Use of HPC Data for Life Cycle Assessment

Characterizing Chemicals in Commerce

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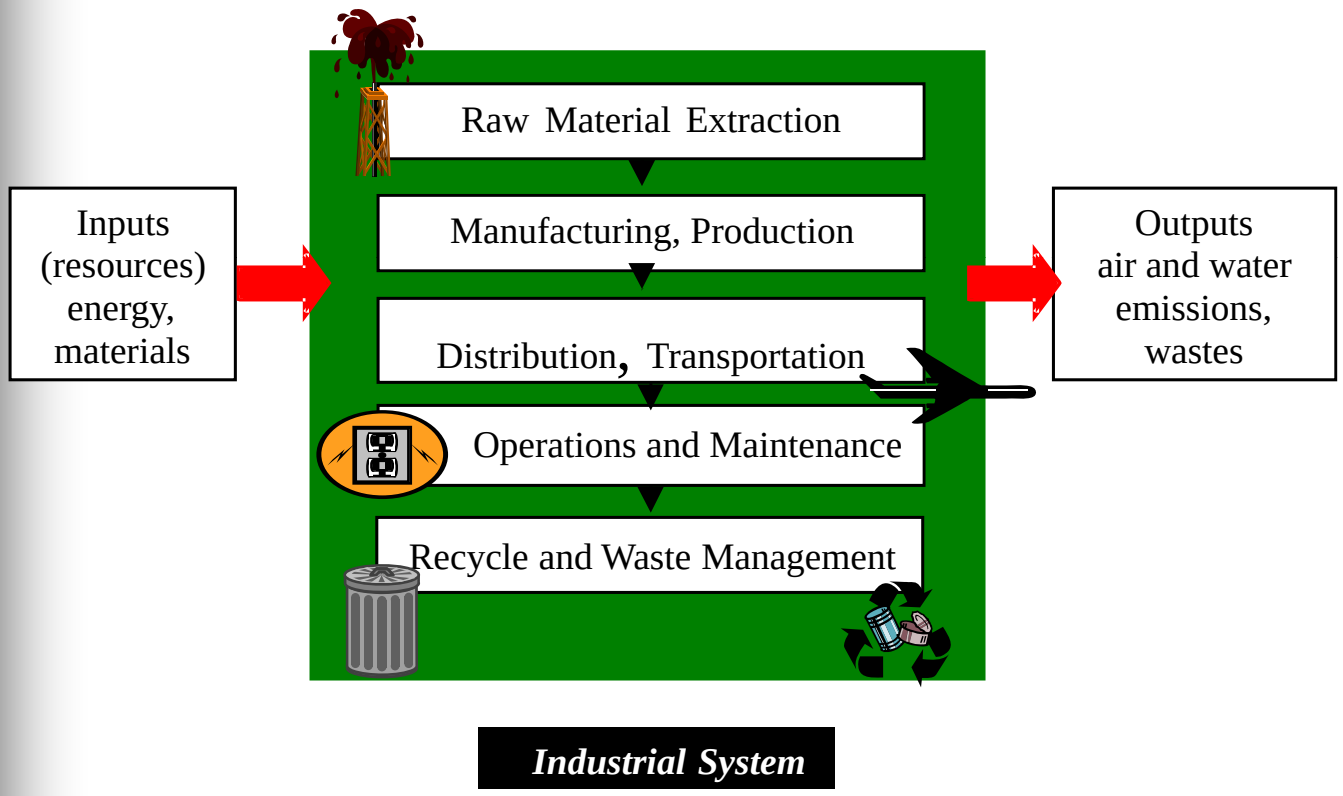
Life Cycle Assessment is:

