One Health Risk Assessment in Singapore

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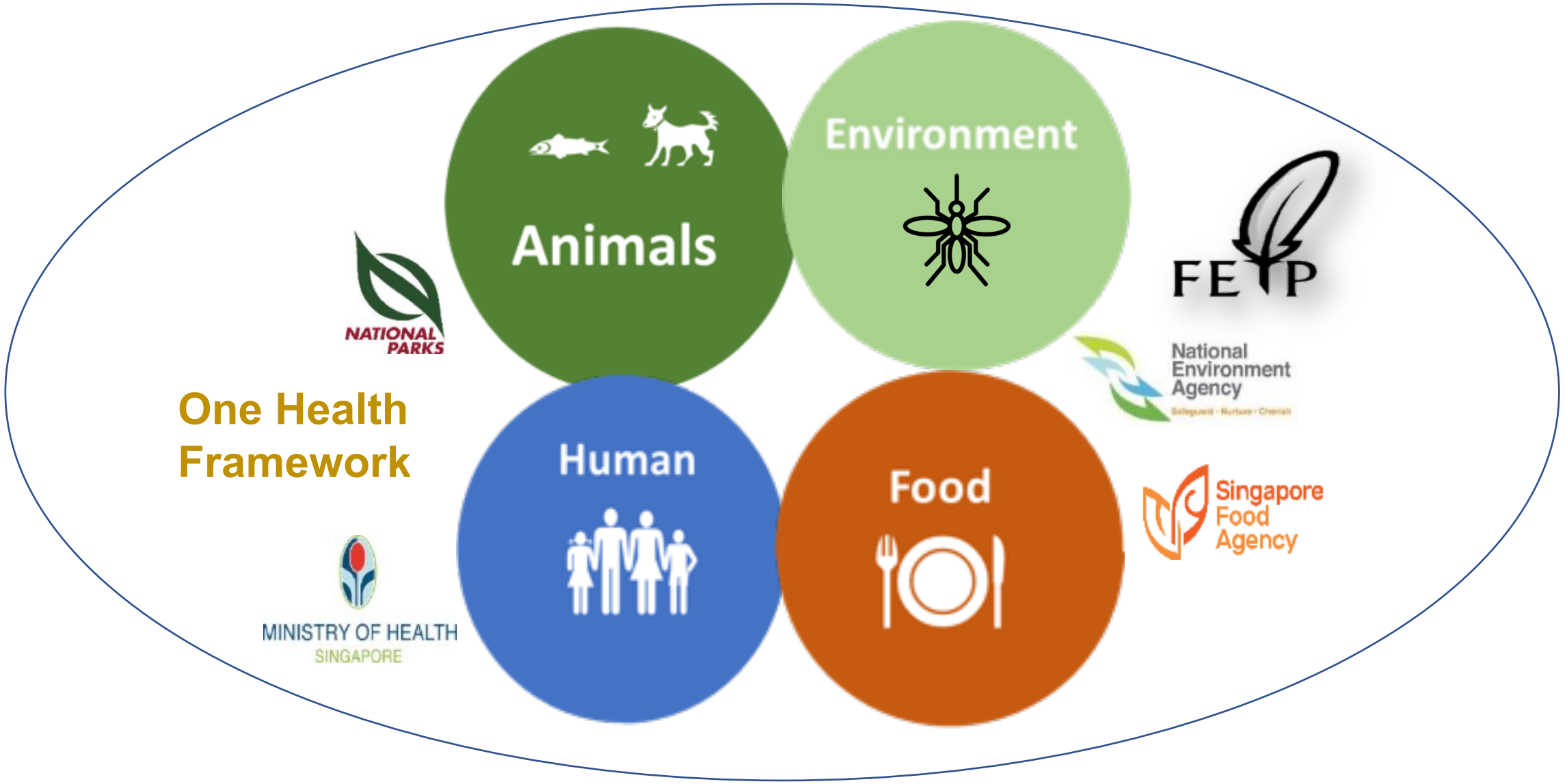
WOG Biosurveillance Landscape



Food Safety in Singapore

Joint Responsibility for food safety

- Multi-agency collaborations (e.g. MOH-SFA One Health approach)
- Partnership with industry
- Public education

Horizon scanning & early alert on overseas food safety/disease incidents

Accredit overseas sources (poultry, pigs, meat & eggs)

