Tehnični vidiki upravljanja s plastičnimi odpadki v Sloveniji

(Technical aspects of managing plastic waste in Slovenia)

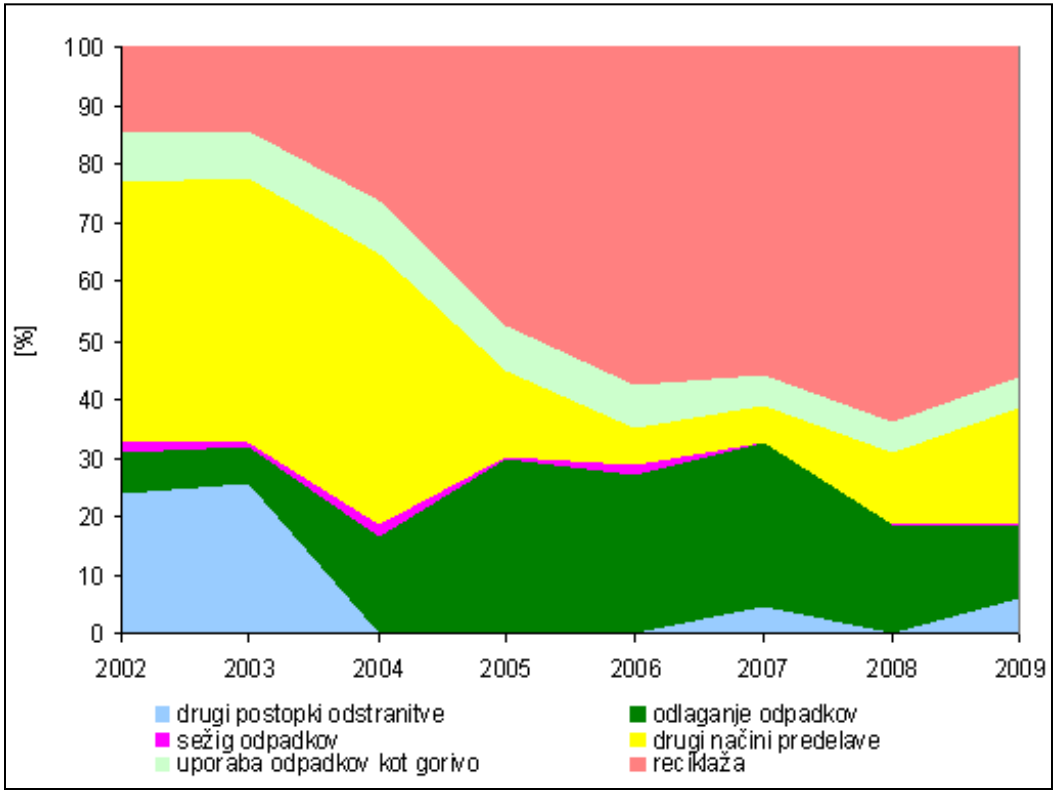
Janez Navodnik

Ljubljana, 2. oktober 2012

GIZ GROZD PLASTTEHNIKA SLOVENIJA

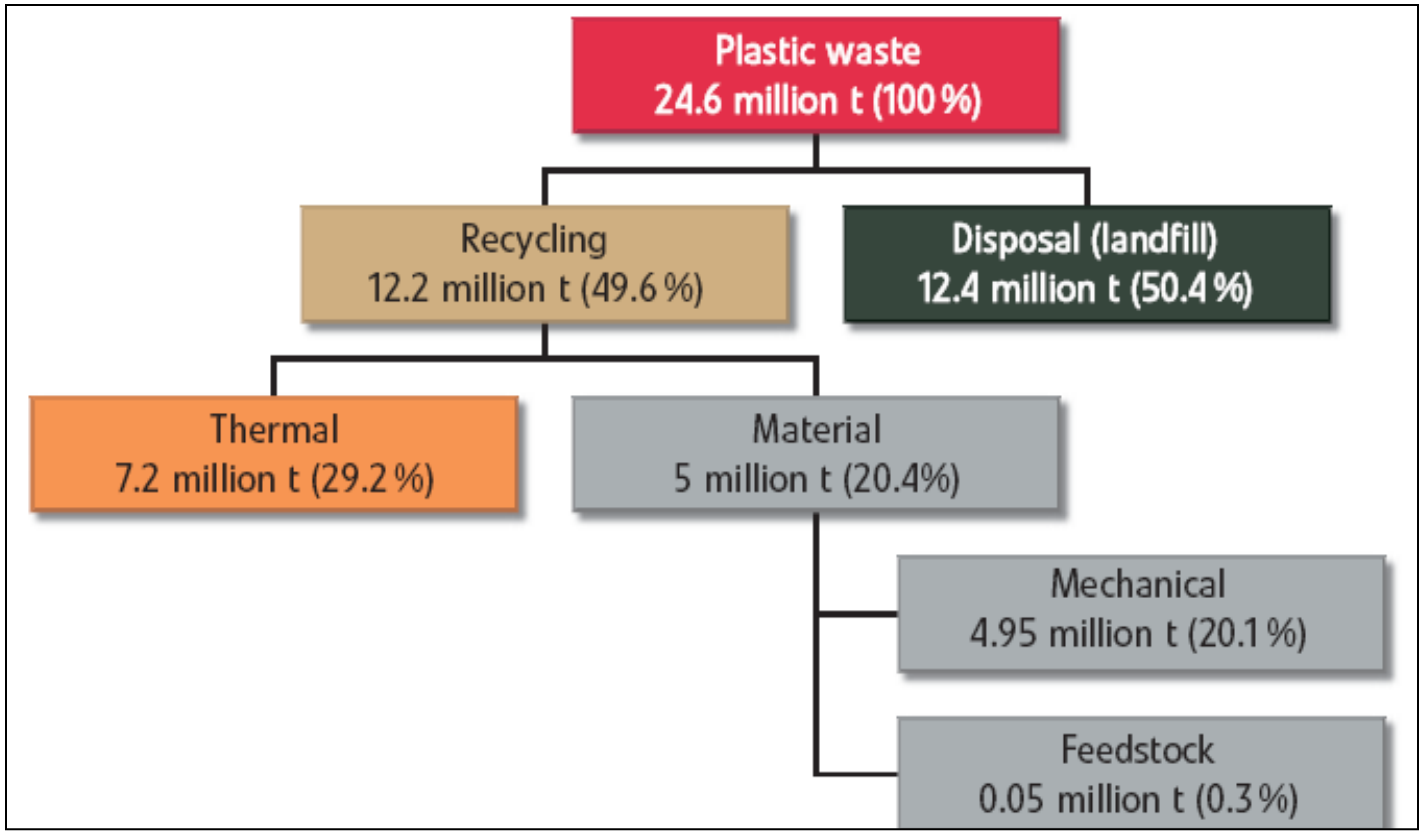
Tehnološki center POLI-EKO

Hierarhija ravnanja z odpadki in realnost v Sloveniji



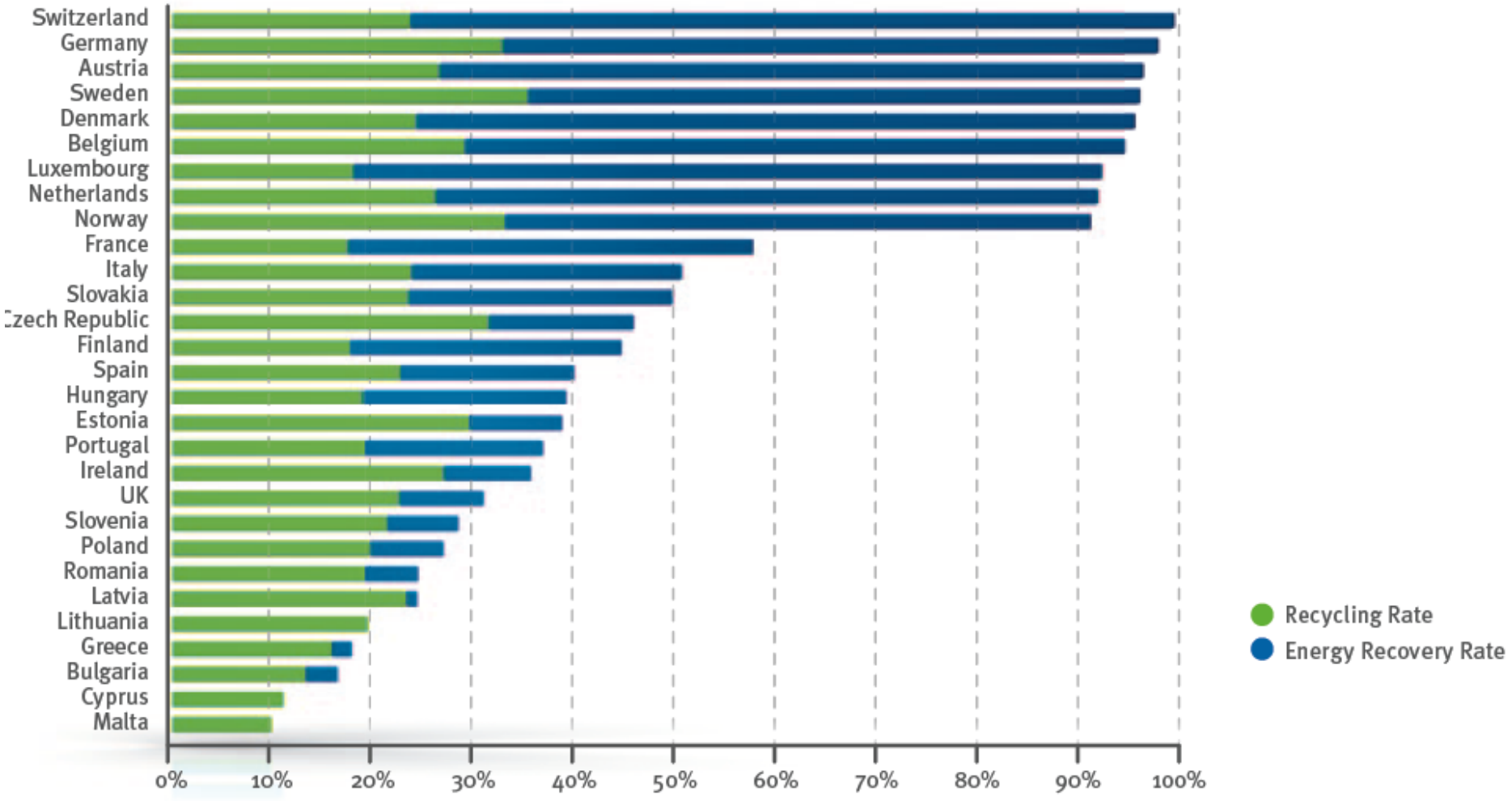
