Reducing future climate change by tackling its primary cause would demand a substantial decrease in anthropogenic greenhouse gas emissions. A net reduction of such emissions has to date not been achieved and with its realization being dependent on political decisions and economic developments, it is highly uncertain whether it will be achieved in the future. As a consequence, the pre-emptive idea has emerged that the scientific community should begin to conduct focused research into a number of potential climate engineering (CE) options with an objective to allow an informed public debate on their merits and dangers vis-à-vis a potentially very large future climate change, should it emerge. While highly contentious because of serious ethical, technological and systemic considerations, before an informed debate can be conducted, understanding better the potentials, limitations and side-effects of the various CE options is important. Here, the MPI contributes by participating with Earth system simulations in the DFG Schwerpunktprogramm "Climate Engineering: Risks, Challenges, Opportunities?" (SPP 1689) in the two closely co-operating projects CompareCE and Land-CE. Using the MPI Earth System Model, in simulations CE measures involving management of solar radiative forcing, afforestation and ocean alkalinity enhancement are studied by means of simulations with the MPI Earth System Model using a few reference scenarios that are derived from the Representative Concentration Pathway (RCP) scenarios used in recent CMIP5 simulations. The results are analyzed in co-operation with the Kiel Earth Institute and the Potsdam Institute for Climate Impact Research and will be provided to other partners in the SPP for further evaluation. More details on the projects can be found at www.spp-climate-engineering.de.