**Can the effect of socio-politico-economic events on land-use in Latvia be seen at a country scale?**

* We know they are linked, but is it the main driver of land-use change?
  + Main driver would indicate that there was a *uniform* shift across the whole country 🡪 how can this be quantified?
    - Pixels of the same time shifting to the same type 🡪 the relationship between the pixels over time is strong
  + Not main driver on country-scale means that pixels are doing different things from each other 🡪 not strong magnitude of pixels shifting to the same thing

**Question 1: Is there quantifiable, country-scale land-use change following SPE events in Latvia?**

* This is a broad question – we just proving the trends that we know exist – i.e. moving towards abandoned land after the SUC
* So here it’s just before and after the events and looking if the area has changed
* Here we don’t care which pixels are changing, we are just looking at if there is a link and a relationship for before and after the event – is the area strongly changing to different type
* Bar chart of areas of area of each land use type before and after

**Question 2: Are the strength and direction of land-use change different among extensive,**

**intensive and abandoned land-use types?**

* Look at the strength of each individual land-use type over time
  + Line graph over time of the 3 lines – area and or number of pixels
* Examine which land-use type each is changing to what – 6 lines over time
  + I 🡪 E
  + E 🡪 I
  + A 🡪 I
  + I 🡪 A
  + E 🡪 A
  + A 🡪 E
* 1985-1990 BEFORE
* 1992-1997 AFTER
* 1998-2003 BEFORE
* 2005-2010 AFTER

**Question 3: Is there a time lag between socio-economic events and the occurrence of land-use change? Does this differ between land-use type?**

* Same as above BUT look at different time periods to look at time lag 🡪 is the relationship stronger here than before? If so, shows that either there are more drivers or that there is time lag – can’t guarantee this means time lag because other factors at play
* 1985-1990 BEFORE
* 1992-2003 AFTER
* 1998-2003 BEFORE
* 2005-2016 AFTER

**Data I need:**

Two datasets:

* Pixels
  + ID of pixel (needs to be the same across time to ensure that we can track the pixel)
  + Class of pixel
* Area
  + Area of each land-use type in square metres for each study year

**Stats:**

* Mutate to create columns of numbers of pixels of each type in each year
* Mutate to create column of most dominant pixel class for each pixel in each time period
* Mutate to get quantity of each of 6 movements
* Mixed-effects models:

Q1: area ~ year + (1|year) + (1|resolution)

* Only include resolution if don’t find combined Landsat

Q2: change ~ year\_period + (1|year) + (1|resolution)

* Only include resolution if don’t find combined Landsat

Q3: change ~ year\_period + (1|year) + (1|resolution)

area ~ year\_period + (1|year) + (1|resolution)

* Only include resolution if don’t find combined Landsat

**Make own classification**

Why?

* LUCAS has only known points of land-USE rather than land cover
* Can potentially derive a more accurate image of what is going on by creating a classification based on ground-truthed data

**Make own classification**

* Landsat 5/7 imagery as base imagery
  + Use surface reflectance version as it has an atmospheric correction 🡪 more accurate ground reflectance
  + Cloud correct
* Plot LUCAS known points of land-use type TRAINING
  + Filter these with CORINE points to ensure agreement
* Add buffer around points
* Create Random Forest supervised Classification
  + Can try with different amounts of trees
  + Why Random Forest supervised?
    - Supervised because we have sample cases that are representative of specific classes
    - Random forest because it is more stable and less prone to overfitting
* Train & classify
* Get resubstitution accuracy and error
* Sample for validation data & get validation error and accuracy
* Display classification
* Extract pixel values and areas and classification maps

**Statistical analysis**

* Format data in R
* Mixed effects models

\*\* If have extra time, compare to LUH or CORINE (CORINE should be simpler and should do this either way)