Vir: ARSO

Količina plastičnih odpadkov v Evropi in načini recikliranja



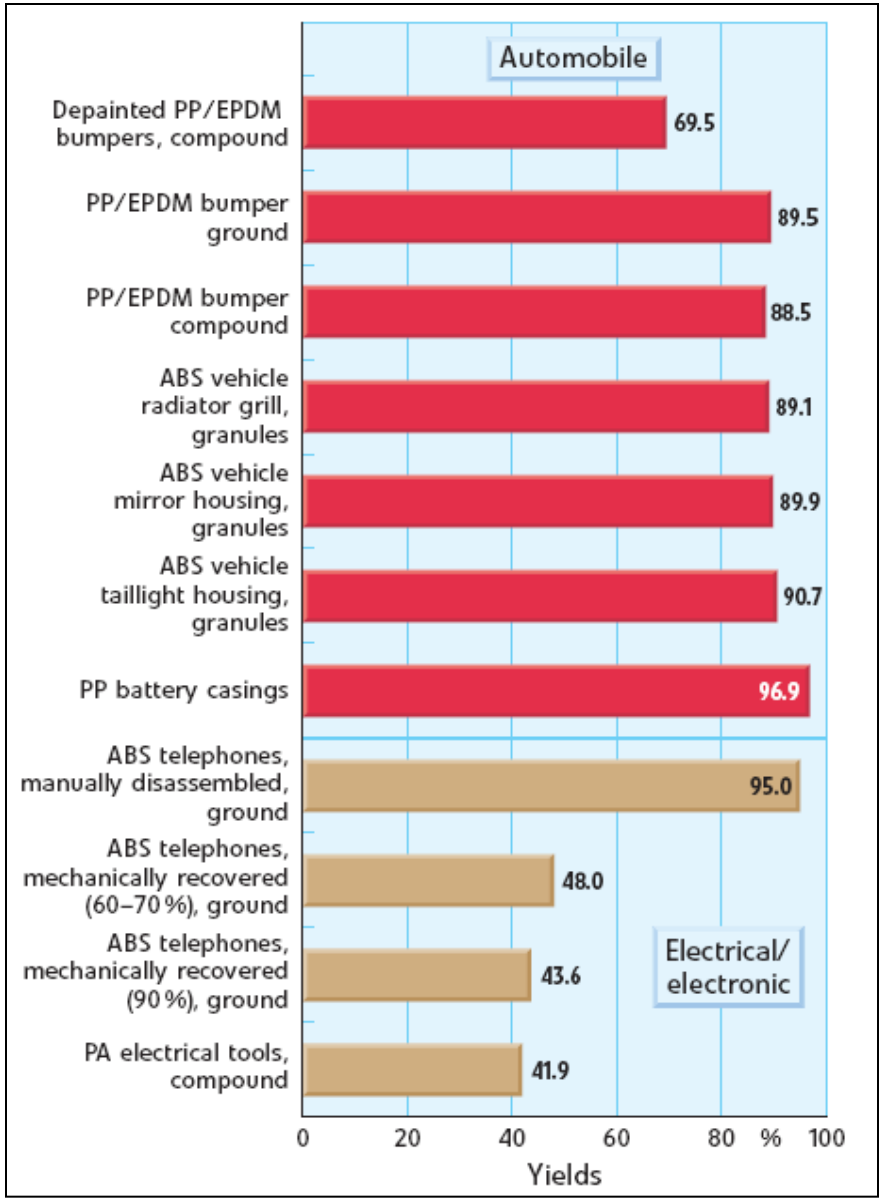
Plastic waste in Europe

Recikliranje in energetska predelava v letu 2010
Zakopavamo denar: Slovenija predela 20 %, razvite države pa preko 90 % odpadkov.



Stopnja recikliranja po državah

Največ se reciklirajo PP-baterije in blatniki, ABS, radiatorji, ogledala, luči in telefoni.



