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# Uncovering the Structure and Mobility Patterns of the Boko Haram Terrorist Group

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The analysis of attacks perpetrated by the Boko Haram jihadist group near the Lake Chad region via a mathematical algorithm provides critical insight into the group's structure and level of coordination—two critical elements of any regional strategy to counter the attacks. The analysis suggests national borders provide some level of safety to the group.

Long-standing religious violence between Nigeria's Muslim and Christian communities precipitated the formation of the jihadist group Boko Haram and its armed rebellion against the government of Nigeria in 2009 (Oladipo, 2015). The group aims to overthrow the Nigerian government and create an Islamic state, and was designated as a Foreign Terrorist Organization on 14 November 2013 by the United States Department of State (Roach, 2012) (United States Department of State, 2018). Terrorist organisations like Boko Haram are exceedingly difficult to combat due to their elusive nature and destructive tactics.

Since 2009, Boko Haram has caused nearly 40,000 casualties and displaced 2.4 million people around Lake Chad (UNHCR, 2019). Despite Boko Haram's significant impact, its internal structure remains largely unknown and the group has been able to operate regionally in defiance of the multinational efforts of the neighbouring countries of the Lake Chad region.

In response, Nigeria, Chad, Benin, Cameroon, and Niger have formed the Multinational Joint Task Force, a mostly military-led group tasked with bringing an end to the Boko Haram insurgency. Other relevant groups are the G5 Sahel, the independent military forces of each country, the UN Office for Counter-Terrorism (UNOCT), and the Sahel and West Africa Club (SWAC). These entities may benefit from a more nuanced understanding of the movement patterns of Boko Haram.

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**Countering the Boko Haram insurgency requires an understanding of the group's internal structure and modus operandi. Analysing the sequence of events attributable to the terrorist organisation sheds light into its internal structure. This analysis is possible by considering travel costs, distances, timeframes and other factors. Using mathematical modelling to understand the level fragmentation of the organisation provides valuable information about the group's structure that can aid regional efforts to counter said attacks.**

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## How does Boko Haram operate and what is its structure?

**Boko Haram is made up of 50-60 cells—separate Boko Haram groups, which may act in an uncoordinated way**

By analysing the mobility of Boko Haram cells, we detect that the enterprise is fragmented into 50-60 cells. The analysis does not present evidence of coordination between each cell, as they move between consecutive attacks.

Assuming travel costs and distances influence the mobility of Boko Haram, we concluded that a few groups cannot be responsible for the many daily events attributed to the terrorist organisation, as this would require rapid and long-distance daily movements. We constructed an algorithm to analyse the footprint of Boko Haram, and by considering distinct mobility capabilities, we detected high levels of fragmentation in the group. (See: Figure 1)

## Progress in countering Boko Haram could be limited by high levels of fragmentation.

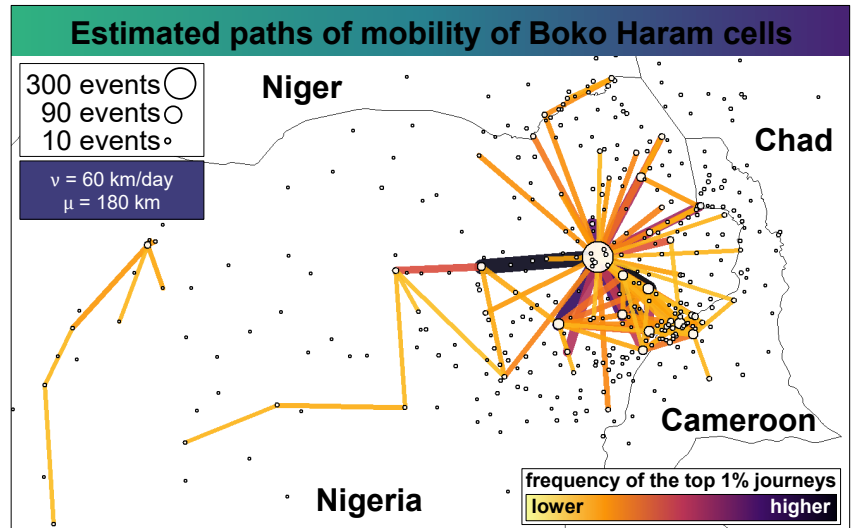
Our methodology suggests that there is no core or central Boko Haram cell, but rather, multiple cells which are equally active and violent, and perhaps some cells slightly less active. The lack of a central cell suggests that many strategic targeted interventions are needed to successfully reduce violence.

