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EMERGING VECTOR BORNE DISEASES AND CLIMATE CHANGE: EXAMPLE OF RIFT VALLEY FEVER

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ecdc EUROPEAN CENTRE FOR DISEASE PREVENTION AND CONTROL

efsa EUROPEAN FOOD SAFETY AUTHORITY

RIFT VALLEY FEVER

RVF assessment by EFSA :

- Epidemiological update and Risk of introduction into EU
- RA on effectiveness of prevention and control measures in Mayotte and EU in case of incursion

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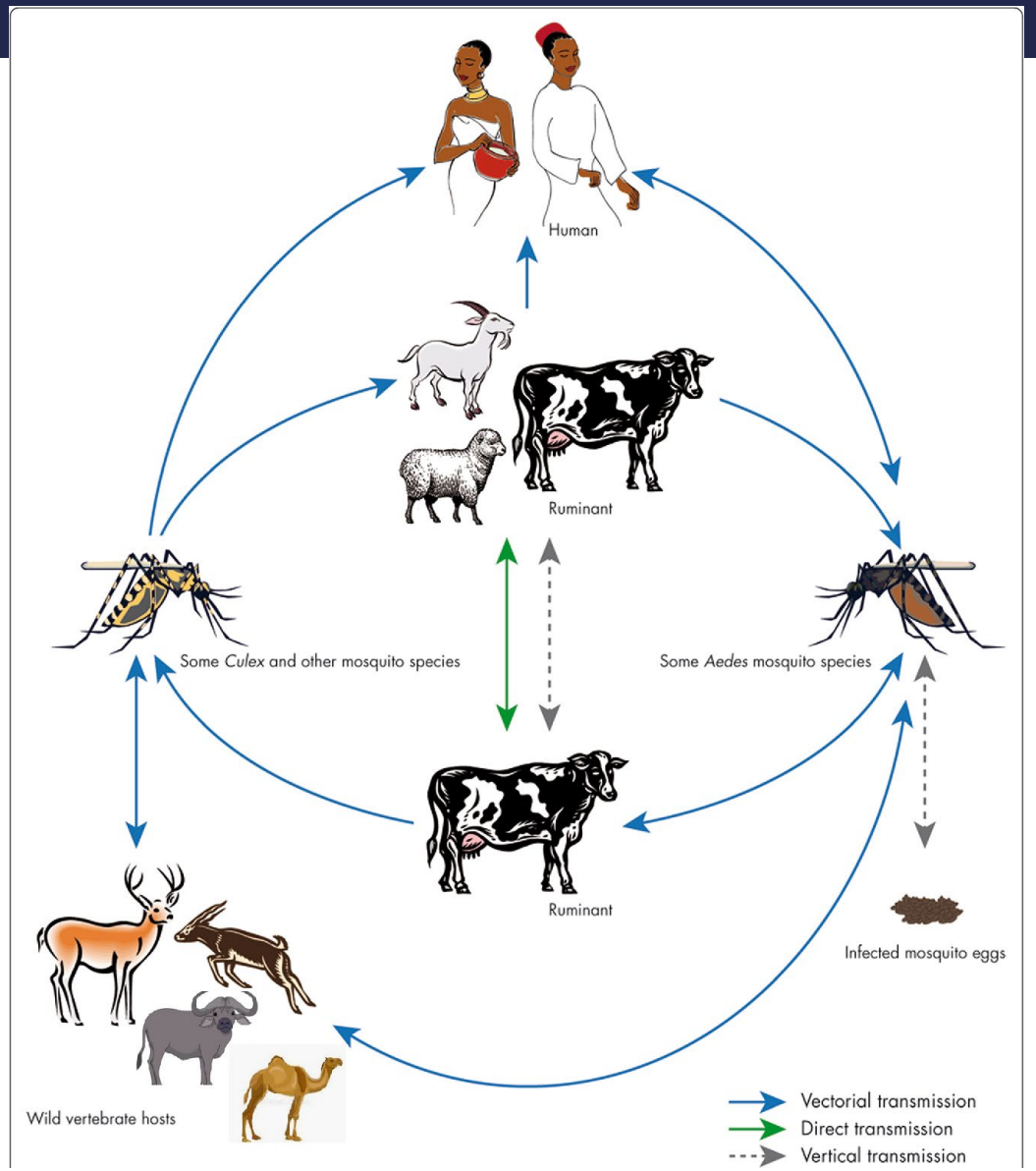
RIFT VALLEY FEVER

