A coupled dynamical downscaling system has been set up to investigate future air quality trends in Melbourne, Australia in 20 and 60 years time. For the first time in Australia, the effect of climate change on multiple urban pollutants is modelled, including carbon monoxide, ozone, oxides of nitrogen, primary and secondary aerosols, and air toxics. The downscaling system consists of (1) a comprehensive air emissions inventory, (2) an ensemble of global climate models, (3) a regional climate model for downscaling from global to regional scale and (4) a meteorological-chemical transport model for downscaling from regional to urban scale and for modeling multi-phase atmospheric chemistry. This paper presents results from simulations of Melbourne’s air quality over three decades (1996–2005, 2025–2034, 2065–2074) with current local emission inventory to investigate climate penalty, and results from the likely scenarios of local emission changes. A preliminary results show that the daily average emissions from sold fuel combustion are projected to decrease by about 10% for the decade of 2065-2074 due to increase of temperature, and that the population exposure is predicted to increase by up to 30% within urban Melbourne. The modelled increase in population exposure is most likely due to the reduced ventilation rates projected for the decade of 2065-2074. Other projected trends in key air quality parameters and population exposure will be also presented and evaluated in the context of the overall system uncertainty.