

The three main variables of CC (elevated CO₂, altered rainfall patterns, and temperature ranges) aggravate seawater rise; drought, heatwaves, wildfires, storms, and floods [118]. It may also indirectly affect species and ecosystems through altering water flows, dryland salinity, and the frequency of extreme climatic events (floods, hail tropical cyclones, and ocean acidity) [122]. Therefore, expansion of species ranges (migration); changes in species compositions and interactions (adaptation); changes in resource availability; spread of diseases to new ranges; changes in the characteristics of protected areas; and changes in the resilience of ecosystems are among impacts of CC on biodiversity [64, 121]. It directly affects the growth and behavior of organisms, modifies population size and age structure, and affects decomposition, nutrient cycling, water flows, species composition, and interactions [64].