Linking bioenergy production with demographics and land use in Croatia – on the road to bioeconomy

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Nacionalna voditeljica Task-a 43 za IEA Bioenergy
Energetski institut Hrvoje Požar

Energy Institute Hrvoje Požar – EIHP
Zagreb, Croatia

- Est. 1991, 90 employees ☺ ☺ ☺
- Research institute with market orientation
- 70% of income generated at external markets
- (some of) Clients: EBRD, EC, Energy Community; EuropAid; FAO; GEF; GGF; IAEA; IEA Bioenergy, UNDP, UNIDO; USAid; WB…

Mission:
developing modern, resilient, secure, sustainable energy systems
including both (non)conventional energy sources by
energy planning, balancing, integration by
developing new energy and business models, innovative approach to each topic

- Participation in >70 EU projects with different sources of funding (IEE, Horizon 2020, IPA, Interreg, IPA-Med, FP7; LIFE…)
- Among top national beneficiaries from H2020 so far…

Energy Institute Hrvoje Požar – EIHP
Zagreb, Croatia

- Since 2000 contracting party to IEA Bioenergy
- Till 2012 IEA Bioenergy Task 29: **Socio-economic Drivers in Implementing Bioenergy Projects**
- Since 2014 IEA Bioenergy Task 43: **Biomass supply for energy markets**

Dept for Renewable Energy Sources, Energy Efficiency and Environmental Protection (1/6) steps out to bioeconomy

- Why?

  To find options for bioenergy projects in a competitive environment (post-feed in period) & improve bankability of bioenergy projects.

- How?
  - Creating new business models for bioenergy projects
  - Discovering innovative value chains from bioenergy by-products
  - integrating biomass supply into existing landscape management and design to reduce biomass supply costs by triggering ecosystem services

- Our team = 25 experts ☺☺☺: energy, civil engineering, urban planning, environmental protection, agroeconomy, architecture, chemical engineering
  - Currently involved in 10 H2020 research projects: biogas, biomass, energy efficiency, transport…
  - Holding IPR and establishing of a spin-off underway…

Biomass (in the eyes of energy):

- **Biomass:** any organic matter, i.e. biological material, available on a renewable basis. Includes feedstock derived from animals or plants, such as wood and agricultural crops, and organic waste from municipal and industrial sources.
- **Bioenergy:** energy generated from the conversion of solid, liquid and gaseous products derived from biomass.
- **Traditional use of solid biomass:** The traditional use of solid biomass refers to the use of solid biomass with basic technologies, such as a three-stone fire, often with no or poorly operating chimneys.

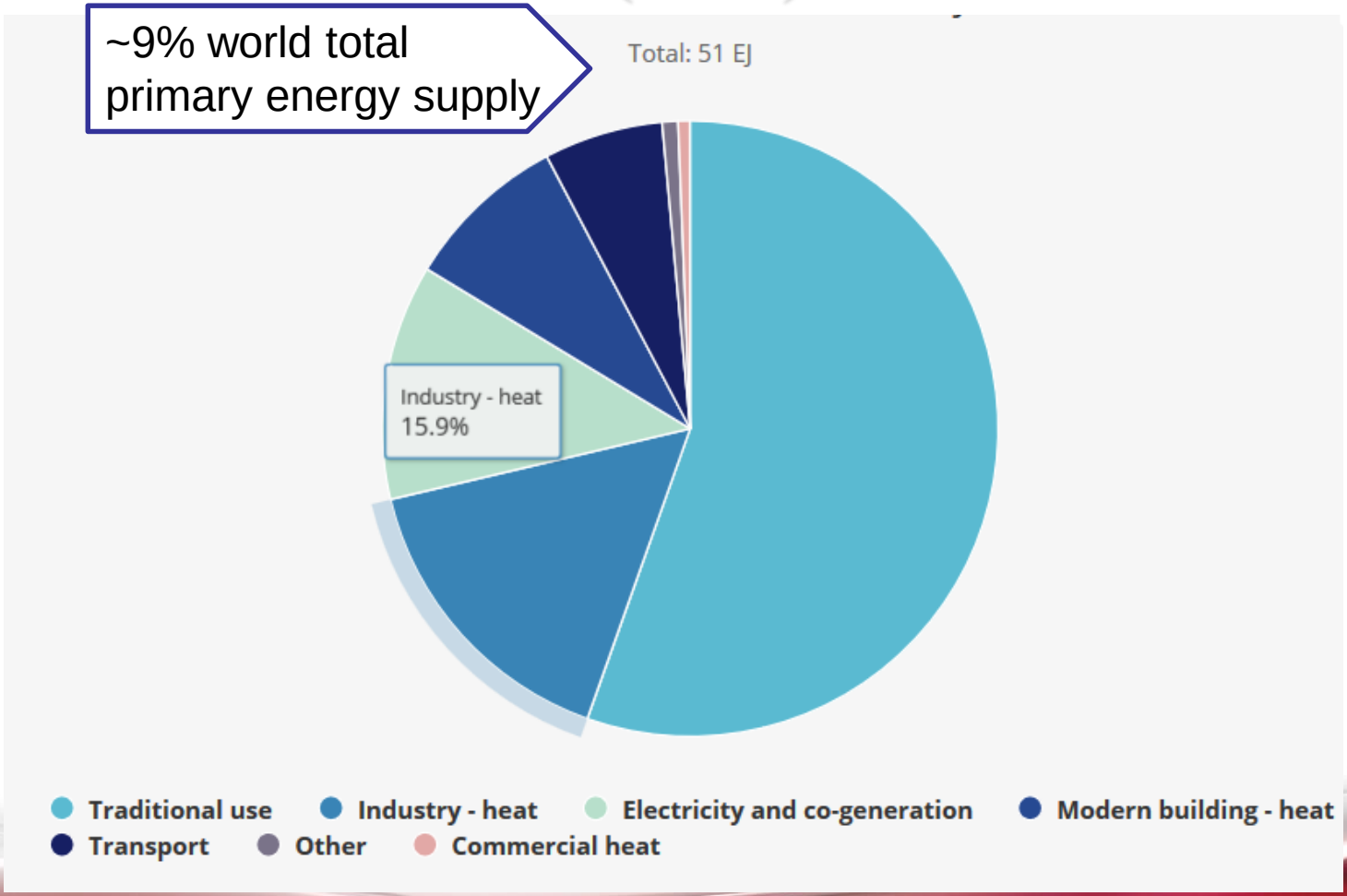
IEA; http://www.iea.org/topics/renewables/bioenergy/

- Renewable energy fuel derived from organic material such as trees, plants, and agricultural and urban waste.
- It can be used for heating, electricity generation, and transport fuels.
- Increasing the use of biomass in the EU can help diversify Europe's energy supply, create growth and jobs, and lower greenhouse gas emissions. In 2012, biomass and waste accounted for about 2/3 of all renewable energy consumption in the EU.

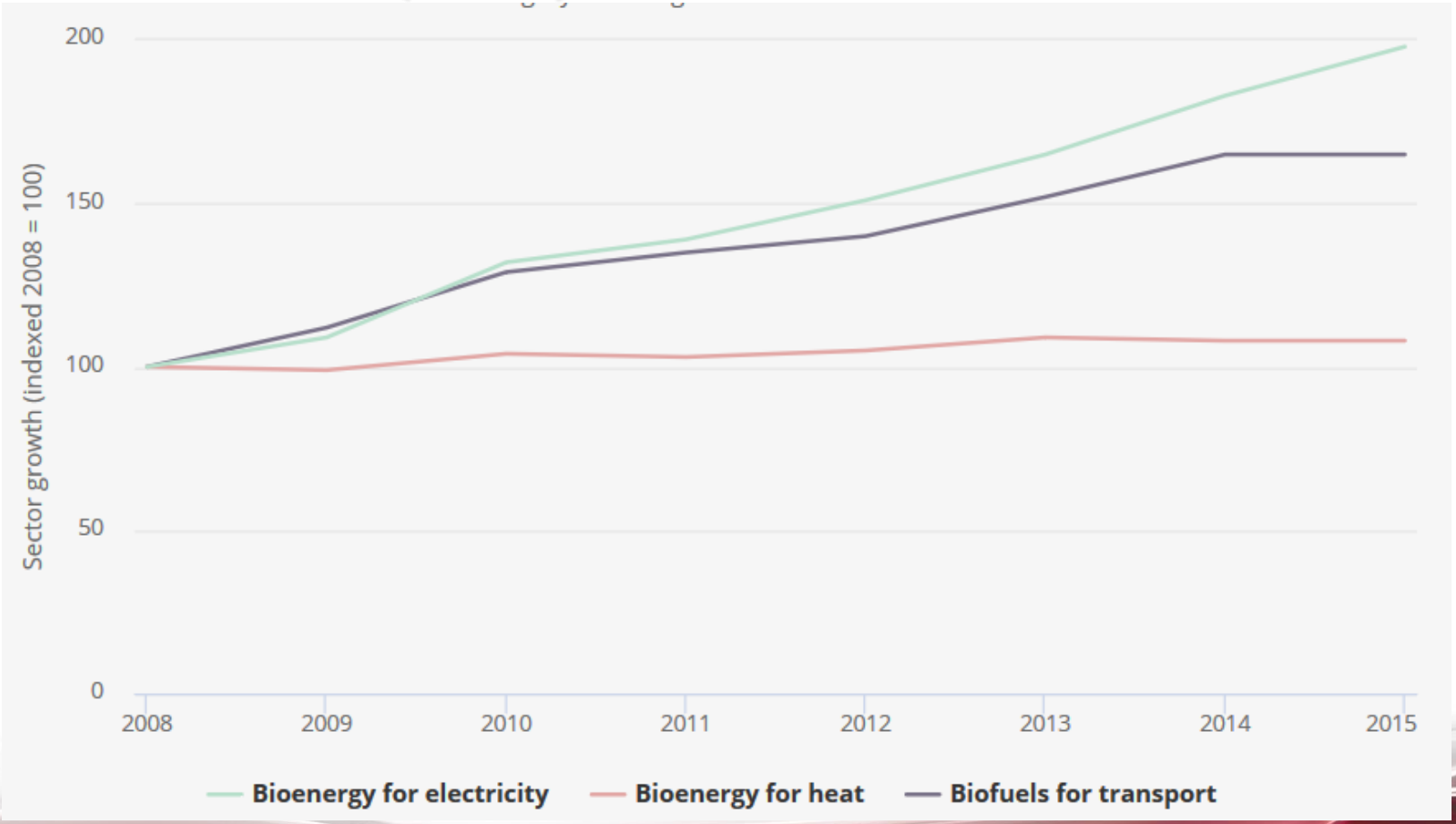
EU; https://ec.europa.eu/energy/en/topics/renewable-energy/biomass

Consumption of biomass&waste resources by end use in 2015 (IEA)

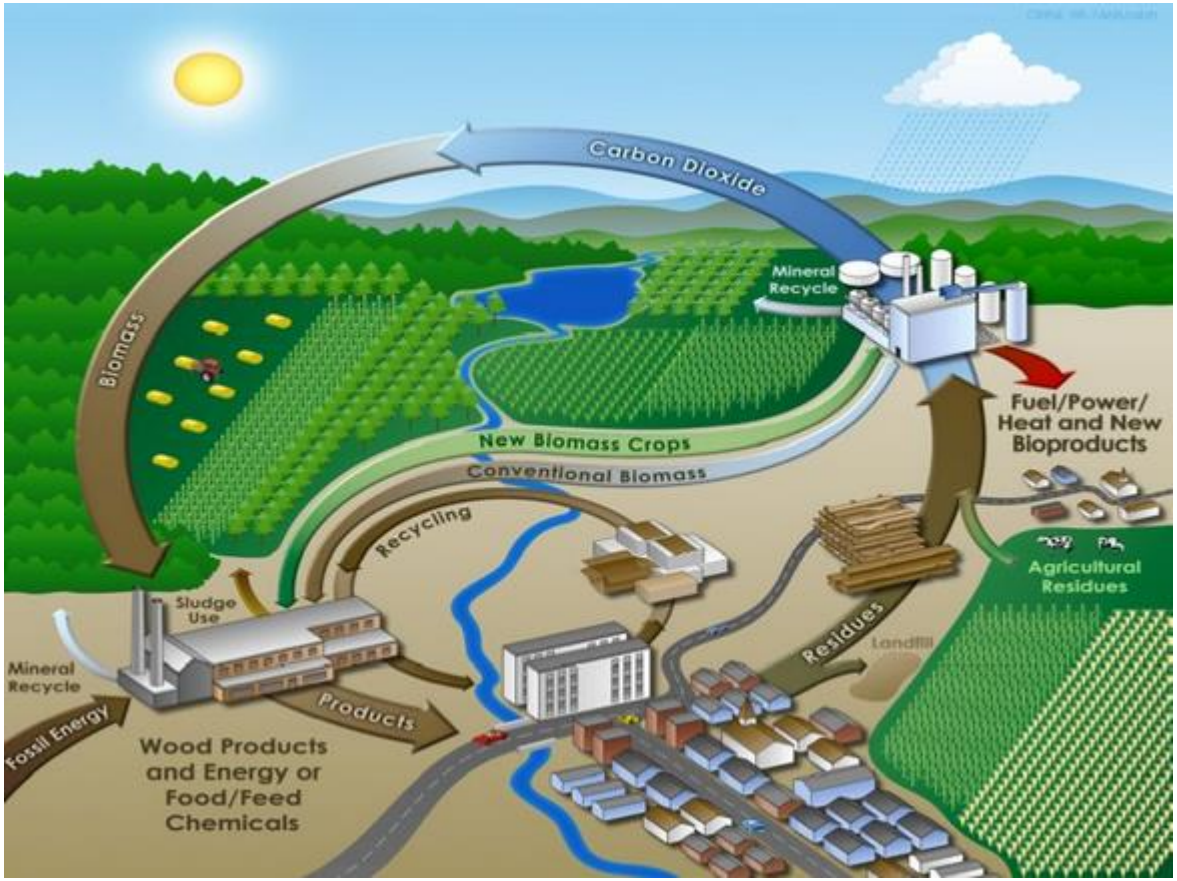
~9% world total primary energy supply



Modern bioenergy growth by sector, 2008-2015 (IEA)



