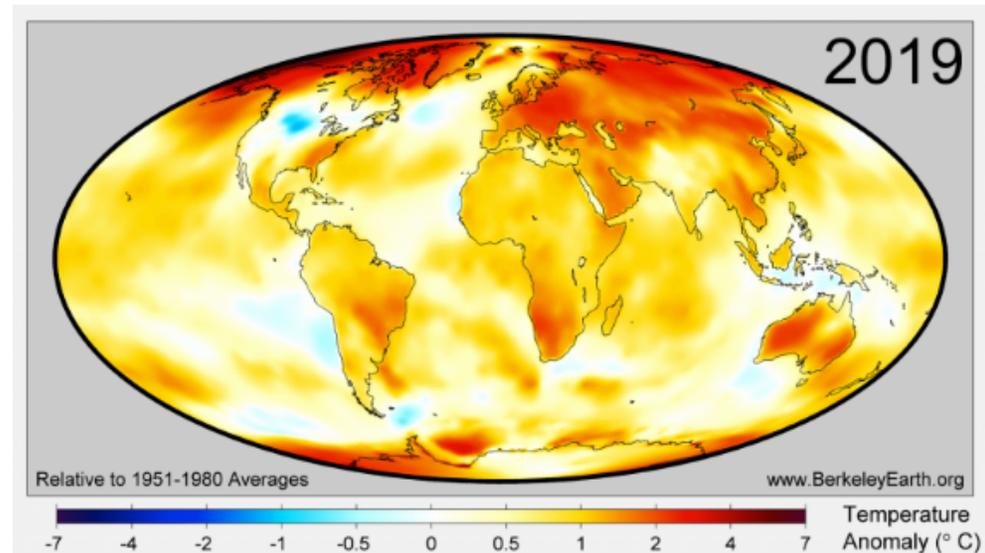


# Rising Surface Temperature



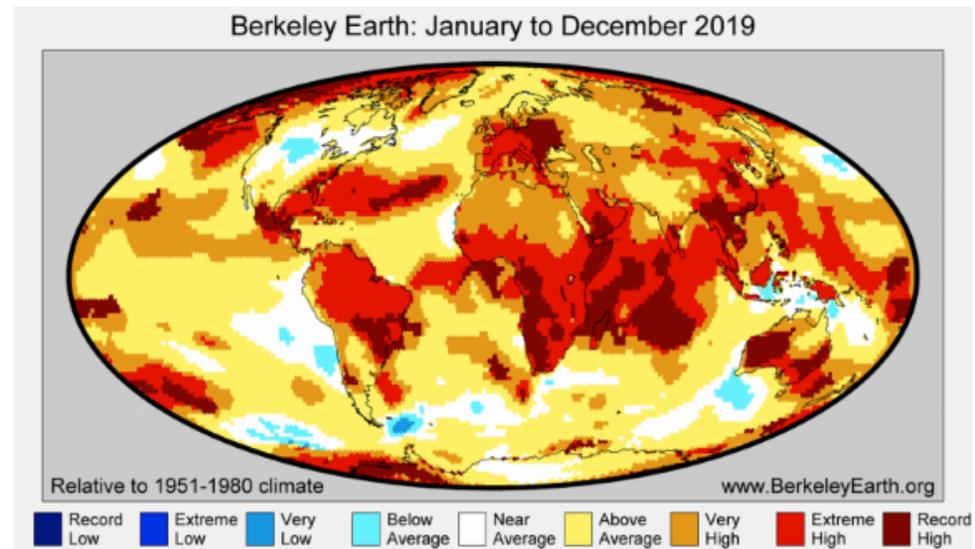
# Degree Local Temperatures in 2019 Increased Over Average temperature in 1951-1980.<sup>70</sup>

- “88% of the Earth’s surface was significantly warmer.”
- “10% was of a similar temperature.”
- “1.5% was significantly colder.”
- “9.9% of the Earth’s surface set a new local record for the warmest annual average.”
- “no places on Earth experienced a record cold annual average.”



