

Duwamish Valley Cumulative Impact Analysis: Using Science to Influence Decision-making in Seattle, Washington

Linn Gould, MS, MPH, Just Health Action, Seattle, WA & BJ Cummings, MA, Duwamish River Cleanup Coalition/TAG, Seattle, WA

Background:

South Seattle's Duwamish Valley has long been referred to as a community with environmental injustices – a community with disproportionately high environmental health burdens and risks and fewer positive environmental benefits than the rest of Seattle – but limited evidence has been available to date to validate or quantify this characterization. The neighborhoods around the Duwamish River are generally low-income, with large minority and immigrant communities. The Duwamish Valley is also home to Seattle's largest industrial and maritime trade centers and is bisected by three highways and the Duwamish River Superfund Site. The purpose of this analysis is to document and quantify the Duwamish Valley's environmental health status relative to the rest of Seattle using a cumulative impact approach.

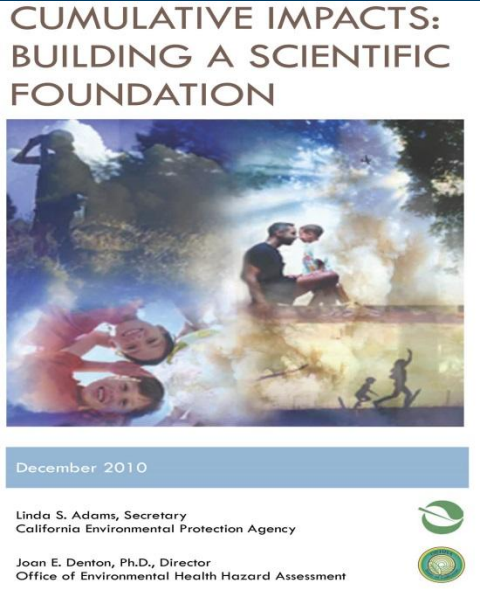
Definitions:

Environmental Justice (EJ): EJ Executive Order 12898 was issued in 1994. The Environmental Protection Agency (EPA) defines EJ as *the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.* EPA's goal is to provide an environment where all people enjoy the same degree of protection from environmental and health hazards and equal access to the decision-making process to maintain a healthy environment in which to live, learn, and work.

Cumulative impacts are defined as *any exposures, public health or environmental effects from the combined emissions and discharges, in a geographic area, including environmental pollution, from all sources, whether single or multimedia, routinely, accidentally, or otherwise released* (OEHHA, 2010). The EJ Executive Order specifically states that *multiple and cumulative exposures should be identified and that impacts will take into account sensitive populations and socioeconomic factors.*

Methodology:

In accordance with California EPA's cumulative impacts ranking methodology (OEHHA, 2010), multiple indicators are divided into five categories, each with an established range of ranking scores.



Component	Definition	Ranking Score
Socioeconomic factors	Community characteristics that result in increased vulnerability to pollutants	1–3
Sensitive populations	Populations with traits that may magnify the effects of pollutant exposures	1–3
Environmental exposures	Contact with pollution	1–10
Environmental effects	Adverse built environment conditions	1–5
Public health effects	Disease and other health conditions	1–5

Three indicators for each component are selected from specified geographic areas (ten Seattle ZIP codes) for a total of 15 indicators. Indicator data for each ZIP code are then ordered from highest to lowest, divided into equal subgroups, and assigned a ranking score for input into the following formula:

$$\text{Cumulative Impact} = (\text{Socioeconomic factors} + \text{Sensitive populations}) \times (\text{Environmental exposures} + \text{Environmental effects} + \text{Public health effects})$$

