CLIMOS

Early Warning System

Risk Avoidance: Completely remove the probability of risk | Risk Mitigation: Reduce the risk impact to an acceptable level

Different world, Different problem

Description of the scenario

By 2050, climate change has severely impacted Europe, especially the Mediterranean, causing droughts, desertification, biodiversity loss, and the collapse of traditional agriculture. Over 90% of the population lives in urban areas, protected from environmental threats. Animal farming is banned. Advanced surveillance and environmental controls have nearly eliminated human cases, reducing the need for intensive early warning systems.

Human Leishmaniasis is nearly eliminated due to advanced surveillance, widespread public health education, and active citizen participation.

New technologies like vaccines, rapid tests, and genetically modified pets aid in prevention. Migrants from endemic regions are screened and included in equitable health policies, helping to contain disease risks despite climate-driven migration. All these factors lead to a reduced need for early warning systems.

KEY MESSAGES

Risk avoidance

- Most people live in cities and spend time indoors to avoid environmental hazards and disease vectors.
- Rapid tests (e.g., for Leishmania in pets) are widely available and used.
- Animal Farming is prohibited, eliminating a major source of disease reservoirs and reducing vector habitats.
- Veterinarians are trained in preventive measures and actively support early detection.
- Training in disease symptoms and response is part of daily life, ensuring early recognition of health threats.
- Compulsory measures (e.g., vaccination, use of repellents) ensure early action before outbreaks occur.
- Fewer people own dogs, and mandatory vaccination for those who do, reduces transmission risk.
- Shift to vertical farming and fish farming in controlled environments avoids contamination and disease outbreaks.

Low EWS use

- Citizens contribute personal and pet health data for ongoing seroprevalence screening
- Citizens actively participate in health screening, enabling early detection and containment of diseases.
- Public health, veterinary, and environmental sectors work closely to track and respond to potential outbreaks quickly.
- Health checks at borders and integration into public health systems provide early detection of incoming disease risks.
- Continuous observation and control of disease-carrying animals (e.g., rats, raccoons) by public authorities

KEY HIGHLIGHTS

90%	~0	100%
Urban Population	Human Cases	Screening Coverage

POLICY IMPLICATIONS & RECOMMENDATIONS

Strengthen public health infrastructure

- Invest in climate-resilient urban infrastructure.
- Design cities to minimise vector breeding sites.
- Integrate disease prevention into urban planning.
- Support controlled agriculture and vertical farming.
- Targeted vector and parasite control measures implemented in urban and rural areas.
- Dedicated funding for SFBD prevention and treatment in rural areas, (serving 10% of non-urban population, potentially at higher risk).

Invest in public health systems

- Develop comprehensive surveillance networks.
- Implement universal screening programs (for humans and pets), first targeting highly vulnerable groups (potentially the 10% non-urban population), with dedicated public funding to support areas with less-developed health infrastructures.
- Dedicated public funding to accelerate vaccine development and deployment (for humans and pets).
- Establish rapid diagnostic capabilities, especially for vector-borne diseases like Leishmaniasis.

Encourage citizen science and participation

- Engage citizens in active surveillance.
- Train community champions in rural areas.
- Involve the public in data collection (e.g., sand fly monitoring), disease reporting, and responsible pet ownership practices.

Integrate health education into society

- Include vector-borne disease training in schools (adding vector-borne diseases during formal biology curriculum revisions), public campaigns, and community programs to build long-term resilience and awareness.
- Targeted education programmes for medical doctors, to close the gap between veterinarians and clinical professionals for humans.
- Ensure Leishmaniasis awareness raising activities for clinicians in rural areas (10% potentially at higher risk).
- Combat misinformation through targeted programs, utilising the same methods/tools as the architects of misinformation.

Support inclusive health policies for migrants

- Implement equitable, culturally sensitive health screening.
- Ensure equitable access to prevention measures.
- Implement vector surveillance and control practices in migrant settlements (temporary or permanent).
- Address social determinants of health.

Expand veterinary and environmental collaboration

- Facilitate coordination between public health, veterinary, and environmental sectors for data sharing and joint disease control strategies.
- Mandate companion animal vaccination.
- Implement urban animal monitoring systems.
- Regulate tourism involving animals.

