ATTACHMENT
Summaries of Select Reports on Climate Change Projections in Los Angeles

The following are summaries of the reports below:

- City of L.A., UCLA, and LARC, Mid-and-End of Century Warming in the Los Angeles Region Report (2012)
- EPA - "Climate Change in the U.S. - Benefits of Global Action" (2015)
- Governor Brown's Executive Order B-30-15 (2015)
- Los Angeles Regional Collaborative for Climate Action and Sustainability (LARC)
- California Department of Public Health (CDPH): "Preparing California for Extreme Heat: Guidance and Recommendations" (2013)
- Los Angeles Department of Water and Power (LADWP): "Urban Water Management Plan" (2010)
- Office of Los Angeles Mayor Eric Garcetti: Sustainability "pLAn" (2015)

This information is provided at the request of the City Council. The City Administrative Officer is unable to verify, validate, support, or refute the information presented herein. Reports can be accessed via the internet (See References).

City of L.A., UCLA, and LARC, Mid-and-End of Century Warming in the Los Angeles Region Report (2012)

EXTREME HEAT - According to the study, the Los Angeles area is home to nearly 18 million people, who as a whole account for approximately $750 billion in economic activity annually. Therefore, extreme weather events caused by increasing global climate have greatly affected the City - costing thousands of lives and dollars annually.

The City has long battled its fair share of environmental issues, most notably the air pollution caused by greenhouse gas emissions. On account of various factors, including air pollution, average overall temperatures are projected to increase.

The City, UCLA, and the Los Angeles Regional Collaborative for Climate Action and Sustainability (LARC) collaborated to release the first in a series of assessments that detail how climate change will directly affect Los Angeles.

Future changes in temperatures are estimated by comparing two different scenarios:

Scenario #1 - Business as usual (No GHG mitigation)
Scenario #2 - Human caused climate change is curbed (with GHG mitigation)

WATER RESOURCES - The research projects that the Los Angeles region will inevitably face a warmer future as a result of climate change, however the severity of that increase compared to today's Los Angeles will depend solely on what action is taken to mitigate greenhouse gas emissions. If global greenhouse gas emissions are not reduced, Los Angeles is likely to have a new climate system by 2100 (end of century). Winter would be lost and replaced by a "super summer".[1] Although Los Angeles is guaranteed to face a warmer future, the state of the City's climate is divided by the possibility of the following scenarios:

- Regardless of GHG mitigation - by the mid-century the L.A. region will be 3°F warmer.
- With GHG mitigation - Efforts to reduce greenhouse gas emissions will lessen the amount of warming by mid-century (2041-2060).
- Without GHG mitigation – The Los Angeles region is projected to be 7°F warmer on average by end of century.
- Without GHG mitigation – The City's temperatures will be like they are today only about 50-65% of the year (183-243 days).
- Today in Downtown Los Angeles, on average six days throughout the year are considered extreme heat days (those that exceed 95°F).
    - Without GHG mitigation - 22 days a year by mid-century (2041-2060), and 54 days a year by end of century (2081-2100) will exceed 95°F.
    - With GHG mitigation - 16 days mid-century (2041-2060) and 12 days by the end of century (2081-2100) will exceed 95°F.

In terms of water resources the UCLA and the City's climate change report found that the City can expect roughly the same amount of precipitation throughout the 21st century as it received in the last few decades of the 20th century. Currently, in present day climate, the region experiences swings in precipitation from year to year, and the findings suggest that this trend will continue under rising climate change.

That said, over the 21st century, studies project an increased risk of flooding, which will make collecting water far more difficult. Much like all facets of the City's climate system, the future of the City's water supply is highly dependent on the following scenarios:

- Without GHG mitigation - more precipitation will fall as rain instead of snow, and the snow that does fall will melt earlier than usual.
    - Without GHG mitigation - the rate of heat trapping emissions will increase causing the Sierra Nevada snowpack to decrease by as much as 32-79%.[2]
    - Earlier snowfall would result in fewer water reserves for the summer.
    - Regardless of GHG mitigation - recharging local aquifers will decrease in both frequency and amount.
        - About 83% of the state's counties already face higher risks of water shortages by mid-century (2041-2060).
    - Without GHG mitigation - the Colorado River is projected to:
        - Decrease in mean natural flow
        - Continue drying along the river basin
        - Increase in drought frequency and duration

