CLIMATE ADAPTATION AND RESILIENCY PLAN: VULNERABILITIES

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INTRODUCTION

Globally, the world has now reached a point for which it is not possible to avoid the impacts of climate change. As global emissions continue to climb, the most extreme climate change models are now generally accepted as the most likely scenario. In some circumstances they are now considered to be conservative projections. The United States is home to millions of unique biome's that will all be impacted by climate change differently, making the need to develop adaptation and resiliency plans at the local level exceptionally important. While no plan can comprehensively address all the ways in which climate change will impact the human species and our environments, this plan has focused on four key areas that the City of Medford can strategically invest in to equitably mitigate the effects of climate change.

Our process for developing the Climate Adaptation and Resiliency Plan is to first identify our city-wide vulnerabilities. Our vulnerabilities report relies on an existing body of research to identify how natural systems in the Rogue Valley may change, and the corresponding impacts of those changes on the regional economy, built environment, public health, and community. While we are no longer able to stop the effects of climate change, strategically spending to improve resiliency and adaptation can help mitigate the effects of climate change, protecting quality of life. Research to understand our vulnerabilities will be ongoing, as new data becomes available.

The second part of this plan will identify key strategies for improving resiliency and adaptation. The Medford Planning Department will work closely with the Climate Adaptation and Resiliency Plan Committee and community members to identify and develop climate change solutions. Any meaningful response, while lead by the City of Medford, must be supported by community members and the private sector to succeed. Regional opportunities to partner in addressing concerns related to climate change will be explored and pursued wherever possible.

HOW TO USE THIS DOCUMENT

This report on *Vulnerabilities* is an introductory document to identify ways that the City of Medford may be impacted by climate change. It should be used to guide research and support policy, regulation, and plan development to improve resiliency and adaptation. This document is a primer to the Climate Adaptation and Resiliency Plan, which will serve to identify strategies for improving resiliency and adaptation to climate change vulnerabilities.

Climate future projections and estimates are created by combining historic climate data, real-time environmental changes, and greenhouse gas emissions into complex models that attempt to predict future climate scenarios. While these models are based on the best available science, they cannot consider every variable that may interact to make future climate outcomes more or less extreme. Withstanding model shortcomings, weather events can compound to exacerbate environmental changes, making many model predictions conservative.

The Representative Concentration Pathway (RCP) models different climate futures based on the volume of greenhouse gases emitted in the years to come. This model is used by the International Panel on Climate Change (IPCC) and the State of Oregon to guide planning and preparedness efforts. The State of Oregon, in their Fifth Climate Assessment (2021)[1] have used RCP2.5, an intermediate scenario assuming that emissions will peak around 2040 then decline; and RCP8.5, which assumes that emissions will continue to rise throughout the 21st century.

The City of Medford has not created any unique data or reports for this plan, but is synthesizing the findings from: The State of Oregon's Fifth Climate Assessment (2021); Climate Change Vulnerability and Adaptation in Southwest Oregon (2020)[2] developed by the Southwest Oregon Adaptation Partnership; Climate Change Vulnerability and Adaptation in South-Central Oregon (2019)[3] developed by the USDA and US. Forest Service; and Climate Wise Rogue River Basin (2008)[4] prepared by the Resource Innovation Group, Geos Institute, USDA Forest Service, and the Pacific Northwest Research Station.

The consensus among these reports is that the Rogue River region will experience hotter and drier conditions and shifts in precipitation, with more rainfall and declining snowpack. These changes will have profound impacts on the local environment and economies as droughts intensify, wildfire risk increases, water and air quality declines, and our natural ecosystems deteriorate. The degree to which these events impact quality of life in the City of Medford depends on our regional approach to emission reductions, adaptation, and resiliency.

ACUTE CC

Refers to weather events like wildfire that immediately effect the environment. The Internal Displacement Monitoring Center[5] estimates that in 2020 alone, 1,714,000 persons were internally displaced in the United States from extreme weather events. Locally, the 2020 Almeda Fire[6] destroyed 2,700 structures, immediately displacing approximately 3,000 residents, many of whom are still experiencing housing insecurity.

