How much are people willing to pay for efficient waste management schemes?

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Waste management

- Improper waste management continues to be a critical issue not only in developing but also in developed countries
- Unsuccessful waste management systems are associated with a number of negative environmental and ‘nuisance’ impacts, as well as threats to human health and safety

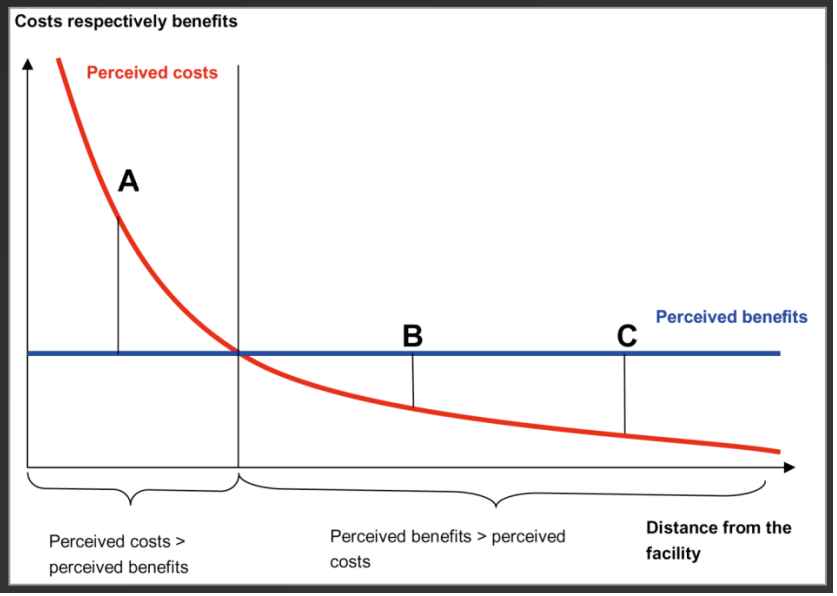
  These negative effects are related with a decline in the quality of life, which, in turn, generates external costs to affected populations and are strongly associated with the NIMBY syndrome...

Externalities and NIMBY

- Although there are net benefits for the society, the external costs of waste management, though small to the society, may be undesirably high at regional level, e.g.:
  - Total utility benefits of 100,000 units to 1,000,000 residents

    Utility benefits per capita: 0.1 units
  - Total utility loss for 1,000 residents living close to the site 10,000 units.

    Utility costs per capita: 10 units
  - The project seems desirable because it provides a net benefit of 90,000 utility units. Nevertheless, it is not justified on a per capita basis for those residing close to the facility.



Waste management and social benefits

Proper waste management systems could….

- reverse negative externalities and
- generate social benefits through reduced impacts, provision of secondary raw materials from recycling, job creation, etc.

Yet, improved waste management systems may be…

- expensive or at least more expensive than traditional waste management approaches (i.e. landfilling)
- more expensive than the society is able to afford, especially in the developing economies

Tackling with the problem…

Improved decision-making processes

- Private costs and benefits alone cannot reflect the true social worth of improved waste management
- Environmental and social costs and benefits should be taken into account to come up with more informed and fair social choices

However, it is necessary …

- to identify the ways in which alternative waste management options affect human well-being and
- to estimate the value of these changes through a variety of appropriate valuation techniques

Total economic value

- The monetary measure of the change in society's well-being from a change in the quality of life is based on its Total Economic Value
- Use values:
  - direct use values (i.e. actual use of an environmental good or service for commercial purposes or recreation)
  - indirect use values (i.e. benefits from ecosystem services and functions rather than directly using them)
  - option values (i.e. value of ensuring the option to use a resource in the future)
- Non-use values include altruistic, bequest and stewardship motivations, reflecting the fact that people value resources for moral reasons, unrelated to current or future use

Valuation approaches

Primary

- Direct market valuation approaches (e.g. market price-based, cost-based, and production functions)
- Revealed preference approaches (e.g. Travel Cost Method Hedonic Pricing Method, etc.)
- Stated preferences approaches (e.g. Contingent Valuation method, Choice modeling, Group Valuation, etc.)