Import requirements, inspect & test imports

Risk Assessment & Management

Farm-to-Fork Systems Approach

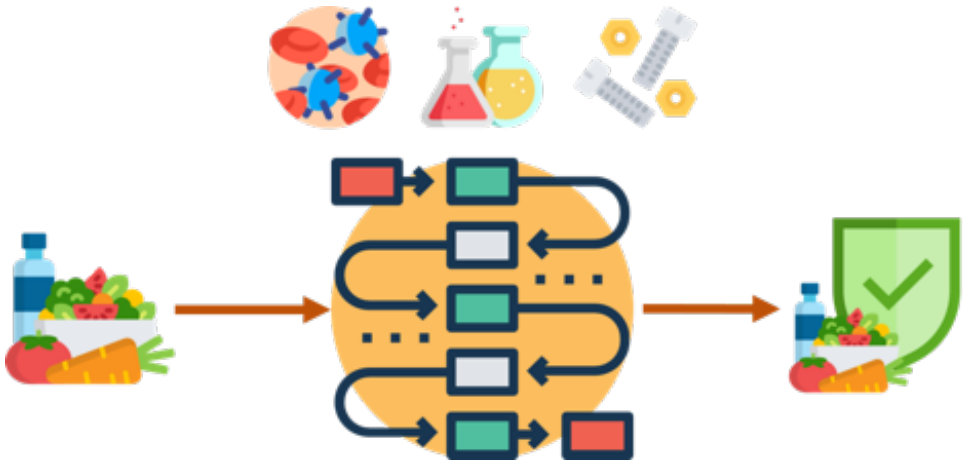
Regulate at retail end (e.g. restaurants, hawker, supermarkets)

Regulate local slaughterhouses, processing plants, food factories, & farms

Surveillance of local farms

Science-based Risk Assessment & Management

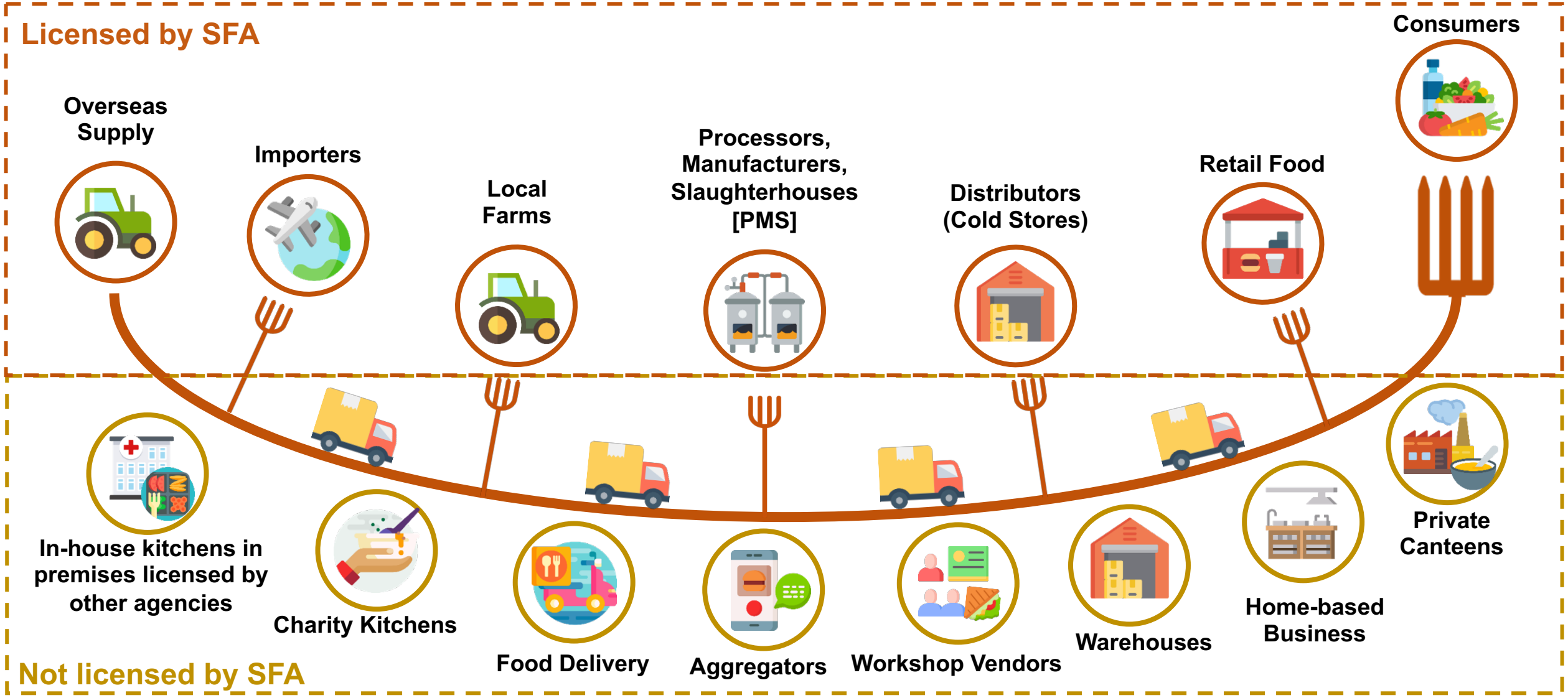
- Based on the stakeholders and control points identified along the food supply chain, SFA will utilise scientific principles to assess the level of risks present and determine the appropriate risk management measures to reduce the risks to a level that will not cause adverse foodborne risks to consumers.



