Facility arrangements, food safety, and the environmental performance of disposable and reusable cups

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'Common drinking cup'

Kempe 2006; http://www.mwra.state.ma.us/04water/html/historypaper/images/3drinkingcup.jpg
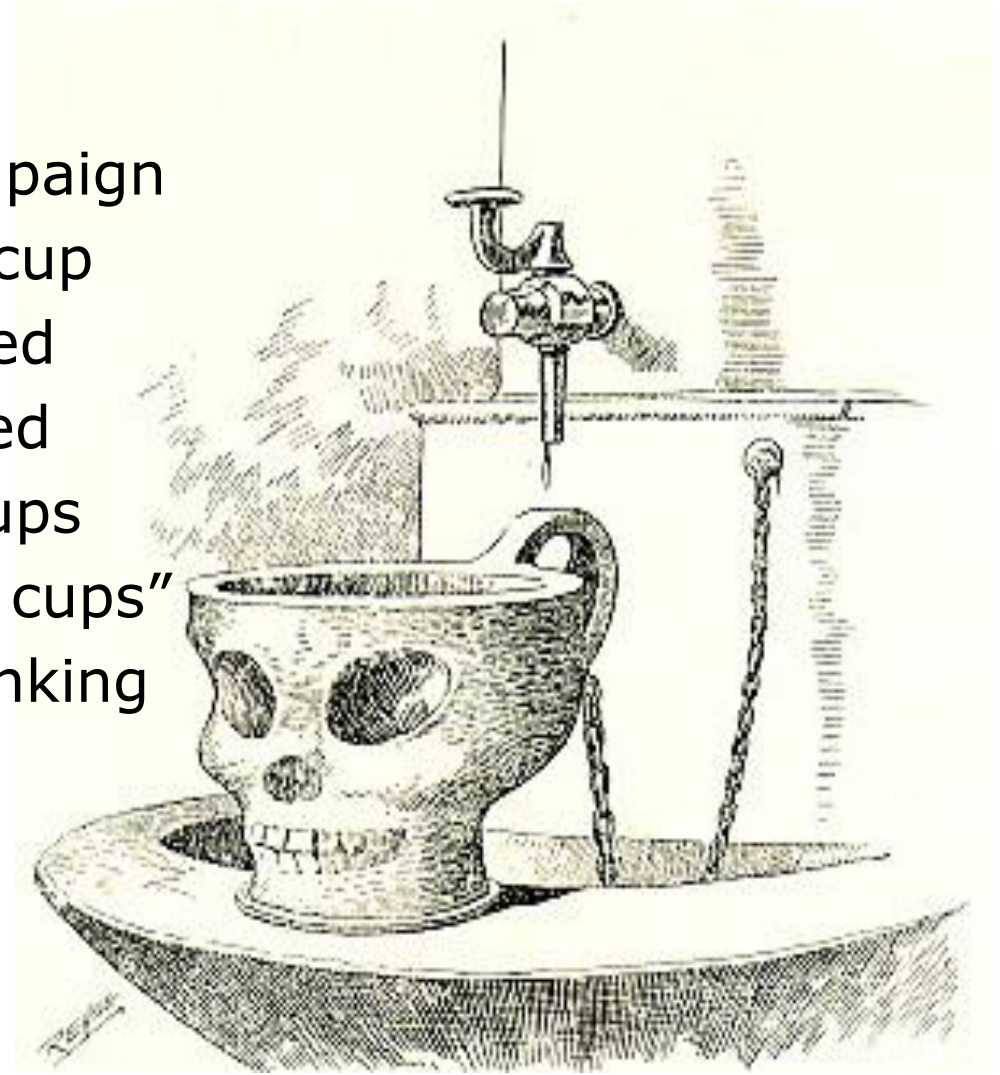
Late 1800, early 1900

Cup for common public use

Provided by public & private establishments:

- Theatres
- Parks
- Schools
- Shops
- Trains
- Post offices
- Hospitals
- ......

