

Sustainability indicators of waste

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Intro 1 : Environmentally Sustainable Communities

Main issues: Energy / Material Flow
Waste reflects Material Flows

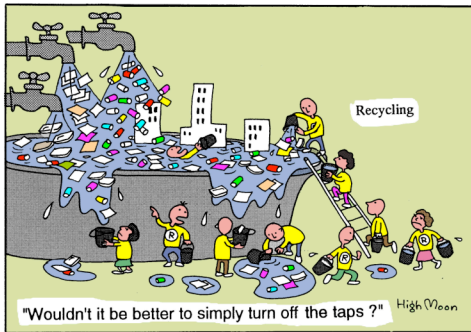
Intro 2 : Environmental Administration

Indicators -> Target -> Accomplishment
No indicator, no progress?

Waste Hierarchy: Reduce, Reuse, Recycle, Disposal
Indicators for Recycle easiest -> More Recycling than Reduce or Reuse

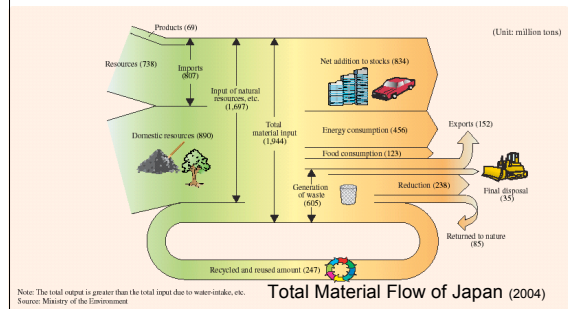
Are plastic bottles a good thing as long as they are recycled?
St Edmundsbury: waste (incl recy) increased with intro of compost coll.

"easy" recycling rate may not be the best indicator

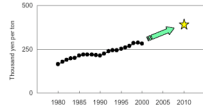


Recycling rates:

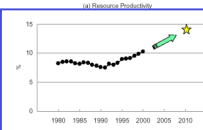
Recovery rate and Utilisation rate (recycled content)
Recovery rate includes amount exported as recyclables etc
Japanese gov't plan uses utilisation rate for target



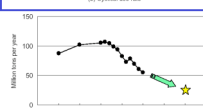
Plan for establishing a sound material cycle society (Japan MoE)



Resource Productivity (GDP/DMI)
1990 ¥210k/t
2000 ¥280k/t
2010 ¥390k/t
(DMI: Direct Material Input)

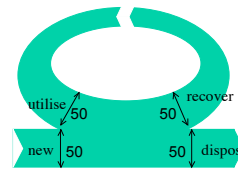


Recycling (Utilisation) rate
1990 8%
2000 10%
2010 14% (target)



Final Disposal (amount landfilled)
1990 110Mt
2000 56Mt
2010 28Mt

Recycling rates and number of use



Closed loop 50% recycling

$$\text{proportion of } n^{\text{th}} \text{ use} = r^{n-1} - r^n$$

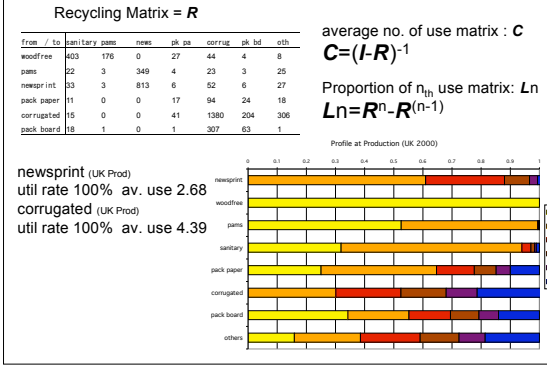
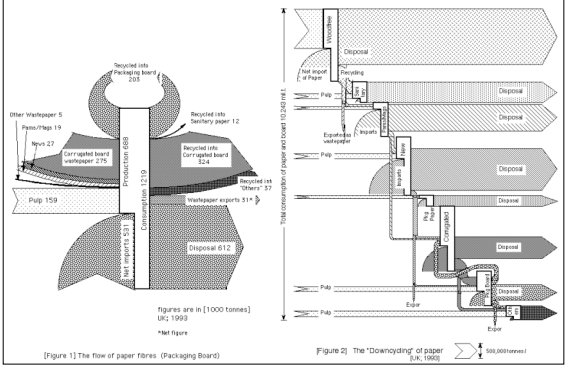
$$\text{average no. of use} = (1-r)^{-1}$$

r : recovery-utilisation rate

Iterations	1st	2nd	3rd	4th	5th
1st	1				
2nd	1	2			
3rd	1	2	3		
4th	1	2	3	4	
Convergence	1	2	3	4	5

[Fig] Profile of 50% recycling rate

Things get a bit more complicated with cascading (open loop recycling)



Indicator for Reuse

Returnable containers etc, "Number of Use" is good enough
 Durable goods, "Number of Use" not necessarily a good indicator
 - "Many users - Short use" better than "One user - Long use"?

"Average Use Time" may be better
 Difficult to random sample existing stock and measure age:

Ave. Use Time = Amount in use (stock) / new production per period (flow)

ie. decreased production is the only way to increase average use time?

The effect of a policy initiative does not immediately reflect on the indicator.
 (more durable product -> results come out only when it wears out)

Indicator for Reduce (minimisation)

Hierarchy: Reduce before Recycling, as recycling itself consume resources
 ie. Recycling is NOT Reduction

Waste Stats: less waste (incl. recycling) - not necessarily more reduction
 - definition / category of waste different among authorities
 - "externalisation" of waste (eating out / ready-to-eat food)

measuring "what is not there" is difficult

diffusion of minimisation behaviour
 comparison with "Business as Usual" scenario (hypothetical)

Improvement of waste statistics would help
 (standardisation of definition and measuring methods)

Wrap up

Good indicators are essential for good policy

Recycling rate not necessarily the best indicator
 (number of use indicator)

Need to be patient with results (e.g. reuse indicators)

Need indicators for reduction