- To carry out effective science-based risk assessment, SFA keeps ahead of global food trends via
  - Alignment to International Standards (Codex, JECFA)
  - Active participation in key forums (ASEAN, APEC)

Farm-to-fork Systems Approach

To **identify key stakeholders and control points** along the farm-to-fork food supply chain



A Whole of Society collaborative practice…

Government

Science-based risk assessment and management from farm-to-fork

- Implement regulatory system (Imported food, local farms, PMS, retail food establishments etc.)

Creates enabling environment for joint responsibility

- Build capabilities (e.g. training)
- Shape mind-sets (e.g. consumer education, risk communication)
- Build supporting ecosystems (e.g. recognition schemes)

Industry

Takes ownership for food safety

- Singapore standards (voluntary scheme e.g. SQES)
- Implement food safety management systems (FSMS)

Consumer

Makes informed decisions

- Advocates for food safety
- Practises good food hygiene

FETP

National Centre for Infectious Diseases

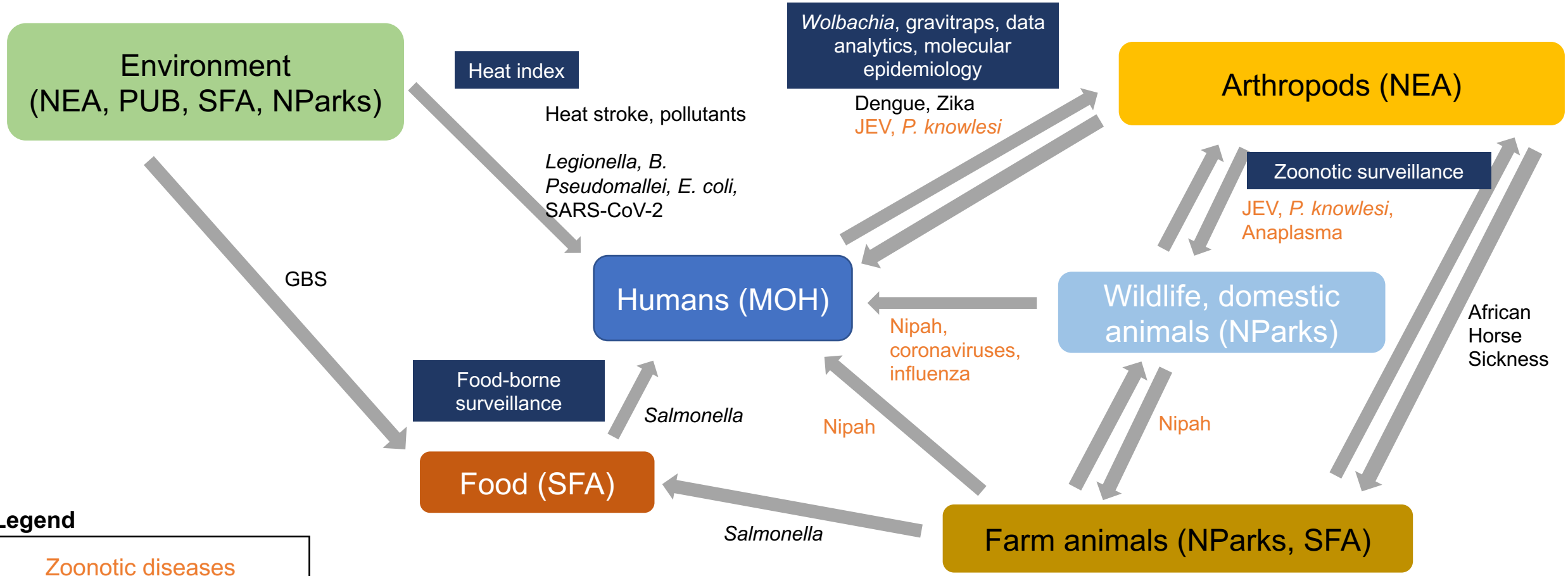
A Whole of Society collaborative practice…

