The 2006 IPCC Guidance on Harvested Wood Products and Some Possible Refinements

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- “Worldwide – according to a study by Winjum et al. (1998) and a report by the UNFCCC secretariat (2003) – the amount of carbon held in harvested wood products is likely to be increasing”
- “The 1996 IPCC Guidelines (IPCC, 1997) did not provide methods for estimating carbon held in HWP, and recommended, for the purpose of basic calculations, a default assumption expressed as ‘…that all carbon biomass harvested is oxidized in the removal (harvest) year’”.

(2006 Guidelines)

Approaches for Accounting for Carbon in Harvested Wood Products

- Stock-change approach
- Atmospheric flow approach
- Production approach
- Simple decay approach

Variables Used to Estimate the Annual HWP Contribution to AFOLU CO_2 Emissions/Removals

- Change in C stock in use and in landfills that came from domestic production
- Change in C stock in use and in landfills that came from domestic harvest
- C in annual imports
- C in annual exports
- C in annual harvest

"Countries may wish to develop more complex, detailed country-specific methods to estimate Variables 1A, 1B, 3, 4, and 5…Tier 3 models could also use decay functions other than first order decay, e.g. linear decay."

(2006 IPCC Guidelines)

“ The guidance here generally assumes that the amount of wood material in use declines following a first-order decay; again this is not the only assumption possible. Different possibilities include linear decay and more detailed approaches based on the real use of these materials. Again no preference on this choice is implied.”

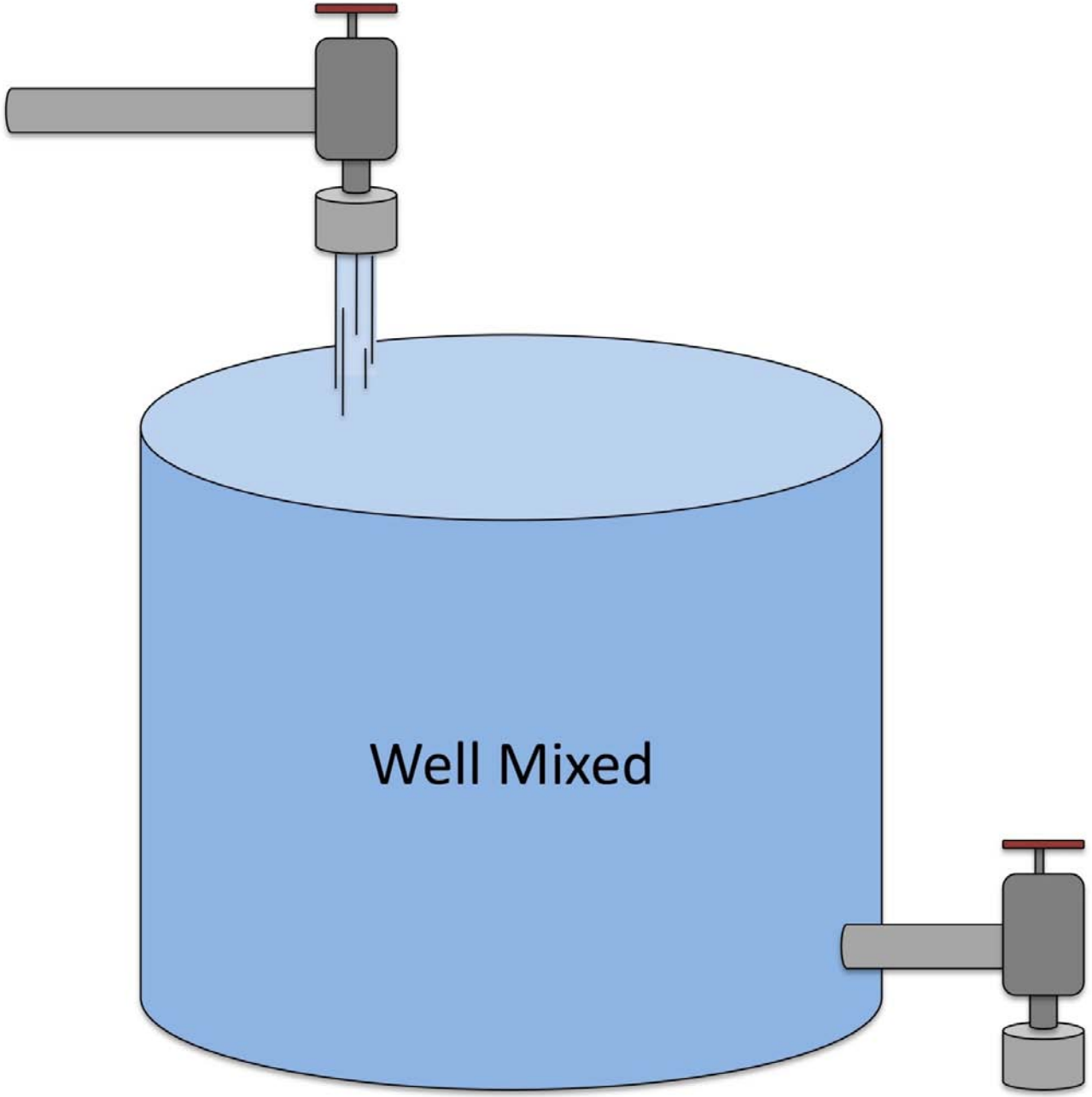
(2006 IPCC Guidelines)

- The objective of accounting for harvested wood products is to provide an accurate estimate of emissions of CO2 to the atmosphere. This means how much, when, and, in some manner, where.
- We suggest that there are at least two simple things that can be done now to improve the clarity of the methods proposed and the accuracy of the estimates produced.

