IWT Challenge Fund Project Information

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Project Reference	IWT008
Project Title	Technology and Innovation Against Poaching and Wildlife Trafficking
Country(ies)	Kenya
Contract Holder Institution	Stimson Center
Partner Institution(s)	**Kenya Wildlife Service, Linkoping University, iHub**
Total IWT Grant Value	£120,000
Start/End Dates of Project	1 February 2015/31 January 2017
Project Leader's Name	Johan Bergenas
Project Website/Blog/Social Media	https://www.stimson.org/programs/project-ngulia
Report Author(s) and Date	Johan Bergenas, February 14, 2017

1.   Project Summary

Over 5,900 rhinos have been killed by poachers in recent years. The U.N. Secretary General, national governments, and independent NGOs have drawn direct and indirect links between wildlife crime and transnational criminal organizations, insurgencies and even terrorist organizations in Africa. Sharply declining wildlife populations also have significant economic consequences. Approximately 10 percent of Kenya's Gross Domestic Product (GDP) comes from the tourism sector, where rhinos and elephants are star attractions, making their disappearance a significant economic threat. The Kenya Wildlife Service (KWS) is fighting to protect the animals, but rangers are overstretched, underequipped, and in need of new tools, training and partnerships. In prospecting for this project in 2013 and 2014, Stimson learned that capacity-building efforts must be locally driven and designed from the bottom-up. Under this IWT grant, Stimson piloted exactly such a ranger-oriented technology and training project partnering with a range of Kenyan and international public and private sector actors.

Instead of creating new plans for the organizations on the ground, we assisted in implementing already existing strategies. In its current strategy – the Conservation Management Strategy for the Black Rhino in Kenya – the KWS identifies two overarching goals: (1) grow the national black rhino population by 15 percent, from 650 to 750; (2) and reduce rhino deaths from poaching to only one percent of the total loss. Stimson supported the KWS in facilitating the protection of the black rhinos at Ngulia Rhino Sanctuary, which numbered 60 when the project launched. We designed the project keeping in mind that the KWS must be able to replicate and scale it if they so desire throughout Tsavo National Park, where Ngulia is located, and in other parks. As such, the project has the potential to continue providing protection for a growing number of rhinos and other wildlife, even after the conclusion of this grant. As evidence of the buy-in achieved, the KWS published a report about our efforts midway through the project (attachment 1). A MoU between the key partners were also concluded (attachment 2)

The KWS and affiliated law enforcement agencies were the key targets of the project. Up to 100 rangers, officers, commanders, and wardens were targeted as being directly impacted. Ultimately, although far beyond the scope of this project as Project Ngulia is a small technology

pilot project, our efforts sought to introduce a more effective approach to building a sustainable tourism sector while also curbing illicit financial flows to transnational organized criminals and terrorist organizations in the region. As such, our approach met several intersecting objectives in Kenya and East Africa more widely. Safeguarding the rhino and other star species is critical to the tourism sector particularly as this sector is one of few economic sectors in Africa, according to the World Bank, where women are well represented as employees and managers. As such, in the long run, the project is part of a movement to ensure economic opportunities for African women. There is also a growing body of evidence that suggests that transnational organized criminals and terrorist organizations are benefiting from the ivory and rhino horn train and, in turn, use the revenues to carry out attacks and conduct nefarious activities that hamper foreign direct investment, trade, and other aspects critical for development in Kenya. A lack of security resulting from rhino poaching therefore inhibits poverty reduction and societal development. This project worked against these trends with short-term impact on park personnel and communities in the surrounding areas, and long term impacts for the economic growth of the country, benefitting all Kenyans, men and women alike.

As a result of the nature and scale of Project Ngulia, direct positive impact on communities outside of Tsavo West National Park (for example Voi and Mtito Andei) is hard to assess. However, there are two measurable improvements over the course of the project that impacts the surrounding areas positively. First, only one recorded successful poaching attack took place vis-à-vis Ngulia indicating a general decline in violence in the area. Second, the project facilitated the introduction of improved connectivity in the area, boosting the signal to 3G, benefitting the general area and its people around the Tsavo West National Park.
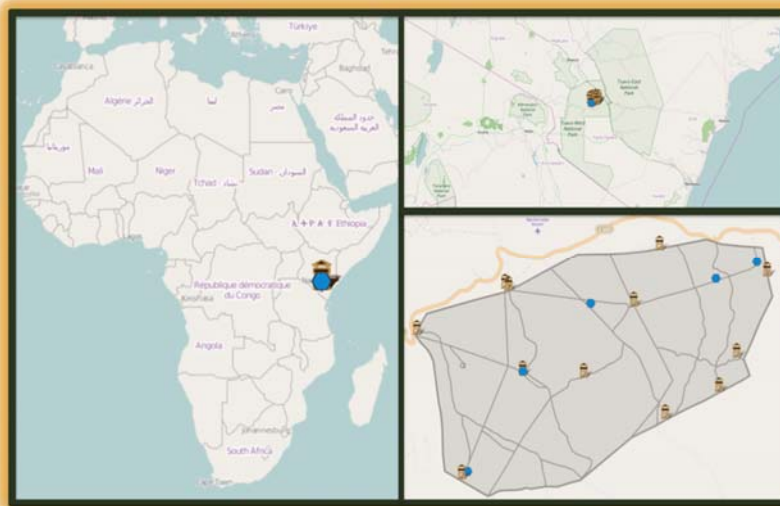
The Ngulia Rhino Sanctuary is located in Tsavo West National Park
in southern Kenya as shown on the above map.

2.   Project Achievements

2.1 Outputs

Output 1: Establishment of a C3 system including deployment of hardware and development of software

The first full version of the C3 system, including hardware, was launched in the field in late 2015, including 47 smartphones for rangers and five tablets for commanders and researchers with the required C3 software (see attachments 3, 4, 5 for illustrations, manual and posters detailing the project and that are available to the users in the field). Additionally, cloud-based database to collect data gathered using the software was launched. During this phase Stimson and partners provided ongoing deployment assistance, including, on average, monthly visits to Ngulia or KWS HQ to manage implementation and provide training and educational support (see attachments 6 and 6 for pictures of the design and commander training). Additional assistance was provided across Ngulia's 9 blocks, focused on smart solutions for power

preservation at the ranger stations, as well as installation of solar panels and new batteries to charge the units.

