**Used oil cost benefit analysis**

The authors of this report have a difficult job. It is clear that not much is known quantitatively about either the used oil market or its environmental externalities. This is a case where a qualitative report would have provided better guidance than the current report. The authors have made a commendable effort to quantify the key costs and benefits in the used oil market. However, the lack of economic scholarship in the area, and possibly a lack of fundamental natural science knowledge, means the quantification exercise is doubtful at best. The State of California should have asked for a broad policy report with an emphasis on reporting gaps in knowledge.

Cost Benefit Analyses (CBA) is broader than the moniker implies. A well-conducted CBA gives the reader a complete description of all impacts, whether they can be monetized or not. Then, the CBA should monetize the impacts that it can while still acknowledging those impacts that cannot be monetized.

In addition, CBA should be conducted with an awareness of the physical and institutional infrastructure where the proposed projects are taking place. If, for example, a water project provides water that cannot be made available for beneficial use because of the operating rules or technical limitation of a dam, than that extra water cannot be counted in the benefits of the project.

The over-emphasis on quantification leads to a report that misses the big picture. One key flaw is the lack of accounting for soil and water impacts from the handling of used oil. A second is the failure to take into account the current environmental institutions in California. Also, the report's model for DIY behavior does not seem plausible and requires further explanation.

1. Lack of a full impacts analysis.

The CBA lacks a full description of the major environmental problems caused by improper disposal of used oil. The report contains detailed research on the business aspects of used oil recycling. However, it is the impacts of that business on the environment that drive regulation. If there were no external, particularly pollution, impacts, there would be no reason for regulating the industry.

The CBA then should start with detailed research into the external impacts that actually drive the need for regulation of lubricating and industrial oils. The primary concern in the academic and grey literature has been the impact of improper disposal on water and land resources. The relevant citations are already in the letter from Prof. Sunding so I will not repeat them here.

*Water Impacts*

However, that letter does not detail the California specific reasons to believe that used oil policy should be targeted toward water and soil impacts. A 2006 report details the possible impacts of used oil impacts on stormwater runoff.[1] They find widespread evidence of stormwater contamination, though perhaps not at levels that would trigger human health effects. The difficulty is that the sampling procedures are unlikely to capture improper disposal. They are designed for more constant sources such as oil leaks from crankcases. The implication is that normal water quality monitoring misses a great deal of used oil pollution. This is a concern because the metal contaminants contained in used oil are associated with water pollution related listings of many water bodies in California. For example, cadmium is responsible for 18 303d listings, arsenic 12 listings, and so forth. While there a variety of sources for metals, used oil is an important one and metals are some of the most difficult and expensive pollutants to remove from water. There are only two 303d listings of water bodies for oil specifically, but they are both on important stretches of the Los Angeles River and subject to mandatory cleanup through the Total Maximum Daily Load process.

The case of Los Angeles stormwater regulations demonstrates how far off the CBA is likely to be if it does not consider water or soil impacts. Local officials estimate that stormwater regulation will cost between 5 and 8 billion dollars for Los Angeles county.[2] The highest net benefit policy scenario (2), has benefits of approximately three million per year, taking the analysis at face value. At a discount rate of 4% for twenty years that is about $40 million in benefits. There is a two order of magnitude difference between the cost estimates of cleaning up stormwater pollution in one large county, of which used oil is a significant contributor, and the largest stream of benefits of all the policy CBA scenarios. This is one indication that the CBA results, by not considering or describing the water and soil pollution impacts, are far off the mark.

The Los Angeles case provides a way out of the benefits transfer box the authors have put themselves in. The authors would like a number that says x reduction of used oil gets you y dollars in benefit. As they correctly point out, that is not possible for water pollution because the cost of used oil pollution depends entirely on local conditions. However, California regulations now mandate that water quality goals be met for many pollutants. Once there is binding mandatory regulation, the benefits of used oil reduction can be calculated as the savings in meeting those water quality regulations. While this would be a substantial amount of work, there

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[1] Charaterization of Used Oil in Stormwater Runoff in California. Office of Environmental Health Hazard Assessment, California Environmental Protection Agency. 2006. http://oehha.ca.gov/water/reports/OilInRunoff0906.pdf. Downloaded July 30, 2013.

[2] Boxall, Bettina. "New Stormwater Runoff Rules could cost cities billions." Los Angeles times. November 9th, 2012. Online.

is also engineering literature on stormwater capture, water filtration, etc. that could be used to support a detailed case study estimate of the regulation cost impact of changes in used oil collection. Than a case study could be scaled up statewide.

Another indication that the report is not useful for policy analysis is the Direct Impacts Reports. In scenario 2 an additional 12.1 million gallons of used oil is collected compared to the baseline. California has already decided that it was worth .40/gallon to incentivize DIY's to deliver used oil based primarily on water and soil impacts.[3] In this CBA the cost of the extra incentive is recognized, but the authors do not include any soil or water benefits from the extra collection. Using .40 as a ballpark figure, this would be an annual benefit of $4.84 million. In other words, a benefit figure for avoiding damage to water and soil, determined by the California legislature, would change the tone of the analysis substantially.