also in tackling antimicrobial resistance

National Centre for Infectious Diseases

Biorisk Landscape in Singapore

Ongoing efforts through individual agencies, One Health platform, RWG Cluster 4

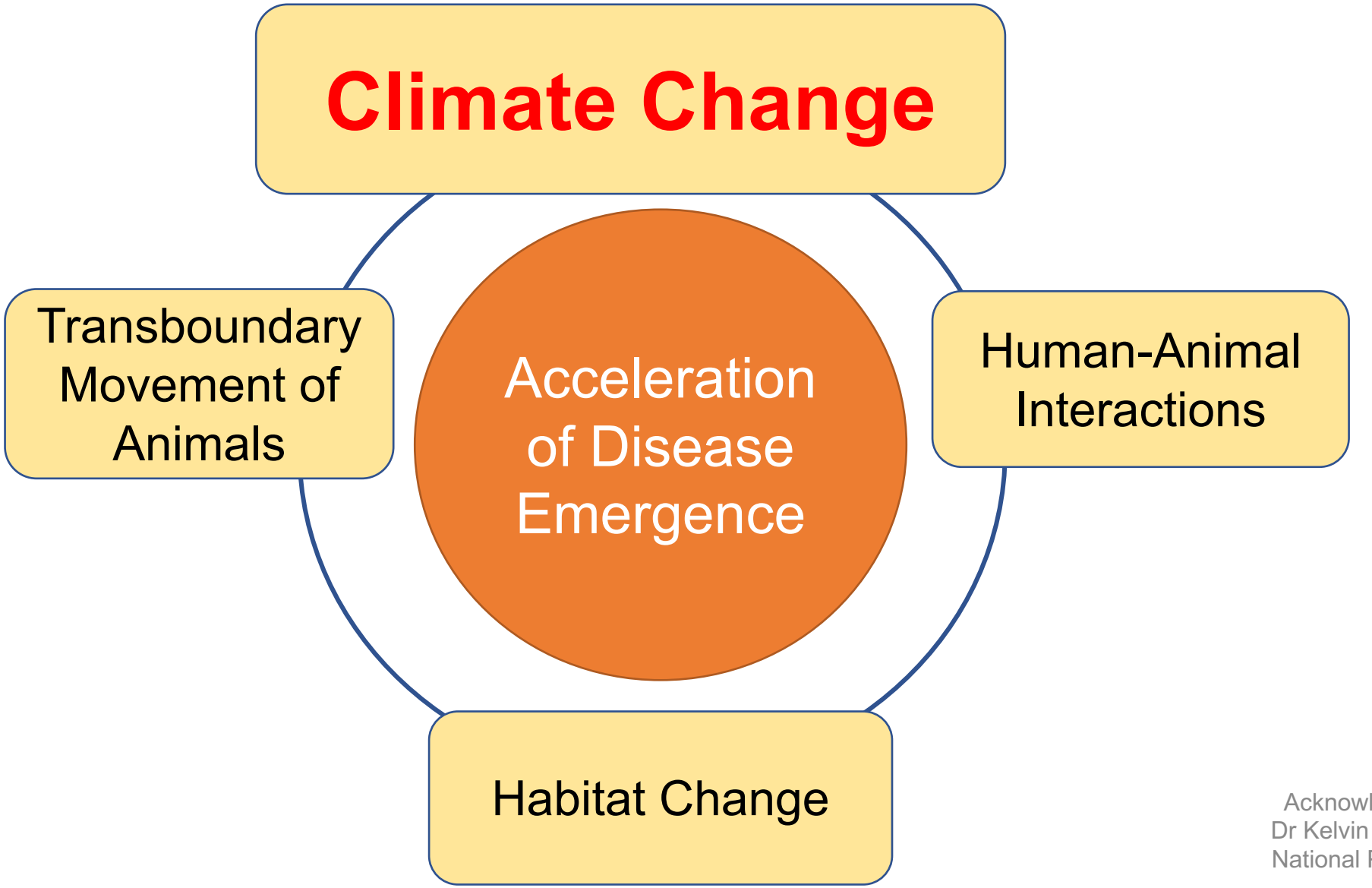


Acknowledgement:
Dr Kelvin Lim, RWG4
National Parks Board

Where else are our environmental health risks?


Anything else?

