Abfallverwertungstechnik & Abfallwirtschaft

Ravnanje z odpadki v sodobni družbi

dr.sc. Renato Šarc

Montanuniversitaet Leoben,

Chair of Waste Processing Technology and Waste Management

9. Konferenca Komunalnega Gospodarstva, Podčetrtek, 20.09.2019.

DEPARTMENT FÜR

Umwelt- & Energieverfahrenstechnik

9. KONFERENCA KOMUNALNEGA GOSPODARSTVA

2019

MONTAN UNIVERSITÄT

K-Project ReWaste 4.0 started

- Start: 01.04.2017 (4 years)
- Total costs: € 4,880,000

FFG

COMET
Competence Centers for Excellent Technologies

bmvit

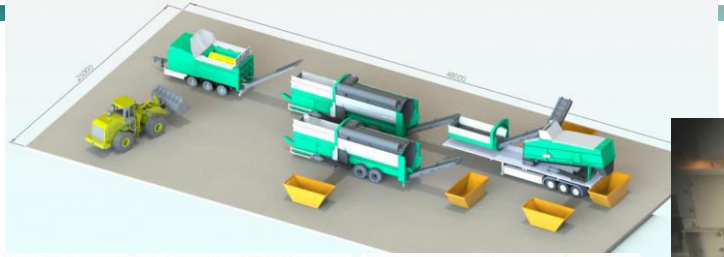
bmwfw
Bundesministerium für Wissenschaft, Forschung und Wirtschaft

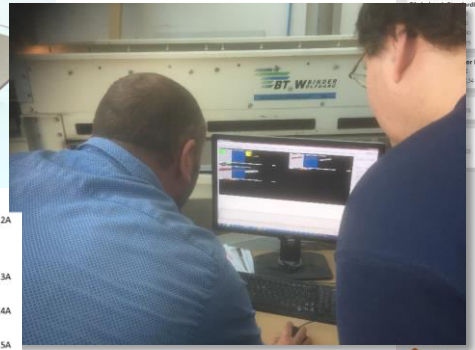
Das Land Steiermark

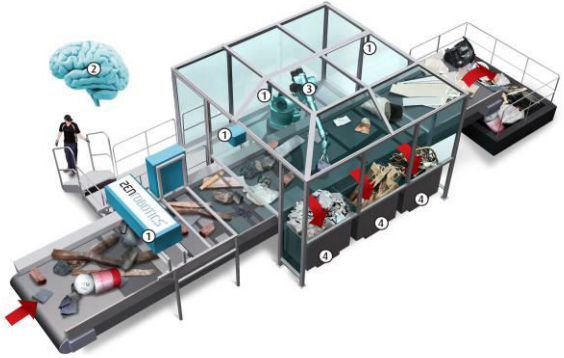
SFG
NEUES DENKEN. NEUES FÖRDERN.

Abfallverwertungstechnik & Abfallwirtschaft

ReWaste4.0 investigates and develops new methods, technologies and concepts!



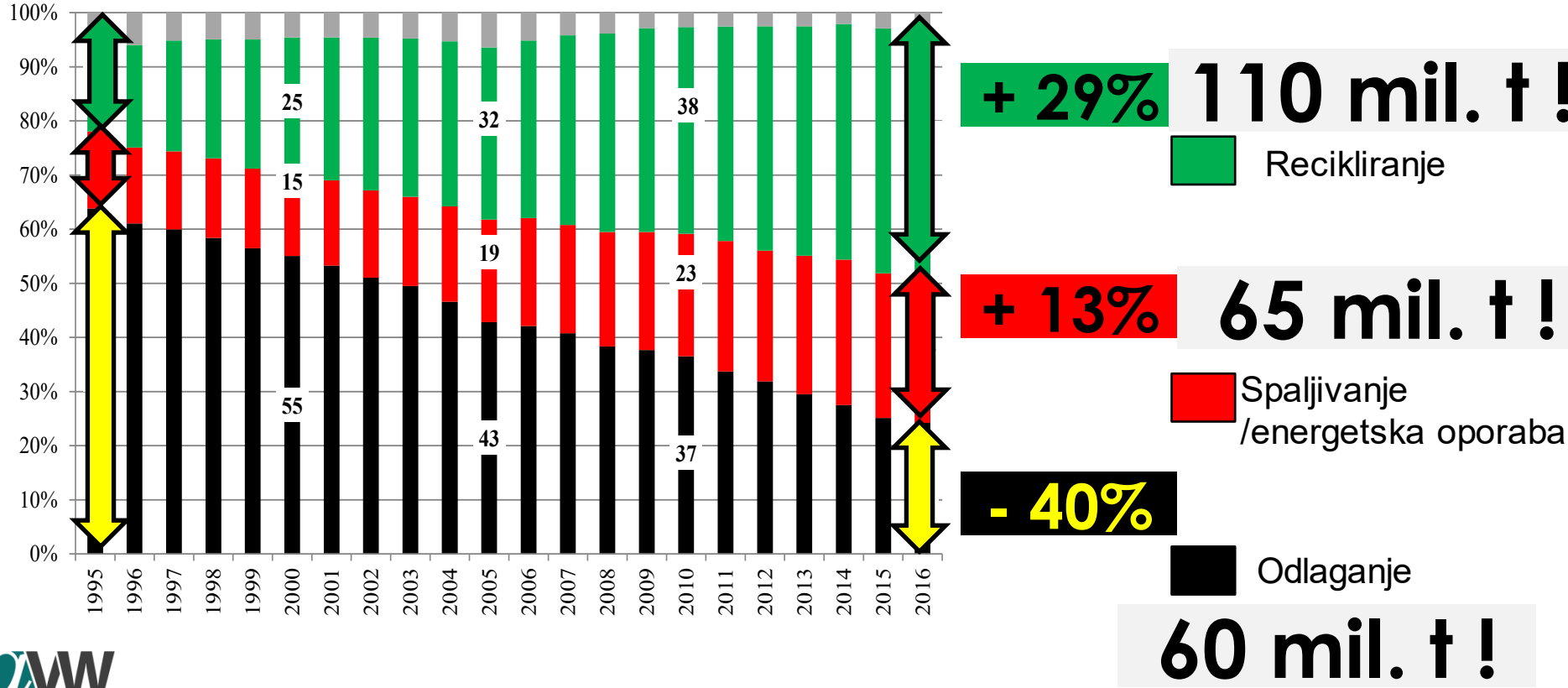




3 teme…

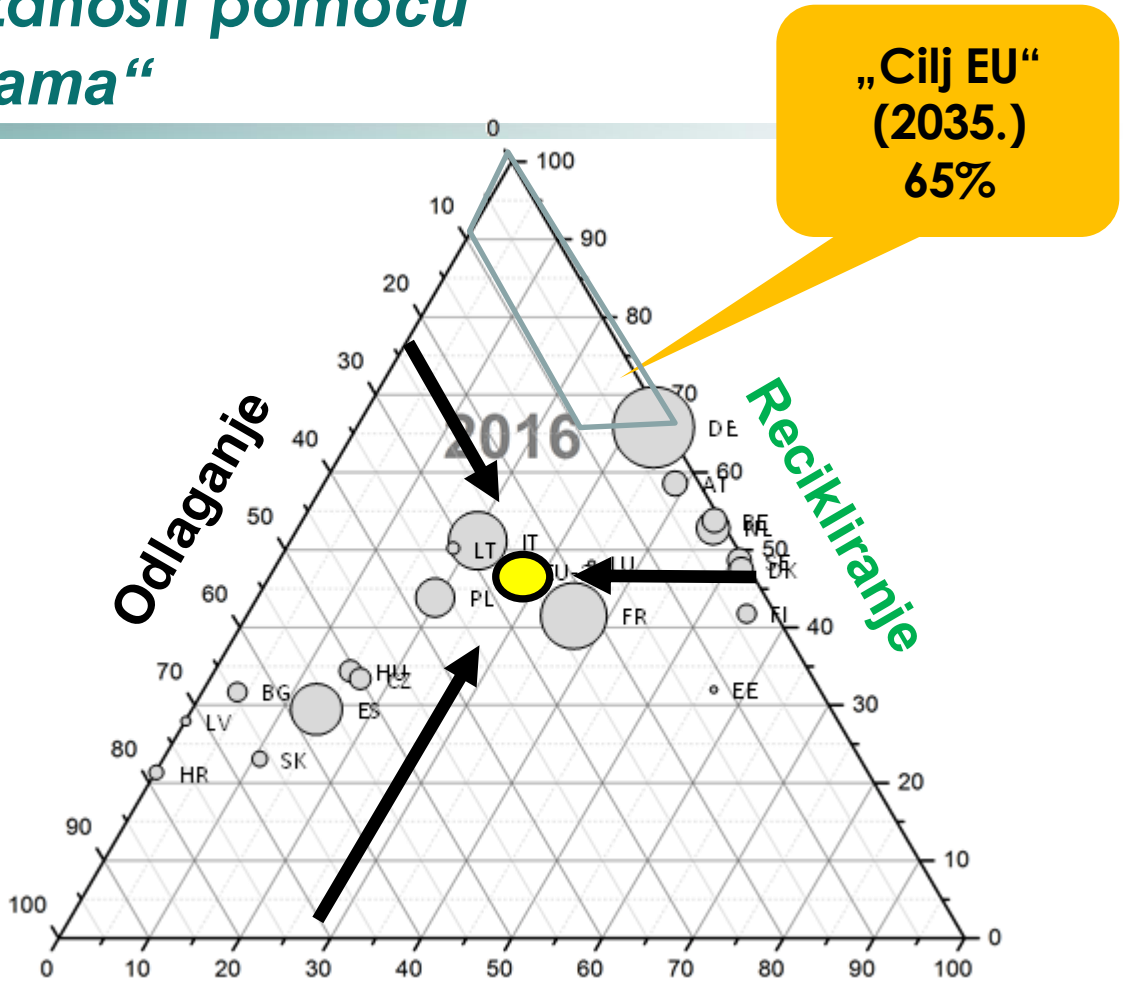
- RIL-dijagram za dinamičku vizualizaciju
- Tehničko-tehnološki razvoj sustava
- Ekonomski i ekološki optimum
- Zaključak

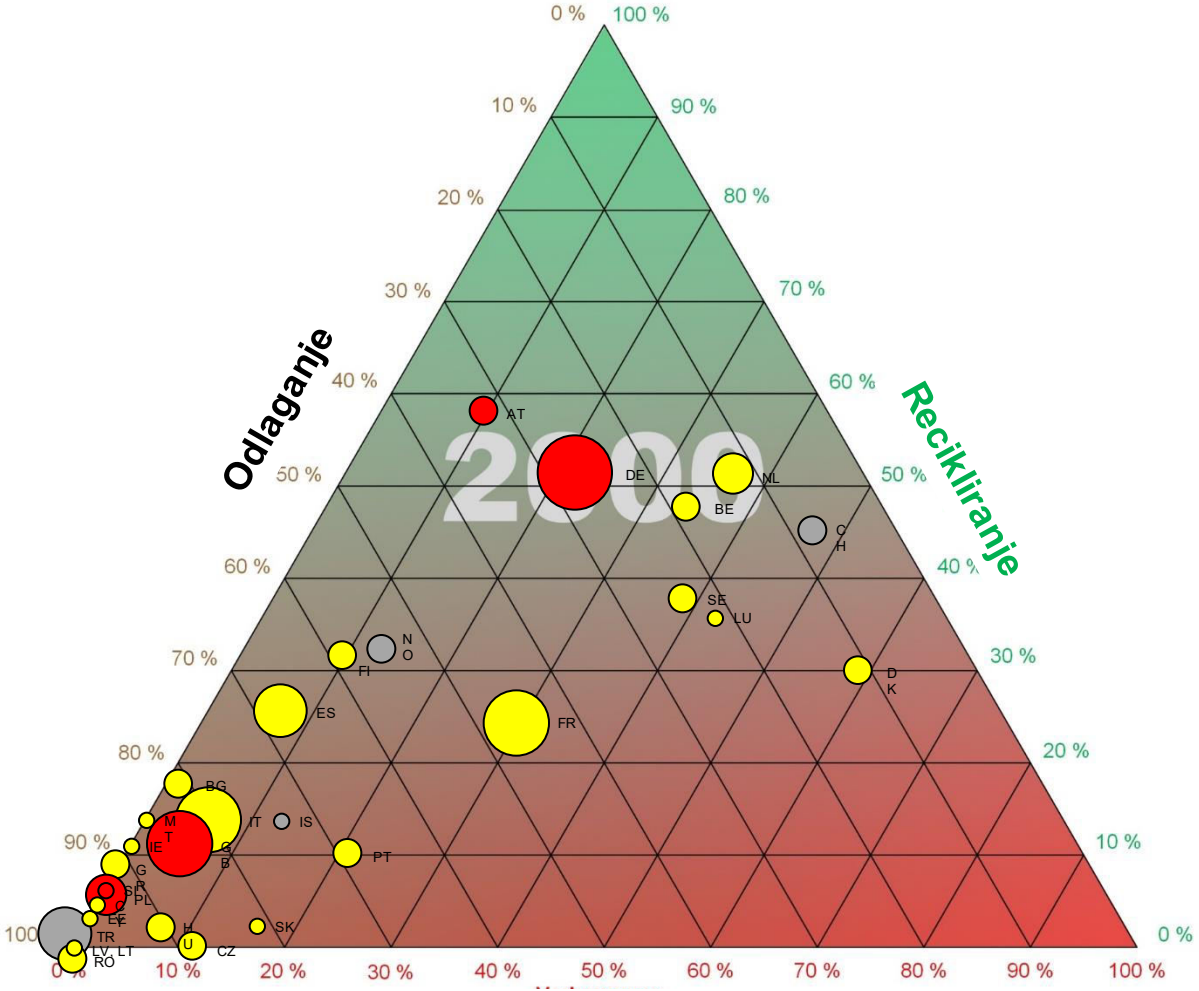
Razvoj obrade otpada u EU od 1995. do 2016.



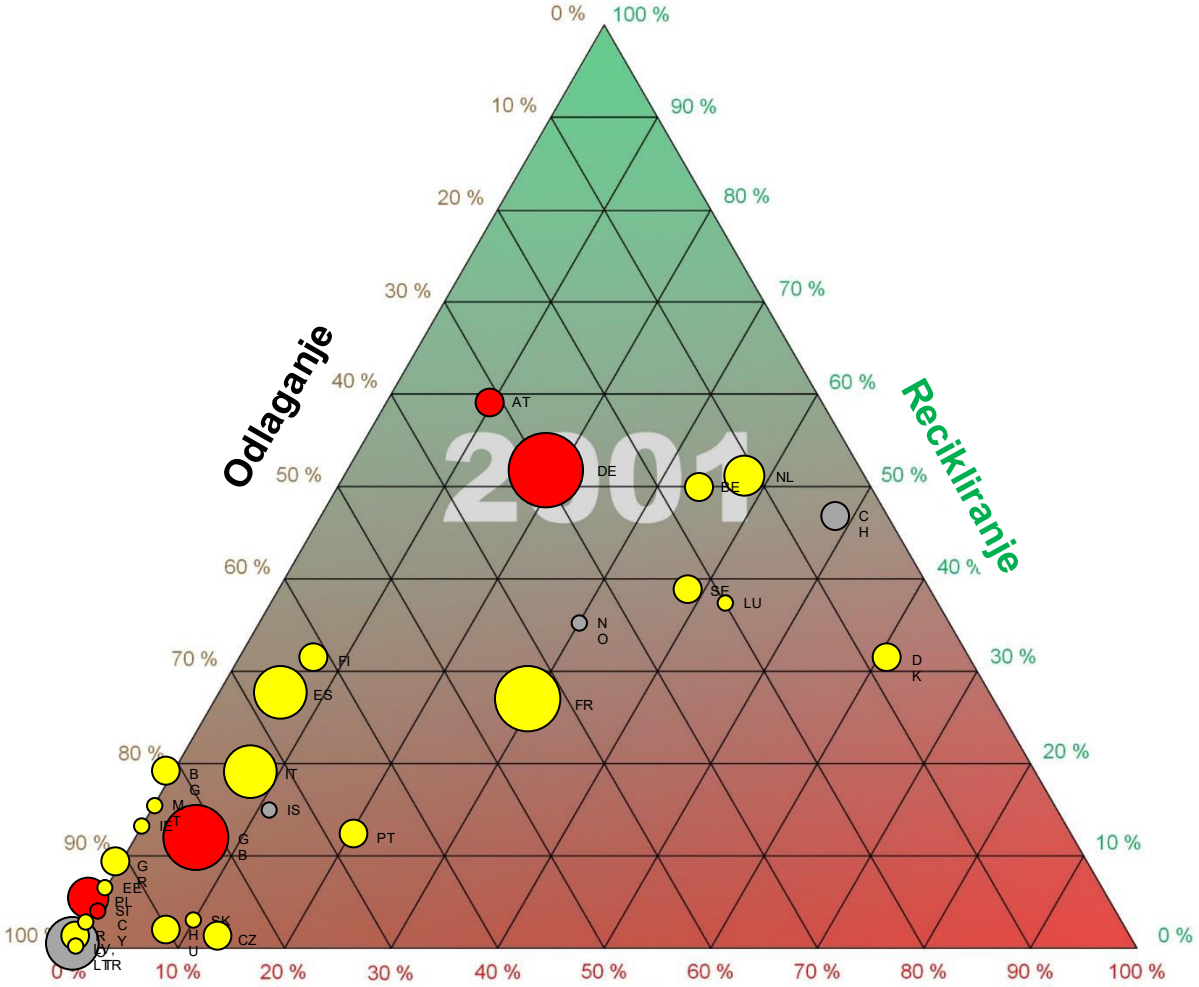
Prikaz razvoja i povezanosti pomoću „ternarnog RIL-dijagrama“

- „ternarni dijagram“
- Svaka država je pozicionirana
- EU prosjek (2016.):
  - **24%** odlaganje
  - **27%** spaljivanje/e.o.
  - **46%** recikliranje