Comparisons of the yields for EE and auto

Večino še vedno zakopljemo, celo industrijsko embalažo

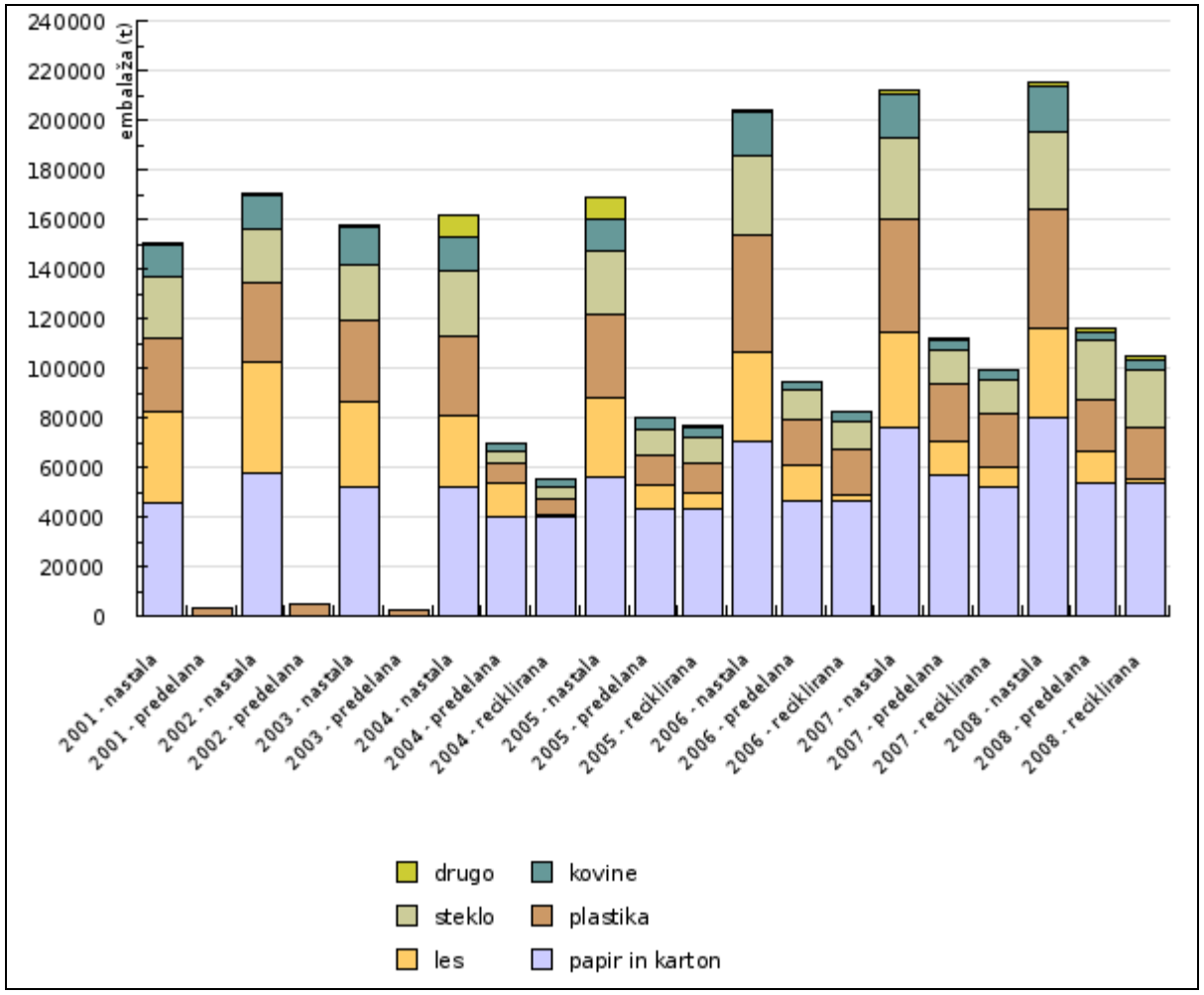
Slovenia 2011 Applications	Total Generation			Recovery in kt				Disposal in kt		
	kt	kg/ cap.	%	Total	Mechanical Recycling	Feedstock Recycling	Energy Recovery	Total	Landfill	Incineration without efw
Packaging	54	26	63,6%	25	20	0	5	29	29	0
Building/Construction	4	2	4,7%	0	0	0	0	4	4	0
Automotive	3	1	3,3%	1	1	0	0	2	2	0
Electrical/ Electronics (WEEE)	5	3	6,2%	1	0	0	1	4	4	0
House wares, Leisure, Sports etc.	5	2	5,5%	0	0	0	0	4	4	0
Agriculture	2	1	2,8%	0	0	0	0	2	2	0
Others (Furniture etc.)	12	6	13,8%	1	0	0	1	10	10	0
Total	84	41	100%	29	22	0	7	56	56	0
				34%	26%	0%	8%	66%	66%	0%

Recovery Rate:	**34%**
• Recycling Rate	26%
- Mechanical Recycling	26%
- Feedstock Recycling	0%
• Energy Recovery	8%
Disposal Rate:	**66%**
• Landfill	66%

Slovenia 2011 Applications	Total Generation	Recovery in kt				Disposal in kt		
	in kt	Total	Mechanical Recycling	Feed stock Recycling	Energy Recovery	Total	Landfill	Incineration without EfW
Packaging	54	25	20	0	5	29	29	0
Household Packaging	34	10	7	0	3	24	24	0
Industrial Packaging	19	15	13	0	2	4	4	0

- Plastic waste grew by 2,8 %.
- The landfilling of mixed waste is not allowed without pretreatment or sorting.
- Still the majority of the plastic waste is going to landfill.
- Two plants have the permission to (co-)incinerate plastic waste.

Recikliramo predvsem papir in kovine



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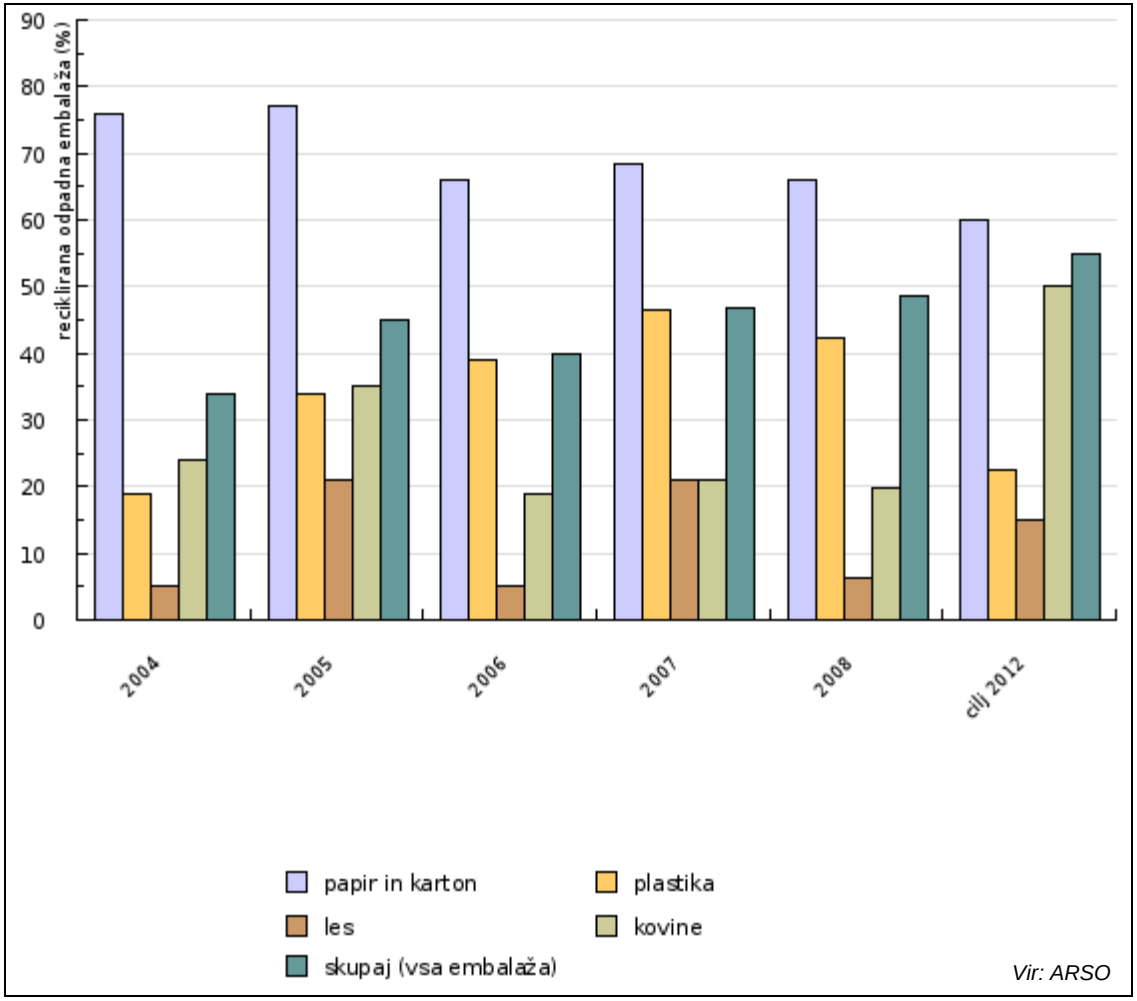
Recikliramo predvsem papir in kovine



KEMIJSKA SESTAVA Prenosne odpadne baterije in akumulatorji	v (%)
Alkalne (Al-Mn)	42,1537%
Cink-ogljikove (Zn-C)	0,0000%
Zrak-cinkove (Zn-air)	0,4870%
Litijeve (Li)	1,0289%
Gumbaste (HgO, AgO, AlMn, Zn-air, Li)	0,4714%
Ostale primarne baterije	18,4835%
Litij-ionske (Li-ion, Li-polimer)	9,3202%
Nikelj-metalhidrid (NiMh)	5,2704%
Nikelj-kadmijeve (NiCd)	6,4754%
Svinčeve (Pb)	15,1733%
Ostale sekundarne baterije	1,1361%
SKUPAJ	**100,0000%**

Prednosti recikliranja

Advantages of Recycling

Energy savings:
Iron and Steel: requires 74% less energy. 2/3rds of steel is recycled.
Non-Ferrous Metals: 96% less energy, 60% of metals rom scrap.
Paper: 36% less energy
Plastic: 80% less energy, only 17% is currently recovered.