Risk Drivers for Disease Emergence



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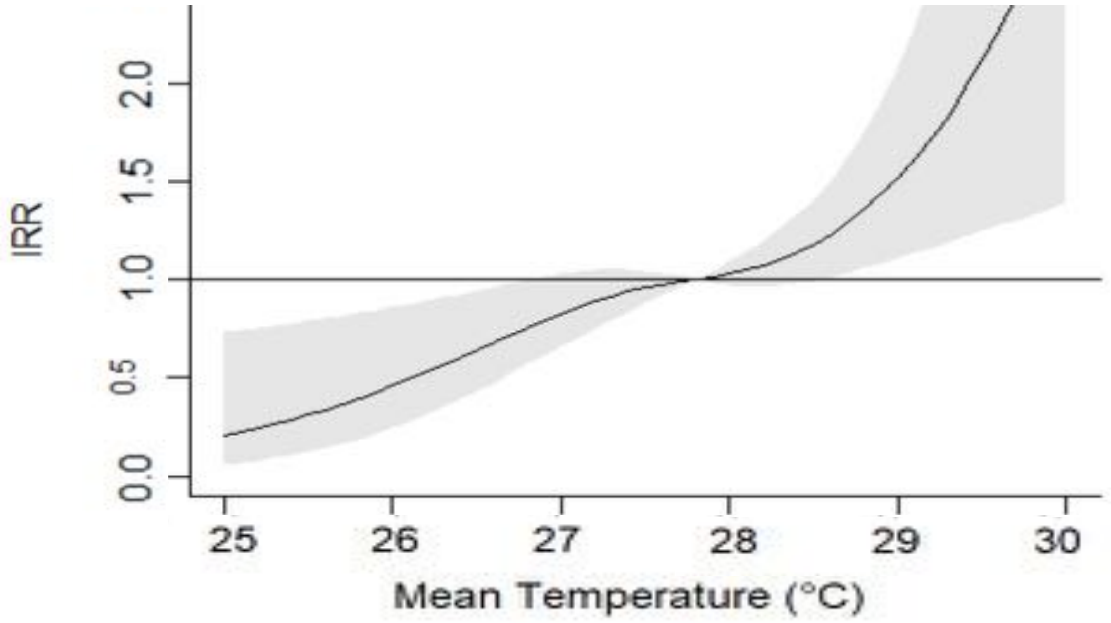
Climate Change Impact on Hosts and Vectors

	Hosts	Insect Vectors
Local warmer weather	Increased transmission and infection rate in animal hosts	Increased pathogen load in cold blooded vectors
Local extreme wet weather	Increased incidence rate in animal hosts and risk of spill-over	More habitats and breeding opportunity for vectors with aquatic stage
Milder winters globally	Changed host migratory patterns Increase infection rate in animal hosts	Increased survival and range of vectors, and their associated pathogens
Intensified dry season overseas	Changed host migratory patterns	Further geographical movement patterns of vectors and the pathogens they carry
Warmer sea surface	Changes to aquatic disease burden	Indirect impact as above

Impact of climate change on mosquito-borne diseases

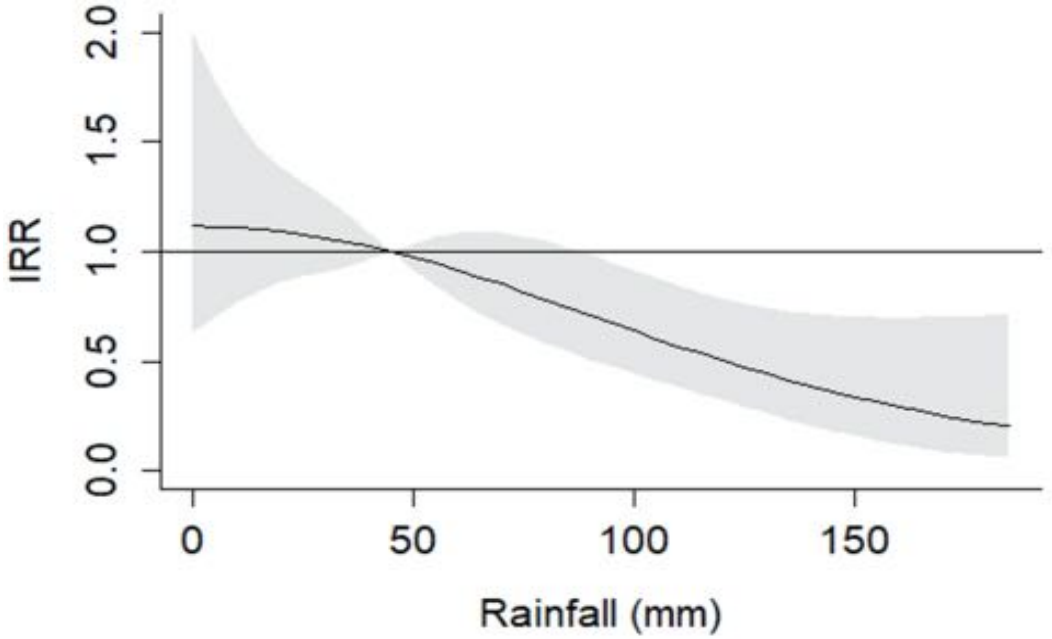
Complexity in the interaction between climatic factors and mosquito-borne diseases