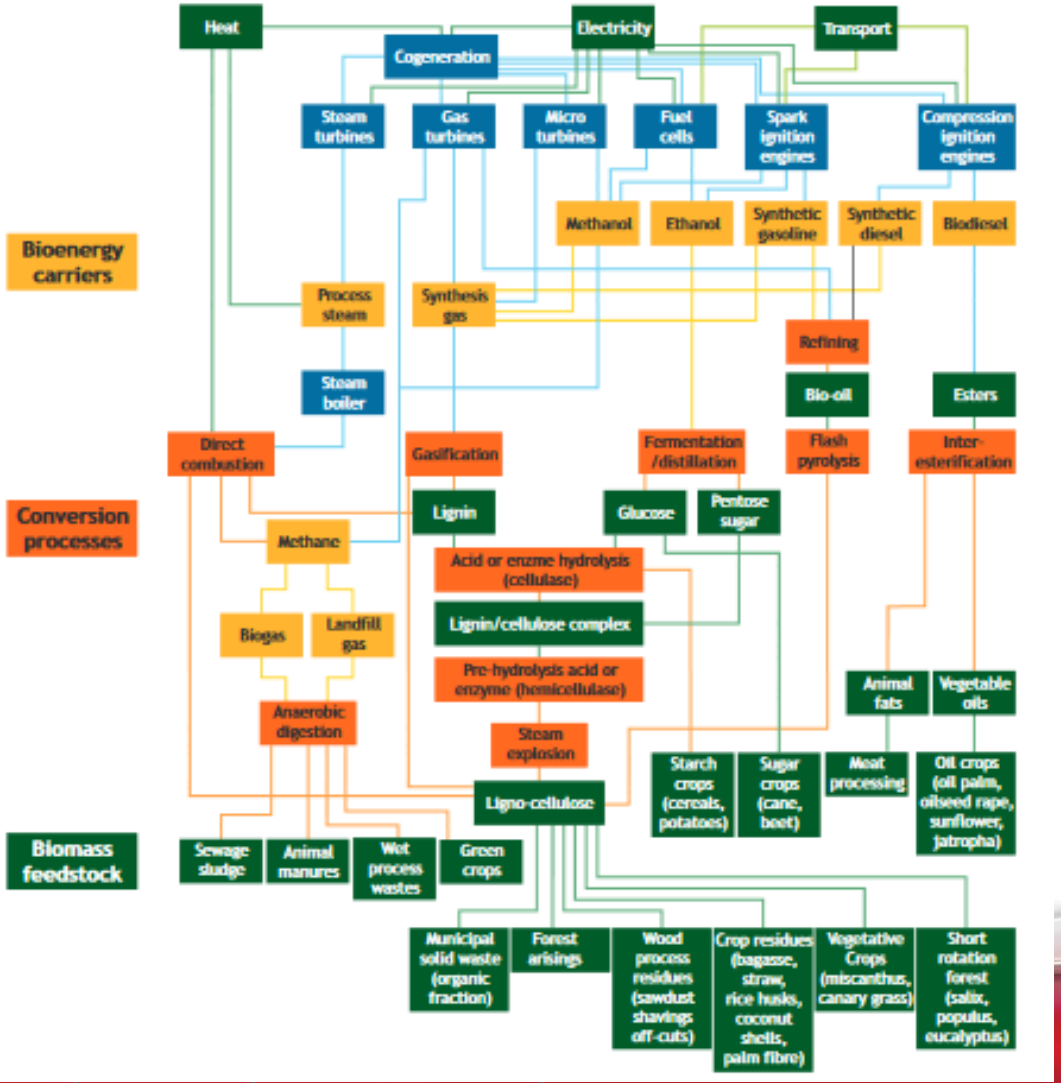
Idealized biorefinery concept (2004)



All parts of the community work together, thus helping to reduce waste and optimize energy and product yields from the substrates

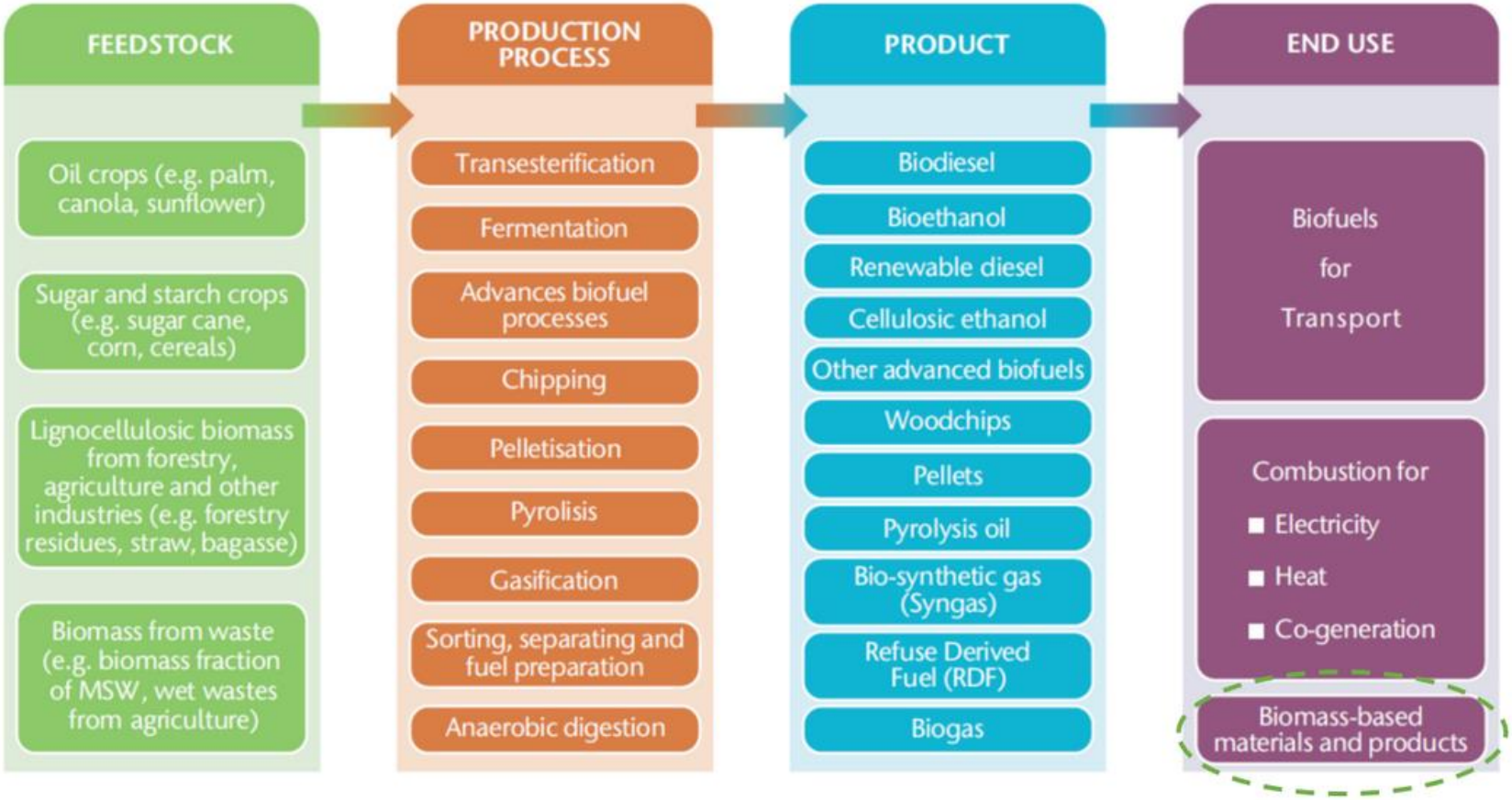
- Herrera (2004) Oak Ridge National Laboratory, Oak Ridge, USA

Biomass feedstocks converted to bioenergy carriers (2007)



IEA Bioenergy (2007): Bio
http://www.iea.org/publicat

Biomass Pathways in the IEA Bioenergy Roadmap (2017)

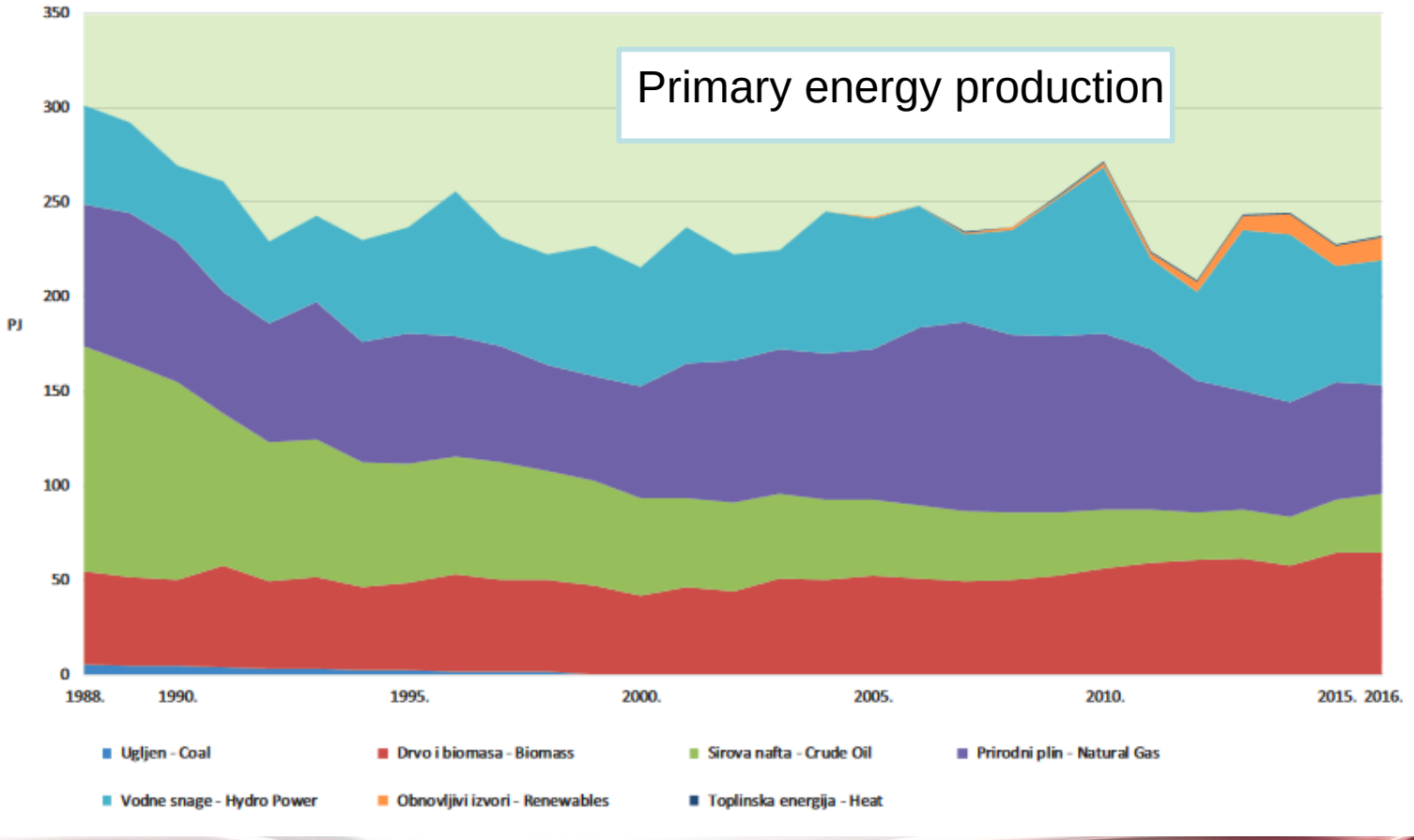


Source: IEA (2017): *Technology Roadmap: Delivering Sustainable Bioenergy; green dashed circle added*

