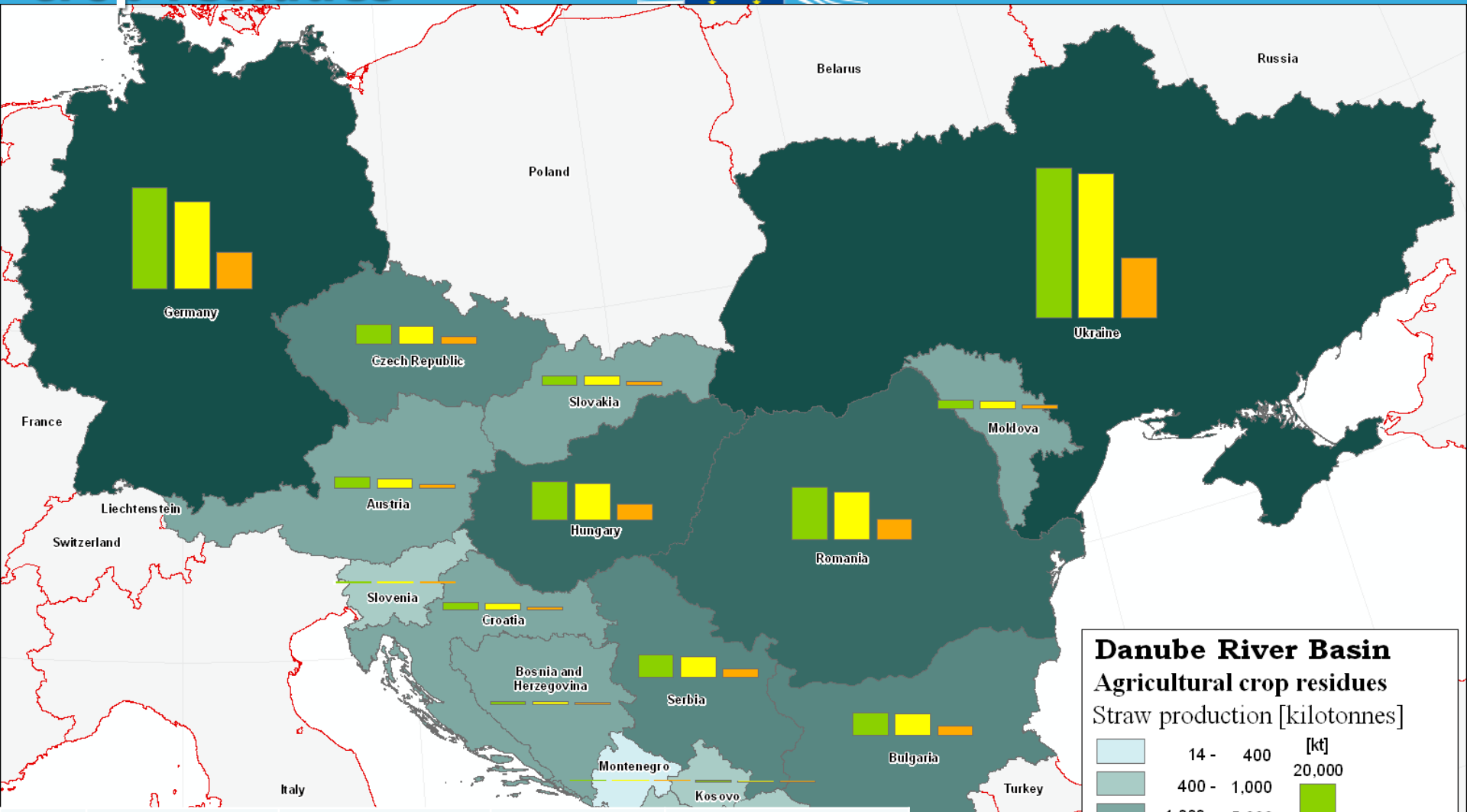


wheat, barley, oat, rye, maize, rapeseed, rice and sunflower

Energy potential of crop residues



	production	collection	available	energy potential
	(kt)	(kt)	(kt)	(ktoe)
DC	179,251	78,790	72,352	30,242
EU28	286,718	122,668	101,486	42,419