SLOW ONSET CC

Refers to the risks and related impacts of gradual shifts in climate, like drought and the loss of biodiversity. Locally, slow-onset climate change required the Federal Bureau of Reclamations to reduce water allotments for agriculture in the Klamath Basin[7] in an attempt to save endangered fish species. The impact has been reduced and ruined crop yields, lost fishing and subsistence opportunities, lost revenues associated with outdoor tourism and recreation, and rising social tensions.[8]

TEMPERATURE

The Fifth Oregon Climate Assessment (2021) reports that Oregon's' annual average temperature increased by about 2.2^0 (F), per century since 1895. If there is no significant reduction in emissions, temperature in Oregon is projected to increase an average of 5^0 (F) by 2050 and 8.2^0 (F) by 2080. Summer temperatures may be as much as 15^0 (F) hotter than the baseline temperature by 2080. High heat events will become more frequent and intense, as the annual number of days over 90^0 (F) continues to increase. Heatwaves like the 2021 event impacting the Pacific Northwest will become more routine. By the end of the century, the number of days over 100^0 annually, may exceed 40.

Increasing temperatures are driving climate change, impacting weather patterns, growing seasons, and the species we currently think of as indigenous to our region. Over the next century, the Rogue Valley Region will more closely resemble the European Mediterranean. With many species and sensitive biome's becoming extinct or severely undermined. Estimates from the Southern Oregon Climate Action Network[21] predicts that by mid-century, Medfords' climate will more closely resemble that currently experienced by Redding, California with a July average high of 96.8^0 and January low of 38^0. By 2100, the Rogue Valley may more closely resemble the Bakersfield, California region with a July average high of 100^0 and January low of 36^0. While these changes may not seem extreme, the

HISTORIC AVERAGE

The historical average helps establish a baseline from which to measure change. NASA's Goddard Institute for Space Studies, the National Oceanic and Atmospheric Administrations National Climactic Data Center and the UK Meteorological Office's Hadley Center all began taking consistent and reliable temperature measurements in 1880.[9] Historic average temperatures is not something communities can return to, but something communities can use to identify trends and associated climate consequences. "Rather than thinking of our future in terms of some historic 'normal' or 'average' condition we need to think in terms of the trends and what those trends indicate the future is likely to bring."[21]

DEGREE DAYS

Degree days are based on the assumption that when the outside temperatures is 65^0 F, we don't need heating or cooling to be comfortable. Degree days are the difference between the daily temperature mean and 65^0 F.[10] This concept is most used to track energy use and estimate related heating and cooling demands in various climate change scenarios. As the Rogue Valley Region continues to warm, the number of heating days will decrease and cooling days will increase. This presents challenges and opportunities for the city to equitably coordinate and incentive increased access to cooling units in both public and private spheres. Community members employed in land-based sectors or that are housing-insecure will be most impacted.

PRECIPITATION & SNOWPACK

As temperatures rise, the region will get more rain than snow. Extreme downpours will become more frequent, but on average, precipitation levels will remain the same. The City of Medford will likely see more winter precipitation and drier springs, creating conditions for exceptionally dry summers. Shifting water availability will effect soil moisture impacting both wild and cultivated plant species and increasing fuel loads in wildfire risk areas.

SNOWPACK

Snowpack may reduce by as much as 75% from the baseline by 2040, and another 75% from 2040 to 2080, practically eradicating any snowpack in the Rogue River Basin. As snowpack decreases, lower flows and higher temperatures are expected. This will negatively impact aquatic species and ecosystems that rely on them. Dissolved oxygen levels are expected to decrease, creating conditions where disease can flourish. Shifts in the timing of stream flows may trigger earlier emergence of aquatic insects and shift salmon spawning and migration times, in turn shifting the availability of primary food sources for migratory species, impacting those dependent upon them for nourishment.

WILDFIRE

Across the West, wildfires are occurring with more frequency and intensity. Fire suppression policies, land management practices, and climate change in combination have created dryer forests with greater fuel loads. As drought seasons become longer and more water is received as precipitation rather than snow, wildfire risk too will continue to grow an may be exacerbated by increasing pest species.

ECOSYSTEM

The distribution of ecosystems around the world is largely determined by two variables: average annual temperature and precipitation. When these variables are modified, the survival of these biomes and the species of which they are composed may be undermined. While some species populations are at risk of decline, others will grow. Insect species will emerge earlier and in greater numbers. Unlike mammals - insects, amphibians, and plants are dependent on external ambient temperatures.

