Applied EH&S Topics

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Accounting ‘Perspectives’

- Most common - corporate level
  - Probably familiar with ‘your’ system
  - Financial / cost accounting helps track income and expenses to their sources
- Also: national / regional level
  - Example: Gross Domestic Product (GDP)
  - Value of all final products made in US
- National accounting -> insight social welfare
  - Aids the consideration of social effects
  - Example: GDP per capita -> ‘standard of living’

Shortcomings of Accounting Systems

- Tell us exactly (but only) what we ask them to do
- Example: national accounts track output
  - If we care about resources, environment, etc. they tell us nothing - because we don't ask!
  - What's worse : the more resources we use (fossil fuels), the more we 'spend' to use them, the higher GDP is
- A corporate accounting system likely does not show expected value of 'contingent liabilities'[1]
  - e.g., from hazardous waste site cleanup
  - Thus if we continue to store waste/etc on-site without accounting for the future costs, we show higher profits

[1]May be included as a footnote to financial statements, without cost

Other Issues

- There are some other, hidden, non-environmental ‘costs’ missing
  - Employee satisfaction, illnesses,resource depletion, deforestation, land use, ..
- A comprehensive system of accounting would include consideration of these
  - Could consider ‘value’ of ecological services
- Note: economists have worked on this, but in general we see little tangible change

Cost Classification

- Systems do a good job of classifying materials, labor, etc.
- Some costs are hard to classify
  - E.g. administration, environment, H&S, ..
  - Lumped into ‘overhead’ accounts and are treated as a cost center
  - Costs that are not understood can’t be managed
- If better classified, costs could be connected with the activities causing them
  - E.g., disposal cost linked to process making waste

Similar Concept: Activity-Based Costing (ABC)

- Conceived by former dean (Kaplan)
- Management accounting mechanism to allocate costs by activities that cause them instead of traditional labor-based methods
- Results in improved costing accuracy
  - Companies that use ABC are not limited to a single driver when allocating costs to products and activities.
  - Consumption ratios often differ greatly among activities. No single cost driver will accurately assign costs for all activities.

ABC Steps

- Identify Activities - usually indirect costs
- Find costs of resources for activities
- Link activities to costs with drivers
- Find cost driver rates for activities
- Allocate costs to products based on activity

ABC Example - Photo Supply

- Budgeted Budgeted
- Activity Cost Pool Overhead Cost Activity Measure Activity Measure
- Machine Setups $200,000 # of setups 100 Material Handling 100,000 lbs. of DM 50,000 Hazardous waste control 50,000 lbs. of waste 10,000
- Quality control 75,000 # of inspections 1,000 **Other OH costs** **200,**000 Machine Hours 20,000
- Total $625,000
- 1,000 boxes of film development chemicals requires:
- Machine setups 4 setups
- DM 10,000 lbs.
- Hazardous waste 2,000 lbs.
- Inspections 10 inspections
- Machine Hours 500 MH

Questions

- What Would Fixed Overhead Allocation Be If Done Exclusively Based On MH?

- Using ABC:
- What Are Activity Rates?
- What Is Total Overhead Cost?