Awareness of public health risks

~ 1900: Anti 'common drinking cup' campaign

1907: Investor's interest in individual cup

1907: One-piece individual cup invented

1908: Two piece individual cup invented

1908: Production 'penny vendor' for cups

1908: Study "Death in school drinking cups"

1909: Kansas law banning 'common drinking cup' in public places

1912: Semi-automatic production of individual drinking cups

1916: Railroads selling individual cups through vending machines

The Cup-Campaigner, April 2010
(http://academicmuseum.lafayette.edu/special/dixie/company.html)

Disposable cup facility arrangement

Advertisement UPS (http://unifimpapercup.com/home/blog/)

Then for protecting public health

Nowadays for simplifying services
- For on-the-go consumption
- When cleaning facilities lack
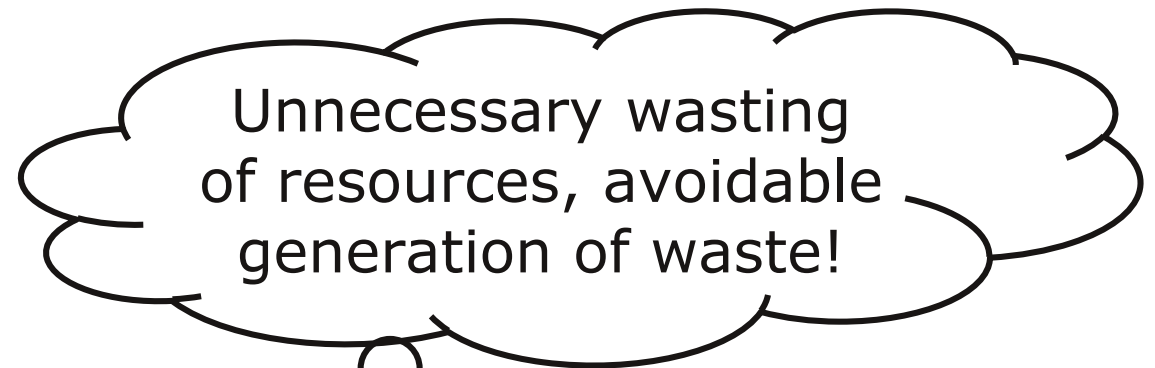- In case of peak demands

Rail road cup dispenser (penny vendor)

About present disposable cup use

Estimated use:

- Yearly 300 E9 worldwide

Disposable cup materials:

- Paper-based
- Plastic-based

Unnecessary wasting of resources, avoidable generation of waste!

Old discussion, new solutions

New contract Wageningen UR for vending machines hot beverages

Annual use:
~2,5 mln disposable polystyrene cups

Question facility managers:
Are bio-based cups better for the environment ?
And what about re-usable cups ? What should we do !

Contents

- Introduction
- Comparison hot beverage cups
  - Three disposable cups
  - Disposable versus reusable cups
- Messages to facility management
- Concluding remarks

GWP outcomes for disposable cups
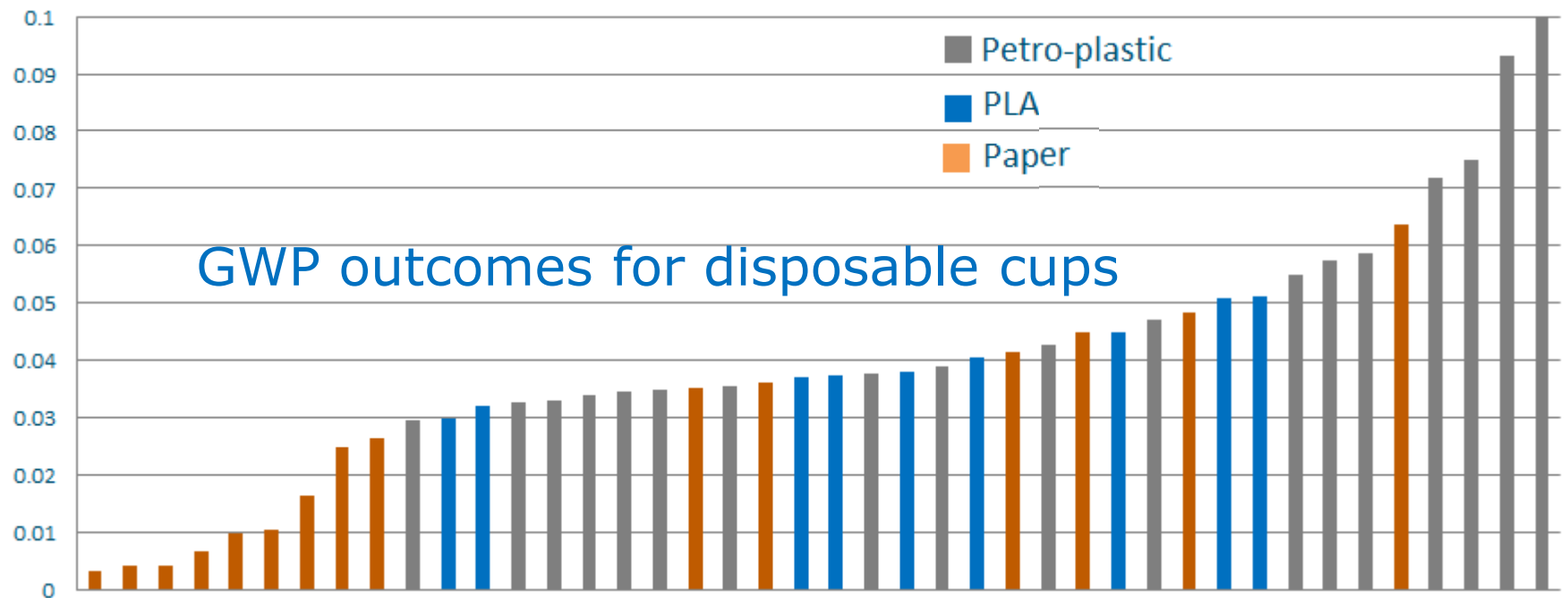
Inconsistencies in existing cup comparisons

