

## **COUNTRY AND MARINE PARKS BOARD**

### **The Use of Technology in Management of Country and Marine Parks**

#### **1. Purpose**

1.1 This paper aims to brief members on the latest application of technology in the visitor services and management of country and marine parks.

#### **2. Background**

2.1 Country and marine parks managed by the Agriculture, Fisheries and Conservation Department (AFCD) cover an extensive area of protected natural habitats, mostly at remote locations. Management of these areas involve labour-intensive monitoring and surveillance work, such as land and sea patrols, as well as stationing of staff on-site for surveillance and visitor counting.

2.2 AFCD has been striving to explore technologies suitable in the countryside setting for our daily operations to enhance the efficiency of management work of both country and marine parks. This paper introduces several pilot projects recently conducted to enhance the efficiency and effectiveness of protected area management, such as automated people counters and hill fire detectors in country parks, as well as video-analytics systems (VAS) for monitoring vessel activities in marine parks and marine reserve.

#### **3. Application of Automatic People Counters in Country Parks**

3.1 Information on visitor flow and usage of country parks is essential for planning and adaptive management of country park facilities to ensure quality visitor experience and proper protection of the natural environment. In the past, the figures of country park visitors were estimated based on sampling counts at 76 strategic locations at country parks, such as main entrances of hiking trails and popular recreation sites. Staff were deployed to count the number of visitors manually at the assigned locations for a fixed period of time at different times of the week, during their regular patrols. The visitor count was then extrapolated to provide an estimate of the yearly visitor figure. While the accuracy of the extrapolated figure could be improved by increasing the duration and number of localities of visitor counts, these would have substantial implications on manpower deployment.

3.2 In 2022, AFCD commissioned a pilot project to introduce automatic people counters to Aberdeen Country Park and Tai Lam Country Park, to capture daily visitor attendance of the concerned country parks continuously and automatically. The project involved the installation of 28 automatic people counters at various entry points leading to the two country parks. Visitor counts captured using infra-red sensors were transmitted to a web-based data visualisation

platform automatically for data analysis and retrieval. As part of the pilot project, validation checks by synchronised manual counting on-site were also conducted to confirm the accuracy of data captured by the counters at the counting locations.

3.3 A total of 0.9 million and 1.1 million visitors to the Aberdeen Country Park and Tai Lam Country Park were recorded in 2023 respectively by the automatic people counters. Apart from recording the actual entry and exit figures of visitors, the application also generated visitor flow with spatial and temporal patterns which would be useful for management purpose. For example, the park entrance at Aberdeen Reservoir Road in Aberdeen Country Park and Tai Tong Shan Road in Tai Lam Country Park recorded about 36% and 22% of the total visitors to the two country parks respectively, indicating their importance to visitors. There was also a clear temporal pattern of visitor flow in all counting locations, with most of the peak counts recorded on weekends. Validation checks by synchronised manual counting found that the automatic counters were reasonably accurate. Nonetheless, the visitor figures recorded by the counters were found to be about 70% higher than the figure estimated from routine manual counts in the same year, suggesting that the automatic counters could capture visitor flow which might have been previously underestimated. The two sets of data showed similar visit patterns.

3.4 Compared with the existing manual counting method, automatic people counters would be more reliable and accurate, while also generating more data on visitor flow and patterns which could facilitate evidence-based management practices and proper allocation of resources. Following the success of the pilot project, we plan to extend the application of automatic people counters to other country parks and phase out manual counting gradually, with the first batch of about 60 counters to be installed in country parks of Central New Territories and Hong Kong Island by the end of 2024.

## **4. Application of Automated Hill Fire Detection**

4.1 Hill fire is one of the greatest threats to the natural habitats in country parks. In the past ten years (i.e. 2014 to 2023), about 210 hill fire incidents were recorded inside or in the close vicinity of country park areas, causing damage to 2 700 hectares of land area and over 63 000 trees.

4.2 Hill fire detection is crucial for firefighting work in country parks as it would facilitate prompt deployment of fire crews for firefighting operations to minimise damage to the natural environment. There are currently 11 fire lookouts in different country parks across the territory. In the past, the AFCD staff were deployed to the fire lookouts during the fire season (i.e. from September to April of the following year) for surveillance of hill fires. This round-the-clock task (24 hours a day for seven days a week) is both labour-intensive and challenging given the remoteness of these fire lookouts and the long working hours. To enhance the efficiency of hill fire detection, the AFCD installed one set of automated hill fire detector using infra-red thermal detection technology at Tin Fu Tsai Fire Lookout in Tai Lam Country Park as a pilot scheme in 2017. The detector could collect and transmit real-time and useful hill fire information, including time, location, scale and images to the Fire Control Centre (FCC) of the AFCD for strategic and prompt deployment of fire crews to exact locations where their

efforts are most needed. The deployment of the automated detector could also save valuable manpower resources.

