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| **Country/ Project**  **name** | **The type of technology & aim of system** | **Provider(s)** | **User group(s)** | **Specie target(s)** |
| **Monitoring the Illegal Killing of Elephants (MIKE):** **Botswana, Democratic Republic of the Congo, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe.**  **Kenya, Uganda, Rwanda- (50+ sites on the continent)** | The MIKE programme relies primarily on two types of data: information on elephant carcasses encountered and information on the level of law enforcement effort in the area. This information is collected by ground data and aerial surveys and then stored in GIS system. Law enforcement monitoring and ranger-based data collection systems for adaptive conservation area management. | MIKE is owned and implemented by the range States of African and Asian elephants, with technical assistance and coordination of the CITES Secretariat- funded by the European Union. The Central Coordinating Unit is based at UNEP in Nairobi. | Rangers, conservation area managers, wildlife authorities and decision makers. | Elephants |
| **Poachers without borders:**  **Democratic Republic of Congo: Garamba National Park.** | Satellite imagery and predictive analytics- DigitalGlobe analysts were given the location and date of the elephant remains discovered between 2011 and 2013, elephant collar data, ranger patrol routes, and the locations of known poacher camps. Using this data, analysts conducted historical geospatial trend analysis, cost surface travel analysis, key terrain analysis, and predictive analysis using DigitalGlobe’s Signature Analyst™ geospatial analytic software. Extrapolate the data to predict where poachers may strike next. | Satellite Sentinel Project, DigitalGlobe Inc. African Parks, (which manages Garamba on behalf of the Congolese government)  and the enough project | Rangers, conservation area managers, wildlife authorities and decision makers in Garamba | Elephants |
| **SMART- Spatial monitoring and reporting tool: DRC, Ethiopia, Madagascar, Mozambique, Malawi, Zimbabwe, Kenya, Zambia, Uganda, Tanzania,** | GIS interface- Compatibility with a wide variety of GPS units and data collection devices. enables the collection, storage, communication, and evaluation of data on: patrol efforts (e.g. time spent on patrols, areas visited and distances covered), patrol results (e.g. snares removed, arrests made), and threat levels. Used to sustain information flow between ranger teams, analysts, and conservation managers. (Open source-free technology) Anti-poaching, illict bushmeat collection and illicit forestry activities also applicable for monitoring fishing grounds. Data collection method aimed at helping protected area and wildlife managers better manage patrolling activities. | WWF, North Carolina Zoo, Wildlife conservation society, CITIES, ZSL, Frankfurt Conservation Society, MIKE | Park rangers, patrolling teams, conservation area managers, wildlife authorities and decision makers. | Site specific |
| **Instant Detect (ID)**  **Kenya** | Seismic and magnetic military grade ground sensors- passive infrared heat detection sensors. The images and sensor alerts are then sent over the Iridium satellite network to a central satellite node which uses a Raspberry Pi computer in near real-time to a secure server to be accessed by individual users. Cameras hidden in canopy. Originally started as a surveillance tool for to monitor animal species then discovered it was useful for poachers.  Anti-poaching device-early warning system for rangers and for remote wildlife monitoring. sensor alerts sent in near real-time to the user. | Zoological society London (ZSL) in collaboration with Seven technologies group (UK) | Kenya Wildlife Service (KWS) | Rhino & elephant |
| **Wildland Security: Trail-guards: Kenya & Republic of Congo** | Hidden amongst the canopy electronic detection and communication devices. Burying radio-transmitting metal detectors alongside elephant trails leading into the park. poachers carrying rifles or machetes will set of a detector, it will send a radio signal to a treetop antenna. Also small fire detectors hidden in trees (Poachers frequently smoke meat from their kills to preserve it during transport to market). Rangers receive intruder's co-ordinates on satellite phones. Anti-poaching detection and alert system | Wildland Security | Wildland Security (NGO) | Rhino |
| **Kenya (Ol Pejeta Conservancy, (90,000-acre reserve in Kenya)- Drone autopilot system** | Drone autopilot system flown at 500m. Thermal imaging cameras: night- differentiating the shapes of animals. GPS-tagged rangers connected by a digital radio system. Anti-poaching detection and alert system | Airware (San Francisco-based tech company) | Kenyan Wildlife Service | Rhino |
| **Kenya- Amboseli Elephant Research Project (AERP)** | The longest study of wild elephants in the world-  10 elephant families collared with Savannah Tracking GPS-GSM collars. In order to understand the distributions and ranging patterns of families with regard to ecological conditions and social status- critical to facilitate land use planning in relation to areas that elephants need for their survival and future security. |  |  |  |