Warming leads to increased metabolic rate, rapid growth, and population growth in some endothermic species, while others will be unable to thrive in the region. One such pest that we can expect to boom in population is the Bark Beetle, whom burrows under the bark of coniferous trees, negatively impacting the health of the tree and sometimes killing it. The proliferation of this insect will in turn have an ecological effect on our forests, contributing to increased fuel loads and wildfire risk, in turn endangering habitat and the wellness of keystone species.

DROUGHT

METEOROLOGIAL DROUGHT
A lack of precipitation or an evaporative demand that exceeds precipitation.

HYDROLOGICAL DROUGHT
When a prolongued meteorological drought effects surface or subsurface water supply, such as a streamflow, reservoir, and lake levels.

AGRICULTURAL DROUGHT
When a meteorological and hydrological drought impacts agricultural production.

SOCIOECONOMIC DROUGHT
When economic and social institutions are impacted by drought.

Between 2000 and 2020, an average of 37% of Oregon experienced drought of moderate intensity, and 7% experienced extreme drought conditions. As precipitation patterns shift durations of drought will become more extreme and more frequent. As droughts occur, water quality is also impacted, affecting aquatic species and those that rely on them for nutrition.[1]

WATER QUANTITY	WATER QUALITY	PUBLIC HEALTH	ASSOCIATED OUTCOMES
INCREASED WATER TEMPERATURE	WATER BORNE DISEASES	VECTOR BORNE DISEASES	REDUCED FOOD SECURITY
DECREASED WATER AVAILABILITY	IMPACTS ON WATER CHEMISTRY	RESPIRATORY HEALTH IMPACTS	REDUCED/ FAILED CROP YIELDS
REDUCED AIR QUALITY FROM PARTICULATE MATTER	HARMFUL ALGAE BLOOMS	RESPIRATORY HEALTH IMPACTS	ECONOMIC LOSSES
		MENTAL HEALTH IMPACTS	IMPACTED BIODIVERSITY
		WEAKENED IMMUNE SYSTEM	INCREASED CARBON EMISSIONS
			BURDENED PUBLIC AND SOCIAL INSTITUTIONS

MEDFORD'S WATER SUPPLY

The Medford Water Commission (MWC) operates and maintains the watery system that delivers drinking water to the City of Medford and White City. The cities of Ashland, Eagle Point, Jacksonville, Phoenix, Talent are served on a wholesale basis. Additionally, two domestic water districts purchase water from the Commission as needed. The MWC derives water from Big Butte Springs and the Rogue River, as a supplemental source when demand exceeds the springs' supply.

Big Butte Springs is a groundwater source replenished by rainfall, snow pack, and groundwater conditions. Water supply is influenced by high temperatures increasing evapotranspiration rates, meteorological drought, wildfire effecting the Big Butte Springs watershed, landslides, extreme flooding effecting one or more treatment facility, or power outages. The Rogue River water supply is most influenced by snowpack.

The Medford Water Commissions municipal rights over Big Butte Springs are senior in priority to many users in the Rogue River Basin. Under this legal agreement, Medford's water allotments can only be curtailed by drought conditions affecting our primary water source. Diversions from the Rogue River are limited, but the MWC has not yet reached the maximum withdrawal threshold. However, in more recent years, decreased flows at the Big Butte Springs have required MWC to rely more heavily on its secondary source. Reliance on the Rogue River as a secondary source to meet demand will likely continue, as population increases and climate change occurs.

In the extreme circumstances where supply cannot meet demand, limited amounts of water may be available from Grants Pass, Gold Hill, Rogue River, or Butte Falls, via truck delivery. Level 2 treated wastewater from the regional reclamation plant and irrigation water supplies may also be sources of non-potable water. Curtailment plans to avoid these scenarios include raising public awareness, requesting or requiring water reductions depending upon severity, and introducing surcharges.

Plans to address future supply shortages and water quality is ongoing and efforts to minimize these challenges include the development of the Rogue Valley Water Supply Resiliency Project,[11] a ten-year plan to safeguard the Valley's drinking water against droughts, earthquakes, and increased demands; and the Water Management and Conservation Plan (2017),[12] a guide to the development and implementation of water management and conservation programs and policies to ensure suitable use of water resources to meet future needs.