Every month, the Ngulia commander has access to a summary report from the collected data. Below is a summary of that data indicating ranger patrol coverage between August to November 2016. At the time of the submission of this report, data was being prepared for December 2016 and January 2017.
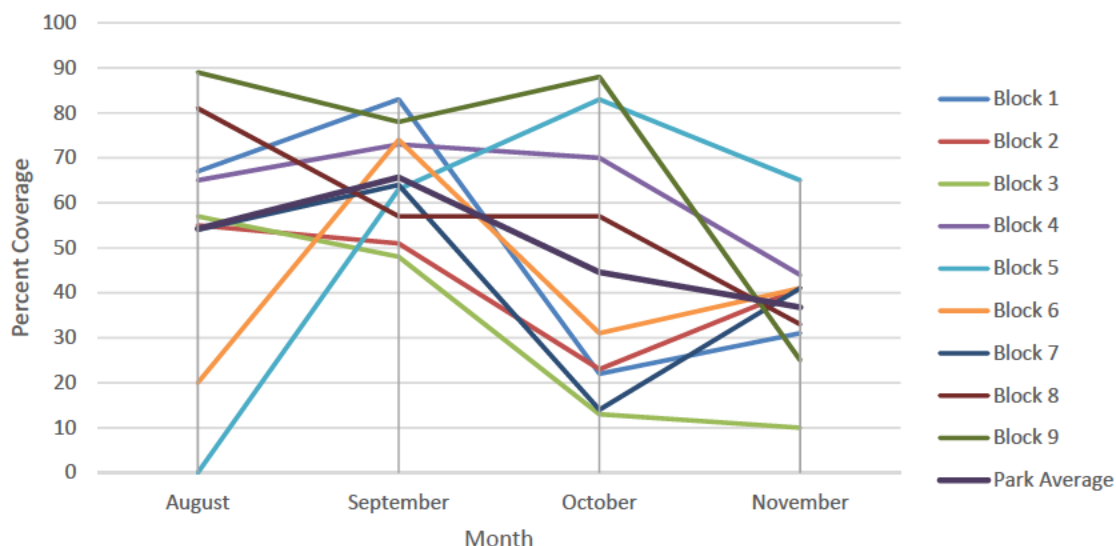
In addition, the C3 system collects security alerts – including footprints, reports of suspicious people, weapons and the like, as well as reports on rhino sightings. A summary of the collected data follows:

Total number of rhino reports between August and November 2016: 251

Total number of alerts, such as footprints, firearms, poacher sightings, fires and other key information, between August and November 2016: 181

Output 2: Deployment of the radar surveillance and sensor system for perimeter control

Starting in 2015, Stimson met with several companies and experts (in the US, Canada, Sweden, and Turkey) to identify a good radar solution for Ngulia. We also brought together a wide-range of technology experts in a two-day planning meeting to make a radar selection, including invitations to critical stakeholders, such as the KWS and Linkoping University. Ahead of this meeting, project partners tested some of the candidate technologies at Kolmarden Wildlife Park (see attachments 8 and 9 for radar coverage and radar tests). At the end of the year, we selected a Turkish company, which subsequently offered to deliver its radar pro-bono.

Based on data captured through the C3 system, Stimson and partners at Linkoping University, iHub, and KWS chose a site for the radar in 2016. The decision was informed by poaching locations, vulnerabilities in the sanctuary, connectivity strength, and data processing considerations.

We also initiated information sessions during our visits to Ngulia with the KWS focused on radar technology and its functionality.

Unfortunately, as a result of internal upheaval in Turkey, the radar company is experiencing some significant challenges, which impacts its ability to take on, at the moment, the partnership with Stimson. Additionally, the Ngulia Rhino Sanctuary recently replaced its commander, the head of the rangers in the park. This means that additional training and education of the C3 system is necessary as the new commander is crucial for the operations. Project partners have already begun this process and have planned training and education in January, February and March 2017. Stimson's change request to this end has been approved (attachment 10). Because Stimson has a sustainable exit strategy,

work on deploying the radar will continue by existing project partners, led by Linkoping University.

Output 3: Final project report that is accessible and publicly available

The Stimson team, on a monthly basis, analyses the data generated by the C3 system and delivers that data to the KWS. The aforementioned graph represents a summary of that data, which is highly sensitive and not for public consumption because it would pose a risk to the rangers and the rhinos. Stimson has published a publicly available report that can be found at https://www.stimson.org/NODE/28208.

2.2   Outcome

The outcome for this project is: "100 fully trained and equipped Kenya Wildlife Service rangers, officers, commanders and wardens protecting 10% of Kenya's black rhino population at the Ngulia Rhino Sanctuary in Kenya's Tsavo West National Park; a scalable and replicable gold standard technological system for wildlife protection."

There are 47 deployed smartphones, 5 tablets and training manuals servicing the rangers at Ngulia, including software in the park generating data on a monthly basis as previously discussed. Throughout the project period, we estimate that between 80 and 90 rangers and commanding officers have been fully trained on the equipment (the estimate is as a result of excessive staff turn-over in the park during the project period). During our last visit to Ngulia in December, we assessed the rangers' knowledge of and ability to use the technology and also reviewed the data collected. These assessments were conducted at the individual and group level and we conclude, taking into account the data submitted, that the current rangers and commanders are comfortable with using the system.

Additionally, our conversations with park management have confirmed an improved capacity to safeguard the sanctuary. For example, during one of our qualitative interviews with the commanding officer in charge of Ngulia, he reported that he "is now able to see the area of coverage [as a result of the data collected and displayed] and make informed decisions on where rangers need to improve in their patrol…"

Throughout the project period, we have executed 20 training missions together with our project partners. We also conduct service and maintenance over phone and through emails as needed.

The rhino population within Ngulia has stabilized and even grown over the project period. KWS Tsavo West staff had identified 60 rhinos in the park at the outset of the project period. We are proud and eager to report that not a single rhino was poached between the beginning of the project and the end of 2016. Unfortunately, in late December 2016, when many rangers are on holiday leave, we received word of a poaching incident that killed two rhinos.

