PRIO-GRID: A unified spatial data structure

Encore meeting – PRIO, Oslo
Introduction

• Traditionally, the quantitative study of armed conflict has been carried out at the country level
• Increasing interest in spatial data and spatio-temporal data
• A shift towards spatial disaggregation of data using conflict zones, conflict events and conflict onset locations
• From country to grid cells, ethnic group polygons and sub-national administrative entities
• Wide variation in spatial data sources. Different formats, different resolutions and various coordinate systems. (e.g. Vector and raster, point and polygon)
• Key challenge: How to combine spatial data?
Introduction

- PRIO-GRID is a spatio-temporal grid structure constructed to aid the compilation, management and analysis of spatial data within a time-consistent framework.
- It consists of quadratic grid cells that jointly cover all terrestrial areas of the world.
- One grid per year.
- Not only for peace and conflict research.
PRIO-GRID

• A standardized framework for spatial data
  – Collect
  – Combine
  – Distribute accessible data

• Created to support research on armed conflict
  – Natural resources and conflict
  – Climatic variations and conflict
  – Development and conflict
  – Natural disasters and conflict
Motivation

• New questions demand new forms of information
Reducing costs

- Combine spatial data into a high quality data structure
- Free and Open-Source, no licensing costs
- Users can import their own spatial data using our shapefile
Solutions

• As Buhaug & Lujala (2005) show, there are often significant discrepancies between national aggregates and local-level conditions, and conflict zones are rarely characteristic or representative of the country at large.

• A recent wave of disaggregated conflict studies, perhaps best epitomized by the special issue of JCR on “Disaggregating Civil War” (2009).

• Three conventional departures from country level analysis of armed conflict:
  – *Sub national groups and actors:*
    • Ethnic groups as the unit of observation.
  – *Sub national administrative entities:*
    • Administrative units as the unit of analysis. Prone to change over time.
    • “Kommunesammenslåing” – The merging of municipalities.
Solutions

— *Grid cells:*

• Fixed in time and space, insensitive to political boundaries and developments
• The stationary nature of the grid structure is a significant advantage
• Allowing units of observation that are identical in shape and size and exogenous to the feature of interest
• May be scaled up or down by varying the resolution of the grid
• Ideal to generate a unified spatial data structure that can facilitate GIS-based research on civil wars
Standardization

• Why standardization?
  – Data are often incompatible. (Formats, Resolutions, Data types)
  – Time and money are wasted trying to reconcile basic but arbitrary differences.

• GIS data suffer from the existence of a variety of different formats.
  – Raster data (continuous data) vs. Vector data (point, line and polygon data).

• Alternative solution, the PRIO-GRID:
  – By streamlining spatial data in a unified grid structure, we believe the PRIO-GRID constitutes a useful point of departure for any peace scientist interested in working with spatial data.
  – Provide data without the need of knowledge about GIS operations or software in often used formats.
PRIO-GRID Structure

- PRIO-GRID is constructed by imposing a quadratic grid on the two-dimensional terrestrial plane using vector polygons.
- Each cell within the grid contains attributes stored within a table which includes variables and values for each cell in the grid.
- By default, each cell covers 0.5 x 0.5 decimal degrees, but may be constructed using other cell sizes. (259,200 cells).
- 64,818 cells contain land.
- 0.5 x 0.5 cell size corresponds to roughly 50 x 50 km at the equator.
- Small enough cells to provide multiple cells for small countries to study within country variation.
- Many spatial data comes in 0.5 x 0.5 decimal degree cell size.
PRIO-GRID South-East Asia
PRIO-GRID Content

• Two type of data
  – No or limited temporal variation
    • Infant mortality rate (2000)
    • Each cell assigned to the country covering the largest share of the cell area (plurality rule). Allows changing boundaries and change of countries
    • Country data derived from the Cshapes dataset (Weidmann, Kuse & Gleditsch 2010).
    • Distance to capitals and borders, travel time
    • Onset and incidence of armed conflicts (compatible with the UCDP/PRIO Armed conflict dataset). Spatial lags
    • Climatic conditions; temperature and precipitation, natural disasters.
    • Ethnic group data
Assigning countries to cells
Aggregating raster to cell (maximum area)
Aggregating disaggregated data

- When data are not released in country-year format, PRIO-GRID data may be used to calculate country aggregated estimates.
- For example total annual precipitation by spatial summarization.
- Another example of how country level data discriminates in state variation.
Demonstration

- How large share of Africa's population live in conflict affected areas?
- How is the variation through time?
Population in Africa

Legend
QueryLayer
- 0 - 483
- 483 - 1128
- 1128 - 2864
- 2864 - 6412
- 6412 - 13059
- 13059 - 21528
- 21528 - 35599
- 35599 - 63405
- 63405 - 133608
- 133608 - 8978730
Conflict site areas (1990) from external source
Conflict areas integrated in PRIO-GRID combined with population data
Konfliktområder integrert i PRIO-GRID

gid: 147995
xcoord: 17.25
ycoord: 12.75
population: 17614
conflict: 1
Analyse

**Population share in conflict areas**

- **Country**
- **Local**

<table>
<thead>
<tr>
<th>Year</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td></td>
</tr>
</tbody>
</table>