Effect of mean temperature on *Culex* mosquito larval habitats in non-residences



36% cumulative increase in Culex larval habitats for a 1°C increase in MeanT beyond 27.5°C

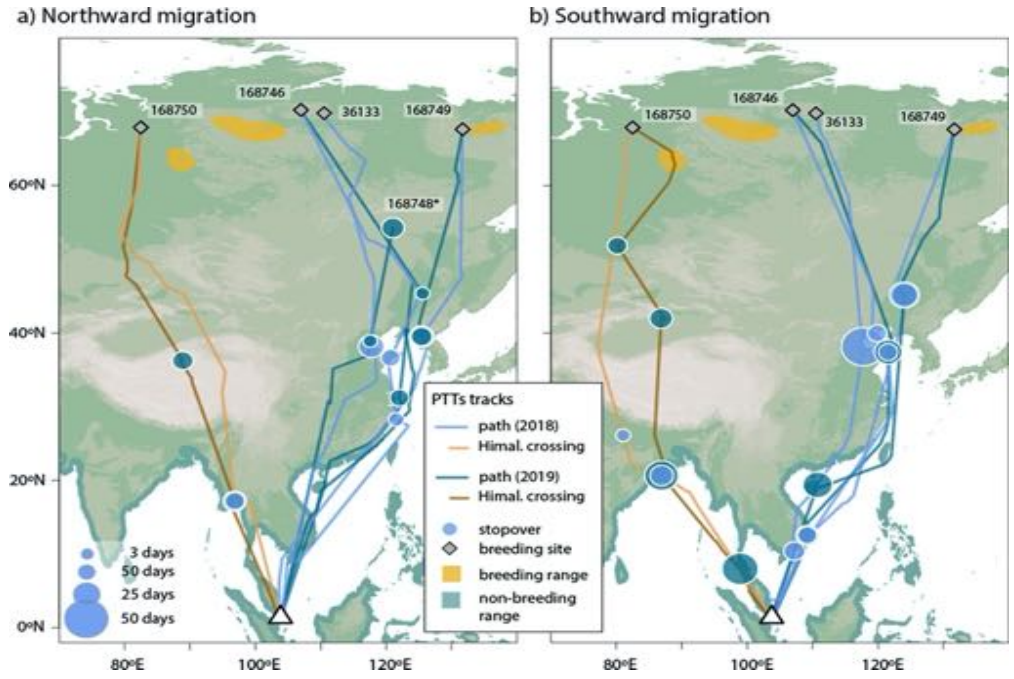
Effect of cumulative rainfall on *Culex* mosquito larval habitats in residences



10.1% cumulative decline in Culex larval habitats for a 10mm increase in rainfall beyond 90mm

Impact of Climate Change on Migratory Hosts

Timing and patterns of bird migrations will change with climate change
Prevalence of disease they carry may also increase



Migratory shorebirds wintering in Southeast Asia can use both the Central Asian Flyway and the East Asian-Australasian Flyway

Intercontinental spread of avian influenza through migratory birds

Strategic Framework for WOG Biosurveillance

Joint Biorisk Prioritisation

1 **Scanning & Early Detection**

Early Warning

Situational Assessment

Proactive Management

2 **Management of Host and Vectors**

Mitigation of Biorisk

3 **Interagency Information Integration**

4 **Science & Technology**

Strategy 1: Scanning and Early Detection

- Identification and prioritization of **key biorisk parameters**
- **Predictive risk-mapping** to identify possible hotspots for disease
- **Disease forecasting and prediction** to build capability in preventing and managing potential disease events

Mock-up of leishmania prevalence map i.e. disease cases, sandfly, licensed dogs

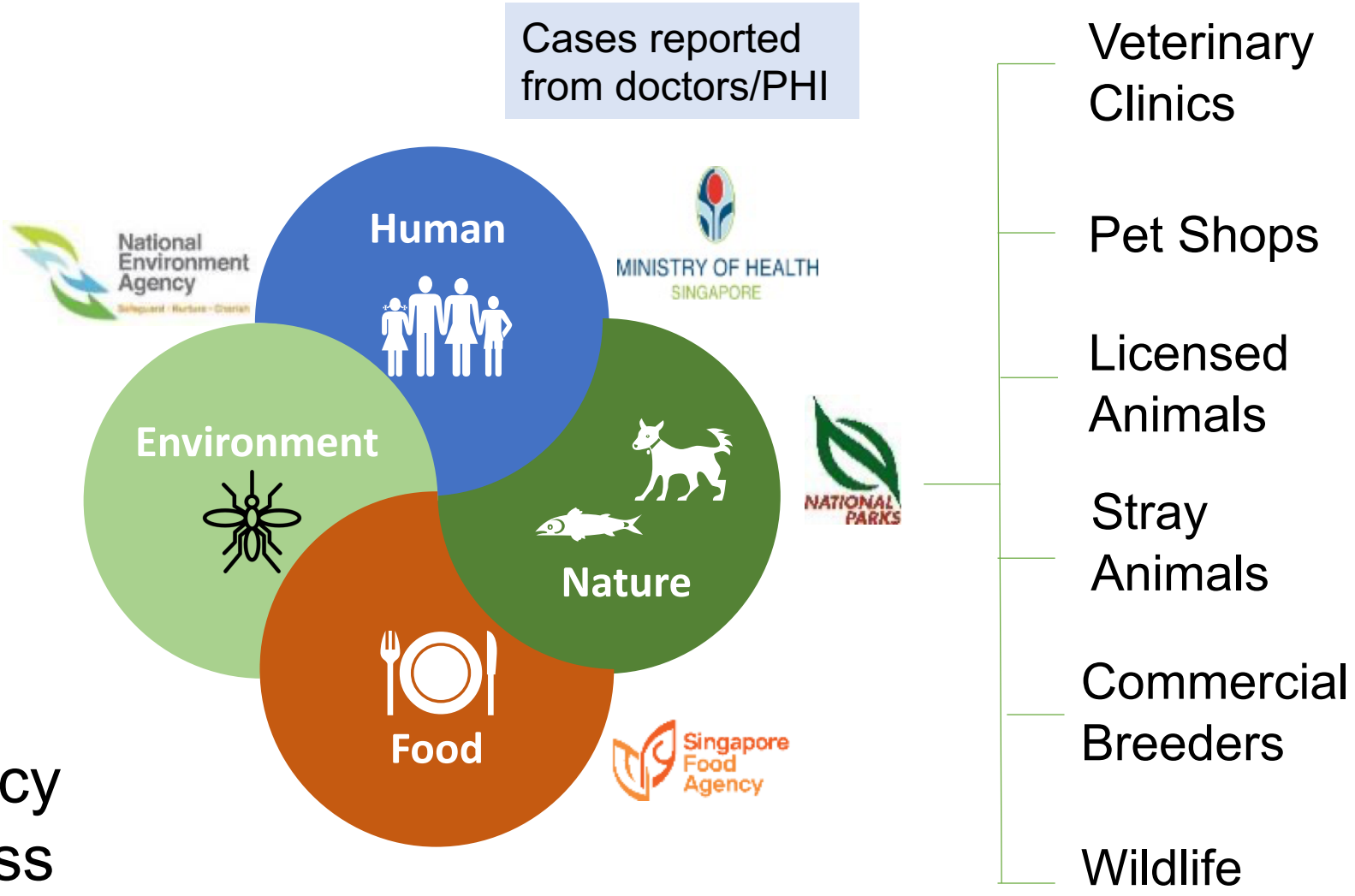
Strategy 2 : Management of Hosts and Vectors

- **Disease Epidemiology, Traceability and Risk Assessment**
  - Understanding transmission pathways
  - Tracing to source and joint risk assessment
- **Population monitoring and management**
  - Management of ecology of hosts and vectors
  - Adopt and/or develop management solutions to reduce disease spill over and/or vector-host contacts
- **Citizen Education and Outreach**
  - Reduce human-animal conflicts
  - Citizen reporting of diseases

Managing Our Built Environment

Strategy 3 : Inter-agency Information Integration

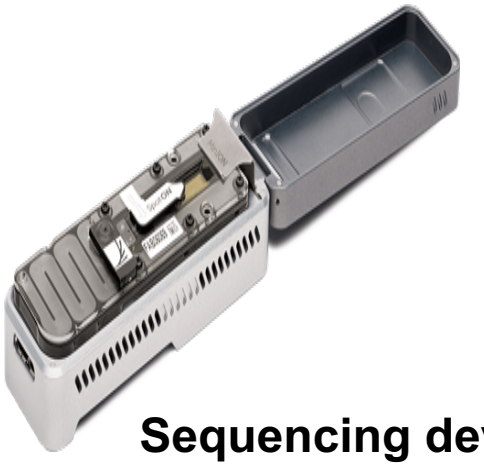
- Integrated national monitoring system for zoonotic diseases
- Information sharing and risk assessment for zoonotic disease management
- Regular review and evaluation of inter-agency emergency preparedness plans



Strategy 4 : Science and Technology

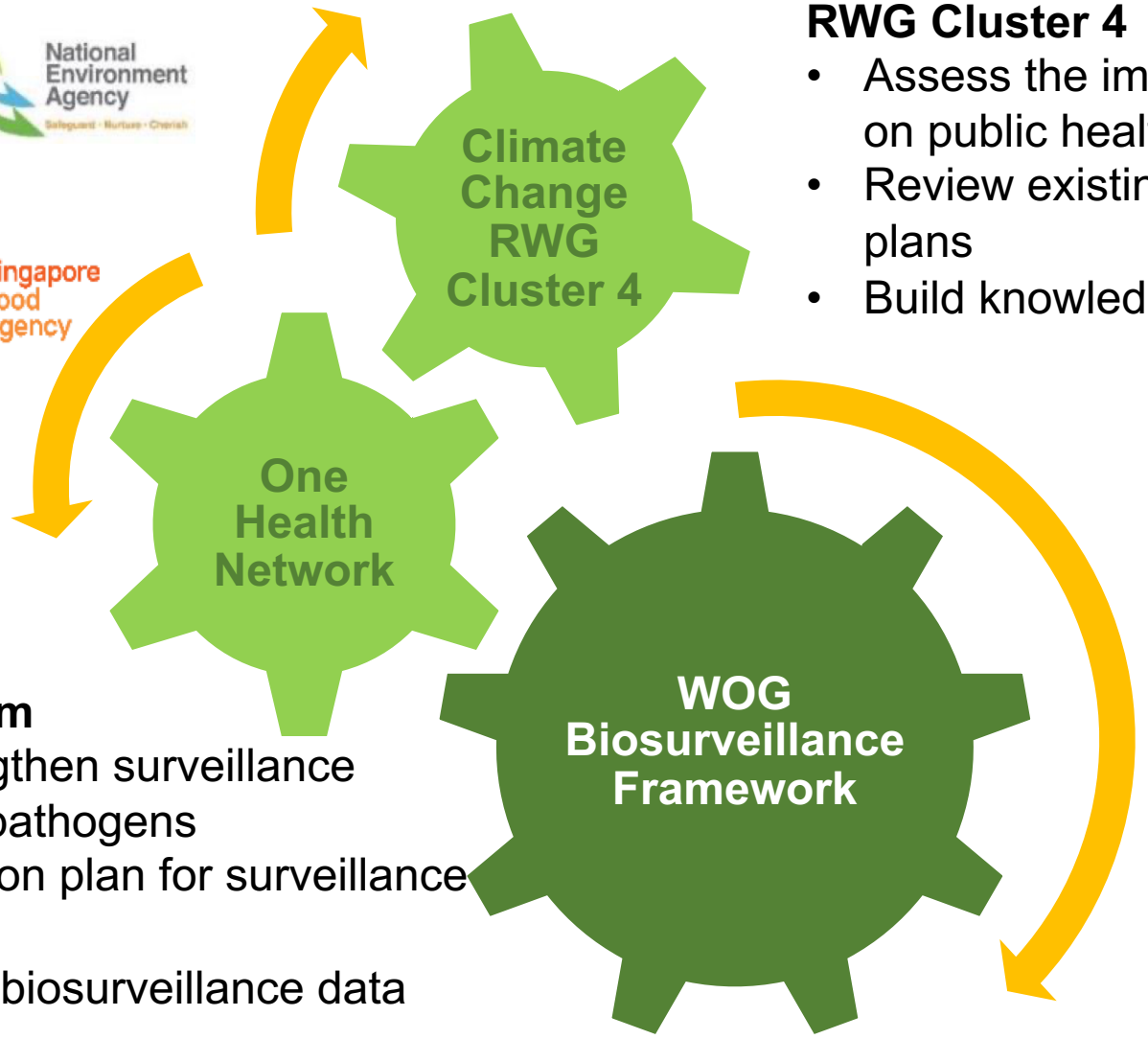
Expand the detection and diagnostic capabilities

- Establish environmental surveillance technologies e.g. eDNA
- Monitor clustering of signs beyond animal-based samples
- Improving sampling technologies e.g. vector trapping
- Advanced genomic platforms
- Develop pre-border migratory host monitoring systems



Sequencing device (Nanopore MinION)

Partners in WOG Biosurveillance



RWG Cluster 4

- Assess the impacts, risks of climate change on public health and food security
- Review existing measures and adaptation plans
- Build knowledge and develop capabilities

One Health Project Team

- Develop plan to strengthen surveillance systems for zoonotic pathogens
- Propose implementation plan for surveillance and monitoring
- Contribute to national biosurveillance data platform