

# **Global Warming and WSDOT**

Addressing Climate Change  
through  
Emissions Reductions  
&  
Adaptation

# This presentation will cover

- **What we know**...emissions, recent legislation, and plans
- **What we see**...changes that have already happened
- **What we don't see yet**...but is likely on the horizon
- **What are we going to do**...preliminary perspectives and next steps

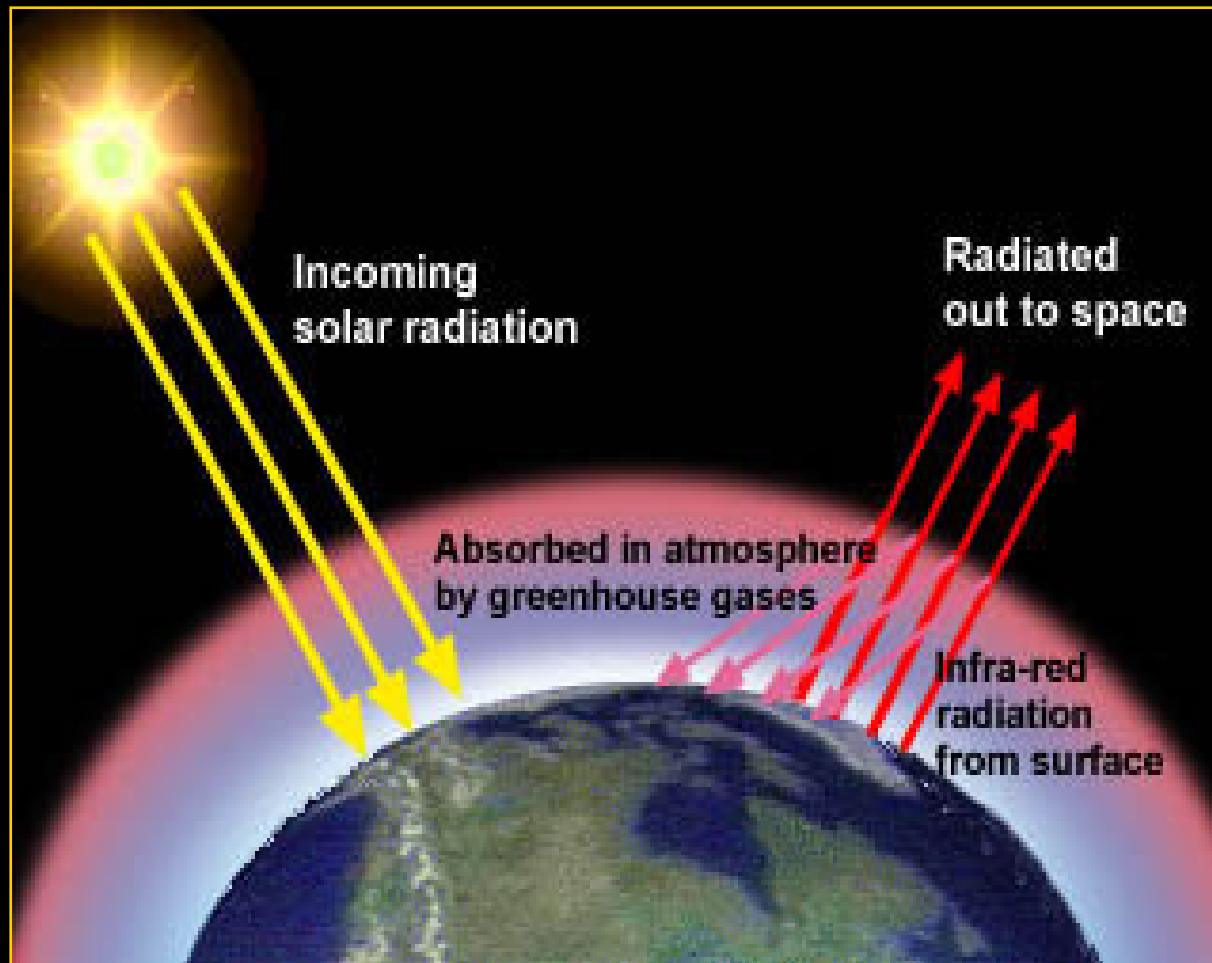
# A Brief Overview of Global Climate Change



Earth at Night  
More information available at:  
<http://antwrp.gsfc.nasa.gov/apod/ap001127.html>

Astronomy Picture of the Day  
2000 November 27  
<http://antwrp.gsfc.nasa.gov/apod/astropix.html>