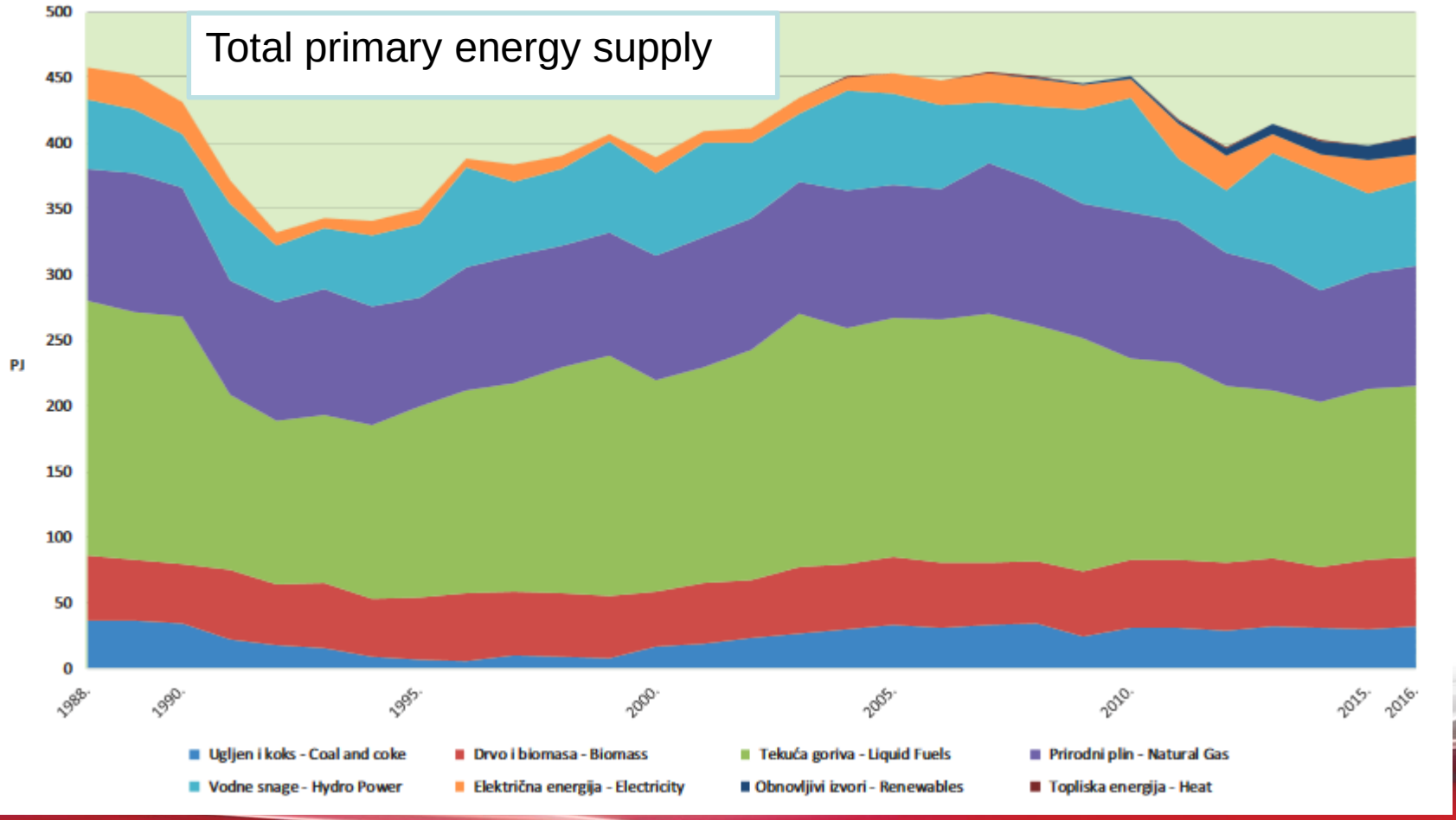
Pathways from biomass into the energy system

DBFZ (2012) Systemic contribution of biomass
https://www.dbfz.de/en/focus-areas/systemic-contribution-of-biomass.html

What Croatia has from bioenergy?



What Croatia has from bioenergy?



What Croatia has from bioenergy?

Current utilisation: 64.15 PJ* (26.4%) in primary energy

- 15,950 GWh in households (mostly fuelwood)
- 73,972 m3 or 666.745 GJ in services
  - Biofuels (per year):
    - Fuelwood: 5.86 m3
    - Woodchips: ~400,000 t
    - Charcoal: ~9,000 t
    - Wood briquettes: 43,000 t
    - Pellets: 270,000 t
    - Biofuels 1G: 6000
  - Solid biomass: 36.449 MW in 18 plants (range: 60 – 8,600 kW)
  - Biogas: 36.734 MW in 32 plants (range: 135– 2,000 kW) + 5.5 MW in 2 plants (landfill and WWTP

And lots of, lots of potential

What Croatia could have from bioenergy – on the road to bioeconomy

- Bioenergy sector in Croatia
  - directly employs 220+ persons in power sector:
  - Woodchips production/availability: ~800.000 m3/year
  - Pellet production: 450,000 t/year expected increase
  - Woodfuel production: <6 Mm3
- Biobased industry in HR: 25.3% in the total value of products sold
- Is that all?
- How to calculate the impact of bioeconomy?

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CONTACT
Bogdan Gherasim

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01 March 2018, 09:00 CET

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Responsibility

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4. fuel.

In Europe, it is called "knowledg

"Knowledge based" and "biobas area which is characterized by it

THE SWEDISH TRADE & INVEST COUNCIL

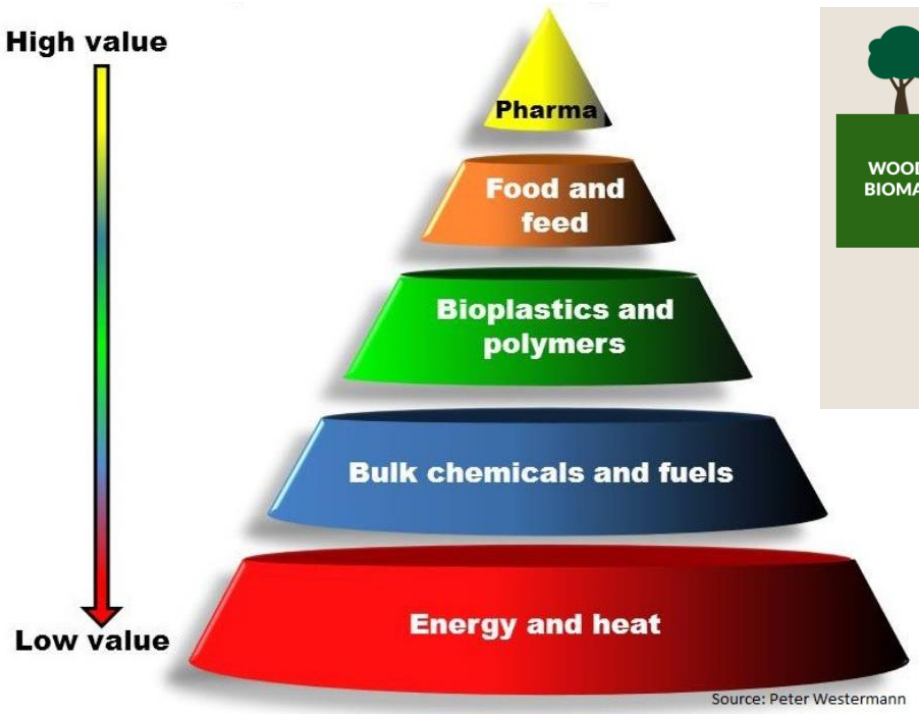
BUSINESS SWEDEN

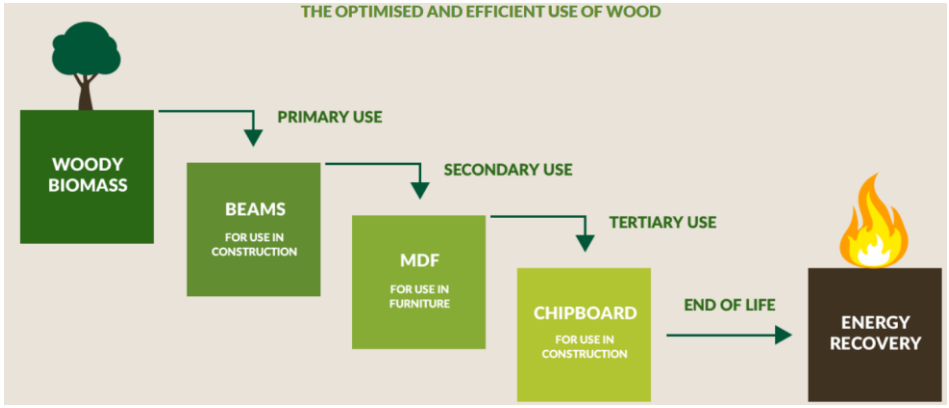
BIOECONOMY IN SWEDEN

SECTOR OVERVIEW

Business opportunities in a bioeconomy growth market

How to make more with less or the same?





http://www.usewoodwisely.co.uk/WhatCanBeDone/

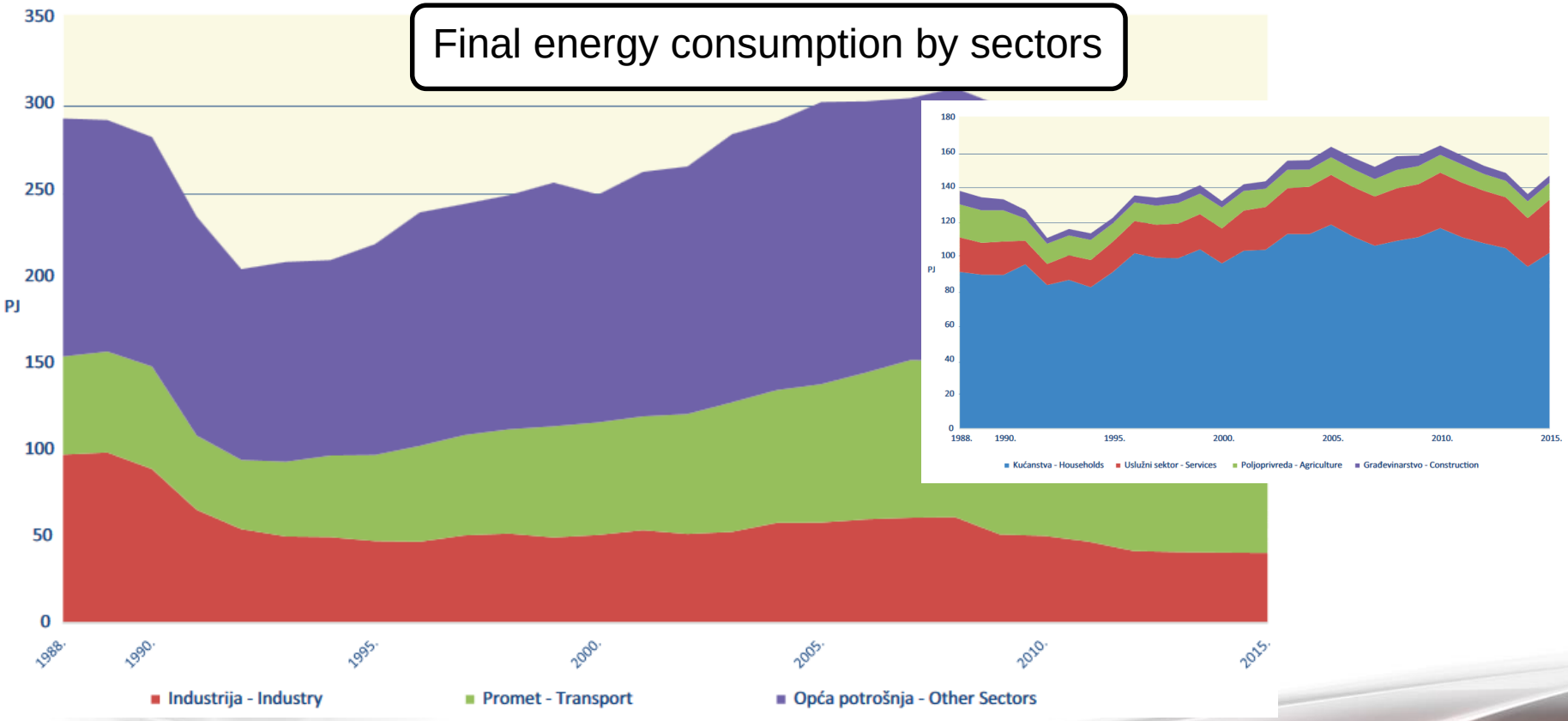
On the road to Bioeconomy

- Transition from fossil base economy to bio-based economy has many directions and individual goals
- Examples:
  - Finland: rural development*
  - Denmark: food production*
  - Sweden: lignin based carbon fibres
  - Nordic countries: market for functional food (nutraceuticals)*
  - Germany: Sustainable agricultural systems and food; greening urban areas; resource protection and biobased circular economy

