Sound Transit Climate Risk Reduction Project – Summary Findings

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What Is Sound Transit?

- Multi-modal public transit agency serving Tacoma-Seattle-Everett region
- 28 million riders (and growing)
- Services operated via contractual partnerships with King County Metro, Pierce Transit, Community Transit, Amtrak, and Burlington Northern Santa Fe (BNSF)
What is the Sound Transit Climate Change Risk Reduction Project?

- Funded by the FTA
- One of 7 climate change adaptation pilot projects
- A partnership between Sound Transit, the UW Climate Impacts Group, and WSDOT – *a first look for ST*
Sound Transit Climate Change Risk Reduction Project

Project Objectives

• Assess climate change risks to Sound Transit operations, assets, and long-term planning;

• Identify initial adaptation strategies and how to best integrate information into ST processes; and

• Provide a state-to-local testing ground for WSDOT’s pilot of the FHWA’s climate change vulnerability assessment methodology.
Projected Changes in PNW Climate

Increasing average temps, more extreme heat events

Projected increase in average temp by mid-century: +4.3°F to +5.8°F (range: +2°C to 8.5°F) (Mote et al. 2013)

Increasing winter precip, more extreme precip events

24-hour storm events in Seattle-Tacoma area projected to increase 14-28% by 2050s, relative to 1970-2000. (Rosenberg et al 2010)
Increased flood risk west of the Cascades
More and larger fall/winter floods possible, compounded by sea level rise in coastal rivers and streams.

Rising sea level
Sea level in Seattle projected to rise +24.3 inches (range: +4 to +56 in.) by 2100. (NRC 2012)
Sound Transit Climate Change Risk Reduction Project

What Do These Changes Mean for ST?

- Sounder
- Link
- ST Express
- Customer Facilities
- Environmental Mitigation
Climate change exacerbates many existing issues already facing Sound Transit.

The probability, timing, and degree to which climate change may affect Sound Transit will depend on many factors.

Many climate change impacts on Sound Transit services will likely be minor to moderate, although more significant impacts are possible.

Sound Transit already possesses some degree of climate resilience and capacity to address climate impacts.
Project Approach

• Drew on existing research for regional climate projections

• ST climate adaptation advisory group

• Staff survey for establishing baseline information on experience, perceptions about climate impacts on ST

• Facilitated workshops (~12):
  o Kick off events
  o Risk assessment & prioritization for facilities and modes
  o Identification of adaptation strategies (by mode)
  o Potential integration pathways (senior managers)

• Report development, Executive Team briefings, and dissemination
Potential Impacts Related to ST

<table>
<thead>
<tr>
<th>Related to Temperature</th>
<th>Related to Precipitation</th>
<th>Related to Sea Level Rise</th>
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<tbody>
<tr>
<td>Increased potential for...</td>
<td>Increased potential for...</td>
<td>Increased potential for...</td>
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<tr>
<td>• Rail buckling</td>
<td>• Mudslides and slope instability</td>
<td>• Temporary flooding of low-lying areas</td>
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<tr>
<td>• Heat stress on electrical and safety equipment</td>
<td>• Larger and/or more frequent river and stream flooding</td>
<td>• Permanent inundation of low-lying areas</td>
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<tr>
<td>• Heat stress on overhead catenary system</td>
<td>• Increased localized flooding due to more stormwater runoff or poor drainage</td>
<td>• Higher tidal and storm surge reach</td>
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<tr>
<td>• Heat stress on pavement, structures</td>
<td>• Seepage due to higher groundwater tables</td>
<td>• Erosion</td>
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<tr>
<td>• Heat stress on landscaping and environmental mitigation sites</td>
<td>• Summer drought</td>
<td>• Drainage problems</td>
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<td>• Corrosion from more frequent or prolonged exposure to saltwater</td>
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Prioritizing Potential Impacts and Services

Two questions assessed:

1. Which climate change impacts matter more across all services?

2. Which services may become higher (or lower) adaptation priorities?
Evaluation Criteria for Impacts Prioritization

- Expected and possible impacts to **service delivery**

- **Geographic distribution** of the impact

- **Potential cost** of managing or responding to the impact [qualitative only]

- **Probability of an impact** – Not a formal criteria, but estimated as an additional aid to decision making
Q1: Which climate change impacts matter more across all services?

<table>
<thead>
<tr>
<th>Potentially Significant Impacts</th>
<th>Potentially Moderate Impacts</th>
<th>Potentially Minor Impacts</th>
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</thead>
<tbody>
<tr>
<td>• Increased mudslide activity</td>
<td>• Larger and/or more frequent river and stream flooding</td>
<td>• Increased heat stress on electrical equipment</td>
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<tr>
<td>• Sea level rise and related impacts</td>
<td>• Increased localized flooding due to more stormwater runoff or poor drainage</td>
<td>• Increased heat stress on the overhead catenary system</td>
</tr>
<tr>
<td></td>
<td>• Potential for rail buckling</td>
<td>• Increased heat stress on facility structures and landscaping</td>
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</table>

* Assumes size of the projected impact is at the high end of what would be expected*
Q2: Which services may become higher adaptation priorities?

**Potential high adaptation priority services:**
- North Sounder
- Edmonds and Mukilteo Sounder Stations

**Potential medium adaptation priority services:**
- South Sounder; Tukwila and Kent Sounder stations
- At-grade or aboveground Link alignments

**Potential low adaptation priority services:**
- ST Express
- Environmental mitigation
- Other customer facilities
- Underground Link
Sound Transit has many options for adaptation...

- **Raise** sensitive ground-level infrastructure
- **Build** berms around sensitive ground-level infrastructure
- **Increase** visual & electronic monitoring of infrastructure in vulnerable areas
- **Move** or relocate infrastructure in hazard zones
- **Modify drainage patterns** to redirect flows, improve drainage

- **Add flexibility** by building in capacity to relocation, raise, add higher capacity in future
- **Modify design standards** to provide higher level of flood & stormwater management, seepage management, heat impacts
- **Partner** with communities to target problem drains/drainages
...And many opportunities for integrating climate change into agency processes

- Climate impacts may influence decisions including:
  - Policy setting
  - Environmental review
  - Strategic system planning
  - Preliminary engineering and final design
  - Operations and maintenance
  - Asset management
  - Intergovernmental relations
Next Steps: Prioritizing action

– Continue monitoring climate change impacts
– Continue working with regional partners to identify further areas of research;
– Identify the climate adaptation considerations for near-term planning; and
– Provide guidance on developing a Climate Adaptation Plan.
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Questions?

Comments?

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