



# Case Studies: Use of RAAM in Real-World Contexts





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## Case Study W: Data Triangulation, Transaction Analysis

### The Challenge

An ongoing conflict has resulted in a severe regional humanitarian crisis, leaving millions grappling with food shortages, inadequate healthcare, and displacement. A complex geopolitical and security environment has created a reduced access environment in which Mercy Corps mid-level and senior management can have difficulty getting to the field. In addition, authorities have declared illegal any form of data collection for which tools and data collection plans are not approved first by authorities. These approvals are not guaranteed and usually take several months to be secured. This is profoundly affecting data collection and posing significant challenges to regular monitoring of essential humanitarian operations.

Recognizing that the multilayered challenges of the context regularly result in reduced access and cause issues for program monitoring, a Mercy Corps country office decided to use the RAAM toolkit to develop supplementary monitoring for a cash distribution program and a nutrition/WASH emergency program. The team chose the RAAM **Transaction Analysis** and **Data Triangulation** methods, as they wished to improve the quality of data from the program activities as well as uncover patterns in aid redemption and vendor market share.

### The RAAM process

In contrast to other case studies, and to adapt to the constant changes in administrative impediments and access, Preparation and Workshopping for implementation of RAAM in this case was more drawn out and asynchronous, taking place over a period of several months. Preparation for RAAM coincided with the program activity planning phase, with the MEL, program, security, and procurement teams all collaborating to select the distribution modality (vouchers) and work out distribution details.

Originally, the team sought to use a popular digital e-voucher platform, as this would most easily provide the data needed to support transaction analysis, but after further investigation, using e-voucher mobile applications or cards was determined to not be feasible due to authorities' restrictions, as

well as the low literacy rates and underdeveloped digital infrastructure in program implementation regions, which would complicate real-time data synchronization during transactions. QR codes were also determined to be less safe, and so the team had to default to generating paper vouchers with barcodes. Even this option required weeks of persistent negotiations to obtain necessary approvals.

Conducting RAAM Preparation together with program activity planning ensured that while adapting to field conditions, teams always kept the need to generate at least some transaction data in mind. While the information provided from barcodes was more limited, it still provided real-time daily redemption data that could be used to cross-check IDs with the program database and support the MEL team to conduct phone call checks in a timely manner to ensure all participants could redeem their vouchers.

Meanwhile, objectives were defined for **Data Triangulation** around increasing confidence in figures produced by the health and nutrition program activities. The program was implementing awareness campaigns through community volunteers and health services through medical centers, and the program felt that triangulation of reported figures from volunteers and centers would help increase confidence in reported results. The RAAM Data Triangulation process helped them to map different data sources and structure a useful framework for the team to compare them.

## Virtual Workshopping

Because of challenges of security, timelines, and restricted travel, RAAM Workshopping in this case was done online. Several preparatory meetings were held to plan the virtual workshop, with the program tailored to address analytical training as well as RAAM objective-setting for participating stakeholders. The main virtual workshop was held over 4 online sessions.

While the virtual workshopping phase was successful and fit the team's needs, it was an overall slower process. Since the analytical Implementation plans could not be fully finalized during the virtual sessions, additional ad hoc calls and emails were needed after Workshopping to iron out necessary details. This slowed down kickoff of the Implementation phase.

The team defined the following objectives in the Workshopping phase:

### – Triangulation

- Gain a thorough understanding of participant utilization of health services and benefits received from services in Program Region X over Implementation Period Y.
- Assess participants' engagement with and benefits received from awareness sessions conducted during Implementation Period Y.

### – Transaction Analysis

- Monitor the number of participants who travel more than 5 km within Program Sub-regions A and B to utilize the assistance they receive from the program
- Analyze market power dynamics among all participating vendors through percentage of participants redeeming vouchers per vendor
- Understand patterns of participant voucher redemption (by time, date of redemption, distribution date, and vendor) during Implementation Period Y.

As the team transitioned from Workshopping to Implementation, they encountered new challenges. First, some vendors in targeted areas were found to not have access to bar code readers or laptops. However, they did have mobile phones and access to the internet and leveraged their volunteer and staff networks to support instructing vendors on how to use the paper barcodes.

