

*„Cirkularna ekonomija –  
put k pametnom, održivom i zelenom društvu“*

# Održivo gospodarenje otpadom i resursima kao temelj cirkularne ekonomije

## - je li RH na tom putu?

Marko Košak, mag.edu.geog.

**ZELENA AKCIJA**

FRIENDS OF THE EARTH CROATIA

# *postojeći linearni model ekonomije: “uzmi-iskoristi-baci”*



16 tonnes

is what the average European consumes in materials every year



6 tonnes

is what the average European produces in waste every year

64% of that waste is landfilled or burnt

Our consumption and waste in Europe is **unsustainable**

We consume too many resources in the form of everyday products, plastics, wood or metals, which we are too quick to discard. We then consume new materials to replace what we have thrown away, generating ever more waste.



## LINEAR ECONOMY

TAKE > MAKE > DUMP



TECHNICAL & BIOLOGICAL  
NUTRIENTS MIXED UP

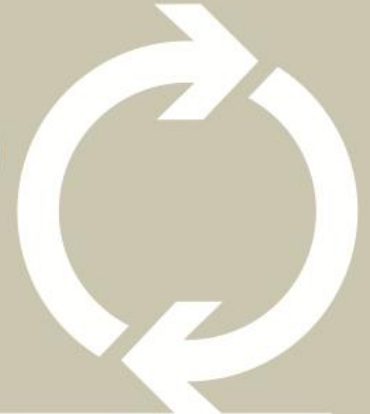
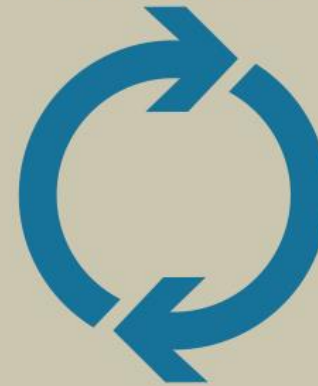
WASTE

ENERGY FROM FINITE SOURCES

## CIRCULAR ECONOMY

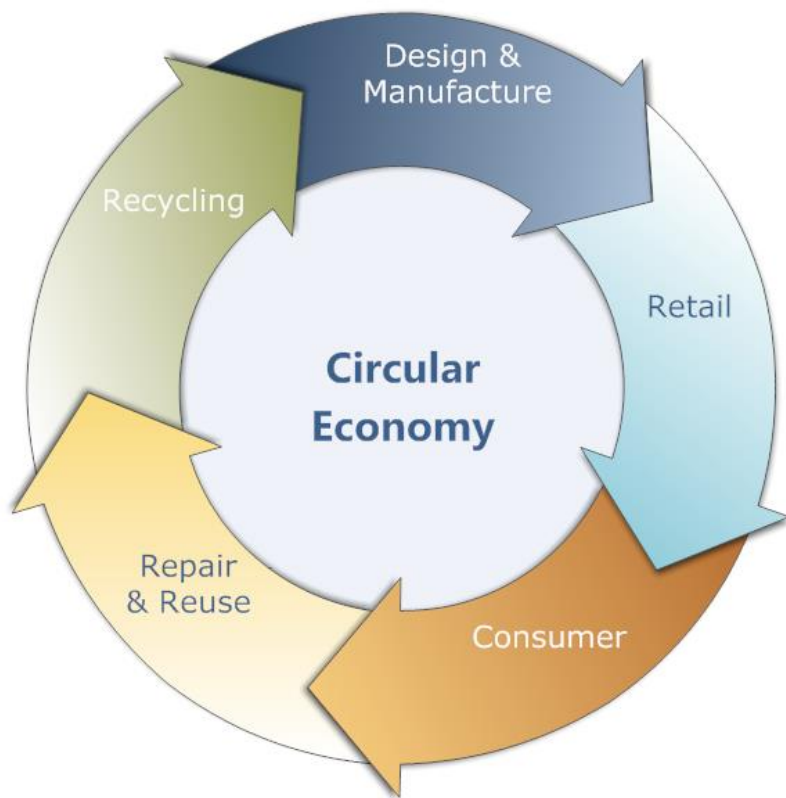
TECHNICAL  
NUTRIENTS

BIOLOGICAL  
NUTRIENTS

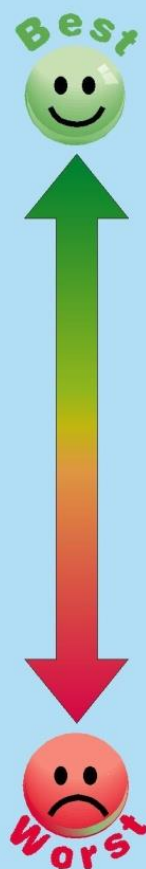


LIVING SYSTEMS

ENERGY FROM RENEWABLE SOURCES



# Waste Hierarchy



Interpretacija?





- 1 **Set a binding EU material reduction target** based on the Total Material Consumption indicator.
- 2 **Set a zero residual waste target** (the waste that is not re-used or recycled) by 2025.
- 3 **Introduce binding waste prevention targets** for municipal, commercial and industrial waste at the European and national levels.
- 4 **Set preparation for reuse targets** for municipal solid waste and packaging, with targets for - at a minimum - textiles and furniture, based on the weight of material per capita put back on the market by approved re-use centres. The targets must not be combined with recycling.
- 5 **Increase recycling targets to at least 70%** of municipal solid waste, using only one harmonised methodology for all Member States to report on, based on the recycling output. Set an overall packaging recycling target at 80% and boost plastic packaging recycling to at least 75%.
- 6 **Set a binding quantitative marine litter reduction target of 50%** with an explicit definition of litter included in waste legislation, in recognition of the serious negative impacts on the marine environment.
- 7 **Introduce obligatory separate collection of waste by 2020**, in particular for biowaste from homes and the hospitality sector as well as separate collection for materials including paper, cardboard, metals and textiles.
- 8 **Promote economic instruments that support the full implementation of the waste hierarchy**, such as extended producer responsibility, pay-as-you-throw schemes and the taxation of resources where appropriate.
- 9 **Design out single-use, non-recyclable products and toxic materials** such as microplastics and oxo-fragmentable plastics.
- 10 **Ban landfill and incineration by 2020** for all recyclable and compostable waste. Ban the financing of incinerators and landfills via structural and cohesion funds.

