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Geospatial Data Analysis for Smart Communities

Concept for the term paper
Politics and electricity production in Switzerland

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1   Introduction

Our society once again faces numerous social, economical, ecological and political challenges. Apart from the increase of political activity, focus on ecological development and technological improvements, we also deal with the consequences of these "positive" changes. As we transition away from industrial petrol based-, towards electrical machines and towards energy consumption for pretty much any activity, we must act accordingly. Politics has always and will always be a touchy subject but an important one. Society often ridicules political parties for a variate of things too long to list in a three page maximum concept paper, yet most people still believe the only way to force change is by being active. With this project, group 1 will visualize the current state of electricity production plants and their electricity production combined with political orientation of the cantons in Switzerland.

1.1   Problem Statement and Relevance

During the Covid-Pandemic, the corona virus affected everyone's living environment. What the Federal Council in Bern and the councils of government in the main towns decided had direct relevance to everyday life. In the latest *"Credit Suisse Worry Barometer"*, compiled by the GFS Bern research institute, the pandemic figures as the top concern, ahead of climate change and retirement provision. Federal Council press conferences, which are normally unspectacular events, became YouTube hits, at least at the beginning of the pandemic, while social media were abuzz with controversy and people were out in the streets protesting against measures. In one sentence: the pandemic is politicizing the masses. Here are five insights.[1]

Highest voter turnout since 1949: Last November's vote on the Covid law registered 65.7% participation, the fourth-highest voter turnout since 1971. The average turnout in 2021 was 56.6%. The last time it was higher was in 1949, when it was 58.5%.

The center: The name change pays off: *"Die Mitte"*, the fusion product of CVP and BDP, senses due to significantly increased mail inquiries from citizens "that the pandemic really politicizes the people in Switzerland," as spokesman Thomas Hofstetter said. And last October's *SRG election barometer* revealed that 15% of designated centrist voters choose the party because it stands for something new.

The SP's Corona policy tipped the scales in part: In the last two years, the SP's membership has climbed by around $1,400$ to $32,814$. The party has seen continuous growth since 2015, said spokesman Nicolas Haesler. In part new members had designated the Corona policy of the party, which focused strongly on economic compensation, as a decisive factor.

Greens: More new members than ever before: Green Party President Balthasar Glättli reports a membership boom. *"We have never registered so many new members,"* he said in an interview with the *Tribune de Genève*. Currently, the eco party has $12,967 members$ - almost 2300 or 21% more than two years ago. It is obvious that many people are warming to the party out of concern about climate change.

GLP praises itself for its "fact-based stance: The Green Liberals have 6800 members - 1700 more than two years ago. The increase had already begun after the 2019 National Council elections. The GLP explains it with its *"credible positions in climate, environmental and European policy"*.

Conclusion: The Swiss parties gained significantly more than $10,000$ new members during the Corona period (see Figure 3). *"Die Mitte"* turned out to be the most attractive party; no other

formation announcing statistics was joined by more people in absolute numbers. Therefore it seems quite obvious that people have not only become more politically engaged but favor progression, socialism and ecological standpoints. Combining these insights with the ever more rapidly increase in electricity consumption, this paper will visualize the current state of power production and political orientation in each of the swiss cantons.

1.2 Research Objectives

For this assignment, group 1 posed themselves to the challenge to recreate the interactive map on the website, from which the data set originates.[2] Additionally macro-economic data is being used to try and find potential influencing factors to types of electricity production plants and amount of electricity produced.[3] To achieve these analysis and visualization the group will use multiple tools to experiment such as *Tableau*, *R-ggplot*, and most challenging *R-rayshader*.

1.2.1 Central Research Question

Whats the relationship between political orientation of a canton and its electricity production method?

1.2.2 Research Goal

Recreate the interactive map on opendata.swiss. To achieve the interactivity as simply as possible, Tableau will be used (see Figure 1).

Use different tools to visualize the electricity plants and political data sets. To achieve the complexity and 3D styling of the **Concept Map**, *R-rayshader* will be used (see Figure 2).

Find the relationship between political orientation and `electricity production plant category`. For the analysis, a multitude of statistical correlation tests will be used to determine statistical significance.

2 Description of the Dataset

The following data sets are used for the analysis.