- Different types of cups (weight, materials)
- Different resources for materials
- Different end of life (EOL) options
- Different data sources
- Different methodological choices
- ....

Review by Van der Harst & Potting (2013)

Own comparison of disposable cups

Ten different cup systems (3 cups of 180 ml & 4 waste treatments)

Eleven impact categories

Systematically using:

- Multiple data sets & data sources
- Different allocation procedures

	Cup material		
Waste treatment	PS (4.2 gram)	PLA (4.2 gram)	biopaper (5.6 gram)
Incineration	**X**	X	X
Recycling	X	X	X
Anaerobic digestion		X	X
Composting		X	X

Results & learnings disposable cups

Simplified presentation based on average results !!!	PS		PLA				Biopaper			
	I	R	I	R	C	AD	I	R	C	AD
Resource depletion	2	1	3	1	4	1	1	3	4	2
Acc. energy use	2	1	3	1	4	2	2	1	4	2
Climate change	2	1	3	1	4	2	1	3	4	1
Ozone depletion	1	2	1	3	4	2	1	2	4	3
Acidification	2	1	3	1	4	2	2	1	4	3
Eutrophicantion	1	2	3	1	4	2	3	1	4	2
Ozone creation	2	1	3	1	4	2	2	1	4	2
Human toxicity	1	2	3	2	4	1	3	1	4	2
Terrestrial ecotoxicity	1	2	2	1	4	2	1	2	4	3
Freshw. ecotoxicity	1	2	3	1	4	2	3	2	4	1
Marine ecotoxicity	1	2	3	2	4	1	3	2	3	1

- Dominant processes consistent across data sets
- Recycling slightly better than other waste treatments
- Credits recycling decreased by 'dirty' power production
- Composting least favourable waste option
- Large spread in results for each cup alternative
- Spread smaller in energy related indicators

