Encouraging Green Building Practices

A Discussion Paper about Community Resilience *November 2015*

Brief: *The construction, operation, and demolition of buildings and infrastructure is a major contributor to greenhouse gas emissions. How we build today locks us in to a future of high or low emissions depending on the choices we make. Planners have a number of tools to encourage practices that not only mitigate emissions but also reduce other critical environmental impacts.*

Problem

Washington State has set a goal of reducing greenhouse gas (GHG) emissions to 50% below 1990 levels by 2050. If it is to meet this goal, reducing the emissions that result from electricity and heat used in buildings will be a key factor. In Washington**, roughly 40% of GHG emissions result from building energy use.** Additionally, GHGs embodied in construction materials have the potential to make up a significant proportion of the State's emissions, and efforts to reduce these emissions during the construction and demolition phases are critical to a holistic approach to green building.

In addition to the GHG impacts of building, construction of homes, offices and other facilities results in an increase of impervious surfaces, contributing to increased stormwater runoff and contamination, urban heat island effect, and a number of other environmental impacts.

Planners in local government have a number of tools available to encourage green building practices that will reduce emissions and have other positive environmental impacts. Key strategies include: requiring new construction to meet LEED standards, providing financial incentives for green building practices, and revising engineering and design standards.

Introduction

Washington is a leader in green building practices nationwide, and many initiatives at the state and local level have been undertaken to encourage energy efficiency, use of alternative energies. Despite this, the state's emissions from this sector have held steady over the past several years, with slight decreases in emissions from heating (RCI in the Figure 1 below) being offset by increases in emissions from electricity usage.

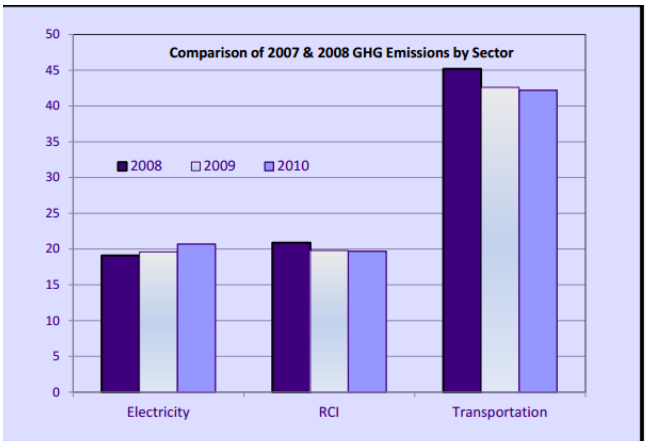

Figure 1: Washington Electricity, Heating and Transportation Emissions, 2008-2010.
Source: *WA State Dept. of Ecology, 2012.*

GHG emissions do not result solely during a building's operating life, however. **The types of materials used and the practices that go into making them also have a significant impact** on the building's life-cycle emissions and should not be ignored. Finally, **what happens at the end of a building's life-cycle is also important**. Landfilling of demolition debris is fuel-intensive, costly, and contributes to the problem of decreasing landfill space. Many types of construction debris can be recycled into new materials, avoiding the problems above as well as the emissions associated with mining and transporting new construction materials.

Finally, green stormwater infrastructure such as bioswales, green roofs, street trees and pervious pavements decrease the environmental impacts of development and have a number of co-benefits.

Reducing Emissions throughout the Project Life-Cycle

Reducing Emissions from Construction

Although often overlooked, emissions from construction materials and energy use can make up a significant proportion of a community's GHG emissions. As Figure 2 below shows, construction emissions in King County represented 8% of total consumption-related emissions.

