

## **Executive Summary**

### **Direct Investigation Report**

#### **Effectiveness of Mosquito Prevention and Control by Food and Environmental Hygiene Department**

#### **Introduction**

The mosquito problem is a public concern. Mosquito infestation would not only be a nuisance to daily life, but also spread deadly diseases such as dengue fever and Japanese encephalitis.

2. The Pest Control Advisory Section and District Environmental Hygiene Offices' ("DEHOs") Pest Control Sections under the Food and Environmental Hygiene Department ("FEHD") are responsible for mosquito prevention and control in public places all over Hong Kong. FEHD also closely liaises with other Government departments and organisations, and provides them with technical support and training to assist in anti-mosquito work at venues and premises under the latter's management.

3. There are public views that FEHD's selected locations for setting up gravidtraps (formerly ovitraps) are incomprehensive, thereby producing inaccurate survey results. The time lag in FEHD's release of surveillance indices makes it difficult for the public to stay on top of the latest situation. Moreover, the relatively high indices recorded in some districts in certain months as reported by the media indicated serious mosquito infestation in those districts. There are also media reports about FEHD's improper management over the Pest Control Sections leading to ineffective mosquito prevention and control.

#### **Our Findings**

4. FEHD plays a leading role in anti-mosquito work. Its duties are multi-faceted, including surveillance of *Aedes albopictus* (generally known as "Asian Tiger Mosquito") infestation and initiating strategic actions in response to surveillance data, taking preventive and control measures, handling public complaints about mosquito nuisance, and managing the Pest Control Teams ("PCTs") under the Pest Control Sections. After examining FEHD's anti-mosquito work, we have identified the following areas for improvement.

## ***Dengue Vector Surveillance Programme***

5. FEHD's key objective is to prevent and control the transmission of diseases by mosquito vectors. Since 2003, FEHD has operated the Dengue Vector Surveillance Programme ("DVS Programme") by setting up ovitraps/ gravidtraps territory-wide to monitor the prevalence of *Aedes albopictus*, a species with extensive distribution and higher risk of transmitting dengue. As at April 2021, a total of 3,440 gravidtraps were placed in 64 selected survey areas throughout the 19 administrative districts in Hong Kong.

### Analysis and release of information

6. Our investigation reveals that FEHD releases monthly the Gravidtrap Index and Density Index of all survey areas by means of table and graphic map. The Gravidtrap Index enumerates the percentage of gravidtraps with the presence of *Aedes albopictus* (referred to as "Aedes-positive gravidtraps"), thereby evaluating whether the species is extensively distributed within a survey area. The Density Index represents the average number of *Aedes albopictus* mosquitoes collected by each Aedes-positive gravidtrap for quantifying their level of activity.

7. FEHD has classified the Gravidtrap Index into different levels and provided a descriptor for each level. When the index surges to the alert levels, i.e. Levels 3 and 4, FEHD should alert the public. However, FEHD only provides the index monthly in actual figures without mentioning their respective levels and implications.

8. As the Gravidtrap Index is classified into different levels, FEHD should have announced the index and its corresponding level. Based on the descriptor for each level, the public can better understand the severity of mosquito infestation in different survey areas and the proper anti-mosquito measures to be taken. When the index surges to the alert levels, FEHD should also highlight such survey areas of special concern for better warning effect. Moreover, the public might be uncertain about the coverage of the 64 survey areas. FEHD should delineate each area's boundaries and release data, including the index and its level, with the assistance of diagrams and interactive maps to make all critical information clear at a glance.

9. In its monthly release, FEHD would highlight the Monthly Ovitrap/Gravidtrap Index (“MOI/MGI”)<sup>Note</sup> to explain to the public whether the threats posed by *Aedes albopictus* were serious. The MOIs/MGIs over multiple years are compared to reveal the trends. The MOI/MGI, obtained by aggregating data from all survey areas, can theoretically reflect the territory-wide breeding of *Aedes albopictus* in that month. Nevertheless, there are as many as 64 survey areas. Even within the same month, the indices in different areas may vary substantially. Taking the data from 2016 to 2020 as an example, despite no significant fluctuation of the MOIs/MGIs during this period, there was a rising trend in the number and frequency of survey areas recording indices at Level 3 to Level 4 each month.