Cost Terminology

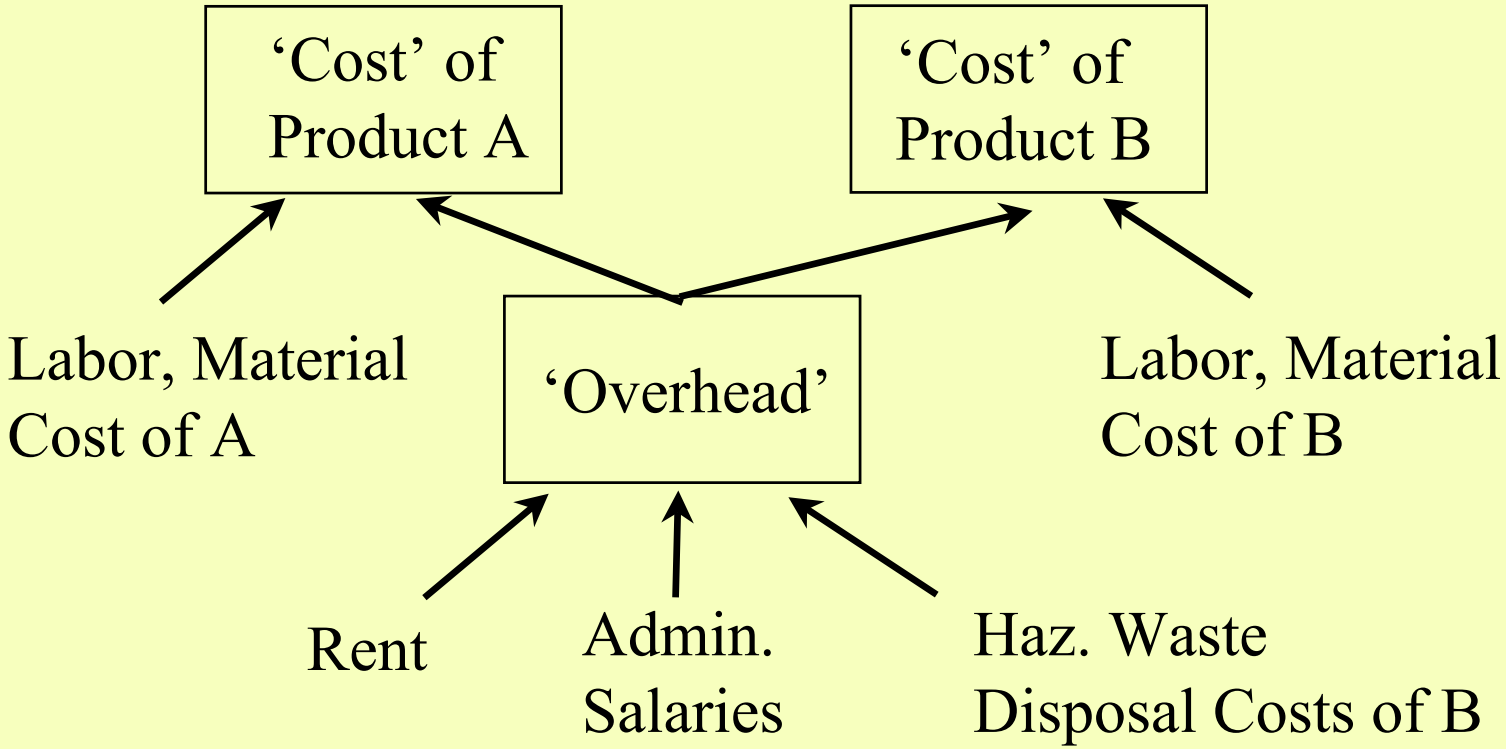
- Private - standard representation - “price”
  - » e.g. labor, materials
- Social - value of externalities, damage
  - » e.g. pollution, worker health & safety, depletion
- Environmental - may be subsets of above
  - » E.g. compliance, waste cleanup, disposal, etc.
- Full - ALL COSTS added together

- Full Cost Accounting is “good” Cost Acct.
  - An attempt to determine ‘true costs’

FCA Goals and Objectives

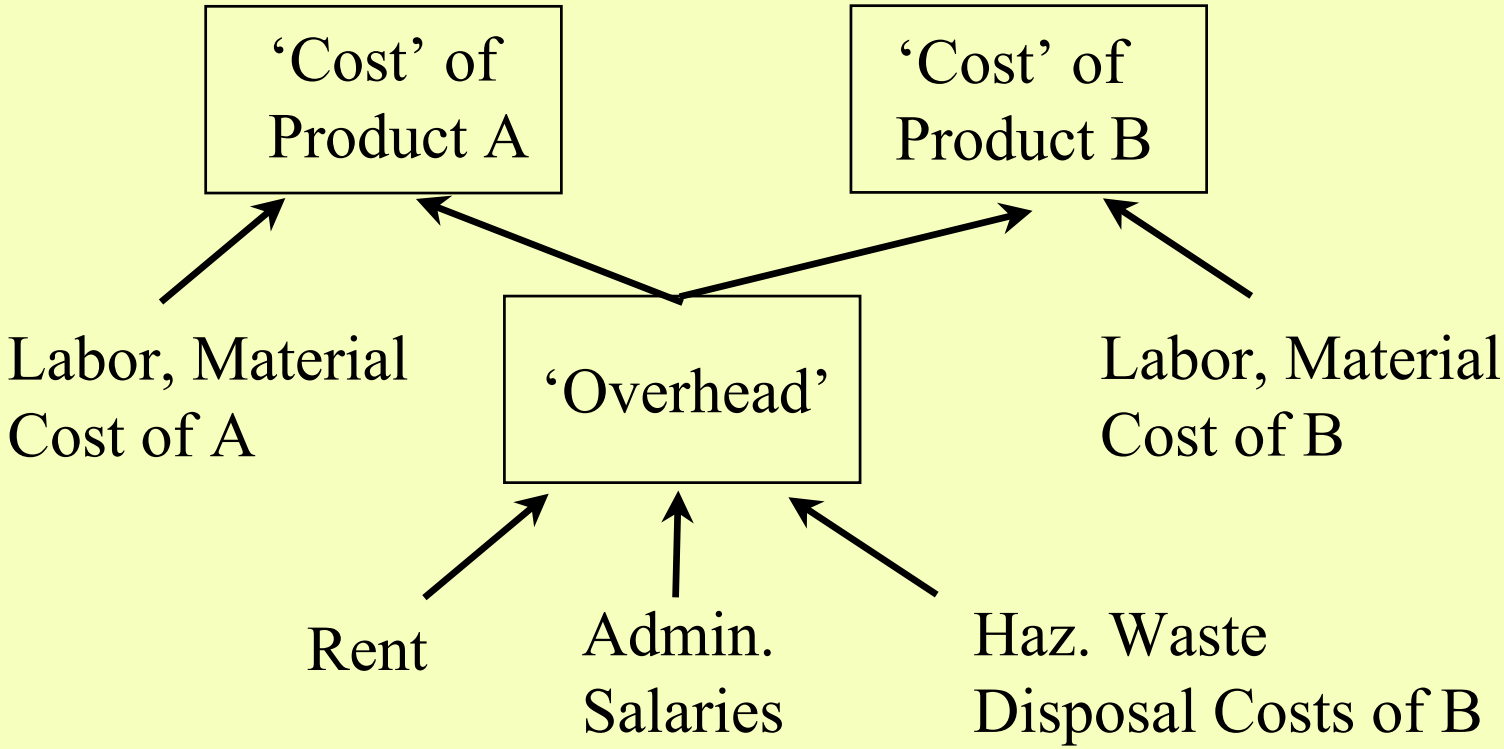
- Represent complete costs of production
- Analyze flows of resources
- Environmental: understand impacts
- “Tag” or “cost” environmental impacts
- Management: minimize ‘full costs’
  - i.e., minimize creation of waste to lower disposal costs - has financial/environmental benefit