Spaljivanje/ Energetska oporaba



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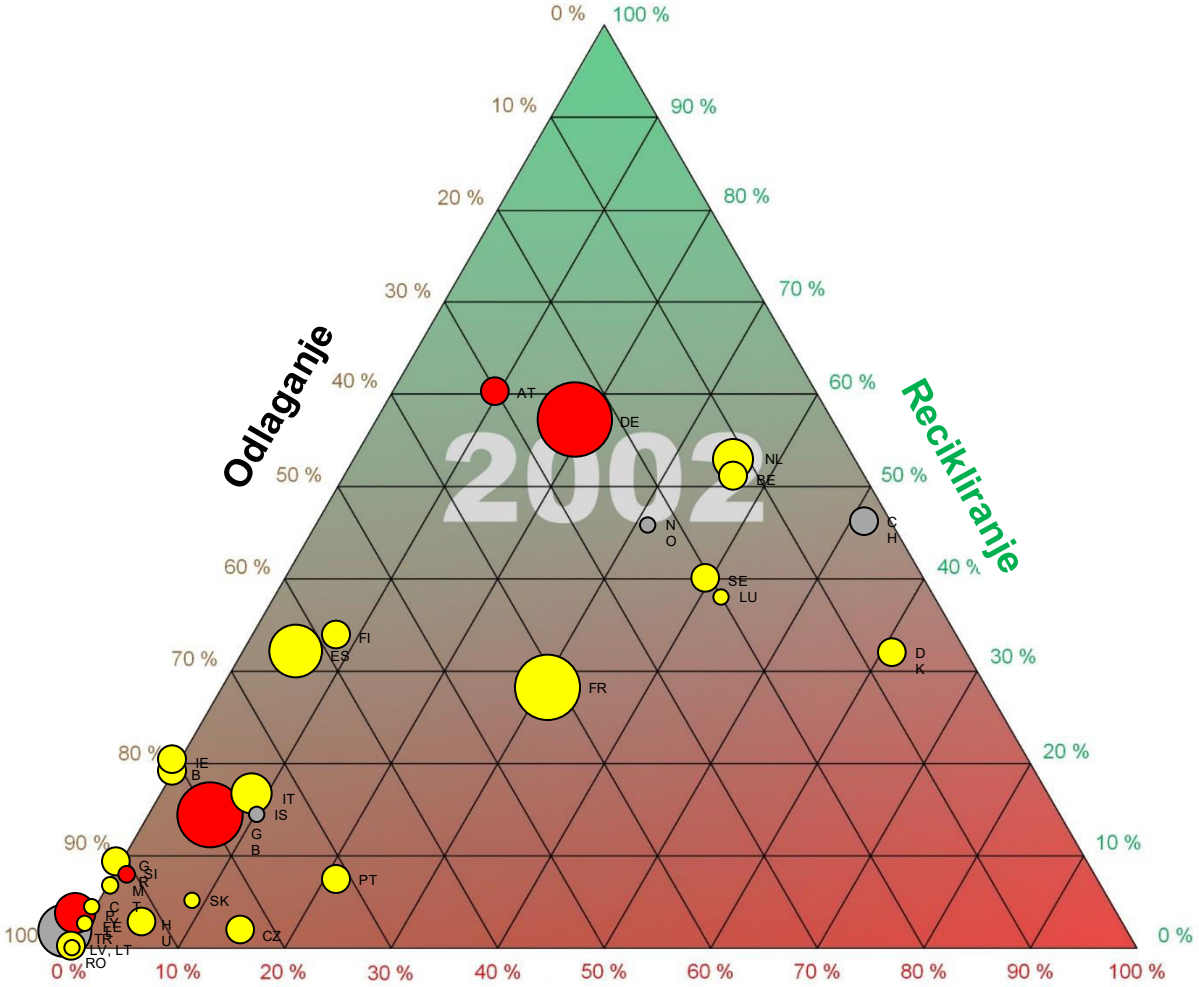

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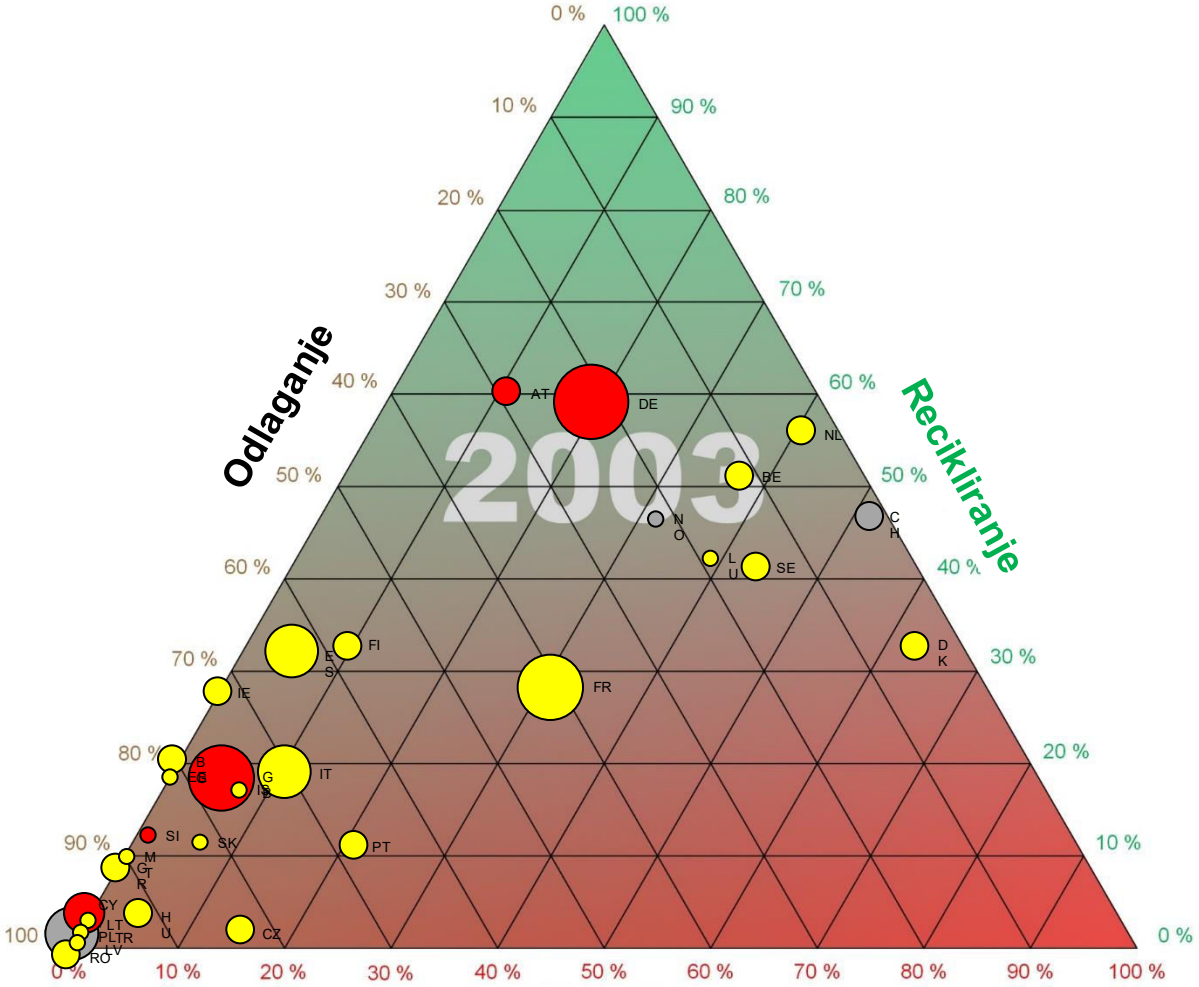

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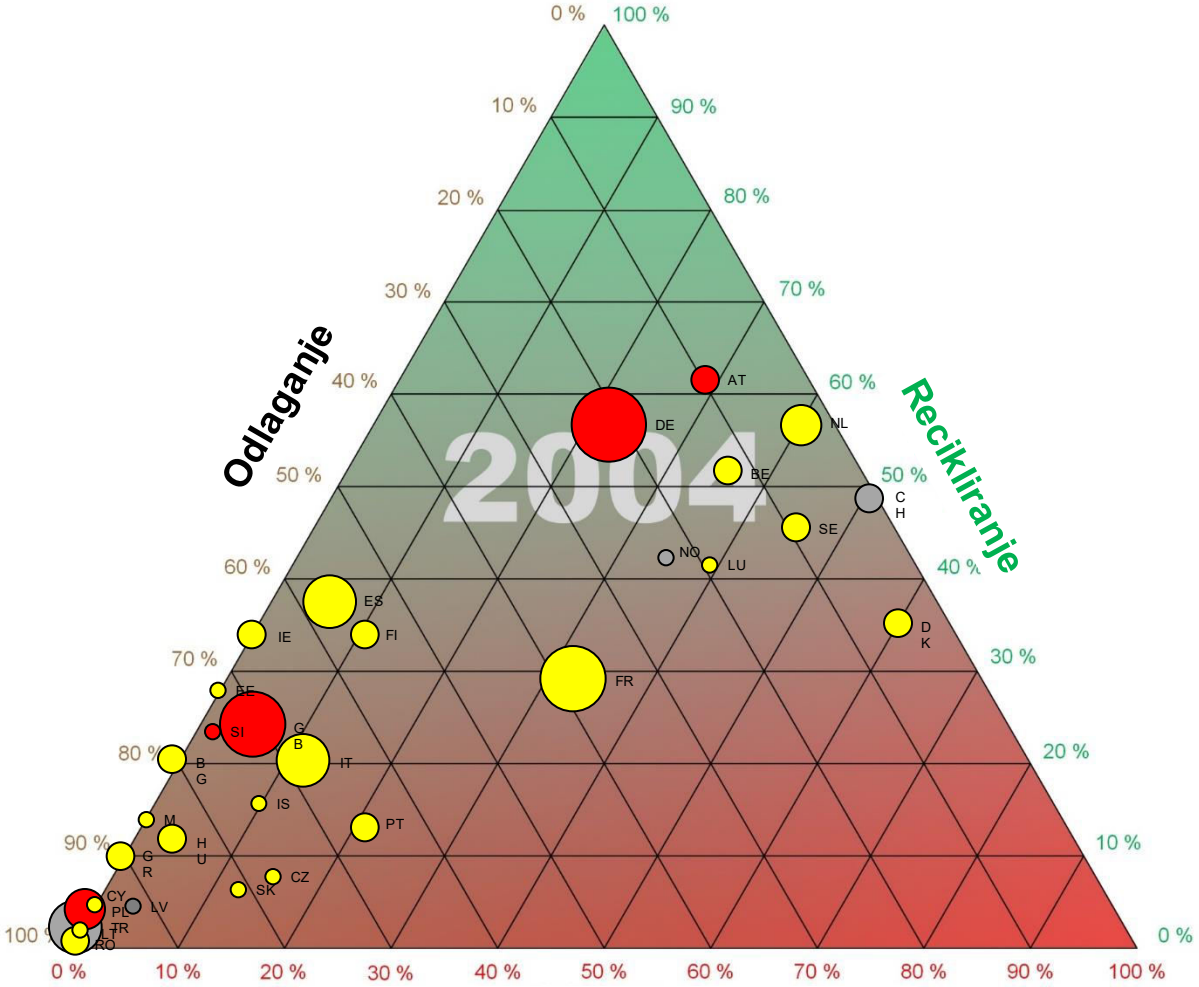

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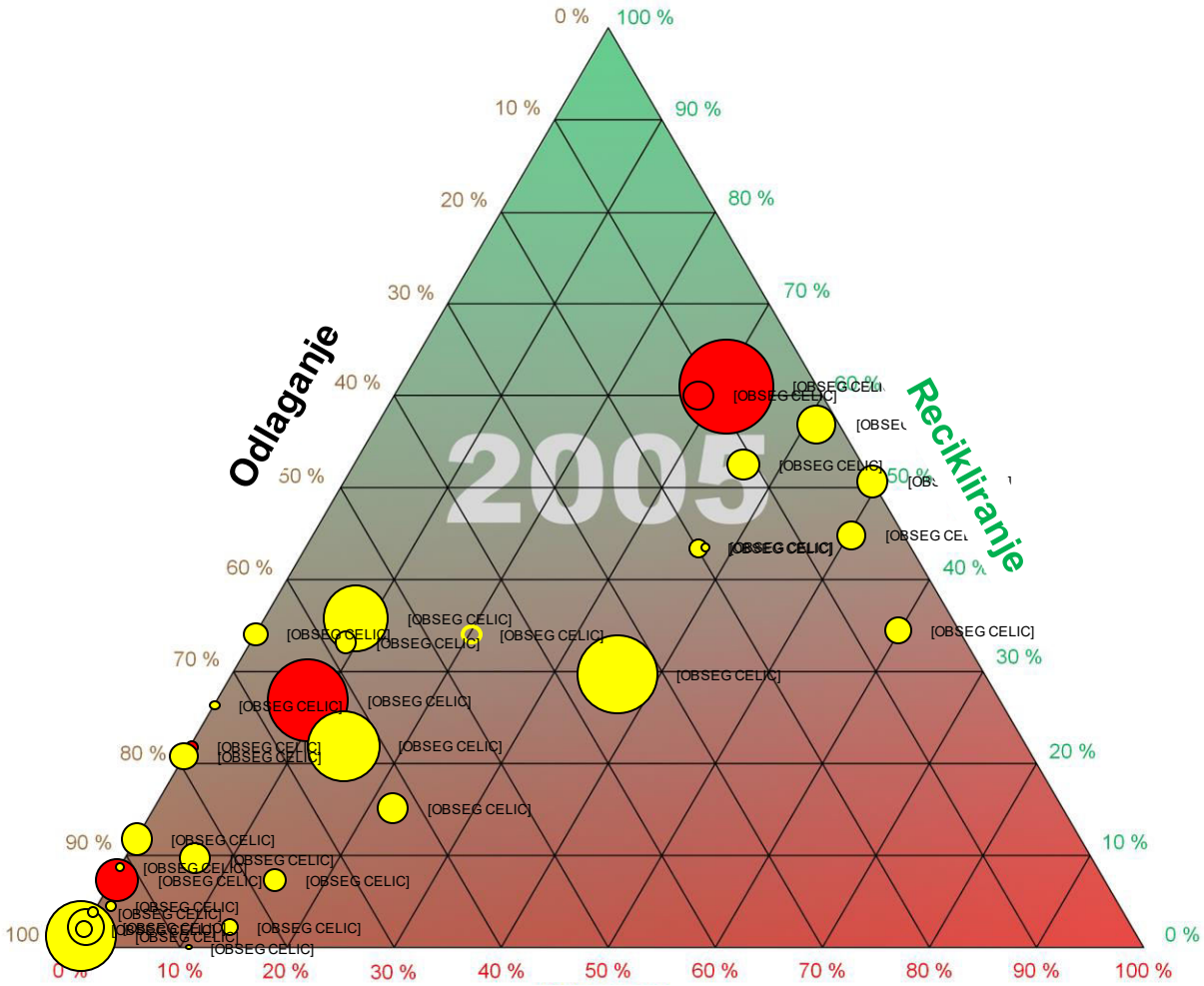