09.07.2015.

Rezolucija  
Europskog  
parlamenta o  
učinkovitoj  
uporabi resursa:  
prijelaz na  
cirkularnu  
ekonomiju





- razvoj mjera za sprečavanje nastanka otpada i postavljanje obvezujućih ciljeva za smanjenje komunalnog, komercijalnog i industrijskog otpada do 2025.,
- proširenje odgovornosti proizvođača uz primjenu načela „plati koliko baciš” za preostali otpad uz obavezne odvojene sustave prikupljanja za papir, metal, plastiku i staklo, te uvođenje obaveznog odvojenog prikupljanja biološkog otpada do 2020., te fiskalnog okvira koji bi bio u skladu s načelom „onečišćivač plaća”,
- povećanje ciljeva u pogledu recikliranja / pripreme za ponovnu uporabu na najmanje 70 % komunalnog krutog otpada i 80 % recikliranja ambalažnog otpada do 2030.;
- strogo ograničavanje spaljivanja, s oporabom energije ili bez nje, do 2020. na otpad koji se ne može reciklirati i koji nije biološki razgradiv,
- obavezno postupno smanjenje svih oblika odlaganja otpada koje bi vodilo do zabrane svih oblika odlaganja, osim određenog opasnog otpada i otpada za koje je odlaganje ekološki najprihvatljivije rješenje,
- poticanje na uvođenje pristojbi za odlaganje i spaljivanje, te smanjenje PDV-a za reciklirane proizvode, ponovno upotrebljive i resursno učinkovite proizvode
- poziva Komisiju da predloži ciljeve, mjere i instrumente za učinkovito rješavanje problema otpada od hrane od najmanje 30 % do 2025., te da države članice olakšaju recikliranje i odvojeno prikupljanje u građevinskoj industriji,
- da se razviju mjere za razvoj tržišta visokokvalitetnih sekundarnih sirovina i razvoja poduzeća za ponovnu uporabu sekundarnih sirovina, a u postupcima javne nabave prednost daje ponovno upotrijebljenim, popravljenim, te obnovljenim proizvodima;
- da se mobiliziraju sredstva EU-a radi pomoći u ostvarenju integriranih ciljeva za gospodarenje otpadom, kao što su odvojeno prikupljanje i razvoj infrastrukture za recikliranje.



**Benefiti?**

## **Economic Savings**

The circular economy will help reduce costs related to extracting and transporting virgin resources. This will also reduce business resource costs; for example, the EU manufacturing sector could save up to \$630 billion per year by 2025 thanks to resource-efficiency measures.<sup>5</sup>

The full implementation of existing EU waste legislation would save €72 billion a year by 2020,<sup>6</sup> and the waste package presented in July 2014 has the potential to increase these numbers significantly.

## **Job creation**

Full implementation of existing EU waste legislation would create over 400,000 jobs.<sup>7</sup> The waste package presented by the European Commission in July 2014 was estimated to create an additional 180,000 direct non-delocalizable jobs by 2030.<sup>8</sup> The thorough implementation of the other three pillars discussed here could increase these numbers significantly.

A shift from taxing labour to taxing resources will lead to reduced labour costs for the employer and/or higher take-home pay for the employee.

The significant investments necessary for creating incineration infrastructure could instead be redirected to developing re-use centres and networks, recycling infrastructure and renewable energy, all of which require more, better quality jobs than incineration and landfilling.

## **Energy Savings**

The circular economy will reduce the energy required for extraction of virgin materials and production. Processes that use secondary raw materials consume considerably less energy than manufacturing from virgin materials. For example, remanufacturing typically uses 85% less energy than manufacturing does.<sup>9</sup> More durable and reusable products and materials will result in longer life-cycles and better retention of the embedded energy of products. Further, this will reduce the need to extract and produce new materials and products, resulting in radical energy savings in extraction and production. As a result, the EU will save energy, increase resource efficiency and will reduce its import dependence on energy from third countries.

## **Resource Savings**

Reuse of products and materials saves a considerable proportion of the resources needed to manufacture goods from virgin materials. For example, UK analysis suggests that remanufacturing saves at least 70% of materials compared to manufacturing new goods.<sup>10</sup>

## **Climate Change Mitigation**

The Circular Economy will represent a significant step towards a low-carbon, resource-efficient economy, advancing towards the EU's objective for 2050.

The waste package presented by the European Commission in July 2014 was estimated to have the potential to reduce emissions by 443 million tonnes of greenhouse gas between 2014 and 2030,<sup>11</sup> without taking into account the further changes discussed here.

## **Health & Well-being**

Reducing hazardous chemicals in production and in products will consequently reduce the impact on human health caused by close daily contact, or from indirect exposure from emissions into the environment.

Eliminating wherever possible toxic materials at the design stage will make it easier to safely and efficiently reuse, repair and recycle those products.

Europeans will benefit from avoiding emissions caused by burning and burying waste. A reduction in crop loss, respiratory and skin diseases, infertility, certain cancers, metabolic diseases and neurological/mental health issues will result. A recent study of the health costs of certain toxic chemicals estimated an annual cost to the European Union of approximately €157 billion per year<sup>12</sup> and noted that this was an underestimate as only some chemicals and some diseases were included.



### **Reduction in marine litter**

80% of marine litter results from land-based activities<sup>13</sup> and is a consequence of unsustainable production patterns and poor waste management. Marine litter also represents a threat to human and ecosystem health, as plastic particles are known to bioaccumulate up the food chain, and carry dangerous pathogens across oceans to new areas.

Turning our economy into a circular economy is the ultimate solution to this problem. A significant reduction in marine litter will bring about a multitude of benefits. The annual costs from marine litter in Europe have been estimated at between €259 to 694.7 million for the fisheries, tourism and recreation sectors, as well as clean-up costs for coastal municipalities. Less waste in the sea means less marine animals and birds suffering entanglement or ingestion of litter, representing savings of around €12 billion each year.<sup>14</sup>

The costs to the marine environment from marine litter cannot be fully quantified, but considering waste has been found in the bodies of hundreds of species, and the remotest corners of the marine environment, urgent action must be taken to prevent the problem from getting worse.

### **Stability of supply**

Improvement of resource efficiency, by measuring and reducing our material, land, water and carbon footprints will result in member states being less dependent on imports.