Foster research and innovation

- Fund research and commercialisation of vaccines.
- Invest in vector control technologies.
- Support diagnostic innovation.
- Fund climate-health adaptation research and implementation research.
- Develop rapid animal diagnostic tools.
- Explore genetic modification technologies (for genetically modified pets).

VISIT US
www.climos-project.eu

climate-health cluster
Co-funded by the European Union
UK Research and Innovation

CLIMOS

Early Warning System

Risk Avoidance: Completely remove the probability of risk | Risk Mitigation: Reduce the risk impact to an acceptable level

Hyper-vigilant world

Description of the scenario

By 2050, climate change has severely impacted Europe, especially the Mediterranean, causing droughts, desertification, biodiversity loss, and the collapse of traditional agriculture. Over 90% of the population lives in urban areas, protected from environmental threats. Animal farming is banned. Despite successful risk avoidance strategies that have reduced sand fly populations, society maintains hyper-vigilance using a comprehensive Early Warning System (EWS) for sand fly-borne diseases.

The EWS is considered a cornerstone of public health management and is fully integrated into existing health systems. Citizens regularly utilise EWS for disease prevention and broader climate-related concerns. AI-driven EWS analyse vast amounts of data from satellite imagery, climate data, veterinary records, and epidemiological data to predict leishmaniasis outbreaks. Globally deployed sensors and comprehensive databases enable real-time tracking of parasite evolution and vector distribution patterns. This high-tech surveillance approach combines environmental controls with sophisticated early warning capabilities.

KEY MESSAGES

Risk avoidance

- Over 90% of the population lives in cities and stays indoors to avoid environmental and health risks.
- Animal Farming is banned, reducing exposure to animal disease reservoirs and sand fly breeding grounds.
- Regular monitoring and vaccination of pets prevent disease spread.
- Fewer people own dogs, reducing key reservoirs for Leishmaniasis.
- Vector-borne disease education is part of daily life, schools, and community programs, promoting early risk recognition.
- Migrants are integrated into healthcare systems with disease screening, minimising outbreak risks.
- Use of genetically modified sand flies and habitat modifications reduce disease vector populations.
- Environmentally responsible strategies reduce risk without harming ecosystems.

High EWS use

- The EWS is embedded in global and national public health infrastructure as a key tool for managing vector-borne diseases.
- Global genomic databases track sand fly distribution, feeding real-time data into the system.
- Deployed sensors provide real-time data on disease hosts and environmental conditions, powering the EWS.
- The EWS is perceived as easy to use, encouraging widespread adoption and daily use.
- EWS affordability promotes broad use across different regions and socio-economic groups.
- Plans are in place to extend EWS capabilities to monitor other vectors and environmental threats.
- Governments, NGOs, research institutions, and pharmaceutical companies contribute to and support the EWS framework.

KEY HIGHLIGHTS

90%	24/7	100%
Urban Population	AI Surveillance	EWS Integration

POLICY IMPLICATIONS & RECOMMENDATIONS

Invest in AI-Driven EWS infrastructure for real-time disease prediction and surveillance

- Support the development and deployment of AI-driven tools.
- Deploy global sensor networks for continuous monitoring.
- Establish comprehensive genomic databases.
- Develop integrated platforms combining multiple data sources (satellite imagery, climate data, etc.).
- Ensure robust cybersecurity for surveillance systems.

Integrate EWS into public health infrastructure

- Ensure EWS are fully embedded in national and global health systems.
- Provide evidence-driven prevention recommendations.
- Expand EWS focus beyond sand fly-borne diseases.
- Design user-friendly interfaces for citizen access.
- Make EWS and health services affordable and accessible to all, including climate migrants and marginalised populations.
- Improve digital literacy among public health staff, by delivering training in multiple formats and ongoing education opportunities rather than one-time event.