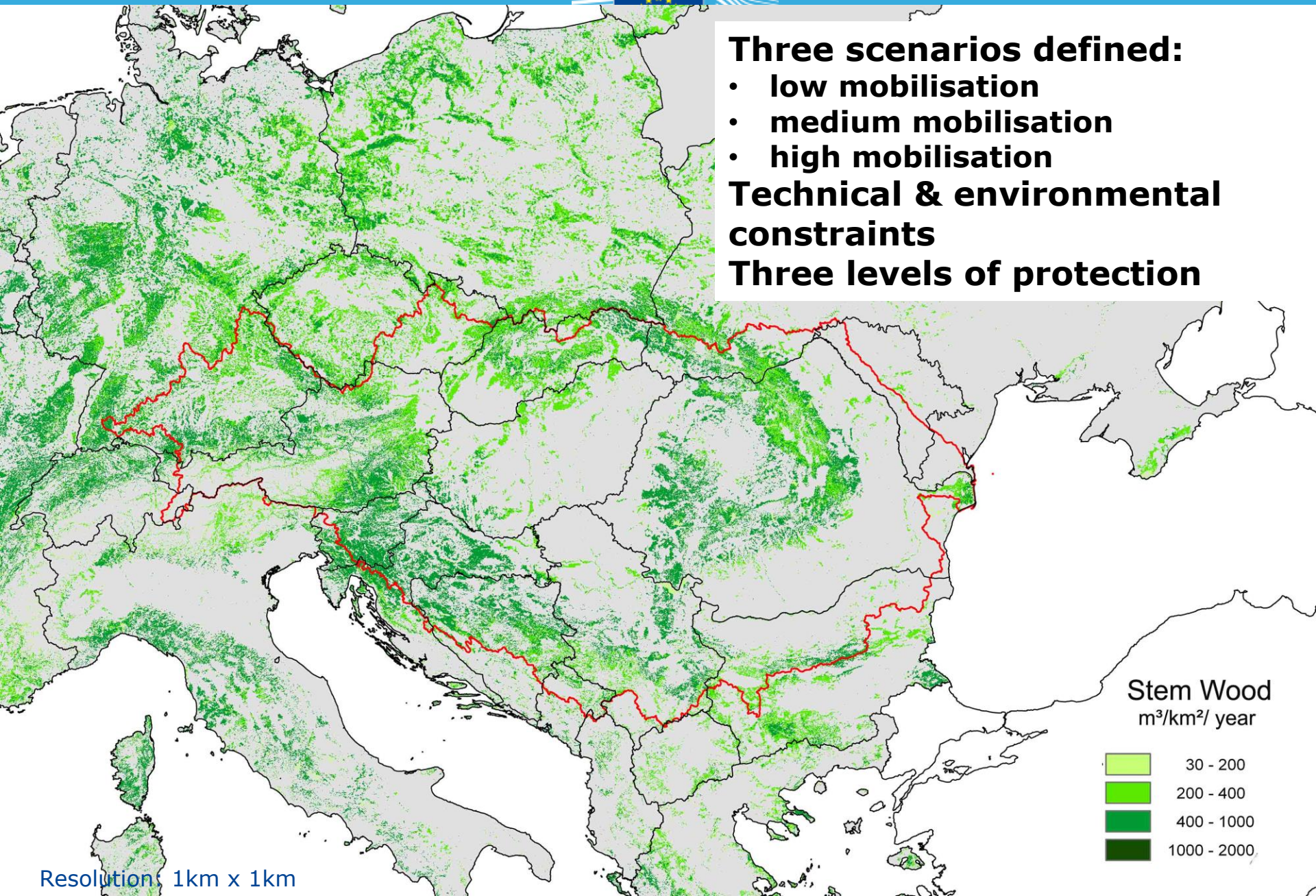
stemwood
– medium mobilisation scenario

Three scenarios defined:

- **low mobilisation**
- **medium mobilisation**
- **high mobilisation**

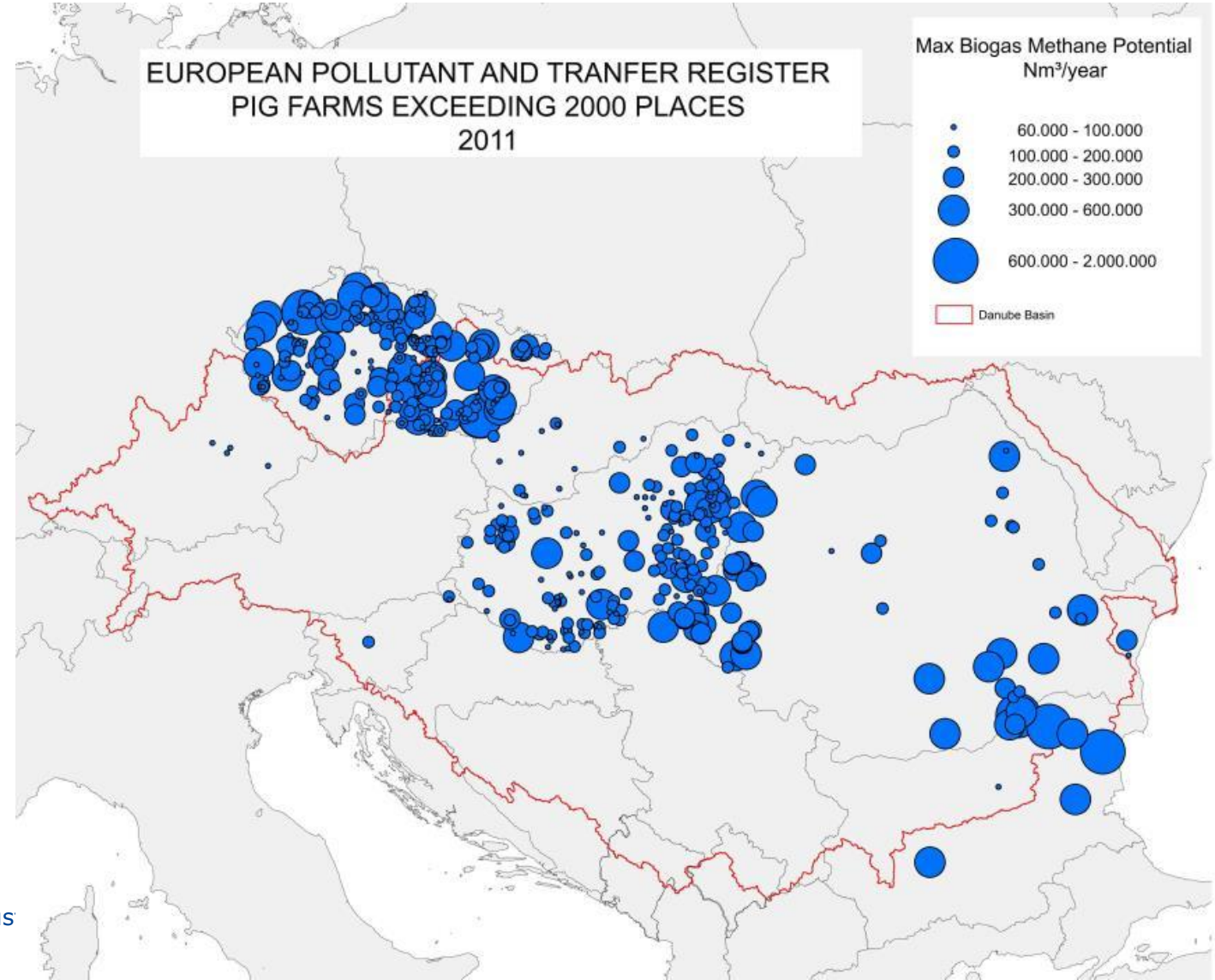
Technical & environmental constraints

Three levels of protection

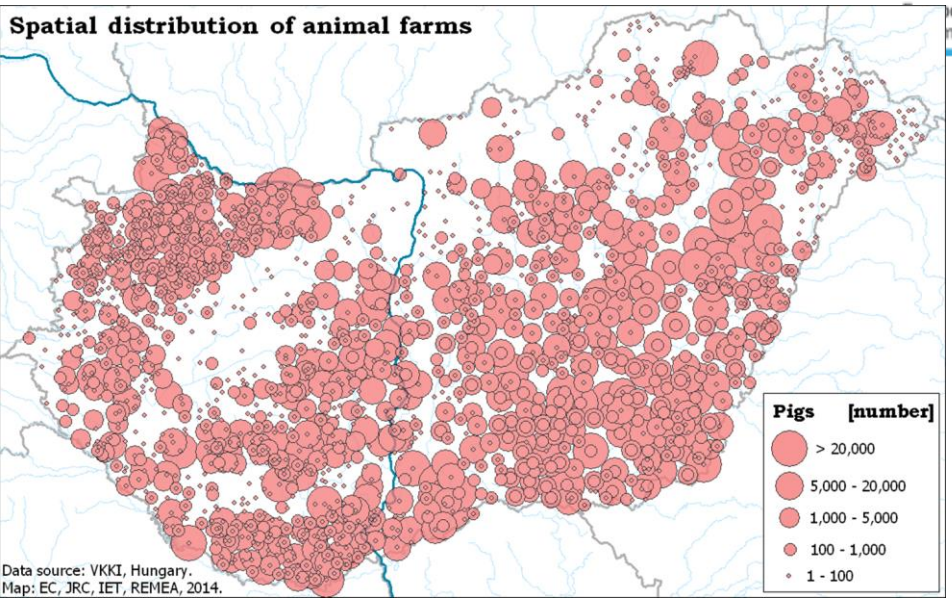