The EU could also benefit from improved trade balance due to reduced imports. The Waste and Resources Action Plan estimates them as €110 billion.<sup>15</sup>

Greater security in resource supply, and reduced land and water consumption outside our borders, can lead to improved geopolitical relations across the world.

## **Agriculture**

Closing the nutrients loop would allow vital components such as nitrogen, phosphorous and potassium to return to the soil in the form of compost, effectively capturing carbon and improving crop resilience, along with increasing the water retention capacity of the soil.

Pesticide-free agriculture would allow for job creation, energy savings and potential health benefits.

**Stanje u Hrvatskoj?**

# Zakon o otpadu, 2004.

## Članak 25.

- Otpad čija se vrijedna svojstva mogu iskoristiti mora se odvojeno skupljati i skladištiti kako bi se omogućilo gospodarenje tim otpadom u skladu s odredbama ovoga Zakona.

## Članak 91.

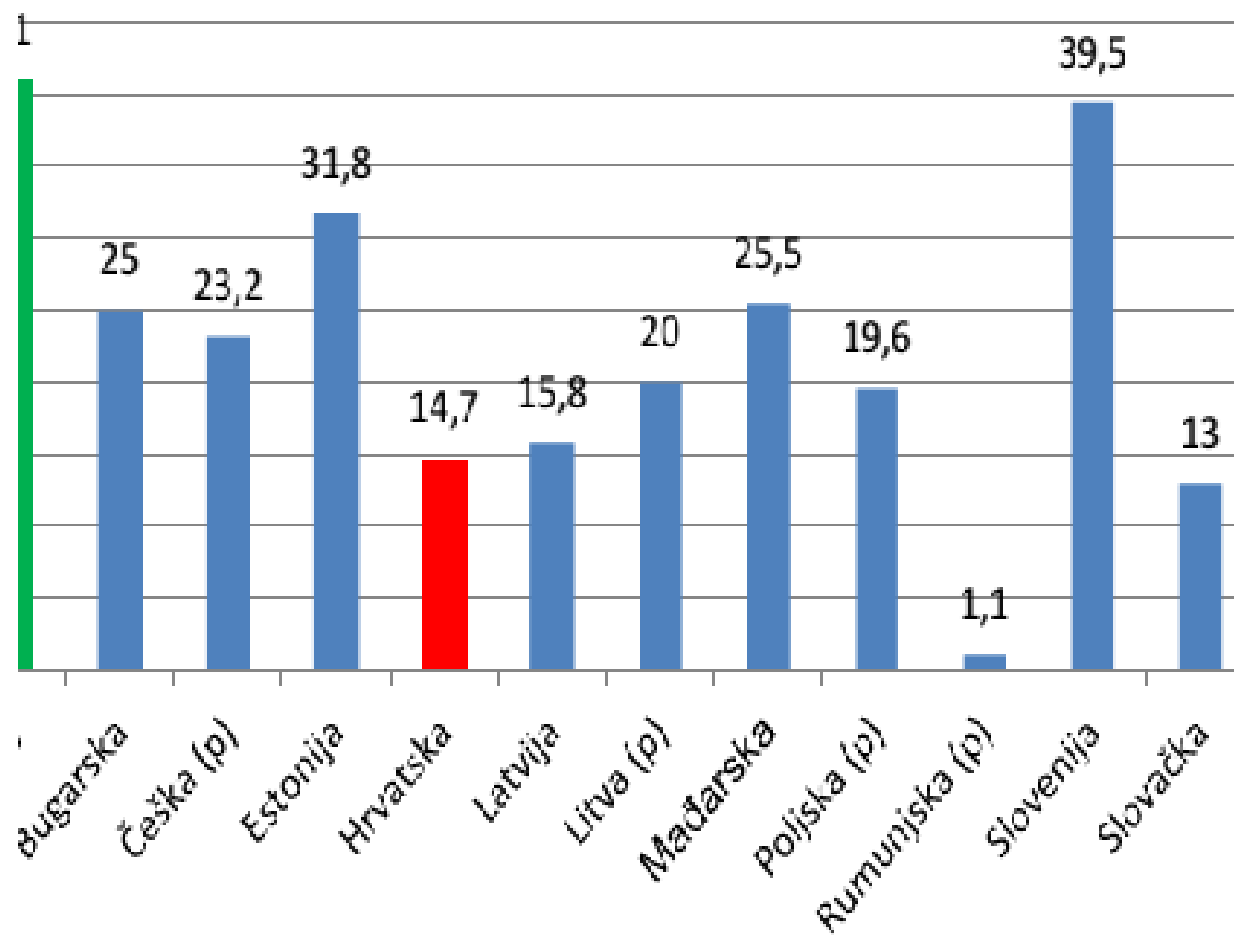
- (1) Novčanom kaznom u iznosu od 150.000,00 do 400.000,00 kuna kaznit će se za prekršaj pravna osoba koja:  
otpad čija se vrijedna svojstva mogu iskoristiti ne skuplja i ne skladišti odvojeno radi omogućavanja gospodarenja tim otpadom sukladno odredbama ovoga Zakona (članak 25.)

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# Zakon o održivom gospodarenju otpadom, 2013.

