African Protected Areas and the Internet of Things (IoT)

Investigating new tools to improve management effectiveness of Protected Areas in Africa

Building on a case study: Pendjari National Park (Benin).

The IoT has the power to transform PA management effectiveness

Less than a quarter of PAs globally are effectively managed[1]. The majority suffer inadequate resourcing (funding, people, equipment, skills). Most today are not able to say whether their conservation programmes are being effective, nor are many able to identify and react to threats[2].

The IoT revolution involving more powerful processors in small remote devices, requiring low power, enabled by powerful communications and analytical systems, all at costs that are falling rapidly, is making possible a transformation in PA management effectiveness. The IoT is already making big impacts in smart cities, and the health and energy sectors, improving effectiveness and efficiency. In PAs however, awareness of the opportunity remains low, investments are piecemeal, and there are important hurdles to overcome to achieve scalable, repeatable and sustainable IoT investments.

IUCN-Papaco (see www.papaco.org) has chosen the Pendjari National Park in Benin as a case study, and has been working with technologists and conservationists from UK charity Smart Earth Network and IOT consultancy Eridanis to develop an IoT Maturity Model for PAs, enabling phased investments which achieve benefits from the start, and enable a full capability to be built up over time on a shared platform which can be deployed across other parks quickly and cost-effectively.

Approach

The Benin mission was conducted in June 2016 and involved three stages:

1. Consultations with a wide range of stakeholders including the Minister, the management at the park agency CENAGREF, the park management team and rangers on the ground, local community representatives through AVIGREF, NGOs working in the park, and the funding agencies. The aim of these consultations was to understand the issues faced and the priorities.

2. A three day visit to the Park guided by several members of the park management, followed by a workshop with management to discuss the park management issues and to start to prioritise the technology opportunities which could improve effectiveness.

3. Research and development, working with a variety of technology providers, of a costed affordable technology and governance vision for the Park aimed at building a scalable sustainable capability able to transform management effectiveness over time and to provide a platform for scaling to other Parks in the region.

What can the IoT deliver in Pendjari national park?

Through this case study, several major challenges faced by Pendjari have been identified, which could be addressed with IoT enabled technology:

4. Cost-effective communications systems are a required foundation for scalable and repeatable IoT enabled investments. Apart from a few walkie-talkies, there is no mobile communication in the park today, making effective coordination of work difficult, and creating safety risks for visitors and staff alike. A combination of inexpensive radio, private 4G and other technologies can now enable voice, text and data communications which, working with GPS, can resolve these issues and enable connected devices to be deployed effectively.

5. Ecological monitoring is today highly time consuming and produces results which are often inadequate for their purpose and too infrequent for effective planning. Drones with powerful cameras, connected cameras and acoustic sensors, and other tools combined with advanced