Suggested Refinements for the 2006 IPCC Methodologies for HWP

1.) address the approaches that have been proposed to date out front in the chapter and then deal with them separately.

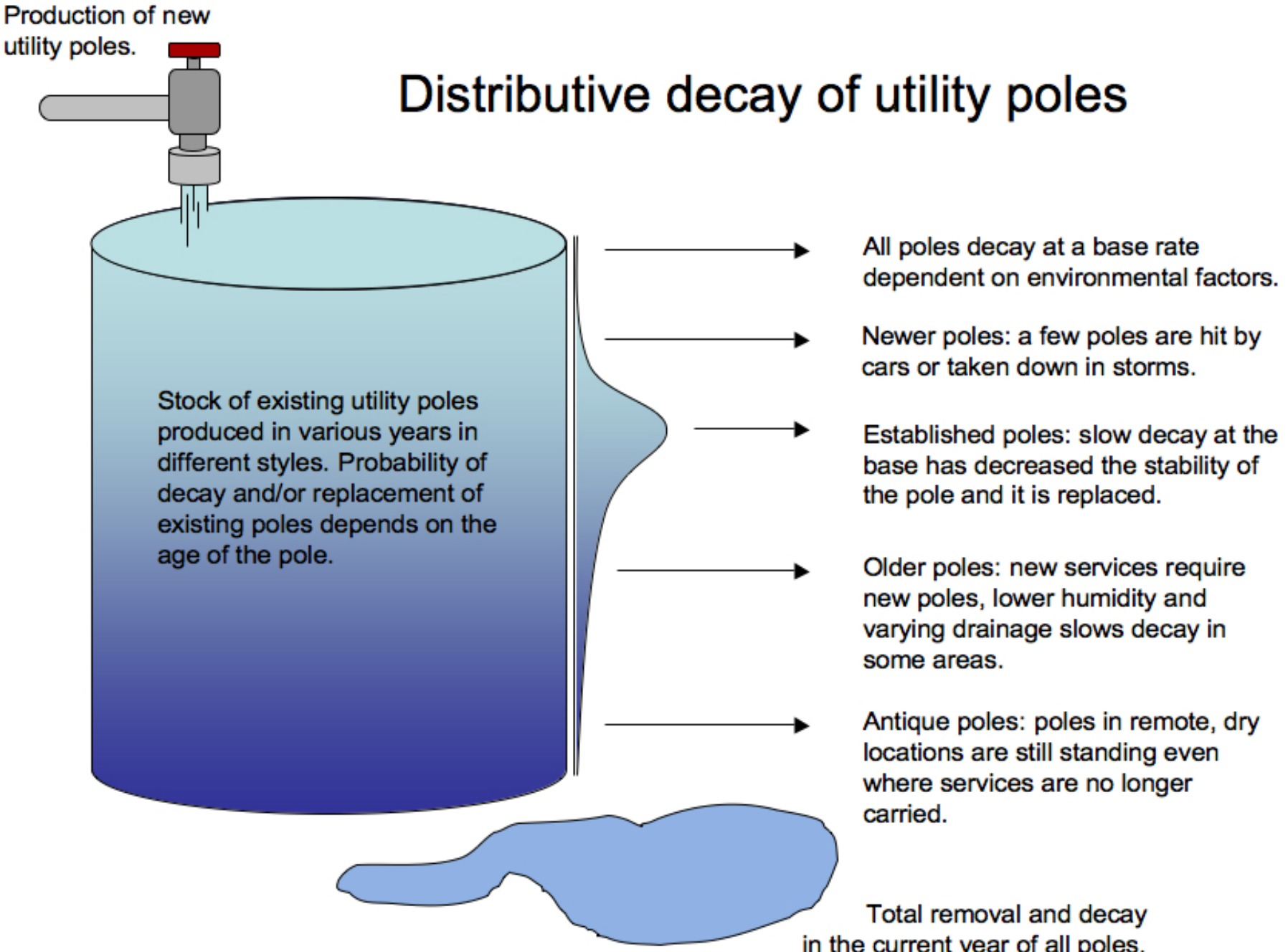
2.) provide a more accurate description of the rate at which wood products are oxidized.