Benefit Transfer method

- ‘Value transfer’ (adjusted or unadjusted transfer of a single estimate, or a measure of central tendency)
- ‘Function transfer’ (transfer of a benefit or demand function from a study site, or a meta-regression analysis function derived from several study sites)

The economic value of improved MSW management…

TEV of IMSW management

Literature review

- Studies monetizing disamenity impacts arising from treatment and disposal facilities (i.e. external costs)

- Studies examining society's WTP for improved MSW management, recycling schemes, etc. (i.e. external benefits)

External costs of landfills

Damigos & Kaliampakos (2012) summarizing transferred unit values from around fifteen studies estimated that:

- The total externalities per tonne of waste range between 2 and 80 $€_{2011}$ when considered as a 'whole' and between 4.5 and 78.5 $€_{2011}$ when valued separately, and then aggregated
- The central tendency of the 'as a whole' and of the 'aggregated' datasets when discarding the minimum and maximum values (i.e. using a 5% trimmed mean) were found equal to 25 and 11.8 $€_{2011}$ per tonne

WTP for improved MSW management

- In total, 37 studies were gathered, which provided 49 point estimates
- Original estimates were converted to monetary values per household per year, for uniformity reasons
- The majority of the observations come from Asia (n=19 or 38.8%), followed by North America (n=13 or 26.5%), Africa (n=8 or 16.3%), Europe (n=4 or 8.2%), Oceania (n=4 or 8.2%) and Middle East (n=1 or 2%)
- Around 60% of the studies were conducted between 2000 and 2009, 20% prior to 2000 and the rest 20% between 2010 and 2014

WTP for improved MSW management

Authors	Country	Region	Study	WTP format	Campaign	Study year	Sample size	Value	WTP/HH/ annum	Comments
Aadland and Caplan (2000)	USA	North America	CVM	OI	Telephone	1997	401	USD	24.60	
Aadland and Caplan (2006)	USA	North America	CVM	DBDC	Telephone	2002	4000	USD	35.64	Calibrated WTP for hypothetical bias
Aadland and Caplan (2006)	USA	North America	CVM	DBDC	Telephone	2002	4000	USD	67.32	Uncalibrated
Afroz and Masud (2011)	Malaysia	Asia	CVM	DBDC	Face-to-face	2009	467	MYR	264.00	
Afroz et al. (2009)	Bangladesh	Asia	CVM	DBDC	Face-to-face	2006	480	Taka	156.00	
Alhassan and Mohammed (2013)	Ghana	Africa	CVM	DC	Face-to-face	2013	200	GHC	44.00	
Altaf and Deshazo (1996)	Pakistan	Asia	CVM	OE	Face-to-face	1990	968	Rs	134.40	
Arekere (2004)	USA	North America	CVM	DC-FU	Mail	1999	618	USD	29.16	
Arekere (2004)	USA	North America	CVM	DC-FU	Mail and personal	1999	757	USD	35.16	
Arekere (2004)	USA	North America	CVM	DC-FU	Mail	1999	618	USD	10.80	
Arekere (2004)	USA	North America	CVM	DC-FU	Mail and personal	1999	757	USD	17.76	
Ayalon et al. (1999)	Israel	Middle East	CVM	OE	Telephone	1998	600	NIS	170.00	
Banga et al. (2011)	Uganda	Africa	CVM	DBDC	Face-to-face	2007	381	Ushs	29,268.00	
Begum et al. (2007)	Malaysia	Asia	CVM	OE	Face-to-face	2004	130	RM	69.88	Value/ton
Berglund (2006)	Sweden	Europe	CVM	OE	Mail	2002	603	USD	56.25	
Blaine et al. (2005)	USA	North America	CVM	DC	Mail	2002	721	USD	28.20	
Blaine et al. (2005)	USA	North America	CVM	PC	Mail	2002	737	USD	18.48	
Bluffstone & DeShazo (2003)	Lithuania	Europe	CVM	DBDC	Face-to-face	1999	460	Litas	32.74	Median value
Bohara et al. (2007)	USA	North America	CVM	DC	Face-to-face	2002	458	USD	67.68	
Caplan et al. (2002)	USA	North America	CR		Telephone	2000	350	USD	69.00	
Caplan et al. (2002)	USA	North America	CR		Telephone	2000	350	USD	96.60	
Ezebilo (2013)	Nigeria	Africa	CVM	DC	Face-to-face	2009	236	Naira	3,660.00	
Ezebilo and Animasaun (2011)	Nigeria	Africa	CVM	PC	Face-to-face	2009	224	Naira	4,676.00	
Fonta et al. (2007)	Nigeria	Africa	CVM	DC-FU	Face-to-face	2003	200	Naira	2,764.00	
Geganzo and Guillermo (2013)	Philippines	Asia	CVM	DC	Face-to-face	2012	240	PhP	700.00	