Advanced materials Recycling

Environmental Advantages:
Less pollution
Reduced greenhouse gas emissions
Conserves natural resources wood, water, and minerals. With a recycling rate of 30%, *we save about 256 billion barrels of crude oil*, the equivalent of 22 million cars per year.

Economic Advantages:
Dramatic energy savings
Job creation: 1.1 million U.S. payroll of $37 billion.
Supports vital industries: paper and steel, plastics converters.
Saves money: selling recycled materials, towns reduce the use of fuels.

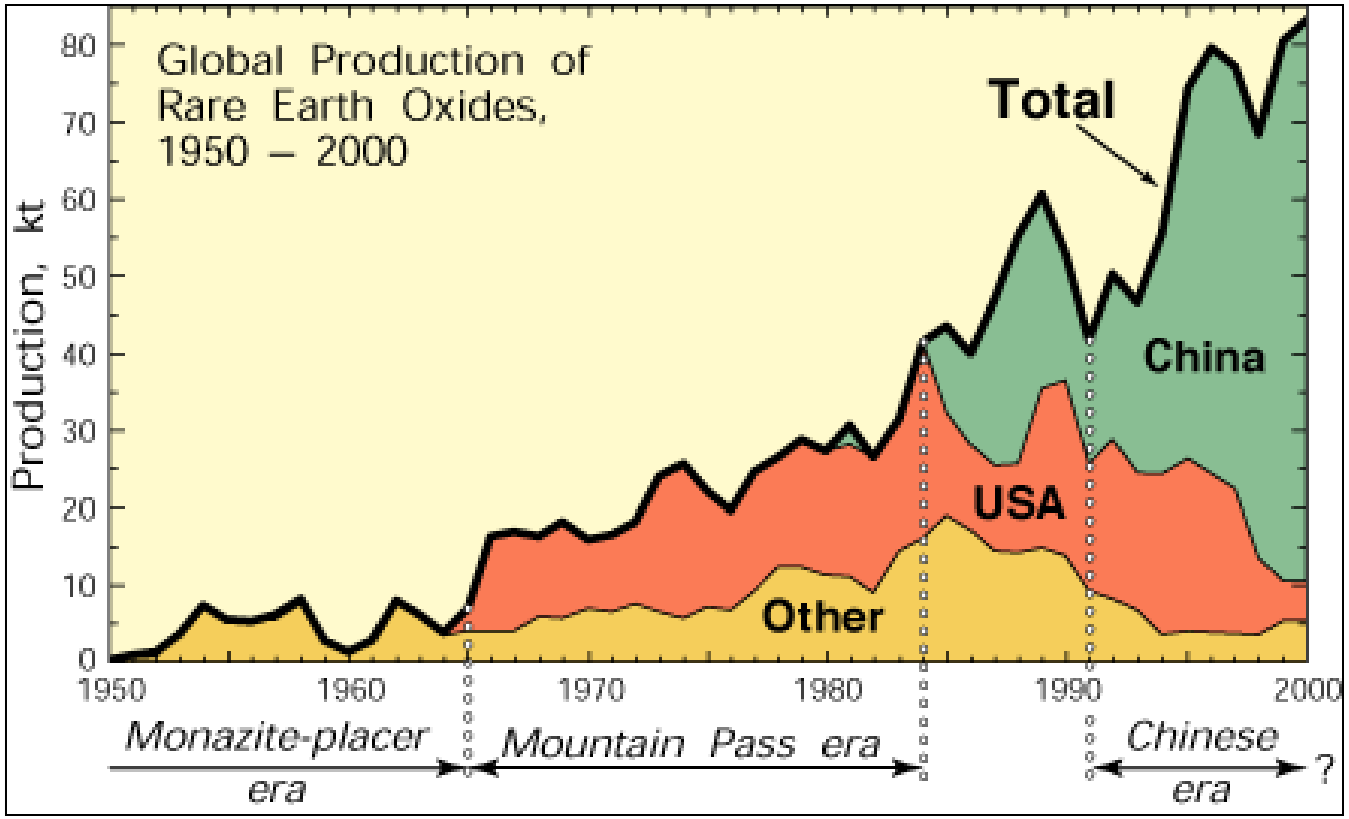
	Priority Group I	Priority Group II
Products	Brown goods, data processing	Office equipments, small appliances, telecommunications, automotive and large domestic appliances (white goods)
Polymeric Matrix	SB, ABS, PC, PC+ABS, SB+PPE, PP, PVC	SAN, PET, PA, PE, POM, PBT, PMMA
Flame Retardants	DBDPE, OBDPE, TBBA, HBCD, Sb_2O_3	PBB-MA, halogenated polyolefines, ammonium polyphosphates, melamine compound, Al and Mg hydroxides
Metals	Pb, Cd, Cr, Hg	Mn, Mo, Ni, Co, Cr, Zn, Au, In, Nd
Fillers	Calcite, barite, talcum, glass, Al_2O_3	

Dragoceni napredni materiali v odpadkih

Kompleksni materiali za recikliranje		
Electronic:	Cars:	Packaging/consumption:
• Li, Ni, Cd (batteries)	• mixed PUR/textile (seats)	• Laminate PE/Al/paper (tetrapak)
• In, Sn, Ga, Se (displays)	• CRP, GRP (RTM parts)	• PVC/textile (carpets)
• Nb, La, Sa, B, Ba (magnets, EMI absorbers)	• PUR/thermoplasts (skin-, slush-,moulding)	• PVC/wax (candels)
• Si, In, Ru, Ti, Os, Pt (fotovoltaic)	• Nanocomposites (MMT, CNT)	• PVC/Cu (cables)
• C/Ni, CNT, Sn, Cu (conductors)	• Rubber/textile	• GRP/thermoplast (sanitary cells)
	• Pb/thermoplasts	• Mixed textile

Kitajska nam prodaja iste drage materiale po večkrat.

"Our Green Economy is 'Made in China"

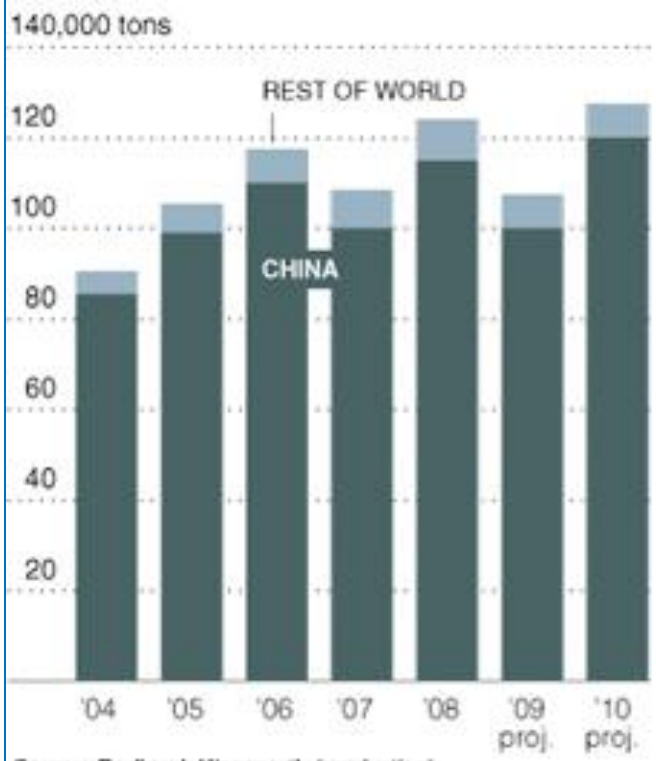


Brez (kitajskih!) naprednih materialov ni nobene industrije.