Document name	Description	Link
ch.bfe.elektrizitaets-produktionsanlagen.zip	All electricity plants in Switzerland that are in operation.	opendata.swiss
je-d-21.03.02.xlsx	Selected indicators in regional comparison	www.bfs.admin.ch

The data set *'Electricity Production Plant'* consists of over 128′000 rows, each representing one power plant in Switzerland. It provides data on the location including the `address` and `coordinates` of the power plant and its `Beginning of Operation`, as well as the `Initial Power` and `Total Power` of these power plants. We also get `categorizations` which represent the following values.

Table 2: Dataset Description

Main-/subcat value	Main-/subcategory	Plantcat value	Plant category
maincat_1	Hydroelectric power	plantcat_1	Wastewater power plant
maincat_2	Other renewable energies	plantcat_2	Diversion power plant
maincat_3	Nuclear energy	plantcat_3	Weir plant
maincat_4	Fossil fuel	plantcat_4	Continuous power plant
subcat_1	Hydroelectric power	plantcat_5	Drinking water power plant
subcat_2	Photovoltaic	plantcat_6	Pumped storage power plant
subcat_3	Wind energy	plantcat_7	Storage power plant
subcat_4	Biomass	plantcat_8	Attached
subcat_5	Geothermal energy	plantcat_9	Integrated
subcat_6	Nuclear energy	plantcat_10	Freestanding
subcat_7	Crude oil	plantcat_11	Biomass usage
subcat_8	Natural gas	plantcat_12	Waste incineration
subcat_9	Coal	plantcat_13	Wastewater treatment
subcat_10	Waste		

Additionally, a supplementary data set (*'je-d-21.03.02.csv'*) is provided with with meta information (`political paricipation`) divided by cantons. Together these data sets lay the basis for our analysis and allows finding correlations.

3   Data Preparation

In order to perform the various analyses, several data preparation steps were necessary. First, the political data for the cantons are loaded (see Table 3). Next, the second data set is loaded, which contains all power plants that currently produce electricity in Switzerland. The column *SubCategory* describes what type of plant it is. To make the data set more understandable, the *subcat_x* label is replaced with the English name. The assignment of categories is described in the corresponding data sets *'MainCategoryCatalogue.csv'*, *'SubCategoryCatalogue.csv'*, and *'PlantCategoryCatalogue.csv'* (see Table 4).

References

[1]   K. Kälin, "Die pandemie politisiert die massen: Stimmbeteiligung so hoch wie nie seit 1949 –
        parteien gewinnen mitglieder." 2022. Available: https://zofingertagblatt.ch/die-pandemie-
        politisiert-die-massen-stimmbeteiligung-so-hoch-wie-nie-seit-1949-parteien-gewinnen-
        mitglieder/

[2]   S. F. O. of Energy SFOE, "Electricity production plants." 2022. Available: https://opendata
        .swiss/en/dataset/elektrizitatsproduktionsanlagen

[3]   B. für Statistik, "Ausgewählte indikatoren im regionalen vergleich, 2021 (kantone)." 2021.
        Available: https://www.bfs.admin.ch/bfs/de/home/statistiken/kataloge-datenbanken/tabe
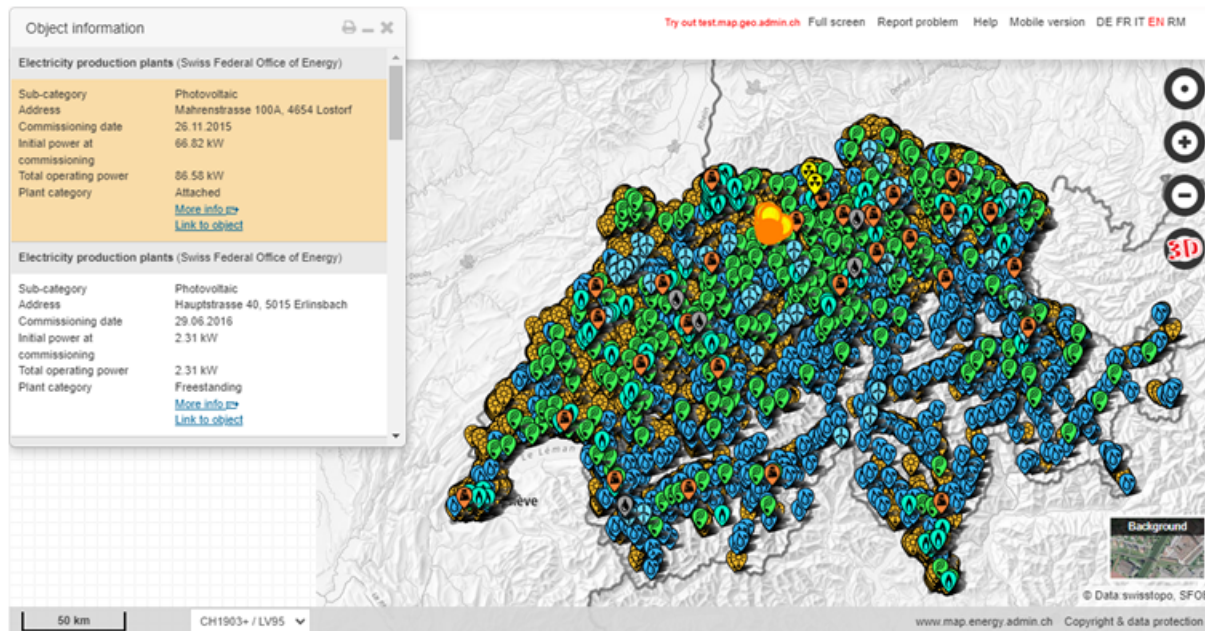   llen.assetdetail.15864476.html