WTP for improved MSW management

A. Value transfers

- The mean annual WTP per household is 94.7 USD_{2014} (median: 73.7 USD_{2014}, 95% C.I. lower bound: 68.5 USD_{2014} and upper bound: 120.9 USD_{2014}), ranging from 7.8 USD_{2014} up to 368 USD_{2014}. A more conservative estimate (i.e. 5%-trimmed mean) is 85.3 USD_{2014}
- The highest mean value is observed for Asian studies (141 USD_{2014}), followed by Africa (90 USD_{2014}) and Middle East (73.7 USD_{2014}), for which there is only one observation
- The values are significantly lower for developed regions, i.e. Europe (65.7 USD_{2014}), North America (58.7 USD_{2014}) and Oceania (62.9 USD_{2014})

WTP for improved MSW management

A. Value transfers

- Urban populations are more likely to pay higher amounts (mean: 107.1 USD_{2014}) for improved SWM systems than those in rural or semi-rural areas (mean: 45.3 USD_{2014})
- The mean WTP amount for improved SWM is 121.9 USD_{2014}, while it is almost the half for recycling (60.6 USD_{2014})

WTP for improved MSW management

B. Meta-analysis

Variable	b	Description
Constant	-182.531***	
WTPSWMI	77.169**	Study estimated WTP for SWM improvement (yes:1, no:0)
CVM	-65.763***	Study conducted via CV approach (yes:1, no:0)
GDPpercapita	.005****	Country's GDP per capita in USD_{2014}
ASIA	193.831***	Study carried out in Asian country (yes:1, no:0)
AFRICA	203.289***	Study carried out in African country (yes:1, no:0)
URBAN	37.348*	Study surveyed urban population (yes:1, no:0)
Model statistics		
N	44	
Adj. R^2	0.429	

Note: dependent variable: annual HH WTP in USD_{2014}; *:p<0.2; **:p<0.10; ***:p<0.05 and ***:p<0.001

WTP for improved MSW management

B. Meta-analysis

- The sign and significance of the coefficients are consistent with expectations.
- *GDPpercapita*, *WTPSWMI*, *ASIA*, *AFRICA* and *URBAN* variables reveal a positive and significant sign consistent with the analysis of the transferred values.
- *CVM* variable has a negative sign, indicating that CVM studies lead to more conservative estimates than other stated preference approaches

Concluding remarks

- The lack of sufficient waste infrastructure, the collapse of the recycling market from the falling prices of raw and recyclable materials and the hostile economic conditions make recycling an economically unattractive option.
- It is necessary to socially justify the cost and the need for an environmentally sound and socially efficient MSW system by quantifying the benefits offered through reduced environmental and social impacts, provision of secondary raw materials, job creation etc., in monetary terms.

Concluding remarks

- The mean annual WTP per household for improved MSW management is estimated at 95 USD_{2014} (5%-trimmed mean: 85 USD_{2014})
- The estimated values differ considerably among geographic regions and are affected by population characteristics as well as the design of the primary studies
- There is a clear need for more research on the field of MSW management valuation to decrease the level of uncertainty of the estimates. Up to then, conservative central tendencies (e.g. trimmed mean) of adjusted values are more appropriate to use following globally accepted guidelines that exist for Benefit Transfer

Thank you for your attention…