Well Mixed

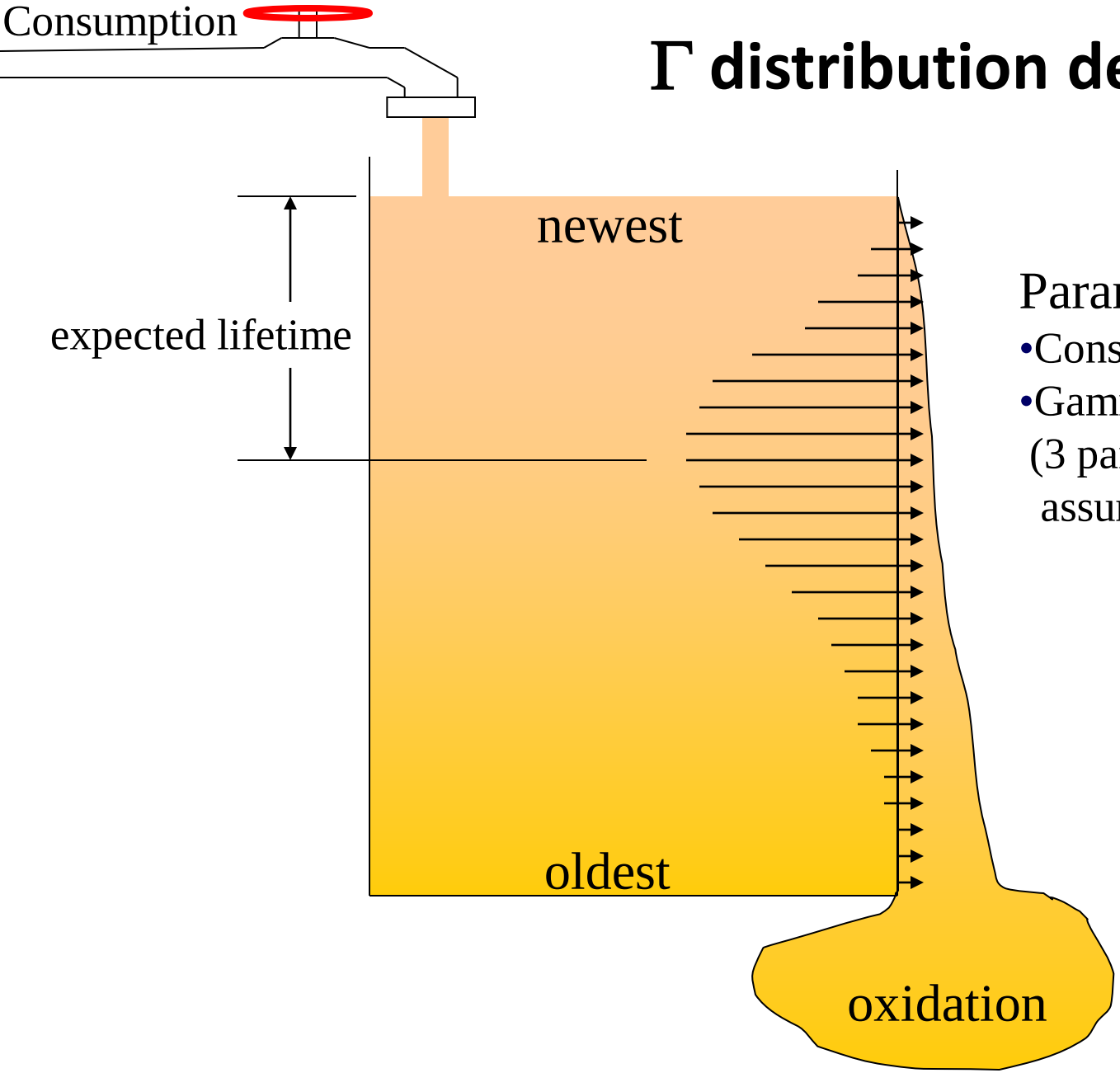
$$\frac{dS}{dt} = production - removal$$