10. As such, the MOI/MGI is too broad-brush in reflecting the extensiveness of *Aedes albopictus* in Hong Kong. The more infested areas are often averaged out by those less infested ones causing the public to under-estimate mosquito infestation. Insofar as realistically revealing the overall condition of mosquito infestation of a particular month is concerned, and for the purpose of yearly and multi-year comparisons, the MOI/MGI is seemingly too general without in-depth analysis.

11. Therefore, FEHD should review how to optimise the use of data from the DVS Programme, such as conducting a thorough trend analysis of the number of survey areas recording different levels of the monthly Gravidtrap Index, especially Levels 3 and 4. This is to ensure that the results obtained can more accurately reflect the actual condition of mosquito infestation in Hong Kong, and to enhance the breadth and depth of such analysis.

### Launch of Density Index

12. In April 2020, FEHD launched the Density Index, which directly correlates with the Gravidtrap Index in reflecting mosquito infestation. For instance, when both indices are at high levels, it shows that *Aedes albopictus* is extensively distributed in the survey area, and its quantity is also high. When the Gravidtrap Index is low but the Density Index is relatively high, it means that *Aedes albopictus* is not extensively distributed but is relatively active in the vicinity of specific gravidtraps.

13. FEHD has introduced the Density Index with good intention as it allows another perspective for the public to understand the infestation of *Aedes albopictus* in Hong

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<sup>Note</sup> MOI/MGI is the percentage of *Aedes*-positive ovitraps/gravidtraps against the total number of traps retrieved monthly from all survey areas.

Kong. However, the Density Index has been launched and released monthly without proper explanations to facilitate the public's comprehension of its objective, concept and correlation with the Gravidtrap Index. In such circumstances, the public might easily confound the two indices, possibly undermining the Density Index as an indicator of the activity level of *Aedes albopictus*.

14. As the Density Index has already been introduced, FEHD should avoid causing misunderstanding by specifying that the Density Index now in force is for reference only. Meanwhile, FEHD should promptly classify the Density Index into different levels with a descriptor provided for each level, and make sure that the surveillance data released is more explicit, uniform and comprehensible.

#### Response mechanism

15. Where a survey area records a monthly Gravidtrap Index at alarm levels (i.e. Level 3 or 4), FEHD would activate the response mechanism to convene district anti-mosquito task force meetings with Government departments and organisations, property management agents and private venues in the area concerned. The management offices of residential premises, schools, construction sites and public utilities affected would also be notified.

16. FEHD is mainly responsible for the anti-mosquito work in public places. Hence, when more serious mosquito infestation is detected in certain survey areas, FEHD needs to promptly collaborate with other departments and parties managing venues and premises in those areas to bring the index down to the target level rapidly. We consider FEHD to have acted positively and commendably in establishing the response mechanism, which would not only expedite communication and liaison, but also create synergy for the overall anti-mosquito work.

17. We note that FEHD did mention the response mechanism in its press releases but mainly in the months when the mechanism was activated, and that its details were lacking. FEHD had not publicly promoted and disseminated details of the response mechanism through other channels as well.

18. Anti-mosquito work is not just the purview of FEHD. It is crucial for other relevant departments, stakeholders and members of the public to do their part to achieve satisfactory results. Moreover, the purpose of establishing the response mechanism is mainly for stepping up communication and liaison amongst stakeholders to enhance the effectiveness of anti-mosquito work. If the public are well informed of the

mechanism's details, they can assist FEHD in monitoring and facilitating its actual operation. Besides, if serious mosquito infestation persists in a survey area even after activation of the response mechanism, the public can report the situation direct to the relevant departments or management authorities for follow-up action. We urge FEHD to strengthen publicity of the response mechanism with its details more widely disseminated for greater public awareness and participation, thereby enhancing the effectiveness of anti-mosquito work.

### ***Anti-mosquito Work***

19. In addition to the territory-wide surveillance of *Aedes albopictus*, FEHD also conducts surveillance of *Culex tritaeniorhynchus* (vector of Japanese encephalitis) and *Anopheles* (vector of malaria), which are less extensive and pose a lower risk of disease transmission, at selected locations. Its surveillance includes collecting samples of adult mosquitoes for laboratory tests to assess the risk of disease transmission.