Mosquito-borne
viral disease of
ruminants and humans

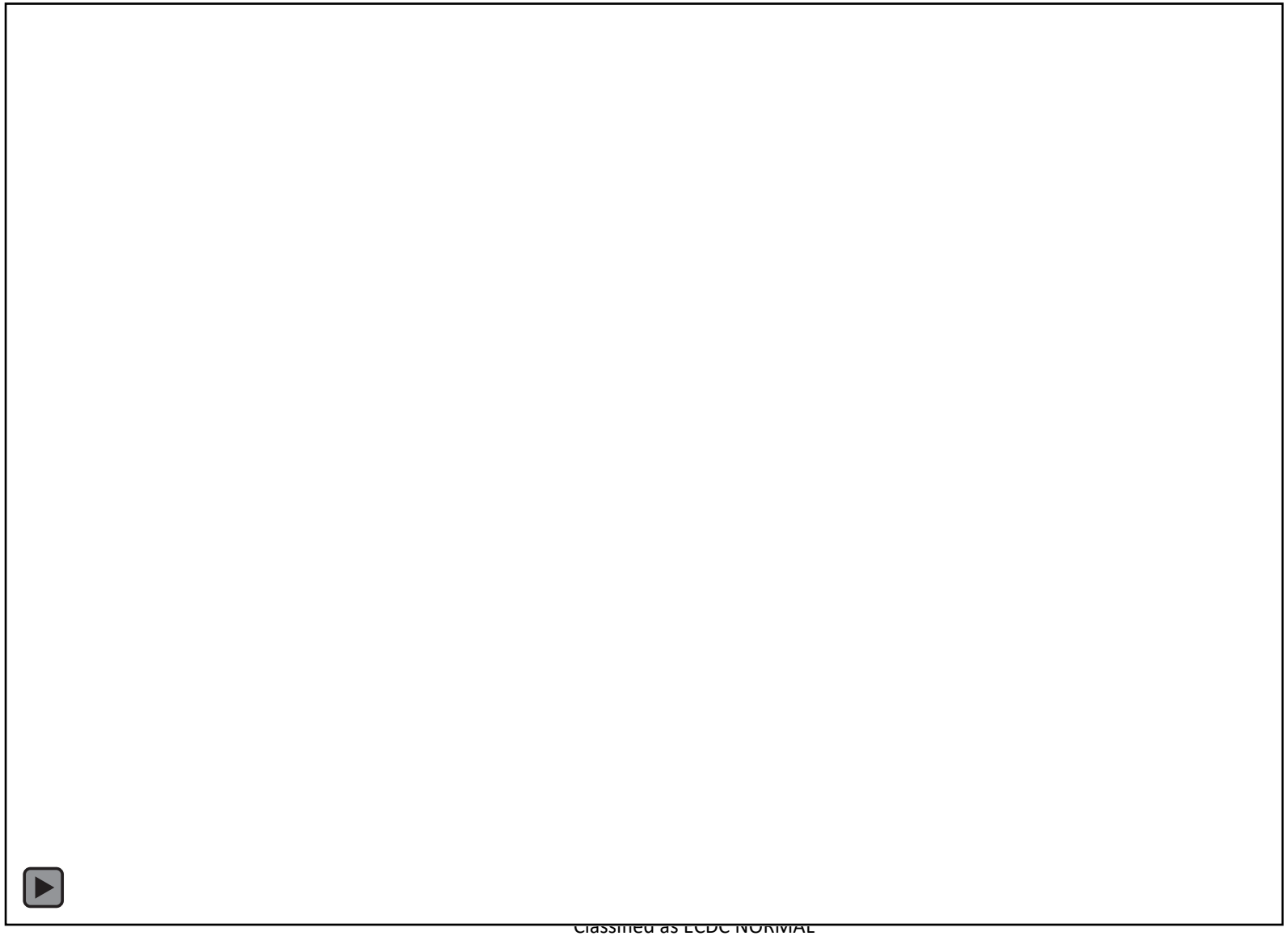
>> serious zoonosis



RIFT VALLEY FEVER

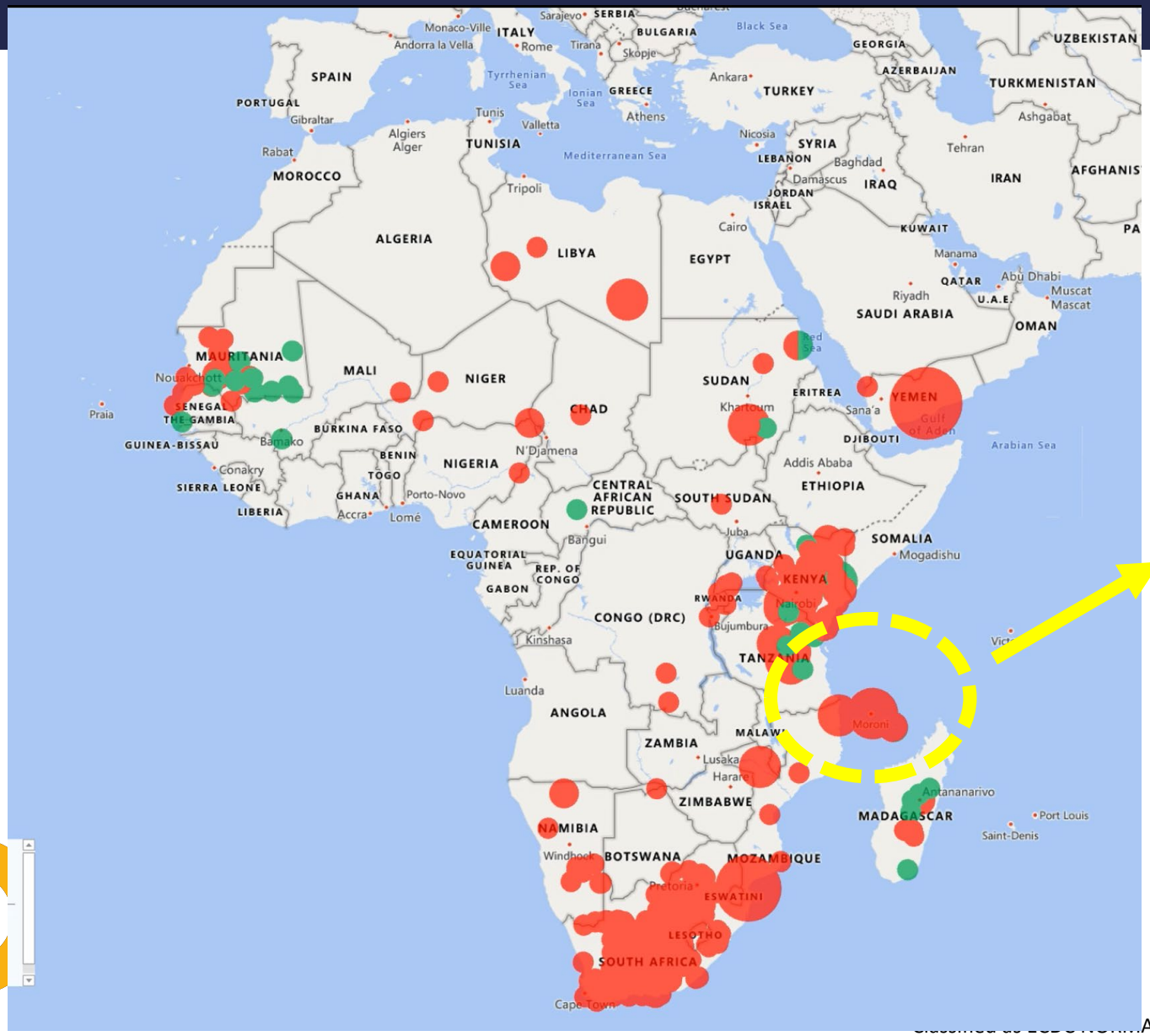
- ✓ **Aedes and Culex** mosquitoes (main vector species)
- ✓ transovarian (vertical) transmission in vectors
- ✓ **inter epidemics period** (5-15 years)
- ✓ **Death or abortion of ruminants**, high impact in young animals
- ✓ **Humans infected** with animals and animal products
- ✓ **Expanding** from Africa