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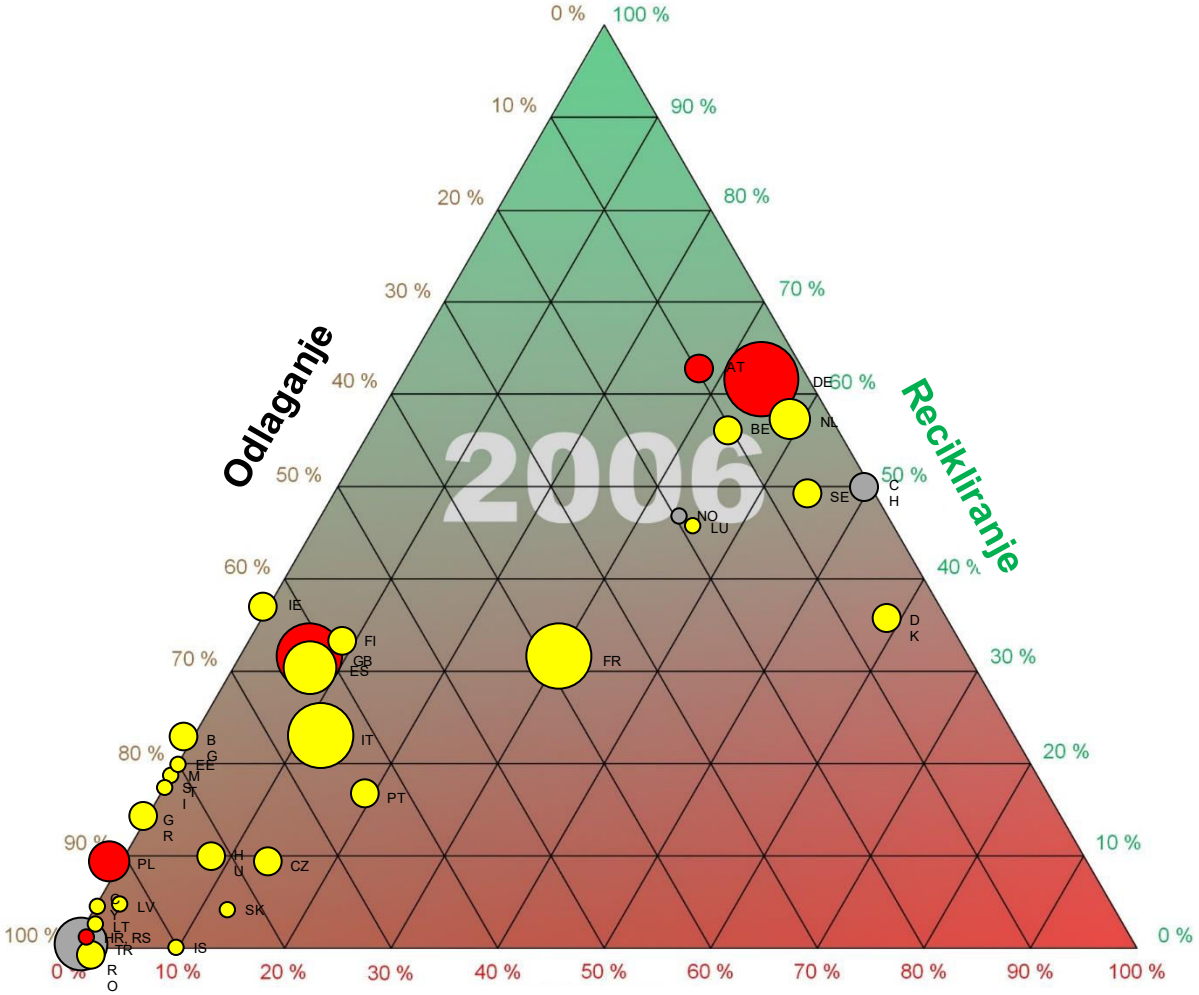
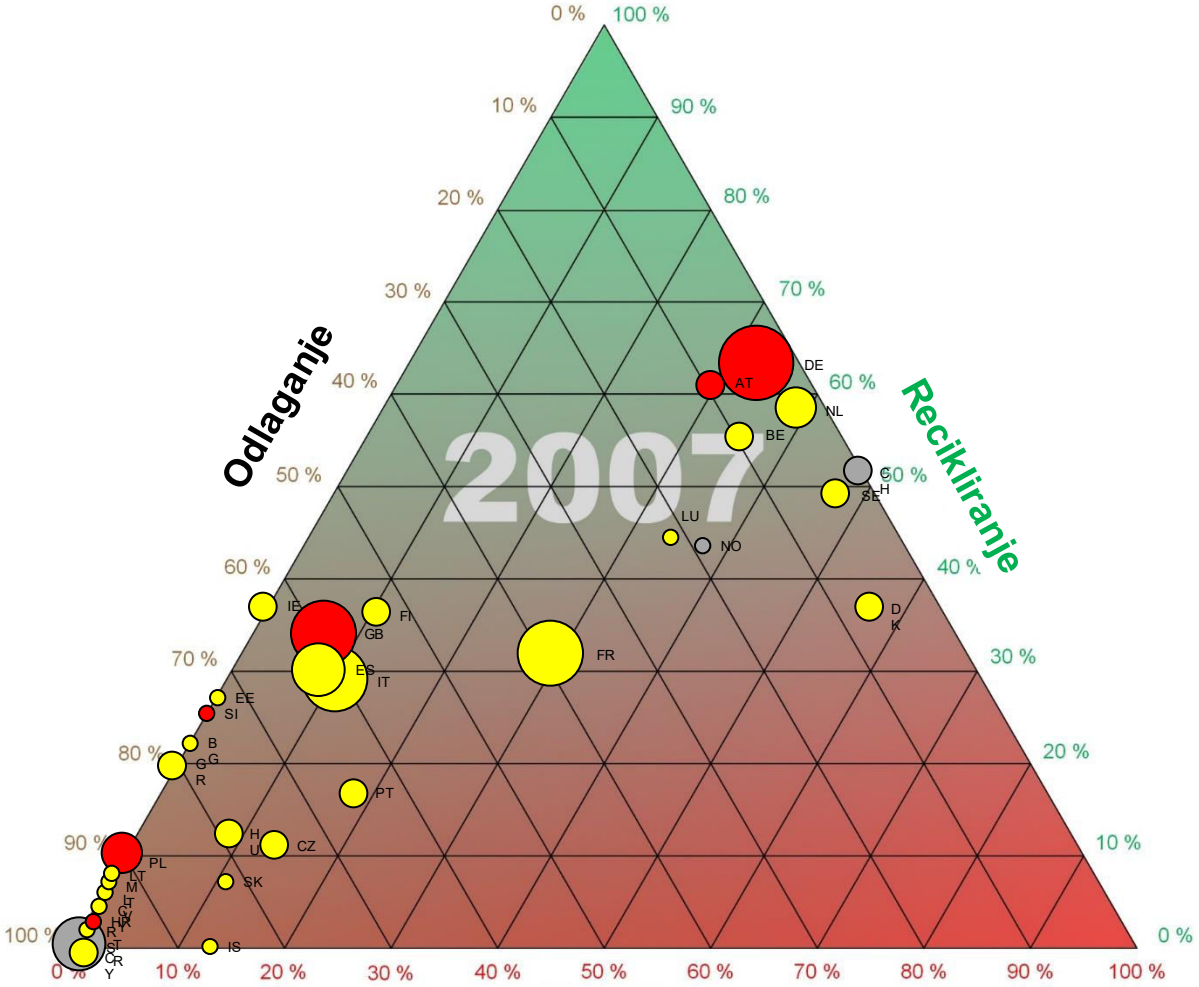


Spaljivanje/ Energetska oporaba



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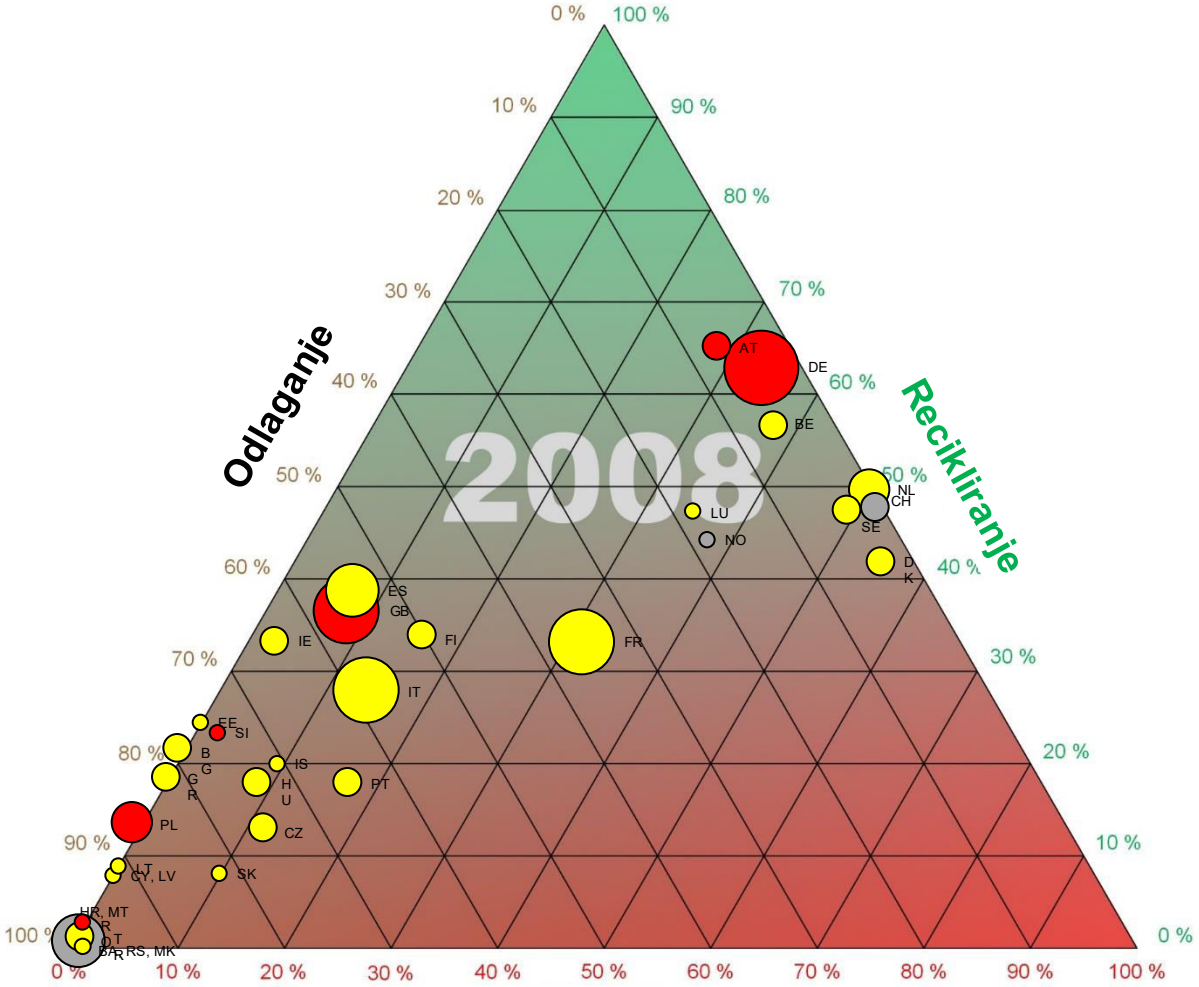

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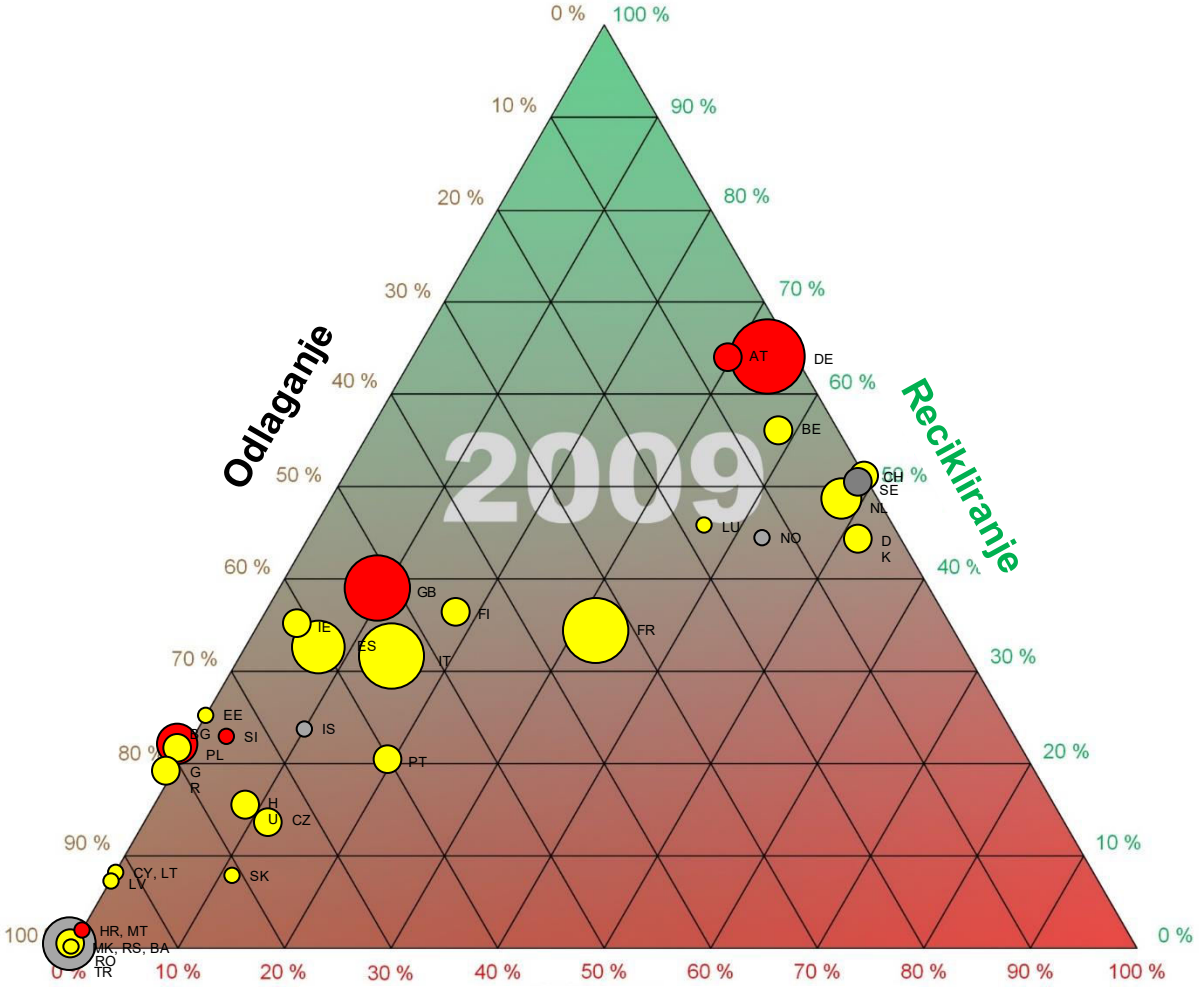

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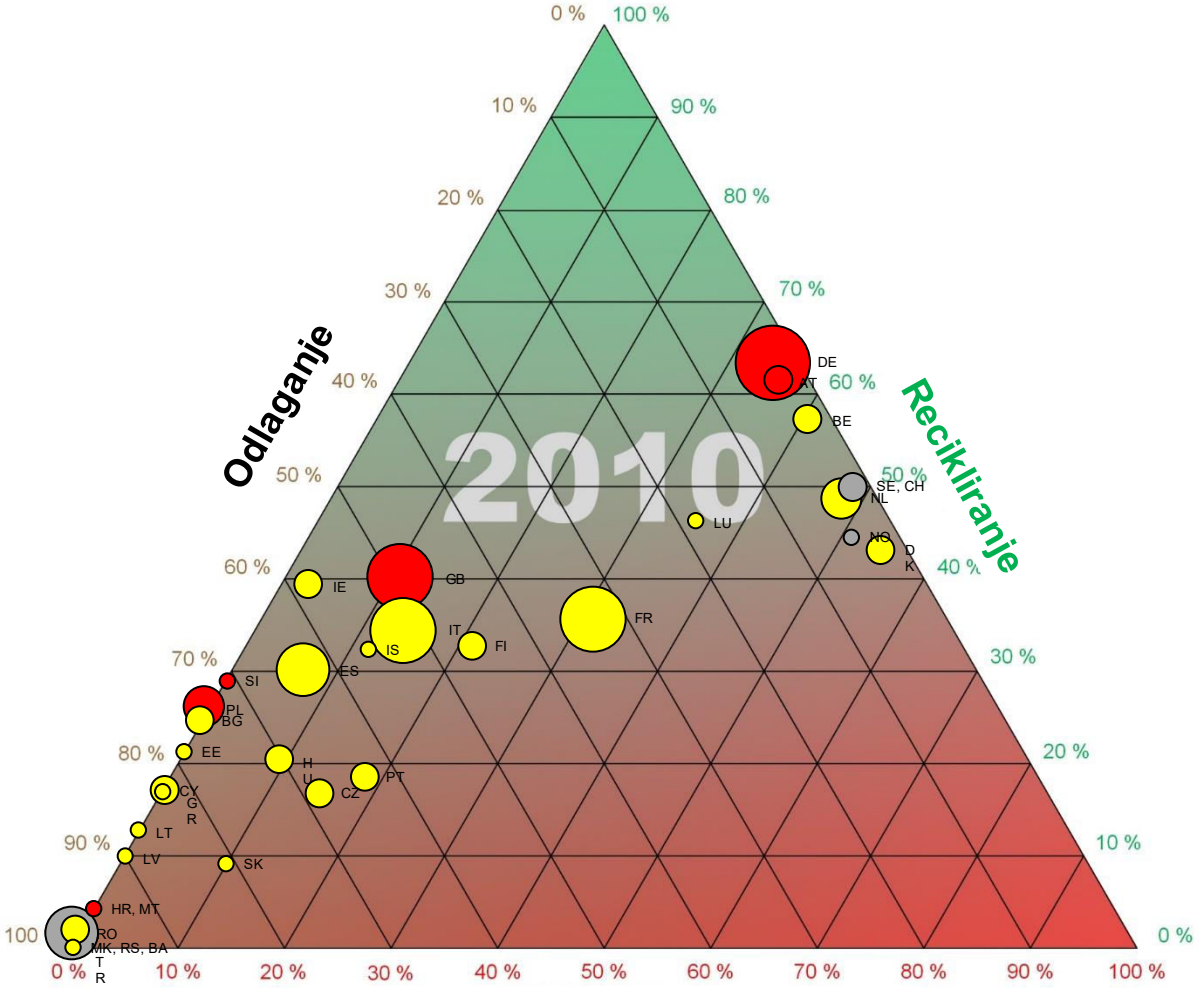

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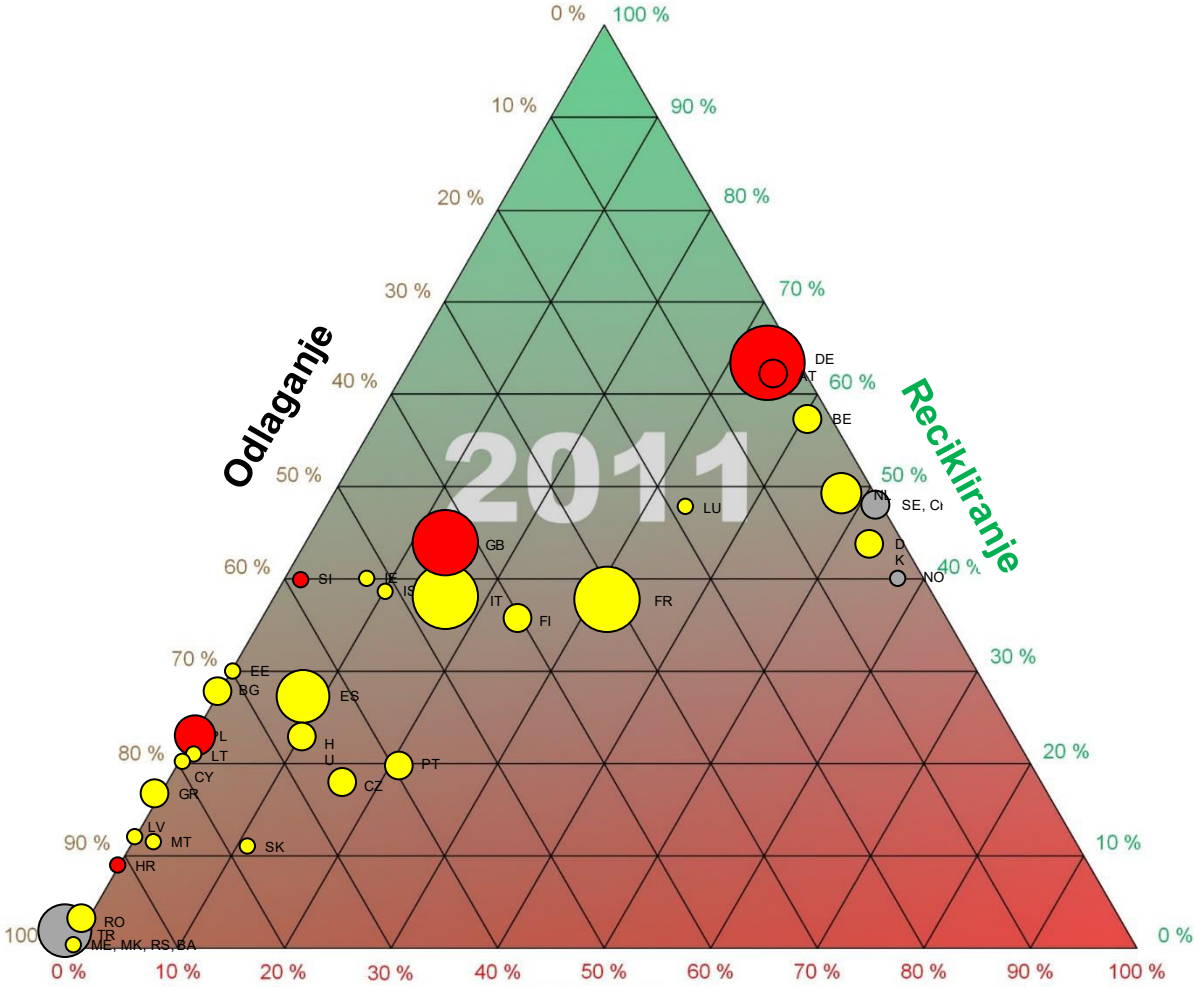