*source: Dubois (FAO): Overview on How Sustaibability of Bioeconomy Has and Should be Addressed at Global and National Levels, Bioeconomy Forum, Riga, 2017

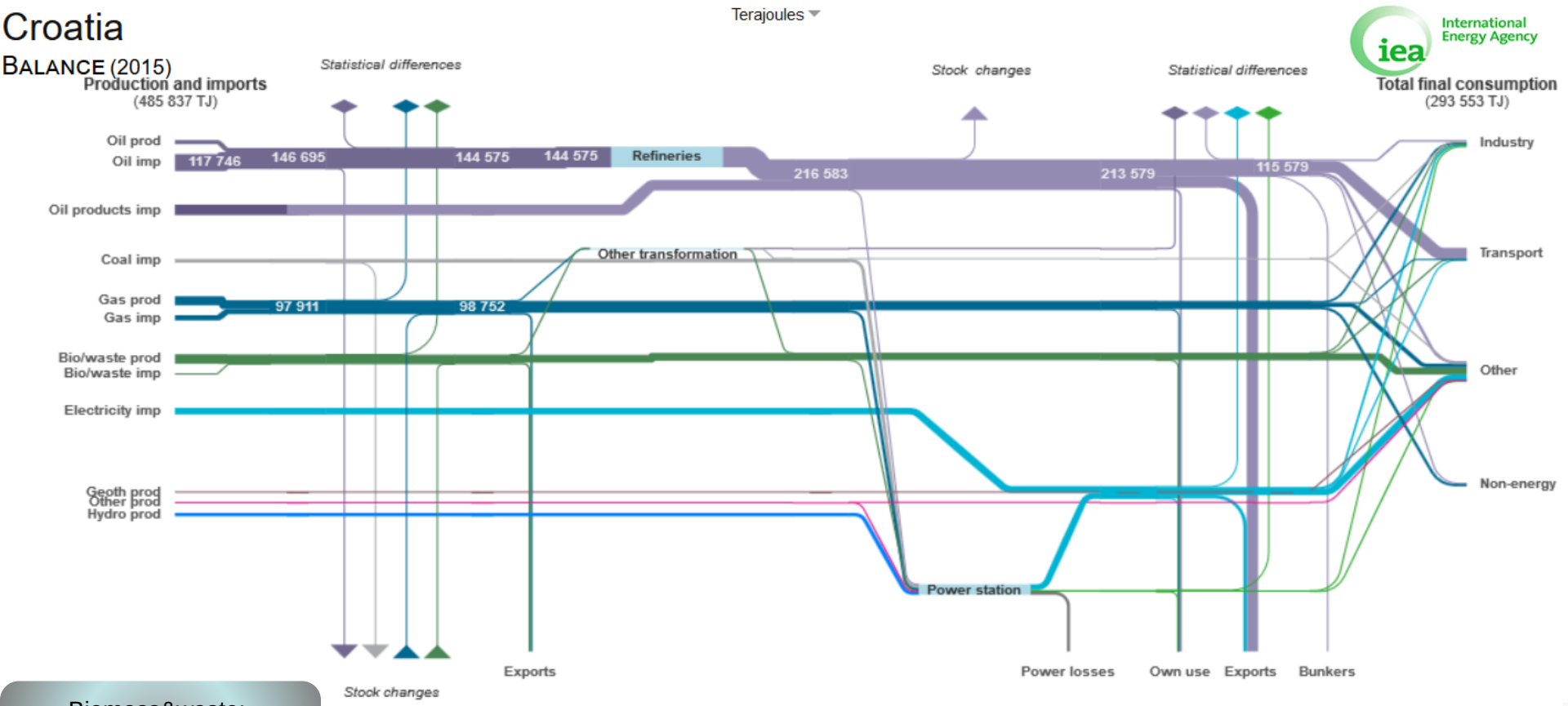
What could be the bioeconomy road for Croatia?

Final energy consumption by sectors



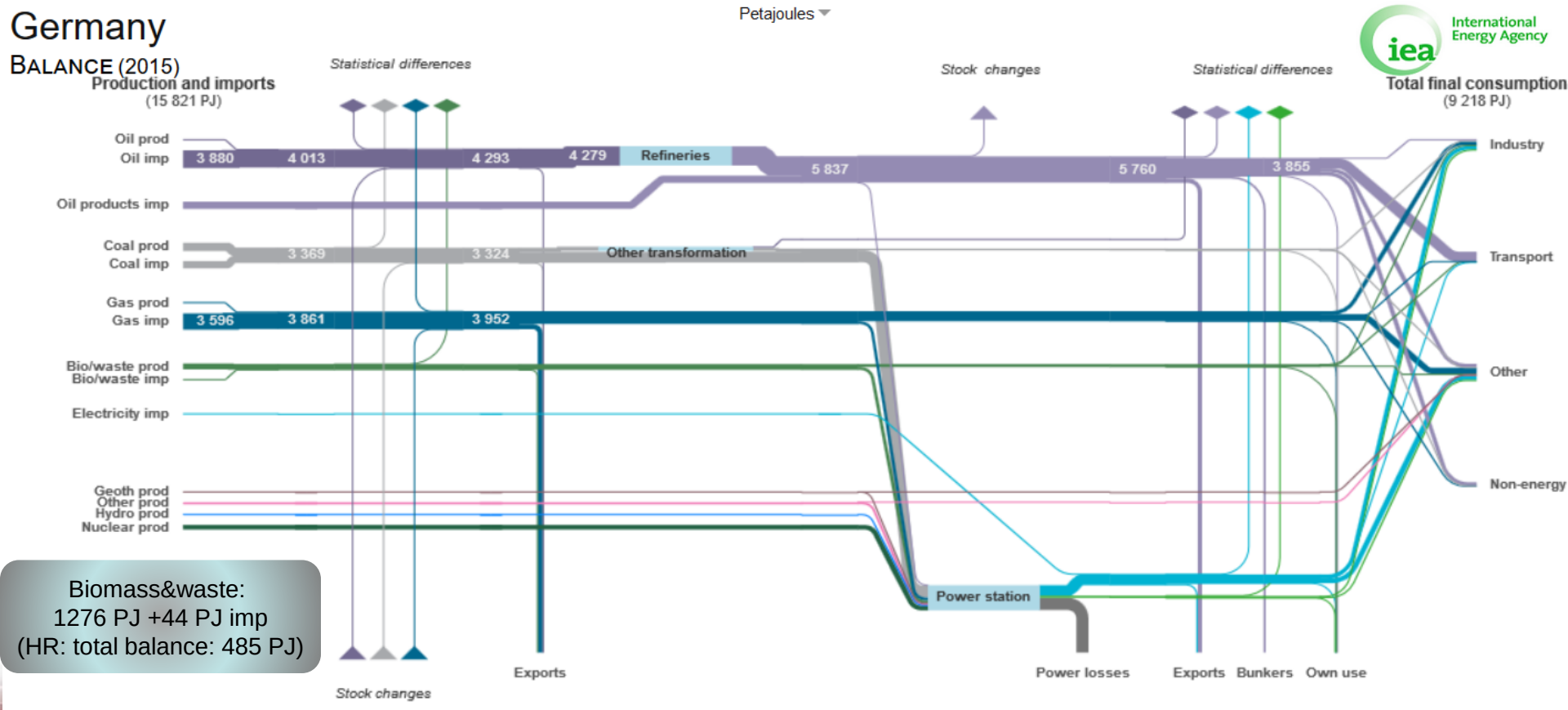

FINLAND
NORWAY
Moscow
UNITED KINGDOM
Amster
POLAND
Warsaw
London
UKRAINE
Paris
FRANCE
Milan
ITALY
Madrid
Istanbul
GREECE
TURKEY
Baghdad
IRAN
Cairo
ALGERIA

HR balance: 485 PJ



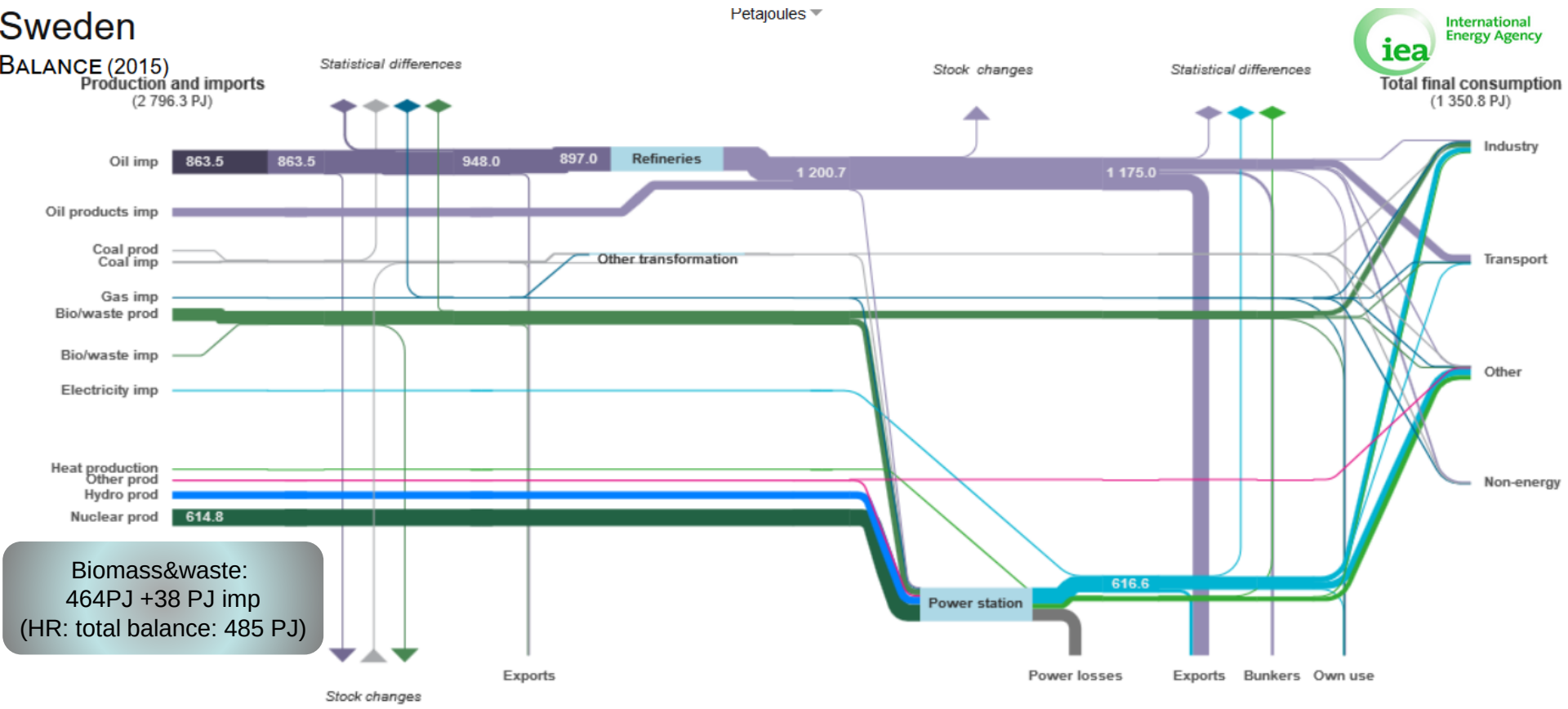
Biomass&waste:
67 PJ + 1 PJ imp
(HR: total balance: 485 PJ)