The most recent Ngulia rhino census reported 84 rhinos in Ngulia. This is an increase of 40 percent, which is substantially higher than the national goal 15 percent. It is impossible to know to what extent our particular project has contributed to this positive trend in Ngulia, but our project has played a significant part in creating a more professional ranger force that can rely on data driven analysis to protect the rhinos. While it is impossible to know for sure, Project Ngulia has played its part in a broader KWS effort to deter attacks on the Ngulia sanctuary.

Finally, aligned with our final outcome, the project has generated interest among other wildlife institutions and countries, including Malawi, which the project is currently in conversation with to replicate the project. Pending resources, the KWS leadership and staff on the ground has also expressed interest in expanding the system to cover the entirety of Tsavo West National Park, starting with the so-called intensive protection zone, a 3000 square kilometre areas outside of Ngulia. As previously noted, several partner organizations have agreed to continue the project beyond the initial project period.

We have consistently featured the C3 system to other wildlife organizations hoping that they would adopt the technology. We learned the competitive nature of the environment community and encountered push-back from many large NGOs challenging our technology as a replication

of tools that already exist. In order to manage this challenge, we generated a side-by-side comparison to some existing systems and how ours offer advanced features (see attachment 11). As the project continues, project partners will continue to seek to convince other wildlife organizations to adopt the technology generated from Project Ngulia. Stimson and project partners are very pleased with the fact that almost all serious wildlife organizations are now adopted Project Ngulia's bottom-up approach to wildlife security. Early on in our project we encountered many high technology efforts, like deploying drones, like World Wildlife Fund, specifically. Today, many organizations, including WWF, have turned to bottom-up efforts integrating communications, sensors, and more advanced technologies on a step-by-step basis.

2.3 Impact: achievement of positive impact on illegal wildlife trade and poverty alleviation

The impact of this project is to "grow Kenya's black rhino population to 750 animals and limit species loss as a result of poaching to 1% by 2016. By protecting key assets to the tourism industry, assist in generating employment and economic development."

By creating a solution to combat poaching that is both replicable and scalable, Project Ngulia – which has contributed to a near zero percent poaching rate in the sanctuary – is a contribution to the global fight against illegal wildlife trade. For example, National Geographic has invited Stimson to partner on safeguarding marine protected areas by integrating technological systems after a robust feasibility assessment, similar to how we carried out project Ngulia. We have also been in discussion with members of the Malawi parliament and there is initial interest to replicate the model in that country. The interest generated in the project demonstrates the applicability and relevance of the technological solution to a variety of other natural environments, including marine protected areas, combatting illegal logging, and mining. Additionally, Project Ngulia is on track to be a strong force for improving the long-term economic development and human welfare in surrounding communities and across the region.

Compared to larger development and environmental projects, this technology project should be viewed as an incubator for much bigger initiatives. It is therefore extremely difficult to make any judgements to its broader poverty alleviation impact besides that it is focused on benefitting the tourism industry that is a driver for poverty alleviation. Please see Question 7 for a discussion on the project's contribution to human development and poverty alleviation.

Stimson has also worked diligently briefing several Kenyan government agencies throughout the project period, including the Office of the President's border security team. At every opportunity, we have participated in briefings and roundtables to inform as many government officials as possible of our efforts to raise awareness and increase capacity of how technology can help with combatting the poaching problem. Similarly, Stimson has been invited to brief and make presentations about the project to UN and government organizations around the world. We have made over a dozen presentations throughout the project period to such diverse groups as the United Nations Development Programme, the UN Counter-Terrorism Executive Directorate, and the Swedish International Development Agency.

3. Monitoring of assumptions

The three assumptions upon which Stimson built Project Ngulia did not change. They are:

1. The KWS is eager to adopt new methods and frameworks to combat poaching.

2. The implemented technology and processes perform as planned, and it will serve as a deterrent to poachers.

3. Ngulia and Kenya have the capacity to continue training and border protection after the project completion.

The enthusiastic participation of the KWS in Project Ngulia, as well as their willingness to expand the project throughout Tsavo West, supports our first assumption. Our most significant measure of monitoring this was that the project received full support from the KWS senior leadership, including a new director that was appointed during the time of the project. The

second assumption has held true as evidenced by the near absence of intrusion into or poaching within the sanctuary since the introduction of the system. We monitored this assumption by tracking poaching incidents and interviewing KWS staff following census exercises that counted the animals. Steps by KWS and other partners to continue the project beyond the IWT grant prove our last assumption. This assumption is monitored by the fact that the KWS is continuing to execute the project with partners beyond Stimson's active participation.

4.   Project Partnerships

The fundamental premise of Project Ngulia was that investments – of resources, technology, knowledge, and time – from a wide-range of public and private sector organizations in Kenya and around the world could be used to leverage the IWT Challenge Fund's investment. Stimson is proud to announce that since the project began, we have secured financial, technical, and in-kind partnerships totalling over $ We are also proud to announce that as Stimson's IWT grant comes to an end, the project does not. Several key partners have agreed to move this initiative forward.

Overall, the following benefits have been identified for each sector that is directly or indirectly involved in the project:

The **Kenyan Government** is the project's primary partner. The project has enabled the government to implement programs involving technologies it otherwise would not have access to in order to achieve national priorities. Throughout this project, a wide-ranging knowledge was transferred to the Kenyan Government, including – at the broadest level – an enhanced understanding of the potential of technology to solve problems in a cost-effective manner.

Our **university partner** offered and received research value, developed new technologies and products, integrated technological systems, and identified new value for off-the-shelf security technologies in emerging parts of the world.

Our project offers **multilateral organizations** – like the United Nations and World Bank – a replicable and scalable case study on how to develop cross-sectorial, capacity building initiatives in emerging and developing regions. Such initiatives can benefit a wide range of security and development priorities.

Our project gives the **technology and telecommunications sector** an opportunity to showcase their products in a real-world environment, demonstrating the products' effectiveness in new markets and building market opportunities across a wider, less conventional customer base. Participating firms educate their prospective customers about what products can help solve discrete challenges while also exercising pragmatic corporate social responsibility. In addition, the companies are able to prove that their sector and products can be partners with donor countries that are executing capacity building projects in other regions across the security and development continuum. Finally, our project served as a launching pad for telecommunications companies to participate in larger capacity building projects with more traditional business models.