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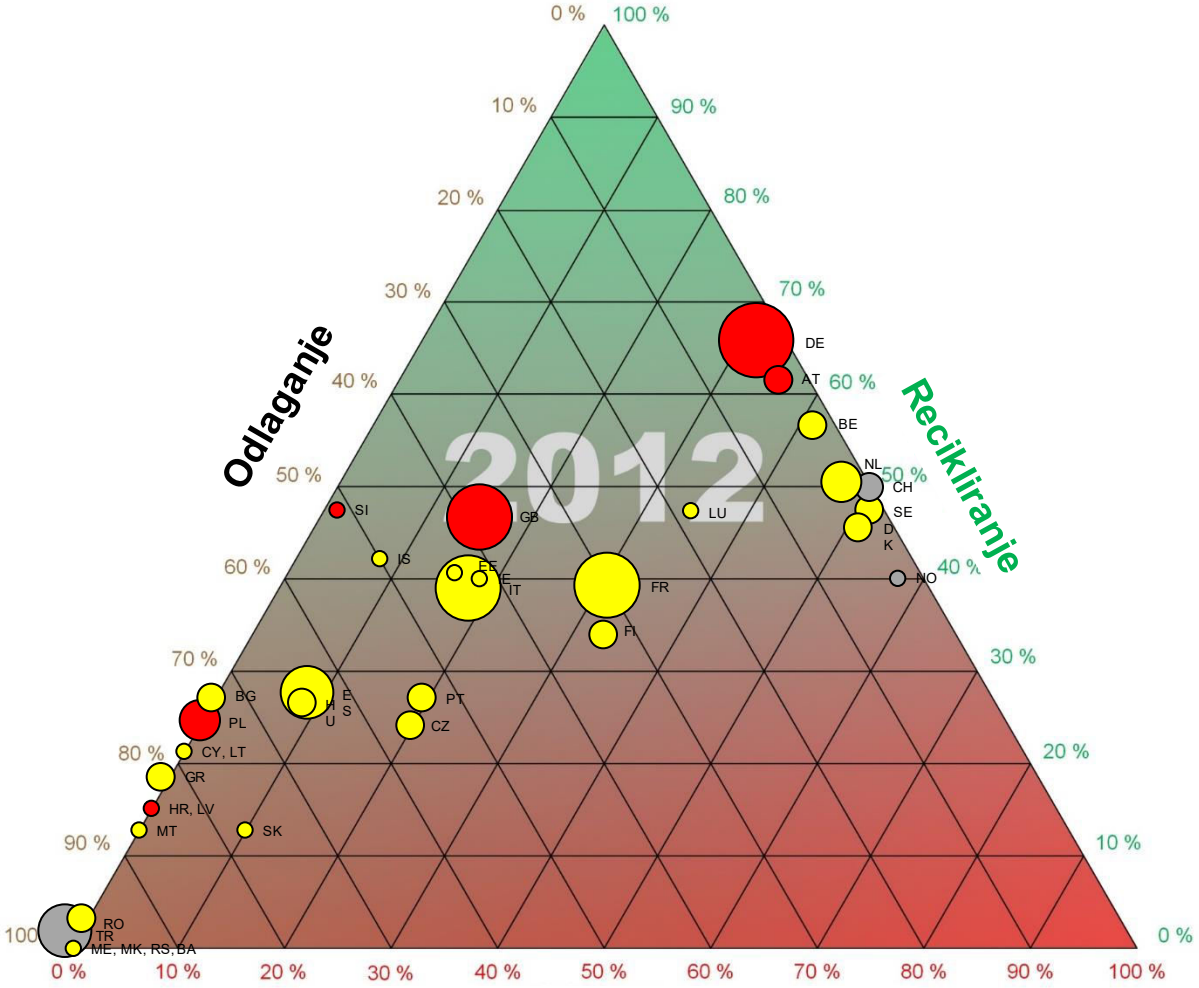

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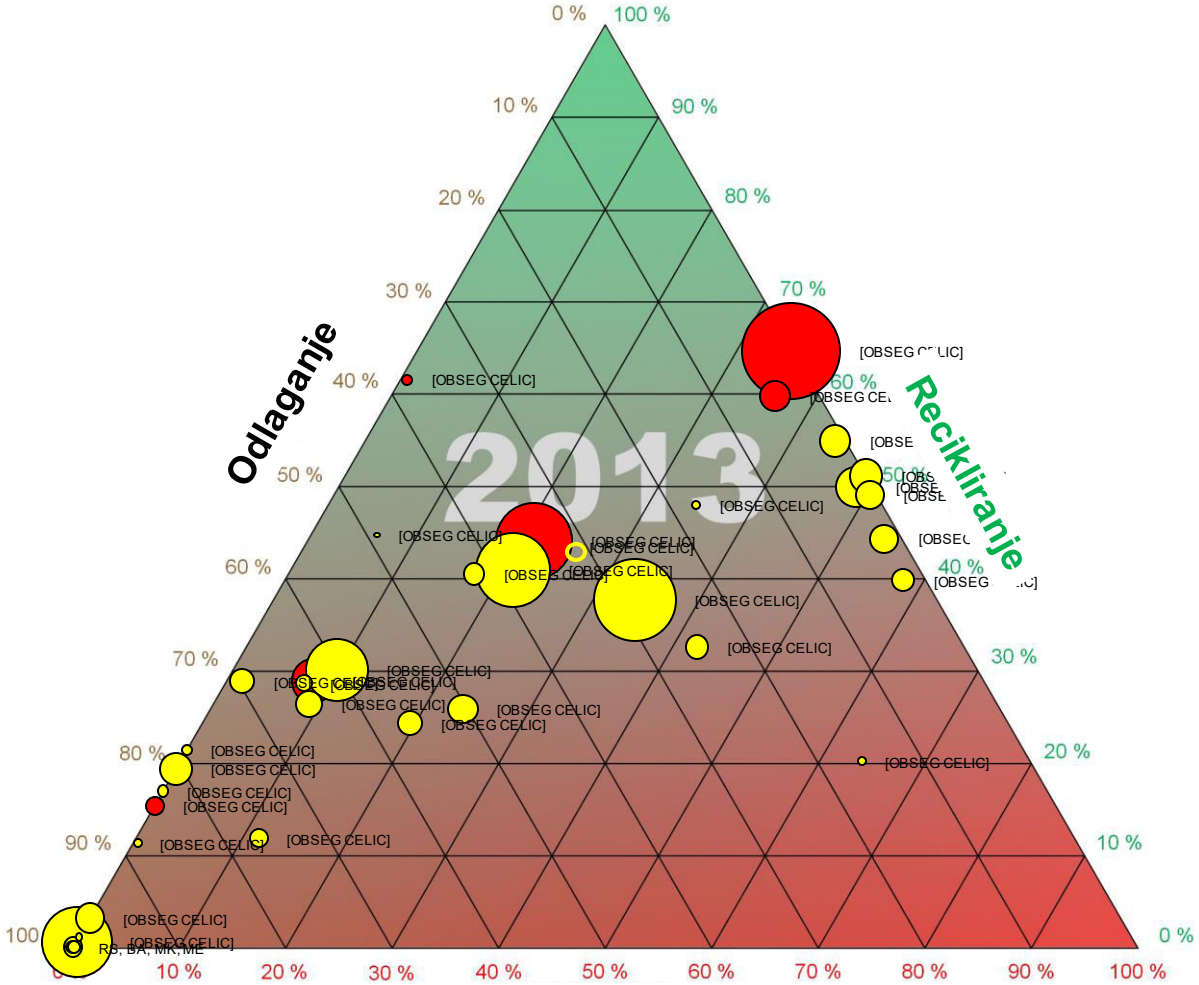

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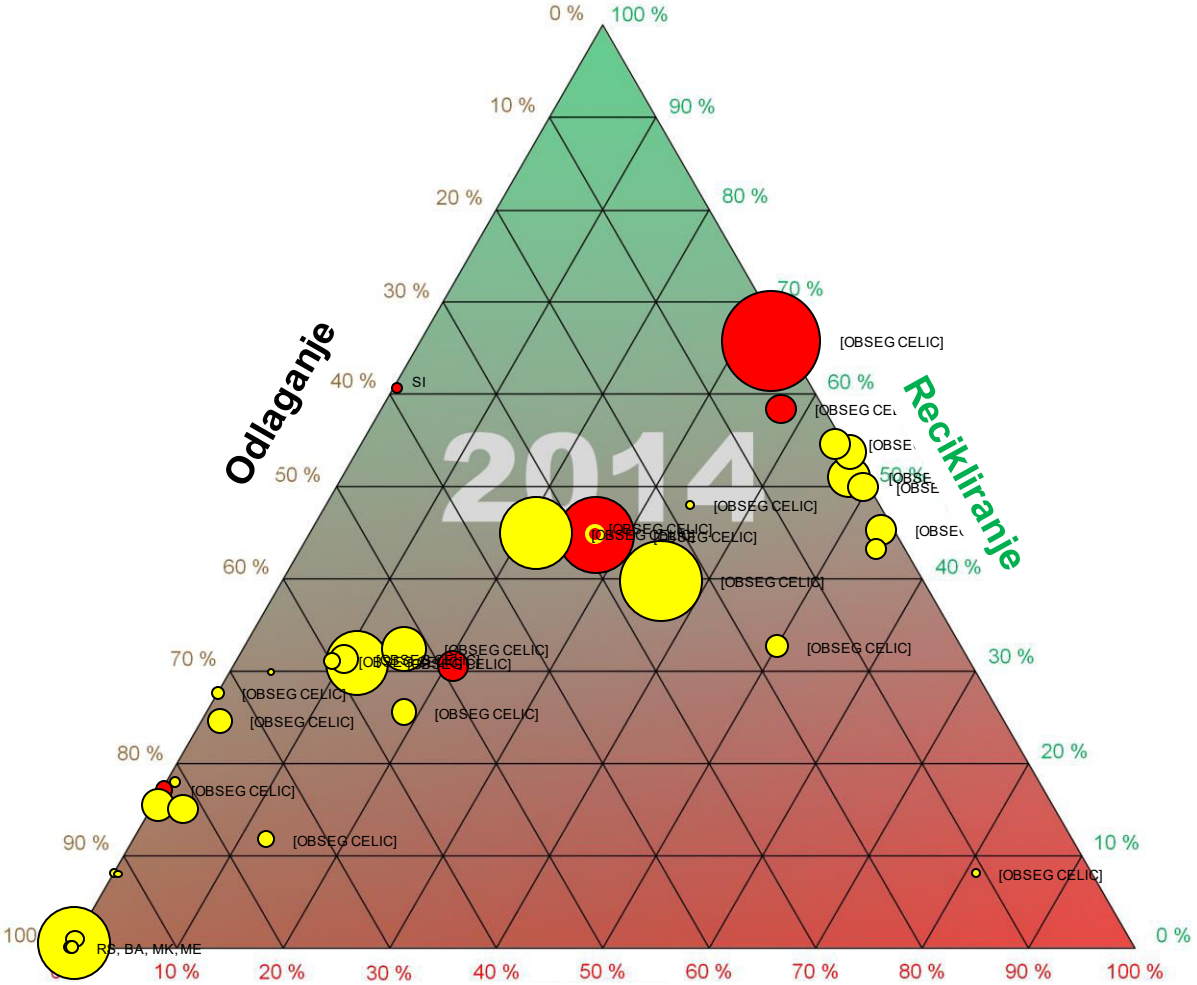

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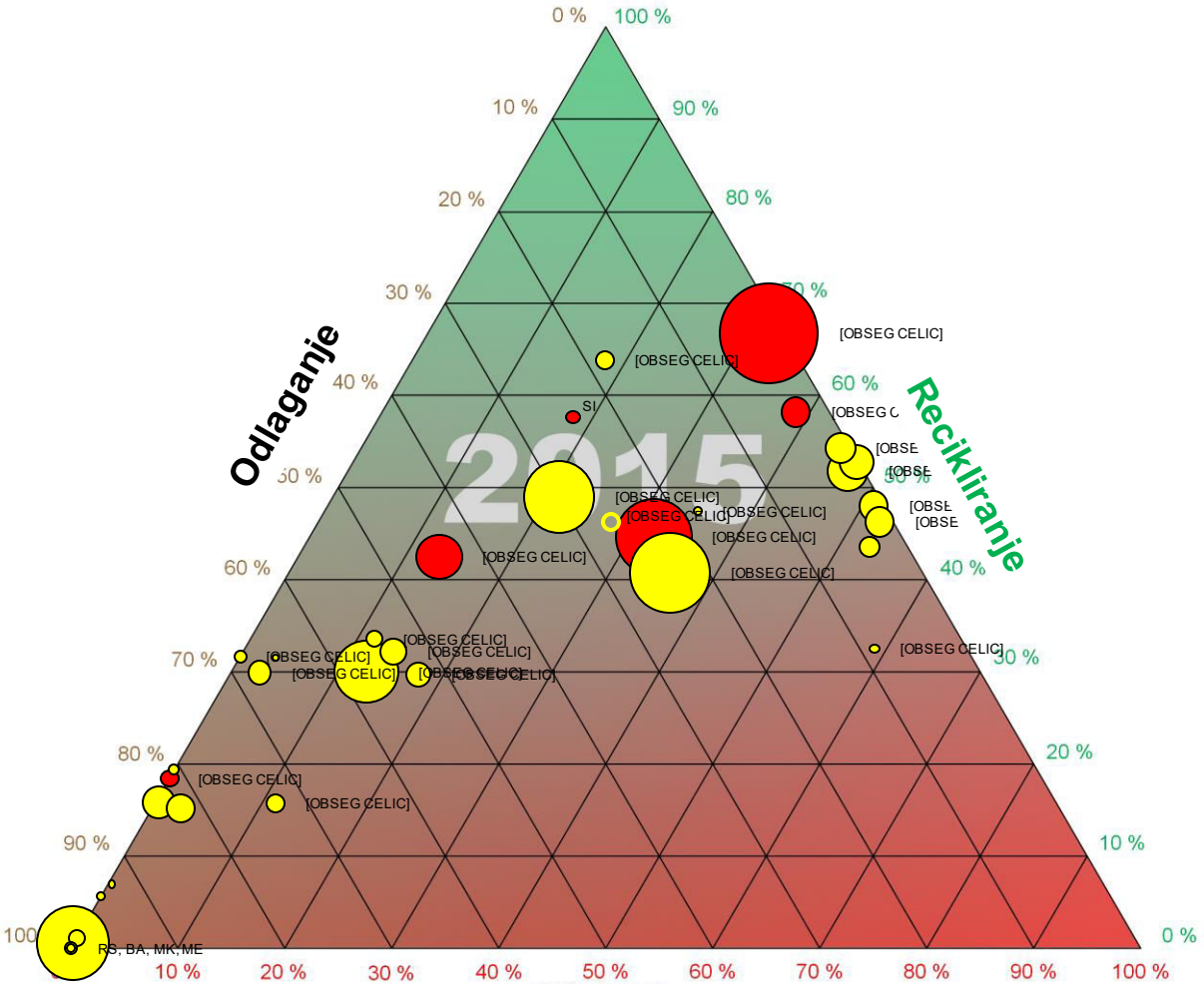