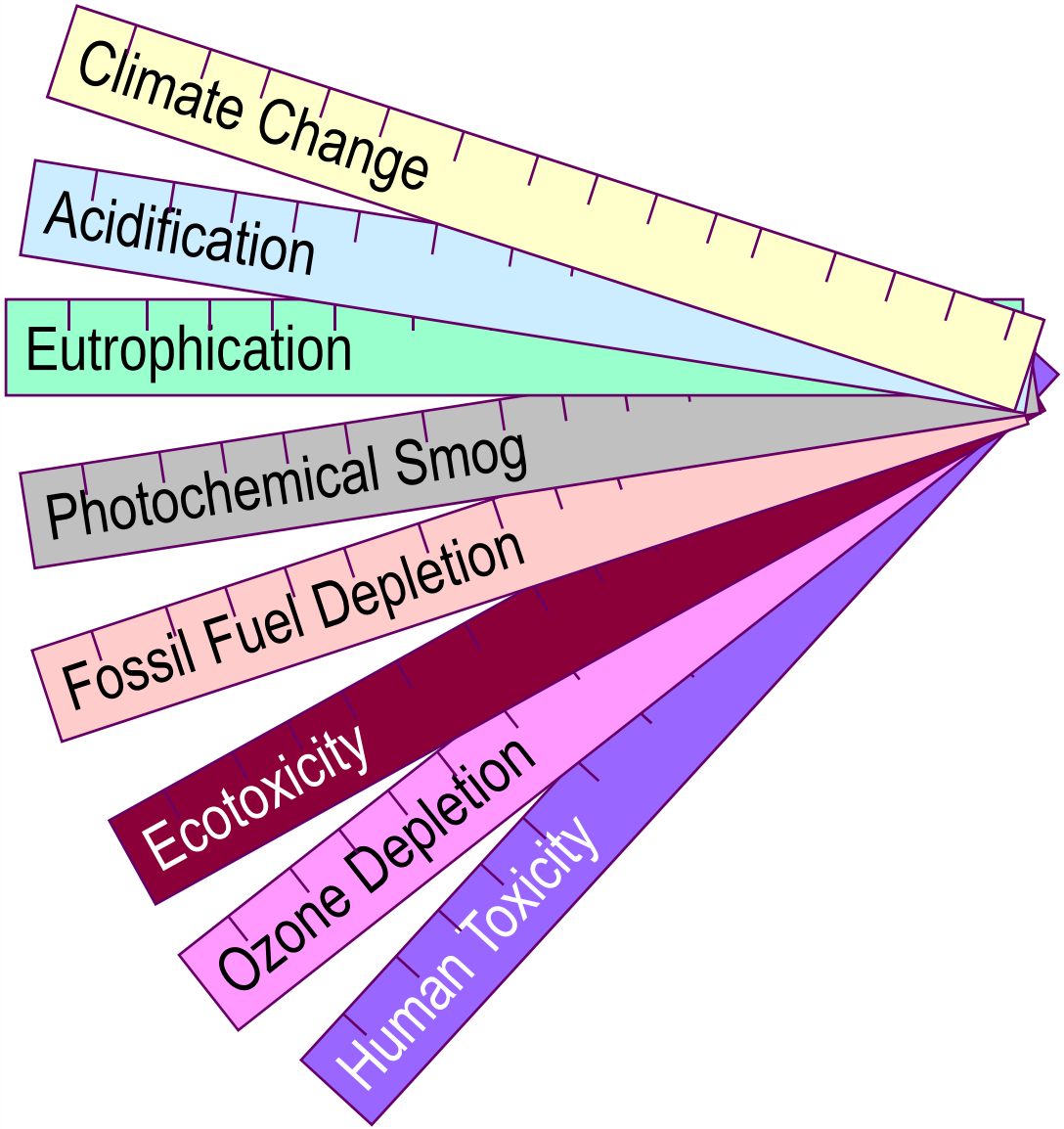
- A comprehensive assessment of environmental impacts of products and services
- Based on input-output analysis of the entire product life cycle
- Using indicators of all relevant environmental impacts to provide an ecoprofile
- Often based on the fate & transport of chemical emissions
- Highly data intensive
- Science-based and useful for many decision

