



Remote Animal Monitoring Solution (R.A.M.S)

TERMS OF REFERENCE

Background

White and black rhinoceroses visiting open landscapes are subjected to frequent poaching for their horns throughout the African rhinoceros range states. The inability to monitor rhinoceros' assets across multiple boundaries, may they be political, spatial and/or temporal (i.e. in real time), makes security measures difficult. Despite regular traditional approaches, this trend continues at an alarming rate.

Currently, strategies such as cameras, rhino monitoring techniques and access control onto the landscape are subjected to human bias, as humans must monitor equipment and verify alarms, etc. Technologies deployed in the wildlife security arena must have suitable Standard Operational Procedures from start to finish (up until prosecutions), which are lacking at the moment. Therefore, data is often not provided in real time and/or false positives lead to complacency.

Consequently, on an open landscape that involves multiple players in the political and management arenas, the deployment of wildlife security resources requires to be aligned with a determined risk or threat for the rhinoceros. Threat landscapes advise the management of interventions to reduce them (such as waterholes where rhinoceros spend time and expose themselves, etc.)

However, little is understood about the spatial ecology and activity budgets of white and black rhinoceros, and therefore what makes them vulnerable to poaching. Security teams need to know in real time where and when a rhinoceros (or another high-value species) is at risk, when it is being harmed, when it is dead, when the horn has been removed, and where the horn is after it has been removed, i.e. be informed of several windows of opportunity for them to intercept, and proceed with follow-up operations and arrests.

Lastly, successful prosecutions are rare due to a lack of evidence, such as when, where and how the rhinoceros was poached. Digital evidence is required to demonstrate and defend arrests made by providing prosecution authorities with prima facie data.

Rationale

Formed in 2013 by Transfrontier Africa, the Black Mamba Anti-Poaching Unit (APU) includes 33 young African women from the adjacent tribal communities. They operate from five stations on the protected area landscape, and boast their own independent Operations Center, day and night patrols, and various technologies that include real-time tracking and in situ visual reporting, camera-traps, and GSM alarms on boundaries. Rapid response is provided as back-up in the event of a conflict situation and daily rhino monitoring by visual, telemetry and cameras assists with the patrol strategy. The Black Mambas have had good and measurable success but need further technological support to compete with the poaching "arms race".

Transfrontier Africa, in conjunction with CISCO, NIL and various players in KwaZulu Natal (HIP), has developed a solution that provides for the issues described above in the form of sensors and LoRa



gateway network. Transfrontier Africa proposes to conduct a Proof of Concept (POC) with the Black Mamba APU in a rhinoceros poaching hotspot on the open Greater Kruger National Park landscape and design the Standard Operating Procedures (SOPs) and protocols for roll-out into the adjacent protected areas within the Greater Limpopo Transfrontier Protected Area.

Once the POC has proven viable, the goal will be to share the technical solution with neighbouring rhinoceros range states, e.g. Zimbabwe, Mozambique, Botswana, Namibia, Eswatini (formerly Swaziland), and Tanzania.

Objectives

In the context of this Project, a LoRa WAN network will be established on the landscape of a selected rhinoceros poaching hotspot, and a large sample of rhinoceros will be fitted with both a subcutaneous sensor on the body and a horn transmitter in the front horn.

- i. The body unit is designed to ping for real time location tracking, and to measure the heartrate and other metabolic processes. Thresholds are pre-set, so that an alarm is sent to the operations room when a particular threshold is measured, for example when the animals' metabolic processes have ceased (i.e. the animal is dead). Thresholds can be reset remotely at any time.
- ii. The horn unit is connected to the body unit by means of Bluetooth technology. An alarm is sent when the connection is broken, at which point the unit becomes active and starts transmitting location and speed, thus providing a breadcrumb trail of its movements.

With this system, two-way communication between the Operations Room and the rhinoceros is established when required. Batteries have an average life-span of 2.5 years, depending on the frequency of "pinging".

These three levels of tactical conditions will allow security resources, such as the Black Mambas, to be deployed to protect assets more effectively, as they can position themselves strategically to intercept poachers and execute arrests. Additionally, all data relating to the above is recorded digitally and downloaded to be used as evidence when an arrest is made.

Lastly, understanding rhino energy budgets and landscape usage will provide excellent insight into the spatial ecology of free-range rhinoceros. This will be a valuable tool for predictive modelling and conservation efforts.