| **Kenya: Ngulia Rhino**  **Sanctuary in West Kenya -Pilot project to gain a better understanding of the technical and training needs at Ngulia.** | **Project Ngulia:**  Smartphone-based C3 software- an input device, where rangers note their observations on security and wildlife matters. Photo documentation with automatic geo-tagging. The app is also a navigation tool, where park rangers get their position overlaid on a map. The interface includes local landmarks such as waterholes, roads, trails, bunkers, borders, their patrol routes etc. Future sensor systems are  being tested in Kolmården Wildlife Park in Sweden. | The Stimson Center (Security think tank based in DC) and the Africa Peace Forum  partnered with technical experts  from the University of Linköping, Sweden. | Kenya Wildlife Service, | Black Rhino |
| **Laikipia, Kenya Rift Valley- Grevy’s Zebra Technical Committee (GZTC)** | Over 2 days 120 teams of scientists, schoolchildren an the U.S. ambassador to Kenya given GPS-enabled cameras, took photos across 25 square kilometers of rangeland to photograph Grevy's zebra. Researchers then fed the photos into a "hotspotter" computer program, which is able to identify animals based on coat design, every zebra's stripes are unique- natural bar code. Now with new technology, scientists can read them like a bar code as well. Can be used for traits of other animals, including giraffe's spots and elephants' ears. Used to estimate population size, keep track of decline.  GZTC Savannah Tracking GPS-GSM collars as their latest generation of collars. You can follow some of these zebras via the MiSavannah tracking APP for iPhones and Androids | Mpala Research Center (Kenya) & Harvard university | Data can advise governments how to best preserve the Grevys. | Zebra: |
| **Domain Awareness Programme- Samburu National Reserve Kenya** | GPS collars, a database that manages the elephants’ location data and a visualization tool integrated into the Google Earth platform. Near real-time monitoring- location fixes made on the hour. Tracking system | Vulcan- Tech development company based in Seattle and Save the Elephants. |  | Elephants |
| **Namibia** | **WWF's Wildlife Crime Technology Project**:  Falcon UAVs (unmanned aerial vehicles) outfitted with night vision and thermal sensors, battery-powered (silent) can fly for about 90 minutes over a range of about 19 kilometres.  Drones have satellite Internet connection-live video stream from the UAV.  Assist rangers in spotting poachers and monitor both animals and the rest of their own patrol team in real-time. | Google gave the WWF a $5 million Global Impact Award to develop new ways to detect and deter wildlife crime. | Namibian park wardens and rangers. Namibia’s Ministry of Environment and Tourism. | Elephant & Rhino |
| **Namibia- Etosha National Park.** | Aerial survey using 14 UAVs - technologically advanced radio systems, GPS tracking systems, sophisticated autopilot and flight stability systems and thermal imaging cameras. Deployed to monitor 280,000 square kilometers. |  | Next Generation Conservation Trust & Namibian government | Black Rhino |
| **South Africa** | **RAPID- Real-time Anti-Poaching Intelligence Device.**  Satellite GPS, a heart rate monitor and a video camera. Collar worn by a rhino broadcasts information on heartbeat and GPS location to a Protect control centre. The collar tracks the animal’s heartbeat: when it rises or falls, a signal is sent to an operator. The centre then activates a tiny camera implanted into the rhino's horn and sees why the change has occurred. If risk of poaching activity, a rapid reaction force receives the GPS location and investigates. | Protect- British NGO. Supported by the Humane Society International (UK). | N/A | Rhino |
| **South Africa- Kruger National Park** | Anti-poaching high-tech, low-speed reconnaissance aircraft equipped with quiet engine & heat sensors to detect animals and humans. | Paramount-Africa's largest privately held defense firm donated plane to South Africa National Park Service. | Kruger national park rangers, patrolling teams, conservation area managers, wildlife authorities. | Rhino |
| **South Africa-Kruger National Park. Pilot of anti-poaching surveillance** | Falcon UAV- infrared night vision camera guided by a UMD-designed computer program that predicts the movements of rhinos and poachers.  UMD researchers plan to add several years’ worth of data collected by local game wardens to the computer model and ground-truth their software. The technology incorporates game theory and other types of advanced programing and is designed to predict future changes in poachers’ behaviour. Same computer model used to predict terrorist and arson attacks. | University of Maryland Institute for Advanced Computer Studies (UMIACS) | Rangers in Kruger National Park | Elephants & Rhinos |