All Life Cycle Stages

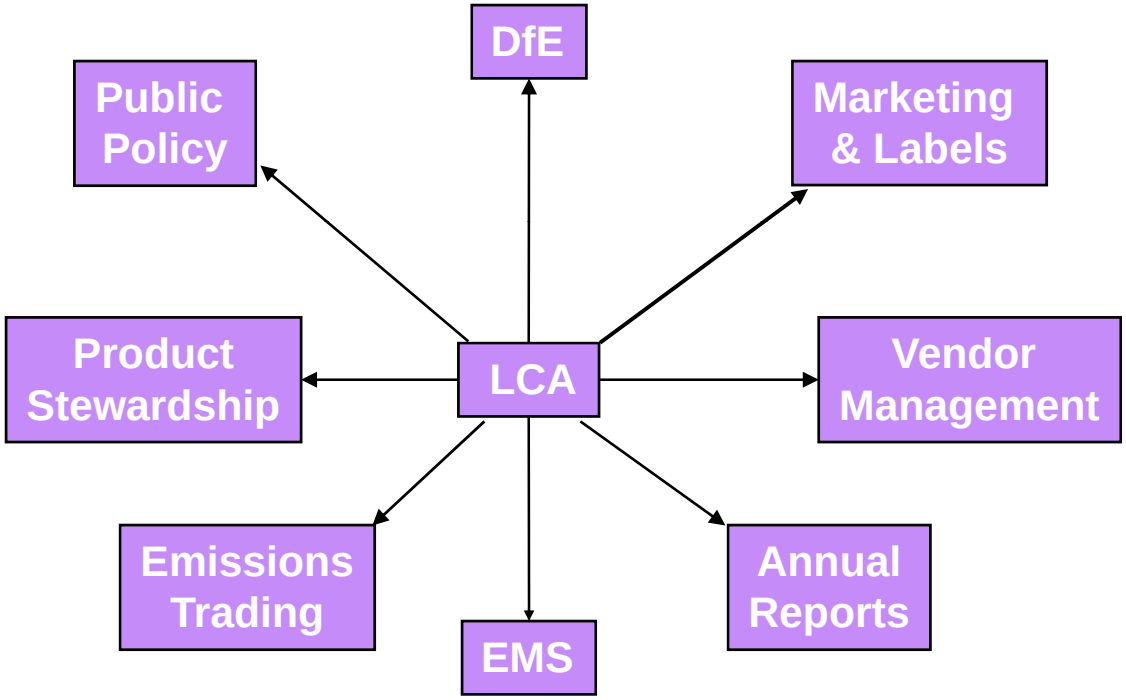


Industrial System

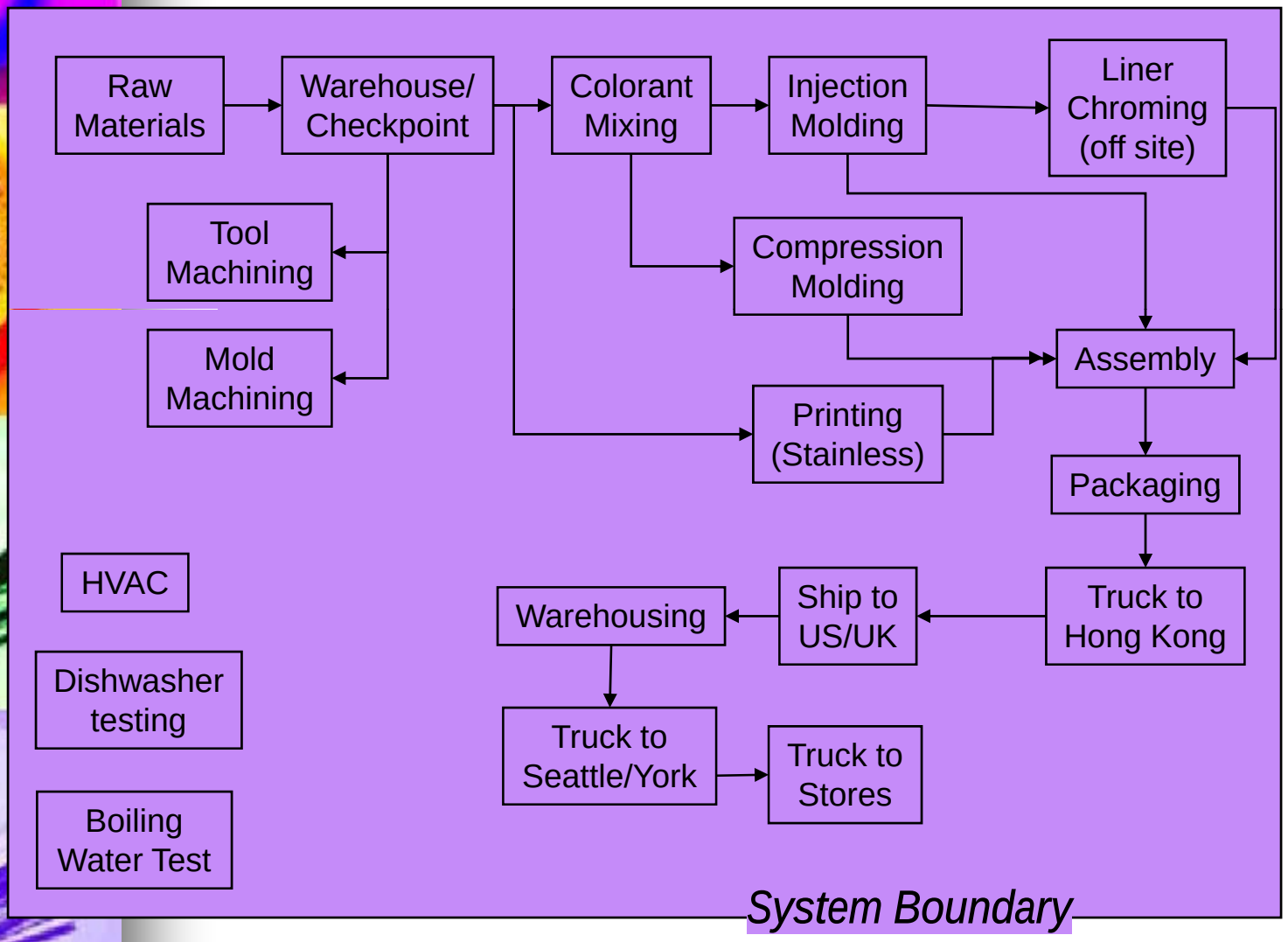
All Impact Categories



Some Uses of LCA



Example Scoping, Cups



FLOWS

Not a comprehensive list, but a minimum list

Resources

- Electricity (location)
- Water (location & type)
- Fuel (in ground)
- Minerals (in ground)
- Biomass (harvested)
- Land use (area & location)

Wastes

- Solid waste
- Radioactive Waste (high, low, medium)
- Hazardous Waste

Air

- CO_2
- CO
- PM (10, 2.5)
- CH_4
- SO_X
- NO_X
- NH_3
- Hg
- Pb
- VOC (NM)
- Dioxin
- PAH's

Water

- COD
- TDS
- TSS
- BOD (5,7,10)
- Flow
- ΔTemperature
- NH3 (as N)
- TKN (as N)
- NO3, NO2 (as N)
- PAH's
- Phosphates (as P)
- Cu
- Ni
- As
- Cd
- Cr
- Pb
- Hg