$$\frac{dS}{dt} = J(t) - kS(t)$$

Distributive decay of utility poles



Γ distribution decay

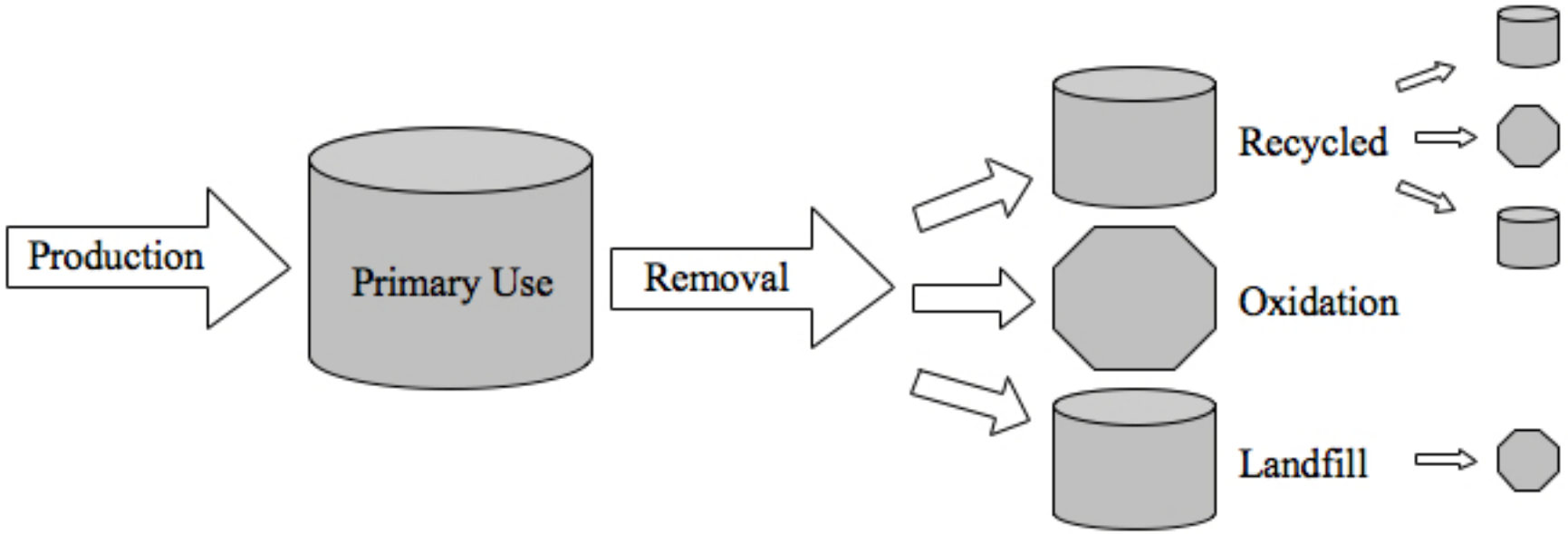


Parameters Needed

- Consumption data/function
- Gamma decay function

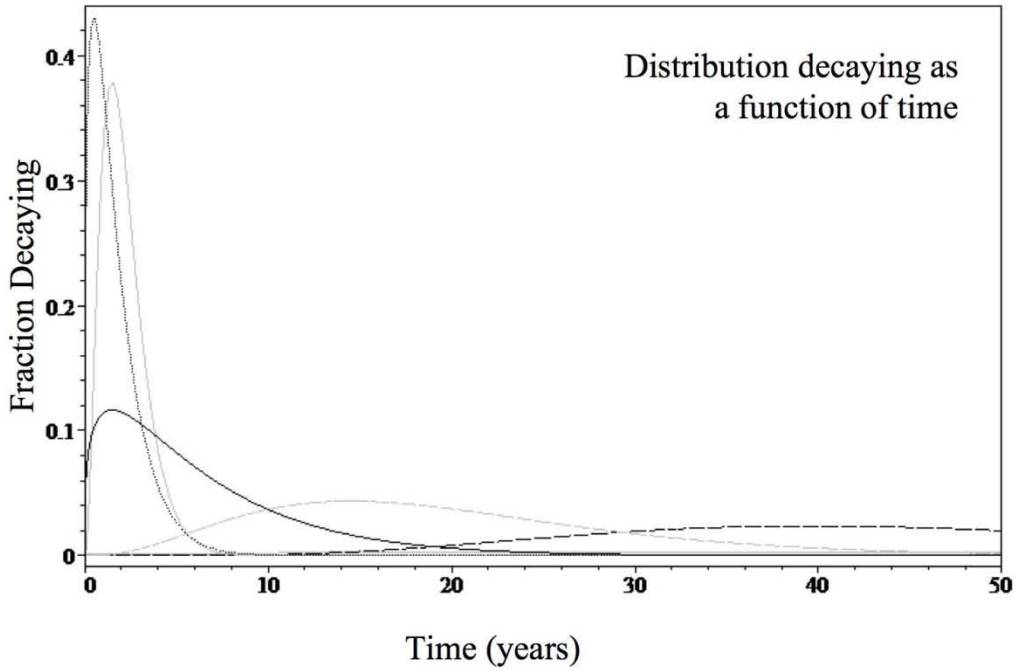
(3 parameter fit; 1 with a few assumptions)

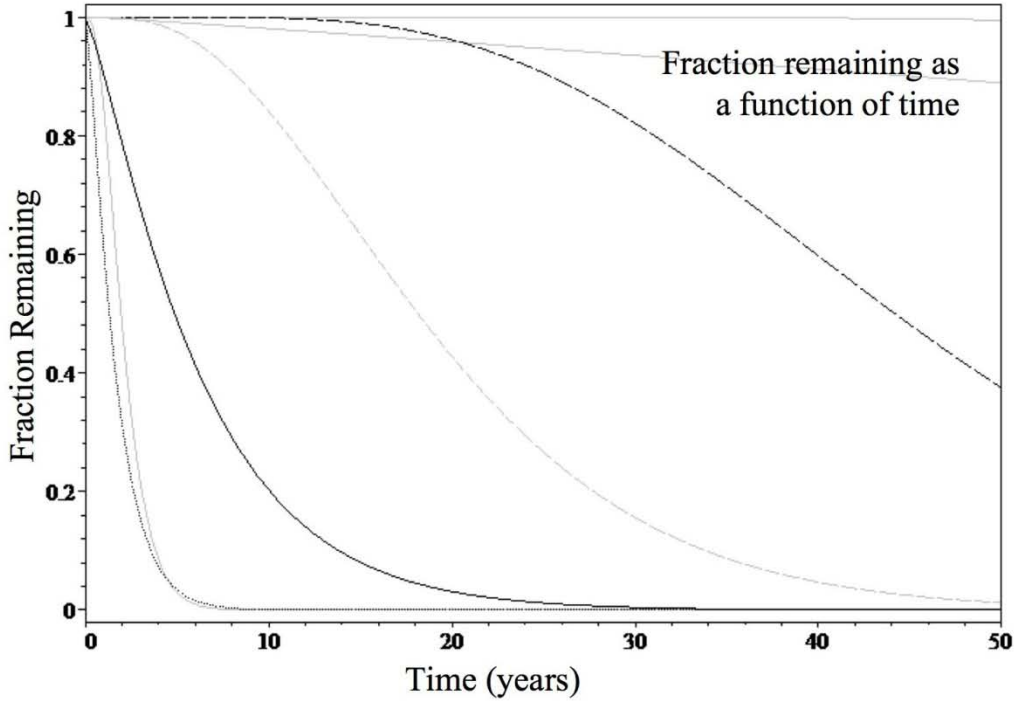
$$\frac{dS}{dt} = J(t) - \int_0^t J(t-\tau)P(\tau)d\tau$$