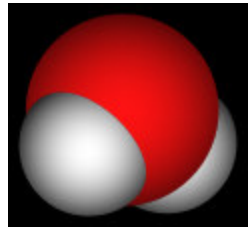
# Greenhouse gases play a critical role in determining global temperature



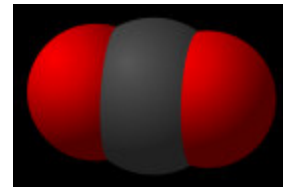
***Rapid increases in greenhouse gases are  
changing this natural balance***

# What are our primary greenhouse gases?

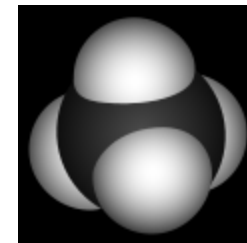
- Water vapor



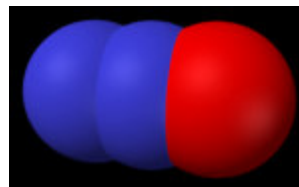
- Carbon dioxide (CO<sub>2</sub>)



- Methane (CH<sub>4</sub>) – marsh gas

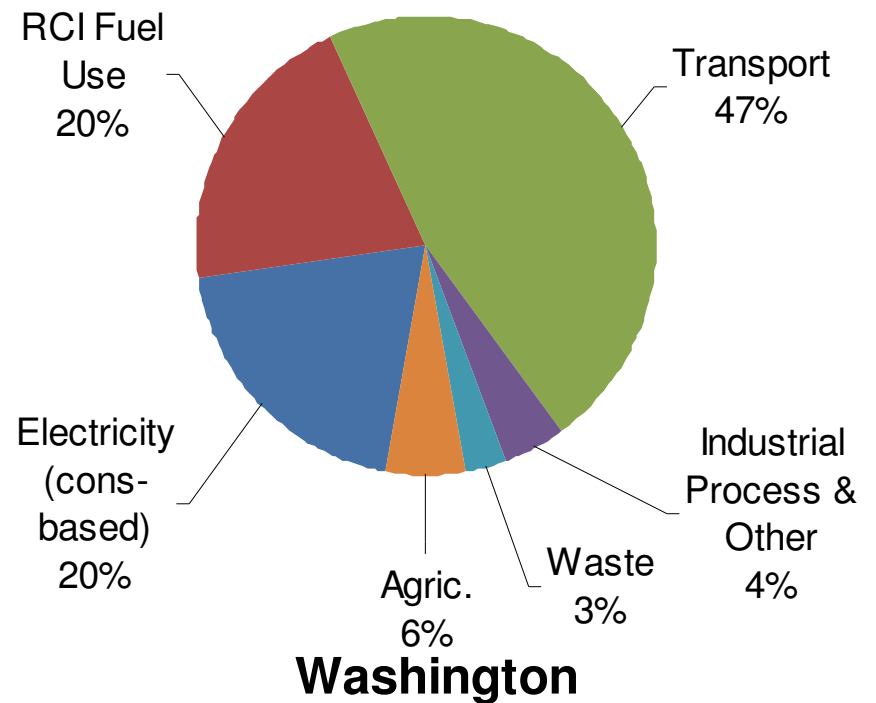
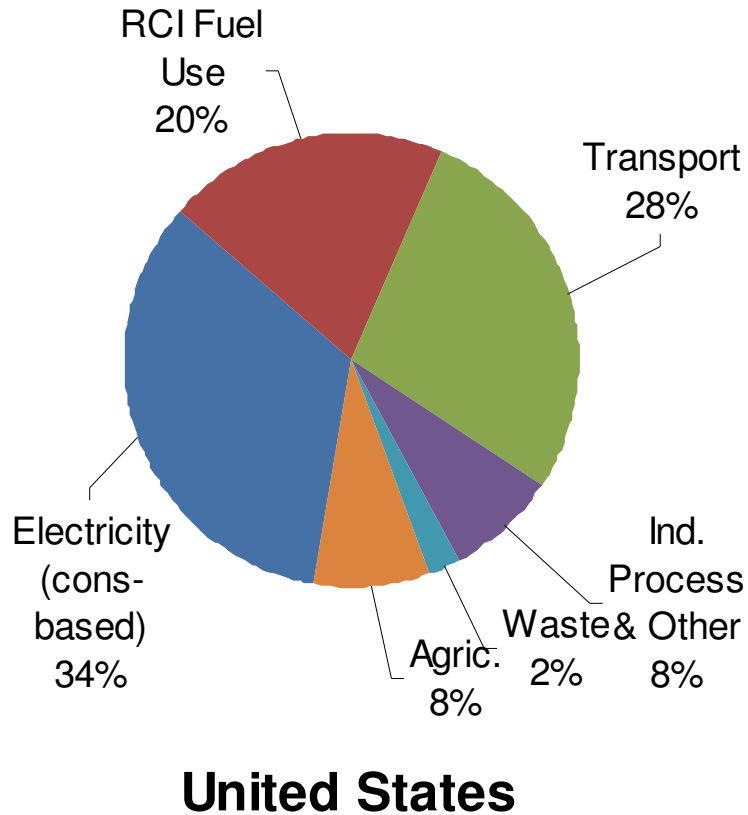


