

<b>Institution: Durham University</b>
<b>Unit of Assessment: 17B</b>
<b>Title of case study: Boundary-making and resolving disputed territorial claims</b>
<p><b>1. Summary of the impact</b></p> <p>Research conducted by our International Boundaries Research Unit (IBRU) since the 1990s has improved the understanding of boundaries and boundary-making and developed end-user resources in the form of databases and digital maps. IBRU has developed processes and techniques which support peaceful dispute avoidance and resolution through an expanded notion of boundary-making on land, along rivers, and at sea. Our work has had direct impact on a range of geopolitical conflicts and disputes, particularly on boundary demarcation and dispute resolution within Africa. It has also shaped practitioner debate over jurisdictional issues in the Arctic and improved the representation of river boundaries in globally-used geospatial data products.</p>
<p><b>2. Underpinning research</b></p> <p>IBRU research on boundary-making has often been undertaken for governments and inter-governmental organisations, to underpin advice about dispute settlement. This has involved generating data on boundaries, assessing why boundaries have become problematic, and developing practical techniques for boundary delimitation, demarcation, maintenance and management. There has been a recursive relationship between conducting this (sometimes confidential) contract research on disputed boundaries and publishing academic work on the topic. Key researchers include Donaldson (DU staff 2003-2012), Pratt (DU staff 1994-present), and Williams (PDRA 2005-7).</p> <p>International treaties have focused on legal delimitations of boundaries, largely ignoring the ongoing processes of physical demarcation, maintenance and management that determine whether a boundary will be effective and problem-free over time (Reference 1). IBRU research has analysed and documented why and how seemingly well-defined boundaries may in practice have disputed locations (References 1 &amp; 2). The IBRU approach to boundary-making processes broadens attention to include all the steps from delimitation to demarcation, maintenance and management. Our research has focused on documenting boundaries, understanding the implications of demarcating and administering them in different kinds of environments (terrestrial, maritime and riverine), and considering how these practical considerations have been affected by the availability of satellite imagery and other new technology (Reference 1).</p> <p>IBRU research on <b>land</b> boundaries has revealed the extent to which supposedly agreed boundaries have not actually been fixed on the ground. The unit's research often comprises 'boundary recovery' using methods ranging from archival research to interviewing villagers about where common practice located the boundary. A particular focus has been Africa where, by 2008, only 25% of terrestrial borders were fully demarcated. In many cases only a handful of ground points were ever surveyed and some of the markers had been lost (Reference 2), resulting in issues of how to resolve ambiguous and disputed cases (Reference 1).</p> <p>Our research on <b>maritime</b> boundaries has highlighted their ambiguity and importance in potential resource conflict. The 1982 UN Convention on Law of the Sea prescribes sovereign rights within a 200-nautical-mile 'exclusive economic zone' off a country's coast, but allows more extensive claims if a 'natural prolongation' (e.g. continental shelf or submarine ridge) extends farther offshore. The UNCLOS definitions are precise-sounding but until recently were operationally vague because of limited mapping. IBRU's work includes a pioneering study of the Arctic which used newly-compiled bathymetric data from the U.S. National Geophysical Data Center to plot the outermost-possible extent of territorial claims to much greater precision than was previously possible (Reference 3).</p> <p>We have also highlighted the importance of <b>rivers</b> as supposedly convenient 'natural' boundaries, and the practical problems associated with them. Rivers constitute about one third of all international boundaries, despite the problems of fixing a permanent border when rivers have migrating or divided channels that change seasonally and over longer timescales (Reference 4). Realising the extent of riverine boundaries, we obtained a grant from the Royal Geographical</p>

Society in 2006 to develop an open-access database, the International River Boundaries Database (IRBD, 2009 and later additions and updates; available at [www.dur.ac.uk/ibru/resources/irbd](http://www.dur.ac.uk/ibru/resources/irbd)). This involved digitising over 1200 sections of river boundary from satellite imagery and connecting them to available treaty information (Reference 5). The result was to depict riverine boundaries much more accurately on small-scale maps than had been done in the only previous resource, a database developed by the Peace Research Institute in Oslo using 1990s mapping.