# Rezultati?











# „ZELENI” OTOCI





**Put kojim Hrvatska ide?**

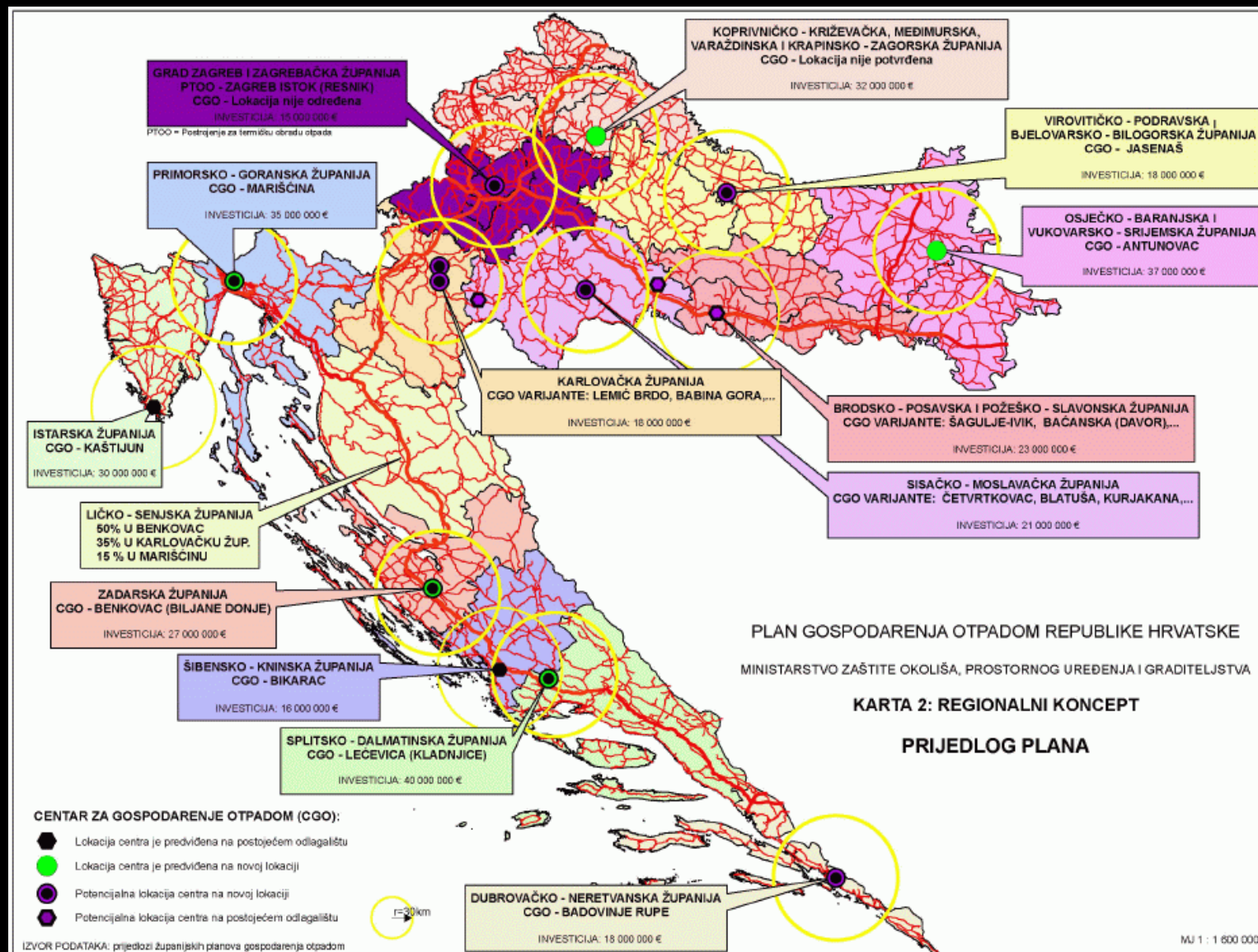
Dokument	Udio (%) godina				
	2006.	2010.	2015.	2020.	2025.
Strategija gospodarenja otpadom RH	6	8	12	18	25
Plan gospodarenja otpadom RH 2007. – 2015.			23		

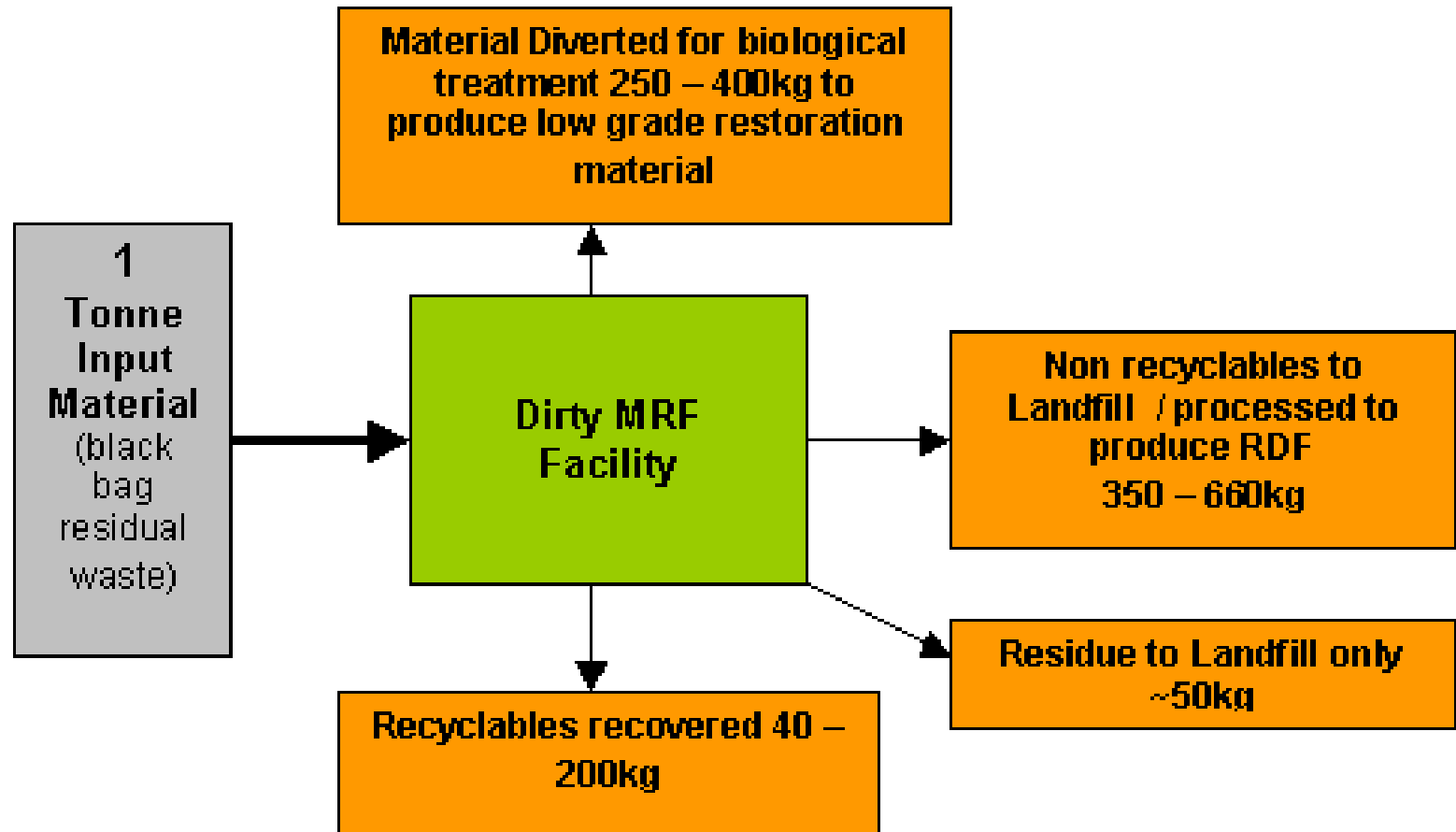
50?