Second, after the first round of distributions, the team found that not all vendors had used the mobile app to scan codes, due to lack of experience/familiarity with the technology. The team held a meeting with vendors to discuss the problem and made demonstrations of how to scan the codes from other vendors that had used the mobile app. The team emphasized that using the barcodes is part of the vendor agreement, and the procurement team helped to reinforce the requirements to ensure that necessary data was collected.

## The RAAM Products

As of the time of toolkit publishing, the team had produced a few significant outputs from their RAAM work. For **Data Triangulation** the program teams completed a comprehensive data source mapping that they used to structure a regular Triangulation exercise, which is conducted periodically to support reporting and program reflection cycles. For example, the team determined that finance data already existed from medical centers they were supporting in certain program areas which could be of use in triangulating results from program activities reported through MEL channels.

For Transaction Analysis, after establishing the transaction data stream through barcodes (which required multiple tests and trials), a preliminary analysis was conducted to monitor participant redemption of the vouchers at each vendor. Transaction data collection is still proceeding as scheduled, with an expectation that the team will be able to address the remaining analytical objectives, and influence the program's adaptations. The program team is continuing to iterate their RAAM products to inform future activities.

## Lessons learned

### 1. Virtual workshopping can work but comes with trade-offs:

Although the virtual workshopping phase proved effective and was necessary given the challenges faced by the team, it resulted in an overall slower process and required more individual persistence to move into Implementation. In general, virtual workshopping is more achievable where the stakeholder group is relatively small (e.g. less than 10 persons).

### 2. Systematic triangulation is frequently the highest value-add for reduced access programs:

Unlike other RAAM methods that fill information gaps, structured and consistent data triangulation enhances data quality. While vital, this can be less attractive for teams at first, especially in cases where the gaps seem pressing. However, the value add of triangulation should not be overlooked – while not necessarily an “easy win”, it is oftentimes the most achievable RAAM method as well as the one with the clearest benefits for teams operating with limited primary data in complex reduced access environments.

### 3. Transaction analysis is highly adaptable:

While transaction analysis is easiest to deploy within e-voucher technology platforms, it can be done with relatively low-tech systems (e.g. paper vouchers with barcodes). This is important given the challenges of reduced access environments. It is common for teams to encounter bureaucratic or logistical challenges with e-voucher platforms, but this should not deter CVA programs from pursuing transaction analysis! In many cases, it is still very possible to establish the data streams you will need.

## Case Study X: Remote Sensing, Context Mapping

### The challenge

Following the aftermath of a severe natural disaster and ongoing conflict, a Mercy Corps country office faced significant challenges in conducting remote data validation and collecting timely information to monitor and adapt cash distribution activities in the field.

Political instability and ongoing violence in the country have exacerbated a humanitarian crisis, causing mass displacement, loss of life, and insecurity in many communities. In the early part of the year when RAAM Remote Sensing and Context Mapping methods were implemented, a natural disaster damaged farmlands, communities, and infrastructure. Later in the year, an escalation of conflict occurred, forcing more and more people from their homes and further threatening communities and aid workers. Mercy Corps teams operated remotely through implementing partners in the country, but frequently ran into barriers to accessing information from the field. With some key personnel stationed outside of the country and the security situation continually evolving, many regular data collection methods were found to not

be sufficient or feasible for the challenges facing the program. Additionally, the barriers to cross-team coordination were also high, as teams often were naturally siloed and did not know all the information the others held.

The Mercy Corps country team decided to use the RAAM **Remote Sensing** and **Context Mapping** methods to support collection and utilization of context data, as well as support identification of new project locations and rapid needs assessments across the region.

*Note that all identifying details about the context of this case study have been removed and cannot be shared for safety and security reasons.*

### The RAAM process

During an in-person workshop held to plan RAAM, representatives from all the engaged stakeholder departments kicked off their collaboration with a data mapping exercise designed to surface and provoke conversations about past information sharing challenges, as well as create a list that would be useful when working through the RAAM Matrix tools.