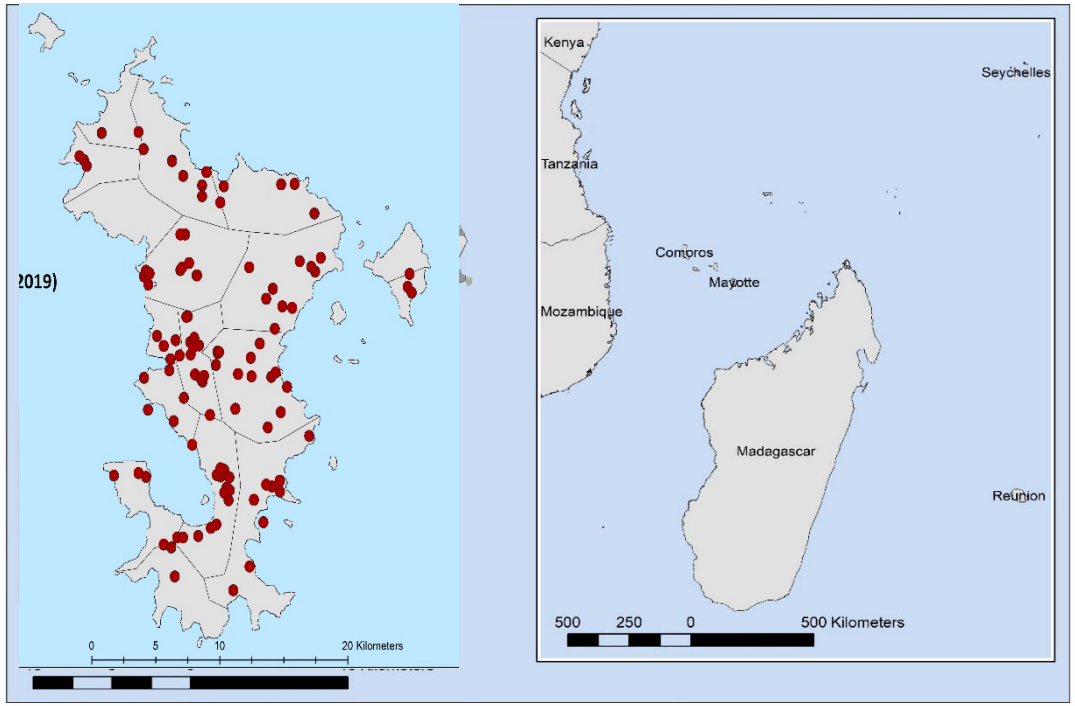
RIFT VALLEY FEVER – EXPANDING



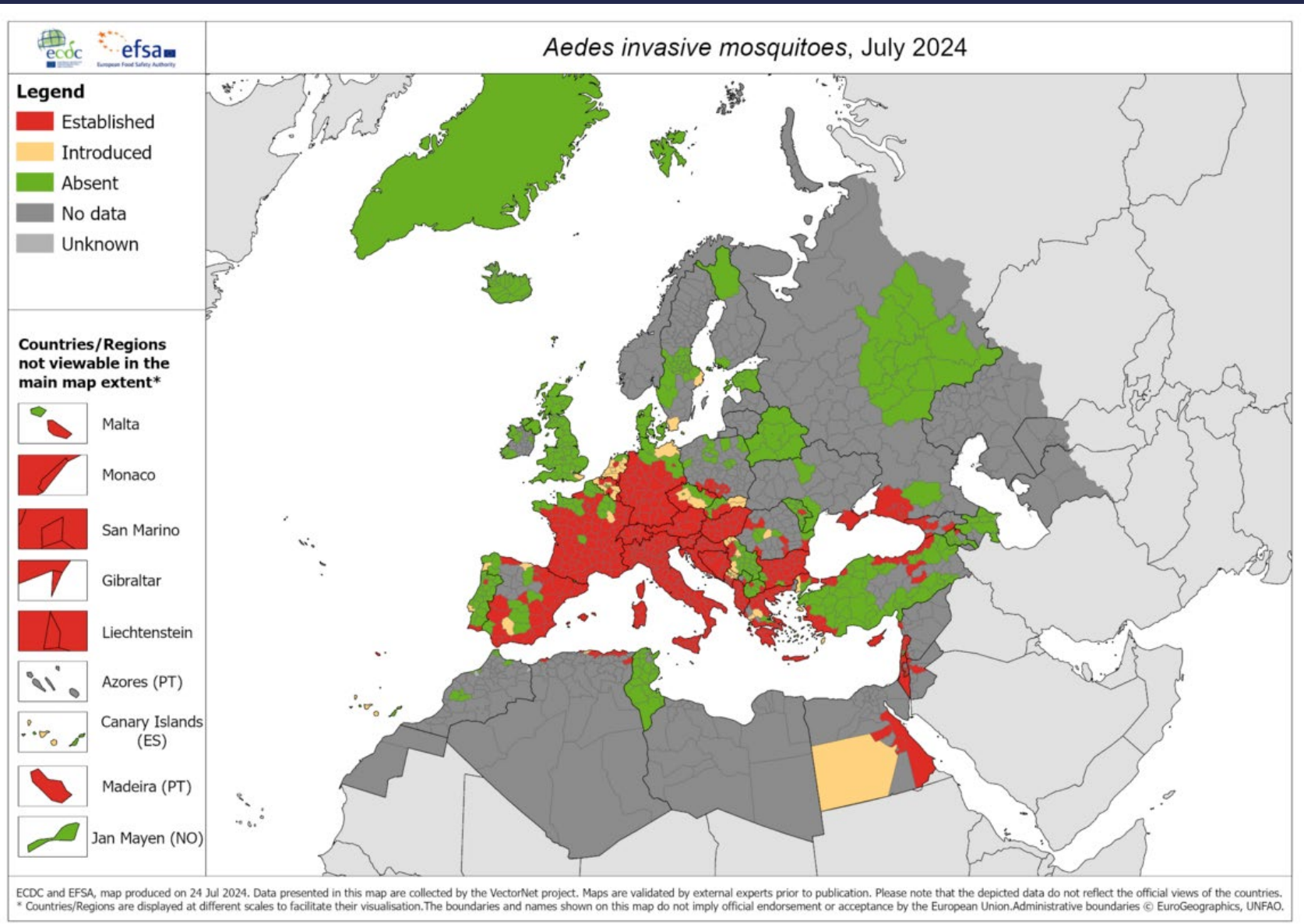
RIFT VALLEY FEVER – SEROPOSITIVITY

RIFT VALLEY FEVER – MAYOTTE EPIDEMICS 2018-2019 (FRANCE)





