



# Wake County Sustainability Task Force News

## Wake County Water Resources

At our July 2010 Sustainability Task Force meeting we talked about environmental economics and discussed the Water logic model. The first draft of the logic model is available on the project website: [www.ncsu.edu/weco/wake](http://www.ncsu.edu/weco/wake)

The Waste strategies work group met in July for the first time to begin crafting recommendations.

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## Environmental Economics

**Laura Taylor, Center for Environmental and Resource Economic Policy (CEnREP), NCSU [www.ncsu.edu/cenrep](http://www.ncsu.edu/cenrep)**

Laura Taylor, an economist in the NCSU Department of Agricultural and Resource Economics presented a short primer on environmental economics. Her slides can be found on the project website: [www.ncsu.edu/weco](http://www.ncsu.edu/weco) Below is a summary of the presentation.

Prevalent myths about how economists think about the environment:

- Economists believe the market solves all problems.
- Economists always believe creating a market (or restructuring a market) is the solution when markets are missing.
- Economists only focus on market prices – the “market value” of resources/environment.
- Efficiency is all that economists are concerned with.

In theory, if a market could be perfectly efficient, then it might be able to solve all problems. A definition of efficiency: an efficient outcome is one in which the maximum *net benefits* are achieved from a utilization of resources, and where “net benefits” is “benefits minus costs”. All of this This assumes **All** benefits and **All** costs of an activity are full reflected.

For a market to be efficient there cannot be any “distortions” such as externalities, monopolists, information problems, transactions costs, or distortionary taxes. But, at least one of these is present when we consider the interaction between humans and the environment. When “distortions” are present, market prices will not fully reflect true benefits and costs of consumption and production. Markets will also not result in resources being allocated in an efficient manner (in other words, net benefits are not

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### NEXT MEETING

Thursday, **Sept 16**

Wake County Commons  
Building

4011 Cary Drive

Raleigh, NC 27610

**4:00– 6:00 p.m.**

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maximized). This is what is referred to as “market failure” in economics jargon. Environmental economics is fundamentally the study of markets when there are distortions. In the human/environment interface, a common distortion that is present is externalities.

**An externality is an action by me that affects others’ production or consumption or well-being, yet I do not (fully) include these effects in my decision calculus.**

A classic example of an externality-generating activity is: Driving your car. The following data comes from Raleigh-Cary area 2005. There were 330.7 million vehicle miles traveled per day (VMT/day). This driving results in approximately 673 million gallons of fuel consumed per year, and 1.67 million metric tons of carbon emitted per year. (For comparison, Atlanta has 152 million VMT/day)

### **What is the cost of driving?**

Private costs: gas, maintenance, insurance, etc. Drivers of cars bear these costs directly.

External costs: crashes, congestion, air pollution, noise pollution. These costs are often not borne by the driver of the car (or are only partially borne by the driver).

**The following presents an example of how economists have tried to quantify all the costs of driving, include the external costs.**

### **What is the full cost of all this driving?**

In 2000, 231 million autos/vans/pickups were estimated to have driven 2.5 trillion miles. Private Costs were estimated to be \$0.53 per mile or \$1.3 trillion.

### **Congestion Costs:**

In data collected from 75 urban areas, there was 3.6 billion hours of delay and 5.7 billion gallons of

wasted fuel, resulting in a total congestion cost of \$68 billion. The privately borne cost (buying gas, loses in workers’ pay) was \$62.5 billion. This means the external cost is \$5.5 billion (total cost less the private costs). \$5.5 billion represents the cost not borne directly by drivers.

### **Crash costs:**

In 2000, 13.8 million accidents killed 43,000 people. The estimated total cost: \$334.7 billion

Insurance payout: \$108.4 billion. Estimated external cost: **\$226.3 billion**

### **Air pollution:**

This a pure externality, with an estimated cost of **\$40.2 billion**

### **Noise pollution:**

Another pure externality, with an estimated cost of **\$4.5 billion**

### **Full cost pricing adds the private costs and the external costs:**

Private costs: \$1.3 trillion or \$0.53 per mile

External costs: \$276.5 billion or about \$0.11 per mile.

So for every mile driven, the individual pays \$0.53 but the cost to society is an additional \$0.11 per mile, **resulting in a full-cost pricing** of a mile driven equal to \$0.64/mile.