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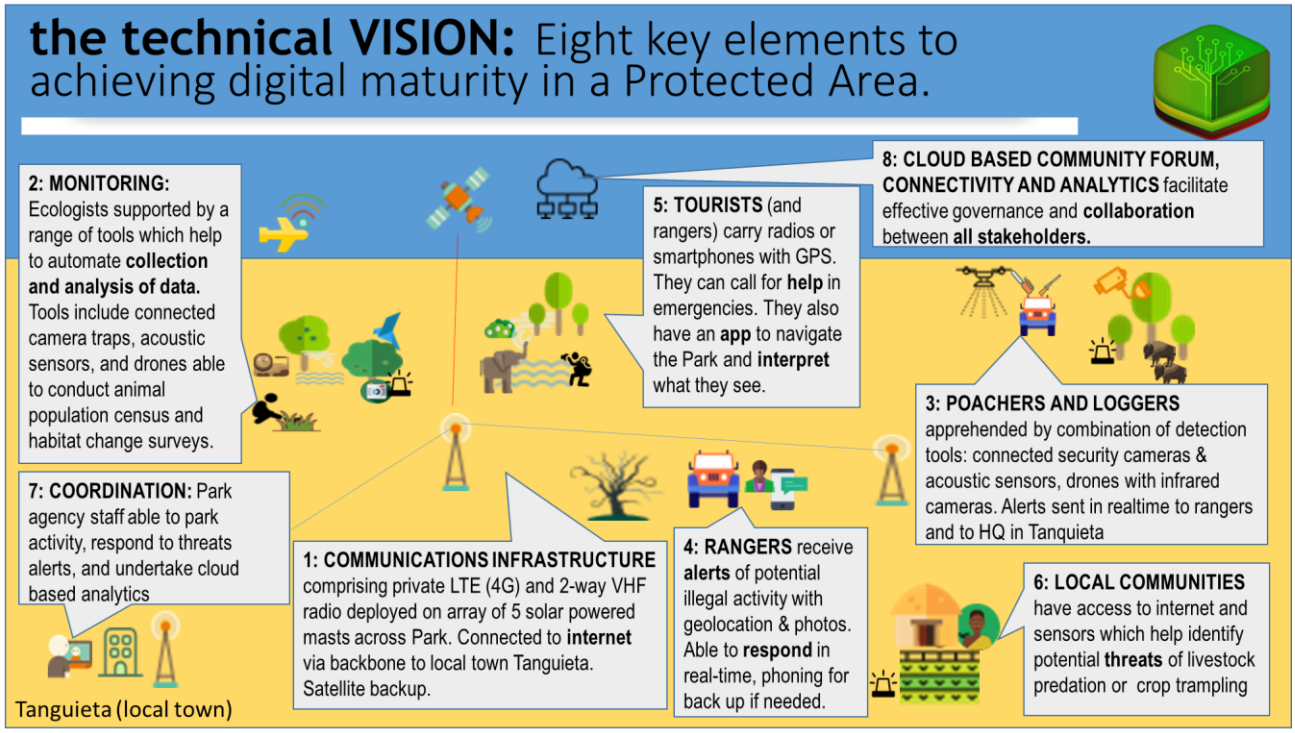
[1] Global Analysis of PA Management Effectiveness; Fiona Leverington, Katia Lemos Costa, Helena Pavese, Allan Lisle, Marc Hockings, Springer Science+Business Media, LLC 2010

[2] Making parks make a difference: poor alignment of policy, planning and management with protected-area impact, and ways forward; Robert L. Pressey, Piero Visconti, Paul J. Ferraro, 2014.

analytical software, can deliver faster and better results for less effort, freeing up valuable resources for more mission critical work.



6. Park patrolling is today inadequately resourced and somehow unable to effectively identify and respond to threats from poachers, loggers and herders. A combination of security cameras and acoustic sensors strategically positioned and supplemented by day and night automated drone surveillance using infrared can detect the threats readily, and send alerts to the rangers in real-time, enabling a rapid response. These solutions release rangers from time-consuming random patrolling to focus on addressing real threats.

7. Governance and collaboration between Pendjari's stakeholders, from park staff, to NGOs, universities, local communities and businesses is quite poor today. This leads to poor coordination of effort, non-sharing of knowledge, duplication of work and mistrust. A community cloud-based platform cannot solve these problems overnight, but together with other measures can facilitate sharing of experience, knowledge and resources, including data storage and analytics, to create the conditions for effective collaboration in the future.

