



Recent mega-drought in Chile as a harbinger of a challenging adaptation for the energy-water nexus in South America

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The extent of the Hadley cell is widening since about 1980 in both hemispheres. This means that the dry zones characterized by the sinking air masses of the Hadley cell are expanding poleward. When taking precipitation minus evaporation (P-E) as an index, CMIP5 models are consistently projecting a further bulging of this dry zone, currently extending to about 30°N and 30°S. In the context of a COPERNICUS Climate Change initiative by the ECMWF, P-E was calculated for a 0.5°*0.5° grid for the whole world - and for a 0.125°*0.125° spatial resolution for S-America. Based on the results, we produced maps for the present conditions and for a period in the mid and end of the present century.

This future exacerbation of the drought situation in Chile - but also in N-Colombia, Amazonian Peru and other regions in S-America - presents a considerable challenge for climate change adaptation of the energy-water-agronomy nexus. The energy sector in S-America is crucially dependent on sufficient and all-year round sustained water resources. But also other sectors compete for water, which makes the problem of declining water resources extremely complex. In many regions of S-America, agronomy is by far the largest user of water and has a primordial importance for food security. Additionally, the population of growing cities, industry and mining are also relying on a stable water provision. Moreover, enough water is a prerequisite for healthy ecosystems, which are a backbone of a sustainable adaptation to climate change. As a bottom line, we are strongly advocating a multi-sectorial adaptation approach for water governance and management, including international organizations, scientists, environmental and civil society organizations, national/federal, regional and municipal authorities, farmers' associations and representatives of the energy, mining, industry and tourism sectors.