Rare Wealth

China accounts for the vast majority of the world's production of rare earths — 17 elements — which are used in a wide array of products.

RARE EARTH MINERAL PRODUCTION

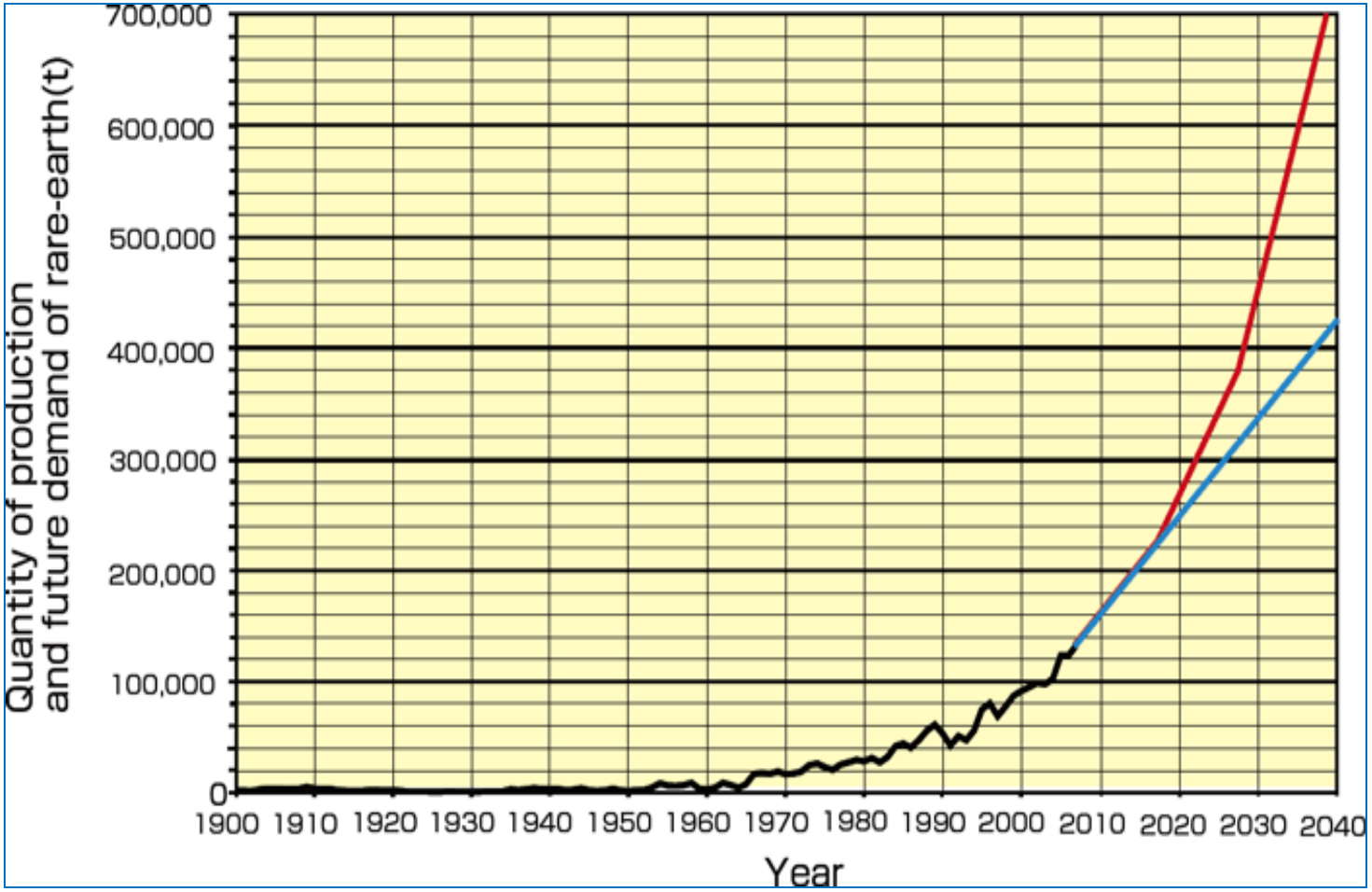


Source: Dudley J. Kingsnorth (production)

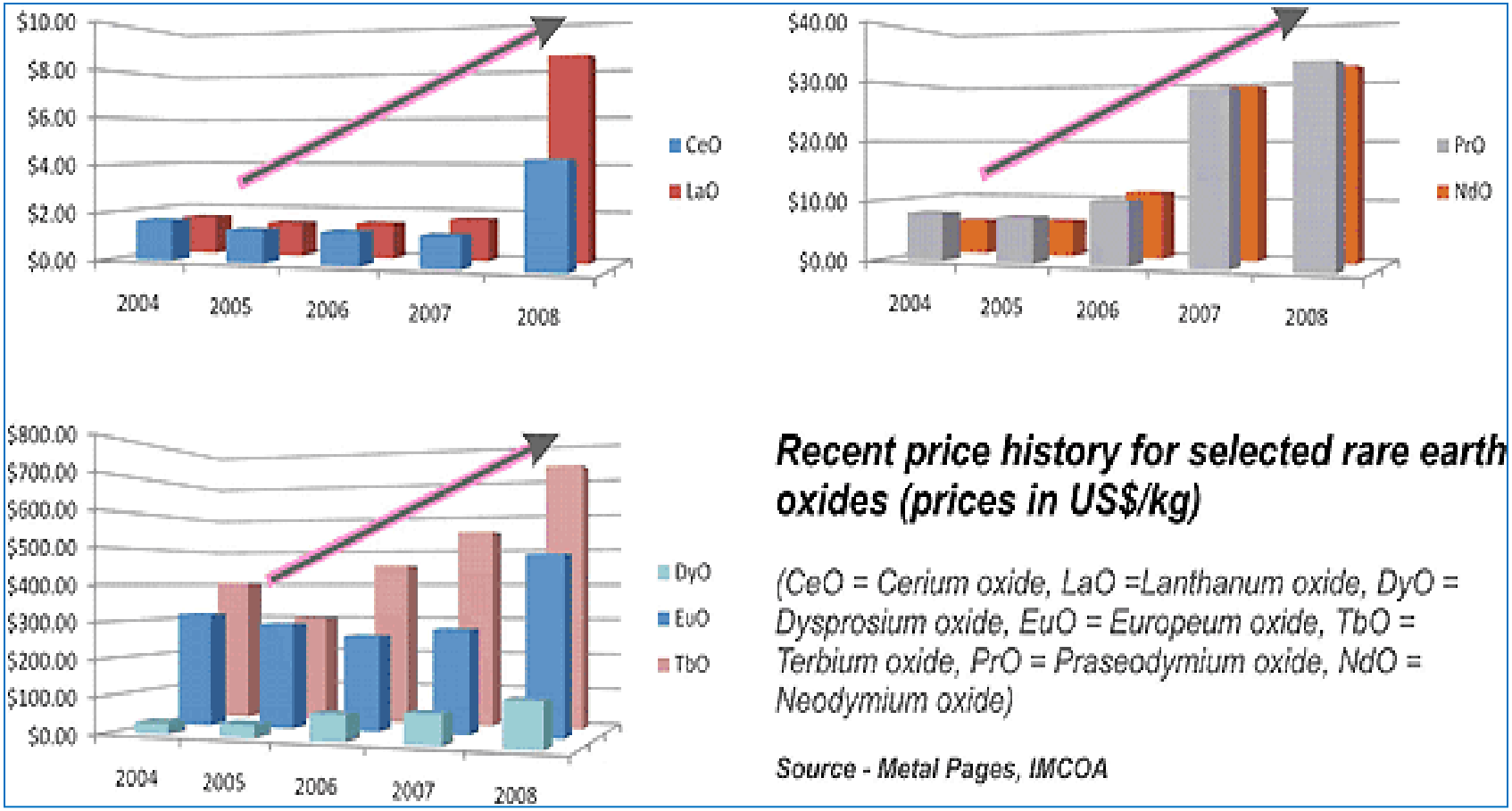
RARE EARTHS	ATOMIC NO.	COMMERICAL USE
Scandium	21	Stadium lights
Yttrium	39	Lasers
Lanthanum	57	Electric car batteries
Cerium	58	Lens polishes
Praseodymium	59	Searchlights, aircraft parts
Neodymium	60	High-strength magnets
Promethium	61	Portable X-ray units
Samarium	62	Glass
Europium	63	Compact fluorescent bulbs
Gadolinium	64	Neutron radiography
Terbium	65	High-strength magnets
Dysprosium	66	High-strength magnets
Holmium	67	Glass tint
Erbium	68	Metal alloys
Thulium	69	Lasers
Ytterbium	70	Stainless steel
Lutetium	71	None

