Animated maps

Overview

In this exercise, we will look at how to use animated maps to vsisualise data with timestamp (temporal data). Althouth animated maps might not fit into a report, short animated map videos or GIF can be used in presentations, blogs, storymaps and webpages to show changes over time. In this practical, you will visualise health data to show a trend.

Dataset

1. The COVID-19 data were obtained from the publicly-available data repository of Our World in Data (https://github.com/owid/covid-19-data/tree/master/public/data), which were originally assembled and updated by the Centre for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU). These data were further collated and aggregated for this practical (see *Covid_data_collation.R*).
2. Data variables (see figs below):
   a. *Location*: name of country/territory/area.
   b. *ADM0_A3*: ISO3 alpha-3 code of each country/territory/area. Some ISO3 codes have been modified to match with the code used in the map shapefile.
   c. *Year*: 2020.
   d. *Week*: from week 4 to week 53 in 2020, as the earliest date in the JHU dataset is 22 Jan 2020 at week 4 of 2020.
   e. *new_cases*: the number of weekly new cases reported by each country/territory/area. In the file called *Total_covid_cases_2020.csv,* it means all cases reported in 2020.
   f. *new_cases_per_million*: weekly new cases per one million population, i.e. *new_cases* divided by the population of each location then multiplied by 1,000,000. In the file called *Total_covid_cases_2020.csv,* it means all cases are expressed per one million population in 2020.
   g. *total_cases*: cumulative weekly cases by location over time.
   h. *total_cases_per_million*: cumulative weekly cases by location over time, per one million persons.

Preparing the data

Open the weekly covid cases data in excel.

ArcGIS Pro needs a date column to enable us animate our maps. We will create a new field **wdate** in the weekly covid data sheet. We will use the function below to calculate the date of the Monday of each week number in our dataset. Make sure the function is applied to all the rows. Save the file as a csv with an appropriate name. Mine is saved as **Weekly_covid_new_cases_2020_map**.

	I2		⋮	×	✓	f_x	=DATE(C2,1,-2)-WEEKDAY(DATE(C2,1,3))+D2*7	

	A	B	C	D	E	F	G	H	I
1	Location	ADM0_A3	Year	Week	new_case	new_case	total_case	total_case	wdate
2	Afghanist;	AFG	2020	4	0	0	0	0	20/01/2020
3	Angola	AGO	2020	4	0	0	0	0	20/01/2020
4	Albania	ALB	2020	4	0	0	0	0	20/01/2020
5	Andorra	AND	2020	4	0	0	0	0	20/01/2020
6	United Ar;	ARE	2020	4	0	0	0	0	20/01/2020
7	Argentina	ARG	2020	4	0	0	0	0	20/01/2020
8	Armenia	ARM	2020	4	0	0	0	0	20/01/2020
9	Antigua a	ATG	2020	4	0	0	0	0	20/01/2020
10	Australia	AUS	2020	4	5	0.196	5	0.196	20/01/2020
11	Austria	AUT	2020	4	0	0	0	0	20/01/2020
12	Azerbaijai	AZE	2020	4	0	0	0	0	20/01/2020
13	Burundi	BDI	2020	4	0	0	0	0	20/01/2020

Animation

We need to join our weekly covid data with the shapefile. Before you add the join, the next step is very important for a one-to-many join type to work. For a one-to-many join, the rows for each country in the shapefile will be repeated for all corresponding weeks in the covid data. Create a new file geodatabase for this practical if you don't have one already and export the countries shapefile into this geodatabase (mine is called **Unit6Practical**). Add the countries shapefile **ne_110m_admin_0_countries** and covid cases data **Weekly_covid_new_cases_2020_map** to your map.

If your countries shapefile and weekly covid data are not in the same geodatabase, the data joining step will not produce the intended results.

Export **ne_110m_admin_0_countries** into your geodatabase by *Right click on layer > Data > Export Features*.