During the project period, the following institutions joined the efforts: the Kenya Wildlife Service, Linkoping University, iHub, Kolmarden Wildlife Park, Airtel, Nokia, Vinnova, Metsekan, SAAB Technologies and Modio. We would like to highlight some key partners and their contributions to the project, as well as some challenges encountered by the project team.

Linkoping University: From the beginning, Linkoping University made a firm commitment to executing Project Ngulia by providing financial and technical resources to help design, develop, and deploy the communications, control and command system (C3). In addition, Linkoping launched a new university initiative specifically focused on wildlife security and technology. Linkoping also developed a technology testing center to pilot more advanced technologies – including radar and other sensors – for integration in the command, control, and communications system deployed in Ngulia. The test center is on the grounds of the Kolmarden

Wildlife Park in Sweden. Linkoping has made a long term commitment to supporting the KWS in carrying this project forward through developing, testing, and deploying new and appropriate technologies. Linkoping has agreed to support wildlife security efforts and technology research and development on an annual basis of approximately $███████ This progress symbolizes one of several sustainability achievements from Stimson's IWT Challenge Fund project, namely to bring in new sectors and resources that fall beyond the scope of the conventional conservation community.

Kolmarden Wildlife Park: We were granted free access to test technologies at the Swedish Kolmarden Wildlife Park and have taken advantage of the opportunity to test technologies ranging from software to drones. These tests have been critical to the overall objectives and success of the project. Kolmarden has also featured our work during its tourism seasons, which draw some 700,000 visitors to the park, and subsequently highlighting the project to a much larger crowd than otherwise possible.

iHub: Widely recognized as East Africa's most prominent Information & Communications Technology (ICT) hub, iHub partnered with the Stimson Center on Project Ngulia. At the suggestion of the team at Linkoping University, iHub was assigned to evaluate the user group (the rangers, commanders and researchers), to develop the code for the mobile application, and to act as frontline technology trainers. Stimson assigned iHub this portfolio to ensure local ownership of the project and to contribute to the sustainable development of the Kenyan ICT sector. The 8-person iHub team includes developers, designers, trainers, and project managers. Linkoping University has had regular contact with the iHub team and have transferred a tremendous amount of technical knowledge and experience. As a result of this project and their unique partnership, iHub and Linkoping University are better equipped to tackle wildlife crime and other development challenges by using technology in innovative ways. In the last 12 months, iHub has engaged the Ngulia rangers, commanders, and researchers in ten user-experience, development, and training exercises. iHub has also invested in this project on a commercial and pro-bono basis, which demonstrates the value they see in participating in Project Ngulia's activities. Linkoping and iHub are currently planning for the next phase of this partnership.

Airtel and Nokia: Stimson secured a Memorandum of Understanding (MoU) with Airtel – the fourth largest telecommunications company in the world – to support the project with in-kind contributions, including data bundles, support and service for SIM cards, etc. Securing support from an additional Kenyan organization was a success for Stimson in terms of ensuring the longevity of Project Ngulia after the conclusion of the IWT Challenge Fund grant. Stimson also facilitated a dialogue between Airtel and the KWS that has continued and will outlive Stimson's direct involvement with the parties. Stimson fostered these relationships with the aim of encouraging and growing public-private sector partnerships in Ngulia. In addition, Stimson facilitated a partnership between Airtel and Nokia to improve the connectivity at the Ngulia site. Nokia provided the financing and technical expertise, in partnership with Airtel. This upgraded connectivity does not just support the C3 system at Ngulia, but is a benefit that extends to other KWS projects and communities in the surrounding areas, with implications for poverty reduction and development at large. Fostering partnerships and collaborative engagement is a strength of Project Ngulia's that will sustain its efforts and strengthen the local community for years to come.

Metsekan: Following the C3 design, development and deployment, radar technology is a critical step of the project. This is a complicated technology, but the project, after careful analysis by Linkoping University, partnered with a Turkish radar company that agreed to build a radar for Project Ngulia as an investment in the project. Throughout 2016, Stimson planned for and was part of the testing of the radar system in anticipation of deployment in Ngulia. Stimson, through its technology partner Linkoping University, also secured the software and deployment support necessary to deploy this radar in accordance with the project plan. However, as a result of internal upheaval in Turkey (attempted coup in June 2016), the radar company is experiencing some challenges, which impacts its ability to take on, at the moment, any further partnership with the project. Additionally, the Ngulia Rhino Sanctuary recently replaced its commander, the head of the rangers in the park. This means that additional training and education of the C3 system and radar deployment is necessary as the new commander will have to be brought up-to-date on the technologies. The remaining Project Ngulia team has

already begun this process, having planned training sessions in February and March 2017. Stimson previously submitted and received approval for this change from the IWT.

The Kenya Wildlife Service: We continue to have good working relationships and we have solidified partnerships with the organizations mentioned above, as well as additional groups, during the course of project. We are particularly proud of our management of KWS HQ transitions, including the Director General position, as well as rangers and commanders being transitioned in and out of the project.

Other Kenyan government agencies: Stimson has worked with or briefed several Kenyan government agencies throughout the project period, including the Office of the President's border security team. At every opportunity, we have participated in briefings and roundtables to inform as many government officials as possible of our efforts.

United Nations: Stimson is frequently invited to brief and make presentations about the project to UN and government organizations around the world. We have made over a dozen presentations throughout the project period to such diverse groups as the United Nations Development Programme, the UN Counter-Terrorism Executive Directorate, and the Swedish International Development Agency.

5.   Project support to the IWT Challenge Fund Objectives

Project Ngulia supports the second objective of the IWT Challenge Fund, "Strengthening law enforcement and the role of the criminal justice system" by training and equipping law enforcement rangers in the Ngulia Rhino Sanctuary to prevent, detect and deter illegal poachers, as well as gather evidence against them to strengthen prosecution in courts.