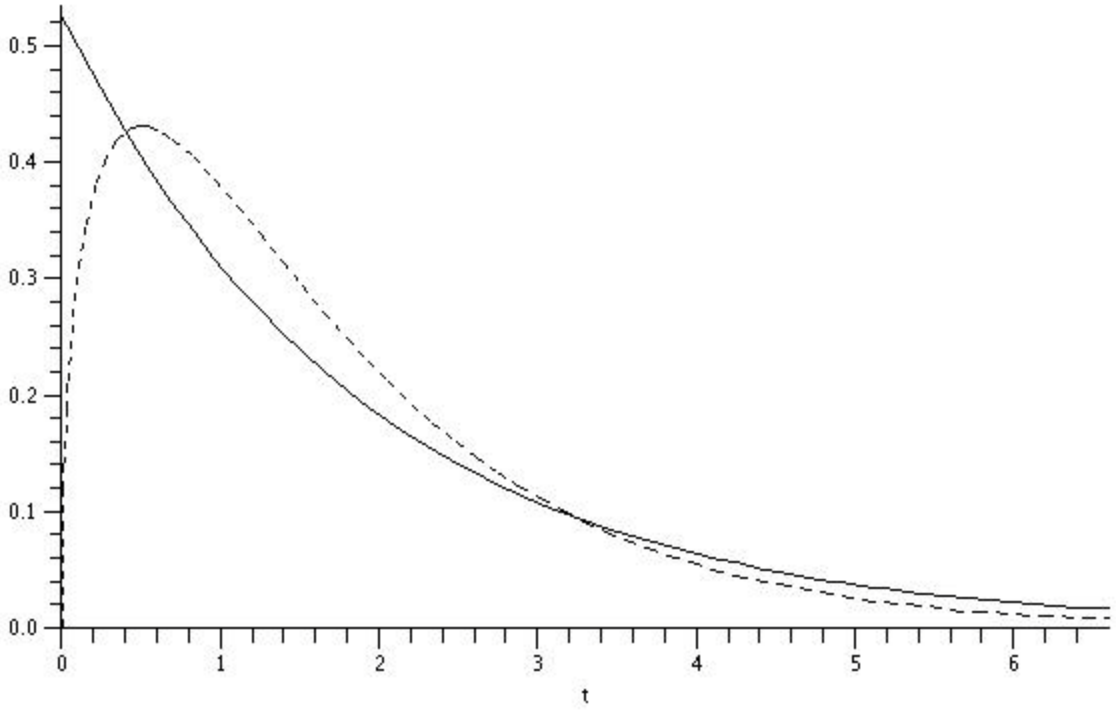

Production
Primary Use
Removal
Recycled
Oxidation
Landfill

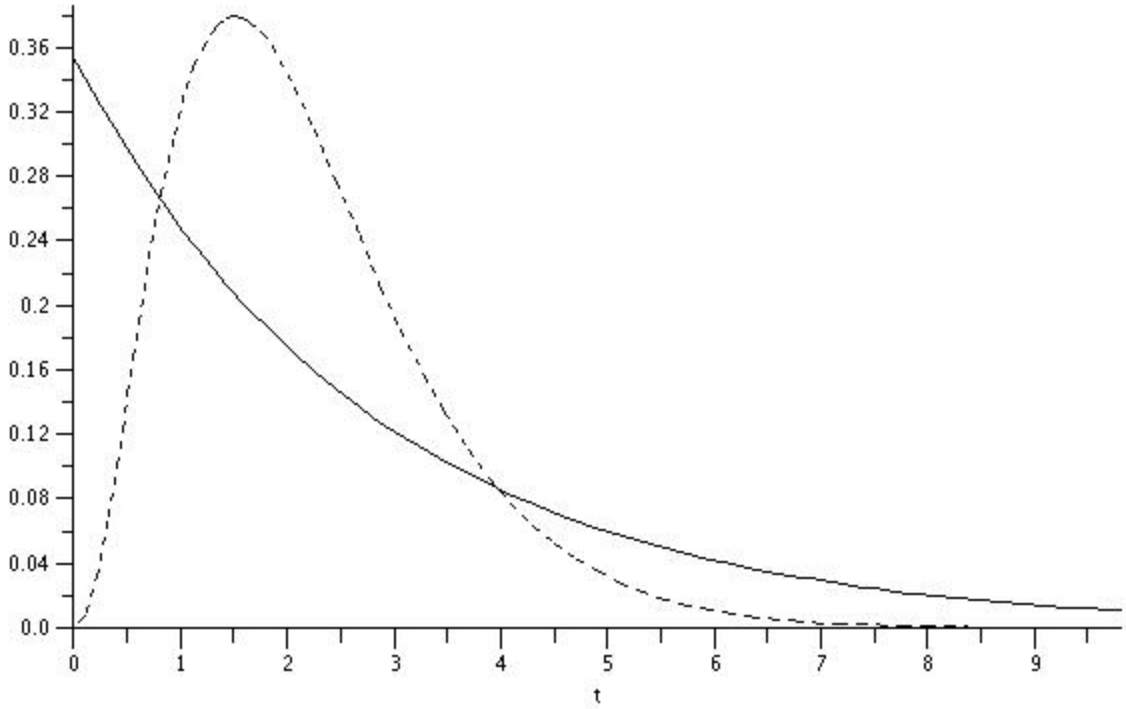
Product (from oak)	Year of max decay	95% decay period (years)	Gamma parameters k	θ
Waste, bark, fuel	2	18	1.305	4.918
Pulpwood	1	5	1.418	1.196
Particleboard	15	40	3.676	5.419
Pallet, packaging	2	5	3.196	0.683
Fencing	40	80	6.662	6.976
Construction	150	300	6.740	26.045
Mining	40	1000	1.128	308.594