During the workshop, the group worked through RAAM Matrix tools for both methods and especially focused on planning roles and responsibilities, given the identified need to establish strong norms of collaboration. The Crisis Analysis team (a dedicated

country context analysis team within the office) had previous experience in GIS analysis and took the lead role in development of analytics, with other teams serving as data providers, findings interpreters, and reporters. After the workshop, the team initiated a weekly RAAM virtual catch-up meeting to govern Implementation of the finalized method plans. The weekly catch-up was led by the Crisis Analysis team and included MEL, CARM, Programs, Safety and Security, the Director of Programs, the Senior Cash Advisor, and the Partnerships team. A typical meeting agenda included:

- Progress updates on all RAAM product development and data sharing
- New suggestions for RAAM products (ex. new layers for context maps)
- Open time for refining/adding to RAAM objectives and refining the method matrix tools

The team also used a joint SharePoint page to coordinate all the RAAM data and products, with access restricted appropriately according to data security. Once teams were able to see and interact with the context maps, Programs and MEL especially expressed a desire to have the products updated more frequently and more team members requested to come to the meetings, which in turn enabled the products to be improved with more feedback and ideas.

## The RAAM products

After the workshop was held, there was a dramatic escalation in violence in key areas where partner staff were located, and it was essential not only for the safety and security team to track these threats but also for the rest of the team to be informed about these incidents. The Crisis Analysis team used maps to understand conflict dynamics and work with the security team to place field updates on maps. The team produced multiple outputs including:

- **Interactive webmaps** mapping single variables closer to real-time, from sources like ACLED, accountability feedback channels, and post-distribution monitoring surveys.
- **Flash reports with static maps** providing multi-variable analysis with more detailed map layers, distributed to a range of recipients and built with data from multiple sources, including media monitoring, conflict events monitoring, UNOSAT remote sensing-based information, infrastructure damage proxies from nightlight analysis, and primary MEL data from needs assessments and participant registrations.

The team utilized several different GIS technologies according to need, capacity, and data type, including Power BI, QGIS, ArcGIS Online, Google Earth Engine, and R Studio. Satellite imagery/data sources used included Sentinel 2, CHIRPS (Climate Hazards Group InfraRed

Precipitation with Station), and the Earth Observation Group.

The maps produced for RAAM informed program decision-makers about where hotspots for reported conflict events were occurring, and their proximity to where program partners were operating. They included information on IDP locations, topography, roads, populations, infrastructure, and areas under the control of the respective parties to the conflict, which were useful for different purposes. Depending on internet connectivity and the kind of information most needed, analysts would make use of interactive maps or static maps with brief narrative report.

In addition to the primary and secondary data sources used in the map, local networks and contacts were used to verify individual data points. Map production time varied: Security maps could be made in a day which typically focused on a specific area and involved fewer layers, while more complex maps, like those showing control areas, could take up to a week to update. On average, it took the team three days to gather data, update, and disseminate maps. Where needed to facilitate interpretation, the Crisis Analysis team communicated with country experts, security experts, and others to validate findings.

Due to the security situation, the RAAM products were used more for monitoring threats than they were used to support monitoring program activities. However, the

team continued to develop them and identify longer-term practical uses for activity decision-making. For example, some mapping products can demonstrate where there are security risks, transportation challenges, and new stakeholders in program locations to engage with or manage. The team has also begun to provide selected RAAM products and information to local implementation partners, who in turn have been more involved in collection information on a range of topics such as cash distribution modalities. These activities have also deepened more general collaboration with local partners on survey design and data analysis and visualization.

Notably, this implementation of RAAM demonstrated an interesting and effective integration of methods. For example, the team produced context maps that included layers from typical context mapping sources (for example INSO, the UN, and partner data). They also included layers derived from remote sensing that could help quantify the natural disaster's impact in different locations. These layers were produced by working through the Remote Sensing RAAM tools to identify objectives and match them with data sources.

### Why Combine Methods?

Different methods have different strengths. For example, remote sensing can often fill information gaps or can be used to verify primary or secondary data sources, and it made sense to bring in remote sensing to understand how the aftermath of the natural disaster was likely still affecting communities that the program could not visit to assess. However, in a context where program analysts and leadership were fully remote, remote sensing information alone is not likely to be reliable and comprehensive enough. Most remote sensing indicators are proxies for the things that humanitarian implementers really care about. For example, analyzing nightlights (a proxy for infrastructure damage) and vegetation (a proxy for impact on agricultural livelihoods) helped illustrate but could not fully answer the program's questions about community needs.

Combining the remote sensing information in a context map with secondary sources on conflict and market dynamics enabled more nuanced analysis. In one of the RAAM maps, analysts created an index using media reports, reports from other aid actors, information from field networks, and satellite imagery layers (e.g. nightlights) to score vulnerabilities of different communities, helping to identify priority areas of implementation.

