# Assessing Environmental Impacts of Lithium Mining from Granites and Pegmatites

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The demand for lithium (Li) is growing as a result of increasing electric vehicle production [1]. To meet this demand, many new sources of Li will be developed [2]. Currently, only 25% of Li is sourced from hard-rock deposits, mostly spodumene [3]. Lepidolite and zinnwaldite are Li-bearing minerals likely to become important in the future. There is limited information on the environmental impacts of developing these deposits as they were not profitable in the past [4]. Aside from Li, these micas contain large amounts of fluorine (F) and cesium (Cs, [5]), potentially harmful contaminants; Li is used in pharmaceuticals that stabilize mood swings [6], F causes fluorosis [7], and Cs may lead to cardiac arrhythmia [8]. Our main hypothesis is that development of these deposits will increase leaching of these elements into the environment, and our work aims at understanding the maximum potential leaching.

Samples of surface water, stream sediment, and granites were collected in the zinnwaldite-rich Cínovec Deposit, Czech Republic. Preliminary data for nearby streams reveals the existence of two distinct water types (sulphate, chloride), but no elevated levels of Li, F, or Cs. To understand the potential leaching of these elements, we are currently performing sequential extraction experiments with the sediment and the granites. The sequential extraction method simulates changes in environmental conditions (*e.g.,* pH decrease, anoxia) and the associated potential leaching of elements. We expect to find increased leaching when probing sorption-desorption processes and changing redox conditions, which probably induces the release of elements bound to Fe and Mn oxides. Bringing Li micas to the surface through mining activities exposes them to weathering, and it is important to understand which environmental changes cause the most intense leaching of the elements of interest.

**[1]** Statista, (2018) accessed Nov 19, 2019. **[2]** Wanger, (2011) *Conserv. Lett.* 4, 202-206. **[3]** Vikström *et al.*, (2013) *Appl. Energy* 110:10, 252-266. **[4]** Bradley *et al.*, (2017) *USGS Report* 2010-5070-0, 48p. **[5]** Tischendorf *et al.*, (2001) *Mineral Mag.* 65:2, 249-276. **[6]** Loganathan *et al.*, (2008) *J Neuropsychiatry Clin. Neurosci.* 20:4, 487-489. **[7]** Yadav *et al.*, (2009) *Environ. Geochem. Health* 31, 431-438. **[8]** Health Canada, (2009), accessed Nov 19, 2019.