6.   Impact on species in focus

Black rhinos in Africa continue to suffer from an onslaught of illegal poaching and the rising demand for illegal wildlife trade. Our C3 deployed at the Ngulia Rhino Sanctuary is a powerful tool to reverse this trend. Currently, it has successfully contributed to protecting the Ngulia rhinos from being poached as previously described, growing the population from about 60 to over 80. The deployment of this system for the entire black rhino population would have a profound impact on the survival of the species altogether. The investment into this project has also contributed to a broader deterrence value in Tsavo West National Park.

7.   Project support to poverty alleviation

Project Ngulia is a small technology pilot project. As a consequence, it is nearly impossible to assess the direct impact of our efforts on poverty alleviation. As the initiative continues to grow, the longer-term socioeconomic effects of the project will begin to unfold. Project Ngulia is, however, part of a broad initiative to protect the world's wildlife, which is intimately connected to a range of broader development goals. That said, there is certainly room to reflect on the potential role of Project Ngulia in poverty alleviation.

The local communities that depend on Ngulia and Tsavo West National Park for tourism revenue are being impacted in the same way as the rest of Kenya, which has seen a double-digits decline in tourism between 2013 and 2014. With the tourism sector losing up to $455 million in 2014, private industry has been severely impacted around Tsavo and indeed throughout Kenya. Further, KWS park entry fees dropped about 12.5 percent from 2012 to 2013. Those numbers have struggled to recover due to the security situation in Kenya and threat to the rhino and elephant populations. In turn, the major tourism industries – lodging, drivers, food, beverage, guides and the like – in the largest population centres around Ngulia/Tsavo West (Voi with a population of about 17,000 and Mtito Andei with a population of about 5,000) are experiencing a decline in customers and consequently in revenue. For example, in November 2014, management at the Ngulia Lodge, which is located adjacent to the Ngulia Rhino Sanctuary, informed staff that none of its personnel on short term contracts (a majority of the total work force) would be renewed. This is one example of a broader trend across the Ngulia and Tsavo West communities. Indeed, as a result of the decline in wildlife tourism, another lodge, the Voi Wildlife

Lodge, has begun targeting conference tourism over wildlife tourism. In an interview with a Kenyan national newspaper, the Voi Wildlife Lodge's General Manager complained that today tourists in Tsavo "see more cows than wildlife." Facing this reality, the lodge had to adapt its outreach. The revenue from conferences and other local tourism will not match that brought in by foreign tourists eager to see exotic wildlife.

While this project is a technological solution that will reduce poaching and wildlife crime in Ngulia/Tsavo West, an important indirect effect of increased physical security at the park will be increased economic security for the adjacent communities. This incidental benefit manifests in several ways: greater confidence among the Ngulia business community, higher employment rates, to name just a few. The pilot project at Ngulia aims to be part of the solution to the economic hardships facing the communities at Mtito Andei and Voi, as well as in building a foundation for protecting communities across Kenya through wildlife security. Project Ngulia's impact is being felt in surrounding communities. The communities, for example, are enjoying greater 3G connectivity, which will in turn help local businesses thrive. These indirect impacts will continue as the project continues by other partners.

8.   Consideration of Gender equity issues

Safeguarding the rhino and other star species is critical to the tourism sector in Kenya, particularly as this sector is one of few economic sectors in Africa where women are well represented as employees and managers, according to the World Bank. As such, in the long run, the project is part of a movement to ensure economic opportunities for African women.

9.   Lessons learnt

There have been many lessons learnt during this project that have continually informed the project and helped project leaders adapt and improve strategies for success. The most important lesson learnt is how to attract private enterprises to invest in projects like this. It became clear very quickly that seeking partnerships with Corporate Social Responsibility departments at companies would not secure the type of technology assistance we required to be successful. Therefore, we built a business case and demonstrated the market opportunities for technology companies that wanted to get involved. We argued that our targeted high technology and telecommunications companies would get an opportunity to showcase their wares in a real world environment, demonstrating their effectiveness to new markets and building market opportunities across a wider customer base. We also suggested that participating firms would have the chance to educate their prospective customers about what products can help solve discrete challenges while also exercising pragmatic corporate social responsibility. In addition, we argued that the companies would prove that their sector and products can be partners with governments and organizations that are executing capacity building projects in other regions across the security and development continuum. Finally, the pilot project is a launching ground to participate in larger capacity building projects where a more traditional business model is in place.

We also discovered that technology projects require hybrid teams. As we built our team, we consulted with biologists and environmental policy experts. We engaged with the defense industry and academics. We came to realize that environmentalists probably shouldn't be in charge of integrating a complex technological system. In the same way, it makes no sense to put technological experts in charge of environmental issues. Yet, a great deal of the technology projects that we came across over the last few years have been led by people and organizations with comparatively shallow knowledge of technology. The long-term commitments from Linkoping University and other partners have been invaluable in filling out the team's expertise. Perhaps most importantly, we are not beholden to a particular technological solution or manufacturer. Our focus is on using data and other evidence to pair the end-user with the most effective technologies.

Our final takeaway was this: the most advanced technology is not necessarily the best suited to solve the problem of wildlife poaching. Unmanned aerial vehicles, a popular technology to fight poaching, can be part of the solution, but drones are rarely the first step, or the second, and

maybe not even the third. Most park rangers today use basic phones, electrical fences, and manual checks for footprints to fend off intruders. The next step in their technological evolution is not a drone system – that comes later. The point here is that we need to build bottom-up solutions fully focused on the current capabilities of the end-user, the rangers.

For the Stimson Center, engaging in a hands-on project like this was ground-breaking. We would not have been able to be successful if it wasn't our ability to leverage staff from other partner organizations, including project managers, user experience professionals, designers and developers.

9.1 Monitoring and evaluation

Project partners have engaged in regular monitoring and evaluation throughout the project. The iterative development of the C3 system incorporated monitoring and evaluation processes such as key informant interviews and focus groups to identify weaknesses and strengths of the system, which then informed technology updates and improvements.

As many of our indicators are quantitative – number of KWS rangers trained, number of C3 systems deployed, number of poachers discovered and/or apprehended, number of rhinos in the park – we have been able to easily track our indicators regularly throughout the lifespan of the project. Mid-year and annual data collection on these quantitative indicators as well as on qualitative indicators through interviews and focus groups measure the impact of the project against our baseline, as well as inform our ongoing efforts to tailor and customize the project to meet the needs on the ground. There have been no changes to the M&E plan over the reporting period.