Export **Weekly_covid_new_cases_2020_map** into your geodatabase by *Right click on layer > Data > Export Table*.
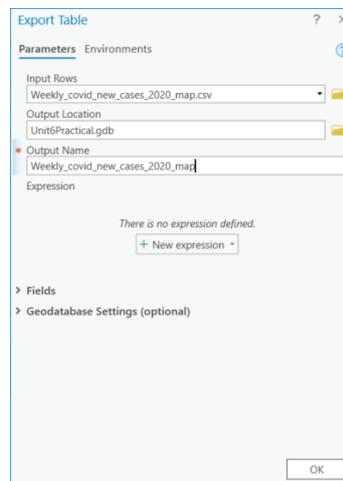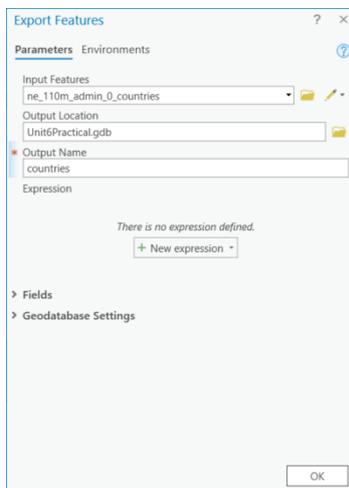
As **ADM0_A3** is the field that matches the **countries** shapefile with the **Weekly_covid_new_cases_2020_map** data, we shall use that field to merge the two datasets.

Search for the *Add join* tool from the *geoprocessing toolbox*. Select the **countries** shapefile as your *Input Table* and the unique field for countries, **ADM0_A3**, as the Input Join field. Select the weekly covid data as *Join Table* and the **ADMO_A3** as Join Table Field. Tick *Keep All Target Features* checkbox to keep polygons for countries where there might not be data and run.
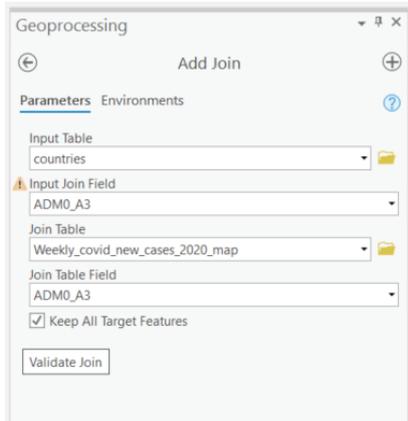
To keep a permanent join and also enable us view all the newly added rows, export the **countries** layer which now contains additional fields from the join as a new feature and save it as **weekly_covid_cases_by_country**. Check the attribute table to see if the number of rows have increased.
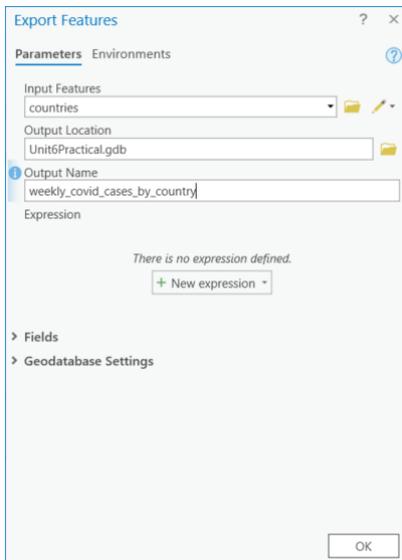
You can use *field view* to examine the properties of each field. You will see that **wdate** field is recognised as a date.

