

# Armed conflict increases with proximity to borders in Africa

Borders: Colonial, Ethnic, and Religious

Spatial Regression Analysis



CSCI 491

Project 4

Bryan Tutt

Theo Symonds



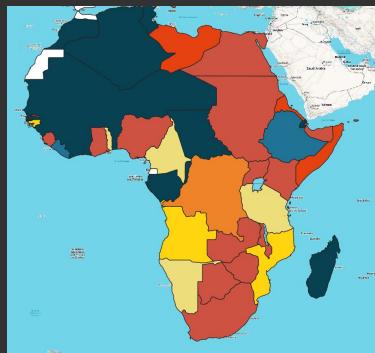
# Data for border types

Polygons for each category



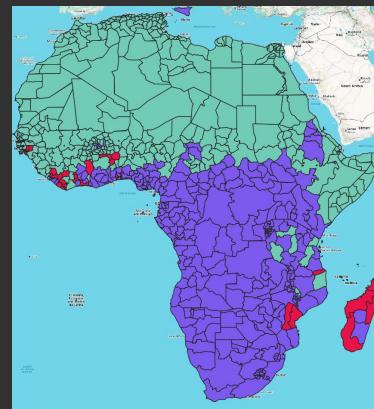
## Political

Polygons of present-day national borders.



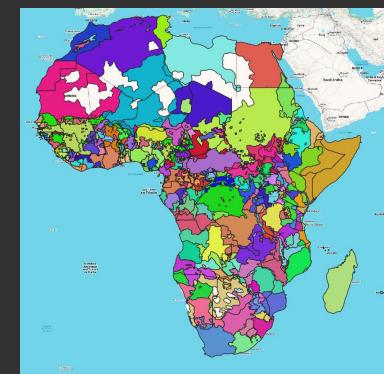
## Colonial

Former European demarcation of the continent.



## Religious

Religious majority per adm3 polygons.



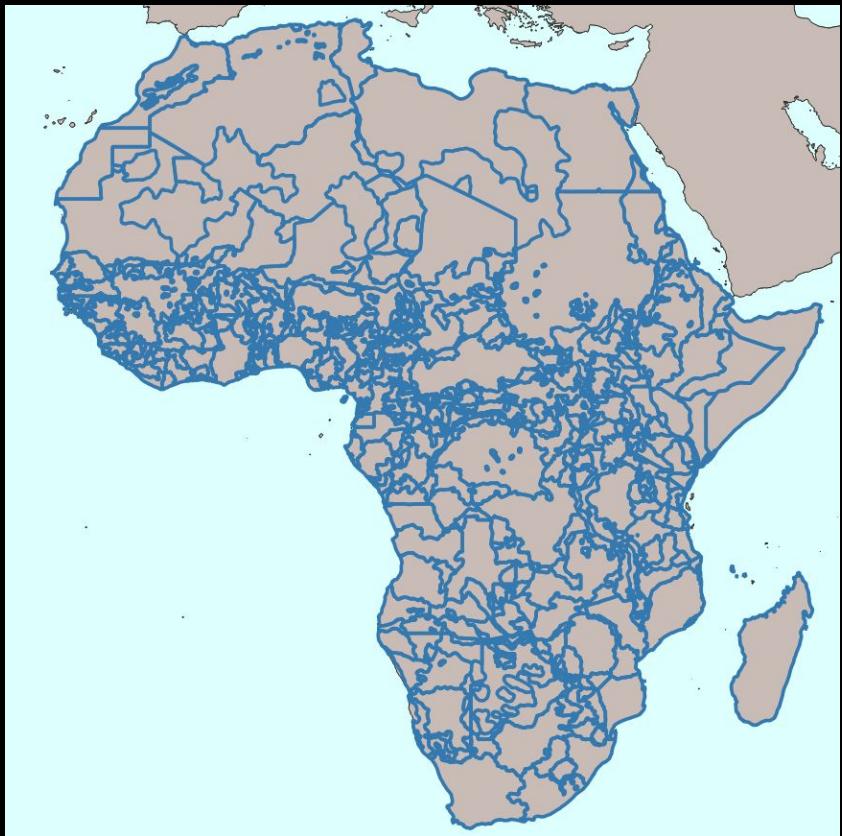
## Ethnic

Polygons of major ethnic groups in Africa.