Foster inclusive migration policies

- Ensure that migrants from disease-endemic regions are screened, treated, and integrated without discrimination.
- Provide migrants with relevant information to raise awareness of protective practices related to infections that they have previously not been exposed to (and lack natural immunity).
- Address concerns about marginalisation while managing health risks.
- Develop inclusive policies for climate refugees.
- Provide advanced healthcare to all detected cases.
- Integrate EWS data for migration planning.

Foster genomic surveillance

- Establish comprehensive genomic databases.
- Enable real-time pathogen and vector tracking.
- Monitor parasite evolution and resistance patterns.
- Share genomic data across international networks.

Promote citizen engagement in EWS use

- Make EWS user-friendly and accessible to all citizens, including children (e.g. through gamification to support learning).
- Invest in health-promotion activities that build trust, transparency and a sense of shared-ownership with the public – focusing on how their continued participation in data sharing ensuring a high-quality EWS.
- Include vector-borne disease training in schools, workplaces, and communities to build awareness and promote early action.
- Integrate digital literacy into school curricula across subjects, not as a standalone skill.
- Offer digital skills programs aligned with real-world needs.
- Invest in underserved areas by supporting public–private partnerships to expand broadband infrastructure in rural and marginalized communities.
- Promote campaigns in media to encourage widespread, routine use of EWS by the public, continuously raising awareness of potential threat, in order to avoid complacency over time.

Support targeted vector control measures

- Enforce compulsory (free through public funding) vaccination and routine health checks for companion animals to prevent zoonotic disease transmission.
- Support safe and targeted use of Sterile Insect Technique (SIT) and genetic control strategies in endemic regions to reduce transmission.
- Develop integrated pest and habitat management practices.
- Regulate or eliminate practices that contribute to vector proliferation and disease spread (e.g. open animal farming).
- Balance vector control with ecosystem preservation.
- Target habitat modification in endemic regions.

Promote international coordination

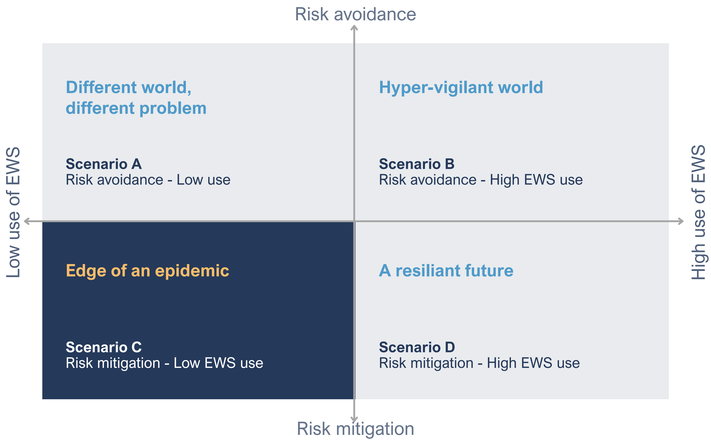
- Coordinate efforts among governments, NGOs, and research institutions.
- Establish comprehensive global control programs.
- Ensure equitable access to EWS technologies.
- Share best practices and surveillance data.
- Harmonise and standardise epidemiological data collection, reporting and ontology (shared vocabulary) across nations.

VISIT US
www.climos-project.eu

climate-health cluster
Co-funded by the European Union
UK Research and Innovation

CLIMOS

Early Warning System



Risk Avoidance: Completely remove the probability of risk | Risk Mitigation: Reduce the risk impacto to an acceptable level

Edge of an epidemic

Description of the scenario

By 2050, organic farming trends and climate change have led to a surge in sand fly populations and associated vector-borne diseases like leishmaniasis, across Europe. Remote work trends and nature reconnection expose more people to risks, while mass migration from endemic countries increases disease pressure.

Citizens remain largely unaware of sand fly-borne diseases, with misinformation complicating public understanding. Despite growing health risks and public pressure, early warning systems and other technological solutions face low uptake due to mistrust, limited awareness, and policy hesitancy. Vaccines and advanced treatments remain in clinical trials, leaving communities vulnerable and unprepared for emerging threats.