70?

# Centri za gospodarenje otpadom

- tehnologija
- dimenzije
- lokacije









+





VEZANO

I sud je potvrdio: Spaljivanje otpada u CEMEX-u je neprihvatljivo!



## Pravomoćna presuda

**CEMEX-U ZAŠLO SUNCE – SPRIJEČENO SPALJIVANJE OTPADA U KAŠTELANSKOM ZALJEVU**

AKTUALNO >> NOVOSTI | VIJEST | 09.07.2015



**Upravni sud opalio pljusku Zmajloviću: Pala dozvola Cemexu za spaljivanje otpada!**

Piše: D.M.  
ponedjeljak, 6.7.2015. 22:15

Share 832

Tekst



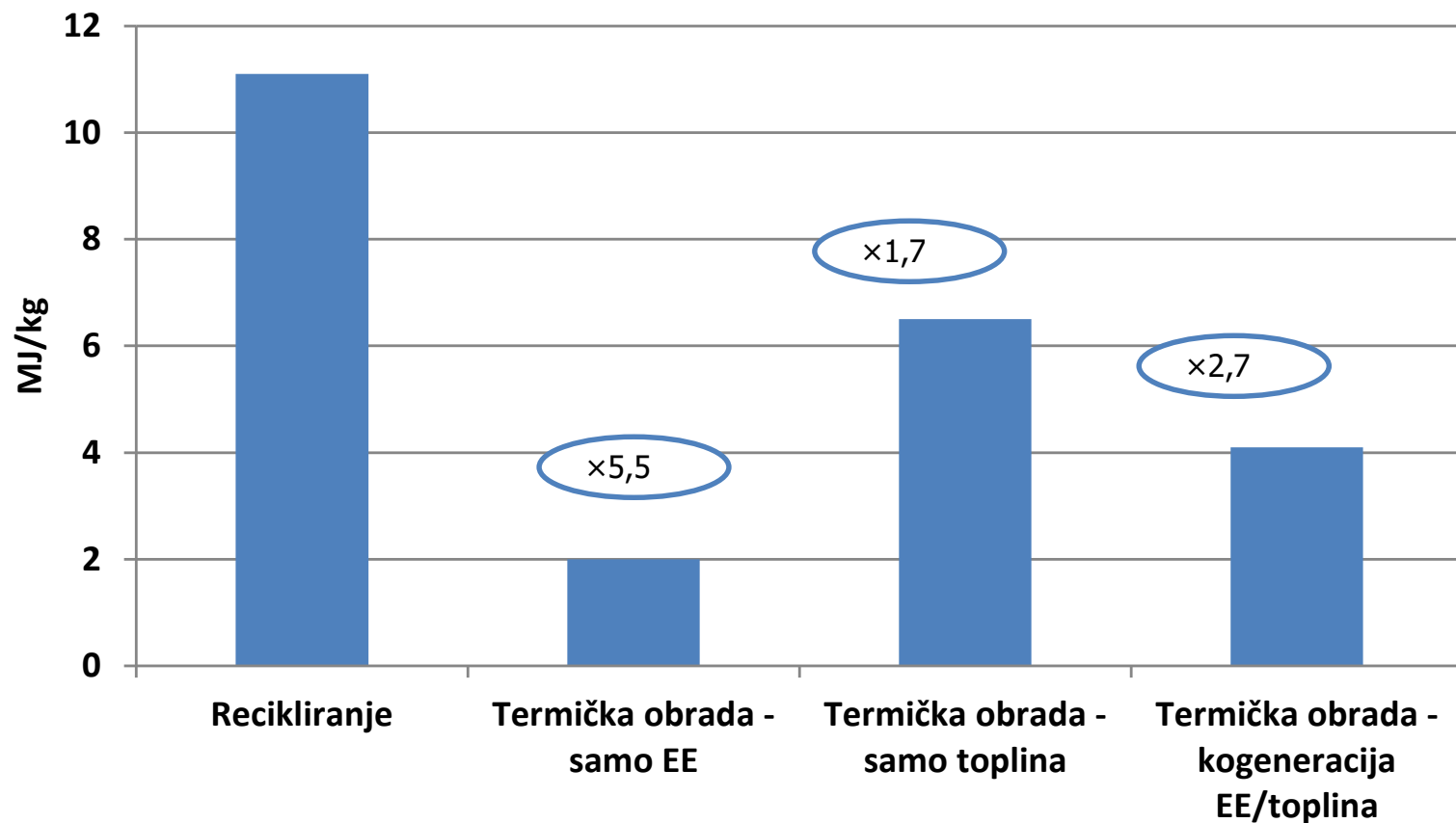
**Cemex ne može spaljivati otpad: Upravni sud u Splitu poništio rješenja Ministarstva zaštite okoliša**