9.2 Actions taken in response to annual report reviews

The reviewer of last year's annual report requested us to respond to, in our final report, the following comments, which we do accordingly below:

It would be useful to set the anti-poaching successes mentioned in the report, against statistics from other areas (including Tsavo West and East National parks, and elsewhere, where black rhinos are found). I.e Can the 0% poaching at Ngulia be claimed to be due to project intervention, or are general levels of poaching, countrywide, also reduced? Cause and effect? Perhaps make mention of the number of poaching 'incidences' within the Sanctuary that were recorded and thwarted due to the C3 system. (Outcome indicator no. 2)

The reviewer is correct that judging cause and effect directly from efforts under Project Ngulia is very difficult. According to one Kenyan government officials during a meeting in Washington, DC organized by IFAW, Kenya has seen a positive downward poaching spiral overall. Other sources, however, say that poaching levels have remained the same. It is impossible to truly know to what extent Project Ngulia has contributed to the relative success of adding and safeguarding the rhinos in Ngulia, and losing only two during the project period. We do feel strongly based on our quantitative and qualitative efforts, however, that we have contributed to a deterrence value, as well as to the professionalization of the ranger force in Tsavo West National Park.

Ensure visibility for IWT Challenge Fund / British Government support on material produced by the project

Stimson has a 30-year track record working on some of the most difficult global security challenges worldwide. Our storied success hinges on engaging local buy-in among our partners. One challenge with prominently featuring our funders, like the United Kingdom, on such materials like training manuals, etc., is that it could send the message that the project does not belong to the rangers but rather to the United Kingdom or to Stimson. In order to enhance local engagement, we frame Project Ngulia as a KWS-owned initiative (http://projectngulia.org/assets/Uploads/KWS-PublicReport-w-Front-final-PRINT-copy.pdf), supported by Stimson with backing from the Government of the UK. We do, however, feature the UK as a backer on Stimson's website. We also recognize the UK government as a funder of

our work during our public appearances, including at an [event](#) in Washington, DC, on January 13.

10.   Other comments on achievements not covered elsewhere

11.   Sustainability and legacy

Project Ngulia has received substantial amounts of attention within Kenya and East Africa more broadly for its innovative and highly collaborative approach to combatting poaching. Project lead Johan Bergenas has been asked to speak in multiple local, regional, and international fora about the project and lessons learned in the field. The exit strategy of Project Ngulia remains the same, which is to create Academy Ngulia, a training facility and convening center for technological solutions to protect wildlife and enforce protected areas. Linkoping's long-term commitment to the KWS rangers at Ngulia Rhino Sanctuary as well as that of many of our private sector partners will ensure that the Academy will come to fruition and continue to be a hotbed for technological innovation in wildlife security for years to come.

12.   IWF Challenge Fund Identity

Stimson has tried to find a good balance between promoting the UK generous support to the work, while still making sure that the project receives the necessary buy-in on the ground. As noted above, the UK Government is noted on Stimson's website as a supporter, and project lead, Johan Bergenas, recognizes the support from the UK government at project events. Project partners have similarly recognized the project. For example, Linkoping created a stand alone website, www.projectngulia.org. In addition, Project Ngulia is a project under the program Partnership in Security and Development program at the Stimson Center.

13.   OPTIONAL: Outstanding achievements of your project during the (300-400 words maximum). This section may be used for publicity purposes

14. Finance and administration

This section seeks information about the finances of your project **over the course of the whole project**. Please amend the financial years in the tables to suit the reporting period and add/remove rows in the sub-tables if necessary.

14.1 Project expenditure

Complete the expenditure table below, providing a breakdown of salaries, capital items and explanations of 'Other' costs. If the budget was changed since the project started, please clarify the main differences. **Explain in full** any significant variation in expenditure where this is +/- 10% of the approved budget lines**.**

Project spend (indicative)	2014/15 Grant (£)	2014/15 actual IWT Costs (£)	2015/16 Grant (£)	2015/16 actual IWT Costs (£)	2016/17 Grant (£)	2016/17 actual IWT Costs (£)	Total Original Grant (£)	Total actual Costs (£)	Comments (please explain significant variances)
Staff costs (see below)									
Consultancy costs									
Overhead Costs									
Travel and subsistence									
Operating Costs									
Capital items (see below)									
Others (see below)									
TOTAL									

Staff employed (Name and position)	Cost (£)
Johan Bergenas, Senior Associate	
Ariella Knight, Research Assistant	
Brian Finlay, President & CEO	
Miles Abadilla, Communications Specialist	
Jim Baird, Communications Director	
Nakia Bell, Grants and Contracts Manager	
TOTAL	

Capital items – description *Please detail what items were purchased with fund money, and where these will remain once the project finishes*	Capital items – cost (£)
TOTAL	

Other items – description *Please provide a detailed breakdown for any single item over £1000*	Other items – cost (£)
Report Design	
TOTAL	

14.2 Additional funds or in-kind contributions secured

Source of funding for project lifetime	Total (£)
Linkoping University	
Airtel	
Nokia	
SAAB in-kind development of technology platform	
TOTAL	

Source of funding for additional work after project lifetime	Total (£)
Linkoping University to make its own investment on a yearly basis	
Airtel to continue to support the project in-kind (estimate dollar commitment)	
Nokia to continue to support the project in-kind (estimate dollar commitment)	
TOTAL	

14.3 Value for Money

Stimson was generously provided £120,000 grant from the UK government. We were able to leverage that amount and secure over £510,000 in in-kind partnerships.

Annex 1 Project's original (or most recently approved) logframe, including indicators, means of verification and assumptions.

Impact

Reduce rhino poaching and the illegal trade in rhino horns with a view towards socio-economic development and human security in Kenya.

Outcome

The Kenya Wildlife Service, through technology deployment and training at the Ngulia rhino sanctuary, will have improved its ranger, commander and research force to protect the rhino population from poaching and more effectively combat the illegal trade in rhino horns. As a result, security will improve and Kenya's rhino population will grow, leading to increased levels of tourism and as such a more stable income stream for the local community around Tsavo West where Ngulia is located. Under Academy Ngulia, the tech and training initiative will serve as a model for other national parks in Kenya and throughout Sub-Saharan Africa.