20. Whether territory-wide surveillance of all mosquito vectors is necessary and which surveillance methodologies are proper for different species are matters relating to FEHD's professional judgement based on its knowledge of various mosquito species and assessment of their risks. These matters are not subject to our comment. Nevertheless, since FEHD has adopted the current surveillance models for years, it is worth reviewing whether they are still entirely applicable to the present environment and situation. FEHD should devise a mechanism for regularly reviewing its methodologies, including any need to step up surveillance efforts, change or adjust the surveillance process, and include more species in its surveillance. In conducting the review, FEHD may consider inviting local academic institutes to participate in joint research for obtaining expert advice from different sectors. The research results can be used to improve FEHD's strategies and implementation of anti-mosquito work.

21. Meanwhile, FEHD has a duty to initiate different levels of control actions as specified in its Pest Control Technical Circular (Mosquito) No. 3 ("Technical Circular") in accordance with the levels of Ovitrap/Gravidtrap Index recorded for a particular survey area. Thus, we have selected a random sample of four survey areas with an index at alert levels, namely Pok Fu Lam (37.9% in June 2018), Yau Tong (45.1% in July 2018), Wong Tai Sin Central (30.4% in June 2019) and Ma On Shan (42.2% in June 2019) and requested FEHD to provide the relevant pest control records for our scrutiny.

22. After scrutiny, we confirm that targeted control actions were initiated by FEHD within the 100-metre radius of *Aedes*-positive ovitraps, including application of larvicidal oils and larvicides at breeding sites, removal of stagnant water and fogging operations with adulticides. The DEHOs of certain survey areas also sought support from other sections for more manpower to handle the control work, conducted joint inspections with relevant departments and provided them with technical advice. Nonetheless, some of FEHD's records were only about the daily routines for mosquito prevention and control in those survey areas, with no indication of control actions taken according to the Technical Circular. FEHD should give proper instructions requiring its staff to clearly record the anti-mosquito actions taken according to the Technical Circular for enhancing internal supervision and monitoring the effectiveness of control actions.

### ***Use of Mosquito-related Complaint Data***

23. FEHD's major target is controlling mosquito vectors because those species pose a serious threat to public health. As regards the nuisance caused by mosquitoes, FEHD tackles it concurrently with its control of mosquito vectors and handling of public complaints about mosquito infestation. FEHD's information shows that it has in place a mechanism for handling mosquito-related complaints, under which FEHD staff are required to contact the complainants to obtain further details, conduct investigations and perform anti-mosquito work. FEHD also maintains the monthly and annual statistics on mosquito-related complaints received territory-wide and in each district.

24. Regarding the collation and analysis of mosquito-related complaint data, as well as the trends of caseload and districts subjected to more serious infestation, FEHD explained that mosquito-related complaints are affected by many factors, including weather, environment and public concern about the mosquito problem. Given the differences in geographical location and demographic features of each district, the complaint data cannot entirely reflect the condition of mosquito infestation in a particular district. As an example, FEHD cited public concerns about the mosquito problem as one of the factors, stating that a spike in mosquito-related complaints during 2016 and 2018 coincided with cases of Zika virus infections and an outbreak of dengue fever in Hong Kong. Nevertheless, FEHD gave no further analysis and explanation on the trends of mosquito-related complaints in the past.

25. We acknowledge FEHD's rationale for according lower priority to the handling of mosquito nuisance. As a matter of fact, most of the mosquito species found in Hong Kong are non-vectors causing only a nuisance with no serious threats to public health.

FEHD also carries out investigations and anti-mosquito work in response to public complaints. However, FEHD has not thoroughly collated and analysed the complaint data, nor has it initiated strategic anti-mosquito measures in districts where mosquito nuisance is more serious. The FEHD cannot adequately address public concerns about the mosquito problem, nor can it meet public expectations for the authorities' preventive and control work.

26. For the general public, the nuisance caused by different mosquito species is indistinguishable. As long as they suffer from frequent mosquito stings in everyday life, they will perceive mosquito infestation as serious. The surveillance data released by FEHD might strike them as falling short of their perception. Hence, FEHD should allocate resources for collation and analysis of mosquito-related complaints to gauge public concerns and identify the districts and locations subjected to higher risk of mosquito infestation, so that it can respond by deploying the manpower and resources of PCTs in a more systematic and efficient manner. In the long run, FEHD should explore the feasibility of incorporating the mosquito-related complaints into its mosquito surveillance data, so as to reflect more comprehensively the actual condition of mosquito infestation in various districts.