Moreover, the maps that demonstrated the aftermath and damage of the natural disaster produced by the Crisis Analysis team were as key data sources in a successful program proposal and were distributed externally to donors and INGO partners who provided positive feedback.

### "Deep Dive" Dissemination

Communicating the findings of RAAM is an important piece of the puzzle. In this case study, RAAM focal points held virtual sessions with the program team to do deep dives into the interactive maps, giving team members time to ask questions and request data for different implementation areas they were interested in.



## Lessons learned

### 1. Context changes can disrupt RAAM implementation without derailing it

- At one point, due to the onset of escalated conflict, the MEL team was unable to develop as many of the RAAM products as they had originally planned. However, they moved forward with developing some products and, were planning on working with the Crisis Analysis team to further develop the products to support MEL work.

### 2. Identify existing capacity and plan for backstopping

- In this case, RAAM development benefited greatly from the involvement of analysts with prior mapping experience. Those analysts had access to and familiarity with different conflict data sets that allowed them to move forward quickly with product development and adapt the products on the fly. However, several team members who had roles in RAAM Implementation left the organization shortly after the workshop, causing some confusion and delay about who would be able to fill their roles as no alternate or replacement had been designated.

### 3. Collectively debate and assign roles and responsibilities

- It might be tempting to have Senior Leadership simply assign relevant roles and responsibilities for RAAM Implementation. However, while leadership likely has the most comprehensive

view of the team's structure, context, and capacity, Implementation works better when teams have a chance to express their interest in different tasks and give input on the decisions.

### 4. It can take time to build practice around using RAAM products

- Uptake and utilization of the context maps was initially slower than expected, as teams were preoccupied with the security situation. However, with time the maps showing the impacts of the natural disaster, and the aftermath proved useful for the program and MEL teams to target assistance, and after being shown the maps and having time to brainstorm, the MEL team identified ideas for how to adapt and use the maps further for routine monitoring, representative sampling, and program decision-making.

### 5. Cross-departmental collaboration requires dedicated time

- Creating norms of collaboration among previously siloed teams is difficult. In this case norms were developed through a slow process of the RAAM leads assisting the MEL and program teams on specific data processing and analytics tasks, building trust and norms around data sharing.

## Case Study Y: Data Triangulation, Context Mapping

### The Challenge

An ongoing conflict in several regions of a country has exacerbated the humanitarian situation, but security concerns limit the ability of program staff from the Mercy Corps country office to directly collect information about the conflict's impact on IDP movements and market access. The Mercy Corps program teams face challenges in making decisions about where and when to target cash and shelter activities.

In 2023, one of the programs in this Mercy Corps country office decided to implement RAAM to help monitor activities. In addition to the conflict-related security concerns that limit staff movement, ability to conduct high-quality monitoring is affected by unstable internet connectivity and the need to receive approvals from multiple government bodies for program activities. To address these challenges, the team chose to use the RAAM **Data Triangulation** and **Context Mapping** methods to support monitoring of cash distribution and shelter provision activities.

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### The RAAM process

After selecting methods, the RAAM Leads conducted Preparation over the course of several months, gathering background documents and planning the agenda and session facilitators. Workshopping took place in-person, with representatives from different stakeholder departments in the program gathering for a week to set Implementation plans for the two methods. Departments included MEL, program and field management, Community Accountability, Cash and Shelter teams, and Crisis Analysis (i.e. the country office's dedicated context analysis team). Since the program and Crisis Analysis staff had not previously worked together on program-focused analytics, the workshop agenda included considerable time for the different stakeholders to discuss their perspectives and build a foundation for collaboration.

Using the RAAM matrix tools for Triangulation and Context Mapping, the group was able to brainstorm specific monitoring objectives for each method. For context mapping, priority objectives were:

1. Monitor trends in security incidents in Region X during program cash distribution periods (armed opposition groups, military)

2. Monitor trends in influxes of new IDP arrivals into locations being served by the program (number of displacements/movements in and out of towns, location of IDPs, camp and host communities)
3. Understand level of market access by IDPs, host communities, vendors, and transporters
4. Track the most recent status of availability of financial service providers (POS agents) and mobile service providers
5. Understand availability and suitability of land for emergency shelter construction

For data triangulation, the team prioritized two monitoring objectives:

1. Triangulate level of market access in the region by comparing context mapping information to other sources
2. Estimate shelter needs by comparing different sources reporting on locations and numbers of displaced persons

With objectives defined, the workshopping team used the method matrices to list and assess available data sources that could serve each objective.