### 3. References to the research

(**Bold** denotes Durham University staff at time of research; journal ranks are from Scopus.)

1. **Donaldson JW, Williams AJ** (2008) [Delimitation and demarcation: analysing the legacy of Stephen B. Jones's boundary-making](#). *Geopolitics* 13 (4), 676-700. (JR 0.691)
2. **Donaldson JW** (2008) [Pillars and perspective: demarcation of the Belgian Congo–Northern Rhodesia boundary](#). *Journal of Historical Geography* 34 (3):471-493. (JR 0.429)
3. **IBRU** (2008) *Maritime jurisdiction and boundaries in the Arctic region; map and briefing notes*. Available at [www.dur.ac.uk/ibru/resources/arctic](http://www.dur.ac.uk/ibru/resources/arctic).  
For a more detailed explanation of the complexity of the definitions involved, see 2010 article by **Pratt** at [www.lecerclepolaire.com/en/documentation-uk/articles](http://www.lecerclepolaire.com/en/documentation-uk/articles).
4. **Donaldson JW** (2011) Paradox of the moving boundary: legal heredity of river accretion and avulsion. *Water Alternatives* 4 (2), 155-170 (JR 0.599)
5. **Donaldson JW** (2009) [Where rivers and boundaries meet: building the International River Boundaries Database](#). *Water Policy* 11, 629-644. (Official journal of the World Water Council; JR 0.510)

### 4. Details of the impact

IBRU's research reaches a wide range of constituencies. It has taken the expertise and knowledge gained in the underpinning research and, through its globally-unique training programme, has created knowledge exchange partnerships leading to impact on boundary-making procedures and dispute resolution, particularly in Africa. Impact has also come through knowledge transfer enabled by the development of geospatial data products: our Arctic map has informed debate among practitioners and governments over territorial and resource claims, and our high-resolution river boundary data has been adopted by Google for its mapping products such as Google Earth.

IBRU's CPD programme has impact by shaping practitioner practices. Since January 2008, IBRU has delivered 16 training workshops around the world to 453 individuals from 65 different countries including representatives from >150 organisations. These workshops covered land, maritime and riverine boundary delimitation, boundary negotiation and dispute resolution, and the use of geographic information in boundary-making. The beneficiaries include government departments (Ministries of Foreign Affairs & Trade, Ministries of Defence, Departments of Survey & Mapping or Cartography, National Boundary Commissions), non-government organisations (including the United Nations), multinational corporations (including Google and hydrocarbon companies), and academic institutions. Approximately 60% of participants were in senior political/managerial or legal/technical roles, 40% in research roles. As demonstrated below, some of them have used IBRU's training to inform specific boundary negotiations.

#### Frameworks for boundary dispute avoidance, demarcation and resolution in Africa

Africa's 53 sovereign states are divided by 165 boundaries, making it one of the most bisected continents in the world, but many of these boundaries are poorly marked. In 2007 a conference of African government ministers agreed to establish an African Union Boundary Programme (AUBP). This aimed to reduce the risk of border-related conflict and promote cross-border integration by improving demarcation across the continent.

The AUBP soon recognised the inadequacy of its existing skills base and technical capacities for the effective implementation of this aim and saw a need for "enhancing boundary delimitation and demarcation research and training capacity" (Source 1a). IBRU was recognised (Source 1b, point 10; 1c, point 13) as possessing the capacity on both African boundary history and management issues and gave presentations on these topics at the invitation-only Second International Symposium on Land, River and Lake Boundaries Management in Maputo, December 2008. This Symposium minuted the need for a handbook on procedures for agreeing boundaries. IBRU was commissioned to do this and Donaldson drafted what became, several years later,

*Creation and Operation of Boundary Commissions in Africa: User's Guide* (Addis Ababa, AUBP, 2013; Source 2). This outlines procedures for handling disputes and managing agreed border creation processes, and its production was hailed as a milestone achievement by a conference of responsible Ministers (see [www.docstoc.com/docs/113653612/Concept-Note-AA-eng](http://www.docstoc.com/docs/113653612/Concept-Note-AA-eng)). Five representatives of AUBP have taken part in IBRU CPD, some of them more than once.