KEY MESSAGES

Risk mitigation

- Compulsory dog vaccination minimises transmission from companion animals.
- Travel health advice and compulsory health checks for endemic country travellers.
- Training programs for farmers on animal hygiene and cleaning practices.
- Community engagement and education programs using interactive multimedia.
- Nature-based solutions including natural predators and insect sterilisation schemes as alternatives to pesticides.
- Emerging vaccines and nanomedicine treatments in clinical trials.
- New building designs have adapted to climate change and limit exposure to outdoor vectors, but controlled environments have inadvertently created ideal breeding grounds for sand flies indoors.
- Proposals for National Pet Vaccination Programs to reduce infected stray dog populations and their role in disease transmission.

Low EWS use

- Public lacks knowledge about EWS capabilities and benefits for health protection.
- Citizens find disease monitoring systems hard to access and use.
- Government concerns about EWS causing panic and affecting economic activity.
- Limited budget and competing social policy demands reduce EWS investment.
- Public distrust of data-driven solutions due to privacy and security concerns.
- EWS seen as government surveillance tools, met with suspicion and resistance.
- Inaccurate information, especially via social media, undermines trust in disease monitoring systems.
- Limited internet access and low exposure to high-tech tools hinder usage, particularly in remote regions.
- Public health services face high staff turnover and limited institutional capacity to support EWS adoption.

KEY HIGHLIGHTS

Increased
Exposure to sand fly-borne diseases

Low
Public Awareness

Trial
Phase Vaccines

POLICY IMPLICATIONS & RECOMMENDATIONS

Enhance public education and awareness
- Launch nationwide education campaigns to inform citizens about the benefits and use of Early Warning Systems for vector-borne diseases.
- Establish credible public information channels to counteract health-related misinformation, especially on social media.
- Increase disease literacy about sand fly-borne diseases.
- Develop clear, accessible communication strategies.

Invest in user-friendly EWS tools
- Develop accessible, easy-to-use digital platforms, especially tailored for rural and low-tech populations.
- Improve internet infrastructure and digital literacy in remote and underserved regions.

Strengthen health system capacity
- Retain institutional knowledge in public health services through better staffing, training, and continuity planning.
- Improve vector control program continuity.
- Accelerate vaccine and treatment development, by implementing a "risk threshold", thereby allowing regulatory and bureaucratic flexibility related to vaccine and treatment development for "high-risk" infections (similar to COVID19).
- Develop advanced diagnostic tools and monitoring technology.

Implement sustainable agriculture practices
- Develop organic farming guidelines that minimise vector breeding.
- Train farmers in hygiene and cleaning practices.
- Support nature-based solutions and integrated pest management.
- Balance environmental goals with disease prevention.
- Encourage architecture and urban planning that minimises indoor and outdoor vector habitats.

Strengthen animal health management
- Expand national pet vaccination programs.
- Address stray animal management (canine and feline) and legislative gaps regarding all animal health management (including other non-domesticated animals).
- Support dog owners with vaccination costs during economic stress.
- Improve companion animal ownership regulations.

Build trust and political support
- Address public concerns about privacy and surveillance.
- Demonstrate clear value proposition for EWS investment.
- Build transparent, accountable health governance systems.
- Engage communities in decision-making processes.
- Prioritise funding for preventive health strategies, particularly those offering long-term savings like EWS and vaccination schemes.

Coordinate migration and travel health
- Implement comprehensive health screening for migrants.
- Improve living conditions for climate refugees.
- Strengthen travel health advice and monitoring systems.
- Develop regional cooperation frameworks for disease control.
- Invest in local initiatives to engage communities and drive trust, through unofficial community-based sources of information.

Support research and innovation
- Accelerate development and equitable access to vaccines, nanomedicine, and genomic-based treatments.
- Fund research and deployment of nature-based solutions like predator introduction and insect sterilisation over banned chemical pesticides.