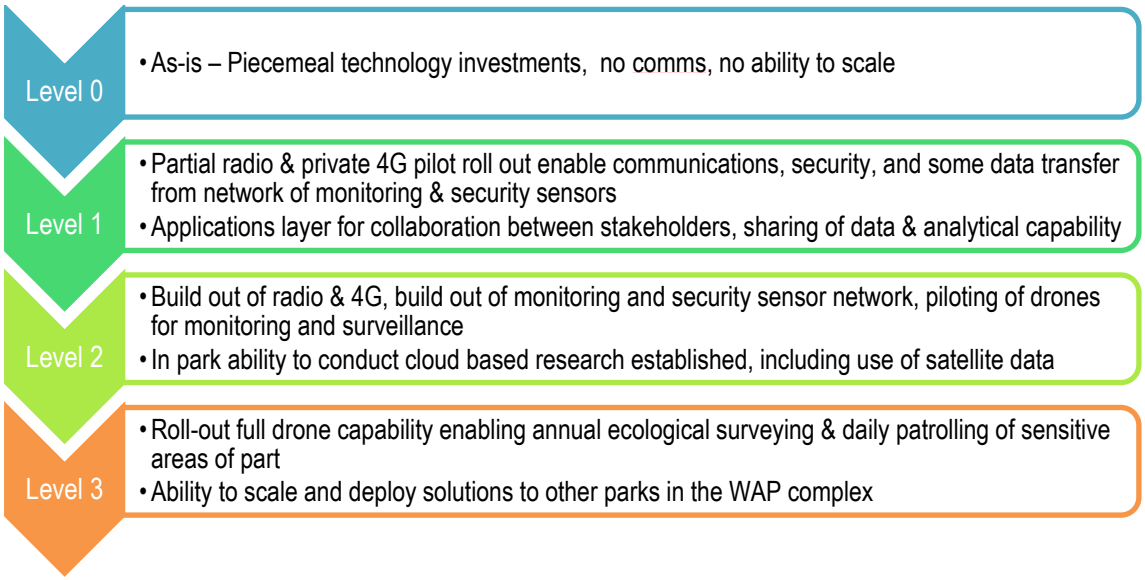
8. Visitors today have few if any online tools which they can use to either plan their visit or navigate the park and interpret what they see. Other more advanced safari parks in Africa have these tools, which are needed to make the visitor experience compelling and safe. Providing these tools in Pendjari will make the destination more competitive, and through citizen science, can support conservation.

A three phase plan to transform Pendjari's management effectiveness

The Smart Earth Network, working with technologists at Salesforce, Eridanis and Dave Systems have developed a phased approach illustrated below to transform Pendjari's management effectiveness through the use of IoT enabled technology at an affordable cost. The approach proposed is scalable and repeatable. All core technology proposed is robust, proven, simple (though some of the software is evolving), and locally or remotely maintainable.

The approach proposes an equipment control, management, maintenance, training strategy is in place from day 1. The level 1 investment phase includes infrastructure upon which later phases can be scaled (masts, transmission layer, applications layer), as well as early use cases which deliver immediate value (such as security and voice communications, ecological monitoring and poacher alerts). The approach proposes the rigorous piloting of use cases on the ground before full rollout.

A Phased Approach to IoT enabled investment in Pendjari National Park
(as an example)



The speed at which Pendjari (or any other park) moves between these phases is a matter of choice and will depend on resourcing, the success of pilots and organisational capacity.

Benefits

The proposed programme will enable better conservation in Pendjari, refocusing effort from low value to mission critical activities. In particular it will:

- Improve communications and security within the park for both staff and visitors
- Collate accurate and timely impacts data, enabling better reporting to the authorities, increasing confidence in the value of conservation programmes
- Rapidly identify threats from poachers and loggers, enabling a timely response
- Improve stakeholder communications, management and collaboration

Finally and most importantly, working on Pendjari NP will serve as an example and will create a set of solutions and infrastructures on which other parks in the region and beyond can build to achieve similar benefits quickly and cost-effectively. New initiatives of this kind will be conducted in 2017.

Readers interested in understanding more can read the public report of the mission 'The Internet of Things for Protected Areas: The Application of Innovative Technologies to Improve Management Effectiveness, First report of IUCN Mission to Pendjari National Park' Simon Hodgkinson and Daniel Young, IUCN, 2016.

More information is also available on www.papaco.org (page publication) and in the monthly Newsletter on African Protected Areas (NAPA). Please also visit our Facebook page.

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