



## Summary of SOUSEI-B and the outlook: Research programs in Japan on earth system modeling

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The Program for Risk Information on Climate Change (SOUSEI) is a national project for projection of global change, with an aim to provide information for adaptation and mitigation, based on scientific evaluation of changes in extreme events and carbon cycle etc. This project began in FY2012 and came to an end in March, 2017. Amongst other themes of the SOUSEI program, Theme B (SOUSEI-B)'s focus has been on earth system modeling incorporating sophisticated carbon and nutrient cycles, and its application for examining future socio-economic pathways of mitigation. MIROC-ESM, an earth system model (ESM) developed under SOUSEI-B has been significantly improved since the 5th phase of coupled model intercomparison (CMIP5), and is starting to be run for the next CMIP6. New features of the latest version of MIROC-ESM include: incorporation of nitrogen cycle for the terrestrial biosphere, explicit iron and phosphate cycle, nutrient deposition to the ocean via atmosphere, and nutrient transport by rivers from land to ocean. Besides these model improvements, understandings have been obtained regarding factors for regulating the earth system response to anthropogenic forcings, such as those on impact of ocean heat uptake on transient climate response to emission (TCRE), impact of earth system uncertainty on future cost for global change mitigation, and dependence of precipitation change on aerosol emission scenario. It is hoped that these results will contribute to coming IPCC's special reports and subsequent Working Group I Assessment Report. Although the SOUSEI program finished, a new follow-on program, called Integrated Research Program for Advancing Climate Models, has been established for the next 5 years so that scientists can further contribute to the next phase of CMIP (CMIP6). There is a component of the new program corresponding to SOUSEI-B, whose scope includes further development of MIROC-ESM to incorporate methane dynamics etc., interactions among water resource, land-use and ecosystem (nexus), and integration of socio-economics and earth system to evaluate the effect of interactions between human society and climate change.