IBRU has also provided technical assistance with several specific cases. This includes preparing reports on the challenges involved in the demarcation of boundaries in northeast Africa (for the Intergovernmental Authority on Development) and central Africa (for the Economic Community of Central African States), and acting as co-facilitator of Namibian boundary commission meetings in Windhoek in 2012 (Source 2, pp. 28-29). We discuss two other cases in more detail because they demonstrate the varied pathways to impact and the range of beneficiaries or affected users: governments, commercial enterprises, and the natural environment.

**Mozambique international border demarcation:** Mozambique's borders are undergoing a process of revalidation. Many of the markers of its terrestrial borders were destroyed during the 1977-1992 civil war, there are disputed claims to mineral resources on the Malawi border which was last demarcated 50 years ago, the southwest Indian Ocean is an increasingly important fishery, and there is international interest in the hydrocarbon resources in the sea bed. In 2011 IBRU helped organise training workshops as part of the Mozambique government's preparation of its baseline position ahead of AUBP-sponsored international negotiations. These workshops, run by Pratt, enabled the "development of tools and practices to achieve the conclusion of ... agreements on the maritime boundaries" through the "training of national experts... [in] boundary delimitation and boundary dispute settlement... [and] international principles and practices regarding negotiation of maritime boundaries"; they also "enhanced the ability of individuals engaged in boundary delimitation and governance to [achieve] better territorial control and governance" (Source 3). Some of the terrestrial borders remain under discussion but the IBRU-trained negotiators reached rapid agreement with Comoros, Seychelles and Tanzania on the delimitation of their mutual maritime boundaries, with three new bilateral boundary agreements, two tripoint agreements, and the revision of an existing boundary agreement providing "clarity on fisheries licensing" and "the establishment of blocs for oil and gas [exploration]" (Source 3), the latter subsequently estimated to contain up to 20 trillion cubic feet of recoverable gas.

**Resolution of a disputed internal boundary in Sierra Leone:** In 2011 IBRU conducted research for the United Nations Environment Programme to help resolve a dispute between the Government of Sierra Leone and Cluff Gold over conservation policy and resource management (Source 4a). The company holds a mining licence defined as extending to the eastern boundary of the Kangari Hills Forest Reserve, one of Sierra Leone's few remaining areas of closed-canopy forest and whose importance for biodiversity led to several \$m of funding from the World Bank's Biodiversity Conservation Project. The mineable gold reserves are estimated to exceed 2 million troy ounces (Source 4a), with a potential value of over \$2 bn. The two sides had dramatically different views about the location of the boundary, first demarcated in the 1920s and marked by physical markers mostly long since lost. IBRU used its archival and procedural knowledge on marker placement (Reference 2) to research historical documents and undertake a field survey to determine the true alignment of the reserve boundary. The resulting assessment, finalised in March 2012, showed that the reserve extends much further than the mining company had claimed. Source 4b states that IBRU's report "helped to clear the path for the government to make a decision on the way forward for the Kangari reserve [...] and helped to promote fact-led conservation in Sierra Leone and de-escalate a growing row between the Ministry of Mines, the EPA\_SL and the Ministry of Land and Country Planning". This allowed commercial development of mining outside the reserve and long-term protection of an important habitat.

### Creating geospatial data products

The second way in which IBRU's work on the practicalities of boundary-making has had impact is through using modern technology to create open-access geospatial data products. Two such products provide improved representations of marine (Reference 3) and riverine (References 4 & 5) boundaries for the public and other users.

