**Can land intensification and abandonment in Latvia be linked to key socio-political events?**

**Background**

Land-use change is a global concern, with changes having vital consequences through biodiversity change and the release of carbon dioxide 1. Land conversion has primarily occurred through changes in agricultural practices1, such as the move towards agricultural intensification2. Many aspects have contributed towards intensification, including socio-political events2. However, the extent to which socio-political events can have a marked influence on trends in land-use change has seldom been quantified, with the most notable studies considering only one socio-political event3. Analysing if the signature of a socio-political shift can be detected from space through land-use change would shed light into if and how long political influence has an effect on land-use at community level.

Due to Latvia’s quick-changing political status, it proves as an appropriate case study to examine if land-use change can be linked through satellite imagery to key socio-political events. The two events I will be examining are (1) the Soviet Union collapse in 1991 and (2) the addition of Latvia to the EU in 2004 (vote in 2003). After the Soviet Union, there was an increase in abandoned land, tree cutting and percent coverage of protected areas3. After joining the EU, the share of large farms (intensive) increased, while the share in small farms (extensive) decreased4. Agricultural abandonment, which can be defined as the cessation of agricultural activities on farmland, has the potential to cause biodiversity change5. Ultimately, this type of analysis could be replicated for other countries to outline the impacts of shifting political power on land cover and thus, have implications for wider aspects such as ecosystem services, the economy and human movement/urbanization across Europe and other regions around the world.

**Research questions**

1. Are key socio-political events in Latvia visible through land-use change detected using satellite imagery?
2. Is the strength and direction of land-use change different with extensive, intensive and abandoned land?
3. Is there a time lag between socio-political events and when the land-use effects are observed? Does this differ between land-use type?

**Predictions**

I believe socio-political events will be able to be detected through land-use change using satellite imagery, indicating a marked signature from space. I believe there will be a strong movement from extensive land to intensive and abandoned lands, with a weaker relationship moving towards extensive land. I think a time lag will be evident, with a stronger lag when transitioning into extensive land-use types.

**Methods**

To examine the effects of the events, I will be using Google Earth Engine, which is an online global spatial analysis platform. Specifically, I will be creating a classification of land use types in Latvia over time to test whether key socio-political events can be detected. Using satellite data, I will first define land-use types into several categories: extensive, intensive and abandoned land. I will then create a classification for each year, allowing me to plot the overall trend in land-use change. The timeframe studied will be determined after researching which satellite data would be most beneficial to the study. I will likely be using data between 1978 to present time, as this allows for around the same time frame before and between each event to be studied. Having a yearly time-step classification will allow me to test time lags and differences between the two key socio-political events in 1991 and 2004. I will test and train the classification with training datasets (CORINE) and assess the algorithm accuracy through estimating error with validation data (LUCAS dataset). To detect and assess change, I will overlay each year and compute gain, loss and change on a pixel scale. Statistical analyses including mixed-effects models will be conducted in the programing language R.

**References**

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