Importantly, dismantling one of the 50 presumed cells would not reduce violence in the region significantly, as each cell is responsible for 2-3% of the casualties and similarly for the number of events. Any military offensive and defensive or preventative strategies against a specific Boko Haram cell would not be noticeable in the overall levels of violence in West Africa.

## How could the terrorist group be countered?

**Significant levels of cross-border cooperation among affected countries are important to address the dimension, structure, and mobility patterns of Boko Haram.**

Boko Haram moves between consecutive attacks, thereby making it difficult to predict the location where a cell will perpetrate their next act of violence. However, our analysis makes it evident that there are some routes which are more frequently travelled by Boko Haram cells. For example, international crossings between Nigeria and Cameroon and between Nigeria and Niger.



**Figure 1: Footprint of Boko Haram in the Lake Chad region between 2012 and 2019.**

The figure shows the most frequently travelled estimated paths between two locations where Boko Haram frequently acts. The dots represent the locations where Boko Haram took part in an event between May 2012 and May 2019 according to the Armed Conflict Location & Event Data project (ACLED). The size of the circular disks or nodes is proportional to the number of events at that geographical location. The lines connecting the dots represent the movement of a cell between two locations. The thickness and the colour of the line is proportional to the number of times that we estimate a journey is made between the two locations. Examples of frequently travelled paths are between Maiduguri, the largest node, and the Cameroon border, and between Maiduguri and the Niger border. Also, the journey between Maiduguri and Damaturu and Potiskum—both located west of Maiduguri—are likely frequently travelled.

Additionally, the footprint of Boko Haram cells suggests that international borders seem to act as a mechanism for the safety of cells that have recently engaged in a violent attack (Skillcorn, Walther, Leuprecht, & Zheng, 2019). A group that committed an attack appears to seek shelter on the other side of a national border crossing from those charged with law enforcement in the country where the attack occurred. This limits the ability of the armies of any one country to counteract the threat.

Therefore, international collaboration is a key element in any security strategy to prevent future attacks, halt the mobility of Boko Haram cells, react after an event has occurred, and conduct on-site forensic analysis. The analysis of the dimension, structure, and mobility patterns of the terrorist group suggests that an effective security strategy should include significant cross-border cooperation that accounts for levels of fragmentation and the implications of national border crossings.

United States Department of State. (2018). Country Reports on Terrorism 2017 - Foreign Terrorist Organizations: Boko Haram. Retrieved November 9, 2020, from <https://www.refworld.org/docid/5bcf1f4d27.html>

**This brief draws on key findings from the journal article:**

Prieto Curiel, R., Walther, O., & O'Clery, N. (2020). Uncovering the internal structure of Boko Haram through its mobility patterns. *Applied Network Science*, 5(1), 1-23.

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1. Generating new research grounded in the logic of urban complexity;
2. Fostering the next generation of leaders that draw on different perspectives and backgrounds to address the greatest urban challenges of the 21st century;
3. Growing the capacity of cities to understand and plan their own futures;

In PEAK Urban, cities are recognized as complex, evolving systems that are characterised by their propensity for innovation and change. Big data and mathematical models will be combined with insights from the social sciences and humanities to analyze three key arenas of metropolitan intervention: city morphologies (built forms and infrastructures) & resilience; city flux (mobility and dynamics) and technological change; as well as health and wellbeing.

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Second, **Emergence** captures the essence of the outcome from the confluence of dynamics, peoples, interests, and tools that characterize cities, which lead to change.

Third, **Adoption** signals to the choices made by states, citizens and companies, given the specificities of their places, its resources and the interplay of urban dynamics resulting in changing local power and influence dynamics.

Finally, the **Knowledge** component accounts for the way in which knowledge is exchanged or shared and how it shapes the future of the city.

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