Normalized Type III Ecolabel

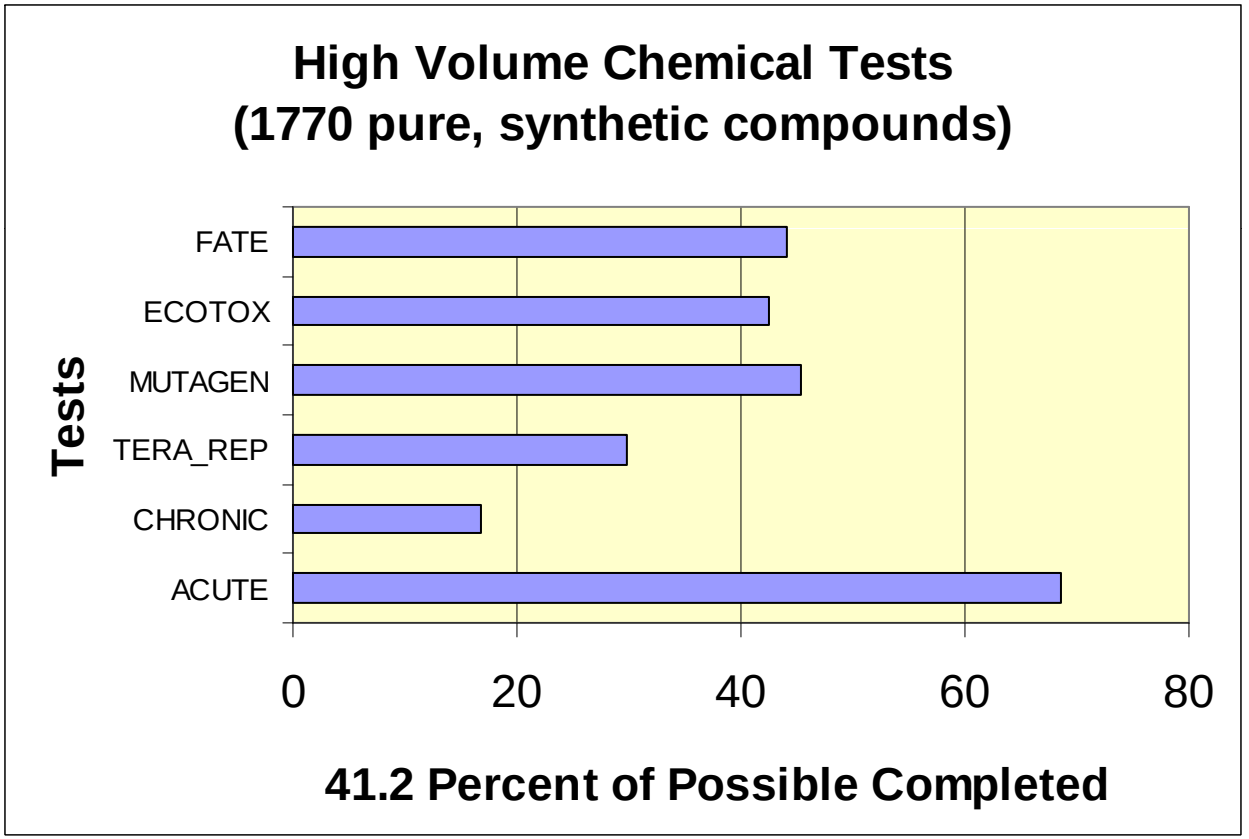
Rosendahl Farm #rfne001 Pork Ecoprofile			
Impact Category	**% of US Average**	**Farm Result**	**Unit per Pound Meat**
Climate Change	40	3.8	lbs CO_2 equivalents
Stratospheric Ozone Depletion	0	0.0	lbs CFC-12 equivalents
Acidification	66	0.1	lbs SO_2 equivalents
Eutrophication	107	0.065	lbs PO_4 equivalents
Photochemical Smog	12	0.0	lbs ozone equivalents
Air-based Toxicity	84	464	lbs PM-10
Aquatic Toxicity	42	0.1	lbs water polluted
Fossil Fuel Depletion	92	2.0	lb oil equivalents
Water Use	34	59	lbs water used
Antibiotic Use	70	0.0001	moles antibiotic used
Soil losses	67	8	lbs soil eroded
Hormone Used	0	0.0	moles hormone used
Gene Modified Organisms	168	78	% of feed is GMO
Biodiversity/Land Use	160	99	% of land farmed