VISIT US
www.climos-project.eu

climate-health cluster
Co-funded by the European Union
UK Research and Innovation

CLIMOS

Early Warning System

Risk Avoidance: Completely remove the probability of risk | Risk Mitigation: Reduce the risk impact to an acceptable level

A resiliant Future

Description of the scenario

By 2050, organic farming trends and climate change create ongoing sand fly challenges across Europe. Extended warm winters, humid springs, and increased nature exposure continue to pose risks. However, an EU-funded, state-run AI-driven Early Warning System (EWS) provides effective management by analysing satellite imagery, climate data, and epidemiological records enabling proactive responses. The system provides a perceived sense of safety while allowing normal life when infection chances are low, with targeted precautions during high-risk periods. Minimal investment in global sensor networks using drones and robots delivers real-time data interpretation. Localised sand fly population management techniques, supported by local governments, minimise environmental impacts while effectively containing disease spread. The EWS takes pressure off health systems by enabling timely resource mobilisation and international collaboration.

KEY MESSAGES

Risk mitigation

Mandatory dog passports quarantine, and regular testing for pets traveling abroad to trace and prevent disease spread.

Compulsory dog vaccination, reducing transmission from companion animals.

Promising human leishmaniasis vaccines under development, aiming to reduce disease impact.

Early education and awareness programs in formal education systems.

Localised sand fly population management techniques by local governments.

Focus on vectors and reservoirs while balancing awareness with preventing panic.

Investment in healthcare system capacity and diagnostic capabilities.

High EWS use

EU-funded, state-run EWS as part of national adaptation strategies, ensuring institutional support and integration into public health strategies.

Low-cost AI-driven system analysing satellite imagery, climate data, and epidemiological records. enabling accurate forecasting.

Global sensor networks using drones and robots for minimal-cost data collection.

Real-time data interpretation providing perceived sense of safety to citizens. increasing public willingness to use the system.

Evidence-based foundation for international collaboration and harmonised mandates.

Standardised data collection protocols and harmonised analysis across regions.

An EWS that offers real-time, localised information on infection risks, helping individuals adjust their activities accordingly.

Reduces burden on the health system by enabling timely preventive actions.

KEY HIGHLIGHTS

EU
Funded EWS

Real-time
Data Analysis

Global
Collaboration

POLICY IMPLICATIONS & RECOMMENDATIONS

Establish EU-wide EWS infrastructure

- Secure sustainable EU funding for state-run EWS systems, with less-affected regions subsidised (despite the lower risk) to ensure regional inequalities avoided.
- Deploy global sensor networks using drones and robotics.
- Implement standardised data collection protocols across regions.
- Integrate EWS into national climate adaptation strategies.
- Fund research on smarter and connected trapping systems.

Advance AI-driven analysis capabilities

- Integrate satellite imagery, climate data, and epidemiological records.
- Develop real-time data interpretation systems.
- Enable localised population management decision support.
- Provide insights into socio-economic risk factors.
- Develop real-time alerts, based on at-risk populations, derived from AI-driven insights.

Strengthen health system integration

- Train healthcare workforce in EWS utilisation.
- Develop new skills and competencies for system integration.
- Balance prevention measures with healthcare capacity investment.
- Develop and fund vaccine research for humans and dogs, and ensure equitable access once available.

Build public trust and engagement

- Address ethical and privacy concerns associated with health data to build public trust in digital health tools.
- Ensure community engagement in system development.
- Integrate awareness programs into formal education systems.
- Include EWS data in public communication strategies to guide safe behaviour and reduce panic, while maintaining transparency and trustworthiness on data collection and use.
- Reinforce public communication to raise awareness without causing panic, ensuring community engagement and transparency.

Foster international collaboration

- Standardise data collection protocols and ensure harmonised data analysis across countries for coordinated responses.
- Harmonise public health mandates for global leishmaniasis management.
- Establish evidence-based foundations for cross-border cooperation, leveraging EWS as a shared platform.
- Coordinate responses to climate-driven migration and disease spread.
- Share best practices and technological innovations.

Implement sustainable environmental management

- Support local government sand fly population management.
- Minimise environmental impacts while maintaining disease control.
- Balance organic farming trends with vector control needs.
- Develop nature-reconnection guidelines that reduce health risks.
- Implement cross-sectoral collaboration on regional and national levels (e.g. medicine, veterinarian, agricultural, recreational sectors).

VISIT US
www.climos-project.eu

climate-health cluster
Co-funded by the European Union
UK Research and Innovation