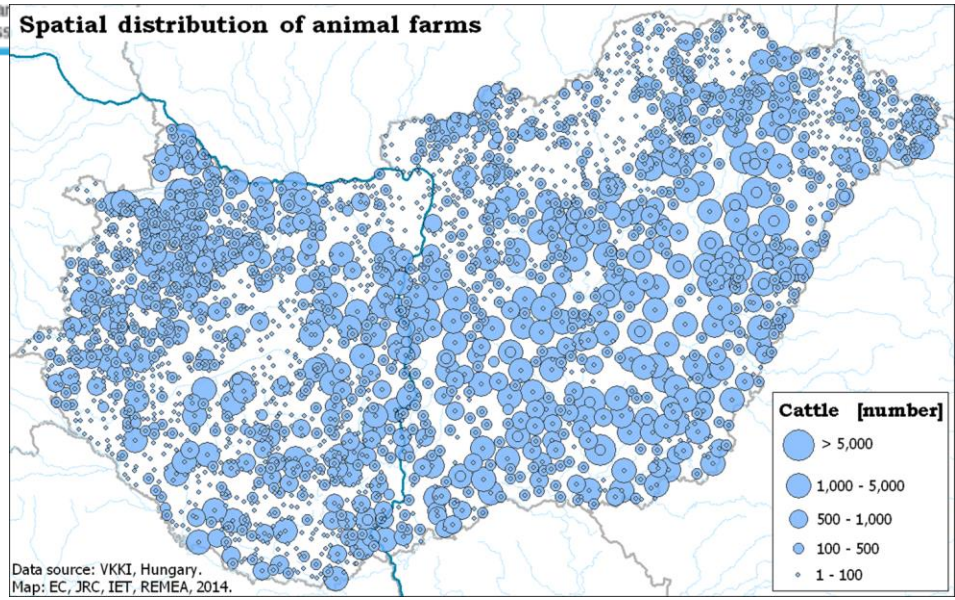
Resolution: 1km x 1km

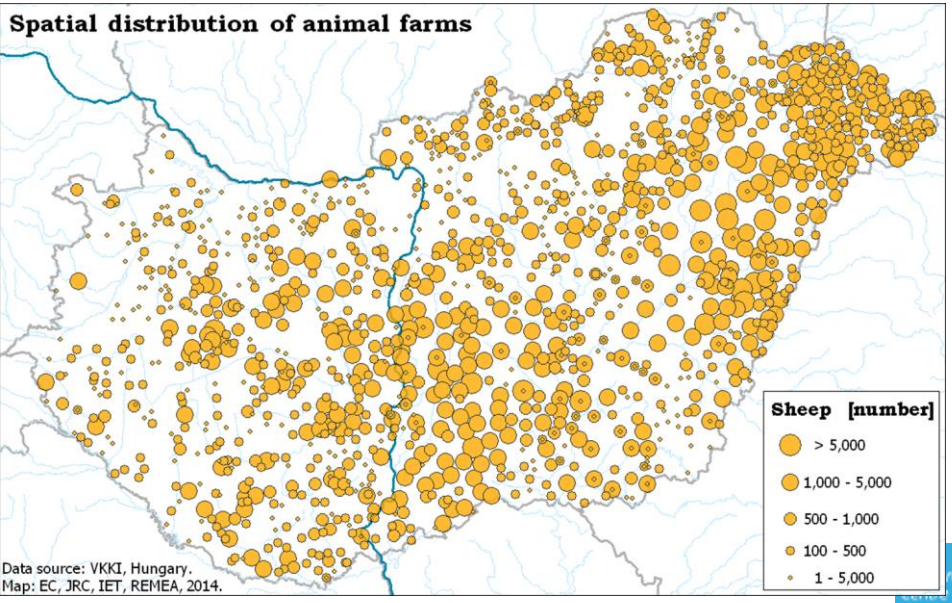
Biogas Potential from Pig Manure

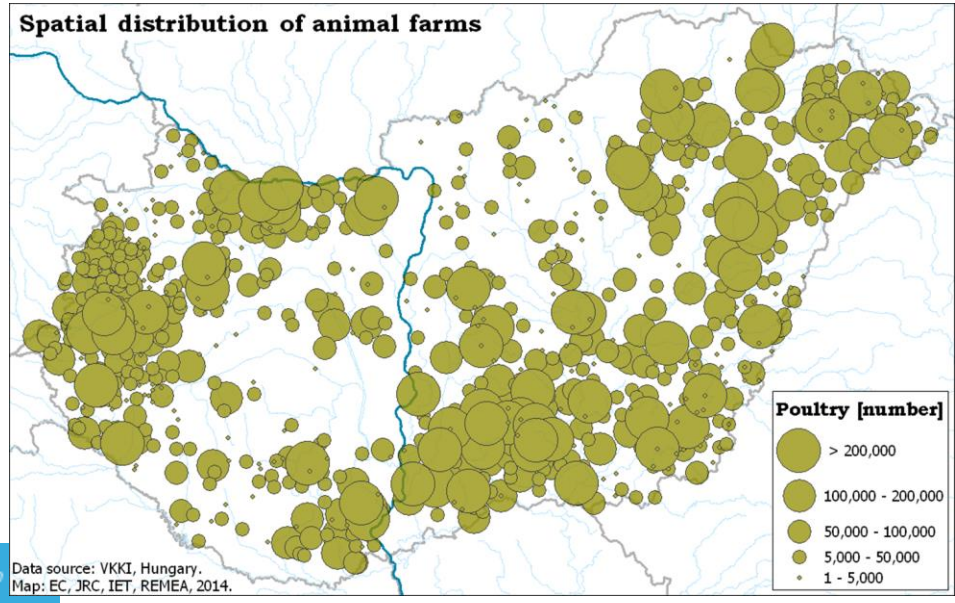


Biogas Potential
Manure









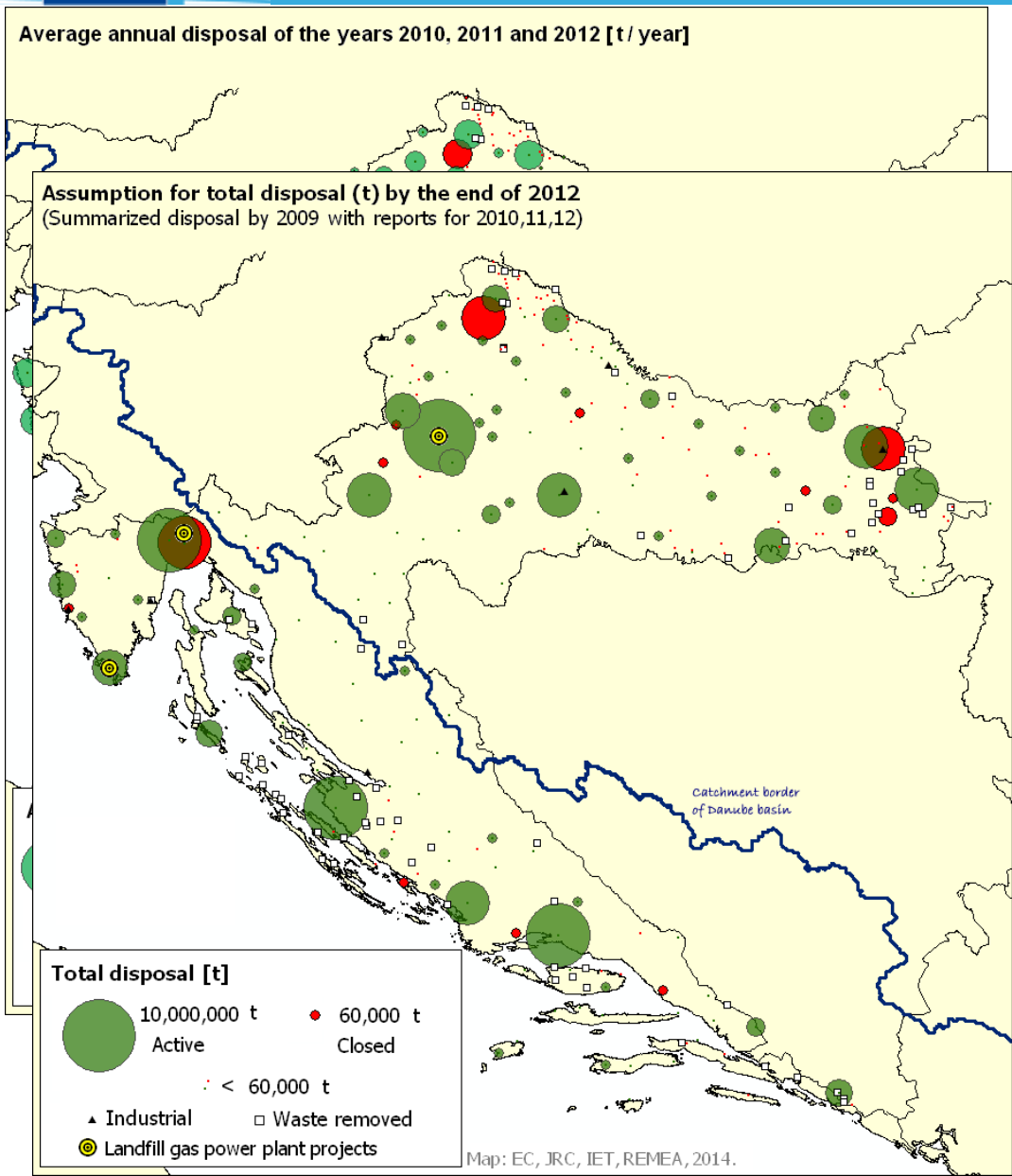
Energy from waste
Case study: Croatia

Current situation

- there are 310 landfill sites
  - 137 active
  - 8 active for industrial waste
  - 94 closed
- waste was removed from 71 sites
- no existing landfill gas recovery
- 3 projects of future landfill gas plants (4.65MWel in total)

JRC's research activities

- Assessment of the potential of landfill gas utilisation for each location
- Calculation of potentials of waste utilisation in incineration plants