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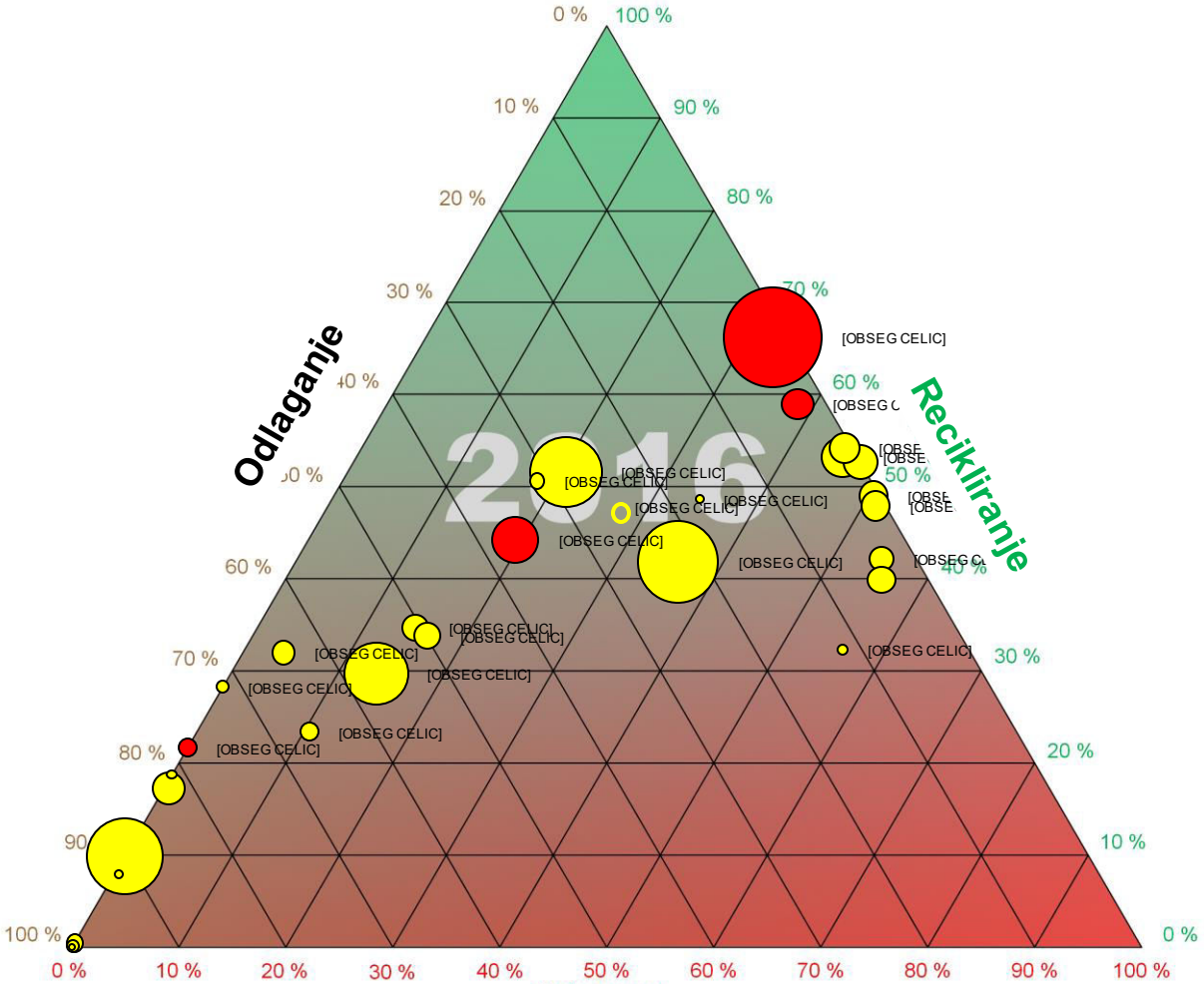
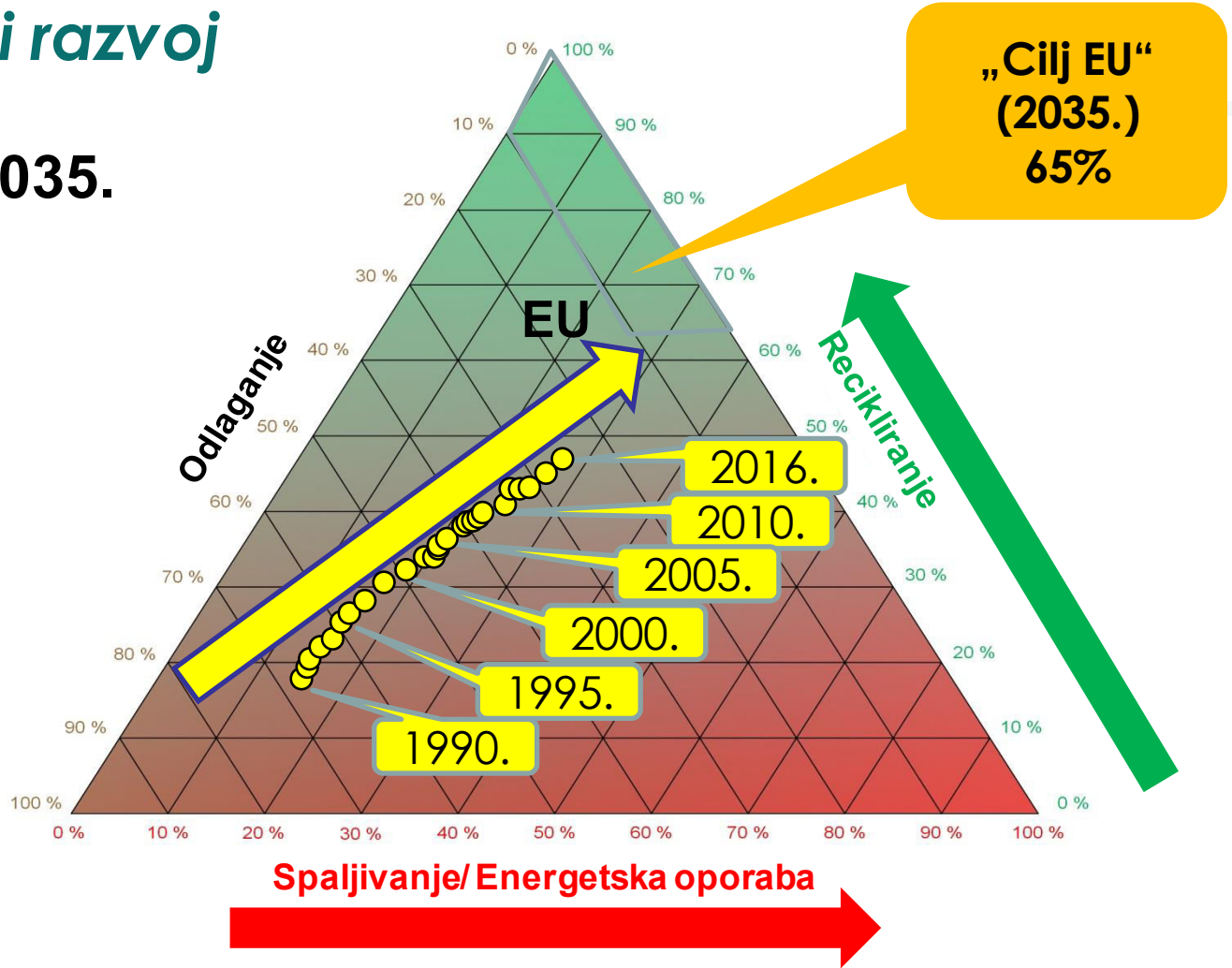
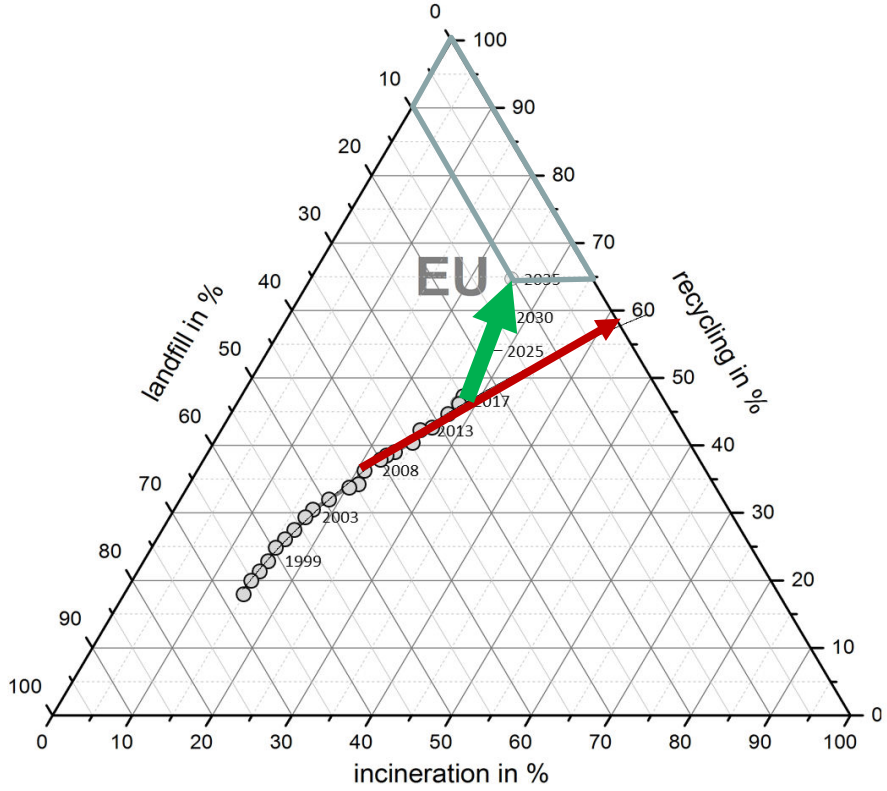


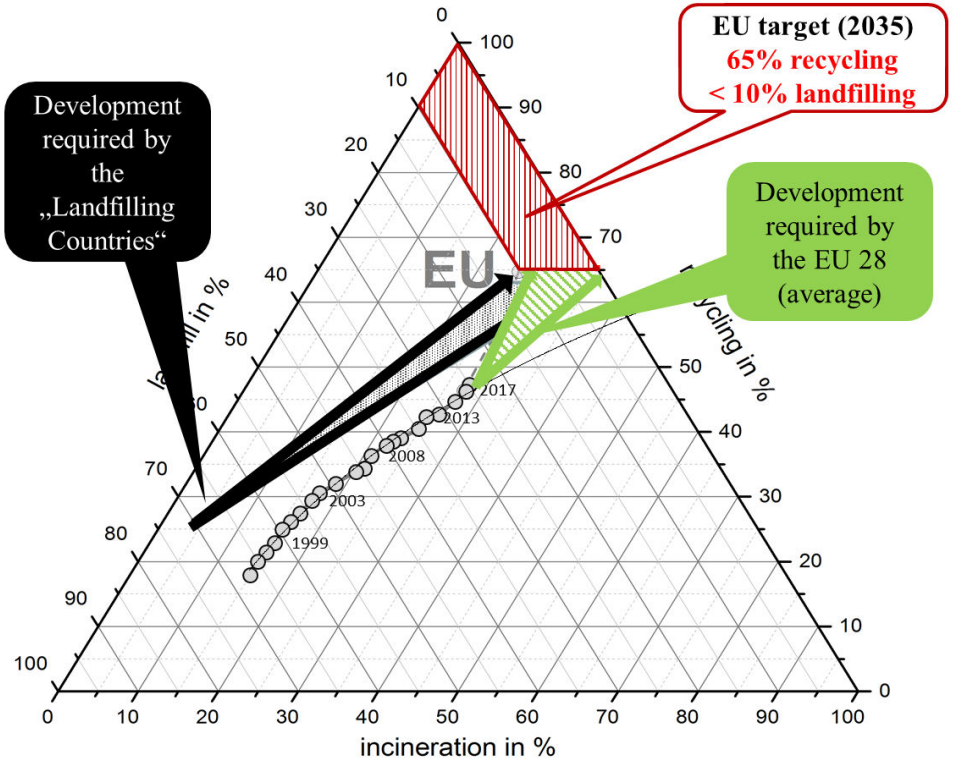
Spaljivanje/ Energetska oporaba

Povezani razvoj

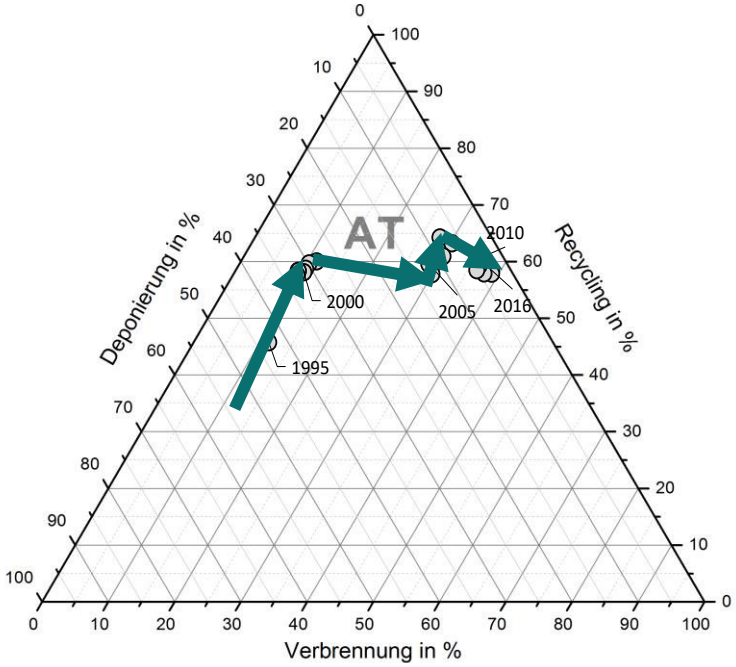
EU: 1990.-2035.

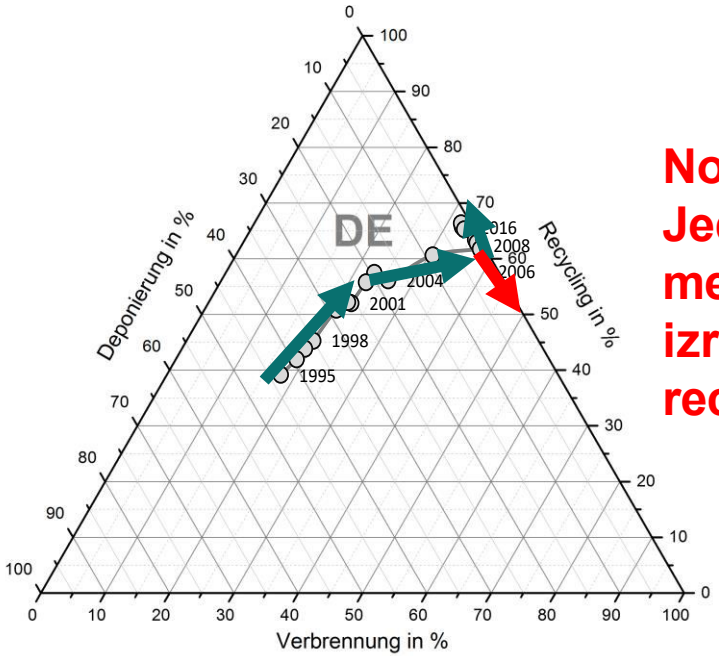



EU
2035
2030
2025
2017
2013
2008
2003
1999
landfill in %
recycling in %
incineration in %


EU target (2035)
65% recycling
< 10% landfilling
Development required by the „Landfilling Countries“
Development required by the EU 28 (average)
EU
2017
2013
2008
2003
1999
incineration in %

„Države oporabitelji“





Novi paket: Jedinstvena metoda za izračun stope reciklaže!

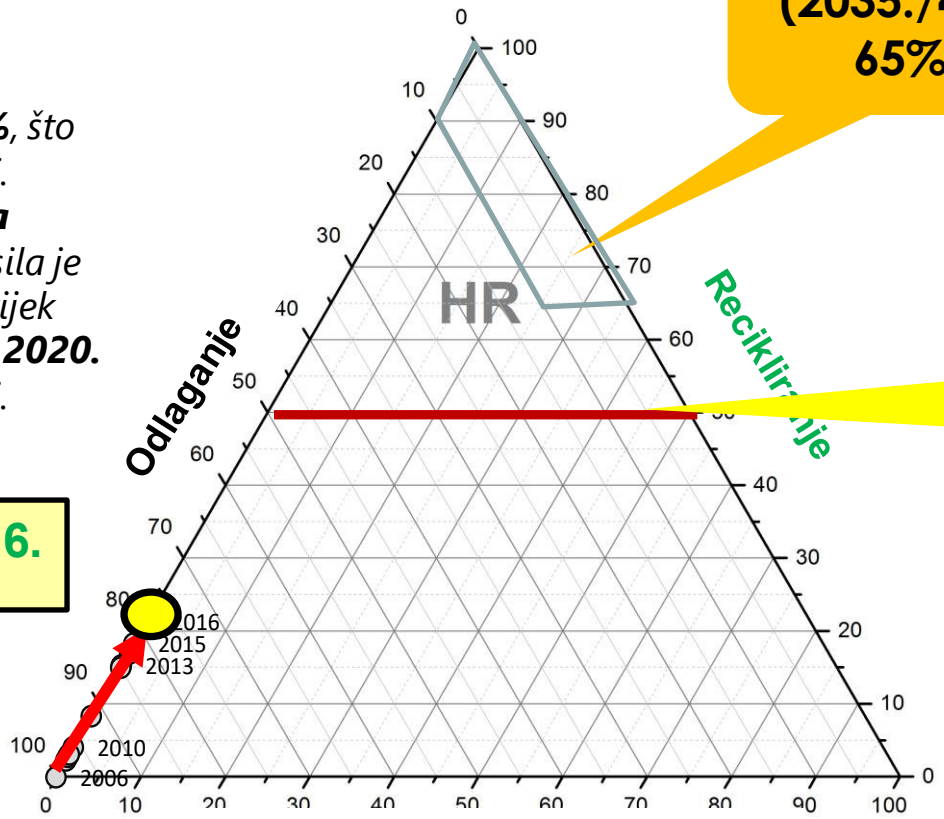
Primarna selekcija i sortiranje KO nisu „recikliranje“!

Pozitivan trend i u HR

HAOP, 2018.