However, even without an actual benefit number it should still be a part of the report to describe how changes in used oil collection would change environmental outcomes. I believe that such a description would make it clear that water and soil impacts have to be considered in policy decisions. If the natural science is not there to characterize the water and soil impacts, than a CBA is premature, economic analysis of environmental outcomes can only be conducted when the natural science work has been done.

*Air Impacts*

The air impacts analysis has the same problem as water and soil, though it is less obvious than the water case since there is a benefits number. A description of the actual air impacts (where, when, why) should be an integral part of the CBA. There should be an entire chapter devoted to saying where and how air pollutants would increase or decrease. Dollar benefits or costs without context aren't informative. The dollar amounts should only be considered as part of the entire qualitative picture of the proposed policies. For instance, we are not told if emissions decrease or increase among populations that already face environmental problems.

The particulates effect gave me real pause. Across several scenarios particulates pollution increases but other pollutants decrease. Without knowing what area or populations are affected it is difficult to decide whether the benefits transfer estimates are plausible. The benefits transfer estimates are only adjusted for income and inflation. If, for example, the extra particulates pollution affects a densely populated area with pre-existing air pollution problems, then it is likely the air pollution benefit calculation is wrong. The context tells us whether the benefit transfer is reasonable.

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[3] The CalRecycle web pages covering the used oil program discuss soil and water pollution but do not mention air pollution. See ex.,http://www.calrecycle.ca.gov/UsedOil/Recycle.htm

A presentation of the physical air impacts is a necessary and integral part of the CBA. Especially with the small net benefits or costs in the various scenarios, it could well be that the incidence of the air pollution is more important to policy than the poorly-supported air pollution net benefit figure.

2. Regulatory and Institutional Structure.

CBA does not take place in an institution-less framework. Instead, CBA should reflect the impact of policies or projects given existing policies and infrastructure. This makes conducting a CBA within the thicket of California's regulatory policies difficult and time-consuming. However, CBA that does not take into account the existing policies and infrastructure is not valuable for policymakers or the public.

Air pollution policy is one of these areas. The claim in the comment letters that sulfur and other pollutants are already subject to binding regulation is not adequately addressed in the CBA. These air pollution benefits are significant, and if the commenters are right that re-refiners would simply change the mix of the fuel to meet the same sulfur standard, than these benefits would disappear entirely. This kind of analysis should be in an air impacts section that describes how changes in policy would result in air pollution impacts. At present, the reader is not presented with the complexities of the regulation and fuel mixing procedure. A reader would not know that the relationship between production of various fuels from used oil and air pollutants is tenuous and may not exist at all.

The carbon reduction benefits are quite small, but the same criticism applies. The authors should ascertain whether used oil, when recycled as fuel, is required to purchase carbon permits under AB 32. It may be that some facilities do not fall under the AB 32 cap and therefore carbon reduction benefits can be ascribed to policies. This should be a straightforward piece of research.

However, again, the biggest impact of considering institutions and policies is in the water sector. Improperly disposed used oil goes into the soil, stormwater runoff, or down the drain into wastewater systems. Both of the latter two have binding regulation in California. Wastewater systems, especially, have detailed cost studies to determine the cost of treatment depending on the constituents.

The water related net benefits of changes in used oil disposal are related to the physical impacts. A change in used oil collection means a change in the flow to stormwater and wastewater treatment, and a change in meeting the costs of meeting the water quality standards. This should be the beginning of the framework for calculating the environmental cost/benefit of used oil policy.

It may be that this analysis cannot be done within the scope of the contract for this CBA. The problem is that without this work on physical impacts and institutions, the CBA is not useful. It would have been better for a committee of economists to review the CBA contract and determine whether the work can be completed.

3. *Used Oil Market.*

A puzzling aspect of the used oil characterization is the difference in DIY behavior between scenario four and scenario one. In scenario one, the DIY incentive increases by .40 and collection of DIY lube oil increase. In scenario four, the used oil price increases by .40 and DIY lube oil collection is unchanged. The authors are clear that the DIY incentive is rarely collected and is mainly an incentive for collection centers. Therefore, the price increase and the DIY incentive should have the same effect to a first approximation.

I think part of the issue is a lack of a reasonable model for DIY behavior. For instance, the CBA assigns a net loss to DIY's from scenario one's increased incentive for DIY's. That is because the cost model for DIY's implies they have a significant net cost for delivering used oil and an increase in the incentive increases those deliveries. The original model has a flaw, people would not be delivering oil at a net cost, they must at least be getting a warm glow utility that cancels out those costs. Or, perhaps time costs are overestimated. Something is amiss with the DIY model, likely leading to the inconsistency between scenario one and four.

There may well be a good explanation for this contradiction, but it would require a complex analysis of the supply side of the used oil market that is not in the document.

The CBA would be easier to understand if the authors presented their model of supply and demand in the used oil market so that the reader could understand where the numbers in the scenarios come from. Similar to my other comments about institutional structure and environmental impacts, a CBA should concentrate at least as much on the mechanisms that produce a cost or benefit as on the quantification of that cost/benefit.

*Conclusion*

This majority of the flaws in the CBA stem from the goal of having a quantitative report. In any CBA, but especially a CBA that has an important environmental component, the emphasis must be on a qualitative weighing of impacts. Monetization of some impacts is less important than providing policymakers an overall sense of the physical impacts that are expected from various policy options.