DE balance: 15 821 PJ (32xHR)



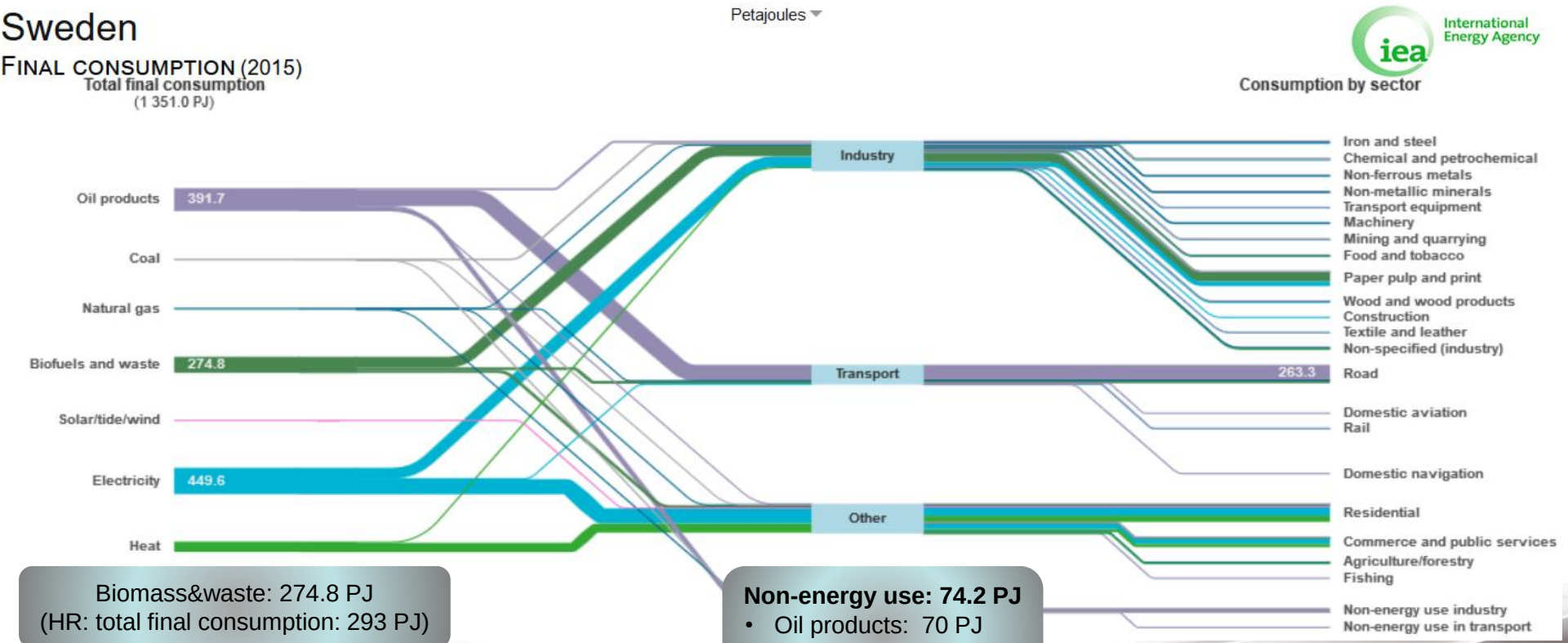
Biomass&waste:
1276 PJ +44 PJ imp
(HR: total balance: 485 PJ)

SE balances: 2 796 PJ (~6 xHR)



Biomass&waste:
464PJ +38 PJ imp
(HR: total balance: 485 PJ)

SE final consumption: 1,351 PJ



Biomass&waste: 274.8 PJ
(HR: total final consumption: 293 PJ)

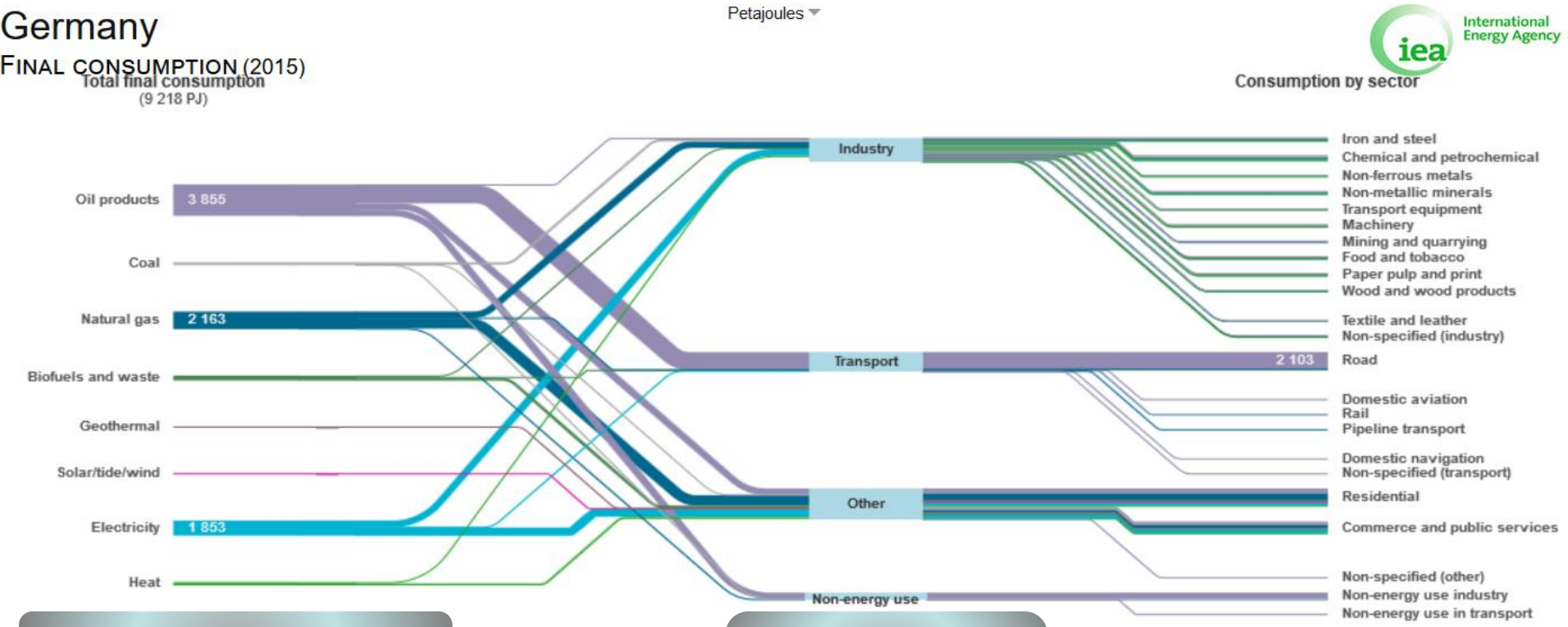
Non-energy use: 74.2 PJ
- Oil products: 70 PJ
- Coal: 0.5 PJ
- Natural gas: 4.1 PJ

SE industry


ABB
AGA
AKZO NOBEL
ASSA ABLOY
AstraZeneca
Atlas Copco
Autoliv
biovitrum
EF
Electrolux
ERICSSON
GAMBRO
H&M
IKEA
metro
SANDVIK
SCA
SCANIA
SKANSKA
SKF
STORAENSO
SWEDISH MATCH
TELE2
TeliaSonera
Tetra Pak
VATTENFALL
VOLVO


BioGaia
ProTectis
Gouttes
BioGaia

DE final consumption: 293 PJ



Biomass&waste: 595 PJ
(HR: total final consumption: 293 PJ)

Non-energy use: 890 PJ

- Oil products: 775 PJ
- Coal: 16 PJ
- Natural gas: 99 PJ

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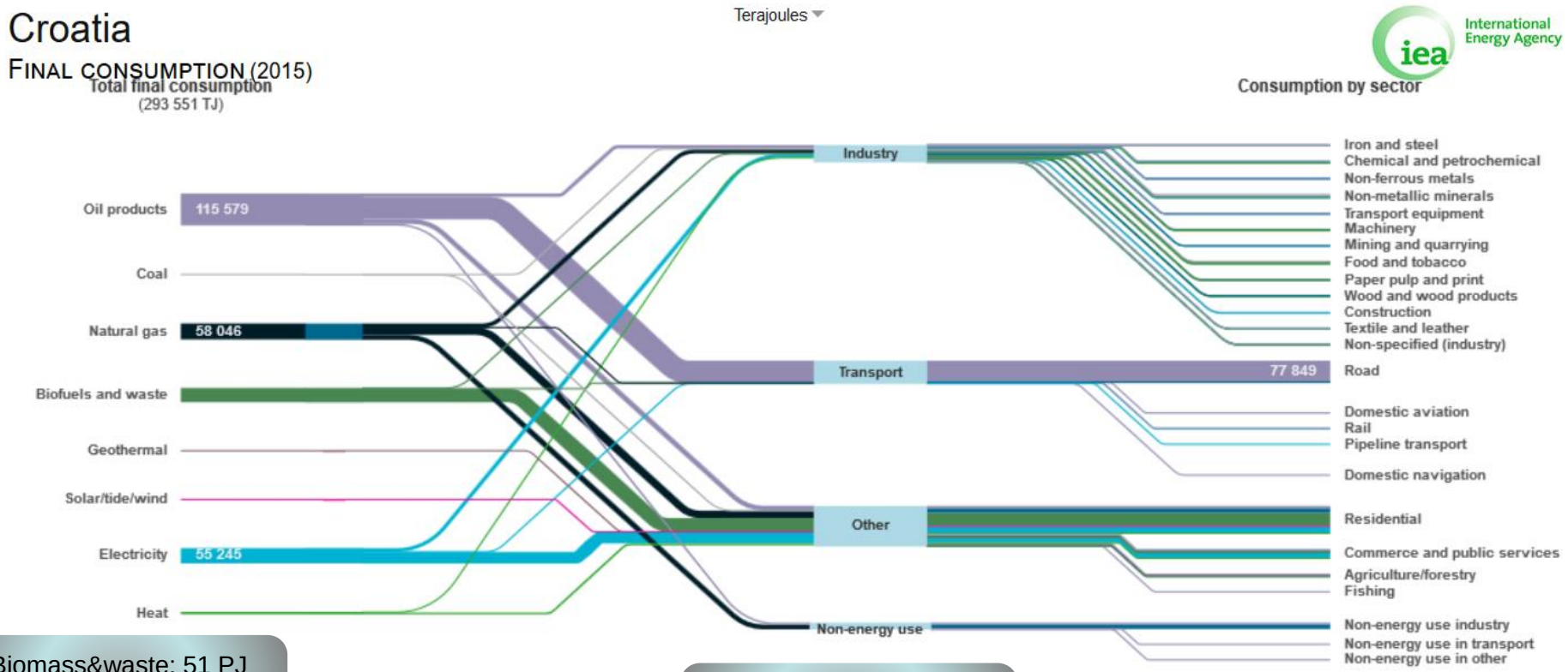
IEA Bioenergy