## Borders Data

# Vectorizing polygon perimeters as lines.

- Basis of our distance calculations.
- Save attributes to categorize each border type: national, colonial, ethnic, and religious.
- These vectorized lines will be used to calculate the closest distance between a cell centroid and a border.



# Data for conflict violence

## Event type

Battle / Protest / Riot /  
Explosion / Violence  
Against Civilians /  
Strategic Development

Each has more subcategories

## Date

Date with specification of  
time precision (day,  
month, year)

## Actor

Perpetrator of incident  
and any association with  
movements

Multiple actors possible

## Location

Country, Region,  
Subregion, District, City,  
Latitude/Longitude  
(EPSG:4326)

Includes geoprecision scale from 1-3

## Fatalities

Number of fatalities  
recorded per event

## Notes

Short description of  
event.

Can help decide whether to exclude  
event from analysis

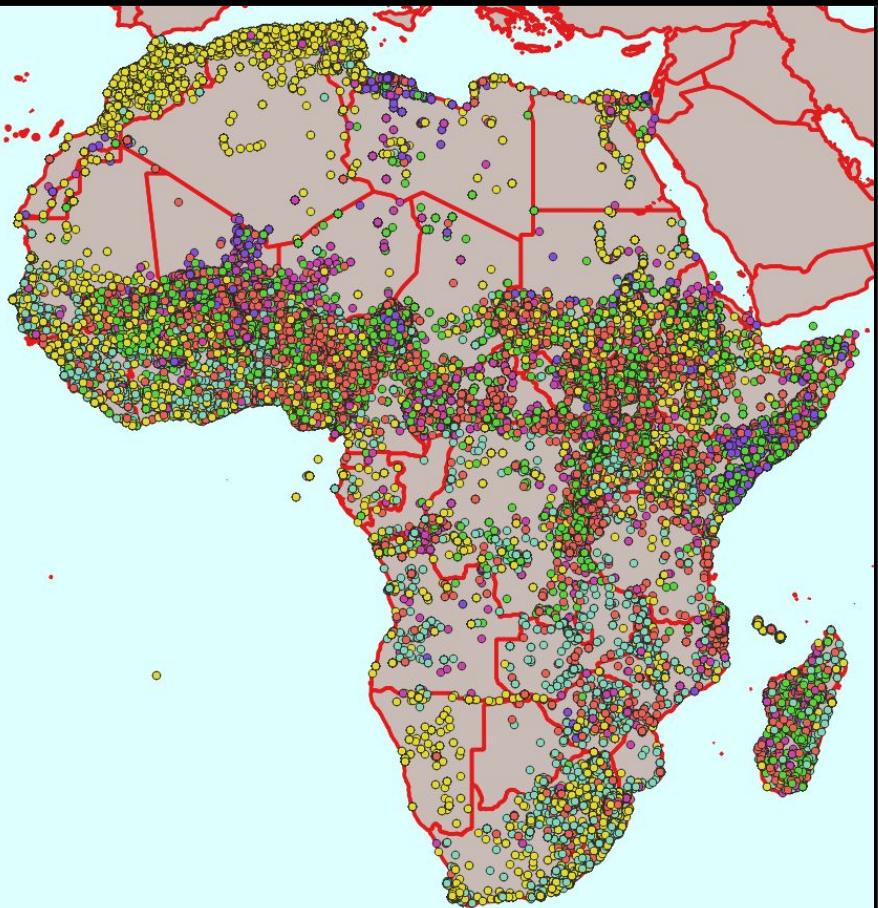
## Source

Sources used to codify  
conflict event.