Appendix

Figure 1: Interactive Electricity Production Plants (Source: Opendata.swiss)

Table 3: Head bfs political parties

	Canton	FDP	CVP	SP	SVP	EVP/CSP	GLP	BDP	GPS
1	ZH	13.660914879	4.41	17.31	26.70	3.30	13.99	1.64	14.08
2	BE	8.360142453	1.87	16.82	30.03	4.18	9.74	8.04	13.59
3	LU	15.558173557	25.49	13.52	24.75	0.71	7.10	NA	12.23
4	UR	NA	39.21	22.25	36.33	NA	NA	NA	NA
5	SZ	23.098084599	18.40	13.81	36.89	0.60	4.58	NA	2.61
6	OW	11.591707418	36.68	2.92	37.28	NA	NA	NA	NA

Table 4: Head electricity production plants

|	TotalPower	MainCategory	SubCategory	PlantCategory	__x	__y
1	13.13	OtherRenewable energies	Photovoltaic	Attached	2613846	1178338
2	3.58	OtherRenewable energies	Photovoltaic	Integrated	NA	NA
3	9.00	OtherRenewable energies	Photovoltaic	Attached	2687136	1277260
4	25.02	OtherRenewable energies	Photovoltaic	Integrated	2701892	1170818
5	20.72	OtherRenewable energies	Photovoltaic	Attached	2722800	1266062
6	9.52	OtherRenewable energies	Photovoltaic	Attached	2708106	1271724
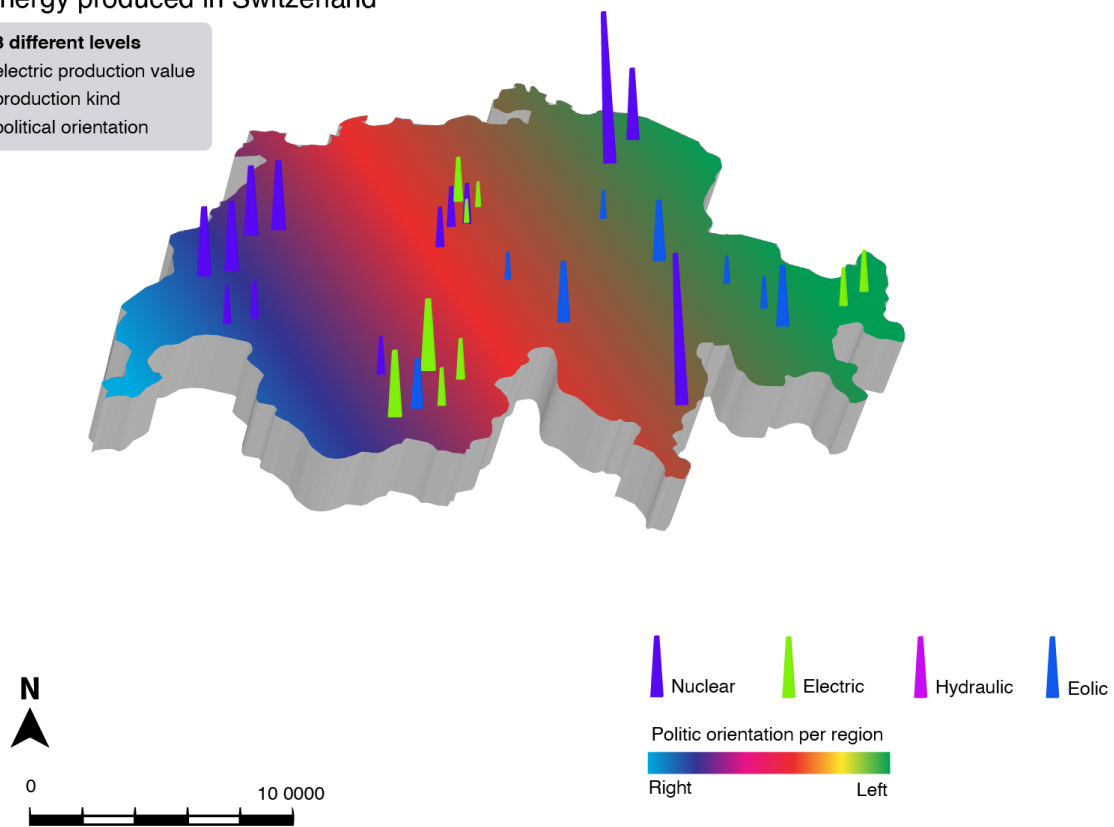
Figure 2: Map Concept (Source: Andreia Almeida)
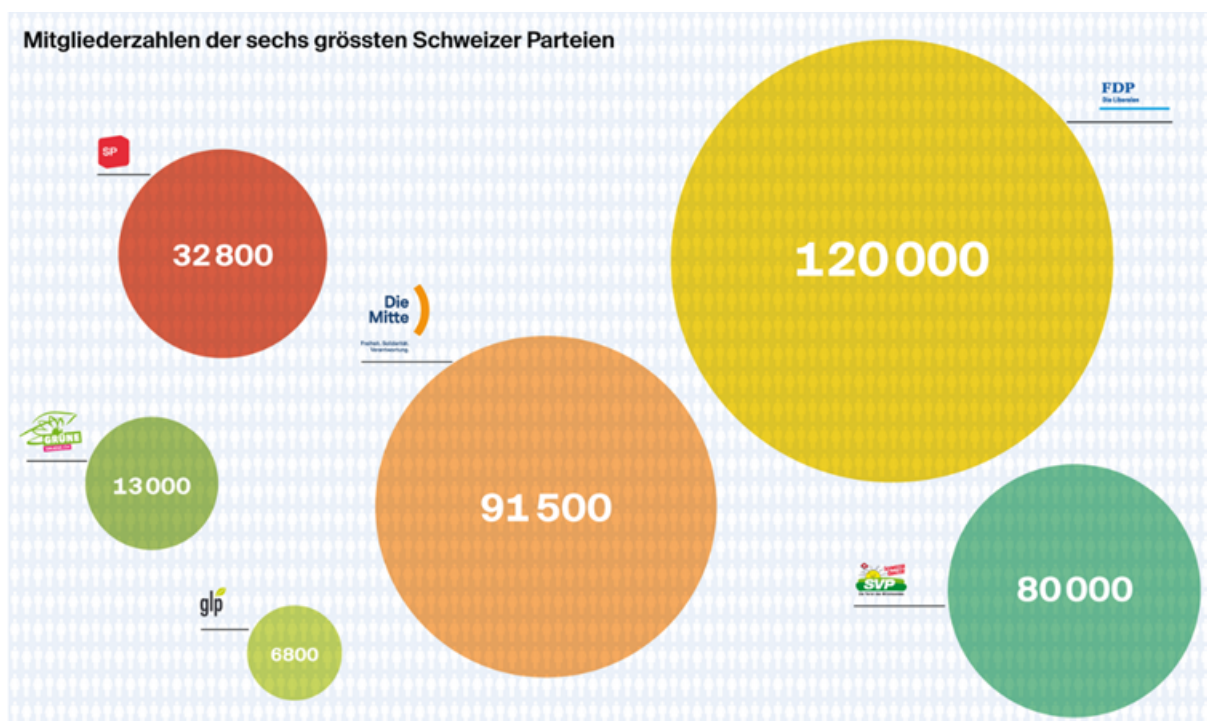
Figure 3: Membership numbers of the six largest political parties (Source: Zofiger Tagblatt)