Tip: you can use the *Convert Time Field* tool to change numeric or string to date if ArcGIS does not do so on the fly.
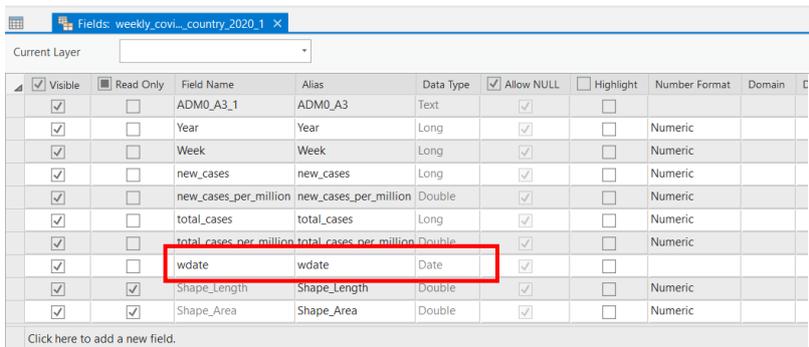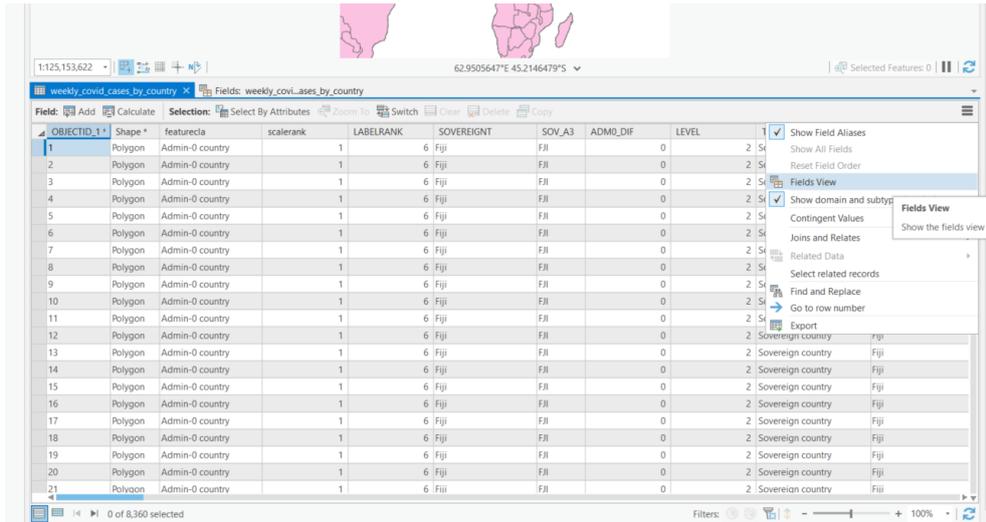
We want to minimise the distortion of the size of countries using transformations and projections. Right click on map in the table of contents, select *properties* and go to the *coordinate systems* tab. Search for *winkel* in the *XY Coordinate Systems Available* box. Select *Winkel I (world)* under *projected coordinate systems*.
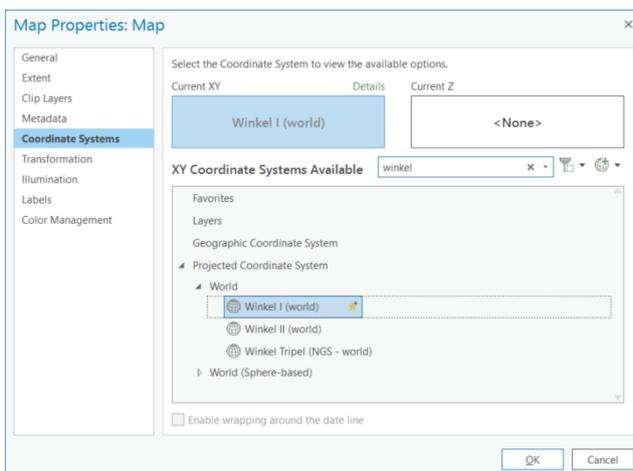
Right click on our **weekly_covid_cases_by_country** layer and select *Properties*. Go to the *Time* tab to setup the layer for animation. For layer Time, select *Each feature has a single time field*. Think about instances where you might use the second option (Each feature has start and end time fields).

For *Time field*, select the field **wdate** that holds our date values. The *Time Extent* will automatically be recognised else you can click on *Calculate* to automatically populate the dates or use the calendar

to select the appropriate initial and end periods. As our data is weekly in seven day time lapses, specify this in the *Time Interval* section. Accept the settings by clicking OK.
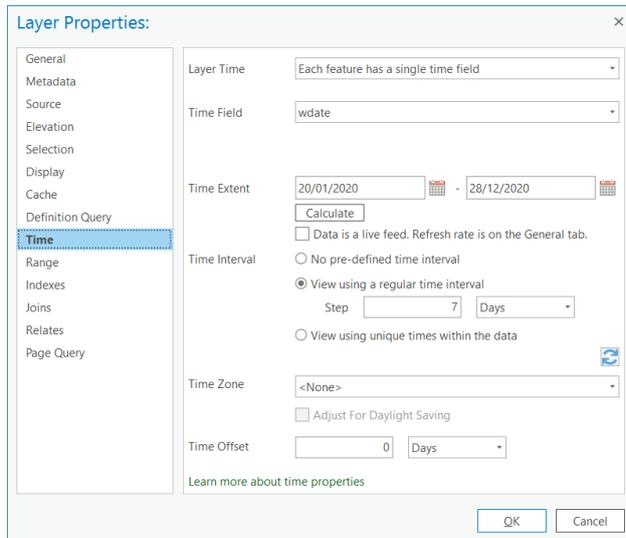
We will now prepare a choropleth map that we will animate over time. Draw a choropleth map the **total_cases** field in **weekly_covid_cases_by_country.** Use *graduated colours, Quantile classification* with ten *Classes*. Select an appropriate *colour scheme*, preferably a progressive colour scheme. You can exclude Antarctica from our map using a *definition query*.