The immediate Project objectives are as follows:

- i. *Objective 1:* A secure, better equipped, and responsive multi-stakeholder landscape for free-ranging rhinoceros that is a deterrent, unprofitable and/or too risky for poachers.
- ii. *Objective 2:* Development of a database of information to further understand rhinoceros' spatial ecology and activity budgets, thereby contributing to future conservation efforts (such as re-introductions) and measuring effects of management interventions (e.g. waterhole closures, de-horning, etc.)
- iii. *Objective 3:* Design of Standard Operating Procedures (SOPs) and testing with Black Mamba Anti-Poaching Unit (APU) in the field for maximum efficiency. Design of protocols for the roll-out



of the Black Mamba package (including patrol optimisation and asset management technologies).

Expected Outcomes

The expected outcomes are as follows:

- i. *Outcome 1:* Real-time prima facie data on rhinoceros' movements, location, activities and their response to management interventions are made available.
- ii. *Outcome 2:* Black Mamba wildlife security staff is better equipped to respond to poaching scenarios through modelling and simulation exercises.

Main Activities to Deliver the Outcomes

The activities to be carried out by Transfrontier Africa, in collaboration with partners and with the support provided under this Agreement, are the following:

- i. *Activity 1:* Erect a wireless, solar-powered LoRa network in a selected rhinoceros poaching hotspot, using existing infrastructure (wind pumps, hides, etc.), for live data feed from key landscape assets and human resources.
- ii. *Activity 2:* Deploy subcutaneous sensors and horn transmitters in 50 rhinoceros and ensure that heartrate, location, other metabolic processes, and horn-separation data is transmitting to the Operations Room.
- iii. *Activity 3:* Deploy horns from legal stockpile fitted with sensors and run simulation exercise of all poacher behaviours with the security personnel (based on recorded poacher incidents $n = 36$).
- iv. *Activity 4:* Produce SOPs, norms and standards for wildlife security personnel at all levels. This Will entail running simulations of security personnel deployment for maximum efficiency in terms of interception and disruption of poacher activities; measuring success (both spatially and temporally); evaluating all data; and redesigning patrols and observation posts accordingly.
- v. *Activity 5:* Organization of a workshop with other players on the landscape to cross political boundaries and offer a solution for the rollout of the Black Mamba Wildlife Security package.

Technical and Scientific Cooperation

This Project is designed to involve several institutions from South Africa with technical assistance from the United States and the Netherlands. Cooperation will be carried out along the following lines:

- i. Transfrontier Africa and the Black Mamba APU will be responsible for the implementation of the Project.
- ii. The local branch of the US-based company CISCO, through the Wild Animal Technology Solutions (WATS), a joint initiative between Cisco South Africa, NIL Data South Africa and Transfrontier Africa will provide technical assistance.
- iii. The Netherlands Institute for Crime and Law Enforcement will provide technical assistance.
- iv. The Southern African Wildlife College, based in Johannesburg, South Africa, will provide peer review of the Project results.
- v. The Greater Kruger National Park (Association of Private Nature Reserves, Balule Region) will work with the team to grant access to a target population of rhinoceros.



Reporting

Tracking and Reporting: Mid-term progress and final output will be reported to BBI team. Participation to BBI meeting and presentation of output would be delivered upon request of BBI team.

Measurable Indicators: The project will be monitored using the following indicators:

- i. *Indicator 1:* LoRa network installed on the landscape with effective network coverage over all poacher hot spots and network integration into Balule Operations Center;
- ii. *Indicator 2:* Minimal to no down time on any antennae with any down time repaired within 12 hours;
- iii. *Indicator 3:* During fitting operations, chopper time limited to a minimum (four rhinos per hour) and down time per animal limited to 25 minutes maximum;
- iv. *Indicator 4:* During fitting operations, no mortality of rhinos;
- v. *Indicator 5:* Effective ability to track assets (rhinos and horns);
- vi. *Indicator 6:* All scenarios tested and recorded for replay in real-life situations;
- vii. *Indicator 7:* Effective ability anti poaching security personnel to intercept assets/ poachers with time to apprehension and prevention reduced to a minimum;
- viii. *Indicator 8:* Workshop/ demonstrations organized in a timely manner with the participation of key role-players from Mozambique.