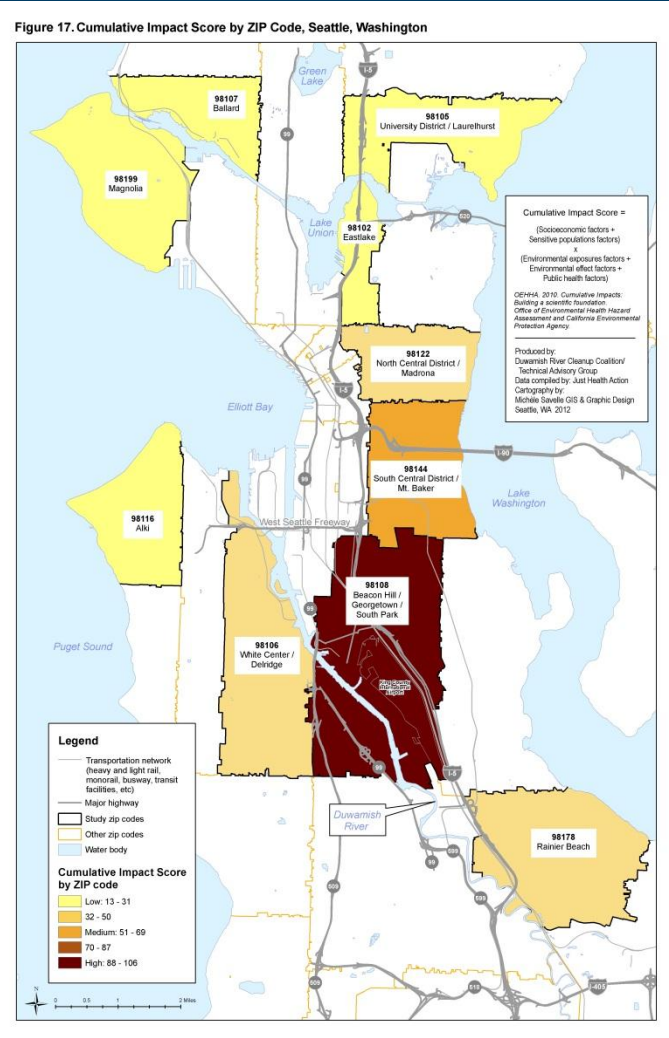
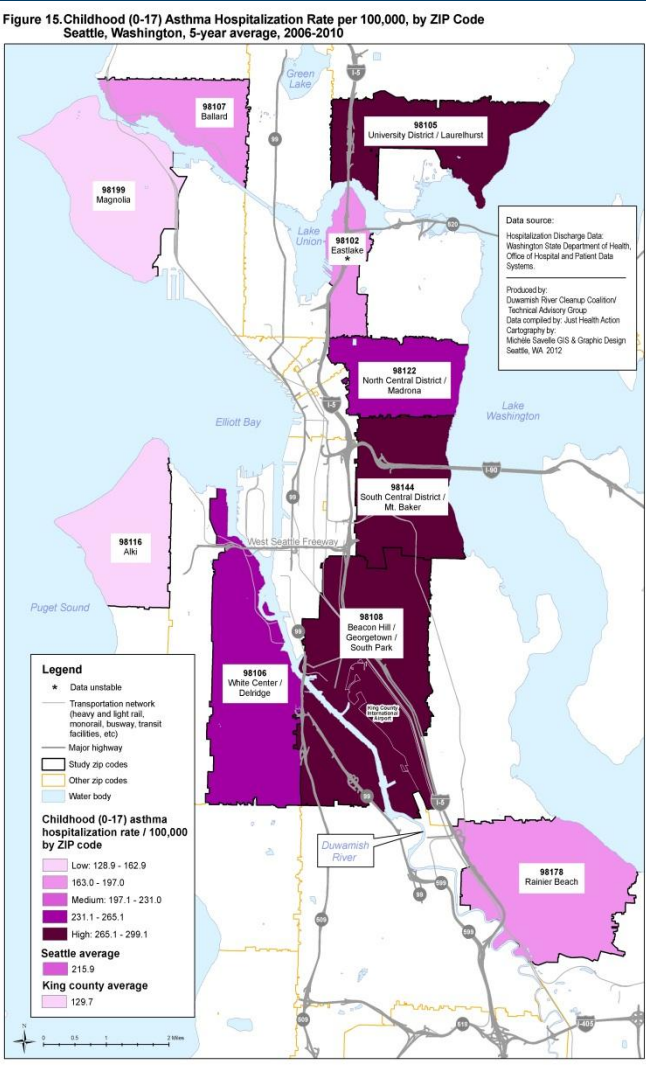
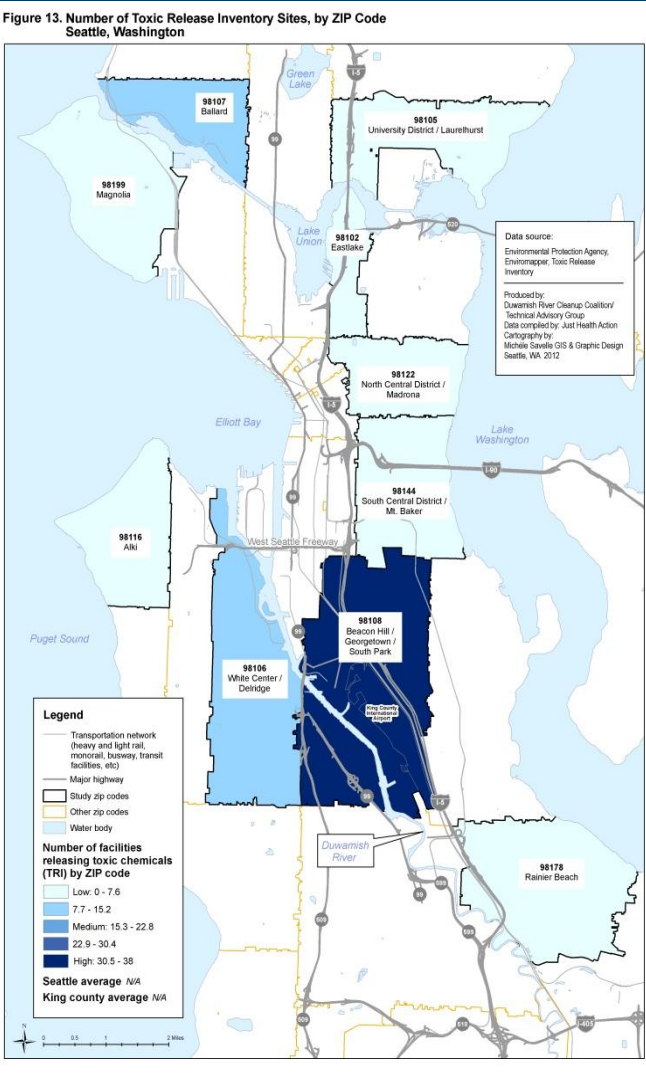
