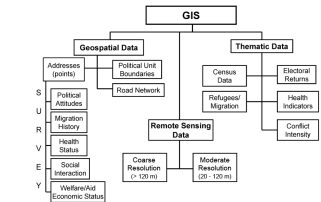# The Dynamics of Civil War Outcomes in Bosnia and the North Caucasus of Russia:
A Project of the Human and Social Dynamics Initiative of the National Science Foundation

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http://www.colorado.edu/ibs/waroutcomes/

Research questions:

- What is the character and localized distribution of economic, social, political, environmental and health outcomes of the wars in the two conflict zones?
- What factors explain these distributions?
- How can the application of an integrated methodology of individual and aggregate data that relies on opinion survey, census, governmental, and remote sensing data collection be operationalized in a spatial analysis across a variety of scales?
- Are postwar developments in the former conflict regions promoting or retarding interethnic harmony and democratic values, thus enhancing or reducing the prospects for long-term peace?
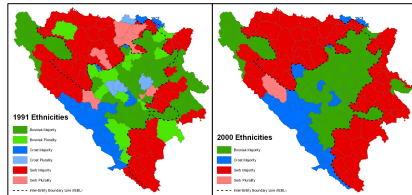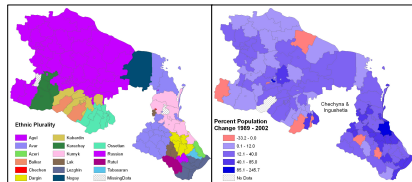

Schema of data collection and analysis.
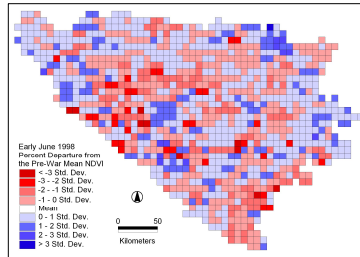
Project study areas.

Bosnia: population by ethnicity 1991 census and 2000 estimates.
Effects of migration, refugee movement, and ethnic cleansing on mixed ethnic regions.
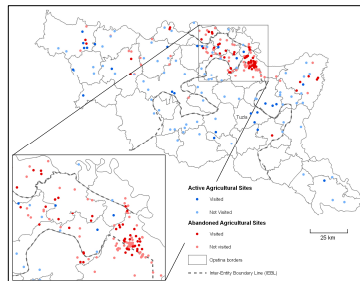

North Caucasus ethnic population and population change.
Diverse nationalities and population increase on the margins of Chechnya.

Analysis of vegetation intensity and land mine activity in Bosnia: remotely sensed 1982-2003 vegetation data from the 8 km Advanced Very High Resolution Radiometer (AVHRR).

To compare the pre- and post-war vegetation, the percentage departure of the early June Normalized Difference Vegetation Index (NDVI) from the pre-war mean was calculated for each pixel (above). Association rule mining and time series graphs reveal that heavily mined agricultural areas underwent substantial vegetation intensity increase following the war compared to unmined areas.

Moderate resolution satellite analysis used Landsat Thematic Mapper (TM) 30m data to detect abandoned agricultural land in northeast Bosnia. The above map shows the ground reference sites used to verify the accuracy of the abandoned land map. Classification of abandoned land was conducted using Quickbird 60cm data from Google Earth and achieved an overall accuracy of 84%.
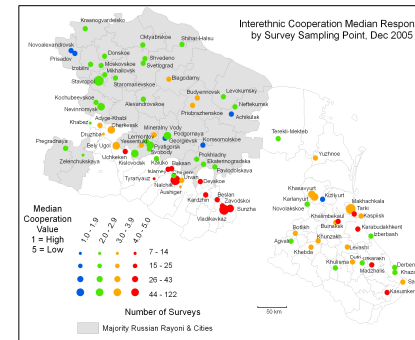
The pictures below were taken as part of the field work in May 2006.
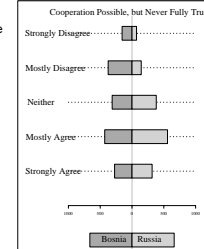

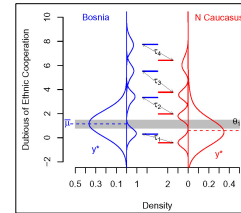**Minefield and abandoned land; destroyed homes near Bosanski Samac.**

Mixed-use agricultural land and an active demining operation, Doboj.
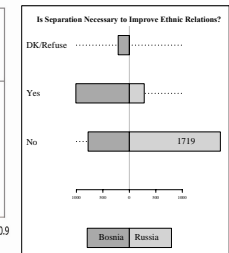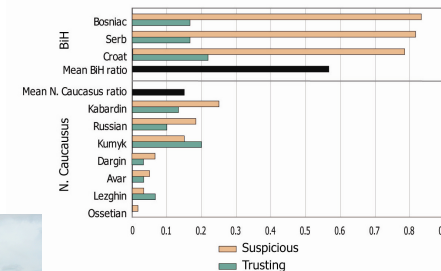

Geographic distribution of responses to a key question on the possibilities of ethnic cooperation is highly variable in both study areas. The map above shows the clustering of low scores in Dagestan and North Ossetia and the bar graph to the right shows a lower average interethnic cooperation potential in Bosnia.

The figure below shows an adjusted distribution of values for the interethnic cooperation scales based on a vignette that allows direct comparison of the two study regions.

Road checkpoint near Chechnya.

Preferences for exclusive ethnic territories are much higher in Bosnia than in the North Caucasus as the bar graphs above and above right indicate. In each region there are dramatic differences within each nationality by economic and socio-psychological factors such as responses to a general trust question. Within Bosnia Herzegovina responses vary significantly between sample points and are related to war experiences especially ethnic cleansing and property destruction (see map above right).

Orthodox shrine in Kaminica commemorating "genocide" of Serbs at Srebrenica.

Future work
- Further analysis of the environmental effects of war using satellite imagery.
- Integration of satellite data analysis with sociodemographic (census) and survey responses in a multiscale GIS.
- Analysis of social distances between individuals, communities, and nationalities from survey responses.
- Field work in the North Caucasus focused on forced migrations and local inter-ethnic tensions.

For the latest findings, see the project website at:
http://www.colorado.edu/ibs/waroutcomes/