

# Potential for geological sequestration of CO<sub>2</sub> in Switzerland

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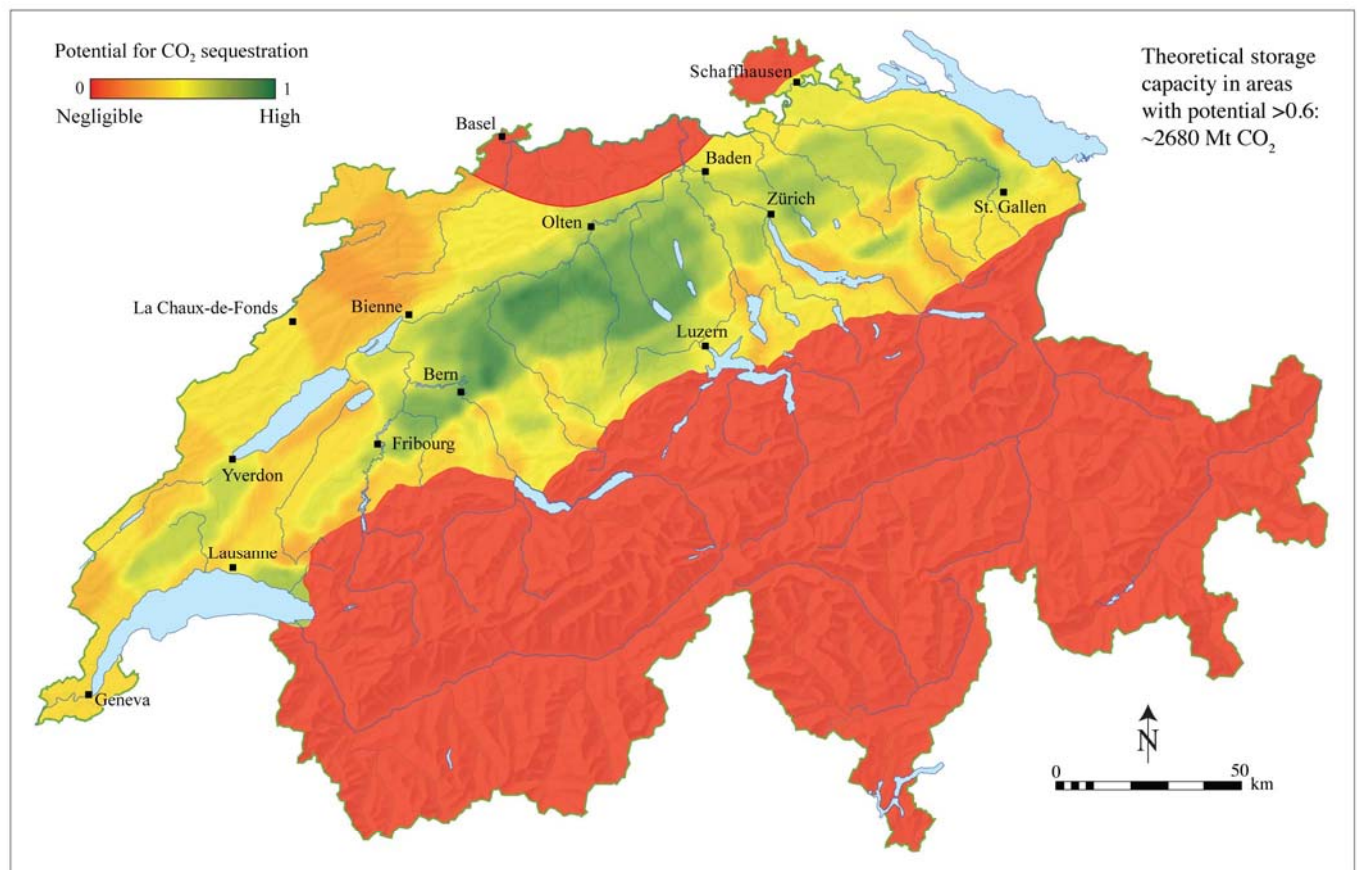
Reduction of anthropogenic CO<sub>2</sub> emissions is considered by the scientific community to be a necessary step towards mitigating climate change. One of the many approaches to this problem is to capture waste CO<sub>2</sub> from industrial sources and inject it into deep, porous geological formations. Under optimal geological conditions, huge amounts of CO<sub>2</sub> can be stored (sequestered) safely over periods of many millennia. This report estimates the theoretical potential for the geological sequestration option within Switzerland.

Only geological criteria for CO<sub>2</sub> sequestration have been taken into account. The conclusions are based on a review of over 150 scientific publications, on unpublished data owned by the petroleum industry, and on the expert opinions of the authors and of five reviewers. The methodology follows an existing evaluation scheme that was developed for the same purpose in Canada. Here the approach has been modified to suit the geological setting and available data in Switzerland, according to international best-practice principles for reservoir safety. Owing to the scarcity of quantitative information on the subsurface of Switzerland, the study relies on 9 qualitative and semi-quantitative attributes (including natural seismicity and the occurrence of faults) derived from analysis of deep drillholes and geological and geophysical data. The weighted combinations of these attributes have been ranked on a numerical scale between 0 (negligible potential) and 1 (high potential). Application of this scheme allows the map of Switzerland to be contoured with respect to CO<sub>2</sub> sequestra-

tion potential with a resolution of a few km<sup>2</sup> (Map).

The conclusions are as follows. The crystalline metamorphic and igneous rocks of the Alps and the sediments underlying the large valleys of Ticino, Grisons and Valais are unsuitable for CO<sub>2</sub> sequestration. In contrast, the sedimentary rocks below the Central Plateau, and to a lesser extent those below the Jura Mountain Chain, locally show moderate to very good potential. At least four layers of porous sandstones and limestones (saline aquifers) underlie very large areas of the Plateau within the technically favoured depth interval of 800–2500 m. Considering all the geological criteria simultaneously, an area of 5000 km<sup>2</sup> (mostly in the sector Fribourg–Olten–Luzern) exhibits sequestration potentials above 0.6. The theoretical (unproven) storage capacity below this area is approximately 2680 million tonnes of CO<sub>2</sub>.

From a purely geological point of view these results are promising. Although the high potentials do not guarantee the feasibility of CO<sub>2</sub> sequestration, they serve as guides to areas that warrant detailed investigation. If this CO<sub>2</sub> storage option is pursued in Switzerland, then thorough geological investigations and a pilot study would be necessary to prove its feasibility and safety. The assessed risks, leakage-monitoring procedures and non-geological criteria (proximity to CO<sub>2</sub> point-sources, economics, conflicts of use of the subsurface, etc.) would have to be taken into account.



Map of Switzerland showing the potential for CO<sub>2</sub> sequestration within deep saline aquifers, estimated from data in the literature. The areas of high potentials (green) do not guarantee the feasibility of CO<sub>2</sub> sequestration. Rather, they serve as guides to areas that warrant more detailed investigation. The portions of the four major aquifers with potentials above 0.6 are estimated to have a theoretical (unproven) storage capacity of approximately 2680 millions of tonnes (Mt) of CO<sub>2</sub>.