### Using Data that Already Exists!

The country's Crisis Analysis team was already collecting data on events happening in program areas and tracking narratives or rumors from local community sources. This data included important and relevant information on IDP movements, camp closures, IDP-host community relationships, food insecurity/malnutrition, community livelihoods and needs, agriculture/farming activities, security incidents, and more.

**Prior to RAAM**, this information was being collected to identify topics for further in-depth crisis analysis, but *engaging in cross-departmental reduced access analysis changed the way that the team used their information*. CA data provided important inputs to the RAAM context maps and triangulation process with *no additional data collection or costs required*.

Data source identification and assessment benefits from collaboration! MEL, CA, Accountability, and technical Cash and Shelter program staff each had perspectives on the feasibility of using different data sources such as community leader reports and security assessments for triangulation. Because of the discussions held during the workshop, analysts could move forward with a complete understanding of the strengths and weaknesses of the data they were using.

Collaboration in humanitarian programs is always demanding. The pace is fast, and oftentimes staff are extremely busy, which makes gathering information in a timely manner challenging. Recognizing this, the team used the workshop and method Matrix Tools to set a realistic plan for roles and responsibilities to implement RAAM, developing RACI charts for each method that identified who was responsible for what tasks between the different teams. A crisis analysis team member was already serving as RAAM Manager and was responsible for coordinating the RAAM system and tasks between teams and disseminating findings to key stakeholders. Data was organized and cleaned by three members of the MEL team, and shared for analysis with the CA team. A Programs team lead was identified as the decision maker responsible for all actions and program adaptations associated with RAAM findings.

High staff turnover rate is often a reality in humanitarian aid. In this country office, several staff who were assigned roles in the workshop subsequently transitioned out of the organization. RAAM was able to continue due to the persons assigned most of the critical roles (the RAAM Manager and several persons who had roles in data management and analysis) remaining with the organization. Without this continuity, implementing RAAM may well have stalled.

Ensuring data protection was a high priority, since multiple teams needed to share information to make the RAAM analytics work. The team developed a RAAM database during implementation and assigned access permissions to sensitive data according to the roles identified in the workshop. They also developed a separate RACI specifically for data security and access.

## The RAAM Products

### Context Mapping

Not long after the workshop, the program saw an anticipated seasonal increase in conflict, due to landscape conditions that make it easier for conflict actors to plan attacks. These incidents impact the well-being of local communities the program serves and pose challenges to humanitarian operations in the region. During seasonal increase, persistent threats from conflict actors occurred, including violent clashes in proximity to identified program locations. A total of 21 conflict incidents were mapped and reported during the season, and after analysis of the overall trends in incident location and damage the team concluded that the security situation was not likely to escalate into a major conflict, that market access still remained free, and the influx of IDPs into program communities was limited.

The Crisis Analysis team worked with other teams to verify the data points, map instances of active conflict, clashes, and movement restrictions, and validate overall findings with local contacts. **Data triangulation** was often used to reinforce confidence in the overall picture.

The program team was one of the most frequent users of the context map, tracking where security incidents were happening, how close they were to intervention areas, and considering what the likely impact would be, for example on displacement. The MEL team also was able to use the map to give context to certain

performance indicators; for example, they were able to better explain the movement of people to and from the markets. In addition, a learning event was held after the first two context maps were published, and they were used during the event to give context to indicator results.

The team also actively used RAAM findings for decision making. The data showed that there was not a large influx of IDPs into program implementation areas because of the nature of the security incidences, and therefore, cash interventions did not take place and shelter interventions were also delayed. This supported the team in making decisions to not utilize resources where they were not needed. Using information from the context map, program decision makers also decided to continue with shelter interventions for IDPs already settled in camps.

### Data Triangulation

Given the frequent changes in access for the program team to the program region, triangulating cash and shelter information became critical. For example, for shelter the team needed to have a reliable estimate of the number of new arrivals to determine if shelter was needed and what kind (for example emergency versus transitional shelter), but could not reliably gather this information directly from the field. Two primary sources identified in the RAAM workshop were volunteers in the field and a local multi-organization coordination

group. The Displacement Tracking Matrix from the International Organization for Migration was then identified as a third source to triangulate against. The team identified a cross-departmental group of analysts who would collaborate on collecting and sharing different sources to produce regular reports to be shared with interpreters and decision-makers.