earthsure

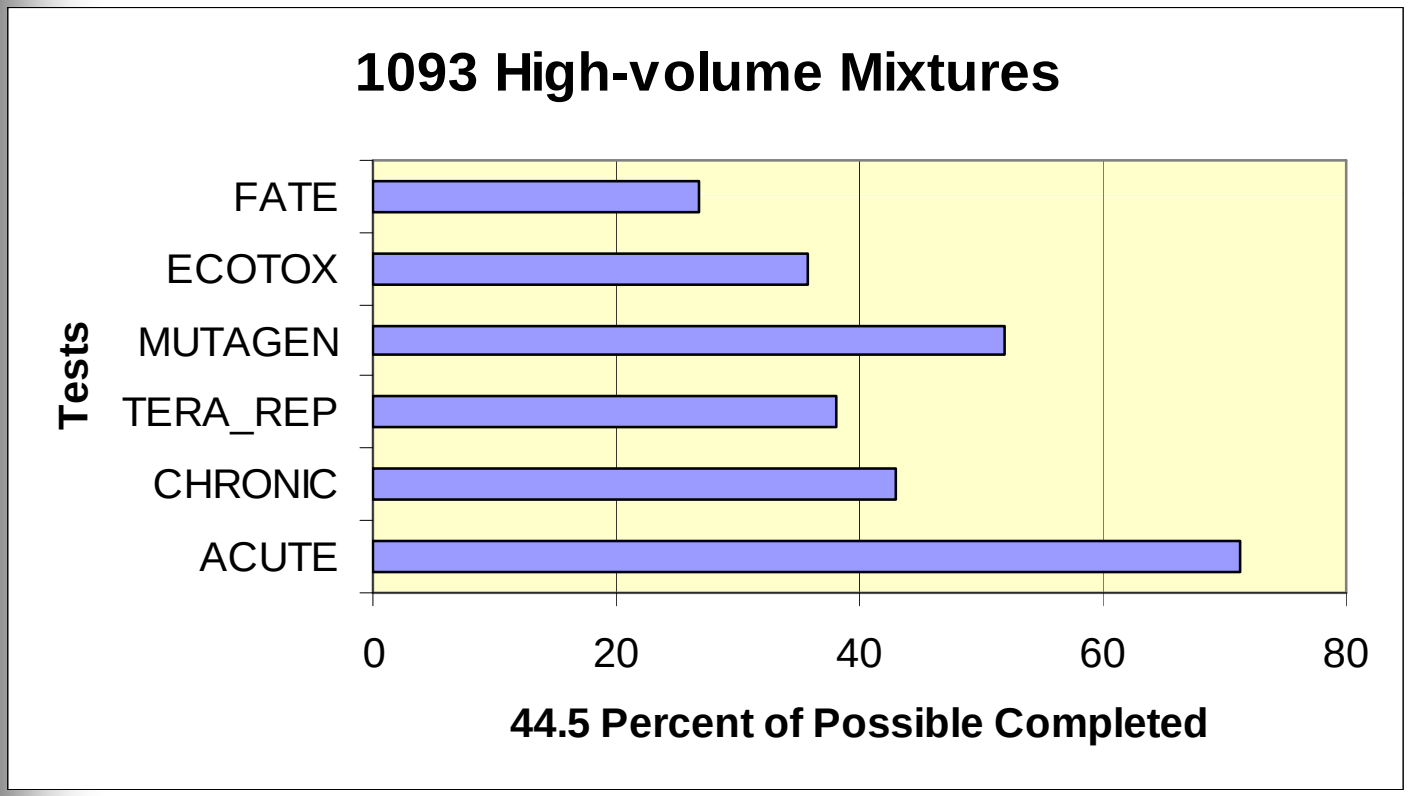
Typical LCA Toxicity Measures

- Benzene or Toluene equivalents for Cancer or non-cancer endpoints
- DALY's (disability adjusted life years)
- Toxic units (based on toxicity & persistence, sometimes bioaccumulation)
- LCA focuses on environmental health & ecotoxicity
- Naturally-occurring chemicals and mixtures are rarely if ever considered

Most Useful HVC's



Natural & Petroleum Oils & Derivatives



Opportunities to Reduce Costs

93924073	Alkanes, C10-14
129813678	Alkanes, C12-14
90622461	Alkanes, C14-16
68475581	Alkanes, C2-3
68475592	Alkanes, C3-4
68475605	Alkanes, C4-5
70955087	Alkanes, C4-6

Summary

- Much of the information in HPV database in useful for LCA
  - Especially the information on acute toxicity, ecotoxicity and fate
- About half of the “substances” are either mixtures or naturally occurring, and toxicity testing is questionable
- There is an opportunity to test components of mixtures to minimize costs