Measuring outcomes – indicators

Indicator 1	Rangers will have the ability to collect and analyse poaching incident and intrusion data. Building a technological system that can clearly identify security threats toward Ngulia is a major part of the pilot project. Today, such a system does not exist (baseline). However, through surveying the animal database and interviewing staff at Ngulia since September 2013, the Stimson team estimates that at least five rhinos have been poached in the last few years and near monthly intrusion incidents are taking place (baseline). The monitoring of animals is currently based on a manual system and does not provide reliable data for poaching incidents and intrusions attempts. The C3 focusing on security capacity building at Ngulia, to be deployed starting January 2015, will allow for systematic and instant data collection at the sanctuary, which will provide for a more accurate baseline and, by September 2015, will result in rangers' ability to log 100 percent of poaching and intrusion incidents. It is important to keep in mind that a major problem that the overall pilot project seeks to solve is rangers, officers and commanders current inability to adequately generate reliable data from which they can alter their counter-poaching strategies.
Indicator 2	A zero poaching and intrusion rate will be achieved as a result of the technology deployment and staff training that the project provides. Building a technological system that can assist rangers and officers to deter and respond to poaching and intrusion attempts at Ngulia is a major part of the pilot project. Today, such a system does not exist (baseline). Protecting the sanctuary is based on patrols and the use of unsophisticated technology, including insecure communications technology. As previously noted, through research and interviews, Stimson estimates that at least five rhinos have been poached in the last few years and near monthly intrusion incidents are taking place (baseline). With added sensor and radar technology, as well as with

	the help of additional training, by the end of the project period, January 2017, a zero poaching and intrusion rate will be achieved as a result of the technology deployment and ranger, commander and research staff training.
Indicator 3	Approximately 35 rangers and officers at Ngulia will be trained on and will actively use the C3S and sensor and radar technology. Today, no such equipment and training are available to rangers (baseline). In addition, the Kenya Wildlife Service will be taking active steps to expand our security system beyond Ngulia and into the immediate intensive protection zone (4x the size of Ngulia), the broader Tsavo area and possibly to other locations within the country. Additionally, by the end of the project period, an additional 35 to 50 rangers and officers will be receiving the benefits of the technology and training. The success of our security model will also be generating interest in scaling and replicating it in other African countries that face poaching challenges, and will be on track to become the new gold standard for wildlife protection in the region. For example, Peace Parks have demonstrated interested in replicating our tech and training model to 10 of their countries of interest. However, for the purpose of this conclusion of this pilot project, Stimson aims to complete the protection of Ngulia, and subsequently see the beginning of scaling the project to the intensive protection zone around Ngulia, which measures four times the size of Ngulia.

Verifying outcomes

Indicator 1	Surveys and feedback from KWS personnel in Ngulia.
Indicator 2	Analysis of the data collected through C3S, sensor and radar systems, as well as KWS records in annual reports and the like. Independent sources, such as media reports, will also be used.
Indicator 3	The KWS, Peace Parks and the African Wildlife Foundation have demonstrated interest in scaling and replicating this technology and training system. Stimson will work closely with these organization to verify this indicator.

Outcome risks and important assumptions

Assumption 1	KWS is eager to adopt new methods and frameworks to combat poaching
Assumption 2	If the implemented technology and processes perform as planned it will serve as a deterrent to poachers
Assumption 3	Ngulia and Kenya have the capacity to continue training and border protection after the project completion

Outputs

Output 1	Today, there is no reliable or secure communications system in the Ngulia rhino sanctuary. By September 2015, Ngulia's 40 rangers, commanders and research staff will be equipped and trained with a smartphone- and tablet based command, control and communication system.
Output 2	A change request was submitted and approved for output 2. While all preparations were made to deploy the radar in January 2017, circumstances beyond Stimson's control resulted in a delay in the deployment.
Output 3	Final project report that is accessible and publicly available

Measuring outputs

Output 1	
Indicator 1	Deployment and a fully functioning C^{3}S, including hardware and software applications
Indicator 2	Ngulia rangers are properly trained on the new technology
Indicator 3	Project team is gathering data on improved ranger ability to safeguard the sanctuary

Output 2	
Indicator 1	Installation of sensor and radar technology
Indicator 2	Appropriate personnel are trained and equipped to utilize sensor and radar surveillance technology
Indicator 3	Sensor/radar systems are fully functioning to provide full area coverage

Output 3	
Indicator 1	Report is published and available
Indicator 2	
Indicator 3	

Verifying outputs

Indicator 1	Data is collected on ranger use of C3 system
Indicator 2	Interviews are conducted with guards and wardens on the perceived changes to border security
Indicator 3	Data is gathered from regional partners and other rhino sanctuaries in the area

Output risks and important assumptions

Assumption 1	Project partners are capable and fully committed to the project through its completion
Assumption 2	Ngulia infrastructure is prepared to handle the installation of all new systems
Assumption 3	The equipment is sensitive enough to develop good working data
Assumption 4	Reaching the full budgetary needs of the project, including possibility of procuring advanced technology beyond the initial deployment of software.

Activities

Output 1	
Activity 1.1	Organize meeting of the implementation team
Activity 1.2	Project lead, Bergenas, coordinates with iHub and Linköping to develop software system
Activity 1.3	Bergenas works with project partners on installation of the new system

Output 2	
Activity 2.1	Organize meeting of the implementation team
Activity 2.2	Bergenas coordinates with Linköping technical experts to determine best placement of necessary sensors/radar
Activity 2.3	Project lead advises on the training of KWS rangers to incorporate best practices of border security

Output 3	
Activity 3.1	Collection of data from ranger use of C3 system
Activity 3.2	Monitoring and evaluation of the project through site visits and conducting interviews with key personnel
Activity 3.3	Analysis of various data and writing of a final project report

Annex 2   Report of progress and achievements against final project logframe for the life of the project Logical Framework