4.3 To further improve the detection performance of the detector and reducing false alarms, the AFCD and the Hong Kong Logistic and Supply Chain MultiTech R&D Centre conducted a pilot project in 2021 to upgrade the hill fire detection system with an enhanced detection model developed by artificial intelligence (AI), video analytics and robotics technology. The results showed that the system could successfully detect hill fire incidents that occurred within its detection range with improved accuracy and effectiveness.

4.4 With the promising results obtained from the trial, the AFCD obtained funding from the TechConnect Block Vote (TCBV)<sup>1</sup> established by the Innovative, Technology and Industry Bureau (ITIB) in 2023 for the wider application of hill fire surveillance technology to all fire lookouts in country parks. The AFCD will set up a “Hill Fire Surveillance Network System” (System) with 11 sets of upgraded AI-assisted automated hill fire detectors at fire lookouts and one set of user control system at FCC. The project is now underway and is expected to be completed by mid-2026. With the adoption of the System, most of the important woodlands and other natural habitats in country parks would be within the detection range of the hill fire detectors. The System will greatly strengthen the AFCD’s efforts on automated surveillance of hill fires round the clock throughout the year, facilitate prompt deployment of fire crews for firefighting to reduce the threat of hill fires and minimise damage to natural habitats and human properties.

## **5. Application of Video-Analytics for Smart Surveillance of Marine Parks and Marine Reserve**

5.1 Currently, there are seven marine parks and one marine reserve in Hong Kong, which are located in remote areas and cover extensive stretch of waters. The traditional methods for surveillance of activities such as illegal fishing or speeding by sea or land patrols are labour-intensive. Since 2022, the AFCD started to set up smart surveillance systems adopting video-analytics technology at three pilot sites at the South Lantau Marine Park (SLMP), the proposed North Lantau Marine Park (NLMP) matrix and the Cape D’ Aguilar Marine Reserve (CDMR). The three projects share the same user-interface for real-time monitoring and gathering of intelligence on spatial and temporal patterns of suspected illegal fishing and speeding activities. The intelligence gathered would facilitate the planning of target-oriented patrol hours and routes to enhance the overall effectiveness of enforcement actions in combating illegal activities.

5.2 The first pilot project was commenced in mid-2022 along with the planning for the designation of the SLMP, with an aim to design and install a VAS at Siu A Chau for smart surveillance of the core area of SLMP (VAS-SLMP). The AFCD collaborated with the Electrical & Mechanical Services Department (EMSD) and paired up with an innovative technology solution provider via E&M Inno-Portal to conduct a proof-of-concept project on the

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<sup>1</sup> The TechConnect Block Vote is established by the Innovation, Technology and Industry Bureau in 2017 to assist various government departments in implementing technology projects, with a view to enhancing operational efficiency and improving public services.

application of VAS for smart surveillance of the SLMP. Currently, the AI is being trained to recognise suspected illegal fishing or speeding activities of vessels and to send alerts to the AFCD enforcement staff if such activities are detected. The VAS-SLMP has been installed and the project is expected to be completed within 2024.

5.3 In late 2022, during the planning for the designation of the proposed NLMP, the AFCD collaborated again with the EMSD to design and install another VAS at Sha Chau for smart surveillance of the proposed NLMP matrix (VAS-NLMP). The proposed NLMP, upon designation, would provide critical linkages with the nearby Sha Chau and Lung Kwu Chau Marine Park and the Brothers Marine Park to form a matrix of inter-connected marine protected areas in North Lantau waters for better protection of the important habitat of Chinese White Dolphins and other marine life. The VAS-NLMP has been installed and the project is expected to be completed within 2024.

5.4 In 2022, the ITIB approved a pilot project on developing a VAS for smart surveillance of CDMR (VAS-CDMR). CDMR is the only marine reserve in Hong Kong, and among the first batch of marine protected areas designated in Hong Kong for habitat protection, scientific research, and education. The VAS would be installed at a nearby research institute. A consultancy has been engaged to design and install the VAS equipped with AI for smart surveillance of CDMR. The VAS-CDMR is being installed and the project is expected to be completed in 2025.

## **6. Way Forward**

6.1 Given the vast coverage, remoteness and site constraints of some country and marine parks areas, wider application of technology would face some limitations and challenges, such as lack of power supply and infrastructure including telecommunication network coverage. Nonetheless, the AFCD will continue to explore innovation and intelligent solutions suitable for the countryside environment, to enhance the management work and visitor services of country and marine parks, improve visitors' outdoor experiences, and protect important habitats and resources in Hong Kong.

## **7. Advice sought**

7.1 Members are invited to offer views on the use of technology in the management of country and marine parks.

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Agriculture, Fisheries and Conservation Department  
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