[1] City of L.A., UCLA, and LARC, Mid-and End of Century Warming in the Los Angeles Region Report (2012)
[2] Cayan, "Climate Change Scenarios for the California Region", 2008

- With increased flooding - the Los Angeles region can expect greater:
  - Injuries/deaths
  - Home and property destruction
  - Public infrastructure damage
  - Chemical and sewage overflow
  - Contaminated drinking water
  - Increase in vector-borne diseases (i.e. from mosquitoes)
- With more droughts - the Los Angeles region can expect greater:
  - Disruption of food supply
  - Less drinking water availability
  - Higher costs of water

EPA - "Climate Change in the U.S. - Benefits of Global Action" (2015)

EXTREME HEAT- A new EPA report, *Climate Change in the United States: Benefits of Global Action*, estimates that without GHG mitigation - the average global temperature will rise by 2°C or 3.6°F, then that is the point that an irreparable cycle of damage from climate change will take a hold.[3] In other words, this increase in heat would become the baseline temperature.

WATER RESOURCES- With regard to water resources, the study further validated that the water cycle is undoubtedly linked to the climate. Climate change has an immense impact on water availability at global, regional, and local levels. With rises in average temperatures the rate of evaporation increases, which could result in drought, heavy downpour, wildfires, and flooding throughout the state.

AIR POLLUTION -

- With GHG mitigation - the impact on the climate will reduce the adverse health effects related to air pollution.
- With GHG mitigation - recent studies project the following significant public health benefits in the United States:
  - Estimated to avoid 13,000 premature deaths by 2050, and 57,000 premature deaths by 2100.
  - Avoidance of premature deaths is estimated to save $160 billion by 2050 and $930 billion by 2100 nationwide.

ELECTRICITY - In today's world electricity is an essential element of our modern day-to-day life. Electricity lights and cools our homes, powers our electronic devices, fuels productivity of goods, and supports critical infrastructure services of the City (i.e. water treatment, telecommunications, etc.). In spite of all its benefits, electricity is also a major contributor of climate change. As reported by the EPA, the fossil fuels generated by electricity account for approximately 30% of GHG emissions in the United States.

[3] EPA- "Climate Change in the U.S.- Benefits of Global Action" (2015)

The current research surrounding climate change projects that California's electricity system will face many more challenges as temperatures increase. Rising temperatures are expected to increase electricity demands, primarily because of greater air conditioning use in both residences and businesses. According to a study conducted by the Cooperative Institute for Research in the Atmosphere, electricity demand is projected to increase by 0.5%-9% across all U.S. regions. This would create a need for increased capacity in the power system to meet the demand. Yet, at higher temperatures, the capacity of both thermal power plants and transmission lines is reduced. The extreme heat puts stress on the power plant system. In addition, the transmission lines that bring power to the City's metropolitan center are located in high-risk wildfire areas. As a result, the following changes are projected to occur in this sector:

- Changes in sector emissions
- System costs
- Generation mix (i.e. an assortment of fuels used to generate electricity.)

As stated in the report, the fate of the City's electricity sector is highly dependent on the following scenario cases:

- With GHG mitigation - the cooling demands will be lower than a future without GHG mitigation.
- Regardless of GHG mitigation - the generation capacity and array of energy sources used to produce electricity is expected to change over time.
- With GHG mitigation - the implementation of local and sustainable electricity sources, such as wind and solar power, can reduce carbon emissions and the risk of supply disruptions.

HEALTH - Weather and climate have a very significant impact on the health and well-being of the City. As a society, we have structured the way we behave and act based around our climate system. With increasing GHGs in the atmosphere the conditions that Angelenos are accustomed to are changing in ways that directly affect human health. The EPA has reported that rising temperatures only further exacerbate health stressors like air pollution and disease. Factors such as increasing population, aging population, and changes in migration patterns all adversely affect changes brought on by climate changes. Current studies attribute some of these adverse effects of climate change to the high concentrations of development in the City's urban and coastal areas.