THE NEW YORK TIMES

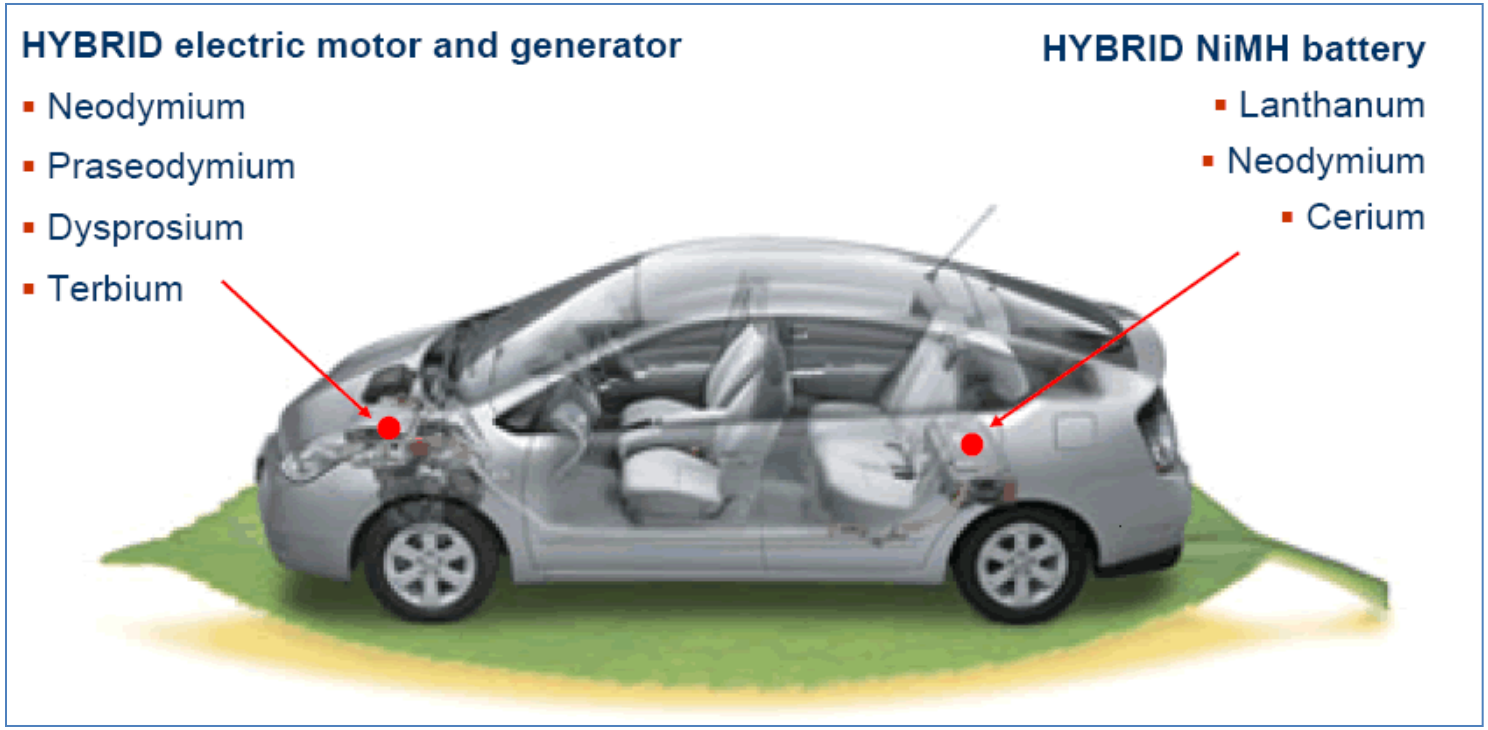
Skokovita poraba redkih naprednih materialov



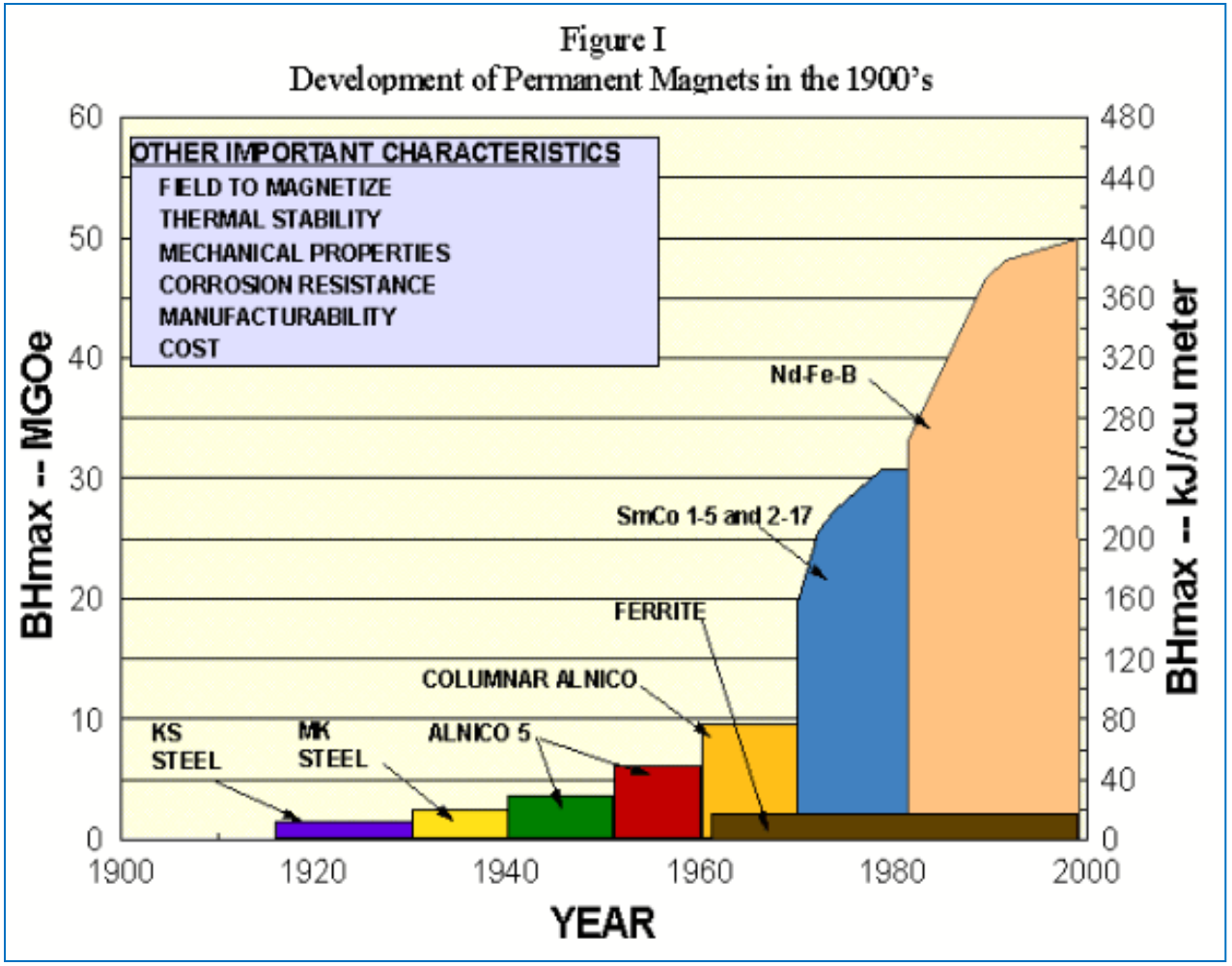
Cene redkih kovin gredo v nebo.



Hibridna tehnologija je v celoti odvisna od redkih kovin.