# MIT o energiji:

spaljivanje je korisno jer proizvodi veliku količinu energije

**ISTINA:**



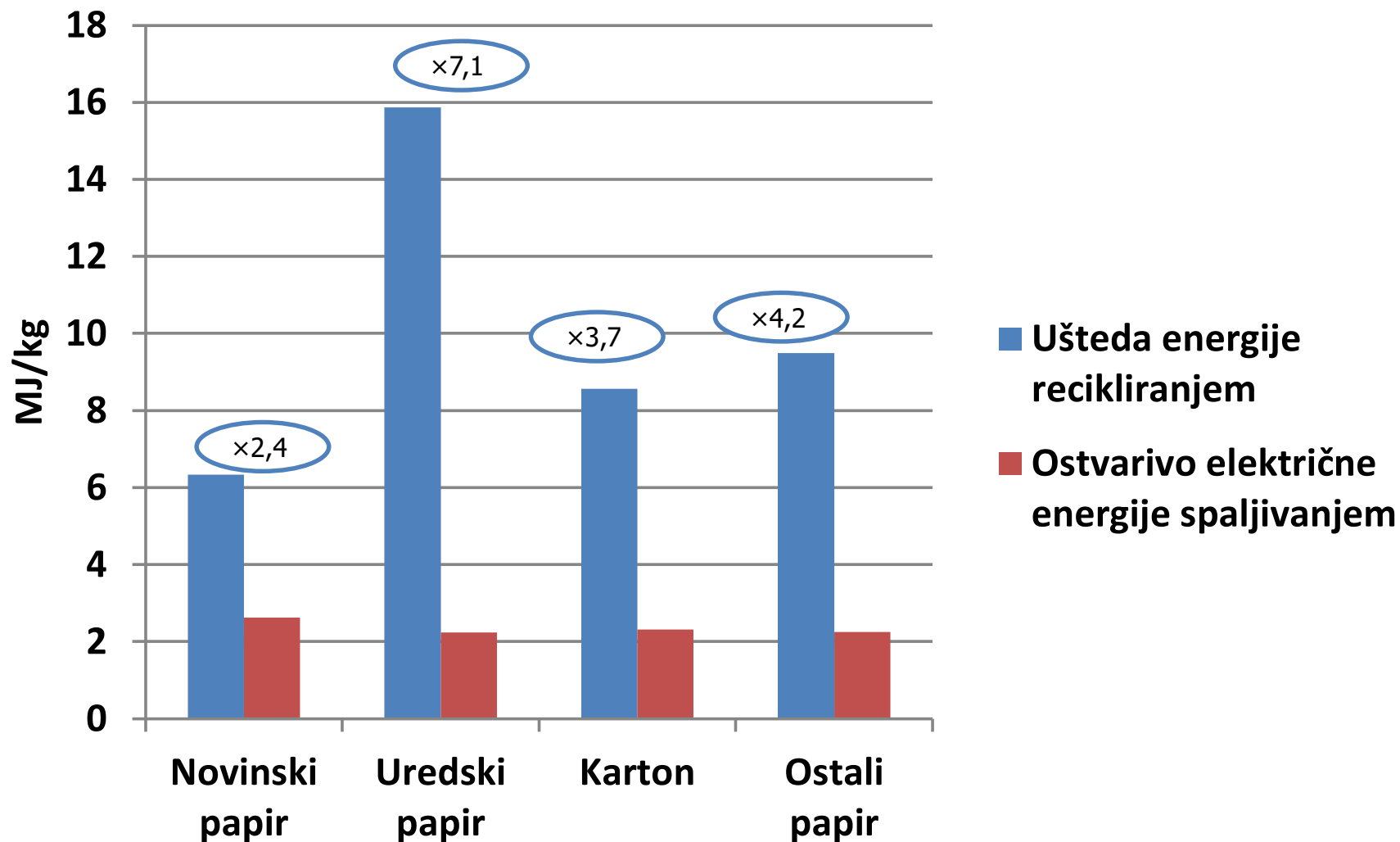
IZVORI:

1. Energy savings from recycling; Source: Comparative LCAs for Curbside Recycling Versus Either Landfilling or Incineration with Energy Recovery, Jeff Morris, Sound Resource Management
2. Energy output from European Countries: *CEWEP Energy Report (Status 2001 - 2004) Results of Specific Data for Energy, Efficiency Rates and Coefficients, Plant Efficiency factors and NCV of 97 European W-t-E Plants and Determination of the Main Energy Results* CEWEP: Confederation of European Waste-to-Energy Plants, <http://www.cewep.com/>

**Tablica: Ušteda energije recikliranje / spaljivanje (ICF)<sup>76</sup>**

<b>Materijal</b>	<b>Ušteda energije po toni recikliranog materijala GJ</b>	<b>Energija dobivena spaljivanjem tone materijala GJ</b>
Novinski papir	17,83	2,68
Glatki papir	10,76	2,25
Karton	16,56	2,33
HDPE	54,22	7,03
PET	56,34	3,65
LDPE	59,61	7,03