### ***Supervision of PCTs***

27. The duties of pest control, including mosquito control, in public places throughout the territory are performed by FEHD's PCTs (comprising in-house and contractor staff) under DEHOs' Pest Control Sections. Some of PCTs' in-house staff are foremen tasked with routine inspections and surprise checks on contractor staff. The remaining in-house staff are divided into 93 teams, each comprising 4 to 11 members, including Workmen II led by a Foreman or Ganger. They are deployed to 19 administrative districts in Hong Kong to perform mosquito prevention and control duties. The contractor staff of 2,178 are all responsible for mosquito prevention and control, with 48 to 192 members in each district.

28. FEHD supervises the performance of PCTs according to its Operational Manual for Pest Control Services (applicable to both in-house staff and contractors) and Operational Manual for Management of Pest Control Contracts (applicable to contractors only) (referred to as "OMs"). The OMs require FEHD to conduct routine field inspections and surprise checks on the service of contractors. Surprise checks on FEHD's in-house teams is also stipulated under the relevant OM.

29. Upon scrutinising the inspection records of three survey areas (namely Wong Tai Sin Central, Tuen Mun West and Ma On Shan), we notice inadequacies in both the routine and surprise inspections on contractors' teams conducted by FEHD's inspection officers of different ranks. After verification, FEHD explained that they were caused by certain officers' failure to carry out inspections as required, or to input the records on the Contract Management Computer System after completing the inspections. FEHD has given due advice to the relevant officers. We have to point out that our selection of only a few survey areas for scrutiny has already revealed incomplete/irregular inspection records or insufficient number of inspecting involving officers of different ranks. This reflects not only inadequacies on the part of inspecting officers in discharging their duties, but also the lack of proper supervision over the inspection work by senior management. FEHD should, therefore, consider establishing a mechanism for periodically reviewing whether the inspection requirements under the OMs have been fully complied with, so as to ensure effective monitoring by way of inspection as expected.

30. Within the regime of PCTs, the scope of duties discharged by FEHD's in-house staff and contractors is more or less the same. Adequate supervision over both groups is crucial to ensure proper deployment of manpower. However, we notice that although inspections of FEHD's in-house staff are conducted, they are only subject to surprise checks in every two months and four months. The frequency is too low and worth a review.

31. It has also come to our attention that some requirements for inspection frequency under the two OMs are inconsistent. Taking the inspection by foremen on the contractors as an example, the OM for Pest Control Services stipulates the frequency on a monthly basis, while the OM for Management of Pest Control Contracts provides it on a daily or weekly basis. The wordings could lead to misunderstanding. Noting the inconsistencies, FEHD undertook to review the OMs and make necessary amendments.

32. Based on the analysis in **paragraphs 28 to 31**, FEHD should comprehensively scrutinise and review the OMs (including introducing a mechanism to ensure compliance with the inspection requirements, reviewing the frequency of inspections on its in-house teams, and amending those inconsistent paragraphs on inspection frequencies), with a view to enhancing the effectiveness in supervising the PCTs.

## Recommendations

33. We recommend that FEHD:

### DVS Programme

- (1) appropriately consolidate the data released monthly under the DVS Programme to make important information clear for better warning effect;
- (2) review how to optimise the use of the DVS Programme data for more detailed trend analyses so as to depict the actual condition of mosquito infestation in Hong Kong more accurately;
- (3) specify that the Density Index announced is for reference only, and promptly categorise the index into different levels and provide a descriptor for each level, such that the surveillance data will be more explicit, uniform and comprehensible;
- (4) strengthen publicity of the response mechanism activated by surveillance indices to raise public awareness and participation;

### Anti-mosquito work

- (5) devise a mechanism for reviewing mosquito surveillance methodologies and seek expert advice from different sectors to improve strategies and implementation of anti-mosquito work;
- (6) draw up appropriate administrative measures to ensure proper recording of control actions taken in survey areas with the index at alert levels for scrutiny where necessary;

### Use of mosquito-related complaint data

- (7) collate and analyse mosquito-related complaints to gauge public concerns and obtain such information as the districts and locations subjected to higher risk of mosquito infestation, so that it can respond by deploying the manpower and resources of PCTs in a more systematic and efficient manner; and

### Supervision of PCTs

- (8) comprehensively scrutinise and review the two OMs (i.e. the OM for Pest Control Services and the OM for Management of Pest Control Contracts), with a view to enhancing effectiveness in supervising the PCTs.

34. We are pleased to learn that FEHD is positive towards our recommendations and has started implementation of some of them. We will continue to follow up with the Department until all the recommendations have been fully implemented.

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