DE industry

HR final consumption: 293 PJ



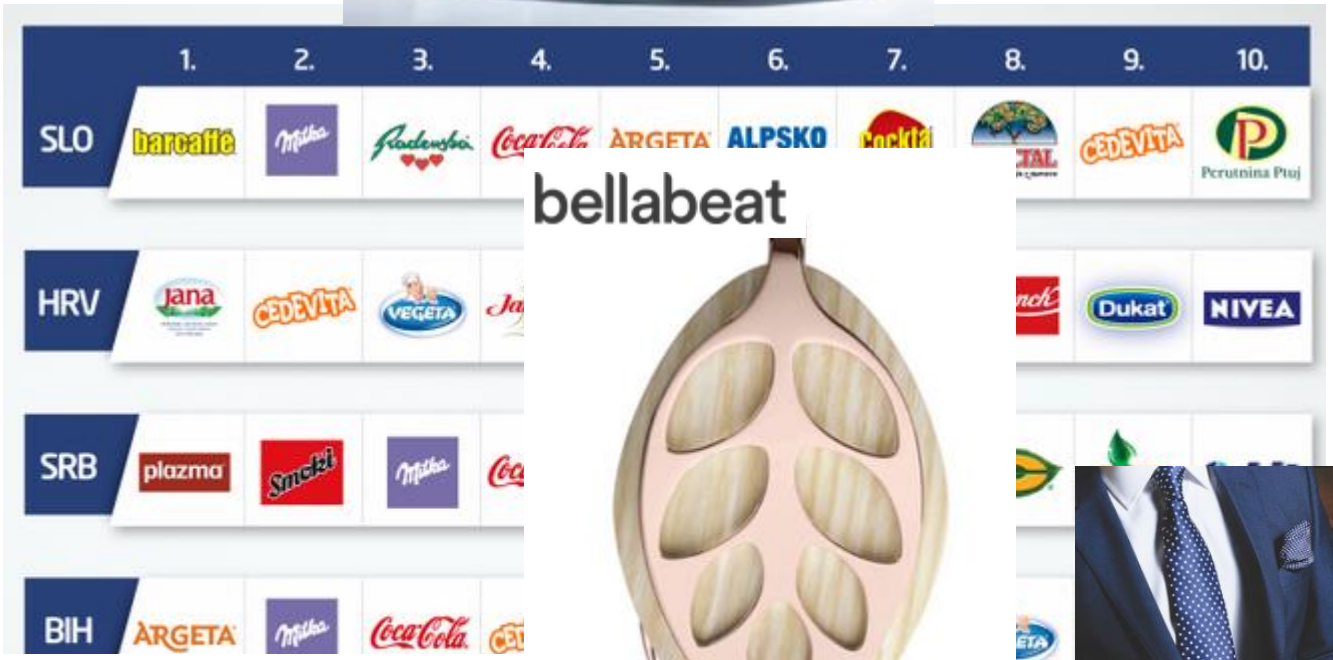
Biomass&waste: 51 PJ
(HR: total balance: 485 PJ)

Non-energy use: 23 PJ

- Oil products 6 PJ
- Natural gas: 17 PJ


RIMAC


AMARENA. SAVRŠENA.
MARASKA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barcaffè
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HRV
Jana
CEDEVITA
VEGETA
Dukat
NIVEA
SRB
plazma
Smoki
Milka
BIH
ÀRGETA
Milka
Coca-Cola

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Get a clear insight into your farm's performance.
Reduce your farm's costs in under 5 minutes per day.
Manage your farm resources more efficiently.


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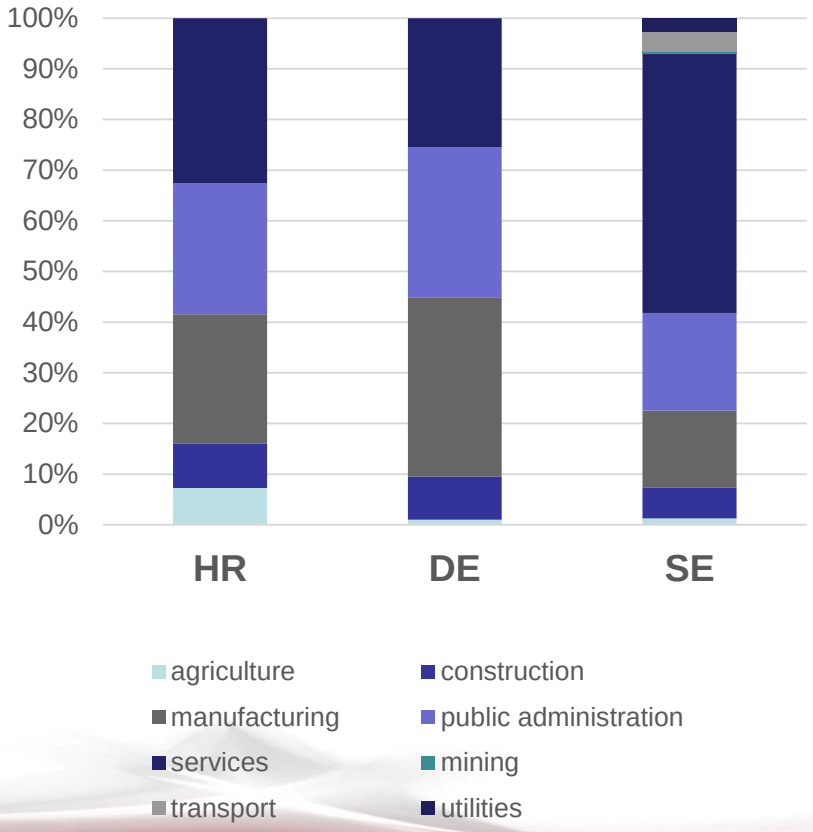
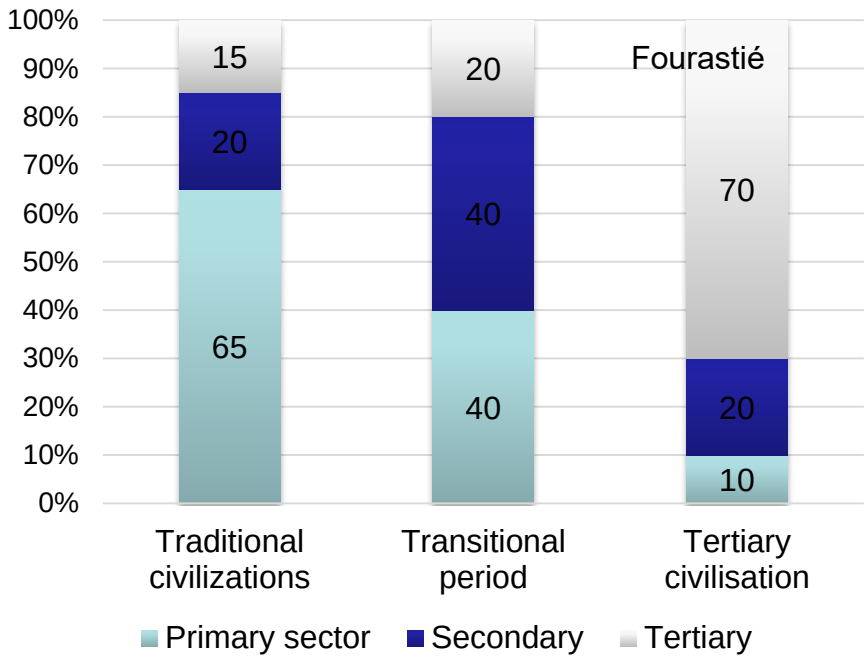
GDP structure comparison: HR-DE-SE





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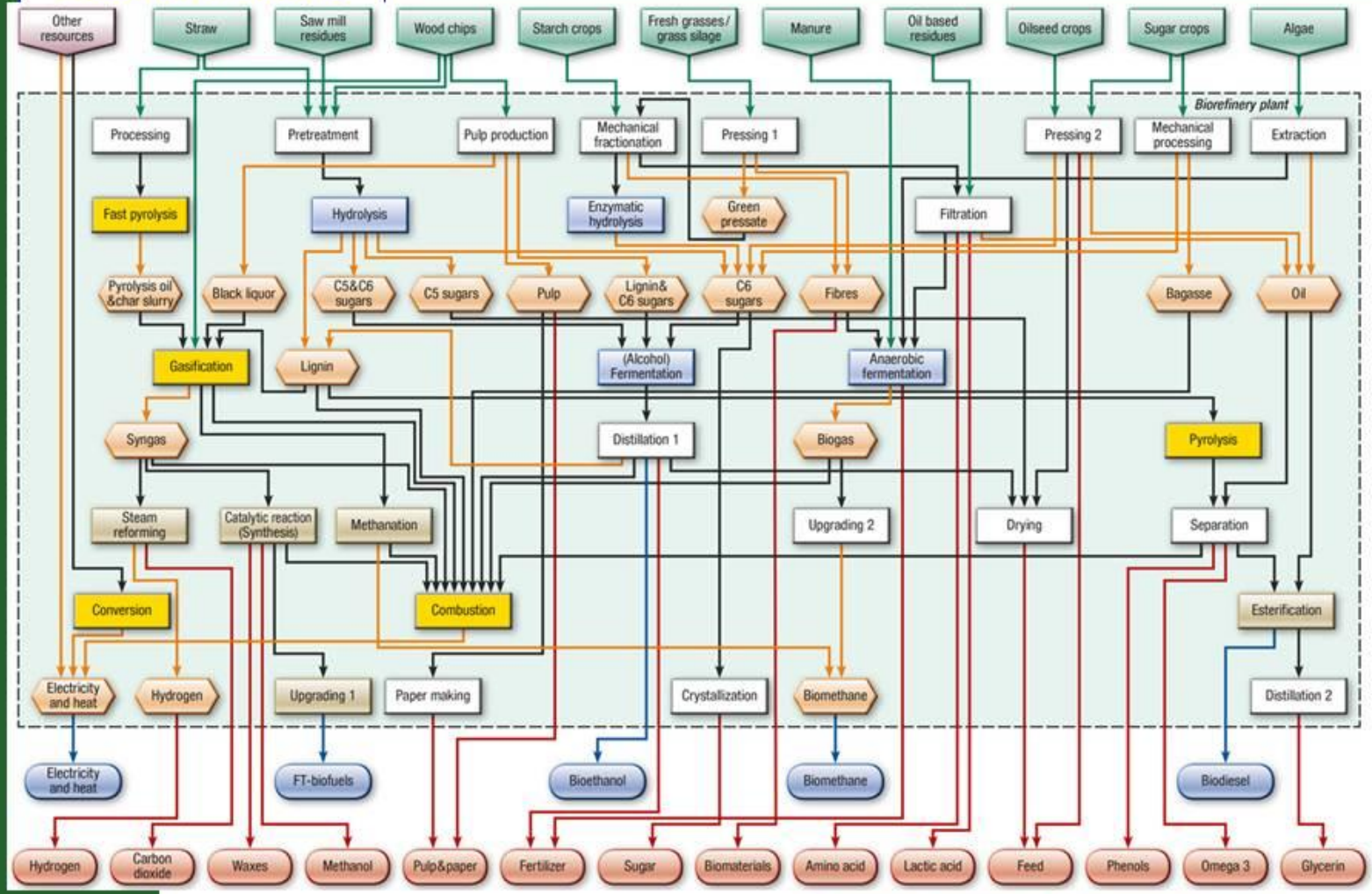
Task 42 Biorefining

Results so far .... Classification Scheme



Source: Joanneum Research, Austria

What if Croatia considers bioeconomy as…

…a link between the existing ICT and biobased industry?

Food products with lowcarbon packaging

Cascade use of biomass

…as a tool to enhance profitability and effectivness of bioenergy projects?

Cascade use of biomass

…a driver to use bioenergy byproducts at hand as a resource?

Nutrients from byproducts of bioenergy generation could replace 30% and 40% of N and P2O5, respectively.

…an opportunity to bring new and exciting jobs in rural areas, as biomass dominantly occurs in rural, not urban areas?

…cascading use of biomass for biofuels and biomaterials?

Is there enough biomass in HR to facilitate transfer to bioeconomy?