In 2018 Business Oregon[13] reported that the most competitive traded sector industries in Jackson and Josephine counties were: e-commerce, forestry and wood products, wholesale trade and logistics, agriculture, food and beverages, and tourism. Specific regional advantages included the production of wood products, business support services, preserved fruits and vegetables, aerospace products, and cannabis crop farming.

A 2022 report from the Oregon Employment Department[14] projects the following occupational growth over the next decade: Food preparation and Serving Related (24.5%), Property Management (22.7%), Personal Care and Services (20.7%), and Healthcare Support (18.7). The Southern Oregon Regional Economic Development Inc. identified four strategic growth areas[15] based on employment trends (2018): healthcare, natural resources, accommodations and food service, and specialty agriculture.

REGIONALLY STRATEGIC GROWTH AREAS

HEALTHCARE

In 2018 approximately 24,614 residents were employed in the healthcare sector regionally. In 2019 Asante announced plans to open a $64 million dollar outpatient cancer center in Medford, indicating a growing market and employment sector. Major healthcare companies in the region include Asante Health Systems and Providence Health and Services.

NATURAL RESOURCES

The Rogue Valley Region appreciates a legacy cluster of forestry and nonmetal mining. In 2018, local forestry and wood products were one of the most competitive traded sector industries, with employment concentrations twice was large as the U.S. average. Fishing and outdoor tourism remain major draws to the region.

TOURISM

Major drivers of tourism include regional cultural events, outdoor recreation, specialty food production, and both amateur and competitive sports. Tourism benefits a range of industries, generating an estimated $11.8 billion dollars annually and directly employing 12,350 residents, (2018). While some tourism attractions are already being impacted by climate change, namely decreased air quality from wildfires, other generators of tourism, like premier sports facility attractions, are growing.

SPECIALTY AGRICULTURE

Derived from six sectors, farms and ranches, specialty foods and ingredients, wineries, farm management and labor services, packaged fruits and vegetables, and agricultural services. The region is also recognized statewide for our competitive production of wine grapes and cannabis. Specialty agriculture is also a major driver of regional tourism.

Climate change will most impact land-based industries and sectors. For the Rogue Valley Region, this could be significant. With 3/4 of the identified strategic growth areas directly and indirectly tied to the natural environment, the region may see a significant reduction in exports and locally spent dollars.

WINE INDUSTRY

The first Oregon vineyard was cultivated in the Rogue Valley and the first winery opened here in 1873, by Peter Pritt.[16] As an internationally recognized wine region encompassing several river valleys and supporting more than 70 grape varietals, the wine industry is a major tourism destination. Climate change may compress the growing season to avoid fruit damage from frost, extreme heat, and wildfire smoke. Extreme heat and drought may impact vine health and create favorable conditions for pests. The use of pesticides and fungicides may increase as a result of increased pest populations and shifts in precipitation patterns. As climate change progresses, some varietals may no longer be viable in the valley and the fermentation process itself may be compromised, by increased chemical hazards and vulnerabilities to microbial contamination and fungal growth.[17] [18] [19]

ORCHARD INDUSTRY

The Pacific Northwest is the leading producer of U.S. tree fruits. For 2016, the region produced approximately 66% of the total U.S. apple crop, 75% of the pear crop, and 82% of the cherry crop.[20] In Jackson County, pears represent the largest edible crop at approximately 6,851 acres.[21] The majority of this acreage is located in the Rogue Valley area. The orchard industry will be impacted by inadequate chill hours (the Bartlett Pear requires 800 chill hours)[22], impairing development of fruit buds making trees vulnerable to pest and disease and may create a mismatch of timing of flowering and pollination, reducing yield. Extreme heat days can create sunburn in crops and alter fruit firmness, synthesis of sugars, organic acids, and antioxidant compounds.[23]

FORESTRY & WOOD PRODUCTS

Working forests contribute $12 billion dollars annually to Oregon's economy and supports over 58,000 jobs. In the Rogue Valley, approximately 5,605 people are employed in the sector - namely in support activities for forestry and wood production and manufacturing. As average seasonal temperatures continue to increase, trees will be more vulnerable to pests and disease. Dryer soil conditions will contribute to wildfire frequency and intensity, impacting timber yields and sector growth.