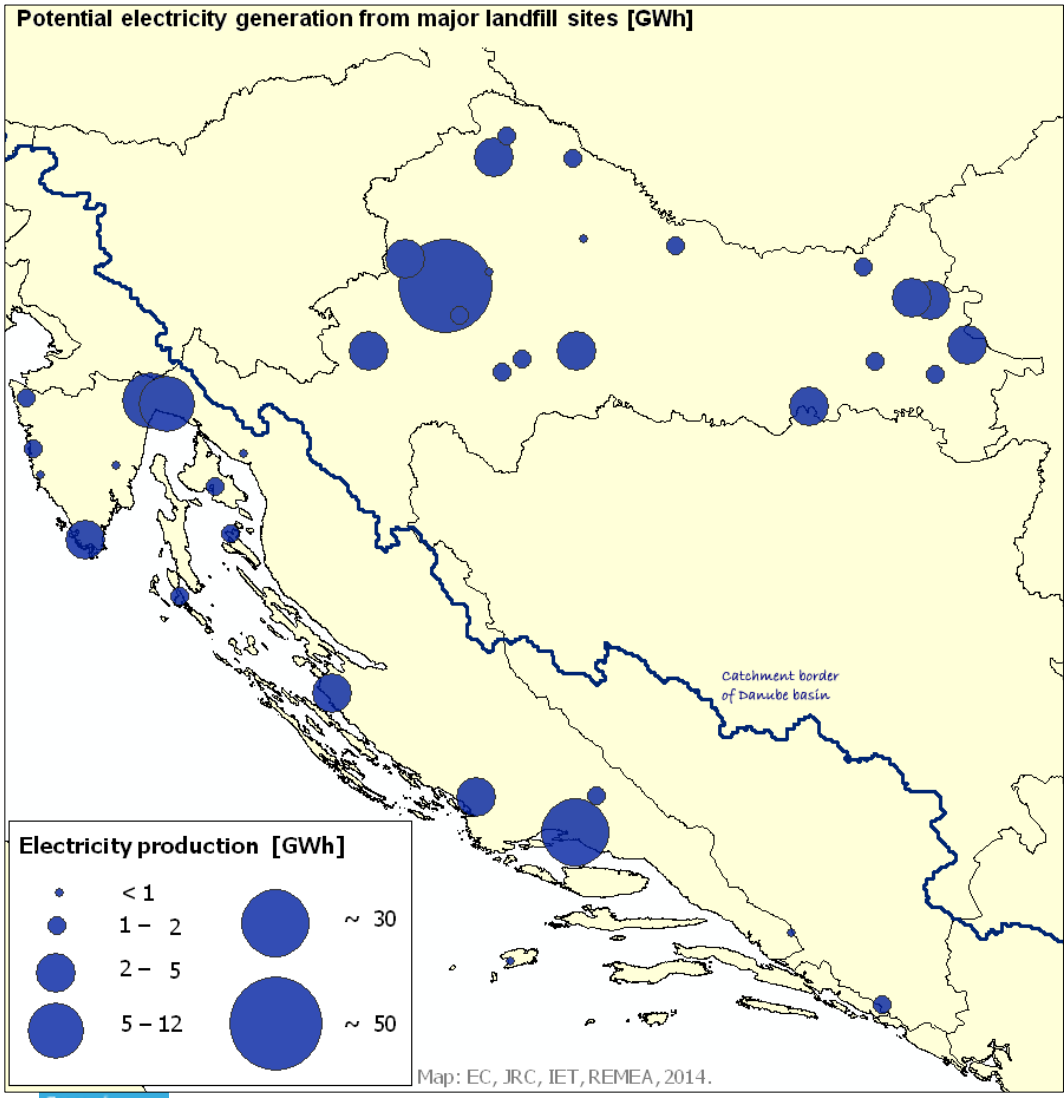


Energy from waste
Case study: Croatia

European Commission

Spatial analysis

- Electricity production from landfill gas recovery systems
- IPCC landfill gas generation model
- Major landfill sites considered



Research Centre

Scientific/Technical Networking

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Cereal straw resources for bioenergy in the European Union, 2006, Pamplona, - CENER.

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SRF, SRC and Energy Grass in the European Union: Agro-environmental component, present use and perspectives, 2007, Harpenden -EEA, Rothamsted.

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Lessons learnt on Bioenergy and National Renewable Energy Action Plans

- **Importance of communication (Markets, media & science), different time frames for Science & Policy**
- **Importance of statistical data bases on multiple uses of biomass and different sectors, bioenergy & bio based or green economy**
- **Importance of stability of policy framework including public support schemes at long term, example of biofuels 10%, 5%, 7% ?**
- **Biomass/Bioenergy sustainability certification before, better than after**
- **Integration of Bioenergy & Water Action Plans**
- **Specification of policy drivers**
- **National policies**
- **Difficulty to quantify ILUC and indirect impacts**
- **Policy coherence based on different scientific input**
- **Difference between Resource availability & Resource mobilisation**