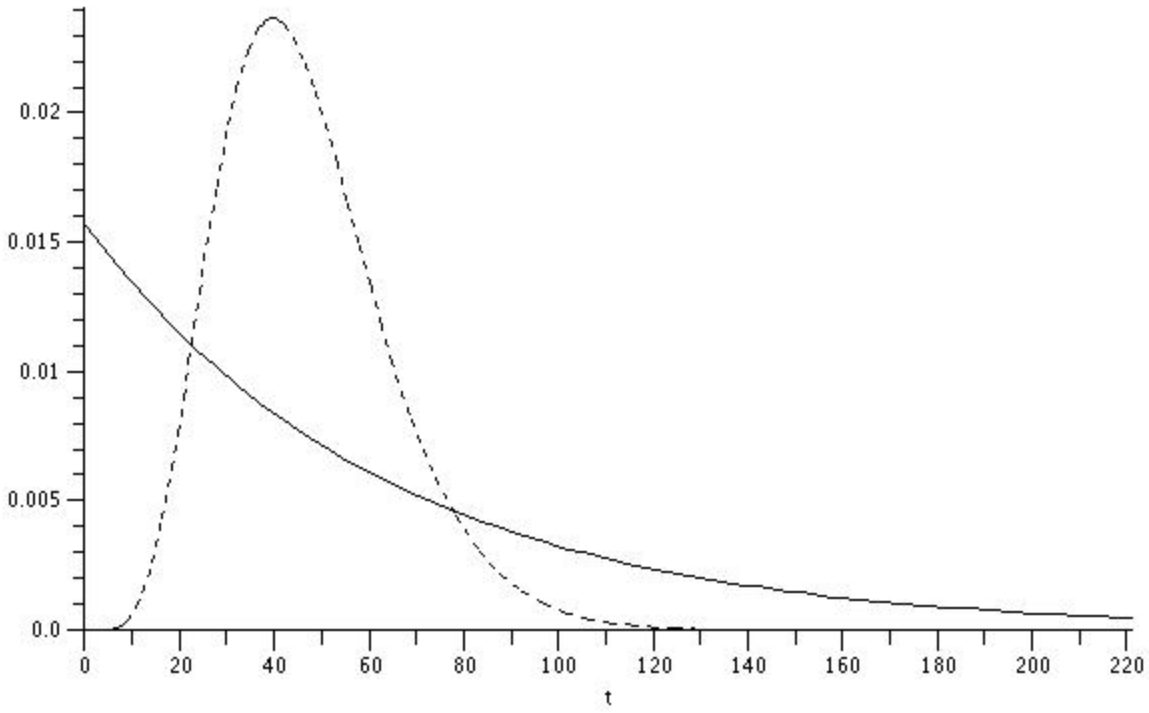
Data courtesy Forest Research, UK

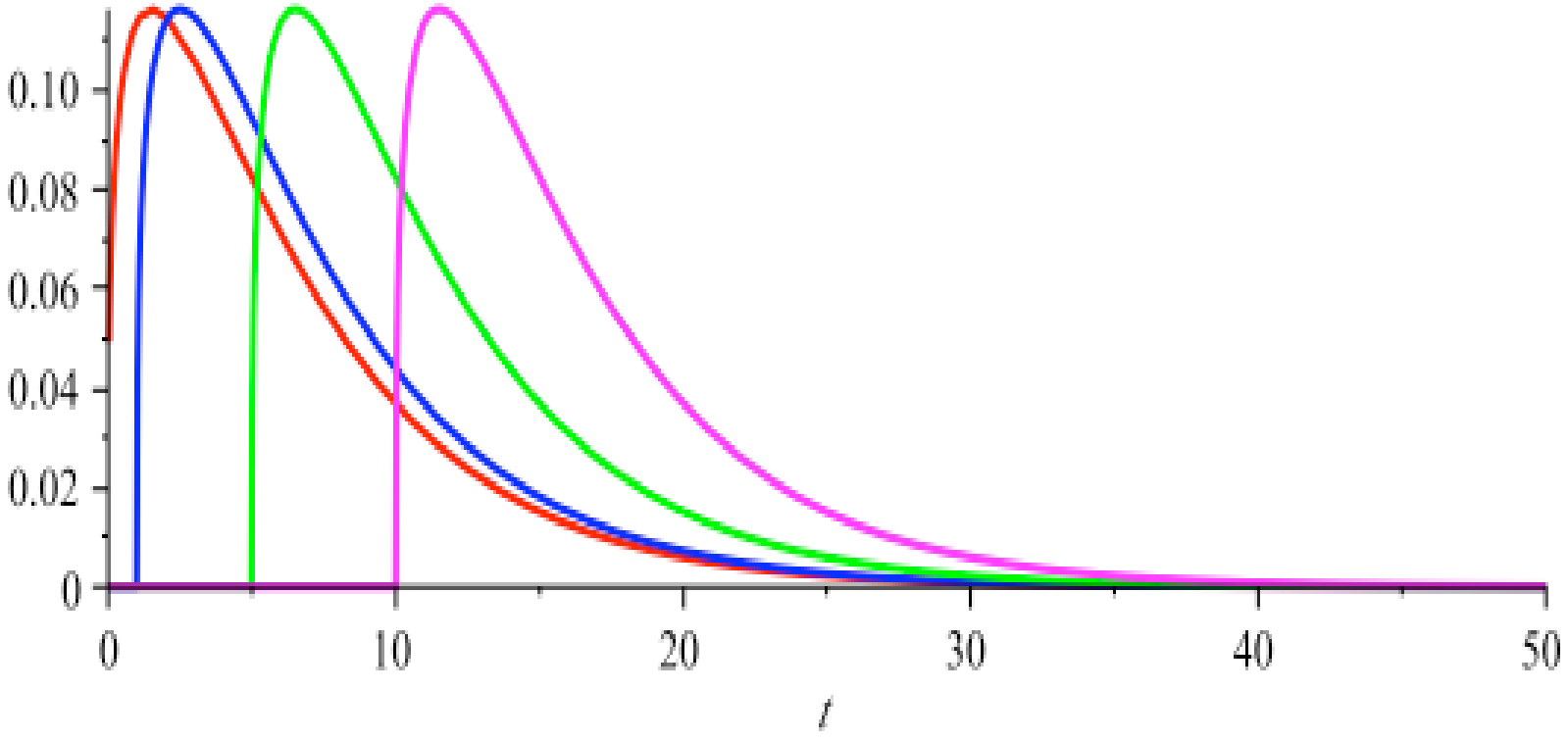

Distribution decaying as
a function of time
Fraction Decaying
0.4
0.3
0.2
0.1
0
0
10
20
30
40
50
Time (years)