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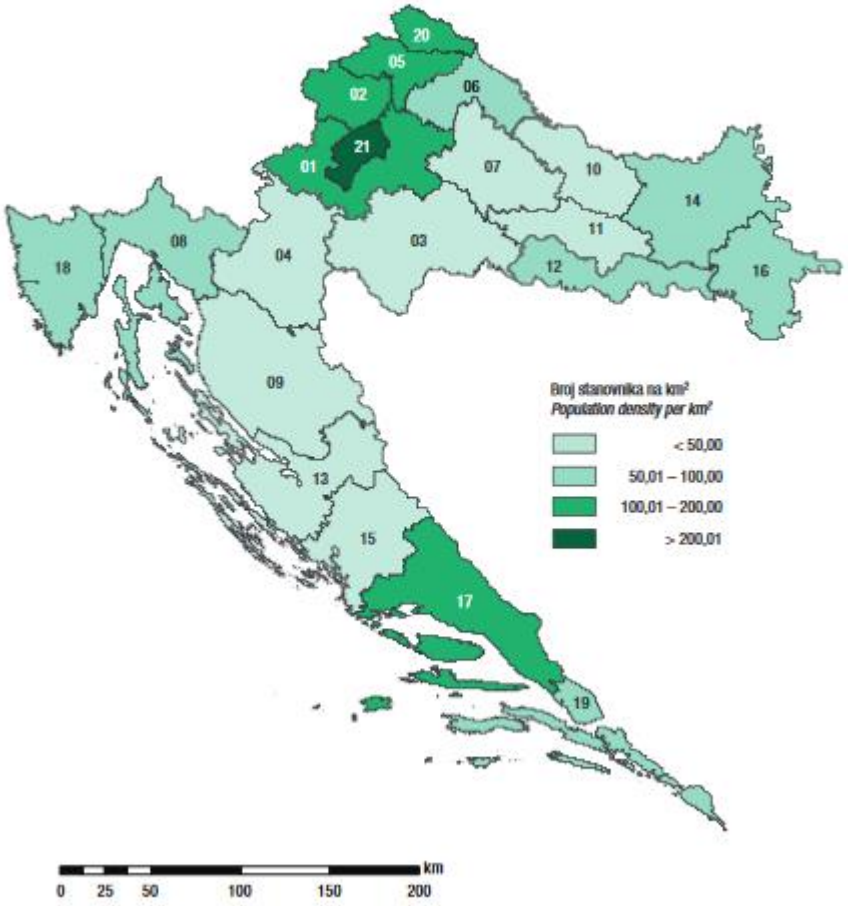
M 2-1. GUSTOĆA NASELJENOSTI STANOVNIŠTVA PO ŽUPANIJAMA, POPIS 2011.
(TERITORIJALNI USTROJ PREMA STANJU 31. PROSINCA 2016.)
POPULATION DENSITY, BY COUNTIES, CENSUS 2011
(TERRITORIAL CONSTITUTION WITH SITUATION AS ON 31 DECEMBER 2016)



Administrative and territorial constitution

2

Upravno-teritorijalni ustroj

Biljne zajednice u RH

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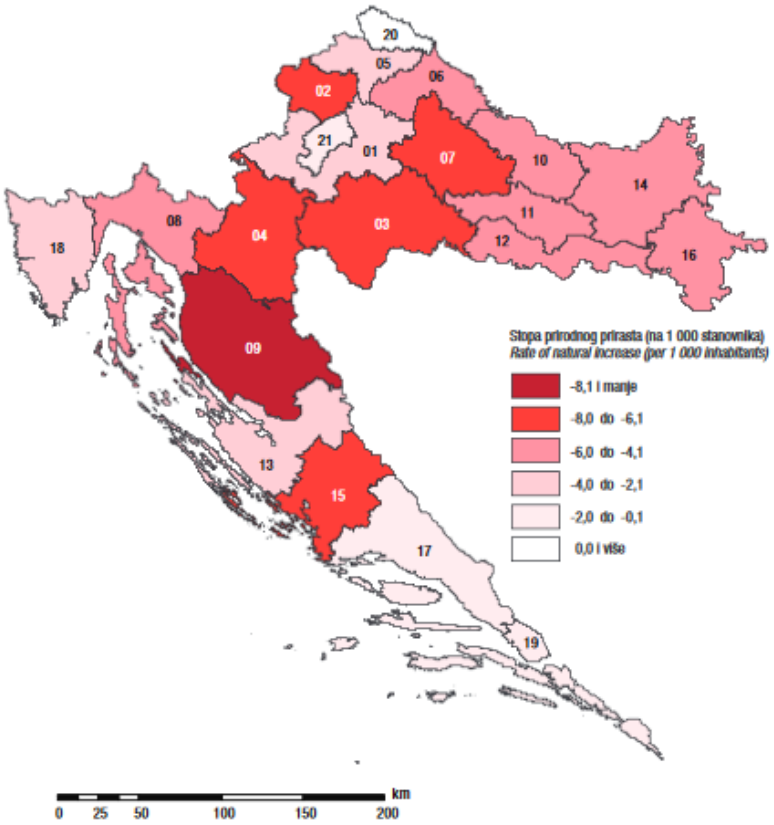
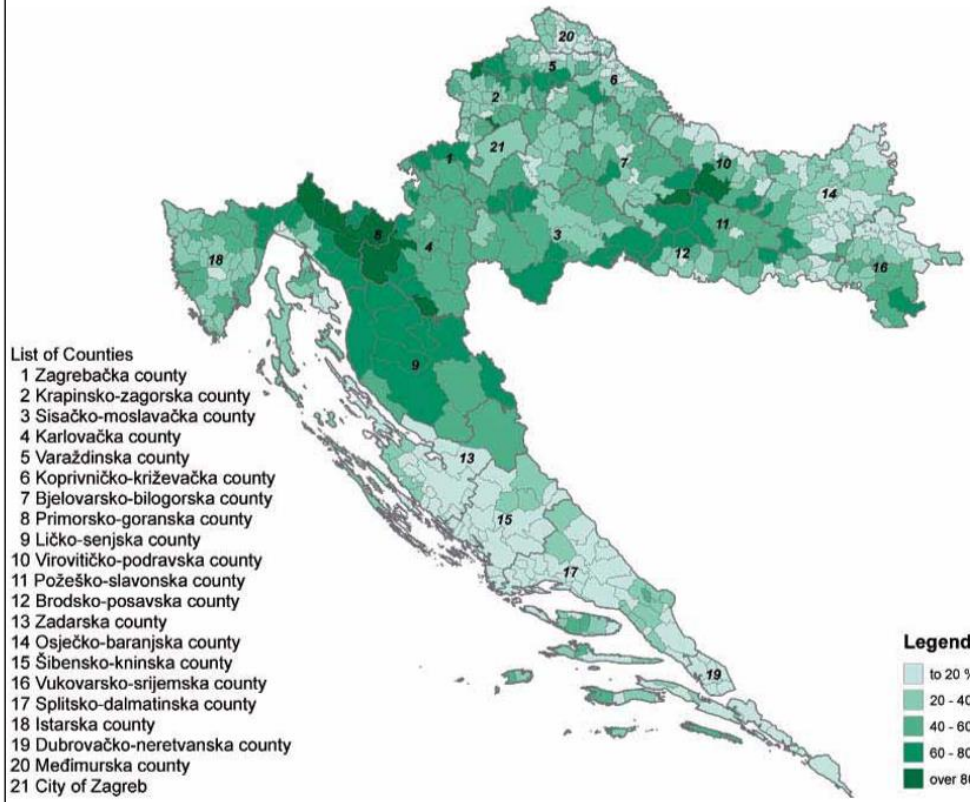
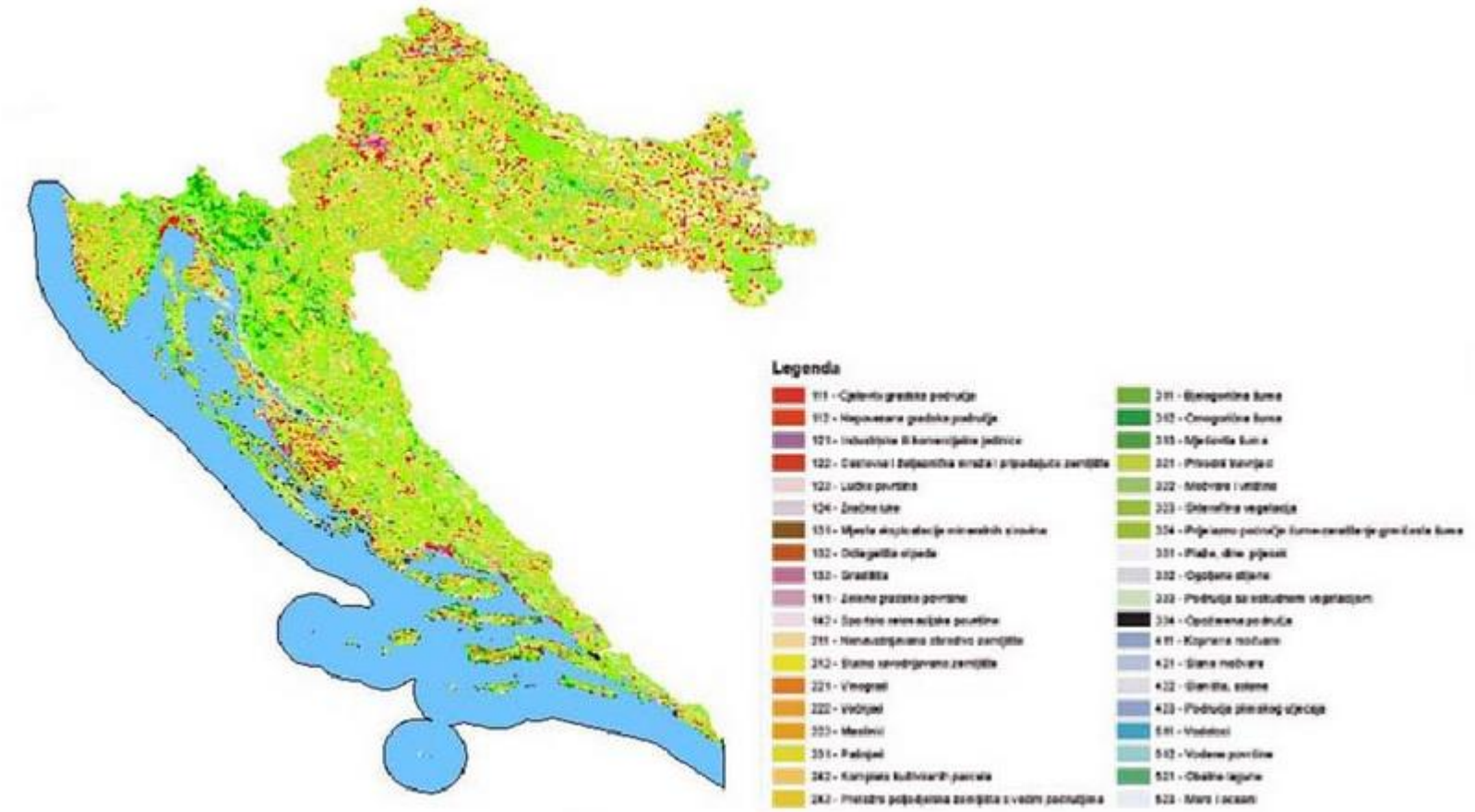
5 Population
Stanovništvo

M 5-1. PRIRODNI PRIRAST PO ŽUPANIJAMA U 2016.
NATURAL INCREASE, BY COUNTIES, 2016





Biljni pokrov RH



(Izvor: AZO CORINE Land Cover 2006 – Hrvatska)

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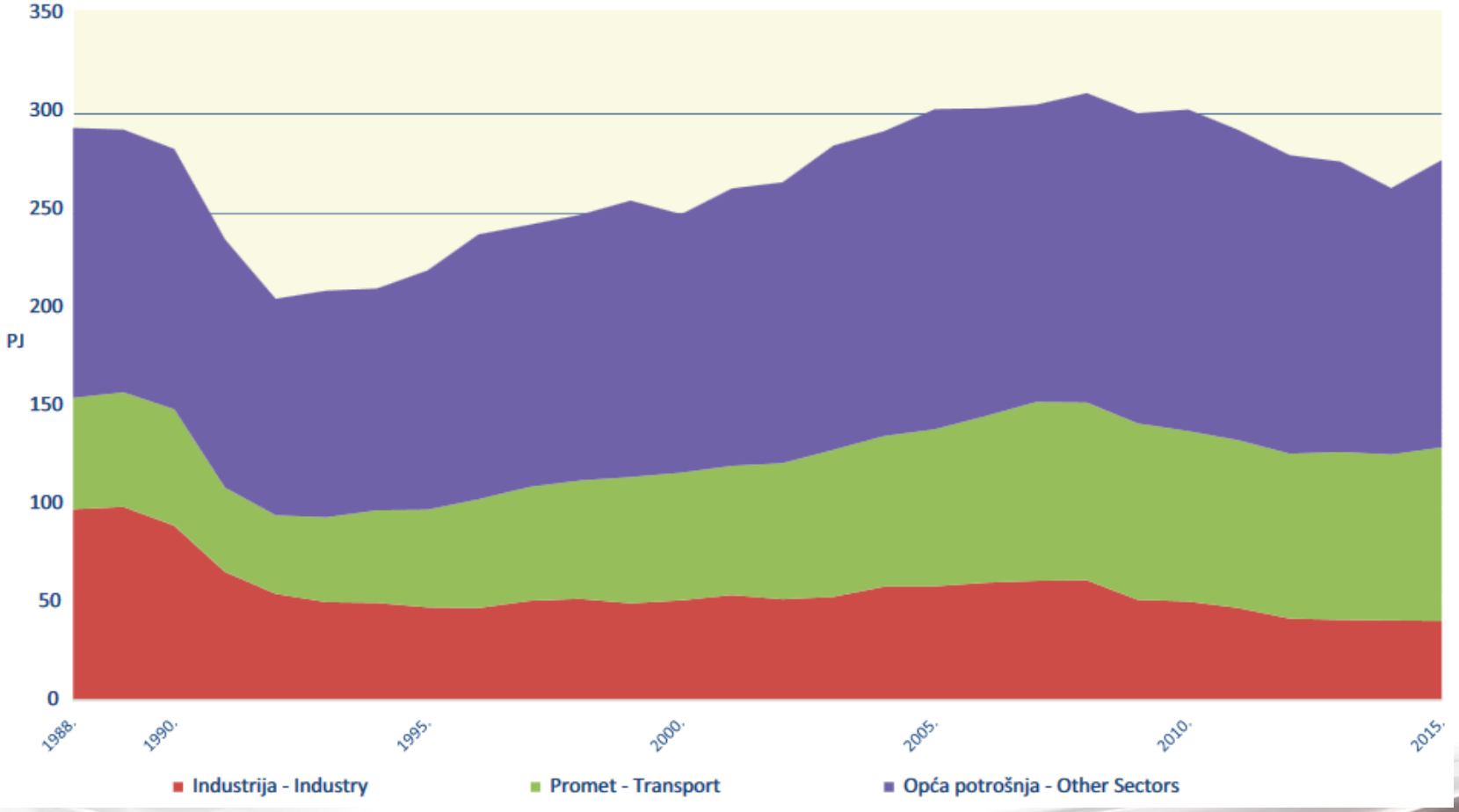
Finalna potrošnja energije po sektorima