TOURISM

Local tourism is driven by outdoor recreation opportunities, arts and cultural events, and specialty food production. For the year 2018 in Jackson County, the following sectors were the top beneficiaries of tourism spending: food service ($142.2 million accommodations ($105.5 million), retail sales ($58.9 million), local transportation and gas ($56.5 million), and entertainment and recreation ($55.2 million).[24]

Outdoor recreation opportunities are central to Rogue Valley tourism branding. Traditionally, the most popular tourism season is summer. However, climate change will make summers in the Rogue Valley less hospitable, with increasing temperatures and continued impacts from wildfires. The COVID-19 pandemic provided a glimpse of what the regional economy may look like without robust

summer tourism. Though there is not yet economic data available to measure the impact, anecdotal evidence suggests that reduced tourism has had sweeping impacts for the region.

The City of Medford's' built environment and infrastructure is vulnerable to acute and slow-onset climate events. Extreme temperatures, increasing storm intensities, and events like wildfire all threaten the integrity of our buildings and infrastructure. *In 2019, Oregon received a C- for its infrastructure from the American Society for Civil Engineers. The Report notes that while Oregon's population increases, much of its infrastructure is beyond capacity and at the end of its service life.*[25] Though more research is needed to understand Medford's personal infrastructure score, the risks from climate change remain the same.

EXTREME TEMPERATURE

Extreme temperatures, like high heat days and more frequent freeze-thaw cycles, will decrease the life of many infrastructure systems, requiring more frequent repair and replacement. In some cases, travel may be impeded, potentially creating supply chain challenges and impacting local tourism.

- High heat may cause pavement to soften and expand, causing rutting and potholes, especially in high-traffic areas. Freeze-thaw cycles can create cracks and fissures in pavements, impacting overall integrity.[26] [27]
- Extreme heat events can cause rail tracks to expand and buckle, requiring frequent repair and speed restrictions to avoid derailment.[23]
- Extreme heat may place stress on bridge joints and other like infrastructure.[23]
- Airport ground facilities will be impacted similarly to roads. As hotter, less dense, air reduces mass flowing over the wing, runways may need to extend to accommodate increased distances needed to obtain adequate speed for lift.[24]
- The electrical grid may also be rendered less efficient by extreme high temperatures, and can be damaged by freezing conditions generating snow and ice.[28] [29]
- Buildings may generally become less efficient as heating and cooling needs increase. Necessary weatherizing may increase maintenance costs and repairs associated with extreme temperatures may become more frequent.

STORMS & ACUTE WEATHER EVENTS

Though infrastructure is designed to withstand weather events based on historical records, as major events occur more frequently, the lifetime of many infrastructure systems will decrease. Major storms and acute events like wildfire will occur more often as a result of climate change and can lead to temporary failures in service or total destruction.

PUBLIC LANDSCAPING

As summer temperatures increase, water is more often received as precipitation, and periods of regional drought grow - the species currently thought of as native and hardy will shift. Existing landscaping may need to be replaced and redesigned to thrive in these new conditions. This may impose significant direct costs over time as landscaping is replaced. Indirect costs may also incur, for example, as the benefits of tree canopy is lost or the existing quality of our public park systems decrease as a result of climate change.

4 PUBLIC HEALTH

Climate change in the Rogue Valley has a direct impacts on public health as water quality degrades, seasonal water availability shifts, days of poor or hazardous air quality increase, and extreme heat days become more regular. These events, in addition to general environmental degradation and biodiversity loss, will impact where people choose to live, visit, and recreate. Vulnerable populations and frontline communities are at particular risk of severe climate-related illness and death, though everyone may experience a decline in health and quality of life.

WATER QUALITY AND DROUGHT

- Increased pest populations and associated spread of disease
- Increased rates of water-borne illness
- Loss of low-cost cooling alternatives
- Loss of subsistence lifestyle
- Increased utility costs
- Development constraints

Regional water quality will be impacted by slow-onset climate change. As temperatures rise, the Rogue Valley Region can expect to receive more precipitation in the form of rainfall as snowpack reduces. As water availability shifts, seasonal streamflow will be lower and waters warmer than what is currently and historically customary. As shallow waters warm, pest population and associated diseases, like mosquitoes and the West Nile Virus, will increase. Bacteria, virus, and waterborne parasites will also flourish in our waterways, increasing vector-borne illness wherever people digest or bathe in open and untreated waterbodies.[1, 2, 3]

The loss of regional water quality and availability may eradicate cooling options for low-income and un-housed populations, like traditional swimming areas. During drought events, surcharges may be implemented to improve conservation, contributing to increased living costs as households turn to home-cooling options, like temporary outdoor pools and air conditioning, burdening low-income community members.