**Arctic Ocean boundaries:** long-standing disagreements between Canada, US, Denmark, Norway, and Russia about their mutual maritime boundaries became more significant in recent years following recognition that the Arctic sea bed contains around 20% of the world's hitherto

untapped natural gas and oil reserves (US Geological Survey estimate in 2008) and that dwindling sea-ice cover may render these recoverable. IBRU's map and briefing notes on the rival claims (Reference 4) were designed to inform debate about Arctic geopolitics and resource claims. The map attracted global media interest, was downloaded over 40 000 times in the first 72 hours following its publication, and sparked intense debate in practitioner communities. Organisations which have requested permission to reproduce the map include the UK Ministry of Defence, NATO Parliamentary Assembly, Canadian Air Force, Lloyd's Exposure Management, Brookings Institution, US Congressional Research Service, and Shell Global Information Services. IBRU's map has been combined with geological resource assessments as the baseline evidence in US government position and policy documents showing the overlapping claims to economic sovereignty related to locations of hydrocarbon reserves in the Arctic Ocean (Source 5).

**River boundaries in Google Earth and Google Maps:** Errors in Google's border mapping have been cited in territorial disputes, such as between Nicaragua and Costa Rica whose mutual border is within a constantly-changing river delta. The digital files created by IBRU as part of the International River Boundaries Database research have been adopted by the Office of the Geographer and Global Issues in the US Department of State (Source 6a), who state that "IBRU's authoritative data [is] critical" for their large and small scale boundary databases, enabling them to "respond to senior policy makers on critical and fast-breaking issues". These State Department databases are publicly and freely available and are widely used by "many of the most prestigious geographic data providers" (Source 6a), including Google for use in Google Earth and Google Maps. Google testify that the database is a valuable resource (Source 6b), and the Google Earth developer blog (Source 6c) discusses how "borders will now more closely follow natural boundaries such as mountains and rivers" and exemplifies this with a river boundary represented by one of IBRU's kml files. In this respect, IBRU's research is helping to improve the accuracy of international boundary maps for millions of computer users worldwide.

## 5. Sources to corroborate the impact

Source 1: Minutes of conferences of African Union Ministers with Responsibilities for Borders:

- (a) 2008 Conclusions of 2nd International Symposium on Land, Maritime, River and Lake Boundaries Management, Maputo, AUBP/EXP/3(VI)  
[www.peaceau.org/uploads/conclusions-aubp-maputo-eng-.pdf](http://www.peaceau.org/uploads/conclusions-aubp-maputo-eng-.pdf)
- (b) 2009 Pan-African Conference on Maritime Boundaries and the Continental Shelf for the Implementation of the African Union Border Programme  
[www.peaceau.org/uploads/conclusions-accra-eng-.pdf](http://www.peaceau.org/uploads/conclusions-accra-eng-.pdf)
- (c) 2010 Addis Ababa AUBP/EXP-Min/5 (Ii) Human Resources Development for the AUBP  
[www.issafrica.org/siteimages/HR.pdf](http://www.issafrica.org/siteimages/HR.pdf) )

Source 2: African Union Border Programme *Creation and Operation of Boundary Commissions in Africa: User's Guide* (Addis Ababa, AUBP, 2013) <http://www.peaceau.org/uploads/au-3-en-2013-en-creation-a-operation.pdf>

Source 3: Testimonial from National Sea and Boundaries Institute, Office of the President of Mozambique (16 May 2013)

Source 4: (a) UNEP Kangari Hills Forest Reserve

[www.unep.org/disastersandconflicts/CountryOperations/SierraLeone/Media/KangarihillsForestReserveboundariesassessment/tabid/79573/Default.aspx](http://www.unep.org/disastersandconflicts/CountryOperations/SierraLeone/Media/KangarihillsForestReserveboundariesassessment/tabid/79573/Default.aspx)

(b) Testimonial from former Country Programme Manager, UNEP Sierra Leone (21 March 2013).

Source 5: US Energy Information Administration (2009) *Arctic Oil and Natural Gas Potential*  
[www.eia.gov/oiaf/analysispaper/arctic/pdf/arctic\\_oil.pdf](http://www.eia.gov/oiaf/analysispaper/arctic/pdf/arctic_oil.pdf); see p.13)

Source 6: (a) Testimonial letter from US State Department

(b) Testimony letter from Geopolitical Programme Manager at Google, 20 May 2013

(c) Geo Policy Analyst, Google Earth, "Improving the quality of borders in Google Earth and Maps" <http://google-latlong.blogspot.co.uk/2010/07/improving-quality-of-borders-in-google.html>