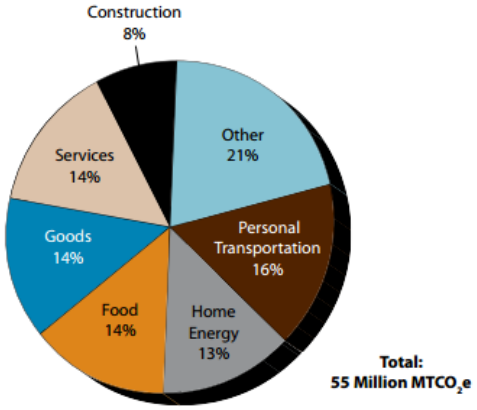

Figure 2: King County Emissions from Consumption.
Source: *King County, 2012.*

The impact of construction-related GHG emissions becomes even more pronounced when focusing on emissions from local government operations. As Figures 3 and 4 show, emissions embodied in purchased materials (here referred to as "Scope 3 – Supply Chain) often represent the largest source of emissions for public agencies. Of these, construction emissions are the largest proportion.

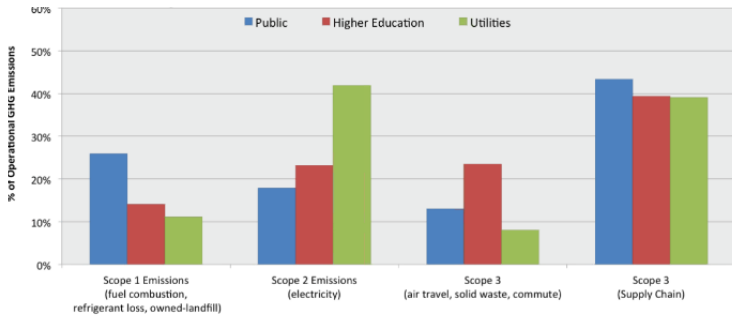

Figure 3: Supply Chain Emissions in Context.
Source: *Good Company for Alameda County, CA, 2015.*

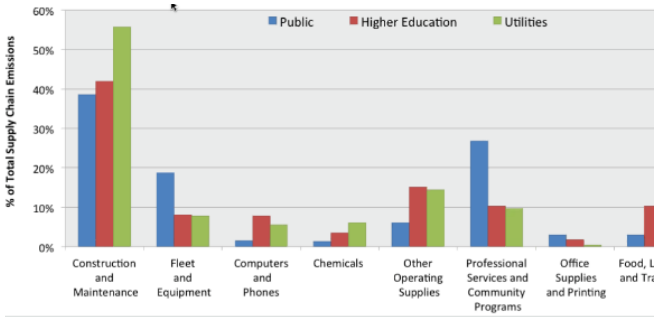

Figure 4: Construction Emissions Compared to Other Supply Chain Emissions.
Source: *Good Company for Alameda County, CA, 2015.*

A number of strategies exist to reduce emissions from construction purchasing in both the public and private sectors. These include:

1. ***Change Standard Specifications to Encourage Use of Low-GHG Materials and Practices***
   a. Implement incentive specs to encourage contractors to reduce use of GHG intensive materials, e.g. a specification that rewards contactors for each pound of cement reduced in a concrete mix. *See Example below: SDOT*
   b. Require contractors to complete a "Carbon Control Plan" prior to construction. This plan would set a goal for emissions reductions during the construction process and identify strategies to meet this goal.
   c. Raise allowable maximum amounts of recycled materials to levels deemed acceptable by ASTM standards.
   d. For public sector projects, require recycled materials to be used to the maximum extent feasible.
2. ***Include Construction Emissions in Local Government and Community GHG Inventories***
   a. By quantifying emissions from its own construction purchasing, a local government or agency can set targets for reduction and determine which strategies are best for doing so. *See Example below: SDOT*
   b. Likewise, an inventory of emissions at the community scale allows a local government to determine where emissions reductions are possible and what strategies will be effective in reducing them.
3. ***Require Alternatives Evaluation***
   a. For public sector projects, carry out an alternatives evaluation during the design phase to determine how project design and material use can be altered to reduce construction-related emissions.
4. ***Require Construction Emissions to be Accounted for in SEPA Checklist***

Reducing Emissions and Environmental Impacts from Operations

In the majority of cases, emissions from energy use during building occupancy will make up the largest proportion of GHGs in an individual project's life-cycle. By allowing and encouraging sustainable design features, local governments can

drastically reduce the emissions from buildings within their jurisdictions.

Buildings and their surrounding sites also contribute to an increase of impervious surfaces. This means that stormwater is unable to soak into the ground, increasing the occurrence of combined sewer overflows and increasing the contamination of surrounding waterbodies as stormwater flows through polluted streets before reaching the nearest river, lake or ocean. Additionally, impervious surfaces contribute to urban heat island effect – the phenomenon where cities are hotter than surrounding rural areas due to absorption of sunlight. Encouraging green stormwater infrastructure (GSI) and urban forestry helps to mitigate these effects.

Strategies for encouraging green building include:

1. ***Design and Construct Public Facilities to LEED Standards***
   a. Require that all new publicly funded facilities above a specified size, constructed by your jurisdiction or agency, are designed and built to a third-party verified green building standard such as LEED® Gold.

2. ***Regularly Audit Energy Use in Municipal Buildings***
   a. Track and manage building energy performance with EPA's Energy Start Portfolio Manager and identify opportunities to reduce energy use.

3. ***Require GHG emissions reporting through SEPA.***
   a. Applicants should be required to report probable GHG emissions over the lifetime of a project under the air quality section of the SEPA checklist. The lead agency can allow the use of an emissions generation template, such as the one developed by King County, or can allow applicants to present their own calculations using an accepted method.

4. ***Provide incentives for green building projects.***
   a. Projects that achieve objective standards for green building or GSI should be encouraged through incentives such as density or floor/area ratio (FAR) bonuses, reduced permit fees, streamlined permit processing, or financial grants. *See Example below: Priority Green*

5. ***Use Fee Reductions to Encourage Green Stormwater Infrastructure***
   a. As climate change reduces snowpack and spring stream flows and raises water temperatures, stormwater management will become even more critical. Create a rate structure for stormwater management utility fees and sewerage fees (for combined sewer and stormwater systems) that encourages the reduction of impervious surfaces, retention of native vegetation, and implementation of GSI techniques.

6. ***Establish Tree and Vegetation Retention Ordinances***
    a. Establish ordinance provisions for retaining existing trees and native vegetation and for replacing removed trees and vegetation. Trees should be prioritized by species and size. Native vegetation should be prioritized for its habitat value and ability to mitigate stormwater impacts. Such ordinances should be balanced with the need to preserve solar access. *(See Example below: City of Lake Forest Park)*

7. ***Remove barriers to alternative energy.***
    a. Remove building code and permitting barriers to installing alternative energy systems such as photovoltaic panels or small wind turbines, and passive heating and cooling systems, as part of green building projects or retrofits. Forms of alternative energy should be allowed by right in certain zones, and height limits and setbacks should allow for the installation of these structures.
    b. Consider creating a height exception for solar and wind systems up to 15 feet taller than building height limits.
    c. In new developments consider requiring “renewable ready” construction.
    d. Work with developers to limit the restrictions on such uses in the development’s CC&Rs.

8. ***Provide financial assistance for energy efficiency.***
    a. Provide funding for property owners for weatherization and other energy efficiency measures for existing homes and businesses, with priority for low-income housing.

9. ***Promote district or neighborhood scale efficiencies.***
    a. A focus on individual buildings without acknowledgement of the neighborhood context does not constitute a holistic approach to emissions reductions. Establish code provisions and incentivize neighborhood- or district-scale efficiencies and improvements that capture and support green building benefits, such as infill development, cottage housing, district heating and cooling, distributed generation grids, urban stream and waterway protection, and pedestrian-friendly, mixed-use communities.
    b. Encourage use of LEED-ND (Neighborhood Development)
    c. Revise Parking Requirements by removing minimum parking standards, setting maximum limits, allowing shared parking, and revising parking design standards to allow smaller spaces. These strategies increase density, which tends to increase energy efficiency and decrease transportation-related emissions.

Reducing Emissions from Demolition

1. ***Encourage Refurbishment Over Demolition***

a. When at all possible, preference should be given to refurbishment or adaptive re-use of existing buildings. This extends the life-span of the building's materials and avoids the need to mine and transport virgin resources.

2. ***Encourage Deconstruction Over Demolition***

a. Deconstruction involves selectively dismantling a building rather than demolishing it. Deconstruction allows for the opportunity of recycling materials for new buildings or other uses.

3. ***Require Recycling of Key Construction Materials***

a. Many construction materials, such as concrete, asphalt paving and shingles, and steel, have a high re-use value. Banning these materials from the landfill ensures that they will be used again, saving landfill space and reducing the need for virgin materials. When combined with a policy of using maximum feasible quantities of recycled materials in public construction projects, this "closes the loop" locally. *See Example below: City of Seattle*

Examples

SDOT – Reducing Emissions from Construction Materials

The Seattle Department of Transportation has made a concerted effort over the past decade to reduce the emissions embodied in the concrete and asphalt that it purchases. These materials are very carbon-intensive to manufacture and are used in large quantities by many agencies, but especially those involved in transportation-related construction.

The first step in the process of reducing these emissions was to establish a baseline against which to measure the effectiveness of reduction strategies. In the City's 2005 greenhouse gas inventory, SDOT determined that its 1990 emissions from concrete and asphalt totaled 4,680 metric tonnes of CO2 equivalent (MTCO2e). The agency derived this number by multiplying quantities of material used during that year by emissions factors obtained from manufacturers[1]. Since 2005, SDOT has tracked its emissions from concrete and asphalt each year to measure its progress in reducing these emissions.

SDOT has, to date, pursued two main strategies for reducing emissions from concrete. The first of these was to incorporate an incentive specification ("incentive spec") into its standard

[1] City of Seattle OSE, "2005 Inventory of Seattle Greenhouse Gas Emissions: Community and Corporate," 2008: 38-39, http://www.seattle.gov/Documents/Departments/OSE/2005%20Seattle%20Inventory%20Full%20Report.pdf

specifications. This spec, used for roadway concrete, gives money back to the contractor for each pound of cement they are able to reduce per cubic yard (CY) of concrete. As long as the concrete meets all the performance standards required for the project, the specification allows for a cement reduction of up to 25%.[2] Because virtually all concrete-related emissions come from the manufacture of cement, this specification can reduce emissions by nearly as much.

The second strategy has been to require that all sidewalks, curbs, and curb ramps contain 25% *pozzolans*.[3] Pozzolans, such as fly ash and blast furnace slag, are recycled materials that can be used in place of cement. Again, this 25% cement reduction results in a 25% reduction in GHG emissions.

Though these strategies pertain to building transportation infrastructure, they can easily be adapted to materials used in the construction of buildings and the surrounding sites.

Priority Green – Encouraging Green Building through Expedited Permitting

The City of Seattle encourages developers to reduce energy use and invest in green stormwater infrastructure by providing an expedited, streamlined process for projects that are committed to green building practices.

To qualify, projects must meet one of the following requirements:

- Reduce energy and fossil fuel use by at least 60% and achieve at least 10 points on the City's Facilitated Building Matrix;
- Achieve at least 3 of the 7 petals of the Living Building Challenge;
- Meet Seattle 2030 District targets, or;
- Achieve LEED Platinum or Built Green 5 Star.

By meeting one of these requirements, a project's permitting process is reduced by 25% at no extra permitting cost to the developer. This incentivizes developers to build green by reducing the amount of time and money that they need to devote to a single project.[4]

City of Seattle – Requiring Recycling of Construction Waste

Incentivizing deconstruction and recycling of construction waste in the green building process is an important first step in reducing the need to obtain and transport virgin materials, but it will only achieve reductions up to a point. In order to reach its goal of 70% recycling of construction waste by 2020, the City of Seattle has begun instituting phased bans of key construction materials from landfilling, in essence requiring that these materials must be recycled. The bans include:

[2] City of Seattle, "Standard Specifications for Road, Bridge and Municipal Construction," 2014: 5-25, http://www.seattle.gov/util/cs/groups/public/@spu/@engineering/documents/webcontent/01_029215.pdf

[3] Hoffman, Jemae, "Cementing our Shrinking Carbon Footprint," *SDOT Blog*, 2011, http://sdotblog.seattle.gov/2011/03/23/cementing-our-shrinking-carbon-footprint/

[4] City of Seattle Department of Planning and Development, "Priority Green Facilitated," Last Updated 2015, http://www.seattle.gov/dpd/permits/greenbuildingincentives/prioritygreenfacilitated/default.htm

- Asphalt Paving, Bricks, and Concrete (2012);
- Metal (2014);
- Cardboard (2014);
- New Construction Gypsum Scrap (2014);
- Unpainted and Untreated Wood (January 2015);
- Carpet (2016);
- Plastic Film Wrap (2016), and;
- Tear-Off Asphalt Shingles (July 2016).

Each ban has a one-year grace period in which landfilling of these materials does not invoke a civil infraction. In order to confirm compliance with these bans, all building permit holders are required to submit a waste diversion report that details the quantities of materials recycled and the locations to which they were taken. The City then follows up with the receiving facilities to confirm the numbers in the waste diversion report.[5]

City of Lake Forest Park – Tree Ordinance

Trees provide a number of benefits to a community, including carbon sequestration, hydrologic benefits, decreased energy use, and an aesthetically pleasing environment.

The City of Lake Forest Park, in an effort to protect and enhance its urban forest, passed an ordinance in 2010 that instituted a multi-layered permitting process for the removal of trees within its jurisdiction. Trees considered to be "significant," – those over 6" DBH (diameter at breast height) require a permit to be removed and must be replaced within 6 months. When multiple trees are removed, or a "landmark" tree – one over 28" DBH is proposed for removal, a review by a professional arborist is required before the removal can be permitted, and trees must be planted to bring the lot back to its minimum canopy coverage goal. Tree removals in environmentally sensitive areas also must undergo arborist review and include increased permitting fees.

If a resident or developer cannot or chooses not to replace trees on their property, they must pay into a tree fund that goes toward the planting of trees in public right-of-ways. [6]

By requiring permits for tree removal, involving a professional arborist in the process, and requiring replacement of trees, the City of Lake Forest Park ensures that it will continue to receive the benefits provided by its community forest.

Resources

Built Green: http://www.builtgreen.net/

Construction and Demolition Recycling Association: http://www.cdrecycling.org/

[5] Seattle Public Utilities, "Recycling Required for Construction and Demolition Projects," Last updated 2015. http://www.seattle.gov/Util/ForBusinesses/Construction/CDWasteManagement/RecyclingRequirements/index.htm

[6] City of Lake Forest Park, *Ordinance No. 1015,* adopted Dec 9, 2010, http://www.cityoflfp.com/DocumentCenter/Home/View/368

Energy Star: https://www.energystar.gov/

Envision Sustainable Infrastructure Rating System: http://www.sustainableinfrastructure.org/rating/

EPA Green Infrastructure: http://water.epa.gov/infrastructure/greeninfrastructure/

EPA Reducing Emissions from Construction: http://www.epa.gov/sectors/pdf/construction-sector-report.pdf

LEED: http://www.usgbc.org/leed

Living Building Challenge: http://living-future.org/lbc

Seattle GSI: http://www.ecy.wa.gov/programs/wq/stormwater/municipal/LID/May12SPUppLIDcommittees.pdf

Sustainable Sites Initiative: http://www.sustainablesites.org/

West Coast Climate and Materials Management Forum: http://westcoastclimateforum.com/

WA State Green Building: http://www.ecy.wa.gov/programs/swfa/greenbuilding/