Decreasing water quality will impact aquatic species populations, effecting households that participate in subsistence lifestyles to any degree. Fish populations, impacted by both warming waters and flourishing bacteria will further decline, affecting human populations as well as other species that both directly and indirectly rely on fish for nutrition.

MENTAL HEALTH

- Increased demand for services
- Increased rates of depression
- Increased rates of suicide

Both acute and slow-onset climate change has been found to impact mental health and wellness. Following acute weather events, individuals may experience the effects of trauma, increased stress, and depression as households may mourn the loss of life, assets, and experience displacement.[30] The indirect effects of slow-onset climate change, like drought, can contribute to increased stress and anxiety, depression, exacerbate existing mental health issues, and in extreme scenarios increase rates of suicide.[31] Existing studies show these outcomes are more predominant in rural and agricultural communities.[32] [33] [34] [35]

EXTREME HEAT DAYS

- Increases in heat related illnesses
- Exacerbated underlying conditions for sensitive groups
- Increased risks for elders, youth, and unhoused populations

Extreme heat events are becoming more common in the U.S., especially during summer months. For many climates, cooling infrastructure in private residences does not exist; and outdoor cooling areas - like pools, may be inequitably placed and generally unable to meet demand, making extreme heat events particularly dangerous for youth, elders, and vulnerable populations. The *Fifth Oregon Climate Assessment*[1] predicts that without any adaptation, excess heatwave-related deaths will increase by an average of 422% by 2031-2080, relative to 1971-2020.

Though the City of Medford is accustomed to high summer temperatures, extreme heat events will become more commonplace. Prolonged exposure to extreme heat can cause heat exhaustion, heat cramps, heat stroke, and death, as well as exacerbate preexisting chronic conditions such as respiratory and cardiovascular diseases.[36] Heat-related illness occurs when a person's body is no longer able to properly regulate temperature, causing vital organ damage. Though heat-related illnesses can effect anyone, it is most common among young children, elders, and individuals with underlying conditions; and disproportionately affects un-housed and low-income households lacking access to cooling systems; and workers in land-based sectors, like farming.

In 2021, a week-long heatwave set new high temperature records for many communities in the Pacific Northwest. Over the period of this week, there was an increase of 600 deaths across Washington and Oregon States - three times what was expected.[37] [38]The City of Medford experienced a high temperature of 115^0 during this event, 14^0 above the normal mean maximum temperature.[39] Events like this will become more frequent, posing potentially dire risks for vulnerable households.

PEST POPULATION INCREASE

- Increased rates of diseases, like Lyme
- Increased risk of wildfire

Environmental changes, like warming waters, increased daily temperatures, and reduced snowpack creates favorable conditions for pest species like mosquitoes, ticks, and bark beetles. The public health danger of increasing pest populations includes increased disease, like the West Nile Virus and Lyme, and exacerbated hazardous climate conditions. The bark beetle, for instance, contributes to increased wildfire risk by weakening tree systems, creating additional fuel loads.[4]

AIR QUALITY

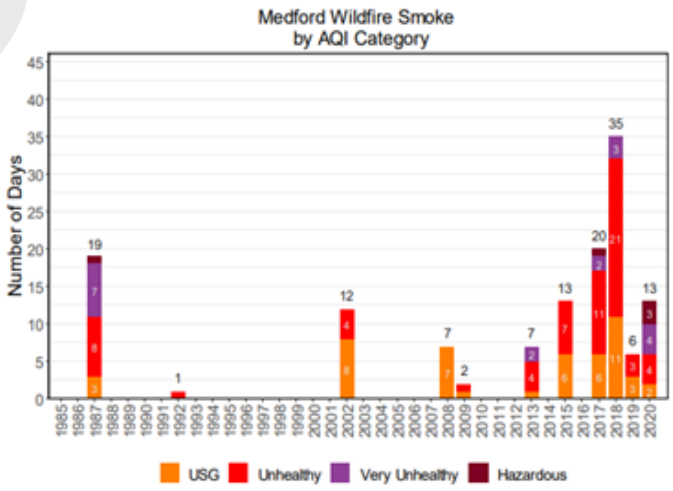
- Increased rates of premature death
- Increased rates of respiratory disease
- Exacerbated health inequity