## Civilian targets

Binary 0/1 for events  
targeting civilians

EVENT\_ID	CN	EVENT\_DATE	YEAR	REGION	TYPE	TIME\_ID	TH	ACTION	ARMED	INJURY	ACTOR\_ID	ACTOR	ACTOR\_TYPE	ACTOR\_ID2	ACTOR2	ACTOR\_TYPE2	ACTOR\_ID3	ACTOR3	ACTOR\_TYPE3	TAZ\_ID	TAZ	REGION	CONTRO	ADMINT	ADMINT2	ADMINT3	ADMINT4	ADMINT5	ADMINT6	ADMINT7	ADMINT8	ADMINT9	ADMINT10	ADMINT11	ADMINT12	ADMINT13	ADMINT14	ADMINT15	ADMINT16	ADMINT17	ADMINT18	ADMINT19	ADMINT20	ADMINT21	ADMINT22	ADMINT23	ADMINT24	ADMINT25	ADMINT26	ADMINT27	ADMINT28	ADMINT29	ADMINT30	ADMINT31	ADMINT32	ADMINT33	ADMINT34	ADMINT35	ADMINT36	ADMINT37	ADMINT38	ADMINT39	ADMINT40	ADMINT41	ADMINT42	ADMINT43	ADMINT44	ADMINT45	ADMINT46	ADMINT47	ADMINT48	ADMINT49	ADMINT50	ADMINT51	ADMINT52	ADMINT53	ADMINT54	ADMINT55	ADMINT56	ADMINT57	ADMINT58	ADMINT59	ADMINT60	ADMINT61	ADMINT62	ADMINT63	ADMINT64	ADMINT65	ADMINT66	ADMINT67	ADMINT68	ADMINT69	ADMINT70	ADMINT71	ADMINT72	ADMINT73	ADMINT74	ADMINT75	ADMINT76	ADMINT77	ADMINT78	ADMINT79	ADMINT80	ADMINT81	ADMINT82	ADMINT83	ADMINT84	ADMINT85	ADMINT86	ADMINT87	ADMINT88	ADMINT89	ADMINT90	ADMINT91	ADMINT92	ADMINT93	ADMINT94	ADMINT95	ADMINT96	ADMINT97	ADMINT98	ADMINT99	ADMINT100	ADMINT101	ADMINT102	ADMINT103	ADMINT104	ADMINT105	ADMINT106	ADMINT107	ADMINT108	ADMINT109	ADMINT110	ADMINT111	ADMINT112	ADMINT113	ADMINT114	ADMINT115	ADMINT116	ADMINT117	ADMINT118	ADMINT119	ADMINT120	ADMINT121	ADMINT122	ADMINT123	ADMINT124	ADMINT125	ADMINT126	ADMINT127	ADMINT128	ADMINT129	ADMINT130	ADMINT131	ADMINT132	ADMINT133	ADMINT134	ADMINT135	ADMINT136	ADMINT137	ADMINT138	ADMINT139	ADMINT140	ADMINT141	ADMINT142	ADMINT143	ADMINT144	ADMINT145	ADMINT146	ADMINT147	ADMINT148	ADMINT149	ADMINT150	ADMINT151	ADMINT152	ADMINT153	ADMINT154	ADMINT155	ADMINT156	ADMINT157	ADMINT158	ADMINT159	ADMINT160	ADMINT161	ADMINT162	ADMINT163	ADMINT164	ADMINT165	ADMINT166	ADMINT167	ADMINT168	ADMINT169	ADMINT170	ADMINT171	ADMINT172	ADMINT173	ADMINT174	ADMINT175	ADMINT176	ADMINT177	ADMINT178	ADMINT179	ADMINT180	ADMINT181	ADMINT182	ADMINT183	ADMINT184	ADMINT185	ADMINT186	ADMINT187	ADMINT188	ADMINT189	ADMINT190	ADMINT191	ADMINT192	ADMINT193	ADMINT194	ADMINT195	ADMINT196	ADMINT197	ADMINT198	ADMINT199	ADMINT200	ADMINT201	ADMINT202	ADMINT203	ADMINT204	ADMINT205	ADMINT206	ADMINT207	ADMINT208	ADMINT209	ADMINT210	ADMINT211	ADMINT212	ADMINT213	ADMINT214	