The above is meant to highlight that drivers do not pay the full cost of the activity they undertake. Markets, as they currently exist, have failed to correctly price driving because there are external costs associated with driving that markets fail to capture. A common policy prescription is to add the external cost of driving to the private cost (through taxes or fees) so that individuals bear the full cost of the



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activity undertaken. Once the price reflects the full cost of the activity, individuals are free to react to those prices however they wish (for example, they may choose to drive less; or they may choose to drive the same amount and pay the higher price per mile). While more sophisticated policy mechanisms are available, a common suggestion has been to add the external cost of driving to the price of a gallon of gas.

**How much would a gallon of gas need to be increased to reflect the costs described above (recall, the example above is from the year 2000)?**

If we assume 21 mpg average for all vehicles, then the external cost per gallon of gas is  $21 \times 0.11 = \$2.31$ . The average cost of a gallon of gas at 2000 prices: \$1.50-\$1.75. Full cost pricing adds the external cost to the private cost of gas, resulting in \$3.81 - \$4.06 per gallon. Adjusting for inflation, the external cost today would be \$2.00 to \$2.90/gallon. Today's gas prices are about \$2.50/gallon, so the **full cost of a gallon of gas today would be \$4.50 to \$5.40, based on the estimates of the external costs above.**

*Big caveats: the above numbers are EXAMPLES only – the study is old (from 2000), but there have been many studies of the same kind, with results varying from under \$1/gallon to upwards of \$4/gallon.*

**How does this example help to formulate recommendations for water, waste and energy in Wake County? The points to take away are:**

- Total costs of production are higher than private costs of production when an externality is present
- Market prices will reflect only private costs of

production

- The exact numbers for this example are not what is important – most original sources are available on-line
- When externalities are present, markets are inefficient, meaning they fail to maximize net benefits.
- Prices will be too low, quantity produced too high, and resources consumed too high (relative to efficient amount)
- External costs **can be quantified**
- Market based policy has a role to play in such things as pricing (taxes, fees), and tradeable property rights.
- Benefit/cost analysis is very useful tool
- It is critical that it include **all** benefits and **all** costs
- Observable market prices (costs or revenues) can be a small component of true benefits/ costs.

**Another example of weighing the costs: Recycling**

In general recycling reduces the use of virgin material and reduces waste that must be disposed. Is it always the best choice? Full cost accounting considers the entire life-cycle and all benefits/costs, from production, through use, and disposal or reuse.

**Disposable drink cups - paper vs polystyrene.**

Paper is recyclable; polystyrene is not. Paper cups are made from bleached wood pulp – a resource-intensive activity involving many impacts. (chemical, water, air, waste, forest systems) Polystyrene is made from petroleum.



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Compared to a polystyrene cup, production of a paper cup uses:

- 6 times more raw material
- 33 times more chemicals
- 36 times as much electricity
- 580 times more water through wood pulp production, and
- produces 2.6 times as much air pollution

Paper cups are only recyclable if they do not have "hot melt" (coating that allows them to hold hot liquids) or wax. Paper is heavier, so more costly to transport to stores, recycling centers, and landfills. Polystyrene is inert. Paper is theoretically biodegradable but landfills are not currently designed to achieve complete biodegradation. **Which is the better choice?**

#### **Some additional notes:**

Economists do not always believe creating a

#### **Laura's presentation was followed by group questions, comments and discussion:**

- It might not be possible to value all costs/benefits, but it is important to note the ones you can.
- When revenues are generated to account for externalities, those funds should be linked to the externality, not deposited into a general fund. This requires political transparency.
- When the benefits of pollution outweigh costs of pollution, continuing to "pollute" should be an option. Sometimes a pollution level is completely acceptable given the costs/benefits. We benefit from production. It is a balancing act judged best in case by case basis.
- Federal regulations may be better than local regulations when the externalities are outside the control of local body.
- Water and solid waste are government activities where prices paid do not reflect full costs of production (prices are not even set by markets in the first place). Would the market

market (or restructuring a market) is the solution when markets are missing. This may be possible to do, such as with the creation of **tradable permits** (cap-and-trade) and environmental **taxes**, but conditions aren't always present that would allow markets to be successful. An example where a market wouldn't work is with enforceable property rights and carbon trading across countries.

For policy analysis, benefits & costs must be quantified. Market prices sometimes represent a small fraction of the benefits/costs we try to quantify. Non-market values add to the benefits and costs and have long been recognized and quantified.

Benefit/cost analysis is a powerful tool – but **all** benefits and **all** costs should be considered (monetized) to the fullest extent possible. Even if it is not possible to monetize, consider the hidden (usually external) costs/benefits. **END**

do better at pricing water than government 'choosing' price? Some argue "yes". While the presentation focused on "market failure", it is important to recognize "government failure" as well. It is not at all clear that government will do better than the market in pricing activities or maximizing net benefits.