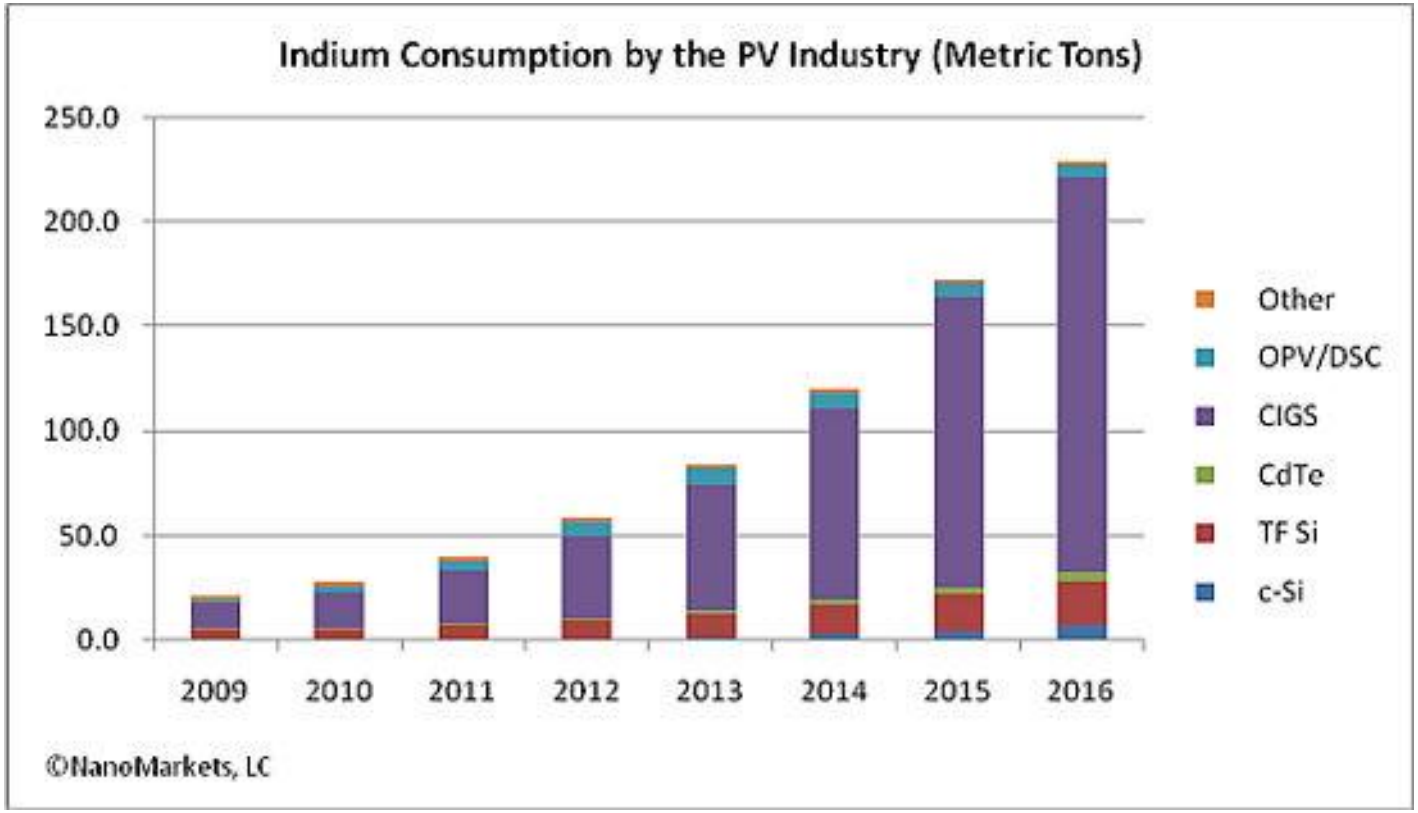
Elektromotorji, aktuatorji in senzorji bazirajo na modernih magnetih.



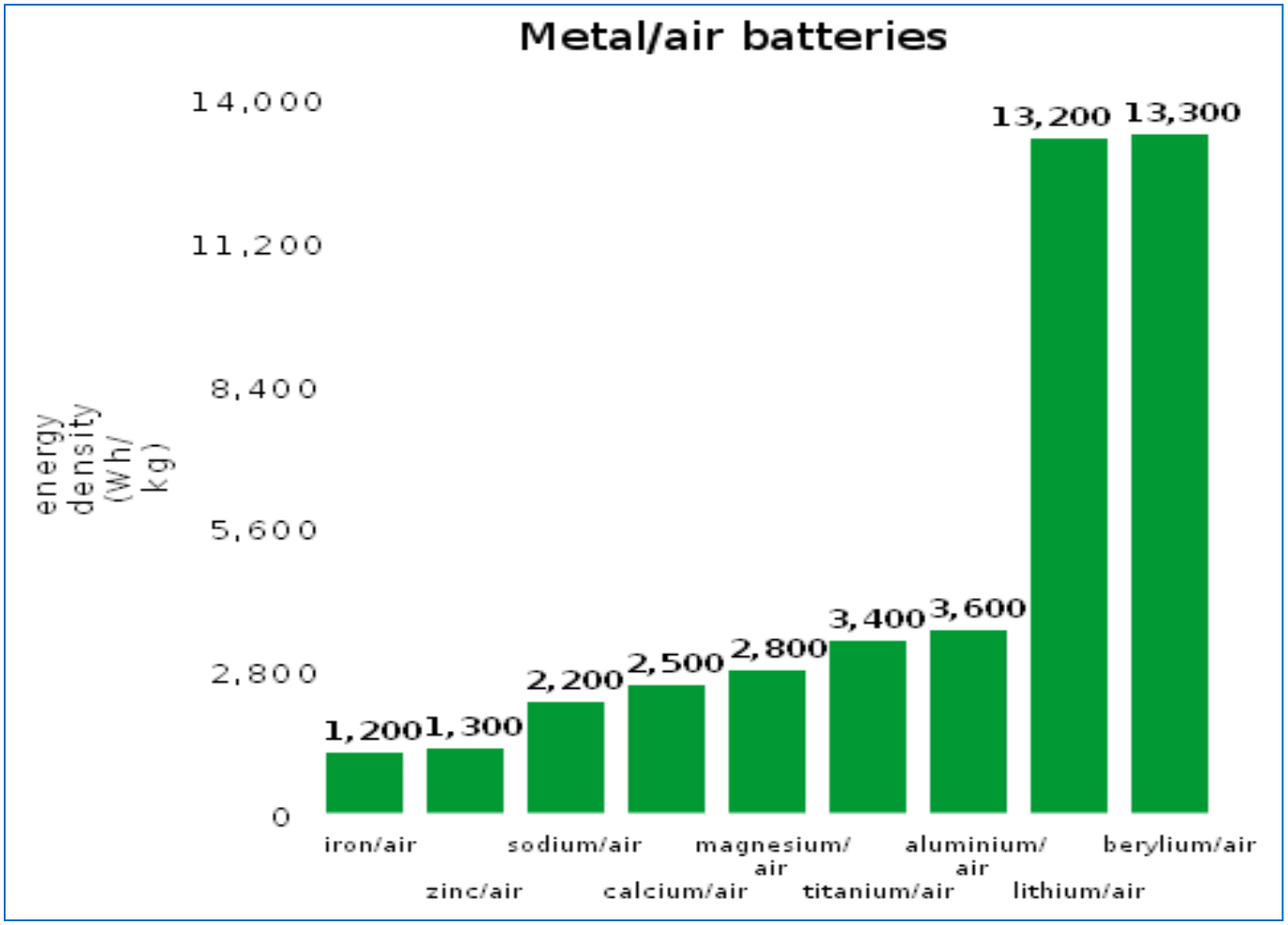
Večji % zlata v telefonih kot v rudnikih

A tonne of ore from a gold mine produces just 5g of gold on average, whereas a tonne of discarded mobile phones can yield 150-400g along with 500 grams of **silver** and 4 grams of **palladium.**

Indij (ITO) je osnova za vse displeje in PV.



Drage redke kovine tudi za shranjevanje energije



HT so usodno odvisne od redkih naprednih materialov.