ADMINT215	ADMINT216	ADMINT217	ADMINT218	ADMINT219	ADMINT220	ADMINT221	ADMINT222	ADMINT223	ADMINT224	ADMINT225	ADMINT226	ADMINT227	ADMINT228	ADMINT229	ADMINT230	ADMINT231	ADMINT232	ADMINT233	ADMINT234	ADMINT235	ADMINT236	ADMINT237	ADMINT238	ADMINT239	ADMINT240	ADMINT241	ADMINT242	ADMINT243	ADMINT244	ADMINT245	ADMINT246	ADMINT247	ADMINT248	ADMINT249	ADMINT250	ADMINT251	ADMINT252	ADMINT253	ADMINT254	ADMINT255	ADMINT256	ADMINT257	ADMINT258	ADMINT259	ADMINT260	ADMINT261	ADMINT262	ADMINT263	ADMINT264	ADMINT265	ADMINT266	ADMINT267	ADMINT268	ADMINT269	ADMINT270	ADMINT271	ADMINT272	ADMINT273	ADMINT274	ADMINT275	ADMINT276	ADMINT277	ADMINT278	ADMINT279	ADMINT280	ADMINT281	ADMINT282	ADMINT283	ADMINT284	ADMINT285	ADMINT286	ADMINT287	ADMINT288	ADMINT289	ADMINT290	ADMINT291	ADMINT292	ADMINT293	ADMINT294	ADMINT295	ADMINT296	ADMINT297	ADMINT298	ADMINT299	ADMINT300	ADMINT301	ADMINT302	ADMINT303	ADMINT304	ADMINT305	ADMINT306	ADMINT307	ADMINT308	ADMINT309	ADMINT310	ADMINT311	ADMINT312	ADMINT313	ADMINT314	ADMINT315	ADMINT316	ADMINT317	ADMINT318	ADMINT319	ADMINT320	ADMINT321	ADMINT322	ADMINT323	ADMINT324	ADMINT325	ADMINT326	ADMINT327	ADMINT328	ADMINT329	ADMINT330	ADMINT331	ADMINT332	ADMINT333	ADMINT334	ADMINT335	ADMINT336	ADMINT337	ADMINT338	ADMINT339	ADMINT340	ADMINT341	ADMINT342	ADMINT343	ADMINT344	ADMINT345	ADMINT346	ADMINT347	ADMINT348	ADMINT349	ADMINT350	ADMINT351	ADMINT352	ADMINT353	ADMINT354	ADMINT355	ADMINT356	ADMINT357	ADMINT358	ADMINT359	ADMINT360	ADMINT361	ADMINT362	ADMINT363	ADMINT364	ADMINT365	ADMINT366	ADMINT367	ADMINT368	ADMINT369	ADMINT370	ADMINT371	ADMINT372	ADMINT373	ADMINT374	ADMINT375	ADMINT376	ADMINT377	ADMINT378	ADMINT379	ADMINT380	ADMINT381	ADMINT382	ADMINT383	ADMINT384	ADMINT385	ADMINT386	ADMINT387	ADMINT388	ADMINT389	ADMINT390	ADMINT391	ADMINT392	ADMINT393	ADMINT394	ADMINT395	ADMINT396	ADMINT397	ADMINT398	ADMINT399	ADMINT400	ADMINT401	ADMINT402	ADMINT403	ADMINT404	ADMINT405	ADMINT406	ADMINT407	ADMINT408	ADMINT409	ADMINT410	ADMINT411	ADMINT412	ADMINT413	ADMINT414	ADMINT415	ADMINT416	ADMINT417	ADMINT418	ADMINT419	ADMINT420	ADMINT421	ADMINT422	ADMINT423	ADMINT424	ADMINT425	ADMINT426	ADMINT427	ADMINT428	ADMINT429	ADMINT430	ADMINT431	ADMINT432	ADMINT433	ADMINT434	ADMINT435	ADMINT436	ADMINT437	ADMINT438	ADMINT439	ADMINT440	ADMINT441	ADMINT442	ADMINT443	