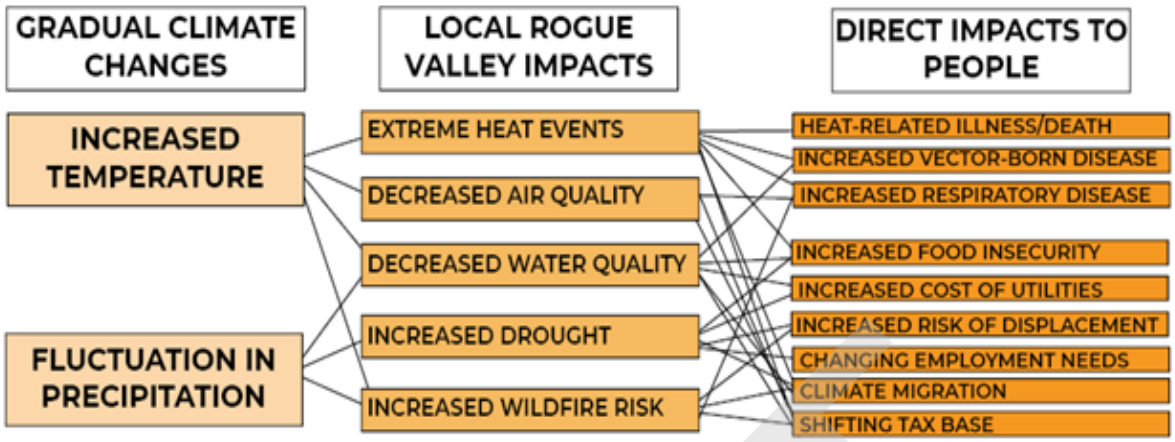
In the state of Oregon, 90% of air pollution is produced from daily activities that involve aerosols, that release toxic chemicals like household paints, and activities that use fossil fuels. The primary source for air pollution statewide is the automobile, with industry accounting for less than 10% of pollution.[40] As car ownership rises and consumer preferences trend towards larger less fuel-efficient vehicles, exposure to air pollutants will continue. As the principal city, Medford faces additional challenges in reducing air pollutants as daily trip generations originate from surrounding communities as well as local community members.

The Rogue Valley is predisposed to stagnant air days that accumulate and trap pollution.[41] The location of the I5 corridor and high volume of daily trips generated creates challenges for maintaining healthy air quality standards. Climate change will further impact air quality, as wildfire becomes more common in Summer and Autumn months; high heat days increase the amount of ozone pollution and air conditioners generate additional particulate matter; and drought conditions increase the amount of particulate matter in the form of dust.

Poor air quality days impact individuals with respiratory and underlying health conditions, but also make the likelihood of developing such conditions more likely. Contrary to many perceptions, prolonged exposure to even low to moderate particulate matter is associates with increased risks of death.[42] Among pollution-related deaths in the United States, poor air quality is the direct cause of half, with environmental-based workers that spend significant time outdoors, housing-insecure populations, elders, and individuals with underlying conditions at significantly greater risk.[43] [44]

Data from the Oregon Department of Environmental Quality shows the impact of increasing frequency and intensity of wildfire on air quality in the City of Medford, where particulate matter (PM2.5) is the pollutant of interest.





PEOPLE AND CLIMATE CHANGE IN THE ROGUE VALLEY

Inaction on climate change is directly impacting the quality of life for all residents in the Rogue Valley, however the burden of these changes is not carried equally. As increased temperatures and shifts in water availability strain our natural and man made systems, our vulnerable households and frontline communities are most at risk for negative health outcomes and displacement. However, the degree to which Medford experiences the impacts of climate change depends on how we invest in climate adaptation and resiliency for our community now.

Maintaining a high quality of life and expanding opportunities to access for Medford community members is a central priority for any climate adaptation and resiliency work. Understanding historical and contemporary barriers to access and resiliency in our city is key to shaping any meaningful response to climate change.