Traditional Accounting System



Source: EPA, "Introduction to Env. Acct. as Bus. Mgmt. Tool, Key Concepts and Terms"

Traditional Accounting System



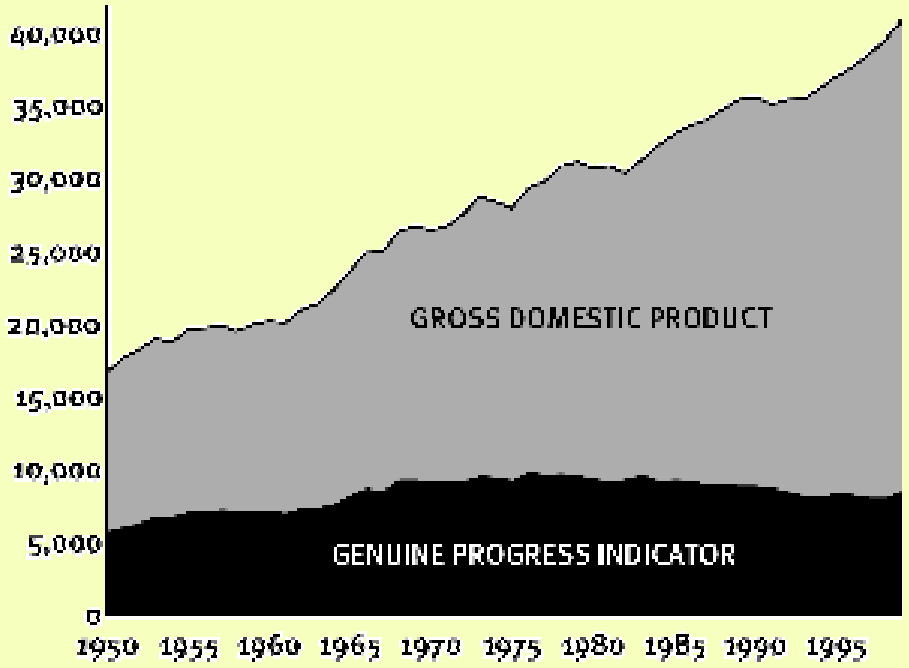
Environmental costs of B put into overhead, allocated to both products (product A subsidizes product B)

FCA at National Level

- Efforts by planners / economists
  - Add ‘satellite accounts’ to GDP, etc
  - Indexes of resource use, environmental damage, social welfare, etc.
- End up creating ‘GDP indices’
- No surprise: less GDP growth given the amount of depletion, emissions, etc.
- See Cobb and Daly “Index of Sustainable Welfare” (ISEW)
- Like finding ‘full cost’ of economic output

Genuine Progress Indicator

- Includes adjustments for crime, volunteer work, resource depletion, income distribution, pollution, long-term environmental, etc.