Triangulation also needed to be flexible to context shifts. For example, the team received unexpected reports of a rumored official suspension of cash interventions. A pause in cash programming in this context could have immediate and severe repercussions for vulnerable communities, and so the responsible triangulation analysts immediately gathered information through their governance and external engagement manager, who spoke with local sources and government agencies who confirmed there was no truth in the rumor. The team followed the RAAM triangulation steps to identify sources to triangulate this information and avoid devastating consequences for the program.



## Lessons learned

### 1. The Workshopping phase is critical but not definitive

- The team's Workshopping phase had pre-identified all the critical data sources and objectives for the analysts to meet, greatly speeding up the analytics development process and allowing the team to quickly produce outputs from RAAM. However, the process of Implementation should result in analysts trying out ideas and iterating the products without feeling constrained by the Workshop consensus. In this case, analysts noticed that while the workshop planning group only anticipated needing a monthly context map update, some key data sources were updated weekly and performing a weekly analysis to track trends made it easier for them to more easily produce a monthly update. This also enabled the team to potentially flag concerning or important trends before the monthly update that other teams needed to be alerted to.

### 2. Focusing on existing internal data can help build buy-in and enthusiasm

- While RAAM methods can bring significant value in helping teams to make better use of available secondary data sources (and they are critical for many purposes), making better use of internal primary data sources can in many cases feel more rewarding and exciting to teams.

## Case Study Z: Remote Sensing

### The Challenge

A program is implementing road rehabilitation activities remotely, targeting improvements to more than 35km of roads in a region of a country affected by an ongoing civil war. While the implementation region is not currently experiencing conflict, program staff still cannot travel to the area and the work is done entirely by subcontractors. Without a ground presence, the program faces issues with planning and monitoring progress of asphaltting work.

Before starting with RAAM, the program team had had ideas about trying to use remote sensing data to help understand traffic and travel patterns in the implementation regions, and even potentially trying to monitor road networks to identify additional areas in need of rehabilitation. However, the team had not put their ideas into action, in large part due to uncertainty about what was possible.

In December of 2023, the team decided to use the RAAM **Remote Sensing** method tools to clarify realistic, concrete objectives for monitoring of

road rehabilitation activities and develop a plan to accomplish them.

### The RAAM process

Because the team was small and mostly located in the same office, they chose not to hold a formal workshop but instead conduct a series of meetings to work through the RAAM steps. The MEL team took the lead in developing RAAM, assigning a RAAM Lead from their team and coordinating different stakeholder departments. The RAAM Lead took charge of reading through the RAAM guidance and using the decision tree to make an initial evaluation of the feasibility of remote sensing in their context. Afterwards, the program team convened and used the remote sensing Matrix Tool as a foundation for discussion, working to identify objectives and indicators as well as discussing what kind of maps would support decision-making.

In discussions, the importance of weather conditions for the success of rehabilitation activities came through clearly, and the team settled on two objectives: (1) monitor newly asphalted roads in the project implementation area after rehabilitation work, and (2) provide the implementation team with relevant satellite-derived weather data to support effective work scheduling.

The team revisited the **feasibility decision tree** provided by the RAAM toolkit during discussions to help the team ask the right questions, identify potential sources of data, and set realistic expectations of what

a final product may look like. For example, the team determined that studying traffic on the roads was not possible due to limited data availability and excluded it from the objectives. The decision tree also prompted the team to ask themselves new questions to better define what they were trying to achieve, such as:

- Do we want to monitor only road rehabilitation in our target area, or are there reasons to monitor the indicators outside of those boundaries?
- Do we want to use, or can we use, historical data on weather and roads in this area?
- Who needs to be consulted to ensure proper and safe implementation (e.g. Security teams)?
- Do we have the skills on our team to do the analysis?

The process of working through the decision tree and Matrix Tool led to a concrete set of indicators and a recognition that to move forward, they would need to recruit additional expertise. Although the team had three members already familiar with GIS technologies and analysis, they had too many responsibilities to take on new analysis, and therefore the team decided to leverage some available budget to bring on a GIS contractor to develop the remote sensing analytics. After a month of recruitment and contracting, they were ready to begin.