		METAL	OXIDE	NAME	USAGE
		Sc		Scandium	X-ray tubes, catalysts for polymerisation, hardened Ni-Cr superalloys, dental porcelain.
		Zr	ZrO2	Zirconium	Zirconium is used as an alloying agent due to its high resistance to corrosion.
		Nb	Nb2O3	Niobium	Niobium is used mostly in alloys, the largest part in special steel such as that used in gas pipelines.
RARE EARTH ELEMENT (LANTHANIDES)	LIGHT REE'S	La	La2O3	Lanthanum	Ceramic glazes, high quality optical glass, camera lenses, microwave crystals, ceramic capacitors.
		Ce	Ce2O3	Cerium	Glass polishing, petroleum cracking catalysts, alloys - with iron for sparking flints for lighters, with aluminium, magnesium and steel for improving heat and strength properties, radiation shielding.
		Pr	Pr2O3	Praseodymium	Yellow ceramic pigments, tiles, ceramic capacitors. With neodymium in combination for goggles to shield glass makers against sodium glare, permanent magnets, cryogenic refrigerant.
		Nd	Nd2O3	Neodymium	Ceramic capacitors, glazes and coloured glass, lasers, high strength permanent magnets as neodymium-iron-boron alloy, petroleum cracking catalysts.
		Pm	Pm2O3	Promethium	Radioactive promethium in batteries to power watches, guided missile instruments.
		Sm	Sm2O3	Samarium	In highly magnetic alloys for permanent magnet as Samarium-Cobalt alloy; probably will be superseded by neodymium. Glass lasers. Reactor control and neutron shielding.
	HEAVY REE'S	Eu	Eu2O3	Europium	Control rods in nuclear reactors. Coloured lamps, cathode ray tubes. Red phosphor in TV tubes.
		Gd	Gd2O3	Gadolinium	Solid state lasers, constituent of computer memory chips, high temperature refractories.
		Tb	Tb2O3	Terbium	Cathode ray tubes, magnets, optical computer memories; hard disk components.
		Dy	Dy2O3	Dysprosium	Controls nuclear reactors. Alloyed with neodymium for permanent magnets. Catalysts.
		Ho	Ho2O3	Holmium	Controls nuclear reactors; catalysts; refractories.
		Er	Er2O3	Erbium	In ceramics to produce a pink glaze; infra-red absorbing glasses.
		Tm	Tm2O3	Thulium	X-ray source in portable X-ray machines.
		Yb	Yb2O3	Ytterbium	Practical values presently unknown. Research.
		Lu	Lu2O3	Lutetium	Deoxidiser in stainless steel production, rechargeable batteries, medical uses, red phosphors for colour television, superconductors.
		Y	Y2O3	Yttrium	Deoxidiser in stainless steel production, rechargeable batteries, medical uses, red phosphors for TV.
		Hf	HfO2	Hafnium	Hafnium is used in filaments, electrodes, and semiconductor fabrication processes for circuits

Table 1: Strategic Metals, including Rare Earth Elements and their common usage

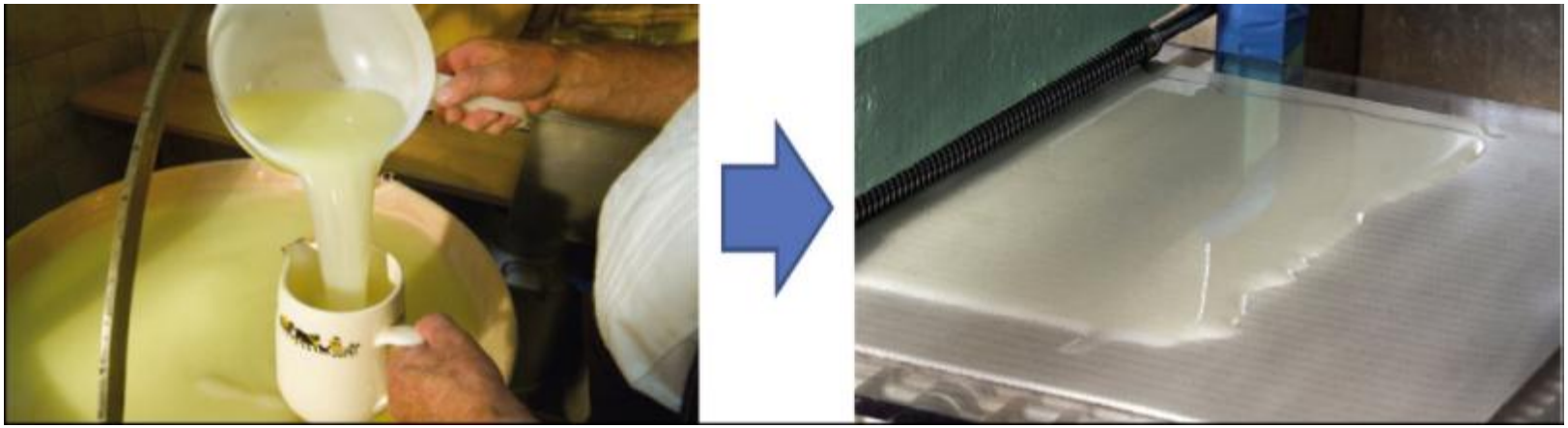
Nekatere cene gredo v nebo.

Metal Oxide	Principal Uses	Price US$ / kg
Lanthanum Oxide 99% min	Re-chargeable batteries	8.50 - 9.00
Cerium Oxide 99% min	Catalysts, glass, polishing	4.70 - 4.90
Praseodymium Oxide 99% min	Magnets, glass colourant	31.80 - 32.70
Neodymium Oxide 99% min	Magnets, lasers, glass	32.50 - 33.00
Samarium Oxide 99% min	Magnets, lighting, lasers	4.25 - 4.75
Europium Oxide 99% min	TV colour phosphors: red	470.00 - 490.00
Terbium Oxide 99% min	Phosphors: green, magnets	720.00 - 740.00
Dysprosium Oxide 99% min	Magnets, lasers	115.00 - 120.00
Gadolinium Oxide 99% min	Magnets, superconductors	10.00 - 10.50
Yttrium Oxide 99.999% min	Phosphors, ceramics, lasers	15.90 - 16.40
Lutetium Oxide 99.99% min	Ceramics, glass, phosphors and lasers	Up to 2,000 / kg
Thulium Oxide 99.99% min	Superconductors, ceramic magnets, lasers, X-ray devices	Up to 3,000 / kg

Uspešni projekti

Zvočnik, 100 % les, proizveden po tehnologiji brizganja

wheylayer



Bio-based and biodegradable packaging from whey protein has the potential to substitute polymer layers in the packing of food.

Development of a technique for the manufacture of whey-coated plastic films with excellent oxygen barrier properties, improved water vapour properties and antimicrobial activity.

Poliuretan iz odpadne lesne biomase

BIOPUR: razvoj specialnih ligninskih kompaundov, kot so npr. elektroprevodni polimeri, inženirski plasti in poliuretan.

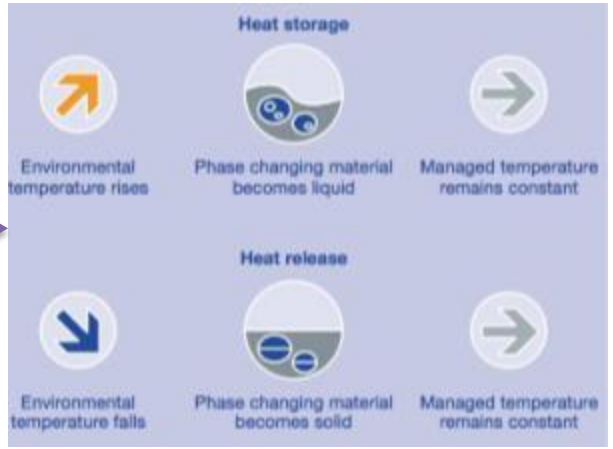
Input *(tons/year)*			Output
Cellulignin	20.000	LIQUEFYING + SYNTHESIS	**Polyurethane - hard** **Polyurethane - soft** **Polyurethane - foam** **64.000 tons/year, η=80 %**
Polyhydrig alcohols	57.000		
Catalyst	1.200		
Hardeners	1.800		

Candle2WPC

WPC

Parafin

PCM



MarineClean

Marine litter removing equipment

Edible and biodegradable food packaging


Hvala za
pozornost!