Currently lags GDP by $24,000 per person

Source: Redefiningprogress.org

Application of Valuation: Hybrid Electric Vehicles (HEV)

- ICE and Battery Powered
- Emissions and Fuel Economy Benefits
- Toyota Prius - Performance not comparable to current internal combustion engine (ICE) vehicle
- Evaluate benefits of improved performance Prius and Corolla ICE- Consumer and Social Perspectives

Hybrid Electric Vehicles

- Compare lifetime private and social costs of Prius and Corolla
- Private Costs
  - Vehicle purchase price
  - Maint. cost (battery replacement)
  - Fuel cost
- Social Costs
  - Costs of air pollutants and GHG emitted

Table 1. Vehicle Attributes and Exhaust Emissions

Vehicle	Car Class	Test Wt[1]. (lb.)	HC (g/mi)	CO (g/mi)	NO_x (g/mi)	CO_2 (g/mi)	Fuel Economy (mpg)	Acceln. 0-60 mph (sec)
Suzuki Metro	Sub-compact	2125	0.04[2] 0.08[3]	0.3 0.34	0.04 0.11	158 207	54.5	15.3[6]
Toyota Prius	Sub-compact	3000	0.06 0.1	0.5 0.55	0.05 0.13	177 232	48.6	14.2
Perf-Prius[4]	***Sub-compact***		***0.06***[5] ***0.1***	***0.5*** ***0.56***	***0.05*** ***0.14***	***210*** ***273***	***42.7***[4]	***10.5***
Toyota Corolla	Compact	2750	0.18 0.23	1.2 1.27	0.12 0.22	236 309	36.5	9.7[8]
Corolla -AT	***Compact***		***0.18***[5] ***0.24***	***1.2*** ***1.27***	***0.12*** ***0.23***	***254*** ***333***	***33.8***	***9.7***[7]
AHEV	***Sub-compact***		***0.06*** ***0.09***	***0.5*** ***0.53***	***0.05*** ***0.10***	***121*** ***158***	***72.9***	***14.2***

Attractiveness of Advanced Vehicles

	Corolla-AT	Perf. Prius	Adv. Car
Purchase Price plus Battery Replacement	$16,210	$22,100	?
Fuel	$ 5,520	$ 4,370	?
Consumer Total	$21,730	$26,470	< $21,730?
Air Pollutants*	$ 260	$ 120	?
Carbon Dioxide*	$ 640	$ 520	?
Social Total	$22,630	$27,110	< $22,630?

* Includes vehicle and upstream emissions
Vehicle Lifetime: 200,000 km, 12 years
Gasoline Price: $1.50/gallon
Air Pollutants: $1400/ton HC, $1050/ton, NOx, $1060/ton CO
Carbon Dioxide: $14/ton
Assumes zero discount rate

Table 3. Gasoline Prices and Social Valuations of Emissions and Carbon Dioxide that Make a Hybrid Electric Vehicle and Corolla Comparable[1]

Vehicle	Perf- Prius	Prius	AHEV[2]
$4,000 More Expensive Than Corolla-AT[3]			
Gasoline Price[4]: $/gal	9.31	6.28	3.47
Emissions multiplier[5]	46	42	31
CO_2[6]: $/ton	586	320	141
$2,000 More Expensive Than Corolla-AT			
Gasoline Price: $/gal	5.68	3.80	2.06
Emissions multiplier	25	20	9
CO_2: $/ton	321	161	50
No More Expensive Than Corolla-AT			
Gasoline Price: $/gal	2.06	1.32	0.65
Emissions multiplier	4	-	-
CO_2: $/ton	55	2	-
Breakeven Vehicle Price Difference[7]			
Price: $	-306	148	1203
No Battery Repl.:$	1174	1628	2683

Hybrid Electric Vehicles

- Current Prius or Performance Prius is more costly than the fuel savings, air pollutant and CO_2 emissions benefits would justify
- To be attractive economically, an HEV will have to offer features that cannot be offered by a conventional ICE

Recommendations

- Learn about your cost acctg system!
  - Be able to get and read reports
  - Or make friends in accounting dept.
- Learn what data is there and how you can use it to improve EH&S systems
  - As you'll see later, linking cost and environmental data is not easy, but it has large rewards.

Conclusions

- Although controversial..
  - Valuation/weighting methods are helpful in collapsing information into meaningful comparisons
- The types of comparisons possible are large with such methods
- The number of interesting policy problems to address is large