- Nitrous oxide (N<sub>2</sub>O) – aka laughing gas



# Why concern about Transportation?

## Greenhouse Gas Emissions (MMTCO<sub>2</sub>e)



# Our Mandate - Washington

- Governor's Executive Order 07-02 (2007)
  - Reduce emissions
  - Adapt to change
  - Support our economy
- Climate Action Team (CAT)
  - Developed proposed 12 recommendations, 3+ focused on transportation
  - A continuing state oversight force continuing to provide guidance – focus on transportation

# Legislative highlights

- 2007 Senate Bill 6001 / 2008 House Bill 2815
  - Target reduction of greenhouse gas emissions to:
    - 1990 levels by 2020
    - 25% below 1990 levels by 2035
    - 50% below 1990 levels by 2050
  - **WSDOT strive to reduce per capita VMT for light vehicles**
    - 18% by 2020
    - 30% by 2035
    - 50% by 2050

- 2008 Senate Bill 6580 – affecting transportation planning
- Links greenhouse gas emissions with transportation and land use

# How do we reduce transportation emissions?

- create more efficient driving conditions (reduce congestion)
- reduce the amount of driving (transit, carpooling, efficient movement goods/services)
- introduce/advocate for more fuel-efficient vehicles

# Project Development & Selection

- **Tier 1** – Low cost / high return from **active traffic management, ramp metering, incident response combined with transportation demand management** (including commute trip reduction, park n' ride, local land use planning).
- **Tier 2** – Moderate to higher cost/benefits from improvements in road network like **adding short lanes to connect interchanges, direct access ramps for transit and high occupancy vehicles, center turn lanes to allow better traffic flow.**
- **Tier 3** – Higher cost/corridor wide benefit from major investments in **high occupancy vehicle lanes (HOV), high occupancy tolled lanes (HOT), transit, commuter rail, general purpose roadway lanes, interchange modifications, bus access.**

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- In the works - already done...
  - 2005/2007 Legislative mandate that 2009 model year vehicles sold in Washington meet California emissions standards.
- What's in our hands...what does the infrastructure look like?
  - e.g., how to support for plug-in electric vehicles? (rest areas, incidence response, intervals along roadways)

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As move forward with Project  
Selection, Design, and  
Construction...

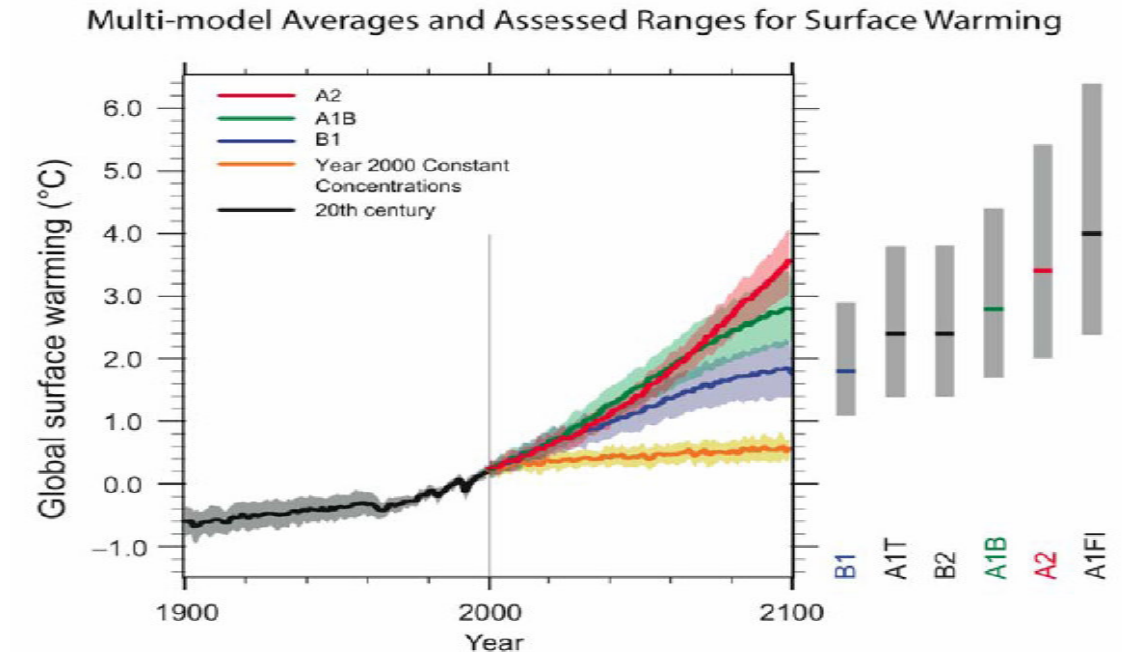
What or Who else do we need to  
pay attention to?

**-Adaptation-**

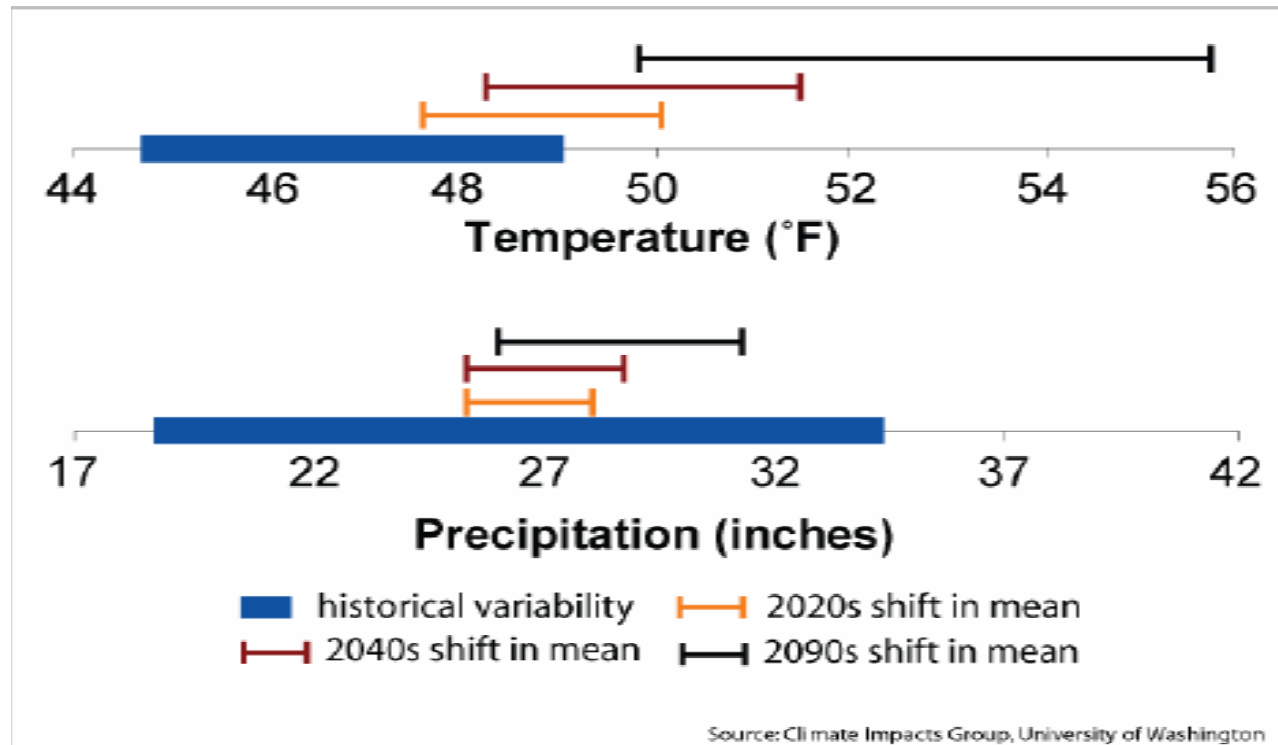
# 21<sup>st</sup> Century Global Warming

Warming expected through 21<sup>st</sup> century even if CO<sub>2</sub> emissions end today due to persistence of greenhouse gases.

Projected range of global-scale warming by the 2090s: 3.2°F-7.2°F



# Changes Relative to 20<sup>th</sup> Century



There is high confidence in projected temperature changes, less in precipitation changes.

# Areas of Concern

## Coastal Processes

- Sea level rise
- Erosion
- Flooding
- Inundation
- Landslides



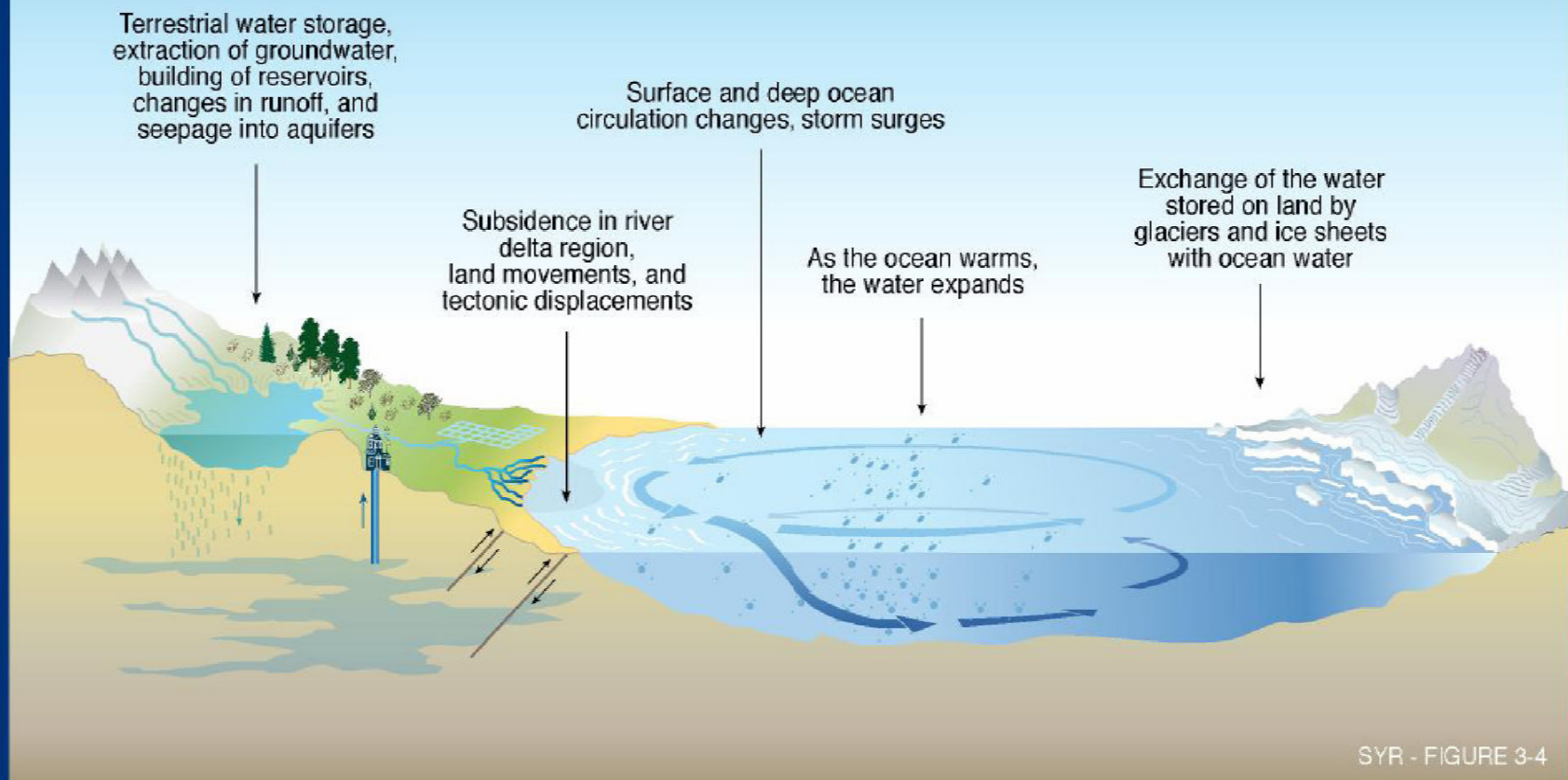
## Coastal Ecosystems

- Salmon
- Salt marsh habitat
- Shellfish



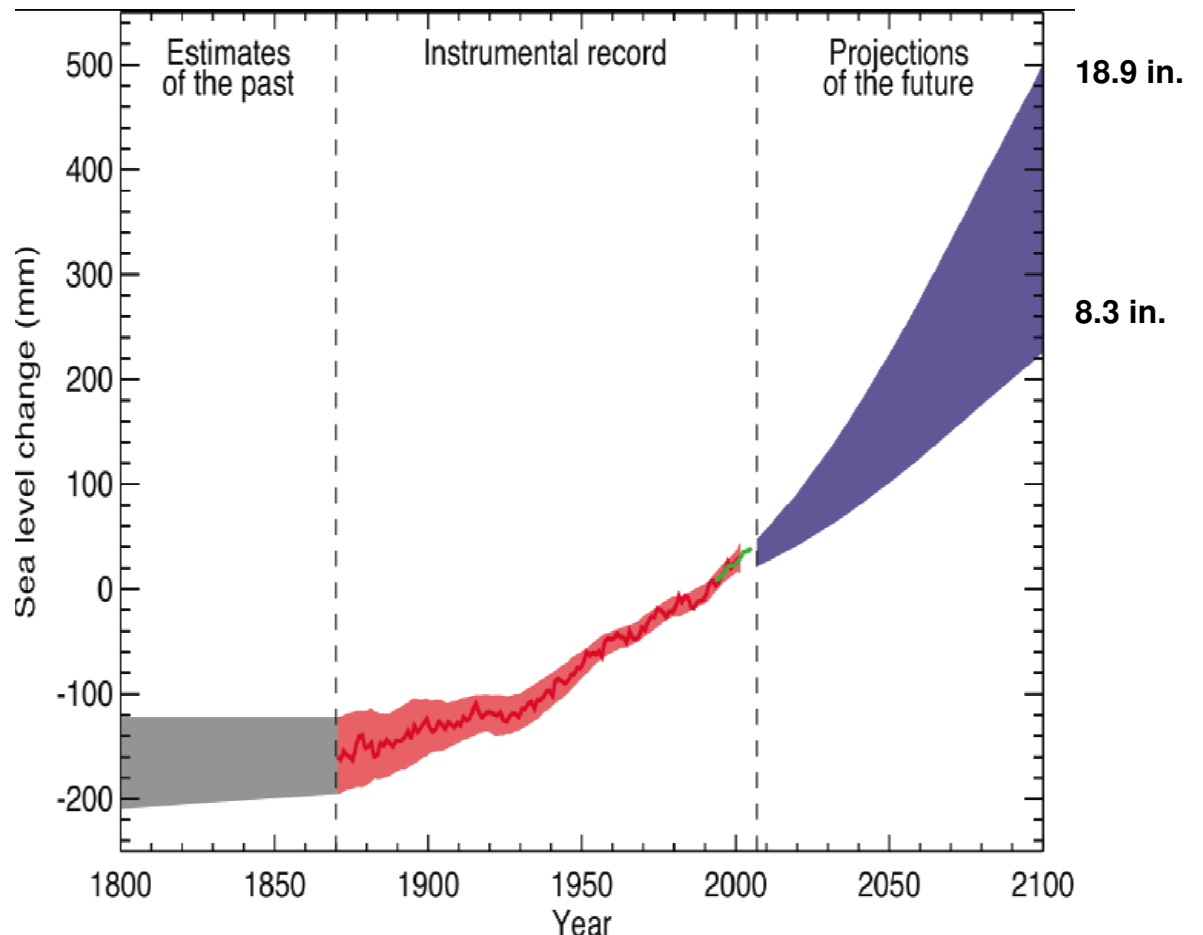
Source: Climate Impacts Group, University of Washington, graphics from Ecology

## What causes the sea level to change?



# Changes in Global Sea Level

- Projected global change: +7-23 inches (varies with emissions scenario)
- Rate of increase expected to be greater than 1961-2003 trend
- Change will not be evenly distributed around the globe
- Projections are based on thermal expansion only



“Medium” emissions scenario

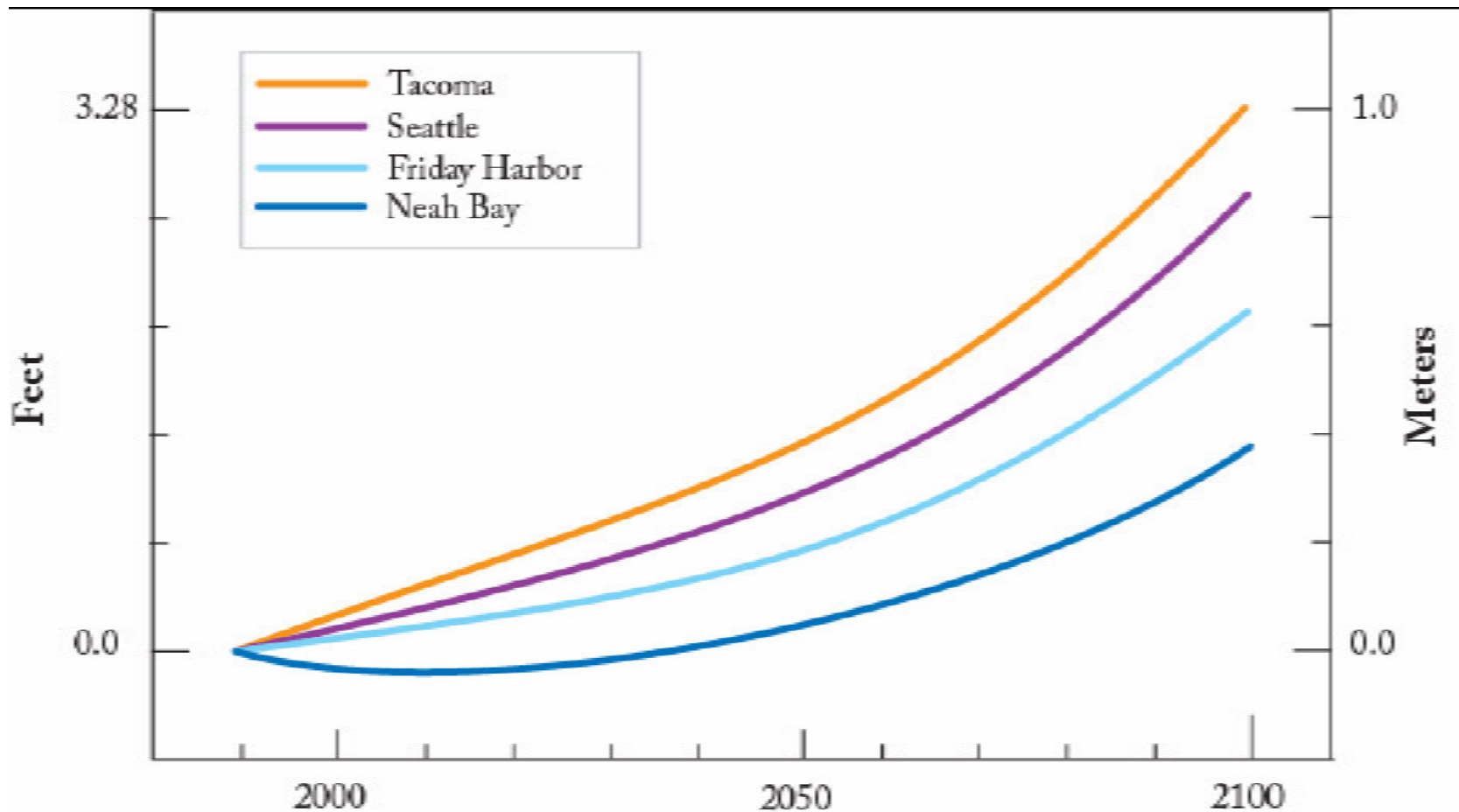
# Sea Level Rise in the Pacific NW

Relative sea level rise affected by

- **Global sea level rise** *(thermal expansion, freshwater inputs)*
- **Tectonic processes** *(subsidence and uplift)*
- **Interannual climate variability** *(El Nino, La Nina events)*
- **Ocean/coastal winds** *(can increase regional se level about +8 inches)*
- **Topography/geology** *(gently sloping beach vs. bluffs)*
- **Short-term events** *(low pressure storms)*