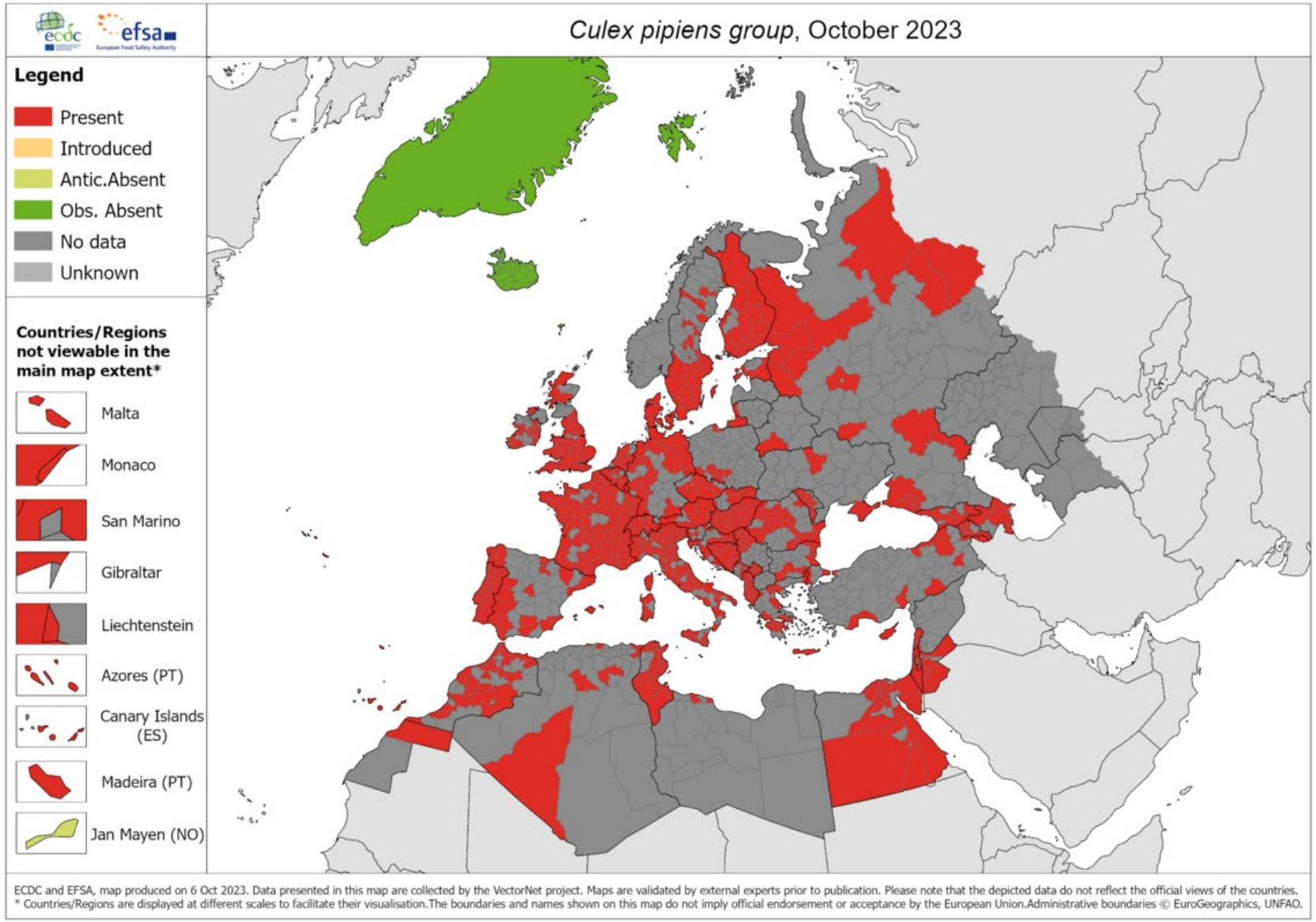
CURRENT DISTRIBUTION OF AEDES INVASIVE MOSQUITOES



- Ae. aegypti
- Ae. albopictus
- Ae. atropalpus
- Ae. japonicus
- Ae. koreicus

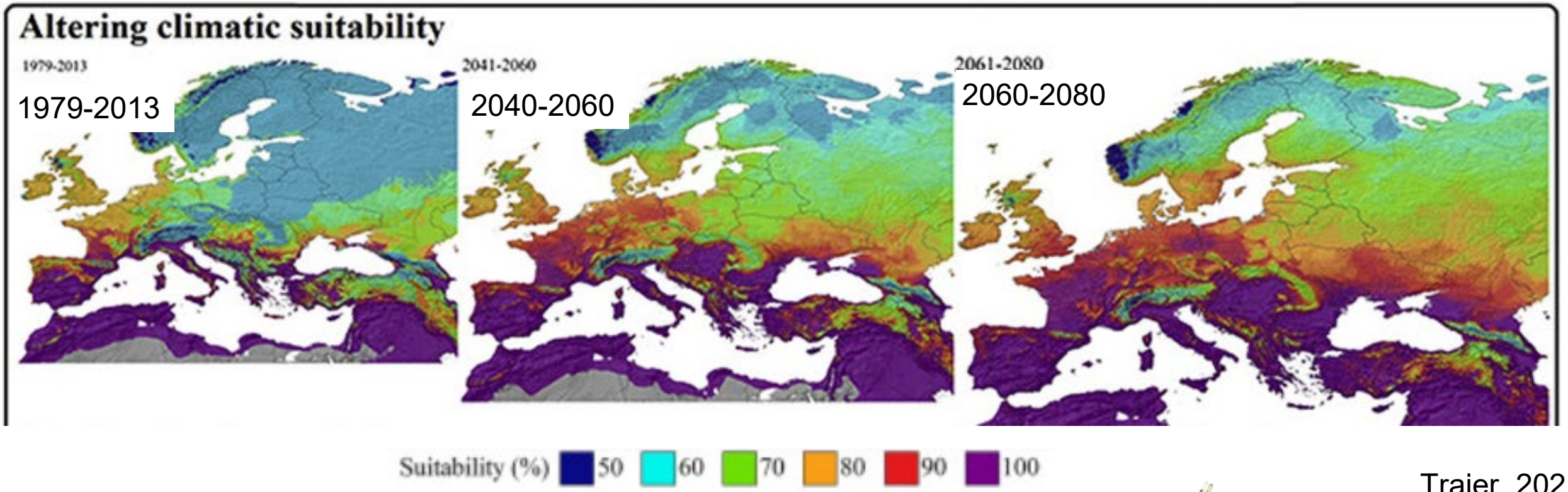
Source: Vectornet (EFSA/ECDC)

CURRENT DISTRIBUTION OF CULEX PIPIENS MOSQUITOES



Source: Vectornet (EFSA/ECDC)

FUTURE POTENTIAL SPREAD OF AEDES AEGYPTI IN EUROPE



Trajer, 2021

- temperature, rainfall and humidity
- climate change
- weather
- anthropogenic factors: land use, human mobility and behaviour

ENDEMICITY VS. EPIDEMIC SPREAD OF RVF

where does the virus “overwinter” in the interepidemic period?

- Transovarial transmission in the eggs of *Aedes* spp. floodwater mosquitoes

- Continuous transmission throughout the year to animals in endemic regions in Africa where climate and environmental conditions favour mosquito breeding and transmission year round.