| **South Africa- Kruger National Parl** | Shot-spotter- Acoustic system used to detect and locate gun shots. | Tech company based in San Francisco | Rangers in Kruger National Park | All animals- mainly Rhino |
| **South Africa-Kruger National Park** | Seeker 2 has been deployed to assist in monitoring movement of suspicious people after dark in the sprawling two million hectare game reserve on South Africa’s eastern boundary,   16 hours flight time, armed with two Mokopa air-to-surface missiles- including electro-optical/infrared and radar. Future upgrades will include satellite communications, and sense-and-avoid capability in order to obtain civil aviation certification. Seabird Seeker light surveillance aircraft | Denel Dynamics & Ivor Ichikowitz’ Paramount Group (Africa’s largest privately held defence and aerospace company)  . | Ichikowitz Family Foundation and South African National Parks (SANParks | Rhino |
| **Unnamed private game reserve adjacent to Kruger National Park- South Africa** | **Connected Conservation (pilot programme):** Secure Reserve Area Network (RAN) created and installed with Wi-Fi hotspots around key poaching points. CCTV, drones featuring infrared cameras, thermal imaging, vehicle tracking sensors as well as seismic sensors on a secured intelligent network. Touch sensitive sensors on fences trigger alarm for rangers with GPS co-ordinates- early warning system with surveillance drones. | Dimension Data (SA) and Cisco (worldwide leader in networking) | Rangers, conservation area managers, | Rhino |
| **KwaZulu-Natal, South Africa** | Aerial surveillance and monitoring using UAVs, infrared cameras and GPS systems- transmitting thermal imagery of wildlife and poachers | Air Shepherd-The Linbergh Foundation,  Ezemvelo, in association with Peace Parks Foundation |  | Rhino/Elephants |
| **South Sudan- 3000 square miles of dense forest in South Sudan’s Western Equatoria state. Forest belt untouched and unresearched because of the decades of conflict in the area.** | Remote-sensing camera traps set to survey wildlife in the region. Camera trap survey- the team sifted through more than 20,000 photos of wildlife—1,190 of which included images of African forest elephants, a smaller, more elusive cousin of the savanna elephant that roams much  of the continent’s plains.  Camera-trap findings expand the known range of forest elephants farther east than previously recorded.  Monitoring stock and range of wildlife. | Funded by a grant from the United States Fish and Wildlife Service’s Great Ape Conservation Fund, with additional funding from the Woodtiger Fund, Bucknell University, and Flora and Fauna International. | Initiative for local wildlife authorities focused on turning community members who once poached elephants into elephant rangers charged with monitoring camera traps, adjusting GPS units in the field, and becoming wildlife ambassadors. |  |
| **Uganda- five Protected Areas of Kibale, Kidepo Valley, Queen Elizabeth, Murchison Falls parks, and Toro Semiliki Wildlife Reserve.** | **Wild Leo- Wildlife Intelligence and Leadership Development program**  By photographing signs of poaching such as snares and animal carcasses, the rangers will create a spatial database that describes where poachers are operating within the reserve. Moreover, arrested poachers will be photographed at the hunting site and the photograph, that shows the latitude and longitude where it was taken, will be used in court to prove the hunting occurred inside protected area.   gathering photo evidence for purposes of prosecution and data collection during patrols. 65 cameras. Goals: Increase poacher apprehension using crime mapping and analysis techniques and increase poacher conviction rates using better courtroom evidence. | Technology donated by the NSCR (Netherlands Institute for the Study of Crime and Law enforcement), a select team of UWA rangers collect photographic evidence of poaching activity using digital cameras embedded with GPS units.  UCF has procured 17 geo-location cameras and 5 water proof cameras for UWA and trained 50 UWA rangers in data collection and analysis.  trained about 200 UWA Law Enforcement Rangers and Crime Analysts on how to use the cameras | The Uganda Wildlife Authority and Uganda Conservation Society |  |

**Competitions to design conservation technology**

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| **Competition name** | **Technology being designed** | **Aim of use** | **Organisation that initiated competition** |
| **Wildlife conservation**  **UAV challenge** | Unmanned aerial systems | To prevent poaching of Rhinos | Kashmir Robotics-Kashmir World Foundation (NGO) |
| **Wildlife Crime Tech challenge** | 16 Winners include 2 for remote sensing devices- the majority are for species identification using Forensic and DNA techniques, others are IT & web-based portals for information storage and exchange to map routes and species specific poaching. **Instant detect only RS winner.** | Tech that aids information gathering around poached species, improves information exchange between enforcement agencies and tracks movement. | USAID, National Geographic, the Smithsonian Institution, and TRAFFIC. |