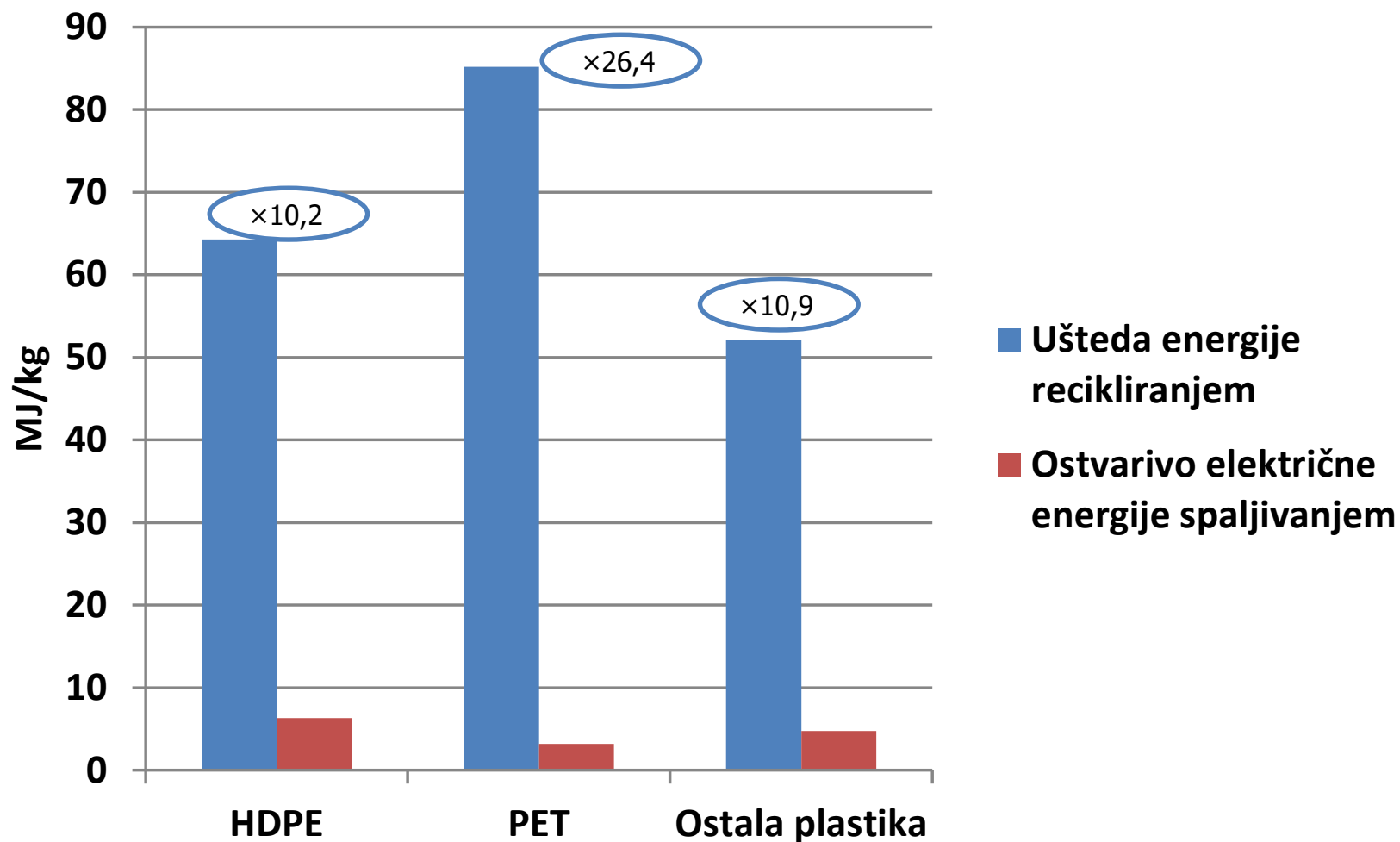
# Papir i karton



IZVOR: Determination of the Impact of Waste Management Activities on Greenhouse Gas Emissions: 2005 Update Final Report, ICF Consulting, October 31, 2005, submitted to Environment Canada and Natural Resources Canada



# Plastika



Costs of electricity generation for several technologies			
Technology/fuel	Capital cost (\$/kW)	Fixed Operating & Maintenance costs (\$/kW-year)	Variable O&M costs (\$/MWh)
Coal	3,167	35.97	4.25
Nuclear	5,339	88.75	2.04
Waste incineration	8,232	373.76	8.33
Photovoltaic solar	4,755	16.70	0
Onshore wind	2,438	28.07	0

Source: US Energy Information Administration (2010).

# [ ZAGREB ]

**2014. donesen PGO do 2015.**

- ishitreno ukidanje statusa vodozaštitne zone Resnik

*sredstva:*

- 83, 5 % (2,7mlrd kn)  
**SPALIONICA OTPADA**
- 0% prevencija
- 0% ponovna uporaba
- 0% skupljanje od vrata do vrata



- kapacitet spalionice: 385 000 t
- produkti: 100 000 t šljake, 10 000 t toksične
- zeleni otoci – nema prikupljanja biootpada, metala, tekstila

# Što ćemo reciklirati?



# **KAKO?**

**rješenja**



# ITALIJA



## Regija Veneto

4.527.000 st.

Sustav gospodarenja otpadom	Broj općina	% općina	Broj stanovnika	% stanovnika	% odvojenog prikupljanja	Količina otpada (kg/st/god.)
<b>Bez organskog otpada</b>	<b>47</b>	<b>8.1</b>	<b>346.305</b>	<b>7</b>	<b>34</b>	<b>657</b>
<i>Bez sustava</i>	28	4.8	313.684	6.3	33	667
<i>Samo za velike korisnike</i>	19	3.3	32.621	0.7	42	555
<b>Sa prikupljanjem organskog otpada</b>	<b>534</b>	<b>91.9</b>	<b>4.592.660</b>	<b>93</b>	<b>61</b>	<b>475</b>
<i>Ulični kontejneri</i>	55	9.5	1.127.305	22.8	47	592
<i>Mješani sustav</i>	30	5.2	217.823	4.4	54	657
<i>Od vrata do vrata</i>	449	77.3	3.247.532	65.8	<b>68</b>	402,2

SLOVENIJA

# Ljubljana

280.000 st.



## Ljubljana; first EU capital to adopt a Zero Waste strategy

The Slovenian capital and three other municipalities, Vrhnika, Borovnica and Log Dragomer join the European network of Zero Waste municipalities

