Master thesis proposal: Peak water using the Open Global Glacier Model

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Mass loss from glaciers has increased during the second half of the 20th century (Vaughan et al., 2013) and is prediced, in all current climate projections, to continue throughout the 21st century (IPCC, 2014). The magnitude of the end of century glacial mass loss varies greatly depending on the region and climate scenario – Huss and Hock (2015) found a global glacier volume decrease between 25% (RCP2.6) and 48% (RCP8.5) and regional losses between 20 and 90%.

Glaciers play an important role as storage magasins, delaying up to 79% of the total precipitation falling on the glacier surface (Aral Basin) as meltwater runoff later in the season. The benefits of this seasonal delay is particularly important in regions with a warm and dry ablation season (Kaser et al., 2010). One of these areas is the Indus basin where, during the pre-monsoon season, up to 60% of the total irrigation volume comes from either snow or glacier melt – resulting in an 11% increase of the total crop production (Biemans et al., 2019). The Indus basin is one example of large river basins which under the present climate experiences water scarcity – threatening the food security for millions of people (Kummu et al., 2014). The populated areas on the dry, western, slopes of the Andes are other examples of regions depending on glacier meltwater for potable water and power generation. Vergara et al. (2007) estimate the cost of mitigation and adaption to retreating glaciers in the Andes between US$300 million up to US$ 1.5 billion.

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