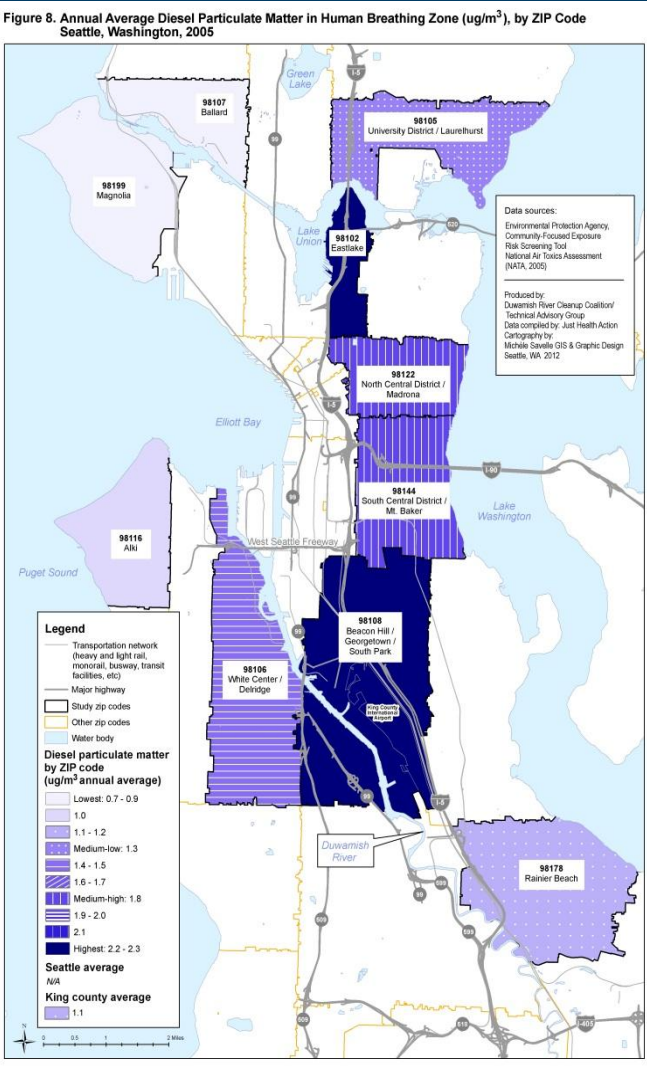
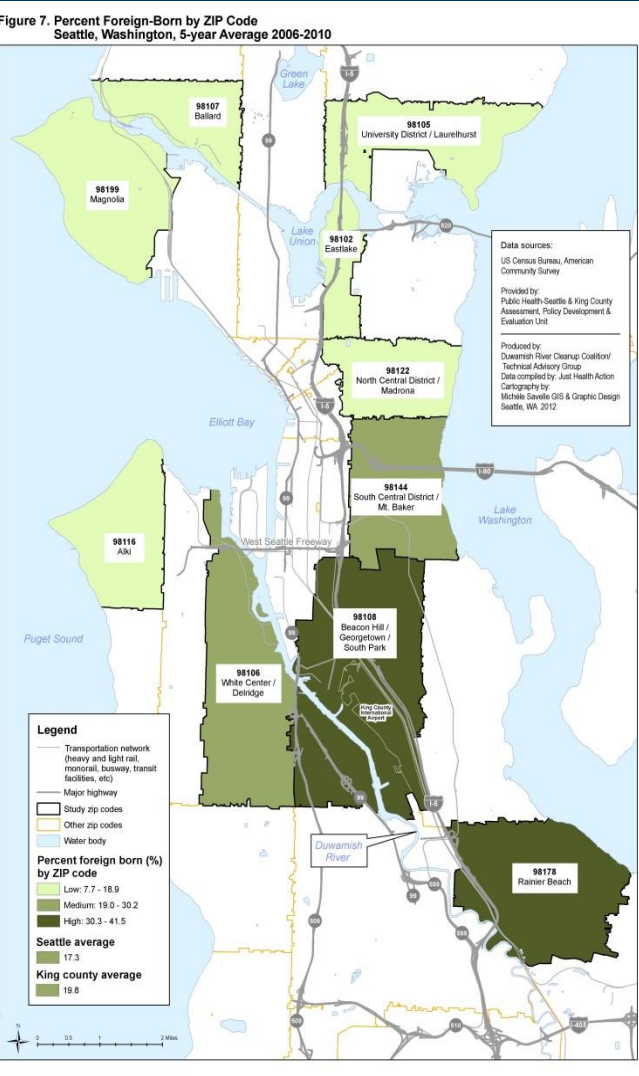
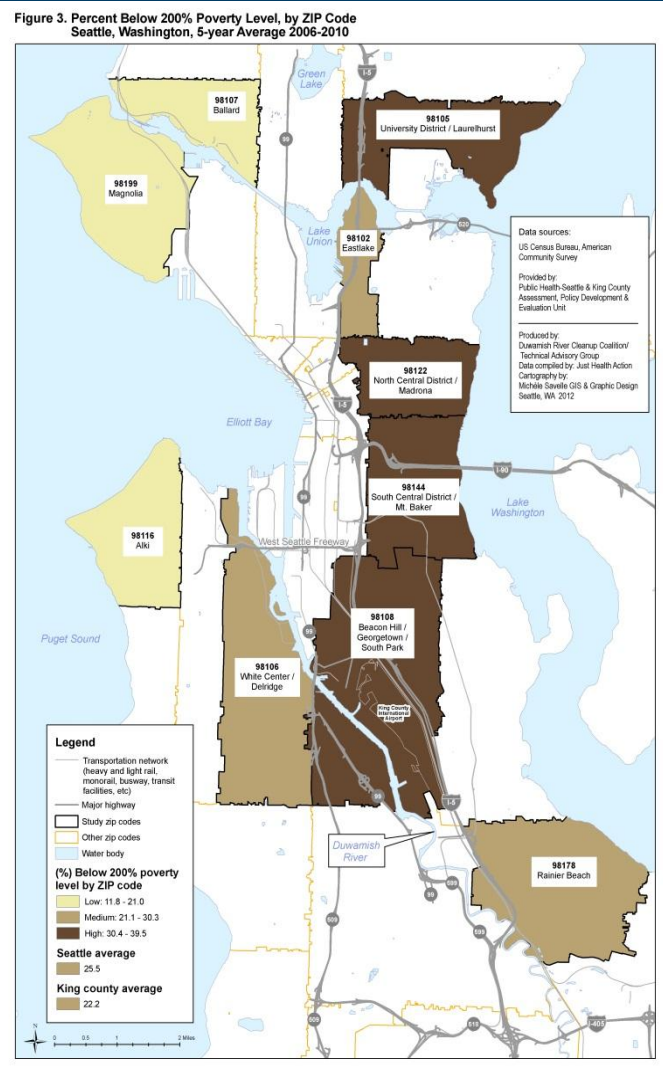
The total cumulative impact score can range from a minimum of 6 to a maximum of 120. High scores indicate disproportionate impacts. Highly ranked scores can be identified for action by communities and decision-makers.