VULNERABLE HOUSEHOLDS

Households less able to respond to external changes for financial or physical reasons are referred to as vulnerable populations. Community Resilience Estimates[45] considers the following factors: poverty, single or zero caregiver, household crowding, communication barrier defined as households where no one has received a high school diploma or non-native English speaking households, elders, instances of unemployment over a 12 month period, disability, no health insurance, no vehicle access, no broadband internet access. Any one of these factors makes a community less resilient.

FRONTLINE COMMUNITIES

Ecotrust[46] defines frontline communities as those "that experience 'first and worst' the consequences of climate change. These are communities of color and low-income, whose neighborhoods often lack basic infrastructure to support them and who will be increasingly vulnerable as our climate deteriorates." Frontline communities may also refer to those households that rely on land-based relationships for subsistence or employment, or work with polluting agents, as they are more exposed to the direct health and economic impacts of climate change.

CLIMATE CHANGE AND INEQUITY

Equity, unlike equality, acknowledges the imbalance of our social systems. At the level of local government, the unequal investment of public goods and racist policies have kept some households from accumulating wealth, creating the inequitable conditions we see today. For these reasons, in combination with continuing social injustice, the burden of acute and slow-onset climate change will unfairly weigh on our vulnerable households and frontline communities.

Households and communities that lack investment are less resilient and adaptive to the impacts of climate change, and also more likely to be exposed to the associated risks. For example, a neighborhood that has not received significant investment may provide naturally affordable housing catering to vulnerable households. The neighborhood may lack tree canopy and the majority of housing may not offer air conditioning. As a result, extreme heat events may unfairly impact the neighborhood, and exacerbate existing conditions among vulnerable households.

The Matthew Effect[47] is a guiding hypothesis that "pre-disaster inequity is exacerbated by differentials in disaster impacts and institutional and social responses." This is to say that vulnerabilities that make a household less able to respond to acute or slow-onset climate change becomes worse following a disaster. This exacerbated inequity may be fueled further by the redevelopment opportunities created by disaster events. As redevelopment occurs, permanent displacement will take place where there is unequal access to capital.

CLIMATE MIGRATION IN THE ROGUE VALLEY

The Rogue Valley Region is at risk of experiencing shifts in population from slow-onset climate change and acute events like wildfire. Climate migration occurs on a gradient, where some households may be forced to relocate, like in an emergency event, while other households may choose to relocate because of decreased air quality from seasonal wildfires of the effects of extended droughts. Environmentally-based livelihoods are most vulnerable to the impacts of climate change, and regions where these sectors are dominant, are at greater risk of experiencing negative population change.

The City of Medford should model planning for two scenarios, population growth and potential population loss. While there is not yet a methodology to project internal climate migration and location choice, anecdotal evidence suggests that the Rogue River Valley is already a destination for households fleeing climate events, like wildfire in Northern California. This anecdote is corroborated by early research that shows climate refugees generally relocate to nearby communities with similar character where the perception of hazard risk is less.

In 2020, Oregon wildfires destroyed more than 5,000 homes, causing $1.15 billion dollars in damages. The 2020 Almeda Fire alone destroyed 2,482 residential properties (Jackson County Damage Assessment Dashboard), many housing low-income and vulnerable populations. Studies of other acute disasters show that vulnerable households are not only more exposed to the risks of natural disasters, but recover more slowly and are less able to return to the communities they fled - as supported by the Matthew Effect hypothesis.

SUDDEN POPULATION CHANGE

Sudden population change would occur as a result of an acute weather event like wildfire. In a scenario like this, the City of Medford would experience increased competition for resources like housing and social services; and increased strain on public resources like open space and public schools. Possible planning scenarios should include acute sudden population influx and associated needs, and possible acute population loss in the event that a natural hazard event directly impacts the City of Medford.

GRADUAL POPULATION CHANGE

Slow-onset climate change may lead to population growth as households may perceive the climate risk of Medford may be less than that of surrounding communities. However, as livability decreases in the Rogue Valley as a result of environmental degradation, public health, and the associated impacts of climate change on local and surrounding economies - population may be expected to decrease. Outcomes from this scenario may include tax-burdened households, loss of property values, loss of tax base, and disinvestment.

Endnotes

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