# ABBY-NET E$^3$-Systems Research Project Update 2019:
# #11a: Assessing the impacts of land use and climate change

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**Project summary**

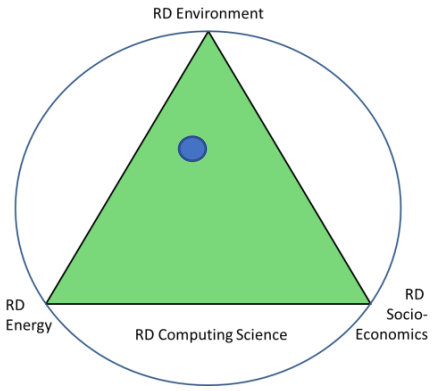
A transition towards increased renewable energy supply can initiate a rapid growth in the installation of biogas-plants and biomass-thermal power plants. The consequent change in land use and agricultural practice can alter the local and regional water and nutrient cycles substantially and increases the risk of deteriorating water quality. Large areas in Southern Alberta are in heavy agricultural use, both in terms of irrigation arable farming and stock farming. It is expected that current agricultural practices will contribute to the nitrate contamination of regional groundwater aquifers. The project builds on a massive dataset of nitrate concentration levels observed at a large number or wells in the region. It develops multiple scenarios of land use (management) and climate change and uses the eco-hydrological model SWAT to investigate projected future levels of water demand and nitrate export with adjusted land use towards biogas expansion.

**Progress to date**

Data collection, field inspection and conceptualization of the project was conducted during an on-site visit to the UofC and other regional experts in the summer of 2018. Great effort to date was placed on setting up, parameterizing and calibrating the SWAT model. Climate data is processed to run SWAT for reference and future periods. The next (very challenging) milestone is to define the matrix of possible scenarios of land use (management) changes, which shall be completed by early September 2019. Results of the scenario analyses are expected by mid-October; the Master thesis is scheduled for submission on 30 November 2019.

**Contribution to E3-system and Implications**

The project is at the core of E3-systems. It addresses the impacts of energy system transitions from an environmental science perspective, looking at the impacts of biogas technologies on groundwater contamination; yet, it takes into consideration agricultural practice, land use change and climate change.




**Geographic location**

The study is conducted in Southern Alberta, focused on a tributary basin of the Oldman river watershed.

**Final Outcomes**

Master thesis with the working title: ‘Assessing the impacts of land use and climate change on nitrate exports from a sub-basin of the Oldman river”. Upon successful completion, the study findings shall be summarized in a co-authored research article to be submitted to an international journal, possibly the “Journal of Hydrology: Regional Studies”.