Fraction remaining as
a function of time
Fraction Remaining
1
0.8
0.6
0.4
0.2
0
0
10
20
30
40
50
Time (years)


0.5
0.4
0.3
0.2
0.1
0.0
0
1
2
3
4
5
6
t

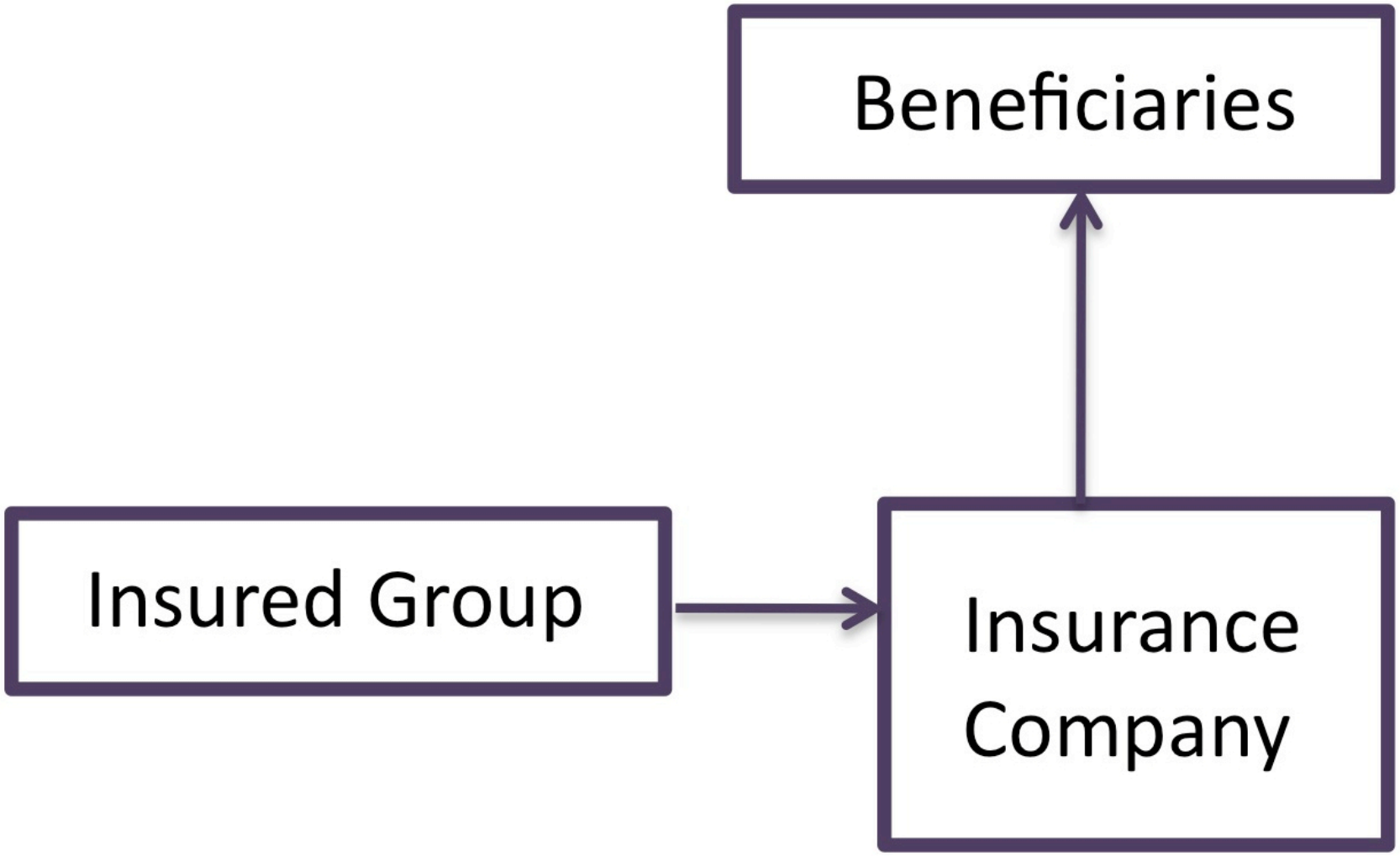

0.36
0.32
0.28
0.24
0.2
0.16
0.12
0.08
0.04
0.0
0
1
2
3
4
5
6
7
8
9
t

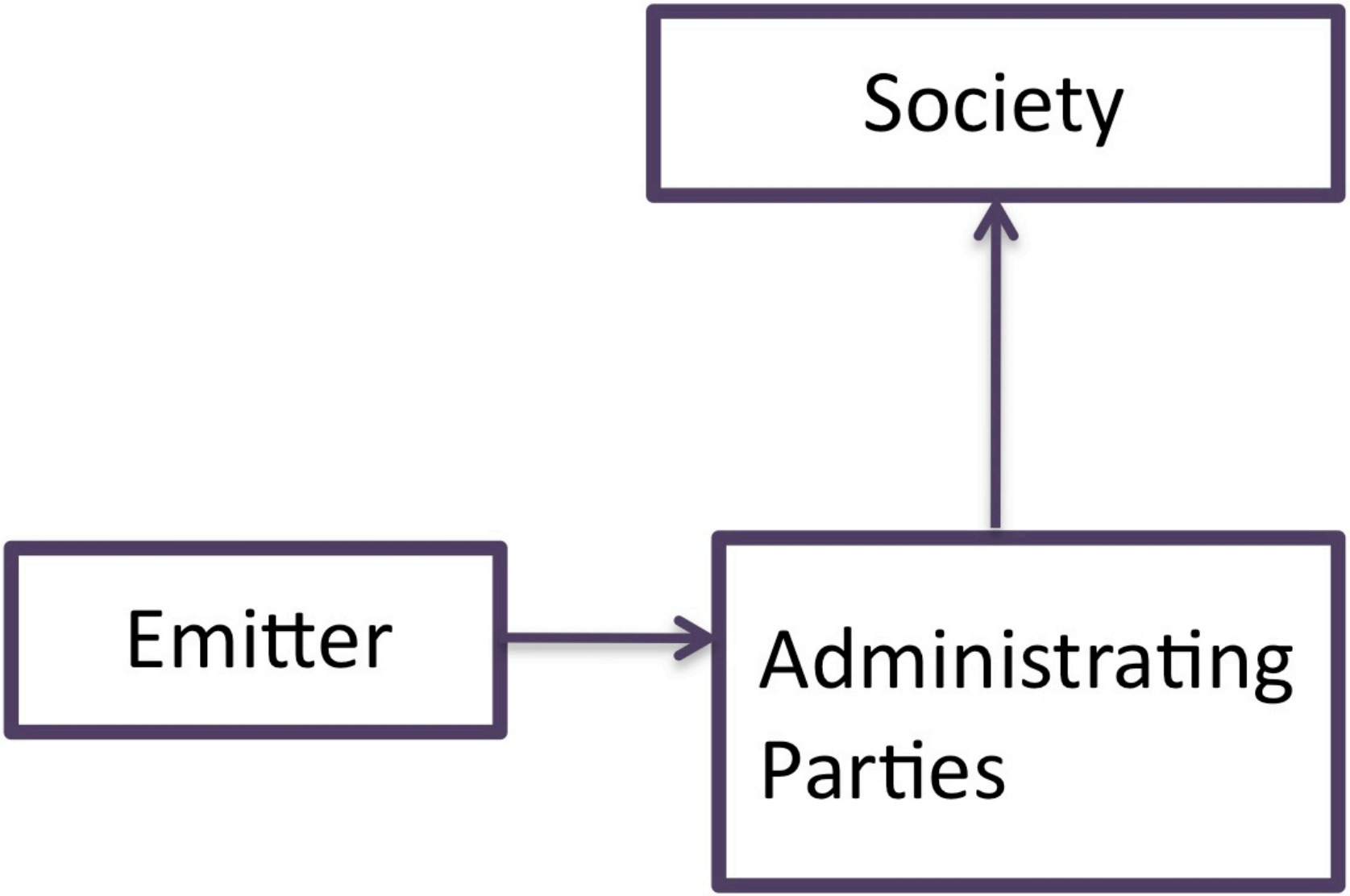

0.02
0.015
0.01
0.005
0.0
0
20
40
60
80
100
120
140
160
180
200
220
t


0.10
0.08
0.06
0.04
0.02
0
0
10
20
30
40
50
t

Product Use	K, theta	Storage Time (yrs)	Cost per ton
Waste, Bark, Fuel	1.305, 4.918	0	41.78
		1	40.55
		5	35.96
		10	30.95

Wood Product	Distr. Parameters		Present Value of Emissions		
Usage	k	θ	Expected	1% error	10% error
2% discounting					
Waste, bark, fuel	1.305	4.918	$ 44.24	± $0.11	± $1.10
Pulpwood	1.418	1.196	$48.35	± $0.03	± $0.34
Particleboard	3.676	5.419	$34.25	± $0.26	± $2.54
Pallet and Packaging	3.196	0.683	$47.88	± $0.04	± $0.43
Fencing	6.662	6.976	$ 20.95	± $0.36	± $3.65
Construction	6.740	25.045	$2.96	± $0.16	± $1.89
Mining	1.128	308.594	$ 5.42	± $0.17	± $1.99
5% discounting					
Waste, bark, fuel	1.305	4.918	$33.99	± $3.74	± $5.55
Pulpwood	1.418	1.196	$46.14	± $0.17	± $0.87
Particleboard	3.676	5.419	$20.71	± $0.35	± $3.58
Pallet and Packaging	3.196	0.683	$44.91	± $0.10	± $0.99
Fencing	6.662	6.976	$ 6.81	± $0.26	± $2.92
Construction	6.740	25.045	$0.18	± $0.02	± $0.14
Mining	1.128	308.594	$ 2.13	± $0.09	± $1.09


Beneficiaries
Insured Group
Insurance Company


Society
Emitter
Administrating Parties

References Cited

- Marland, E., and G. Marland, 2003. The treatment of long-lived, carbon-containing products in inventories of carbon dioxide emissions to the atmosphere. Environmental Science and Policy 6: 139-152.
- Marland, E., K. Stellar, and G. Marland, 2010. A distributed approach to accounting for carbon in wood products. Mitigation and Adaptation Strategies for Global Change 15: 71-91.
- Shirley, K., E. Marland, J. Cantrell, and G. Marland, 2010. Managing the cost of emissions for durable, carbon-containing products. Mitigation and Adaptation Strategies for Global Change, in press.