*„...Time je stopa oporabe komunalnog otpada u **2017.** godini iznosila **24%**, što je za 3% više nego u 2016. godini. Stopa **recikliranja** komunalnog otpada iznosila je također **24%** što je još uvijek niže od ciljanog udjela za **2020.** godinu koji sukladno čl.55. ZOGO iznosi **50%**. ...„*

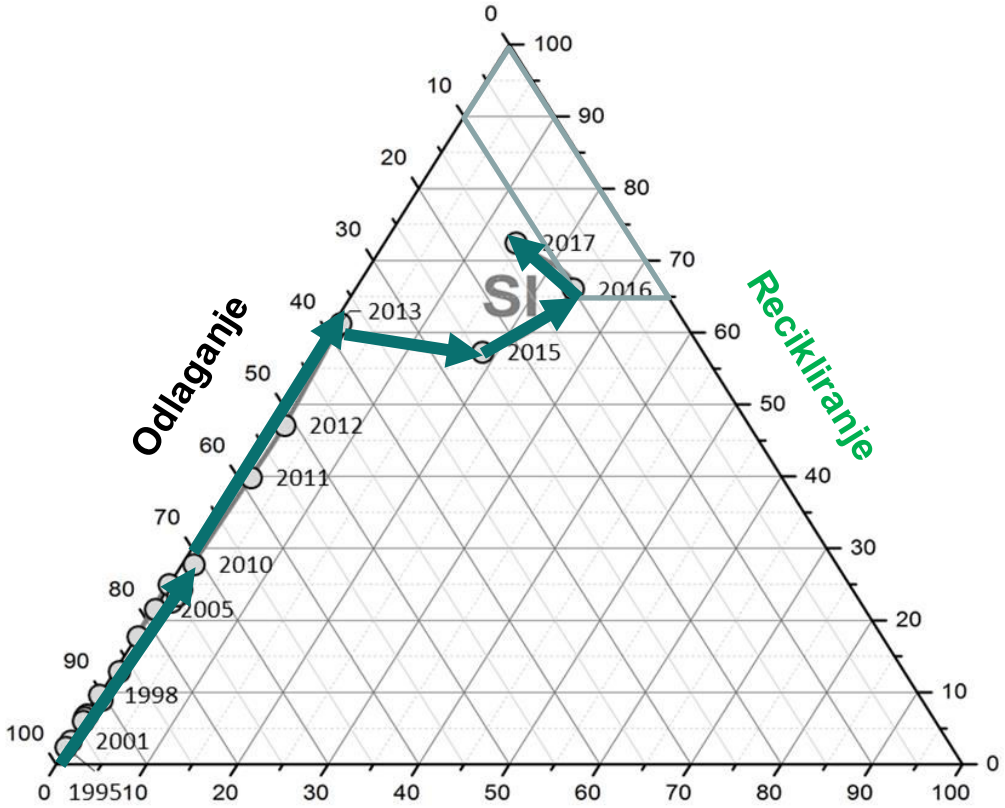
21% u 2016.
Eurostat, 2018



„Cilj EU“ (2035./40.) 65%

Trenutni cilj HR (2020.) 50%

Dinamičan razvoj i odličan primjer = Slovenija

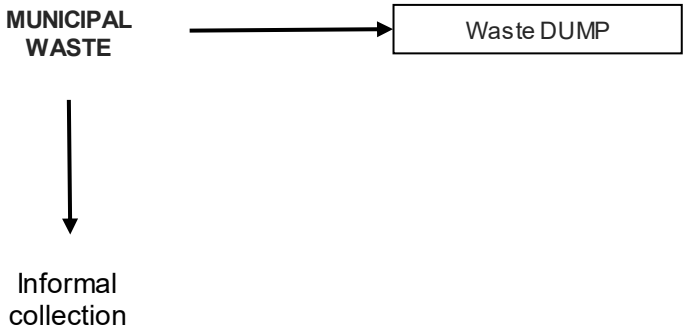


Tehničko-tehnološki razvoj sustava gospodarenja komunalnim otpadom

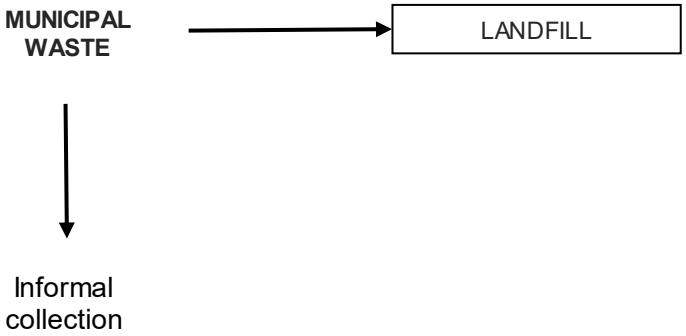
Pomberger & Sarc, 2017./2018.

