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Case study

Deriving actionable intelligence from geospatial data

RUSI

The Challenge

- Derive and share accurate, timely military intelligence using open source data

The Benefits

- Respected, actionable military intelligence
- Impactful visualisations that clarify issues
- Exceptionally high volume of research output
- Rapid creation and sharing of maps

The UK's leading defence and security think tank, the Royal United Services Institute (RUSI) uses ArcGIS to derive actionable open source intelligence from geospatial data. Researchers analyse critical security concerns and share insightful maps to inform government policy, the United Nations and major media groups around the world.

The Challenge

In the face of growing international concern about North Korea's weapons programme, RUSI's Open Source Intelligence and Analysis group launched a ground-breaking project to systematically collect and analyse open source data about the illicit movements of oil tankers in the East China Sea. The United Nations had imposed sanctions restricting North Korea's access to oil, with the aim of slowing the proliferation of weapons of mass destruction and impeding the country's nuclear programme, and RUSI aimed to uncover clear evidence of how North Korea was routinely evading these sanctions.

When this vitally important initiative, called Project Sandstone, was launched in 2018, researchers initially used open source geographic information system (GIS) software to analyse geospatial data. However, this free-to-use software was very slow and unable to digest and analyse the significant amount of open source data that RUSI was accruing daily.

The Solution

Within just a few months, RUSI switched to using Esri's ArcGIS system, a proven GIS technology that has the powerful analytical engine and geoprocessing tools that the organisation needed for a project of this scale and international importance.

Using ArcGIS Pro, RUSI was able to process and analyse transponder signals from oil tankers in the East China Sea, as well as supplementary radar and satellite data from multiple providers. It used the temporal analysis features of ArcGIS to track the routes taken by suspicious vessels, over time, on digital maps. The organisation also conducted criterion-based analysis to pinpoint the small areas of the East China Sea where secret ship-to-ship oil transfers are most likely to take place, based on average wave lengths, water depths and commercial shipping activity.

Through this approach, RUSI was able to find and track 'ghost ships' and monitor banned deliveries to North Korean ports. It leveraged Esri's cartographical tools to create high quality map products illustrating the findings of Project Sandstone and used ArcGIS Online to share information digitally. The analysis undertaken with ArcGIS informed a major Financial Times documentary.

"Fundamentally, ArcGIS is just an amazing tool for layering different streams of data to create cartographical intelligence products," says Joe Byrne, Research Fellow, Open Source Intelligence Analysis (OSIA), at RUSI. "It has all the analytical and geoprocessing tools that we need to collate many sources of data, segment geographies, analyse ship movements, annotate maps and disseminate powerful visualisations."

Following the success of Project Sandstone, ArcGIS is now being used across many more of RUSI's military research projects. ArcGIS Pro is, for example, playing a key role in monitoring the expansion of Russian military bases in the Arctic and tracking the movements of an alleged civilian ship, known to be moving Russian military equipment in the Black Sea near the Crimean Peninsula.

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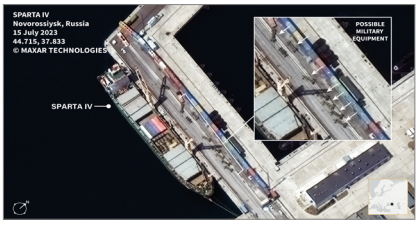
> “ArcGIS enables us to provide a service to policy makers and the general public, providing them with better data to help them understand complex military situations and make better decisions.”

Joe Byrne, Research Fellow, Open Source Intelligence Analysis, RUSI

An ArcGIS map showing Russia’s likely use of the SPARTA IV, an alleged civilian vessel, to transport military materiel from Tartus, Syria to its port in Novorossiysk



SPARTA IV possibly unloading “interesting cargo” in Novorossiysk on 15 July 2023
Sources: Maxar Technologies and RUSI OSIA.

The Benefits

Respected intelligence that informs action

ArcGIS helps RUSI to deliver precise, trusted intelligence, which decision makers can use to take action that leads to change. In East Asia, ArcGIS-derived intelligence has led to the removal of dozens of ships involved in illicit trade. “Our ArcGIS research underpinned a high-profiled investigation into sanctions evasion and directly contributed to changes in the behaviour of vessels operating illegally in the vicinity of North Korea,” explains Giangiuseppe Pili, Assistant Professor, Intelligence Analysis Program, James Madison University, and Associate Fellow, OSIA, RUSI. “In this one project alone, ArcGIS had a significant impact.”

Impactful visualisations that clarify issues

ArcGIS provides RUSI with an effective way to visualise its research and create impactful, meaningful maps that clarify what are often complicated issues. A series of 2D and 3D maps have, for instance, been created with ArcGIS to help people understand the development of North Korean nuclear test sites. “Seeing data in one map image is so powerful,” Byrne explains. “ArcGIS enables us to provide a service to policy makers and the general public, providing them with better data to help them understand complex miliary situations and make better decisions.”

Exceptionally high volume of research output

In eighteen months, two people using ArcGIS Pro generated around 500 cartographic intelligence products which have been used by organisations such as the UN Panel of Experts on North Korea and investigative reporters. According to Pili, this exceptionally high volume of output was possible due to: the simiplicity of the ArcGIS geoprocessing tools; the ability to create and use repeatable analytical processes; and the reliabilty of the ArcGIS platform. “ArcGIS is very robust, enabling us to digest a large amount of data in a very efficient way,” he says. “It is impossible to underestimate the capacity of the ArcGIS platform to process vast amounts of data and still not crash.”

Rapid dissemination of time-critical research

Critically, RUSI can produce and share ArcGIS maps very quickly to shed light on fast-changing and critical international crises. Cartographic outputs showing Russian ships evading the Baltic Convention in the vicinity of Crimea were produced rapidly and disseminated to international decision makers, providing them with valuable contextual and situational information. These ArcGIS maps were also shared with active units in the Ukraine. Pili explains, “If we cannot report intelligence quickly, the window of opportunity to react and take action can be lost. ArcGIS helps us to work under time constraints to prove where ships are as soon as possible.”

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