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ANDREWS & KURTH CLIMATE CHANGE OUTLINE

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1. EFFECTS ANALYSIS - OVERVIEW

EPA, through its TSD, considered various health and welfare effect scenarios.

A. Health Effects

The TSD focused primarily on airborne health effects. "Breathing ozone at sufficient concentrations can reduce lung function, thereby aggravating asthma or other respiratory functions."[1] Climate change affects the sources of ozone precursors "through physical response (lightning), biological response (soils, vegetation, and biomass burning) and human response (energy generation, land use, and agriculture)."[2] NO_x emissions due to lightning are expected to increase in a warmer climate. Studies indicate that influx of ozone from the stratosphere to the troposphere could increase due to large-scale circulation shifts caused by climate warming.[3]

Microbial activity in soils will likely increase. Biogenic emissions are projected to increase by up to 59%, contributing to a 30 to 50% increase in ozone formation over the northern continental regions.[4] Even atmospheric circulation is expected to change in a warming climate. The air will stagnate, likely degrading air quality in some densely populated areas.[5]

For example, New York City deaths are projected to increase by approximately 4.55 from the 1990's to the 2050's in ozone-related matters.[6]

B. Food Production and Agricultural Effects

Warming is likely to cause northern migration of weeds, which respond more positively to increasing CO_2, particularly invasive weeds. Further, glyphosate, the most widely used herbicide in the United States, loses its efficacy on weeds grown at increased CO_2 levels.[7]

With earlier springs and warmer winters, there will be a proliferation and higher survival rate of pathogens and parasites.[8]

Late season frosts could injure plants blooming during earlier warm weather. Some plants and crops are presently at their temperature threshold and would suffer.[9]

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[1] TSD at 89.

[2] TSD at 89.

[3] TSD at 89.

[4] TSD at 90.

[5] TSD at 90.

[6] TSD at 92.

[7] TSD at 97.

[8] TSD at 97.

[9] TSD at 99.

Irrigation will be drastically affected. There will be an increase in the need for irrigation due to decreased rainfall in certain regions, and due to the increased evaporation.[10] Longer growing seasons will exacerbate the situation. The estimated increase in irrigation requirements in the U.S. 64% if stomatal effects[11] are ignored, 35% if they are included.[12]

The TSD expressed a high level of confidence that for North America, cold-water fisheries will be negatively affected and that warm-weather fisheries will benefit.[13]

C. Forestry Effects

While global warming may increase the available CO_2 for uptake, it also has increased the size and number of forest fires. Insect outbreaks that affect forestry will increase.[14]

D. Water Resources Effects

Rising temperatures will diminish snowpack and increase evaporation. Higher demand for irrigation will strain surface and groundwater availability. The Rocky Mountain region will suffer, with its drier climate. While streamflow in the U.S. has increased 25% in the last 60 years, there has been a 2% per decade reduction in the southwest since 1950.[15] Glaciers in North America are melting, and the rather rapid retreat of Alaskan glaciers constitutes about 1/2 of the total estimated glacial mass loss worldwide.[16]

Groundwater systems will be slower to recharge while withdrawal demands will increase.[17]

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[10] TSD at 100.

[11] The passing of water vapor and other gases into and out of the plant through tiny pores in the outer layer epidermis of the leaf or stem.

[12] TSD at 100.

[13] TSD at 103.

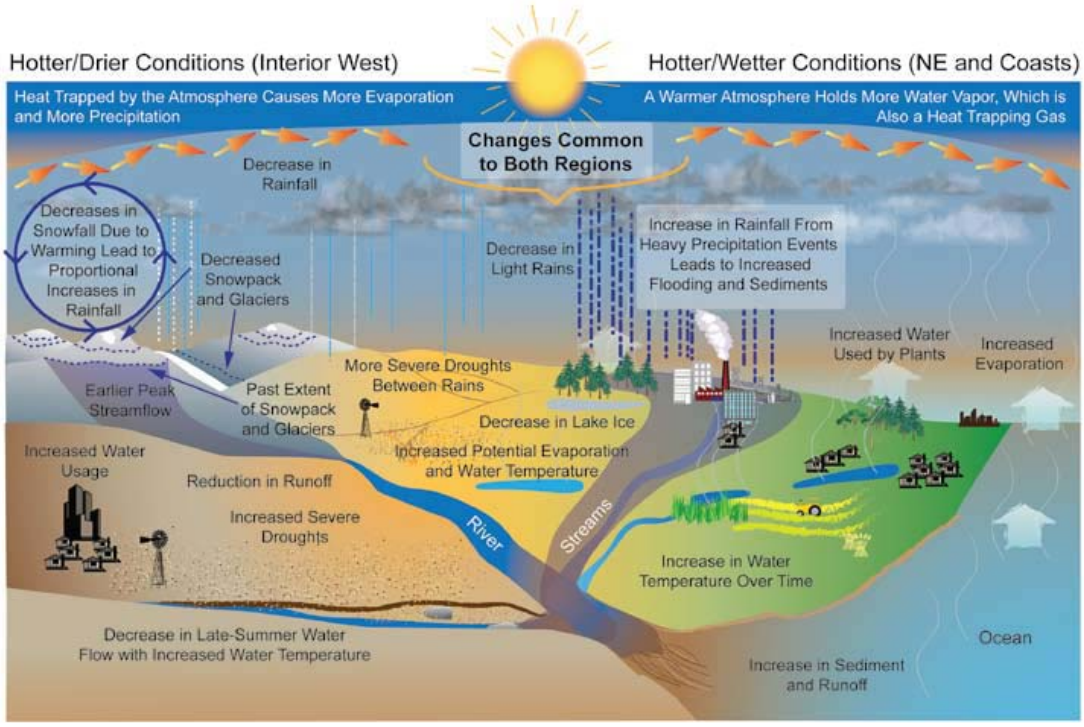
[14] TSD at 104.

[15] TSD at 110.

[16] TSD at 111.

[17] TSD at 113.

Figure 1. Projected Water Cycle Effects of Warming



Lowering of surface water bodies will lead to resuspension of bottom sediments, liberating toxic compounds. This could affect long-term river cleanup planning.

In coastal areas, precipitation increases on land have increased river runoff, polluting coastal waters with more nitrogen and phosphorous.[18]

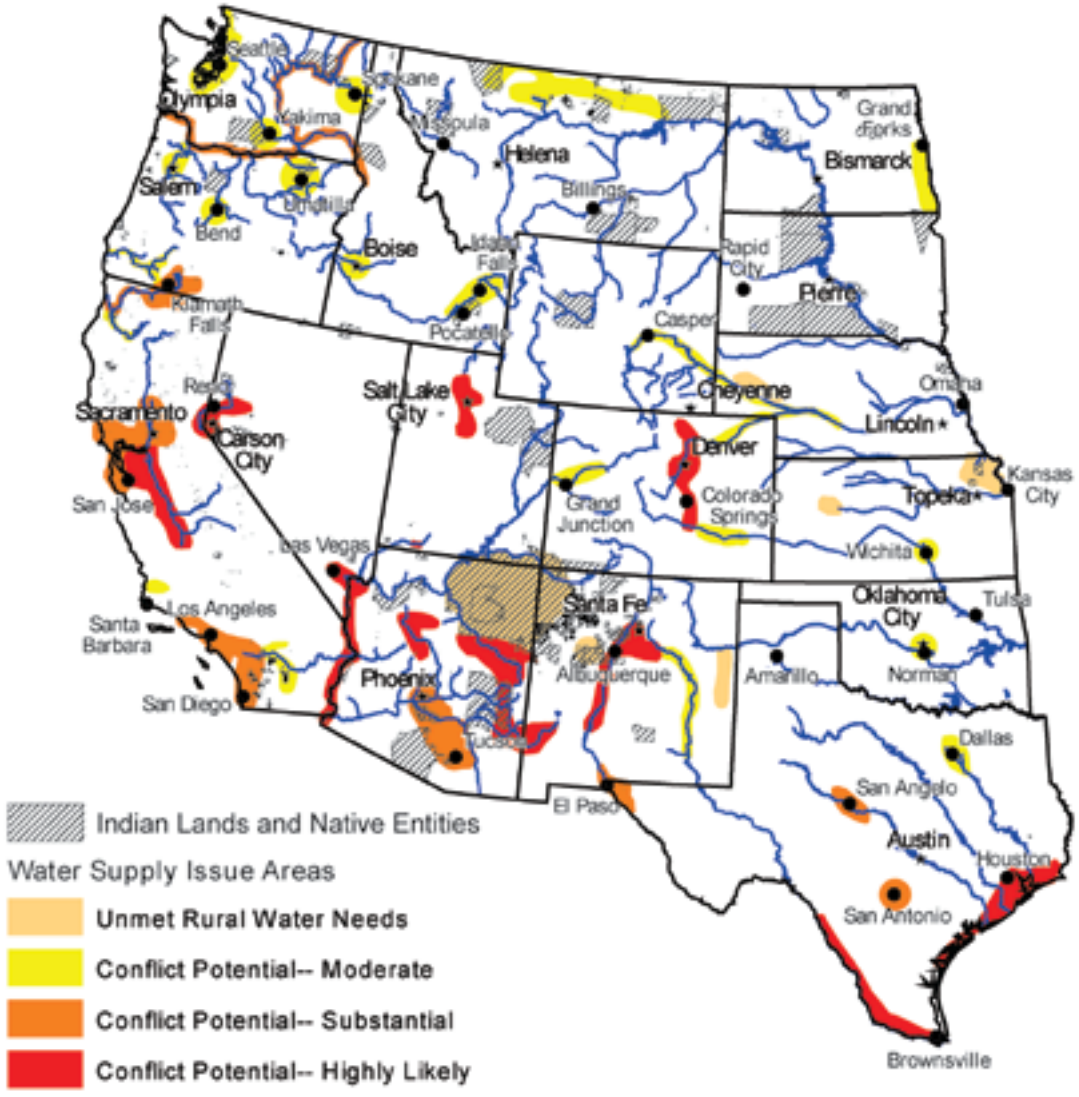
Increased air temperatures lead to higher water temperatures, especially during low-flow periods. In lakes and reservoirs, higher water temperatures lead to longer period of summer stratification (when surface and bottom waters do not mix). DO is reduced at higher temperatures. Low oxygen stresses aquatic animals, such as coldwater fish, insects and crustaceans on which they feed. [19]

Areas heavily dependent on groundwater will suffer as the climate warms.

[18] TSD at 114.

[19] Impacts at 46.

Figure 2. Potential Water Supply Conflicts by 2025



Climate change will challenge existing sewer systems. Incapacity, aged systems and inadequate catchments all contribute to the problem This will be a problem for municipalities.