Now that our initial map is ready, we can animate it.

Activate the animation ribbon as shown below
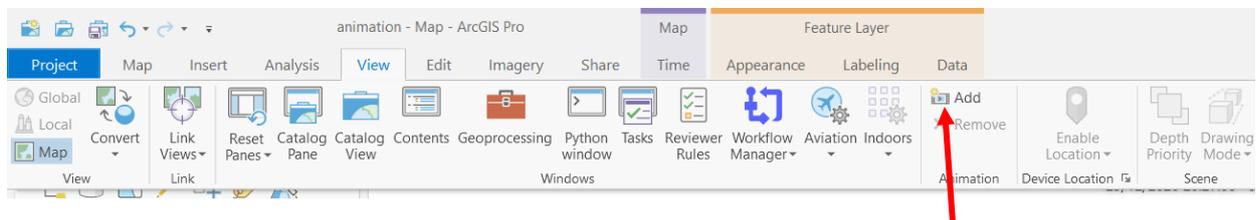
You should activate the animation ribbon by clicking on this icon found on the view ribbon

On the animation ribbon, click on *import* and select *Time Slider Steps*. This will import the time settings you specified in the Layer properties window.

Set the duration to 20 seconds for a short but not too fast video. Approximately three weeks will be displayed per sec as we have 53 weeks.
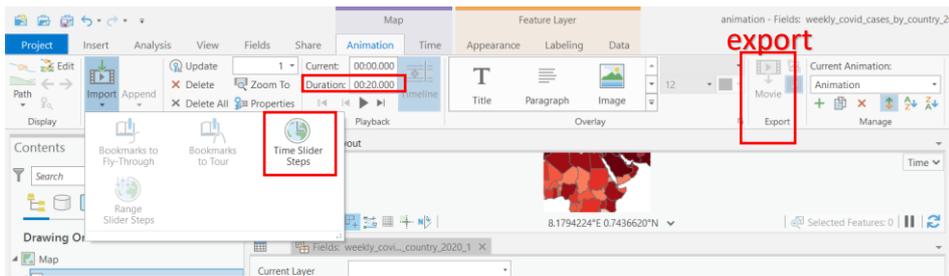
A time slider will appear on top of the map that you can use to play and pause your animation.
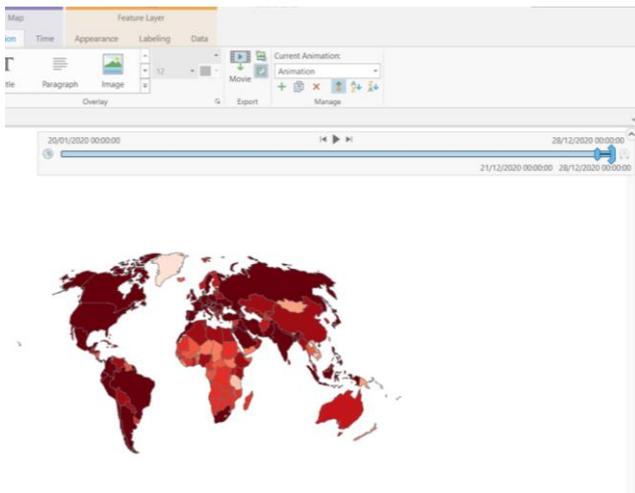
Use the *export* button shown above to get the various formats in which you can export your video.

I exported a video and a gif. The export could take a while so you can grab a cup of coffee at this point.
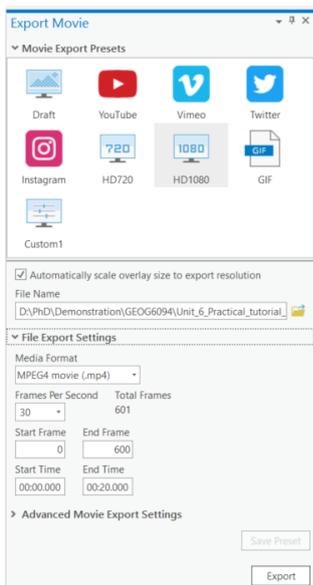
There are other tools that can be used to explore the animated frames. Feel free to experiment with them.