Abfallverwertungstechnik & Abfallwirtschaft

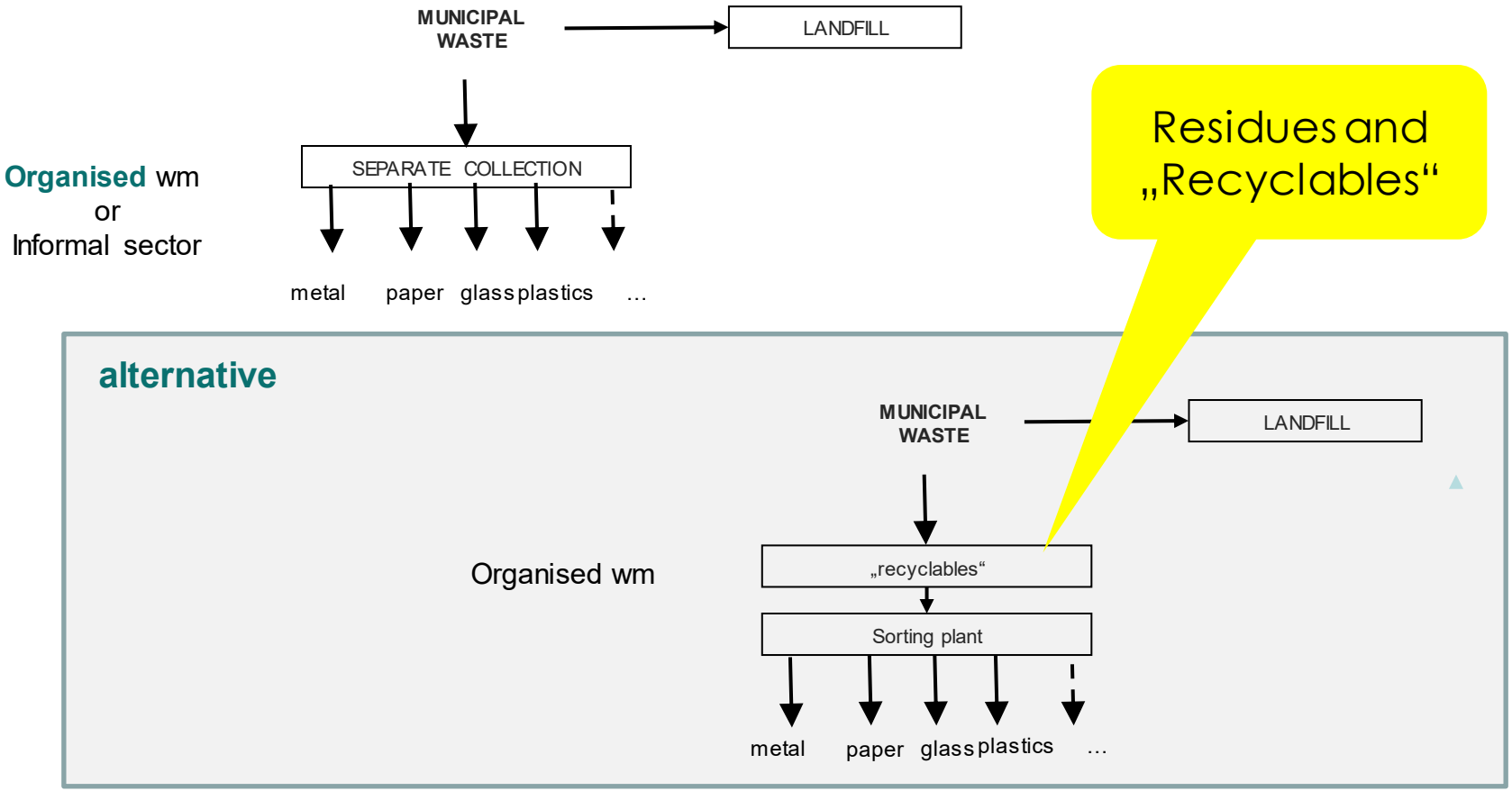
1. Level of waste treatment



2. Level of waste treatment

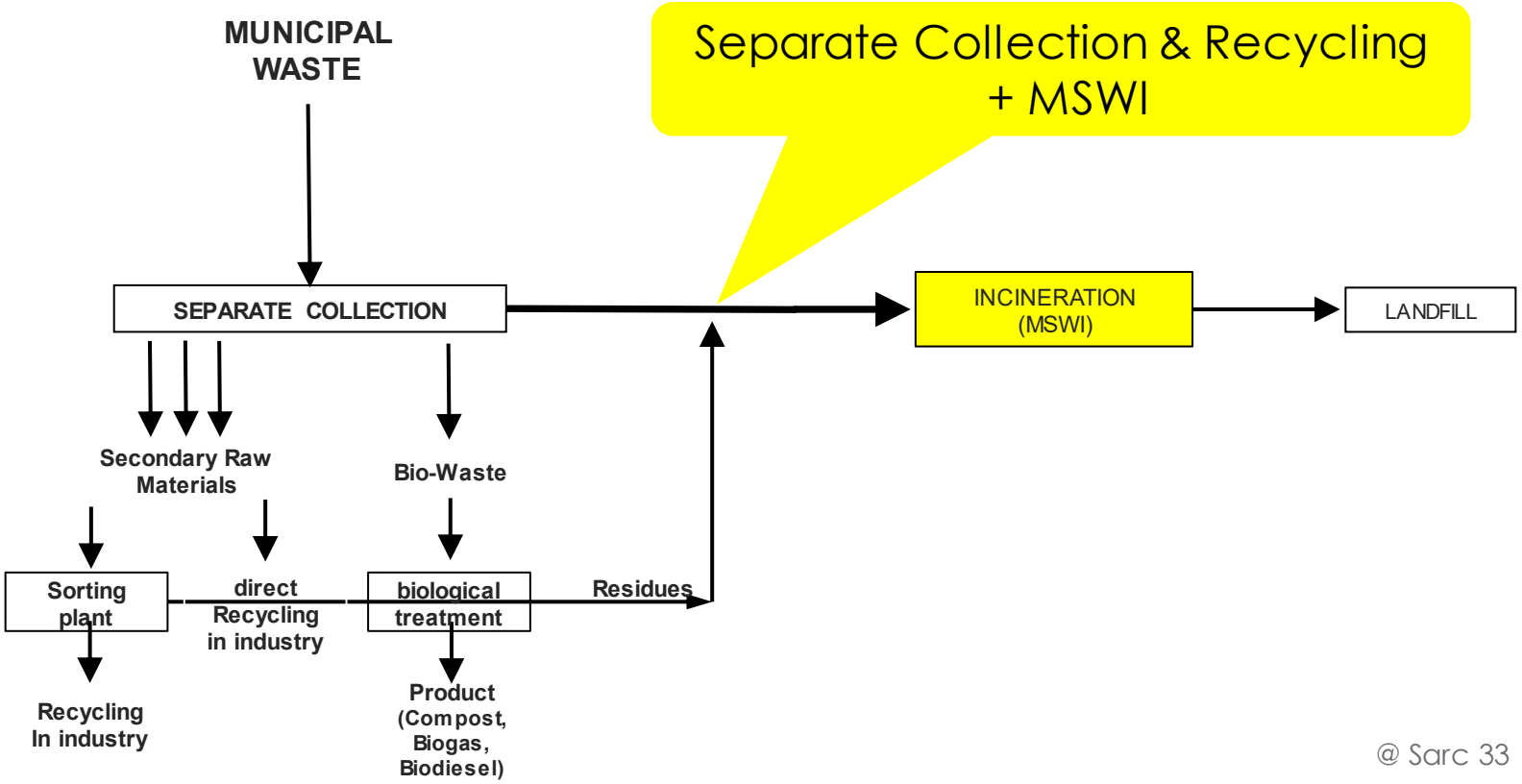


3. Level of waste treatment



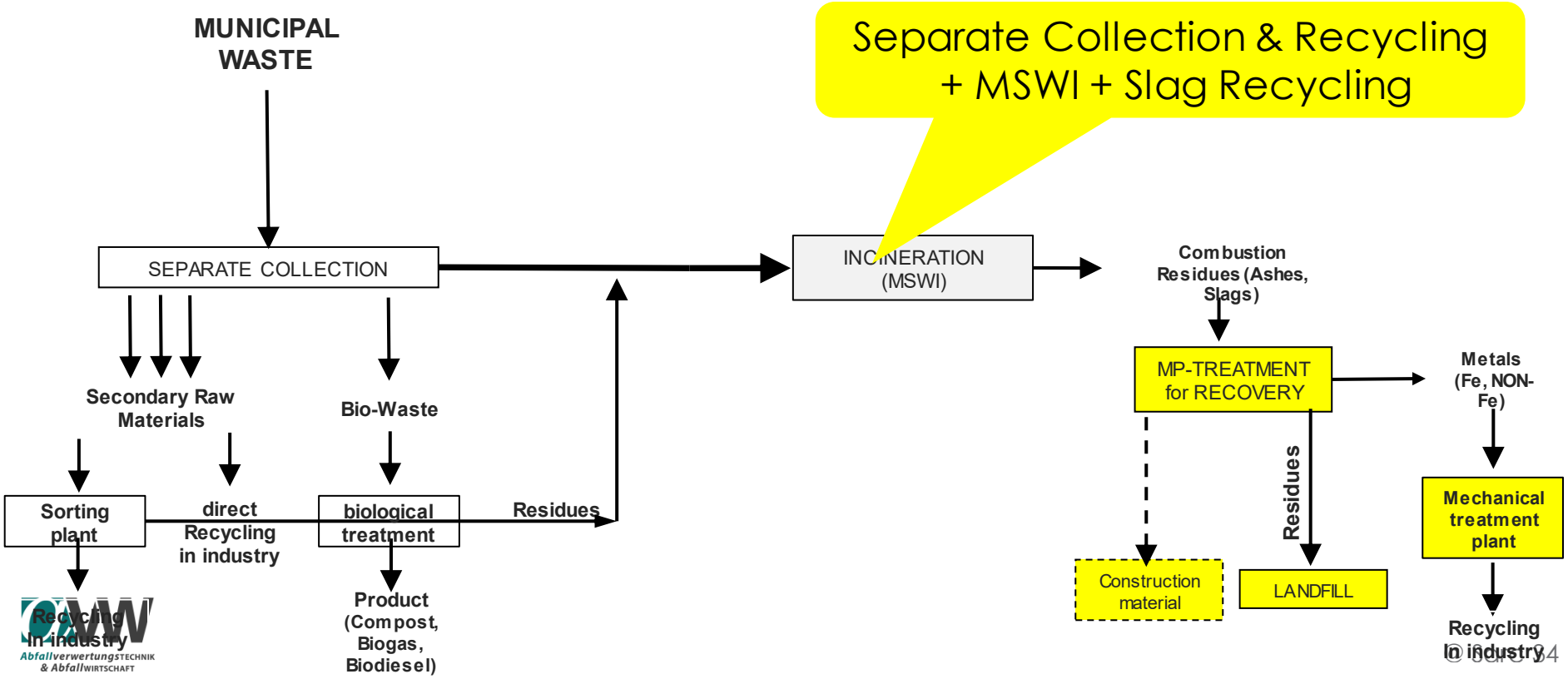
4. Level of waste treatment

MSWI = Municipal Solid Waste Incinerator



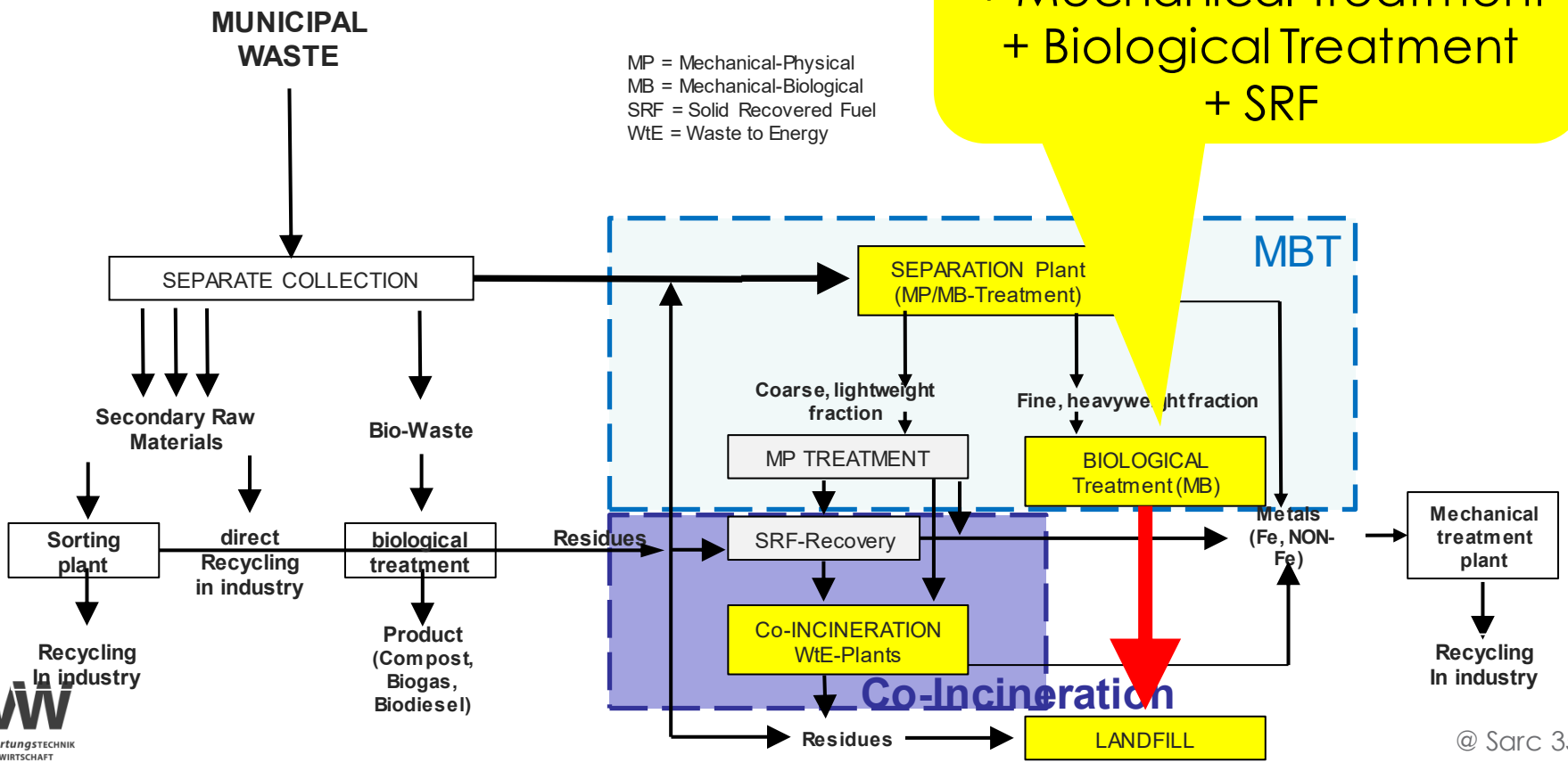
5. Level of waste treatment

MSWI = Municipal Solid Waste Incinerator



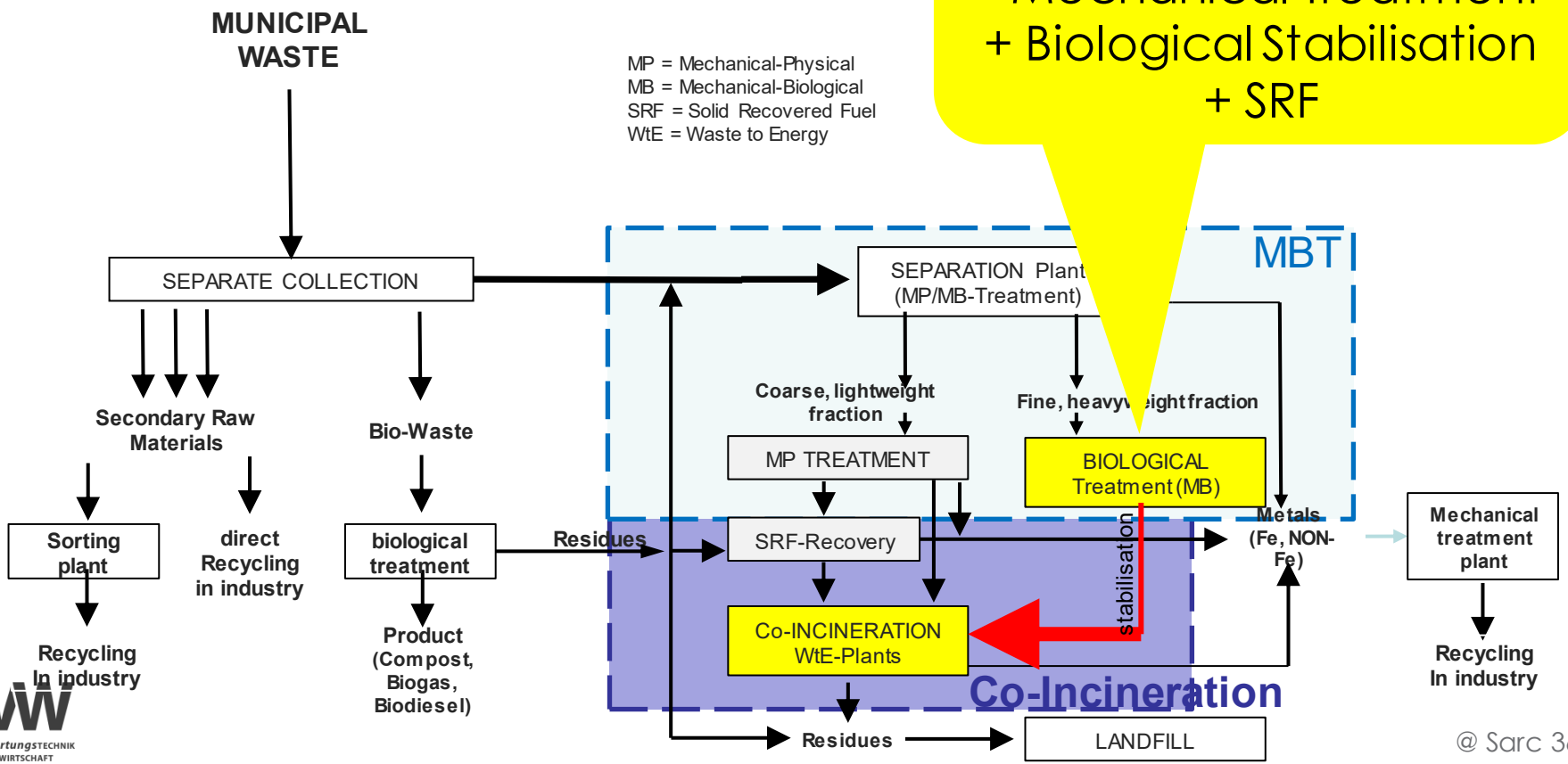
6. Level of waste treatment

Separate Collection &
Recycling
+ Mechanical Treatment
+ Biological Treatment
+ SRF



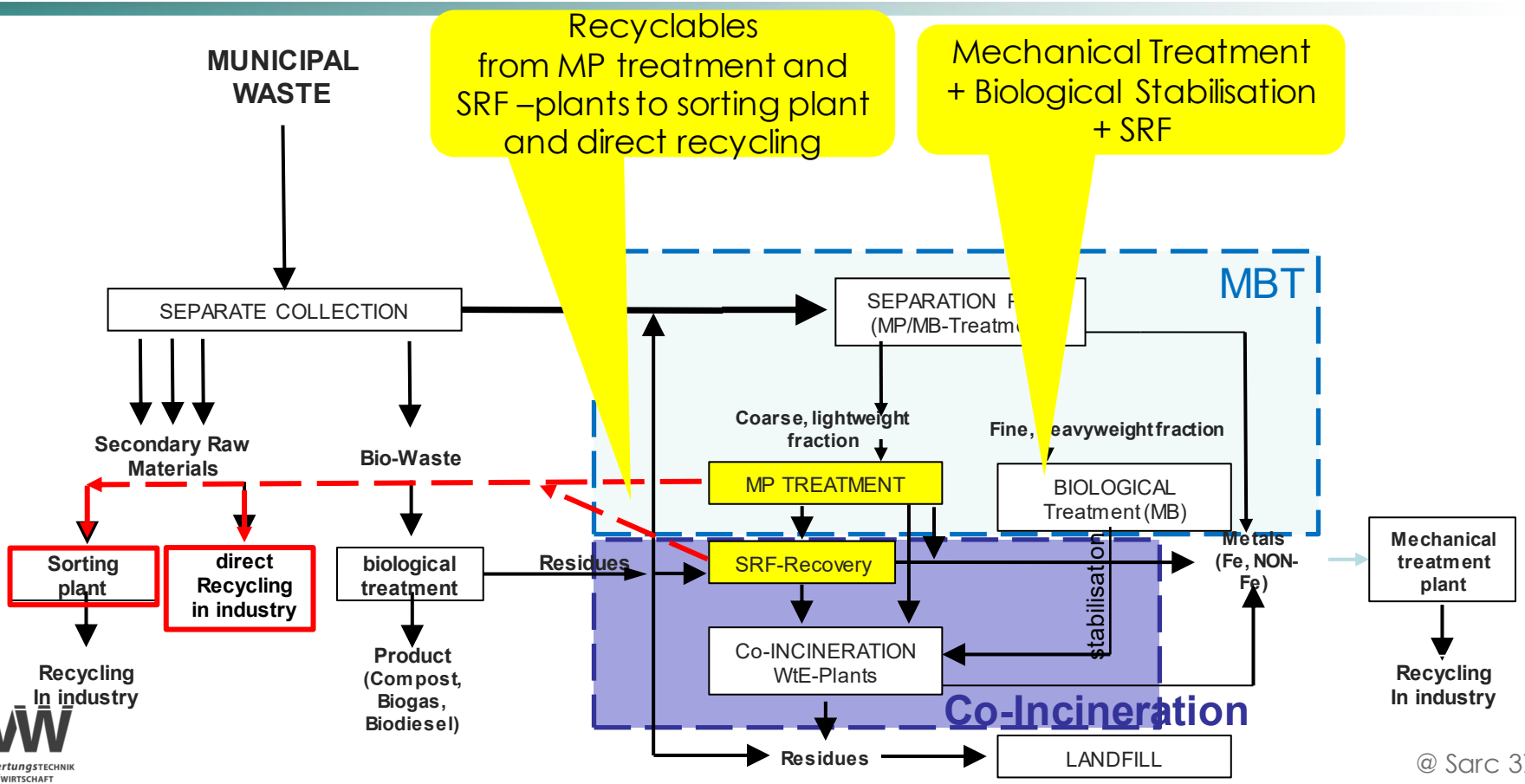
7. Level of waste treatment

Separate Collection & Recycling
+Mechanical Treatment
+ Biological Stabilisation
+ SRF



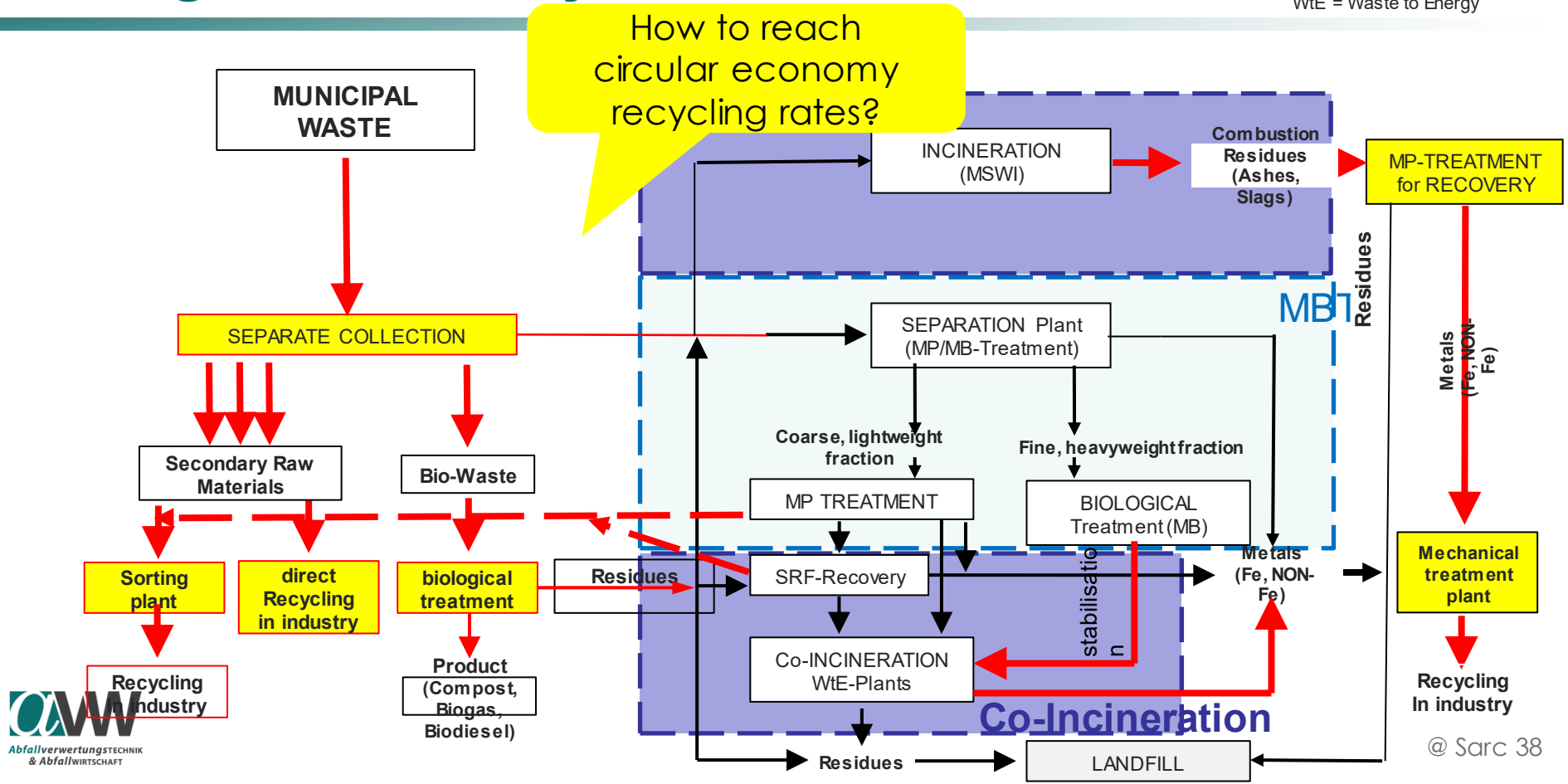
8. Level of waste treatment

MP = Mechanical-Physical
MB = Mechanical-Biological
SRF = Solid Recovered Fuel
WtE = Waste to Energy



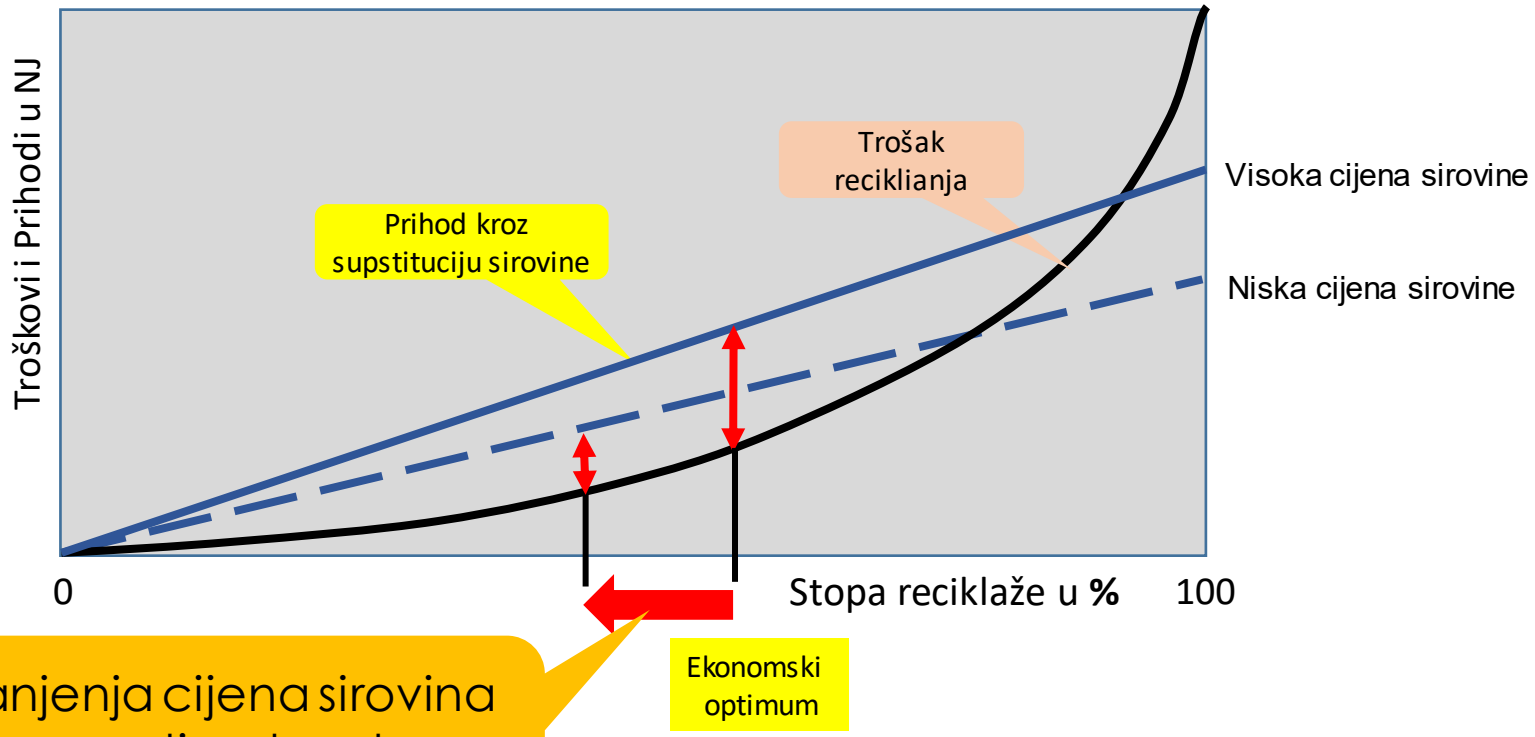
9. High end - reality - combinations

MP = Mechanical-Physical
MB = Mechanical-Biological
SRF = Solid Recovered Fuel
WtE = Waste to Energy



Ekonomski i ekološki optimum

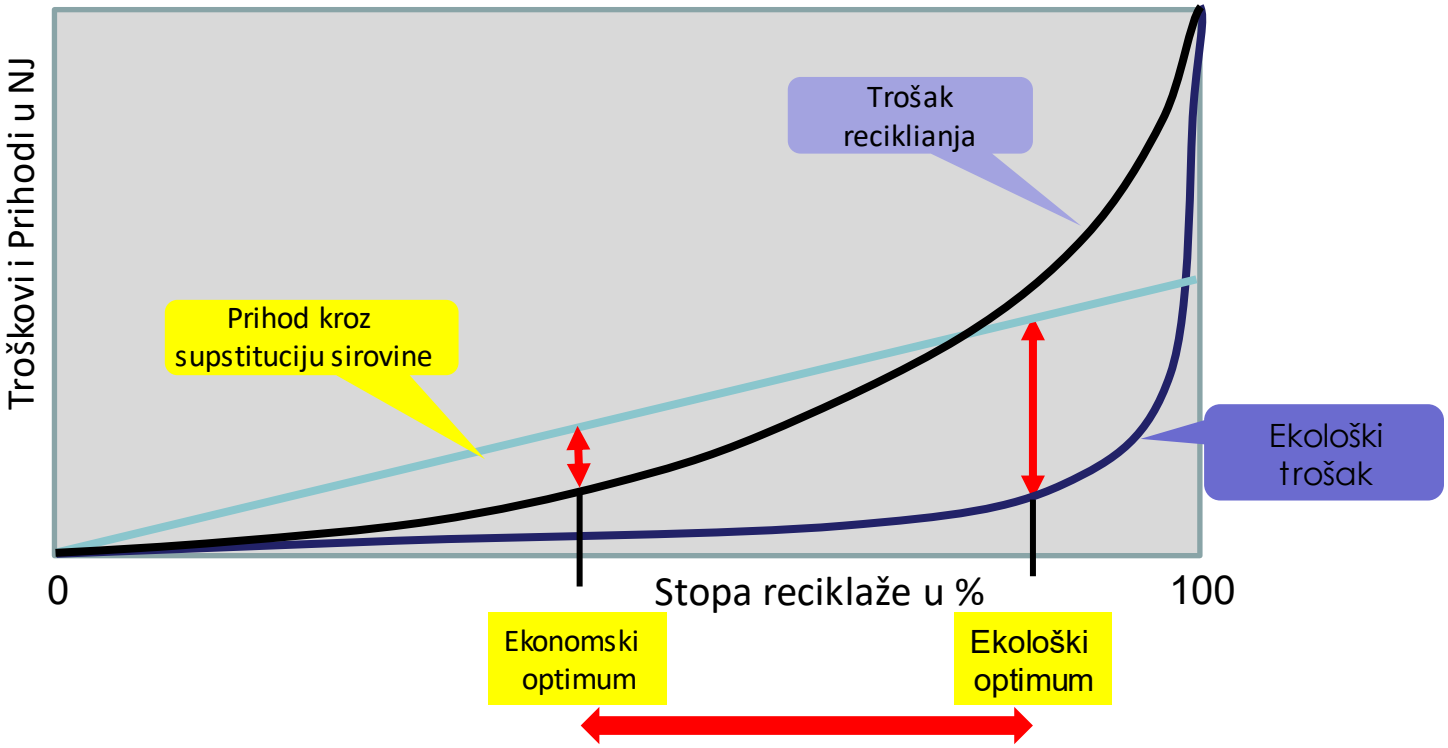
Ekonomski optimum



Kod smanjenja cijena sirovina smanjuju se optimalna stopa reciklaže i prednosti reciklaže!