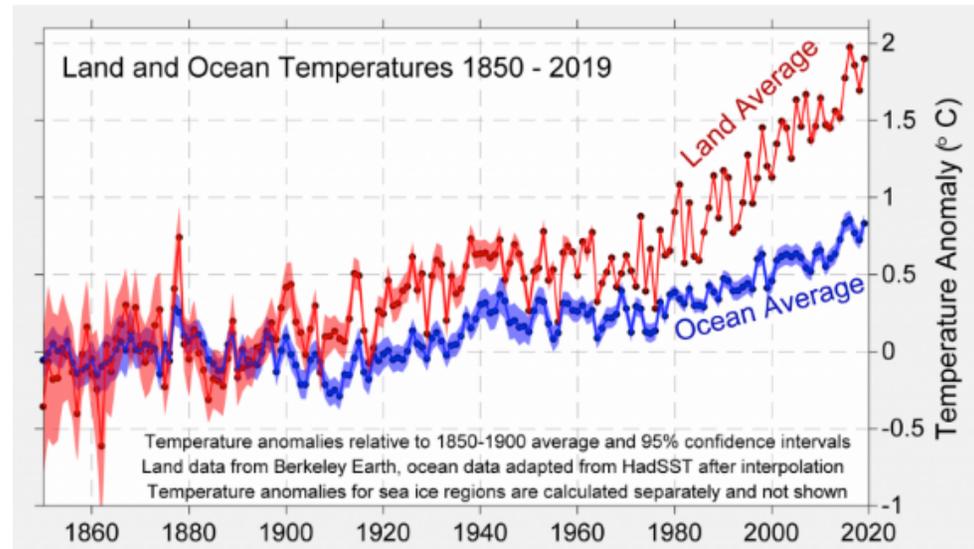
# 2019 Local Average Temperatures Versus Average Temperatures in the Historic Climate<sup>71</sup>

- “In a stable climate only 2.5% of the Earth would be expected to have temperatures “Very High” or higher in any given year.”
- “In 2019, 52% of the Earth have annual averages that would rate as “Very High” compared to the historical climate, including large portions of the tropics.”



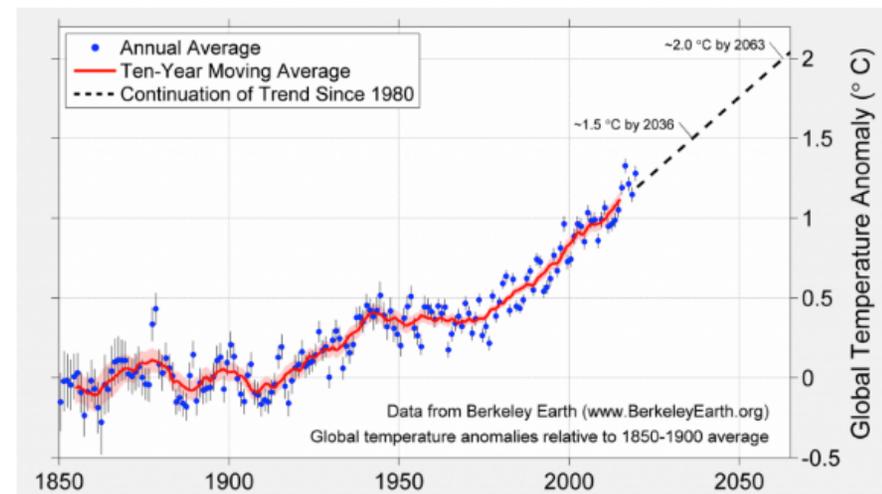
# Comparison of Land and Ocean Average Surface Temperatures<sup>72</sup>

- “Land areas generally show more than twice as much warming as the ocean.”
- 2019 global average land surface temperature was the second warmest, and global average ocean surface temperature was the 3<sup>rd</sup> warmest
- “However, the differences between the 1st, 2nd, and 3rd warmest years in the ocean are small.”
- The Arctic Ocean experienced the highest rate of warming.



# Global Average Surface Temperature Trends/ Goals Relative to Pre-Industrial Times<sup>73</sup>

- The Paris Agreement calls for limiting the the increase in global average surface temperature from its pre-industrial level to
  - below 2 °C (3.6 °F), and
  - no greater than 1.5 °C (2.7 °F).
- “Since 1980, the overall trend is +0.19 °C/decade (+0.34 °F/decade) . . . .”
- At this rate, the increase in global average surface temperature will reach
  - 1.5 °C (2.7 °F) ~ 2035, and
  - 2 °C (3.6 °F) ~ 2065



# U.S.A. Average Surface Temperatures With Modest to Little GHG Emission Reductions<sup>74</sup>