- Cheap, abundant water is only possible with a tiny demand and a huge supply. Considering Wake County (where demand is large relative to available supplies), one can have shortages and cheap water. But not cheap and abundant water.
- What's wrong with less pollution is better? Taylor's response: Society isn't willing to bear all the costs for no pollution. And in some instances, it can be the case that the benefits associated with the pollution-generating activity outweigh the costs of the pollution generated. Understanding the tradeoffs requires a careful consideration of all the benefits and all the costs of an activity on a case-by-case basis.
- Assess taxes on property based on energy use. **END**

**A draft logic model** was developed from all the participant comments about water that has been collected since January. This first draft was sent to the taskforce the week before this meeting. It was handed out at that meeting and participants were asked to review the model, and determine how well their ideas were reflected. In addition, they were asked to identify three strategies they think would provide the most benefits for the investment. Each table was asked to write the highlights of their discussion. The results of these exercises and additional comments turned in will help reformat the logic model. The goal of the model is to help visualize all that has been discussed and simplify it into a diagram. [Download the logic model here.](#)

**Table 1**

- There are a number of contradictions in the logic model including:
- Infrastructure helps serve not hinder
- Having a way to deal with fluctuation is the reason of having a reservoir
- The outcome “no reservoir or delayed reservoir” contradicts the outcome “new reservoir”
- No mention of drought tolerant/native landscaping or low flow fixtures

**Table 2**

- Reduced flood damage seems an odd goal
- Educate/teach and survey
- Fund long term infrastructure
- Advocate codes and regulations to support reuse and water uses
- Are all external factors uncontrollable?

**Table 3**

- Distinguish between long and short term strategies
- Link outcomes and goals back to strategies (i.e. - affordability)
- Medium term outcomes should be based on relative starting point (i.e.-reduce pollutants in sensitive areas)
- Logic model is missing some sort of feedback

loop, or place for evaluation. It is a one-way logic model.

**Table 4**

- Consider establishing a centralized water control authority
- Eliminate City of Raleigh’s control or assumed defacto control
- Establish small community representation for water authority
- Examine how watershed resources are currently allocated

**Table 5**

- Define affordable water supply
- Increase grey water consumption
- Amend building codes to reduce consumption
- Studies are needed to better understand and protect our groundwater supplies in Wake County
- The first 2 strategies can be combined to read: “ Improve coordination and planning among water supply, wastewater and stormwater jurisdictions”

**Participants were then asked to individually write on index cards what they thought were the top 3 strategies in the logic model**

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**that would provide the most benefits. If strategies were missing, they could add new ones.** WECO staff compiled the list and counted the number of times strategies were chosen. If a participant re-worded a strategy that was in the logic model, we made note to edit the strategy but lumped it in with the original strategy. *Strategies added by participants are italicized.*

- 5 Evaluate policies (*including building codes*) and remove hindrances to water reuse and public health protection
- 4 Match water quality treatment to water use
- 4 Educate on water conservation and benefits of water resource protection (*including land design*)
- 4 Coordinate planning between water, waste water, & stormwater entities
- 4 Improve regional planning and implementation (*including stormwater utility, land use & water protection, design planning*)
- 4 Develop funding to pay for strategies (*including stormwater utility*)
- 4 *Implement a county-wide stormwater utility (or regulation)*
- 3 Preserve & conserve land (*improve watershed protection, ala NYC*)
- 3 *Set prices correctly- conduct an analysis; determine & include full cost of production; to meet multiple needs of conservation, infrastructure maintenance and affordability*
- 2 Adjust pricing to incentivize conservation and reuse
- 2 Restore streams and wetlands, replant forests and stream buffers
- 2 Maintain/upgrade water supply infrastructure
- 2 Conduct local watershed planning to target efforts appropriately
- 1 *Assess Wake County aquifer water quality and quantity*
- 1 Use LID, BMPs, conservation design ("*land design*" was added to several other strategies instead. If it was counted here, then this one= 3)
- 1 Evaluate and adjust ordinances to remove hindrances for LID and conservation design
- 1 *Conduct benefit/cost analysis of key options*
- 1 Protect groundwater supply
- 1 *Integrate land use and water protection strategies*
- 1 *Native/drought tolerant landscaping*
- 1 *Low flow fixtures*
- 1 *Review Wake County Watershed Plan to identify missing elements*
- 1 *Allow citizens freedom to use water as they see fit*
- 1 *Increase the supply of water*
- 1 *Promote & regulate for smart growth(prepare for population growth)*