ADMINT444	ADMINT445	ADMINT446	ADMINT447	ADMINT448	ADMINT449	ADMINT450	ADMINT451	ADMINT452	ADMINT453	ADMINT454	ADMINT455	ADMINT456	ADMINT457	ADMINT458	ADMINT459	ADMINT460	ADMINT461	ADMINT462	ADMINT463	ADMINT464	ADMINT465	ADMINT466	ADMINT467	ADMINT468	ADMINT469	ADMINT470	ADMINT471	ADMINT472	ADMINT473	ADMINT474	ADMINT475	ADMINT476	ADMINT477	ADMINT478	ADMINT479	ADMINT480	ADMINT481	ADMINT482	ADMINT483	ADMINT484	ADMINT485	ADMINT486	ADMINT487	ADMINT488	ADMINT489	ADMINT490	ADMINT491	ADMINT492	ADMINT493	ADMINT494	ADMINT495	ADMINT496	ADMINT497	ADMINT498	ADMINT499	ADMINT500	ADMINT501	ADMINT502	ADMINT503	ADMINT504	ADMINT505	ADMINT506	ADMINT507	ADMINT508	ADMINT509	ADMINT510	ADMINT511	ADMINT512	ADMINT513	ADMINT514	ADMINT515	ADMINT516	ADMINT517	ADMINT518	ADMINT519	ADMINT520	ADMINT521	ADMINT522	ADMINT523	ADMINT524	ADMINT525	ADMINT526	ADMINT527	ADMINT528	ADMINT529	ADMINT530	ADMINT531	ADMINT532	ADMINT533	ADMINT534	ADMINT535	ADMINT536	ADMINT537	ADMINT538	ADMINT539	ADMINT540	ADMINT541	ADMINT542	ADMINT543	ADMINT544	ADMINT545	ADMINT546	ADMINT547	ADMINT548	ADMINT549	ADMINT550	ADMINT551	ADMINT552	ADMINT553	ADMINT554	ADMINT555	ADMINT556	ADMINT557	ADMINT558	ADMINT559	ADMINT560	ADMINT561	ADMINT562	ADMINT563	ADMINT564	ADMINT565	ADMINT566	ADMINT567	ADMINT568	ADMINT569	ADMINT570	ADMINT571	ADMINT572	ADMINT573	ADMINT574	ADMINT575	ADMINT576	ADMINT577	ADMINT578	ADMINT579	ADMINT580	ADMINT581	ADMINT582	ADMINT583	ADMINT584	ADMINT585	ADMINT586	ADMINT587	ADMINT588	ADMINT589	ADMINT590	ADMINT591	ADMINT592	ADMINT593	ADMINT594	ADMINT595	ADMINT596	ADMINT597	ADMINT598	ADMINT599	ADMINT600	ADMINT601	ADMINT602	ADMINT603	ADMINT604	ADMINT605	ADMINT606	ADMINT607	ADMINT608	ADMINT609	ADMINT610	ADMINT611	ADMINT612	ADMINT613	ADMINT614	ADMINT615	ADMINT616	ADMINT617	ADMINT618	ADMINT619	ADMINT620	ADMINT621	ADMINT622	ADMINT623	ADMINT624	ADMINT625	ADMINT626	ADMINT627	ADMINT628	ADMINT629	ADMINT630	ADMINT631	ADMINT632	ADMINT633	ADMINT634	ADMINT635	ADMINT636	ADMINT637	ADMINT638	ADMINT639	ADMINT640	ADMINT641	ADMINT642	ADMINT643	ADMINT644	ADMINT645	ADMINT646	ADMINT647	ADMINT648	ADMINT649	ADMINT650	ADMINT651	ADMINT652	ADMINT653	ADMINT654	ADMINT655	ADMINT656	ADMINT657	ADMINT658	ADMINT659	ADMINT660	ADMINT661	ADMINT662	ADMINT663	ADMINT664	ADMINT665	ADMINT666	ADMINT667	ADMINT668	ADMINT669	ADMINT670	ADMINT671	ADMINT672	