**No best cup material due to large spread in results
Recycling slightly better than incineration**

Environmental Strategies Research (fms) division
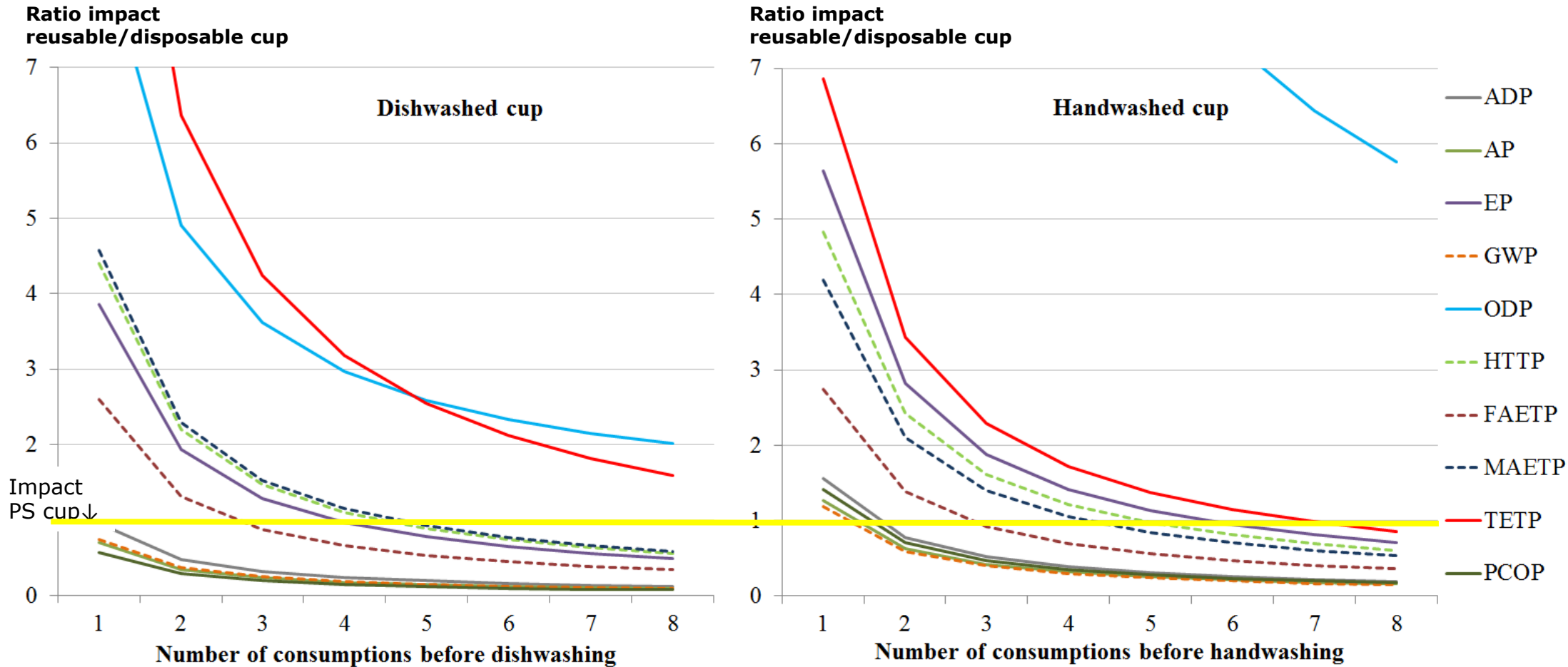KTH Royal Institute of Technology • www.kth.se

Reusable cups

Feasible on fixed workplaces
(~70% WUR-staff uses reusable cup)

Unpracticable for "mobile workplaces"
(e.g. students, lecturers)

Environmental impact
strongly influenced
by cleaning behaviour

Impact disposable slightly less than reusable cups (large uncertainties !!!)

Ratio impact reusable/disposable cup

Dishwashed cup

Impact PS cup↓

Number of consumptions before dishwashing

Ratio impact reusable/disposable cup

Handwashed cup

Number of consumptions before handwashing

Legend: ADP, AP, EP, GWP, ODP, HTTP, FAETP, MAETP, TETP, PCOP

'Common drinking cup' after all ?

https://thisdayinwaterhistory.wordpress.com/tag/common-cup/

Re-introduction no option

Infinitive individual reuse:
- Good for the environment
- Bad for private health ?

Still existing in some countries, e.g., Istanbul

Messages to facility management

No cup, reusable nor disposable, convincingly best (given large uncertainties in outcomes)

Justifies management choice for cup material complying best to own facility preferences

Environmental gain small after more than 3 reuses, no individual health risk expected by less than 3 reuses

Focus on facility arrangements stimulating cup reuse:

- Payment for cup additional to payment for beverage
- Raising awareness with customers

Separate collection disposed cups ?

Waste processors in the Netherlands typically send separately collected disposable cups to incinerator

Some commercial initiatives do guarantee recycling

Separately collected cups are contaminated:
- Drink left-overs (ca. 20%)
- All other kinds of small waste (ca. 20%)

The type of collection system influences contamination

Conclusions

Comparison disposable cups:

- Biobased not better nor worse than PS cups
- Recycling slightly better than incinerating cups
- Composting of biobased cups least preferable
- Relative large improvement potential PLA cups
- Material-competition stimulates ambitions all producers

Comparison reusable versus disposable cups:

- Impact disposable slightly less than reusabel cups

Overall conclusion:

- **Reusing cups is most environmental friendly !!**