As stated in the report, unmitigated climate change is projected to harm human health as a result of the following environmental changes:

- Increases in extreme temperature
- Increases in extreme weather events
- Decreases in air quality

Without GHG mitigation - the report projects that extreme weather events will cause higher rates of:

- Death due to heat stroke
- Cardiovascular diseases

- Respiratory diseases
- Infectious diseases
- Vector-borne disease (e.g., Lyme disease and West Nile virus)

Governor Brown's Executive Order B-30-15 (2015)

On April 29, 2015 California Governor Edmund G. Brown Jr. issued an executive order to establish a California greenhouse gas reduction target of:

- 40% below 1990 levels by 2030.
- 80% below 1990 levels by 2050.

This marks the most aggressive climate adaptation benchmark by any North American government to reduce GHG emissions before the mid-century. In addition, the Governor issued a groundbreaking call to action with hundreds of world-renowned researchers called the "Consensus Statement." This Consensus Statement translates key scientific findings from disparate fields into one unified document. Some of the principal consensus findings from Governor Brown's order include:

ELECTRICITY - Governor Brown announced in his inaugural address that in 15 years, California's electricity will go from 1/3 to 50% renewable sources. This would entail:

- Reducing petroleum use in cars and trucks by 50%
    - Double the efficiency savings from existing buildings in California.
- Reduction of petroleum will:
    - Make heating fuels cleaner
    - Reduce the release of methane, black carbon, and other potent pollutants across various industries.
    - Manage farm and rangelands, forests, and wetlands so they can store carbon to reduce emissions.

CONCLUSION - Brown's groundbreaking call to action finds that the impacts of climate change are already being felt in California, and will disproportionately impact the state's most vulnerable populations. As a result, the California Air Resources Board shall update every three years the state's climate adaptation strategy by identifying vulnerabilities in the following climate change sectors:

- Water
- Energy
- Transportation
- Public Health
- Agriculture
- Emergency Services
- Forestry
- Biodiversity
- Ocean and coastal resources

Los Angeles Regional Collaborative for Climate Action and Sustainability (LARC)

The Los Angeles Regional Collaborative for Climate Action and Sustainability (LARC) is the sole climate collaborative in the Los Angeles Region and its network is a cross-section of

climate practitioners and decision-makers including academia (i.e. UCLA), City of Los Angeles, County of Los Angeles, City of Long Beach, regional agencies, non-profits, and businesses. This extensive network performs climate mitigation and adaptation work by using cutting edge research.

EXTREME HEAT - As reported by LARC, all locations in the County are most likely to have an increase in temperature. However, according to LARC the increase will vary by topographic location. High elevations and inland areas separated from the coast by at least one mountain complex are estimated to warm approximately 20-25% more than the coast. LARC findings predict that climate change will raise temperatures approximately 4.6°F on average over the entire Los Angeles region. The warming contrast between inland and coastal zones also has a large effect on increase of expected extreme heat days. It is two to three times greater in coastal locations and three to five times greater in inland areas.

AIR POLLUTION- Regardless of GHG mitigation- the study projects that large wildfire occurrences will increase, primarily towards the end of the century. Wildfires impact the following:

- Ecosystems
- Air quality from smoke
- Wildlife habitat
- Health
- Safety

California Department of Public Health (CDPH): "Preparing California for Extreme Heat: Guidance and Recommendations" (2013)

The California Department of Public Health (CDPH) is the state department responsible for public health in the state of California. It is a subdivision of the California Health and Human Services Agency. In October 2013 the CDPH issued a guidance document for cities and counties on ways to reduce warming due to climate change. The following information is presented from this document.

EXTREME HEAT- To combat rising temperatures, California's strategy to prepare for climate change includes measures to develop heat-warning systems, improve outreach systems, and identify and reduce vulnerabilities to extreme heat. For instance, the City has adopted a strategy that includes measures to protect and increase urban trees to help cool the city in the face of extreme heat threats. That said, the CDPH recommends the following preparation & protection strategies for reducing heat-related risks:

- Improving heat-health warning systems
- Promoting and expanding urban greening and the use of green infrastructure as part of cooling strategies in public and private spaces.
    - Planting more shade trees in urban areas
    - Using vegetation
    - Restoring urban streams
    - Educating the public
- Developing an urban heat island effect index

- Identifying and checking on residents that are most vulnerable to heat
- Providing public cooling centers
- Examining and expanding the use of cool porous, or sustainable materials in pavement.