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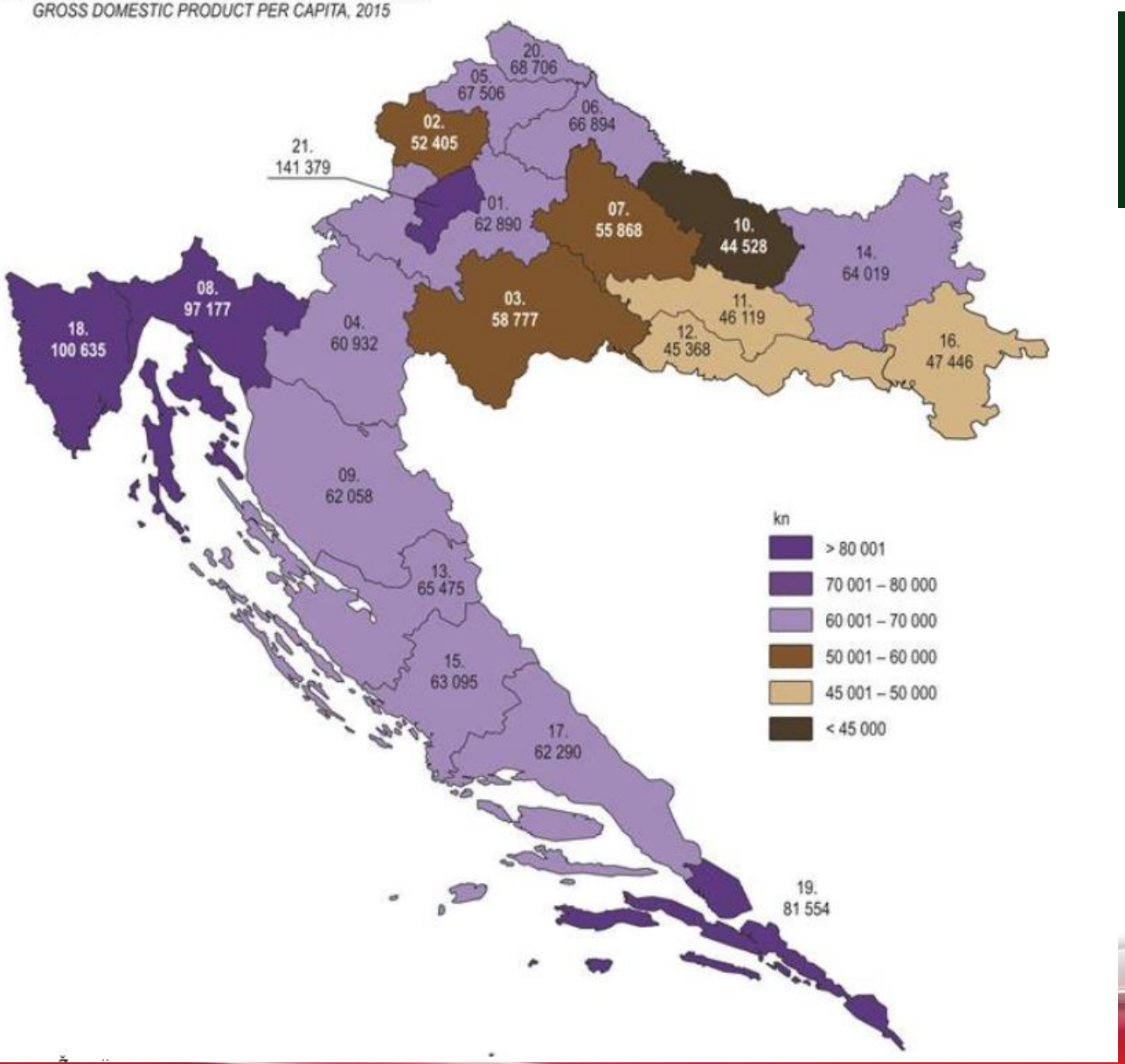
K-1. BRUTO DOMAĆI PROIZVOD PO STANOVNIKU U 2015.
GROSS DOMESTIC PRODUCT PER CAPITA, 2015



Pathways from biomass into the energy system

DBFZ (2012) Systemic contribution of biomass
https://www.dbfz.de/en/focus-areas/systemic-contribution-of-biomass.html

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Savska 163, 10000 Zagreb

Tel. 016326169
Mob. 0995326169
bkulisic@eihp.hr

Upitnik za istraživanje smjera razvoja bioekonomije u Hrvatskoj

- Bioekonomija podrazumijeva prelazak s fosilnih na niskougljične sirovine koje dolaze iz tijekova otpada, poljoprivrede ili šumarstva te sličnih industrija temeljenih na prirodnim resursima.
- Bioekonomija je usmjerena na nove mogućnosti za rast, kako u tradicionalnim tako i u novim sektorima temeljenih na prirodnim resursima, imajući na umu globalne izazove (npr. nesigurnost dobave sirovina) te ograničenja u resursima i okolišu.

IEEP, 2014: 〈http://www.ieep.eu/assets/963/KNOSSOS_Green_Economy_Supporting_Briefing.pdf

- Kako bi odredila okruženje za pozicioniranje bioekonomije, Europska je komisija napravila Europsku strategiju za izgradnju održivog gospodarstva temeljenog na bio-osnovi kao priliku za rješavanje nekolicine izazova poput sigurnosti u opskrbi hranom, ograničenost prirodnih resursa, ovisnost o fosilnim resursima i klimatske promjene, s naglaskom na održivo korištenje prirodnih resursa, konkurentnosti, socioekonomskih i okolišnih pitanja.
- Strateško okruženje postojećih sektora – poput poljoprivrede, ribarstva, šumarstva, prerađivačke industrije, (obnovljive) energije, prijevoz, upravljanje vodama itd. Već uključuje dovoljno elemenata koji su dovoljni za podršku razvoja zelenog gospodarstva EU.

EC: Our life Insurance, Our Natural Capital: An EU Biodiversity Strategy to 2020. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, COM(2011) 244 Final .

1. Po Vašem mišljenju, iz kojeg bi se sektora najbrže mogla omogućiti nova sirovinska osnova biomase za bioekonomiju u Hrvatskoj? Poredajte odgovore prema brzini stvaranja nove sirovinske osnove. *1 najbrže, 14 najsporije*

	Sektor (i vezane djelatnosti)	Rang
1	Ratarstvo – agro ostatci (npr. slama, kukuruzovina, oklasci…)	
2	Trajni nasadi (voćarstvo, vinogradarstvo, maslinarstvo) – granjevina, komina masline, koštice	
3	Ribarstvo – uzgoj akvakultura	
4	Stočarstvo – nusproizvodi stočarstva, sirutka, klaonički otpad	
5	Šumarstvo – nekomercijalno drvo, ostaci iz drvno prerađivačke industrije	
6	Gospodarenje otpadom - oporaba	
7	Upravljanje muljem iz pročistača otpadnih voda	
8	Uzgoj biomase na poljoprivrednim površinama	
9	Uzgoj biomase na šumskim površinama	
10	Urbana biomasa (biorazgradivi otpad nastao pri održavanju zelenih površina, organska komponenta otpada iz domaćinstava…)	
11	Biomasa nastala kod održavanja prometnica	
12	Biomasa nastala kod održavanja vodotokova	
13	Proizvodnja hrane i krmiva	
14	Ostalo: navedite što	

2. Po Vašem mišljenju, koji bi se sektor imao najviše koristi (zaposlenja, investicije, konkurentnost) od bioekonomije? *1 najviše, 14 najmanje*

	Sektor (i vezane djelatnosti)	Rang		
		Nova radna mjesta	Investicije	Konkurentnost
1	Poljoprivreda			
2	Ribarstvo			
3	Šumarstvo			
4	Prehrambeno-prerađivačka industrija			
5	Farmaceutska industrija			
6	Drvno-prerađivačka industrija			
7	Građevinska industrija			
8	Proizvodnja umjetnih i organskih gnojiva			
9	Proizvodnja plastičnih masa			
10	Gospodarenje otpadom			
11	Komunalna poduzeća			
12	ITC sektor			
13	Energetika			
14	Ostalo: navedite što			

3. Po Vašem mišljenju, koji bi od postojećih strateških okvira omogućio najbrži prijelaz na bioekonomiju? *1 najbrže, 9 najsporije*

	Sektor (i vezane djelatnosti)	Rang
1	Strategija ruralnog razvoja	
2	Strategija industrijskog razvoja	
3	Energetska strategija	
4	Strategija industrijskog razvoja	
5	Niskougljična strategija	
6	Strategija pametne specijalizacije	
7	Strategija razvoja vodno-komunalnog gospodarstva	
8	Strategija gospodarenja otpadom	
9	Ostalo: navedite što	

4. Koja bi, od postojećih industrija najbrže mogla prijeći na niskougljičnu sirovinu? *1 najbrže, 14 najsporije*

	Sektor (i vezane djelatnosti)	Brzina
1	Poljoprivreda	
2	Ribarstvo	
3	Šumarstvo	
4	Prehrambeno-prerađivačka industrija	
5	Farmaceutska industrija	
6	Drvno-prerađivačka industrija	
7	Građevinska industrija	
8	Proizvodnja umjetnih i organskih gnojiva	
9	Proizvodnja plastičnih masa	
10	Gospodarenje otpadom	
11	Komunalna poduzeća	
12	ITC sektor	
13	Energetika	
14	Ostalo: navedite što	

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5. Po Vašem mišljenju, u kom smjeru bi ste trebao ulagati u razvoj novih industrija? *1 najviše značajno, 11 najmanje značajno*

	Bio-proizvodi	Brzina
1	Toplinska energija iz biomase	
2	Proizvodnja energenata iz biomase (peleti, briketi, drveni ugljen)	
3	Istovremena proizvodnja toplinske i električne energije (kogeneracije na biomasu)	
4	Proizvodnja biogoriva	
5	Prehrambeno-prerađivačka industrija	
6	Bio-rafinerije	
7	Bio-plastika (ambalaža prehrambeno prerađivačke industrije)	
8	Bio-plastika (proizvodi iz plastičnih masa, glazure, završni sloj kod MDF/medijapana…)	
9	Biokemijski proizvodi u farmaciji	
10	Biokemijski proizvodi u industriji (otapala, zaštitna sredstva u poljoprivredi, gnojiva…)	
11	Funkcionalna hrana	
12	Ostalo: navedite što	

6. Po Vašem mišljenju, ocijenite rizik u opskrbi hranom ukoliko se Republika Hrvatska odluči razvijati u smjeru bioekonomije? *1 sasvim siguran rizik, 7, nema uopće rizika*

1	2	3	4	5	6	7

7. Koji bi bili najveći rizici ispred Republike Hrvatske ako se odluči razvijati u smjeru bioekonomije?

8. Tko bi trebao preuzeti inicijativu?
    a. Sveučilišta
    b. Ministarstva, koja?
    c. Državne agencije
    d. Privatni sektor sa strukovnim organizacijama
    e. Poljoprivrednici sa strukovnim organizacijama
    f. netko drugi? Tko?

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