## The RAAM products

Working with the GIS contractor, the team completed several steps to get to a final analysis. First, they recorded GPS points for the locations of road rehabilitation activities, and worked with the program team to confirm the data was valid and up to date. Using those points, they were able to identify 5 clusters of roads (and associated regions) that were priorities for monitoring. The team made use of UNOCHA imagery published on the Humanitarian Data Exchange detailing road polygons in the region as part of this analysis.

Next, the GIS contractor identified a suitable satellite weather data source: the Advanced Baseline Imager (ABI) from the [GOES-R Terrestrial Weather \(ABI/GLM\)](#) product from the United States National Oceanic and Atmospheric Administration. The contractor worked with the team to overlay the road clusters data layer with satellite imagery of the region and various weather data layers derived from ABI, all on a webmap. Finally, the team added a layer on subdistrict/community population size in and around the implementation region, to help estimate the impact of the road rehabilitation.

Once the map was finalized, the layers included:

1. GPS points of rehabilitation activities (completed, ongoing, and planned)
2. Satellite imagery data for pre- and post-rehabilitation roads
3. Forecasted weather at rehabilitation sites, especially humidity and temperature
4. Population size of communities in the area.

Overall, **development of the full map took 1 month** after the GIS contractor came on board and Implementation began. The team relied on the [ESRI](#) ArcGIS platform for webmapping, and worked with their IT and procurement teams to get access to a Pro version of the non-commercial ArcGIS license. The process required contacting customer service and providing legal and financial documentation and took another week to get access to the platform. The team chose ArcGIS largely due to familiarity with the platform and its ability to work with and access the chosen remote sensing data, and the contractor was able to use its features to program the map to update in real-time.

During the development of the product, the team faced challenges validating the remote sensing analysis. The team worked with the GIS expert to define the boundaries (polygons) of the different road clusters to be monitored, and these polygons allowed analysis of changes over time using different imagery indices that could help monitor rehabilitation progress. However, natural features such as bumps in the roads, curved terrain, and other differences affected the reliability of the analysis, and while local contacts were helpful for confirming certain changes in the roads and surrounding areas, they could not provide extensive enough data to fully validate the analysis.

After extensive research, the team decided to use a drone to take photos of the areas – especially the roads – to serve as validation data, which could then be used to calibrate the satellite imagery analysis. Given the complex operating context, the team worked closely with the organizational security leads before deploying this strategy to ensure safety of team members and communities. The team used the **RAAM Information Dissemination** guidance to help them reach out to the community and inform community leaders of what they were doing.

## Decision-making

The team decided to disseminate information from the remote sensing-based map in three ways:

1. Giving access to the interactive map to key team members
2. Issuing a weekly brief report
3. Sending emergency notifications of any critical findings over email.

Since the map was updated in real-time, it was shared just once with the program team for them to use in regular monitoring the status of road rehabilitation. The weekly briefs and any emergency notifications supported construction scheduling, as conditions would frequently change and for example cause the team to cancel pre-scheduled work.

Given the sensitivity of the operating context and the need to safeguard locational data, the team paid close attention to data protection throughout the process, ensuring that all activities followed applicable laws as well as their own organization's robust data security policy.

## Lessons learned

### 1. Preparation and Workshopping are essential

- Though the team did not do a formal workshop, the MEL leads still worked through the steps and were able to clearly articulate their needs, discard options that were found to not be feasible, and set realistic objectives. They collaborated with the program team, safety and security, IT, and procurement to set a practical plan that had buy-in and approvals. This process, while it demands time and engagement, made it possible to complete Implementation in a short time window.

### 2. Finding you don't have the expertise you need is not the end

- Many teams are scared off use of analytical methods like remote sensing because of the perceived complexity and difficulty of the analysis. The analysis is not always as difficult as it seems, many derived data products and simple indices exist that can be used by data analysts without extensive geospatial background, and the RAAM tools help teams to identify these options. However, oftentimes the kind of analysis needed to meet the objectives requires geospatial expertise which the team does not possess or (as in this case) cannot spare. When that happens, recruiting short-term expertise to help you is a feasible option. *Support from consultants/contractors does not have to*

*be expensive or lengthy, especially where teams can provide a well-defined scope for the project with desired indicators, primary data sources, and needed outputs.*

### 3. Time spent investigating secondary data sources can save far more time in analysis

- According to the team, finding existing UNOCHA data on the region's road networks likely cut the time required for RAAM product development in half. This existing data source was of immense importance to the satellite imagery-based analysis, and would have had to be created from scratch otherwise.