Los Angeles Department of Water and Power (LADWP): "Urban Water Management Plan" (2010)

WATER RESOURCES - The Los Angeles Department of Water and Power, (LADWP), along with other agencies in Southern California are faced with the challenge of providing a reliable high quality water supply to meet the City's current and future needs. As a result of increasing climate change, water supplies in California have become scarcer, affecting water supplies originating in the Sacramento-San Joaquin Delta and Colorado River Basin.

The LADWP is already taking into account potential supply disruptions from its water sources in the future. By strengthening the following water conservation methods the City is preparing to minimize the adverse effects of climate change on the water supply:

- Significantly enhancing water conservation, storm water capture and recycling projects to increase supply reliability through the following:
  - Climate appropriate landscaping
  - Rain gardens
  - Improving water use efficiency in households and agriculture.
- Implementing treatment for San Fernando Basin groundwater supplies.
- Implementing water infiltration into the soil through permeable surfaces help a great deal.
- Ensuring continued reliability of the water supplies in Southern California.
- Maintaining the operational integrity of the Los Angeles Aqueduct.
- Meeting or exceeding all Federal and State standards for drinking water quality.

Office of Los Angeles Mayor Eric Garcetti Sustainability: "pLAn" (2015)

In April 2015, Los Angeles Mayor Eric Garcetti announced the launch of the city's new Sustainability Plan; known as the plan. This plan is a comprehensive outlook on sustainability through the lens of environment, economy, and equity.

ELECTRICITY - Energy conservation is an important component of the plan. For example, the City's 140,000 standard streetlights were installed with Light-Emitting Diode (LED) replacements saving a minimum of 40% in energy usage and realizing $10 million in savings each year. In addition, the program reduces carbon emissions by approximately 40,500 tons per year. Also, to better combat this issue, the following preparation and protection strategies for mitigating electricity disruptions are mentioned in the plan:

- Introducing locally produced and distributed sources of electricity.
- De-carbonizing the City's electrical grid.
- Leveraging local expertise to develop and support climate-change related technologies.
- Preparing for energy code upgrades.
- Having fire officials adjust fire management plans based on expected need to battle more frequent wildfires near transmission lines.

AIR POLLUTION - As stated by the plan, Los Angeles has made great improvements at combating air pollution since the 1970's; however more work is required to protect public health and improve the City's air quality. Mobile sources (trucks, ships, aircraft, and personal vehicles) emit 90% of the region's air pollutants.

According to Garcetti's plan, a key piece of the solution will be the City facilitating the transition to low and zero-emissions transportation primarily though electric vehicles (EVs). The City will strive to eliminate non-attainment days (where air pollutants surpass federal standards) by making EV use more convenient and efficient, and by shifting commercial goods movement to lower or zero-emissions technologies.

To better combat air pollution, the Plan mentions the following preparation and protection strategies for mitigating electricity disruptions:

- Accelerating air quality improvements at the Port of Los Angeles from the current Clean Air Action Plan.
- Converting local goods movement to zero emissions.
- Improving air quality and reducing toxicity in the City's most affected neighborhoods
- Strengthening policies that reduce emissions from cars, trucks, and other mobile sources.
- Leading by example with air quality improvement to the City fleet, airport, and public transportation.

Disclaimer

The studies summarized here are provided for informational purpose only. This Office is unable to support and/or validate the information or studies summarized.

References

1. City of L.A., UCLA, and LARC, Mid-and End of Century Warming in the Los Angeles Region Report (2012): http://climateresolve.org/c-change-la/

2. EPA- "Climate Change in the U.S.- Benefits of Global Action" (2015): http://www2.epa.gov/cira

3. Governor Brown's Executive Order B-30-15 (2015): https://www.gov.ca.gov/news.php?id=18938

4. Los Angeles Regional Collaborative for Climate Action and Sustainability (LARC): http://www.laregionalcollaborative.com/

5. California Public Health Department (CDPH): "Preparing California for Extreme Heat: Guidance and Recommendations" (2013): http://publichealth.lacounty.gov/docs/climatechange2.pdf

6. Los Angeles Department of Water and Power (LADWP): "Urban Water Management Plan" (2010):https://www.ladwp.com/ladwp/faces/ladwp/aboutus/a-water

7. Office of Los Angeles Mayor Eric Garcetti: Sustainability "pLAn" (2015): http://www.sustainablecitiesinstitute.org/los-angeles-mayor-launches-sustainability-plan