Project summary	Measurable Indicators	Progress and Achievements
Impact Grow Kenya's black rhino population to 750 animals and limit species loss as a result of poaching to 1% by 2016. By protecting key assets to the tourism industry, assist in generating employment and economic development		While this project is a technological solution that will reduce poaching and wildlife crime in Ngulia/Tsavo West, an important indirect effect of increased physical security at the park will be increased economic security for the adjacent communities. Project Ngulia's impact is being felt by improved connectivity and increase in rhinos, critical for many businesses to thrive as they depend on tourism for their livelihoods.
Outcome 100 fully trained and equipped Kenya Wildlife Service rangers, officers, commanders and wardens protecting 10% of Kenya's black rhino population at the Ngulia Rhino Sanctuary in Kenya's Tsavo West National Park; a scalable and replicable gold standard technological system for wildlife protection.	Indicator 1: At least 50% of KWS staff participates in initial training Indicator 2: Rhino population within Ngulia stabilizes and grows over the project period Indicator 3: Generated interest in replicating this system by other wildlife institutions and countries	We had a total of 100% of KWS rangers participate in 20 trainings over the course of these two years totalling engagement with circa 100 rangers, commanders, researchers and other KWS staff. There were 60 rhinos in the park at the outset of the project period, and we are proud and happy to report that not a single rhino was poached between the start of the project and until late December 2016. In the most recent census, the rhino population in the sanctuary stood at 84, which is a 40 percent increase since the project started. It is impossible to know exactly to what extent our project has contributed to this positive change, but we have participated in a broader deterrence trend vis-à-vis poaching and the rangers are more professional and technologically savvy than when we started. Beyond this project period, the consortium that Stimson put together will continue executing the project and seek to scale and replicate it elsewhere. This represent a sustainable exit strategy for Stimson. Finally, aligned to the last measure for our outcome, the project has generated interest among other wildlife institutions, companies and academic organizations (see partner section) for continuation, replication and scaling, including Malawi that are currently examining its viability.
Output 1. Establishment of a C3 system including deployment of hardware and development of software	Indicator 1: Deployment and fully functioning C3 system, including hardware and software applications Indicator 2: Ngulia rangers are properly trained on the new technology Indicator 3: Project team is gathering data on improved ranger ability to safeguard the sanctuary	The first full version of the C3 system, including hardware, was launched in September 2015 in the field with 47 smartphones for rangers and five tablets for commanders and researchers delivered (all including the C3 software). A cloud-based database was launched. During this phase Stimson and partners provided on-going deployment assistance, including near-monthly visits to Ngulia to manage ranger, commander and researcher questions and concerns with the C3 system and how to use it effectively. Additional assistance was provided to Ngulia's all blocks focused on smart solutions for power preservation at the ranger stations, as well as installation of solar panels and new batteries.
Activity 1.1 Organize meeting of the implementation team		Completed in February 2015: Stimson brought together over 20 organizations, including technology and conservation experts, technology companies and

		government actors for a two-day workshop to form a strong implementation consortium.
Activity 1.2 Project lead, Bergenas, coordinates with iHub and Linköping to develop software system		Completed in February 2015: Stimson organized, with project partners iHub, Linkoping University, the Borders Institute (Kenya-based border security expert group) and ICT specialists, a user experience field trip to Ngulia to determine the specifications for the C3 system.
Activity 1.3 Bergenas works with project partners on installation of the new system		Completed in May 2015: A beta version of this C3 system was deployed in the field to a selected pilot group of rangers, commanders and researchers. A complete version was launched in September 2015.
Output 2. Deployment of the radar surveillance and sensor system for perimeter control	Indicator 1: Installation of new radar tower Indicator 2: Appropriate personnel are trained and equipped to utilize radar surveillance Indicator 3: Sensor systems are fully functioning to provide full area coverage	A change request was approved for this output in the following manner. Throughout 2016, Stimson planned for and executed testing of a radar system in anticipation of deployment in the Ngulia sanctuary, in accordance with the logical framework. Additionally, we have secured a placement for the radar in Ngulia, in collaboration with the KWS. The radar deployment will, however, be delayed and executed likely in the second quarter of 2017 by existing project partners as discussed above.
Activity 2.1 Organize meeting of the implementation team		Completed in November 2015: Stimson brought together the project consortium, including inviting the KWS, to Sweden for a two-day planning meeting to map out a path for development and implementing the project's second output, a radar and sensor surveillance system connected to the C3 system in the park.
Activity 2.2 Bergenas coordinates with Linköping technical experts to determine best placement of necessary sensors/radar		Completed in December 2015, After careful consideration and based on ranger data from the C3 system in the field, Stimson and partners Linkoping University, iHub and KWS have chosen a site for the radar in the Ngulia sanctuary. The location was informed both by poaching locations and vulnerabilities in the sanctuary as well as by connectivity strength and data processing considerations.
Activity 2.3 Project lead advises on the training of KWS rangers to incorporate best practices of border security		Trainings are ongoing per previous comments. We are doing ongoing training with the rangers both on the C3 system and in preparation for the radar, providing them with training materials.
Output 3. Final project report that is accessible and publicly available	Indicator 1: Outputs 1 and 2 are fully operable Indicator 2: Quality data is collected and available for analysis Indicator 3: Feedback from personnel is received by project lead	Stimson has released a publicly available report at https://www.stimson.org/NODE/28208.

Activity 3.1 Collection of data from ranger use of C3 system	Stimson's project partner Linkoping university collects data on a monthly basis on patrol coverage and alerts made using the C3 system.
Activity 3.2 Monitoring and evaluation of the project through site visits and conducting interviews with key personnel	On average, Stimson and its implementation partners have visited Ngulia for quantitative and qualitative analysis on a near monthly basis over the last 12 months.
Activity 3.3 Analysis of various data and writing of a final project report	Stimson has released a publicly available report.

Checklist for submission

	Check
Is the report less than 10MB? If so, please email to IWT-Fund@ltsi.co.uk putting the project number in the subject line.	X
Is your report more than 10MB? If so, please discuss with IWT-Fund@ltsi.co.uk about the best way to deliver the report, putting the project number in the subject line.	
Have you included means of verification? You need not submit every project document, but the main outputs and a selection of the others would strengthen the report.	X
Do you have hard copies of material you want to submit with the report? If so, please make this clear in the covering email and ensure all material is marked with the project number.	X
Have you involved your partners in preparation of the report and named the main contributors	X
Have you completed the Project Expenditure table fully?	X
Do not include claim forms or other communications with this report.	