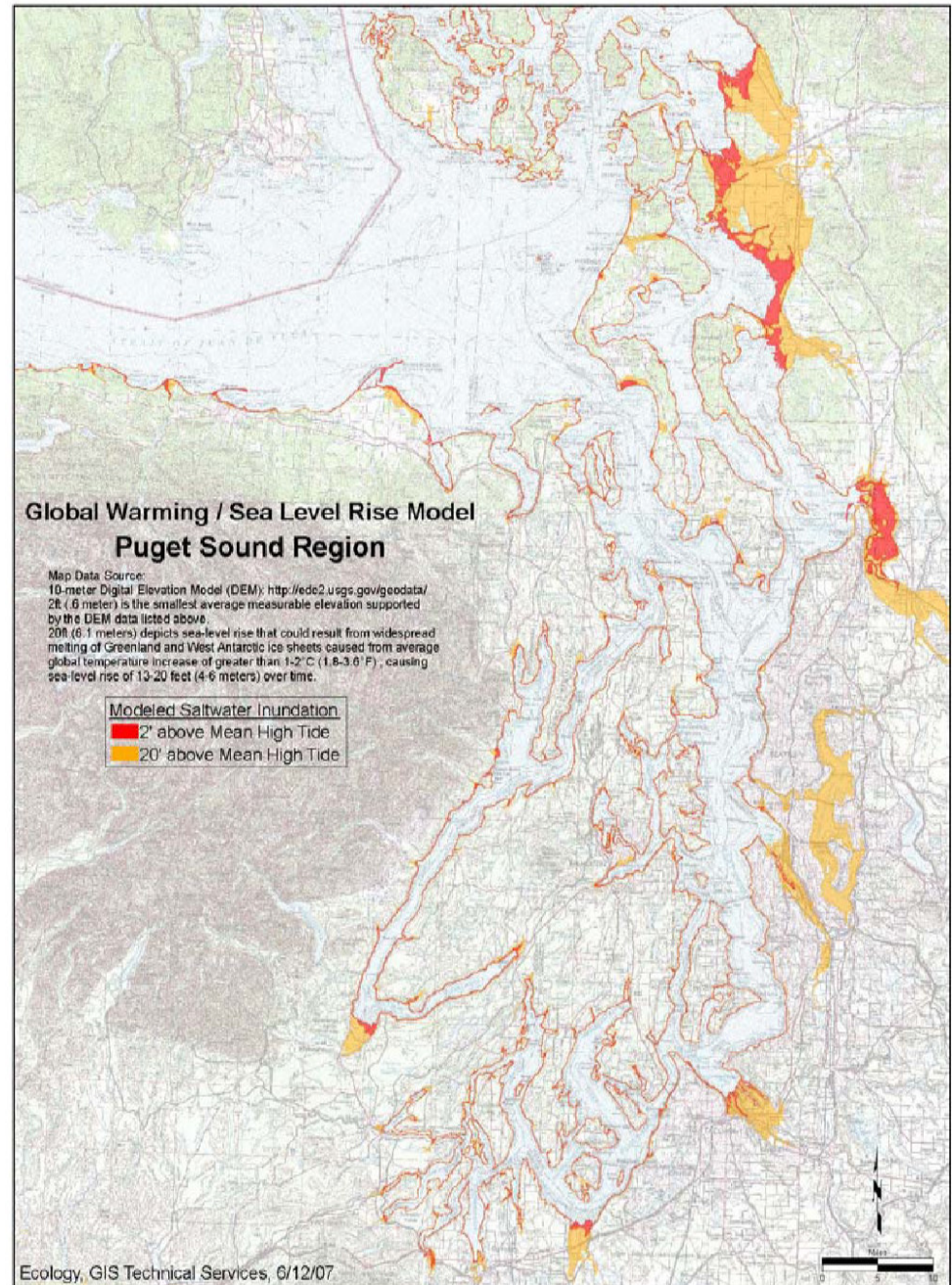
# Puget Sound Sea Level Rise

Relative sea level rise may be greatest in South Puget Sound (approx. 3 ft. by 2100) and least near Neah Bay (approx. 1 ft. by 2100)



# Vulnerability of Puget Sound to Rising Sea Level

- Inundation maps draw attention to large, low-lying areas where extensive flooding is possible/
- These maps downplay high risk areas where flooding is not the primary hazard (downtown waterfront, bluff landslides, contaminated shoreline sites)



## Changing Coastal Flood Risk

- In Puget Sound, the difference between a typical annual high water event and:
  - The 10 year flood elevation = about 1 foot
  - The 100 year flood elevation = about 2 feet
- With 1 foot of sea level rise, a 100 year flood event becomes a 10 year event.
- With 2 feet of sea level rise, a 100 year flood event becomes an annual event.



Anacortes (4 February 2006)



Whidbey Island (4 February 2006)

# Adaptation Summary

- Global and regional climate is already changing.
- These changes are expected to continue to accelerate in the coming decades.
- Sea level rise will be experienced as a series of escalating disasters.
- Awareness of adaptation needs will result in better long-term decisions.

# Increasing Resilience

- Limit armoring
- Restore shorelines
- Remove dikes
- Improve processes for siting new construction
- Set back development
- Protect key geomorphologic processes (sediment supply)
- Identify critical natural and built environments
- “When engineering is inevitable, be imaginative”

# WSDOT Next Steps

- Climate change executive committee
- Heightened focus on GHG issues
- Spotlight on reducing emissions & VMT
- Evaluation of WSDOT design policies and existing vulnerable facilities

and...

Recognize that the past may no longer be a dependable guide to the future

# Questions?

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