Indicators for Cumulative Health Impact Analysis:

Data were collected for 24 available indicators for all ten ZIP codes as shown in Table 1. The 15 indicators used in the cumulative impacts scoring formula are highlighted and were selected based on:

- EPA Environmental Justice definition;
- Information collected through a Community Based Participatory Research project in the Duwamish Valley;
- Scientific evidence compiled from public databases;
- Best professional judgment.

Table 1	Indicators Evaluated for Cumulative Health Impact Analysis
Component	Indicator
Socioeconomic Factors (Rank 1-3)	Percent Adults 25 and older Without a College Degree, by ZIP Code, Seattle, Washington, 5-year Average 2006-2010
	Percent Below 200% Poverty Level, by ZIP Code, Seattle, Washington, 5-year Average 2006-2010
	Percent Non-white Population, by ZIP Code, Seattle, Washington, 2010
	Percent Adults (18-64 years) With No Health Insurance, by ZIP Code, Seattle, Washington, 5-year Average 2007-2011
Sensitive Populations (Rank 1-3)	Percent Adults With No Leisure Time Physical Activity, by ZIP Code, Seattle, Washington, 5-year Average 2007-2011
	Percent Presence of Children Under 5 years, by ZIP Code, Seattle, Washington, 2010
	Percent Presence of Elderly 65 years and Older, by ZIP Code, Seattle, Washington, 2010
Environmental Exposures (Rank 1-10)	Percent Foreign-Born by ZIP Code, Seattle, Washington, 5-year Average 2006-2010
	Annual Average Diesel Particulate Matter in Human Breathing Zone (µg/m³), by ZIP Code, Seattle, Washington, 2005
	Annual Average Benzene in Human Breathing Zone (µg/m³), by ZIP Code, Seattle, Washington, 2005
	Stunned Site Ranking for Confirmed and Suspected Contaminated Sites, by ZIP Code, Seattle, Washington
Environmental Effects (Rank 1-5)	Percent Tree Canopy, by ZIP Code, Seattle, Washington
	Square Feet per Resident of Park Area by ZIP Code, Seattle, Washington
	Number of Toxic Release Inventory Sites, by ZIP Code, Seattle, Washington
Public Health Effects (Rank 1-5)	Life Expectancy at Birth in Years, by ZIP Code, Seattle, Washington, 5-year average, 2005-2009
	Percent Adults Overweight or Obese by ZIP Code, Seattle, Washington, 5-year average, 2005-2009
	Heart Disease Death rate per 100,000, by ZIP Code, Seattle, Washington, 5-year average, 2006-2010
	Stroke Death rate per 100,000, by ZIP Code, Seattle, Washington, 5-year average, 2006-2010
	Percent Adults With Doctor Diagnosed Diabetes by ZIP Code, Seattle, Washington, 5-year average 2007-2011
	Percent Adults With Hypertension, by ZIP Code, Seattle, Washington, 2003-2011 odd years
	Childhood (0-17) Asthma Hospitalization Rate per 100,000, by ZIP Code, Seattle, Washington, 5-year average, 2006-2010
	Percent Adult Cigarette Smokers, by ZIP Code, Seattle, Washington, 5-year average, 2007-2011
Lung Cancer Death Rate Per 100,000, by ZIP Code, Seattle, Washington, 5-year average, 2006-2010	
Assault Hospitalization Rate Per 100,000, by ZIP Code, Seattle, Washington, 5-year average, 2006-2010	
Selected for Cumulative Impacts Analysis	



Component	98108 Beacon Hill/ Georgetown/ South Park	98144 S. Central District/ Mt. Baker	98178 Rainier Beach	98106 White Center/ Delridge	98122 N. Central District/ Madrona	98102 Eastlake	98107 Ballard	98105 University District/ Laurelhurst	98116 Alki	98199 Magnolia
Socioeconomic Factors	3	3	3	2	2	1	1	2	1	1
Sensitive Populations	3	3	3	2	1	1	2	1	2	2
Social Vulnerability	6	6	6	4	4	2	3	3	3	3
Environmental Exposures	10	5	2	4	5	7	2	3	2	1
Environmental Effects	5	3	3	3	3	4	5	3	3	1
Public Health Effects	3	3	3	4	4	1	3	2	1	2
Environmental Vulnerability	18	12	8	11	12	13	9	8	6	4
CUMULATIVE IMPACT SCORE	106	66	50	46	43	30	28	21	19	13

Influencing Decision-making: Preliminary findings

To ascertain how the Cumulative Health Impacts Analysis is being used, a survey was sent in summer and fall of 2013 to 43 members of 13 different public agencies and community organizations representing the South Seattle Environmental Justice Interagency Workgroup. The Workgroup's purpose is: *“Through improved communication, coordination, and collaboration between agencies and communities, we aim to reduce exposure to environmental toxics in South Seattle. The survey asked which organizations have reviewed the document, how the Analysis is being used, and how the information has influenced decision-making in that office. Responses received to date (Many responses have been delayed due to government furloughs) have included:*

- As an evidence base when giving neighborhood “toxic tours” (Seattle-based community organization);
- Advocating for more resources to improve neighborhood conditions (South Park community organization);
- A reference when requesting funding for grants (South Park community organization and Port of Seattle);
- Assistance in informing community outreach efforts (Port of Seattle);
- Assistance in identifying mitigation measures for site cleanups and construction activities (Port of Seattle);
- Information dissemination (University of Washington);
- Considered along with other resources to inform county improvement activities and referenced in internal discussions about equity in the Lower Duwamish area (King County);
- Proposal by Seattle Mayor for a \$250,000 Duwamish River Opportunity Fund to develop health interventions and mitigation for local residents (City of Seattle).

For more information: