

Strengthening Surveillance and Prevention of Sand Fly-Borne Diseases



CLIMOS Project Policy Brief for Early Detection & Risk Reduction



Sand fly trap installed in a rural area where dogs, the main reservoir of *Leishmania infantum*, and livestock shelters create environments that support sand fly breeding and feeding.

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Executive Summary

Sand fly-borne diseases (SFBDs) are neglected tropical diseases that pose an escalating public health threat across Europe and the Mediterranean, as climate change, environmental degradation, urban expansion, and human mobility or displacement reshape the risk landscape. Persistent surveillance gaps, particularly in sand fly monitoring, continue to undermine early detection.

This policy brief addresses critical inconsistencies in current surveillance and prevention strategies of SFBDs, highlighting fragmented data collection, underreporting, and the lack of standardised entomological monitoring. It emphasises the importance of climate-adaptive tools and One Health data integration.

Drawing on early evidence from the Horizon Europe CLIMOS project, which is piloting harmonised sand fly-borne disease surveillance and integrated climate–health datasets across 13 European and Mediterranean countries, this brief calls for harmonised reporting protocols between public and veterinary health sectors, stronger cross-country collaboration, and targeted prevention strategies focused on environmental risk reduction and population exposure. It translates lessons learned from the field into actionable policy recommendations, including expanding surveillance to currently non-endemic areas, integrating human–animal–vector–environmental data systems, and promoting mandatory national reporting of sand fly-borne diseases to enhance preparedness and response (Figure 1).

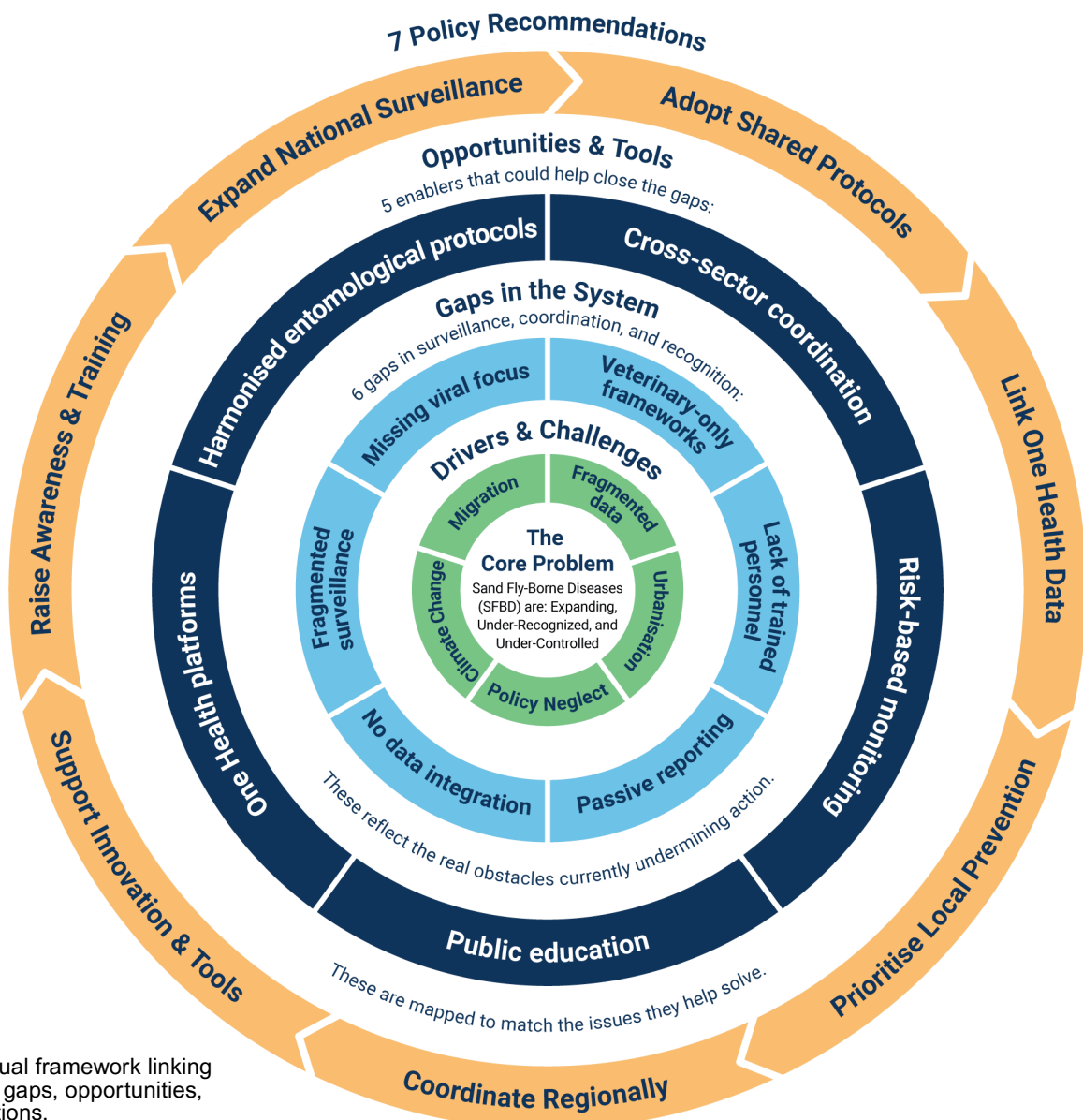


Figure 1. Conceptual framework linking drivers of SFBDs, gaps, opportunities, and recommendations.

Surveillance as the Foundation of Preparedness

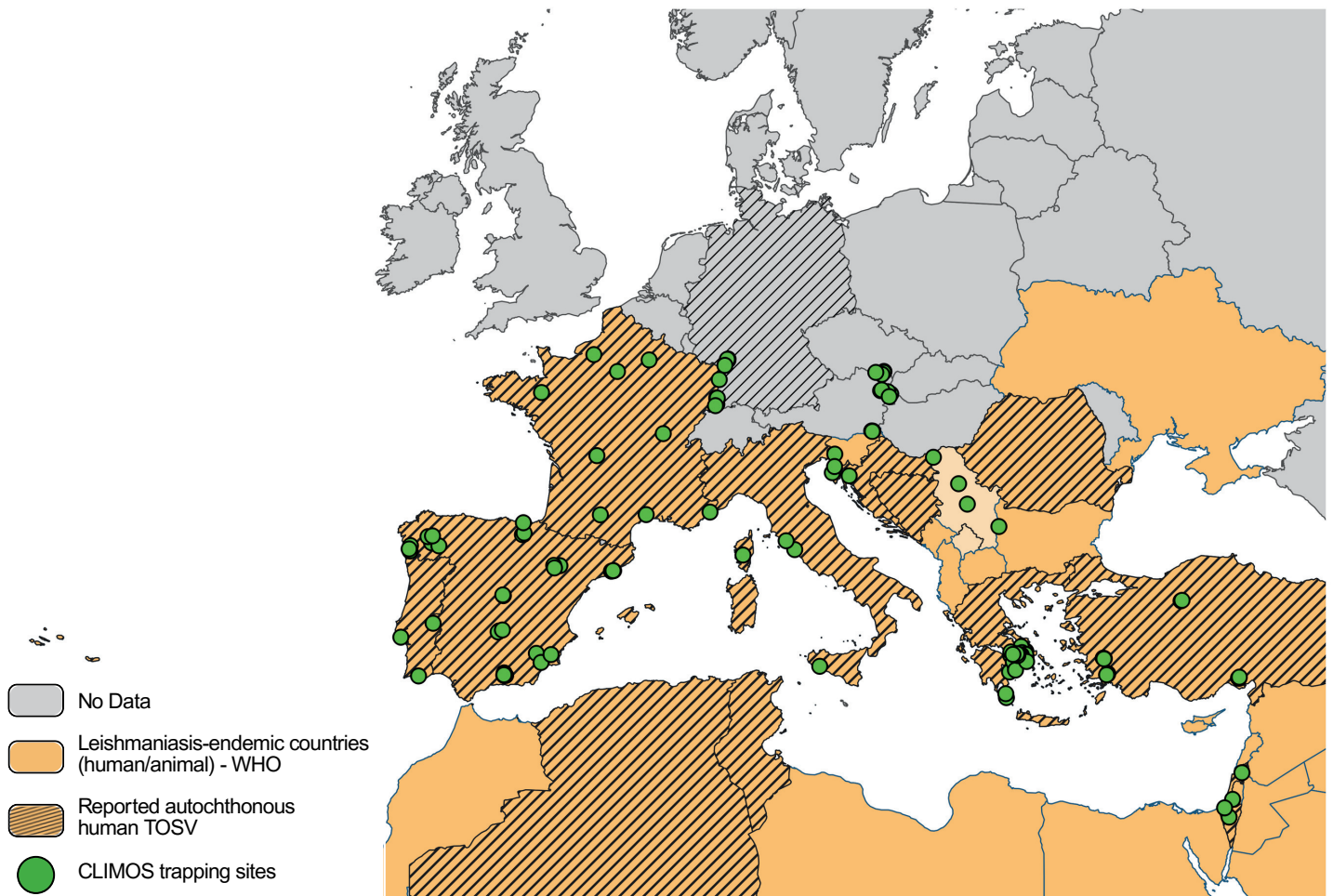
Sand fly-borne diseases, including cutaneous leishmaniasis (CL), visceral leishmaniasis (VL), and viral infections such as Toscana virus (TOSV) and Sandfly Fever Sicilian virus (SFSV), pose a growing public health threat across Europe, the Middle East, and the Mediterranean Basin (Map 1) [1,4].

For leishmaniasis, current estimates suggest that between 1,100 and 1,900 human VL cases and 10,000 to 17,000 human CL cases are reported annually across the WHO European Region, although substantial underreporting is likely [4,5].

For sand fly-borne phleboviruses, available data are even more fragmented. TOSV is currently the best documented, with transmission reported from several Mediterranean countries, but most detected cases originating from Italy; in southern Tuscany alone, 331 neuroinvasive TOSV infections were laboratory-confirmed between 2016 and 2021. Since 2023, Italy has been the only country where TOSV is subject to mandatory national notification (Map 2).

For other sand fly-borne phleboviruses, case information remains scattered, and no comprehensive regional burden estimates or harmonized notification systems exist, suggesting substantial underdiagnosis in routine surveillance [1,6].

Map 1 - Status of leishmaniasis endemicity (human and animal) and autochthonous human Toscana virus infection in the Euro-Mediterranean region, and CLIMOS trapping sites generating harmonised surveillance data [3,6,7,8].



Surveillance as the Foundation of Preparedness

While CL is more frequently reported in humans, VL remains a concern due to its link to infected dogs, which serve as key carriers of the disease (reservoirs). Regional surveys in Europe indicate that canine seroprevalence can reach double-digit levels in some endemic areas, with hotspots of high endemicity, typically in southern Europe. The northward expansion of sand fly vectors and infected reservoirs further increases the risk of human and animal transmission [3,4].

Less is known about the distributions of the phleboviruses, though growing evidence suggests that they are widespread [1,6].

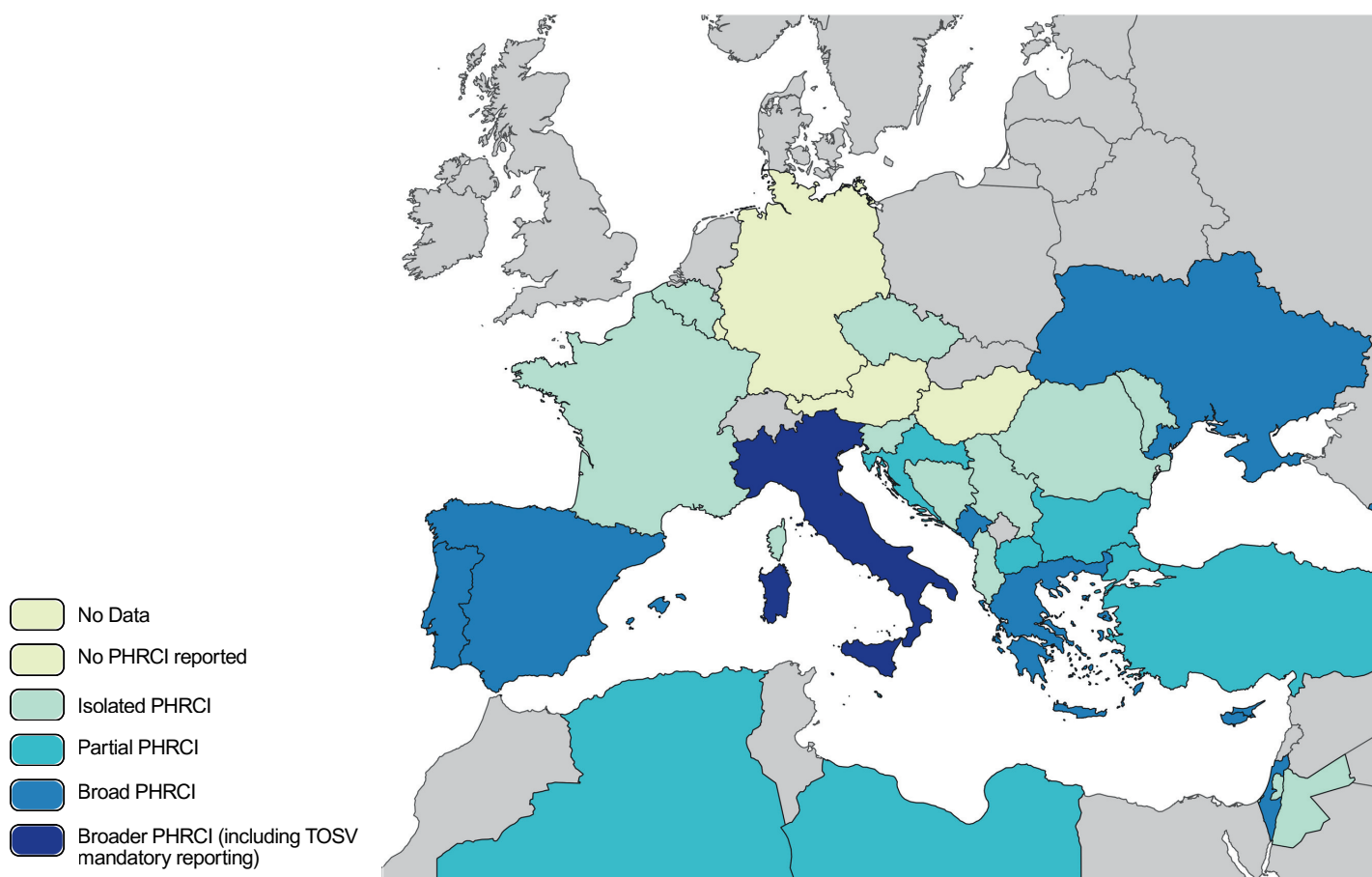
Climatic changes are also reshaping the risk landscape. Projections show that between 2001–2010 and 2011–2020, the percentage of regions within already endemic countries where climate is suitable for transmission increased from 55% to 68%.

The analysis also highlights emerging suitability in previously unaffected areas, including Austria and Germany [2,5,9].

Sand flies are often excluded from national monitoring, and SFBDs, particularly viral infections, remain under-prioritised in many health systems, with limited diagnostic capacity. These gaps delay detection and allow silent transmission to persist [3,7]. Map 2 shows the Public Health Response Capacity Index (PHRCI), a composite score of notification, surveillance, and control capacity, highlighting substantial cross-country gaps in preparedness for SFBDs across the region.

CLIMOS is building the evidence base for a Europe-wide early warning system (EWS) for SFBDs by systematically collecting and analysing past and present sand fly surveillance records across participating and other regions and feeding this data into climate-modelling approaches and risk mapping to guide public health action [6,10].

Map 2 - Sand fly-borne Diseases Public Health Response Capacity Index (PHRCI), scoring countries on six notification–surveillance–control components for human and animal leishmaniasis; additionally, mandatory Toscana virus (TOSV) notification is highlighted [2,7,8].



Current Gaps in Surveillance and Prevention of SFBDs

Despite clear signs of expansion, SFBDs surveillance and prevention remain fragmented and under-resourced in most of Europe and neighbouring regions. These gaps are not only technical but also structural and systemic, affecting both vector detection and human and animal case identification.

Limited national surveillance coverage

In many countries, sand fly surveillance remains limited, unstructured, or research-driven, and disconnected from national public and veterinary health programmes. Where vector control strategies exist, they often focus on mosquitoes and ticks, excluding sand flies [11].

Non-harmonised methods and data

Monitoring of sand flies across countries relies on diverse trapping methods (mainly sticky traps and CDC light traps), but also on varying surveillance regimes (when, how often, where, and with what coverage) and inconsistent diagnostic and reporting practices. This lack of harmonisation makes it difficult to share data across borders and weakens regional risk assessments.

One Health coordination gaps

In many countries, SFBDs continue to be addressed primarily within the veterinary sector, with limited integration into national human health strategies. While some Ministries of Health have developed more proactive approaches, others face constraints in ownership, coordination, or sustained budgetary support. Cross-sector data sharing between public health, veterinary, and entomological services remains limited; VL surveillance is largely passive even where the disease is notifiable, CL is inconsistently included in reporting systems, and entomological data are rarely linked to clinical or veterinary information, reducing their potential for early warning and response.

The European-Mediterranean region remains vulnerable to preventable SFBDs outbreaks, with limited early warning and response capacity and no shared baseline to guide coordinated action. Institutional responsibilities for prevention and response remain uneven, resulting in variable standards and limited long-term commitment.

Underreporting and diagnostic gaps

Human and animal infections often remain undiagnosed due to insufficient clinical awareness, limited diagnostic capacity, or lack of mandatory reporting protocols, especially for viral SFBDs such as TOSV and SFSV, and animal leishmaniasis.

Inconsistent notification across the European-Mediterranean

National surveillance and reporting requirements for leishmaniasis and other SFBDs vary widely between countries: some mandate notification (often only for specific clinical forms), while others do not require reporting at all. Although leishmaniasis must be reported to the World Health Organization (WHO) and the World Organisation for Animal Health (WOAH), it is not currently listed as a notifiable disease by the European Centre for Disease Prevention and Control (ECDC) or the European Food Safety Authority (EFSA). This circumstance leads to highly uneven obligations for human and animal cases, making it difficult to obtain a consistent global picture of the leishmaniasis burden and hindering early detection of emerging foci [2].

For sand fly-borne phleboviruses, routine notification is even less consistent; apart from TOSV in Italy, there is no harmonised mandatory reporting and no coordinated regional overview based on standardised surveillance data [1,6].

One of the key added values of CLIMOS is to generate harmonised sand fly and phlebovirus data to support the first pan-European-Mediterranean maps of phlebovirus circulation and public health response capacity for SFBDs.



Phlebotominae sand fly (female)

From Gap to Action: Policy Recommendations

SFBDs are emerging public and veterinary health threats that require urgent and coordinated action.

The challenges related to SFBDs surveillance and prevention are increasingly recognised, but fortunately, many of the necessary tools are already available. Thus, the priority now is to advocate long-term commitment, strengthen cross-sector coordination, and strategically apply existing tools and capacities across borders.

CLIMOS advises national and regional authorities to adopt a focused set of realistic, coordinated actions to mitigate current risks and to address system gaps. The following recommendations aim to support public health systems to become more resilient and proactive.

Experience from CLIMOS fieldwork shows that these principles can be translated into practice by mapping existing surveillance systems, strengthening integrated sand fly–*Leishmania*–phlebovirus surveillance in selected regions, and co-designing practical guidance with ministries, public health institutes, and veterinary authorities.



Establish national surveillance programmes for SFBDs

Sand flies should be included in national vector surveillance strategies. Public health authorities should institutionalise risk-based surveillance, including in newly affected regions.



Standardize entomological surveillance methods

Countries should adopt regionally harmonised protocols for trapping, identification, surveillance regimes, and reporting of vectors. Harmonisation will improve the comparability of data, enable cross-border collaboration, and allow earlier detection of transmission shifts and prevention.



Integrate sand fly-borne disease data into One Health platforms

Human, veterinary, and entomological data need to be interoperable. Ministries of animal and human health, agriculture, and environment should develop fully integrated data recording systems, supported by complementary legal frameworks for cross-sectoral information sharing and analysis.



Integrating SFBDs prevention into national health strategies

National and local prevention efforts should explicitly include SFBDs, with guidelines for animal reservoir screening, community protection, and targeted vector control. Central coordination, long-term planning, and sustained funding should support these efforts.



Increase public and professional awareness

Governments should run targeted awareness campaigns for at-risk groups, clinicians, veterinarians, and local authorities. Clinical education and professional development must include SFBDs recognition, with emphasis on viral infections such as TOSV and SFSV, especially in regions where incidence is low or overlooked.



Invest in innovation rooted in surveillance

Digital tools, real-time risk mapping, and early warning models should be developed and deployed, but only if they are based on robust and timely updated field data and linked to operational response systems.



Support regional coordination and shared learning

Cross-border knowledge exchange is essential. Platforms such as CLIMOS can bring together countries and institutions to compare approaches, co-develop tools, test new solutions, and generate evidence to inform national and EU-level guidance for SFBDs prevention and control.

Conclusions: A Window for Strategic Action

Despite clear warning signs, many national responses remain reactive rather than proactive. Uneven surveillance coverage, under-resourced prevention, and limited data integration have left Europe and surrounding countries vulnerable to:

- Disease underreporting and delayed outbreak detection.
- Silent transmission in newly affected regions.
- Persistent gaps in coordination and timely response.

There is still a window of time to move from reaction to prevention. Effective prevention begins with surveillance, but surveillance is only effective when:

- **Timely** – able to detect new risks early, before they escalate.
- **Coordinated** – linking sectors, regions, and disciplines with shared protocols and responsibilities.
- **Risk-based** – targeting high-priority areas using complementary epidemiological and environmental evidence.

While innovations in diagnostics, vector surveillance, and data integration will continue to play crucial roles, what is urgently needed is greater advocacy, stronger cross-sector and cross-country collaboration, and sustained financial and operational commitments that capitalise on existing knowledge and expertise.

This policy brief offers practical, experience-informed recommendations and actions drawn from the multilateral work of CLIMOS partners across Europe and neighbouring regions.

Initiatives like these are already showing how shared methodologies, digital tools, and regional cooperation can address surveillance gaps and support more consistent preparedness for sand fly-borne diseases.

CLIMOS in practice

From data to policy: Working across 13 European and Mediterranean countries, CLIMOS is generating comparable evidence on sand fly-borne diseases and related viruses. Key early contributions include:

- **Shared surveillance picture:** Large-scale, coordinated sand fly collections and pathogen screening across diverse settings in CLIMOS partner countries, generating shared datasets on species distributions, infection patterns, seasonality, and climate sensitivity. These data, including previously undocumented vector–pathogen combinations, provide a stronger foundation for understanding risks of SFBs and for developing risk maps and early warning tools [12].
- **Standardised surveillance:** Harmonised protocols for sand fly trapping, species identification, and detection of *Leishmania* and sand fly-borne phleboviruses in humans, animals, and vectors, supported by inter-laboratory comparisons and external quality assessments to align screening approaches across countries [6,13,14].
- **Integrated climate–health datasets:** multi-source datasets combining climatic, environmental, socio-economic, human, and animal health variables to delineate hotspots, vulnerability profiles, and emerging risk areas.
- **Early warning tools:** Development and testing of digital tools, including risk maps and EWS that link real-time and historical data to operational thresholds for surveillance and response [11,15].
- **Policy-relevant co-creation:** Stakeholder workshops and training activities with public health, veterinary, and environmental authorities that help translate these insights into practical guidance and future national and international strategies.

Key Actions - Moving Forward

- Expand the surveillance of SFBDs into potentially suitable and non-endemic regions.
- Promote mandatory case notifications and harmonised reporting systems.
- Integrate human, animal, and vector data through One Health frameworks.
- Invest in climate-adaptive surveillance tools and early warning systems.
- Strengthen cross-border coordination and shared learning platforms.
- Raise awareness among professionals, local authorities, and citizens.

By acting now to strengthen surveillance and prevention, policymakers can better protect high-risk and vulnerable communities and build more resilient health systems.

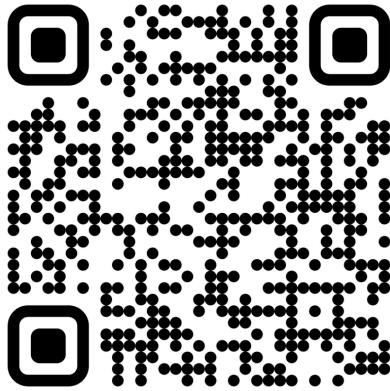


Entomologists processing sand fly catches from overnight surveillance traps

Key Actions - Moving Forward

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