ADMINT673	ADMINT674	ADMINT675	ADMINT676	ADMINT677	ADMINT678	ADMINT679	ADMINT680	ADMINT681	ADMINT682	ADMINT683	ADMINT684	ADMINT685	ADMINT686	ADMINT687	ADMINT688	ADMINT689	ADMINT690	ADMINT691	ADMINT692	ADMINT693	ADMINT694	ADMINT695	ADMINT696	ADMINT697	ADMINT698	ADMINT699	ADMINT700	ADMINT701	ADMINT702	ADMINT703	ADMINT704	ADMINT705	ADMINT706	ADMINT707	ADMINT708	ADMINT709	ADMINT710	ADMINT711	ADMINT712	ADMINT713	ADMINT714	ADMINT715	ADMINT716	ADMINT717	ADMINT718	ADMINT719	ADMINT720	ADMINT721	ADMINT722	ADMINT723	ADMINT724	ADMINT725	ADMINT726	ADMINT727	ADMINT728	ADMINT729	ADMINT730	ADMINT731	ADMINT732	ADMINT733	ADMINT734	ADMINT735	ADMINT736	ADMINT737	ADMINT738	ADMINT739	ADMINT740	ADMINT741	ADMINT742	ADMINT743	ADMINT744	ADMINT745	ADMINT746	ADMINT747	ADMINT748	ADMINT749	ADMINT750	ADMINT751	ADMINT752	ADMINT753	ADMINT754	ADMINT755	ADMINT756	ADMINT757	ADMINT758	ADMINT759	ADMINT760	ADMINT761	ADMINT762	ADMINT763	ADMINT764	ADMINT765	ADMINT766	ADMINT767	ADMINT768	ADMINT769	ADMINT770	ADMINT771	ADMINT772	ADMINT773	ADMINT774	ADMINT775	ADMINT776	ADMINT777	ADMINT778	ADMINT779	ADMINT780	ADMINT781	ADMINT782	ADMINT783	ADMINT784	ADMINT785	ADMINT786	ADMINT787	ADMINT788	ADMINT789	ADMINT790	ADMINT791	ADMINT792	ADMINT793	ADMINT794	ADMINT795	ADMINT796	ADMINT797	ADMINT798	ADMINT799	ADMINT800	ADMINT801	ADMINT802	ADMINT803	ADMINT804	ADMINT805	ADMINT806	ADMINT807	ADMINT808	ADMINT809	ADMINT810	ADMINT811	ADMINT812	ADMINT813	ADMINT814	ADMINT815	ADMINT816	ADMINT817	ADMINT818	ADMINT819	ADMINT820	ADMINT821	ADMINT822	ADMINT823	ADMINT824	ADMINT825	ADMINT826	ADMINT827	ADMINT828	ADMINT829	ADMINT830	ADMINT831	ADMINT832	ADMINT833	ADMINT834	ADMINT835	ADMINT836	ADMINT837	ADMINT838	ADMINT839	ADMINT840	ADMINT841	ADMINT842	ADMINT843	ADMINT844	ADMINT845	ADMINT846	ADMINT847	ADMINT848	ADMINT849	ADMINT850	ADMINT851	ADMINT852	ADMINT853	ADMINT854	ADMINT855	ADMINT856	ADMINT857	ADMINT858	ADMINT859	ADMINT860	ADMINT861	ADMINT862	ADMINT863	ADMINT864	ADMINT865	ADMINT866	ADMINT867	ADMINT868	ADMINT869	ADMINT870	ADMINT871	ADMINT872	ADMINT873	ADMINT874	ADMINT875	ADMINT876	ADMINT877	ADMINT878	ADMINT879	ADMINT880	ADMINT881	ADMINT882	ADMINT883	ADMINT884	ADMINT885	ADMINT886	ADMINT887	ADMINT888	ADMINT889	ADMINT890	ADMINT891	ADMINT892	ADMINT893	ADMINT894	ADMINT895	ADMINT896	ADMINT897	ADMINT898	ADMINT899	ADMINT900	ADMINT901	