September 8, 2014



# BELGIJA

## Flandrija



### FLANDERS

Population: 6.2 million

Area: 13,522 km<sup>2</sup>

Population density: 456/km<sup>2</sup>

Average annual rainfall: 850 mm

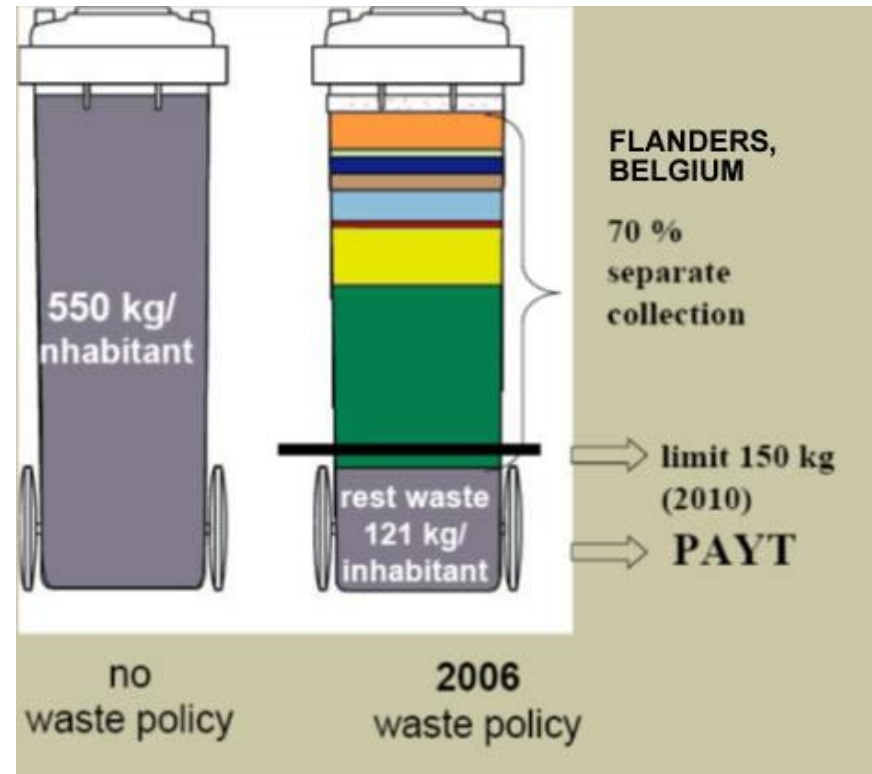
Average temperature range: 3°C to 18°C

Altitude: 5 to 288 meters above sea level

Waste diversion rate **73%**

Waste generation: 1.5 kg/capita/day

Spending on waste management per capita:  
US \$116.33 per year





# SAD

## San Francisco



### SAN FRANCISCO

State of California

Population: 805,235

Area: 121 km<sup>2</sup>

Population density: 6,633/km<sup>2</sup>

Average annual rainfall: 518.16 mm

Average temperature range: 8°C to 21°C

Altitude: 16 meters above sea level

Waste diversion rate: 77%

Waste generation: 1.7 kg/capita/day



Advertisement for composting on a San Francisco bus. (photo: Larry Strong, courtesy Recology)



**SAD**  
**San Jose**  
950.000 st.  
**> 64 %**



**AUSTRALIJA**  
**Canberra**  
320.000 st.  
**> 69 %**



**NJEMAČKA**  
**Dresden**  
530.000 st.  
**> 65 %**



*Pametna osoba rješava probleme, genijalci izbjegavaju nastanak problema! (A. Einstein).*



# Prevenција nastanka

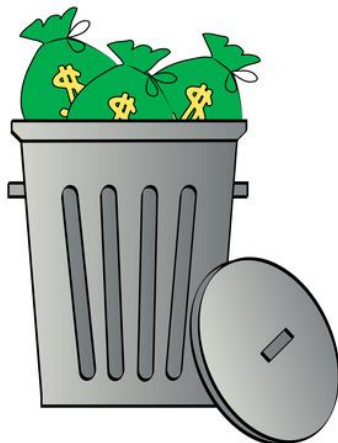
- sustav individualne odgovornosti

proizvođača



i

potrošača





# Ponovna uporaba









# Recikliranje i kompostiranje



# DODATNA INFRASTRUKTURA

## *SORTIRNICA*



## *KOMPOSTANE*

- *linije za kompostiranje i linije za proizvodnju bioplina*



**UVIJEK OSTAJE NEŠTO ZA  
SPALITI?**





**Centro Riciclo Vedelago s.r.l.**

## **PROJECT “100% RECYCLING”**

### **Waste from SORTING and DRY FRACTION Processing**

#### **input**

**Waste from Packaging  
Sorting**

**Waste from Industrial  
Waste Sorting**

**Dry Fraction from Urban  
Solid Waste**



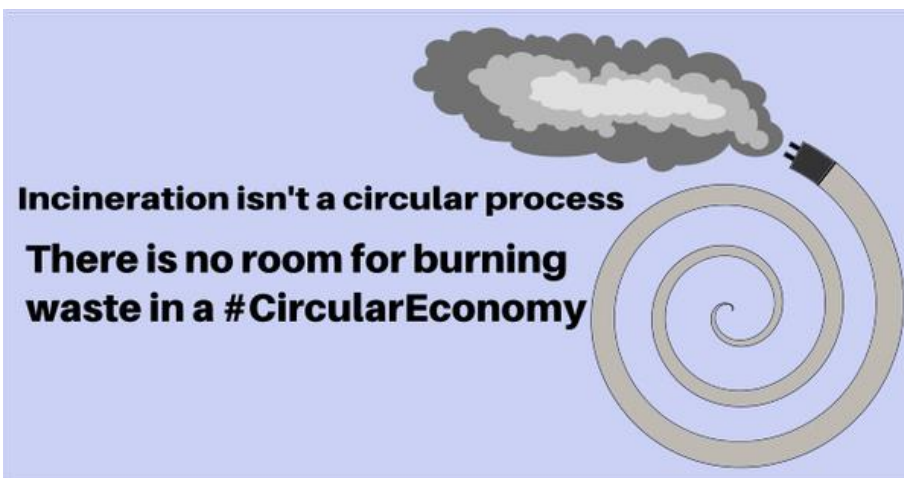
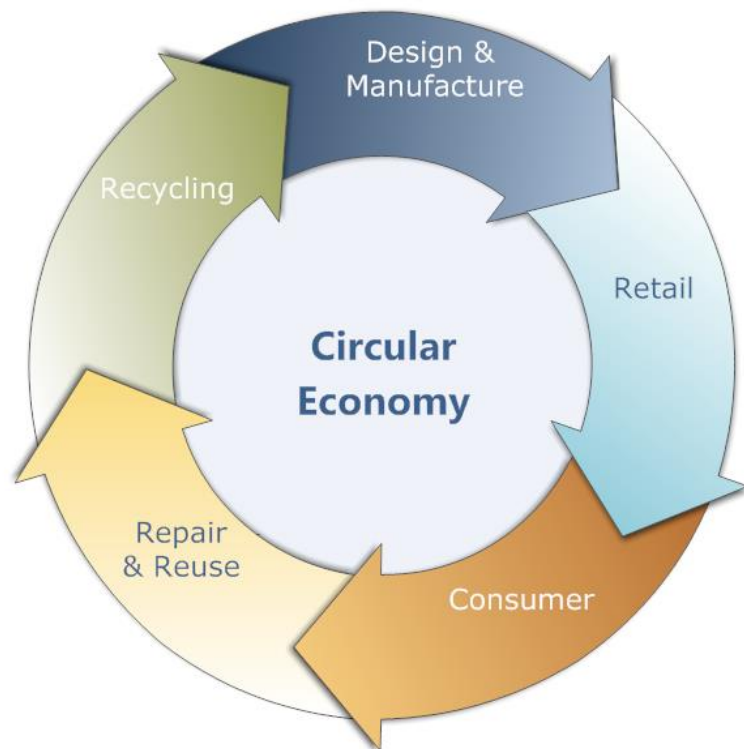
#### **output**

**MPS**


**Plastic Flake  
“synthetic sand”**







**Spaljivanje otpada je nepotrebno!**



***“odlagališta zakopavaju dokaze  
neodgovornog ponašanja ljudi, a  
spalionice iste te dokaze spaljuju”***

*Paul Connet, profesor emeritus, Sveučilište St. Lawrence, New York*