Pomberger, R. (2016.) Recy & DepoTech 2016.

Glavni aspekt između ekonomskog i ekološkog optimuma



Koliko nam vrijedi viši standard?
Tko će platiti razliku?

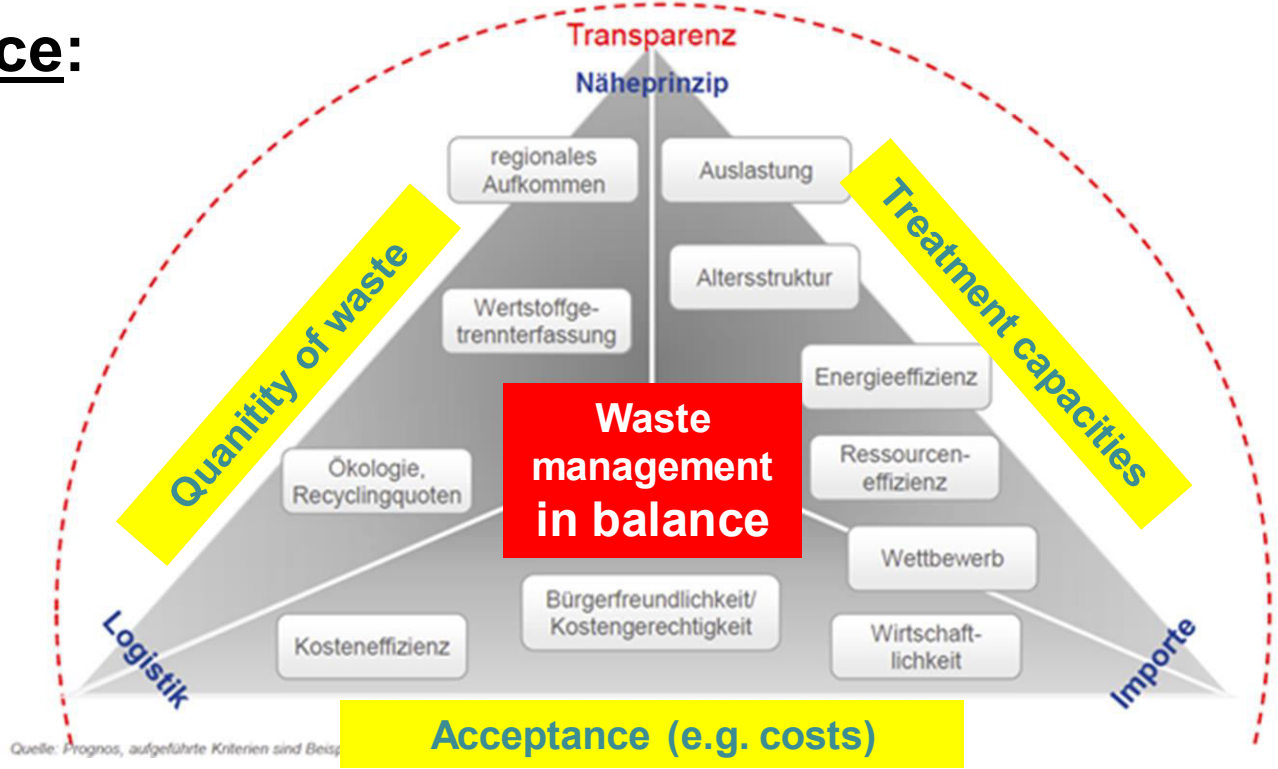
Pomberger, R. (2016.) Recy & DepoTech 2016.

Zaključak – odabrani aspekti

Ravnanje z odpadki v sodobni družbi

System in balance:

1) **Acceptance**
2) **Quantity**
3) **Capacities**



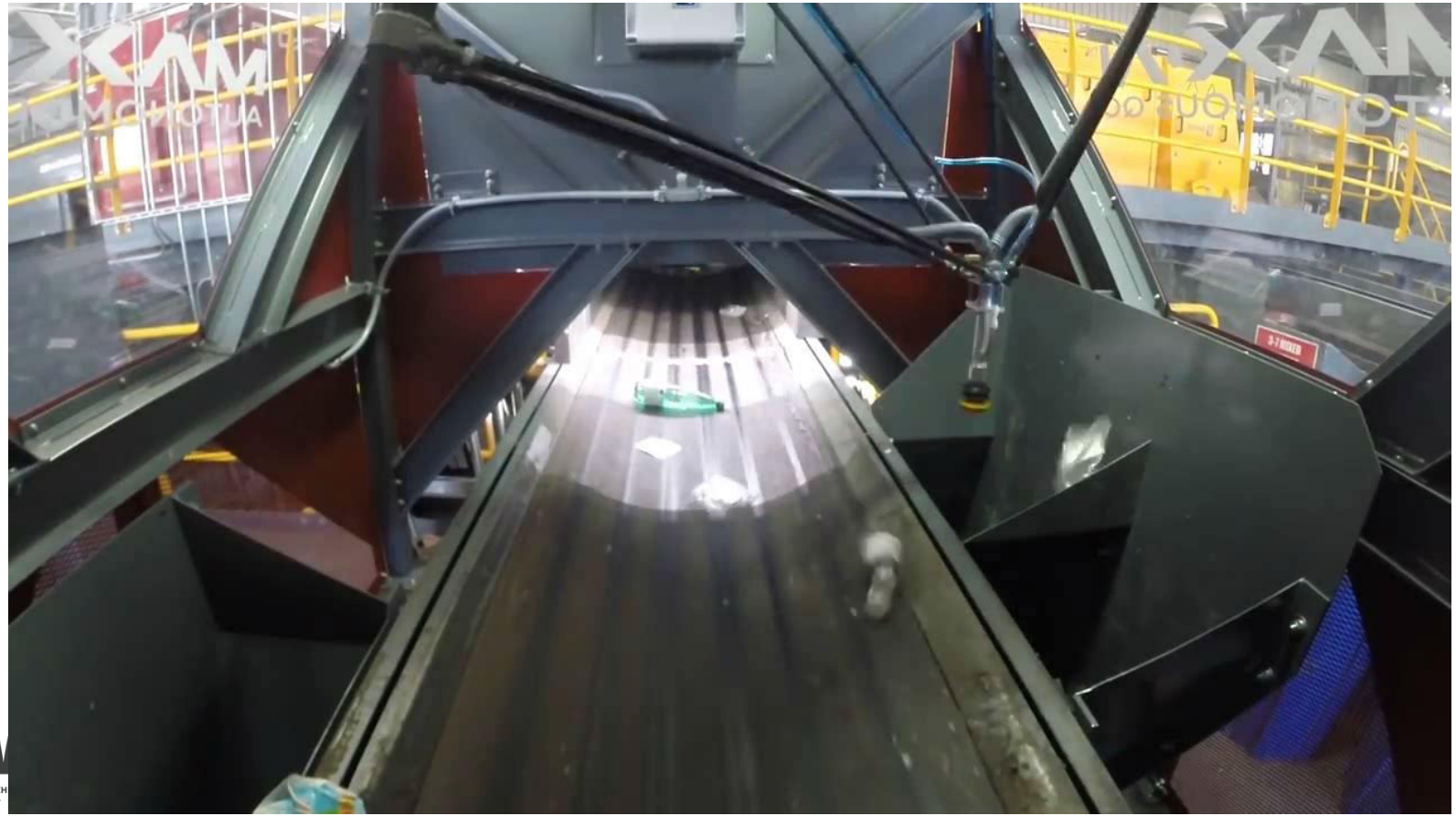
Quelle: Prognos, aufgeführte Kriterien sind Beisp

China – from green fence to national sword

Recycling capacities in EU must be built up!

Abfallverwertungstechnik & Abfallwirtschaft

New modern technologies!



SMART Waste Factory 4.0

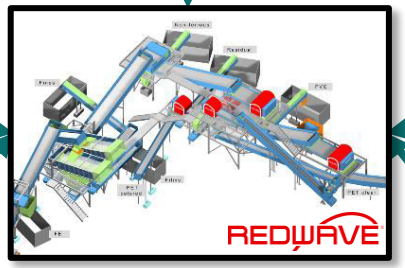
Machines

Machine data

Characterisation
Quality
Sorting

Mixed Input Quality

Impurities, composition



Quality

Purity, Output, Throughput

Chemical parameters

„Smart Waste Factory 4.0“

Impurities

Secondary Raw Materials & Fuels

⇒ **Digital cross-linking**
⇒ **Online/ontime waste data and plant control**
⇒ **Cooperation men-machine**

New markets for regranulates

Prognosis 2025

+10 Mio. t/a

more plastic granulates

https://recy[illegible]al.eu/Archive/47349

We have to bring them back into the products

More co-incineration plants

Less MSW incinerators

But

more

Co-incineration

and

WtE plants in industry

http://www.enages.at/

Positive Development of Energy Recovery of RDF in Austrian Cement Industry: 1988 - 2018

- Substitution of conventional fuels

  2013: ***72.4%***

  2014: ***75.5%***

  2015: ***76.1%***

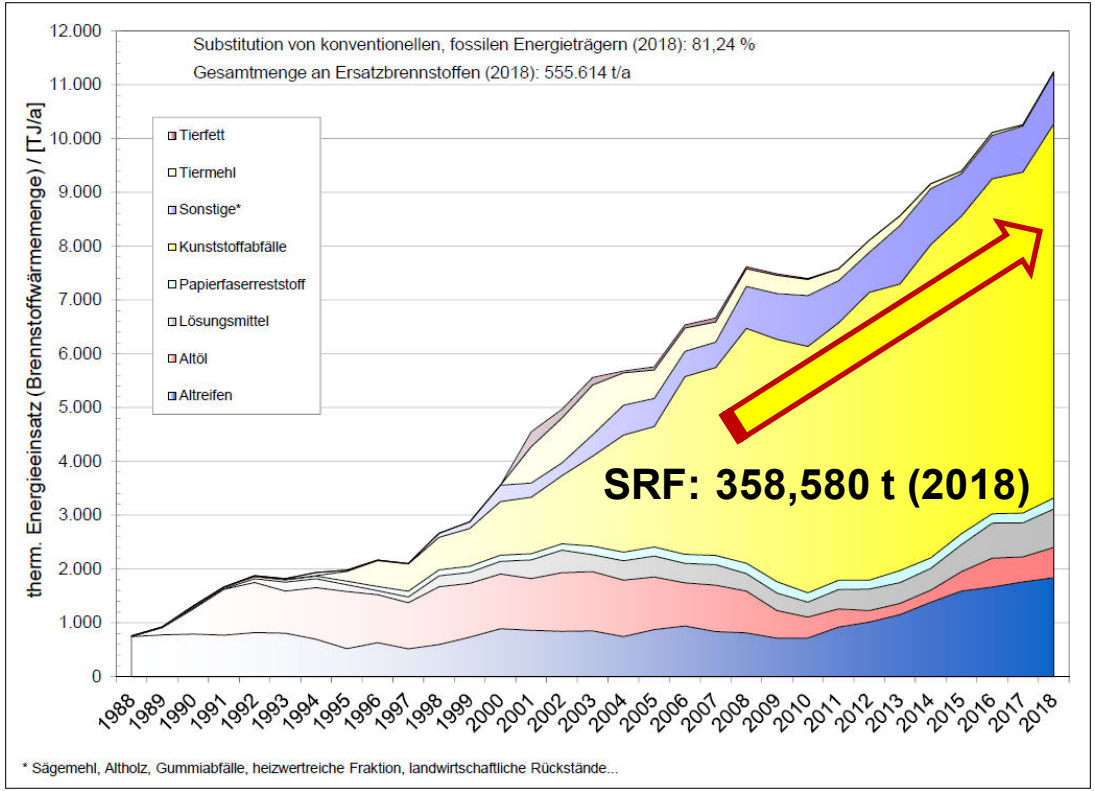
  2016: ***78.2%***

  2017: ***80.6%***

  2018: ***81.2%***

- RDF – total amount 2018:

  555,614 t/a



Quellen: Mauschitz 2018

VÖZ (2015): Zement trägt Verantwortung Nachhaltigkeitsbericht 2014

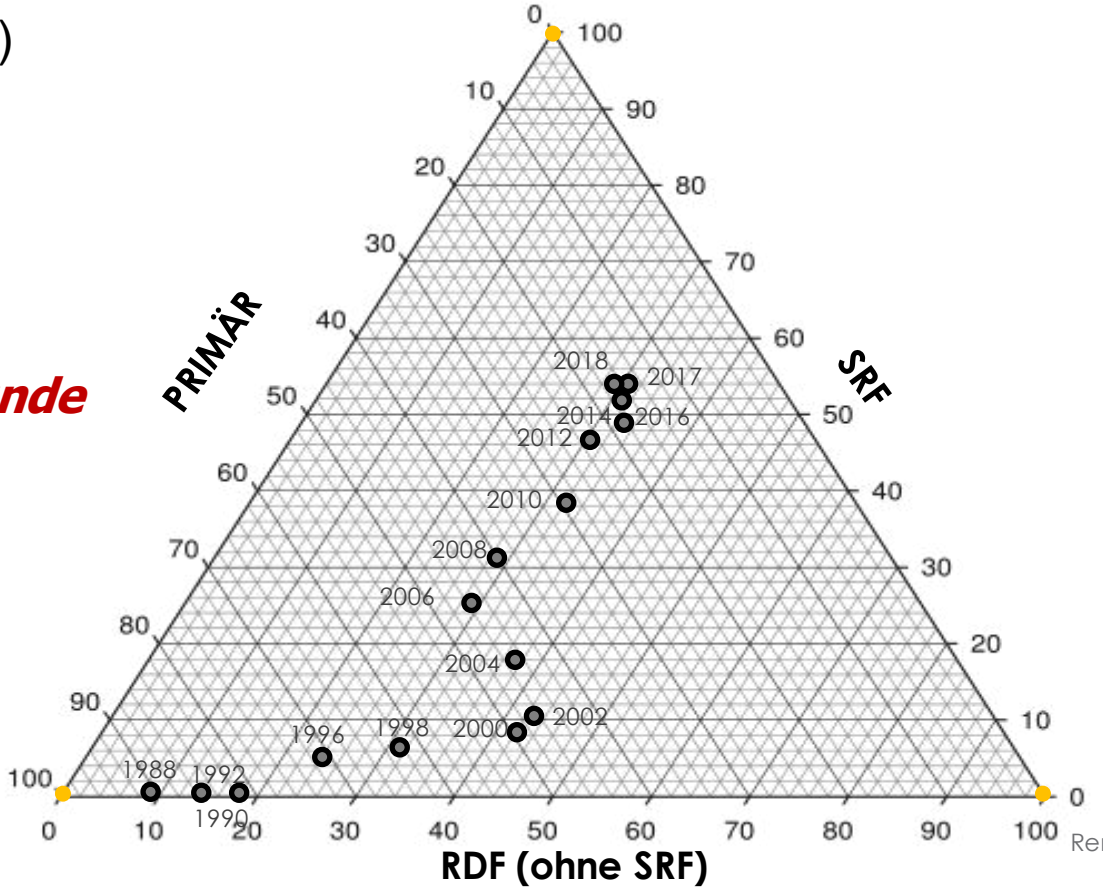
Abfallverwertungstechnik & Abfallwirtschaft

TSR in cement industry and importance of SRF

(mass related % evaluation)

- ***„SRF" (2018):***
  - ***101 kg SRF/$t_{Klinker}$***
  - ***68 kg SRF/t_{Zement}***
  - ***6.18 t/Betriebsstunde***

Auswertung basiert auf Daten aus Mauschitz (2019)



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Hvala!

dr.sc. Renato Šarc
renato.sarc@unileoben.ac.at

Montanuniversitaet Leoben (Austria)
Department of Environmental and Energy Process Engineering
Chair of Waste Processing Technology and Waste Management

DEPARTMENT FÜR
Umwelt- & Energieverfahrenstechnik

MONTAN UNIVERSITÄT
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