ADMINT902	ADMINT903	ADMINT904	ADMINT905	ADMINT906	ADMINT907	ADMINT908	ADMINT909	ADMINT910	ADMINT911	ADMINT912	ADMINT913	ADMINT914	ADMINT915	ADMINT916	ADMINT917	ADMINT918	ADMINT919	ADMINT920	ADMINT921	ADMINT922	ADMINT923	ADMINT924	ADMINT925	ADMINT926	ADMINT927	ADMINT928	ADMINT929	ADMINT930	ADMINT931	ADMINT932	ADMINT933	ADMINT934	ADMINT935	ADMINT936	ADMINT937	ADMINT938	ADMINT939	ADMINT940	ADMINT941	ADMINT942	ADMINT943	ADMINT944	ADMINT945	ADMINT946	ADMINT947	ADMINT948	ADMINT949	ADMINT950	ADMINT951	ADMINT952	ADMINT953	ADMINT954	ADMINT955	ADMINT956	ADMINT957	ADMINT958	ADMINT959	ADMINT960	ADMINT961	ADMINT962	ADMINT963	ADMINT964	ADMINT965	ADMINT966	ADMINT967	ADMINT968	ADMINT969	ADMINT970	ADMINT971	ADMINT972	ADMINT973	ADMINT974	ADMINT975	ADMINT976	ADMINT977	ADMINT978	ADMINT979	ADMINT980	ADMINT981	ADMINT982	ADMINT983	ADMINT984	ADMINT985	ADMINT986	ADMINT987	ADMINT988	ADMINT989	ADMINT990	ADMINT991	ADMINT992	ADMINT993	ADMINT994	ADMINT995	ADMINT996	ADMINT997	ADMINT998	ADMINT999	ADMINT1000	ADMINT1001	ADMINT1002	ADMINT1003	ADMINT1004	ADMINT1005	ADMINT1006	ADMINT1007	ADMINT1008	ADMINT1009	ADMINT1010	ADMINT1011	ADMINT1012	ADMINT1013	ADMINT1014	ADMINT1015	ADMINT1016	ADMINT1017	ADMINT1018	ADMINT1019	ADMINT1020	ADMINT1021	ADMINT1022	ADMINT1023	ADMINT1024	ADMINT1025	ADMINT1026	ADMINT1027	ADMINT1028	ADMINT1029	ADMINT1030	ADMINT1031	ADMINT1032	ADMINT1033	ADMINT1034	ADMINT1035	ADMINT1036	ADMINT1037	ADMINT1038	ADMINT1039	ADMINT1040	ADMINT1041	ADMINT1042	ADMINT1043	ADMINT1044	ADMINT1045	ADMINT1046	ADMINT1047	ADMINT1048	ADMINT1049	ADMINT1050	ADMINT1051	ADMINT1052	ADMINT1053	ADMINT1054	ADMINT1055	ADMINT1056	ADMINT1057	ADMINT1058	ADMINT1059	ADMINT1060	ADMINT1061	ADMINT1062	ADMINT1063	ADMINT1064	ADMINT1065	ADMINT1066	ADMINT1067	ADMINT1068	ADMINT1069	ADMINT1070	ADMINT1071	ADMINT1072	ADMINT1073	ADMINT1074	ADMINT1075	ADMINT1076	ADMINT1077	ADMINT1078	ADMINT1079	ADMINT1080	ADMINT1081	ADMINT1082	ADMINT1083	ADMINT1084	ADMINT1085	ADMINT1086	ADMINT1087	ADMINT1088	ADMINT1089	ADMINT1090	ADMINT1091	ADMINT1092	ADMINT1093	ADMINT1094	ADMINT1095	ADMINT1096	ADMINT1097	ADMINT1098	ADMINT1099	ADMINT1100	ADMINT1101	ADMINT1102	ADMINT1103	ADMINT1104	ADMINT1105	ADMINT1106	ADMINT1107	ADMINT1108	ADMINT1109	ADMINT1110	ADMINT1111	ADMINT1112	ADMINT1113	ADMINT1114	ADMINT1115	ADMINT1116	ADMINT1117	ADMINT1118

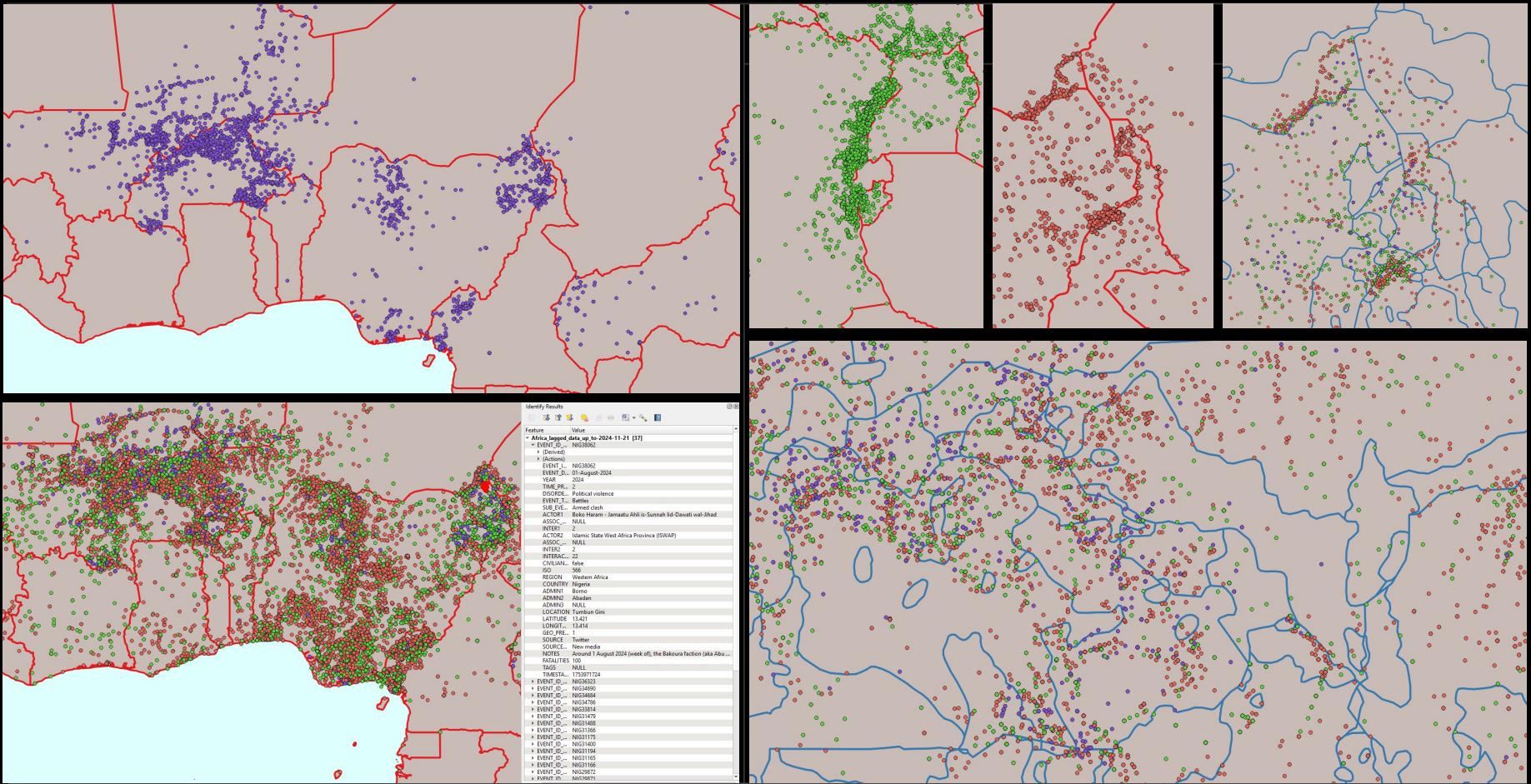


QGIS Visualization

**Provider:** ACLED  
**Dataset:** Africa  
(12-month lag)  
**Period:** 2020-2024

Symbolized by event type category

- Africa lagged data up to 2024-11-21
- Battles
- Explosions/Remote violence
- Protests
- Riots
- Strategic developments
- Violence against civilians



# Control Variables

## War Status

ACLED

Important to determine whether the area (country, region) is in a state of war.  
Helps to determine the conflict-risk of the neighborhood surrounding a cell.

## Population

NASA

Areas with more people will inherently have more reports of violent conflict.

## Road km

OpenStreetMap

Control for easily accessible areas versus areas with less motorized access.

## Land cover

Google Earth Engine

Urban areas will likely have more events reported than remote areas. Challenging terrain will also likely have an effect that should be controlled for (desert, jungle, riversheds, etc.)

## Temporal

ACLED

Control for seasonality which might affect some areas more than others.

*Consider counting number of conflict incidents per month.*

# Plan for analysis

**When two cells are otherwise similar, does the one closer to a border have a higher expected number of violent events?**