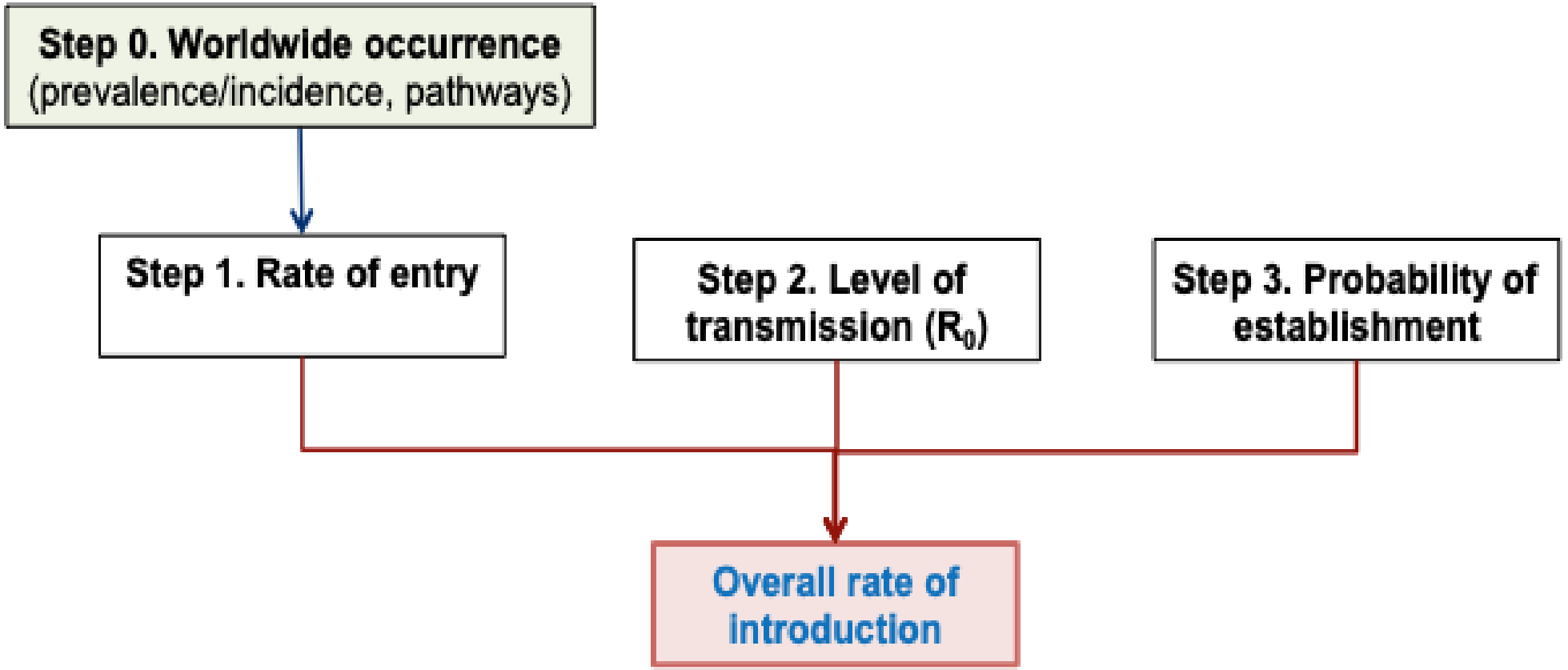
RIFT VALLEY FEVER – RISK OF INTRODUCTION

Possible pathways of introduction to EU:

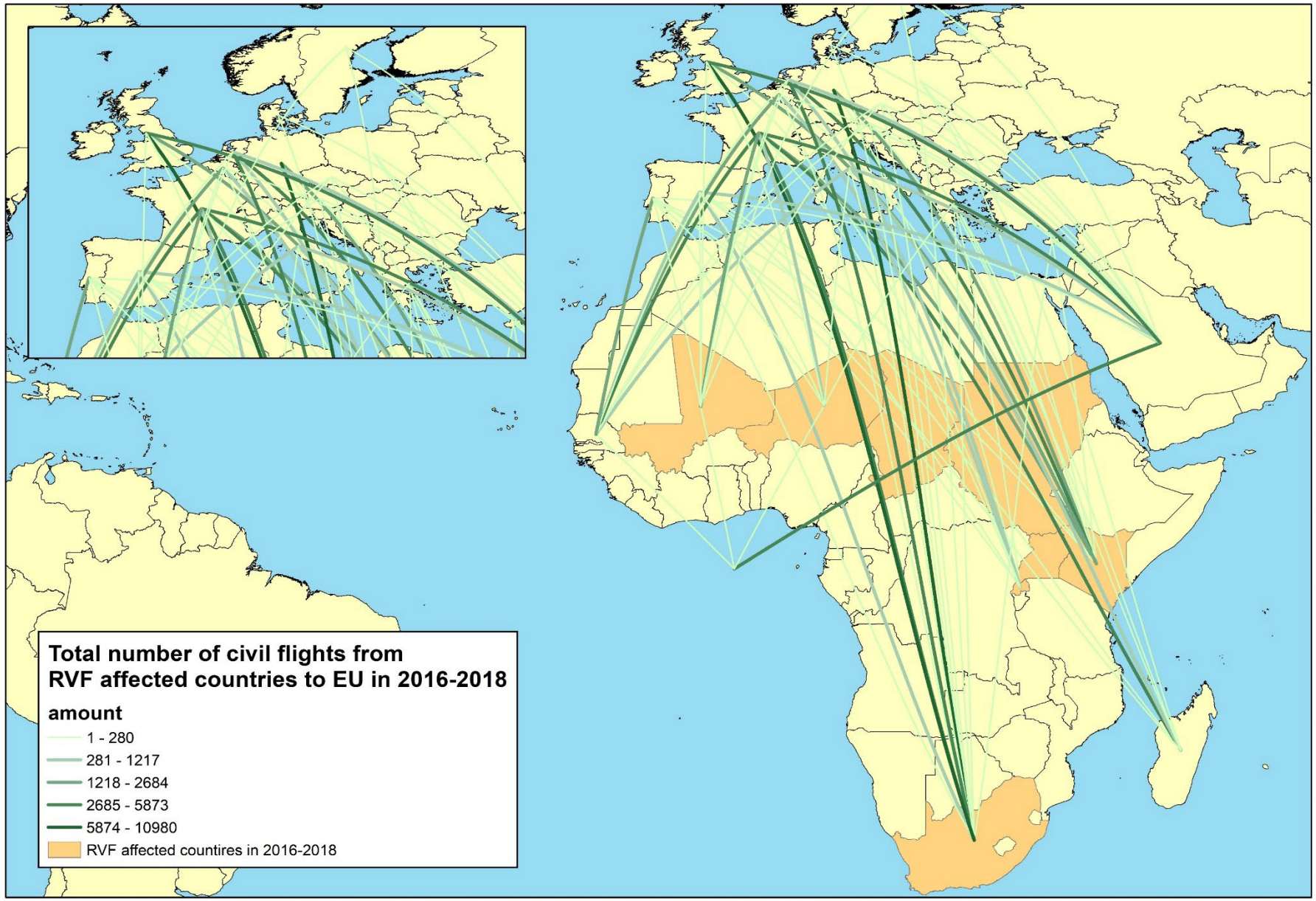
- ✓ infected animals: uncontrolled movements
- ✓ infected vectors: imported or active movement
- ✓ contaminated products : fresh products
- ✓ infected humans : dead-end hosts

RIFT VALLEY FEVER – RISK OF INTRODUCTION

Methodology: Mint RISK model



RIFT VALLEY FEVER – RISK OF INTRODUCTION



civil flights from countries that have reported RVF

RIFT VALLEY FEVER – RISK OF INTRODUCTION

animal pathway: less than 0.002 epidemics/year (**1 epidemic every 500 years,** worst case scenario)

vector pathway:

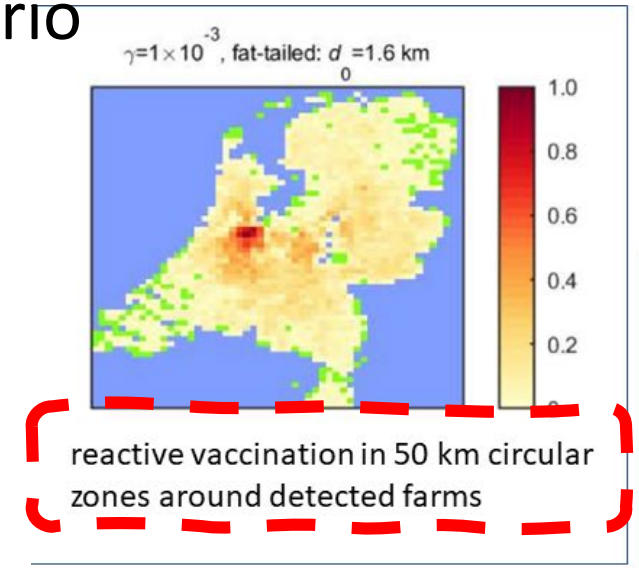
- Netherlands: 0.0044 epidemics/year
- Malta : 0.0025 epidemics/year
- Belgium and Greece: 0.0014 epidemics/year
- Much lower for other MSs

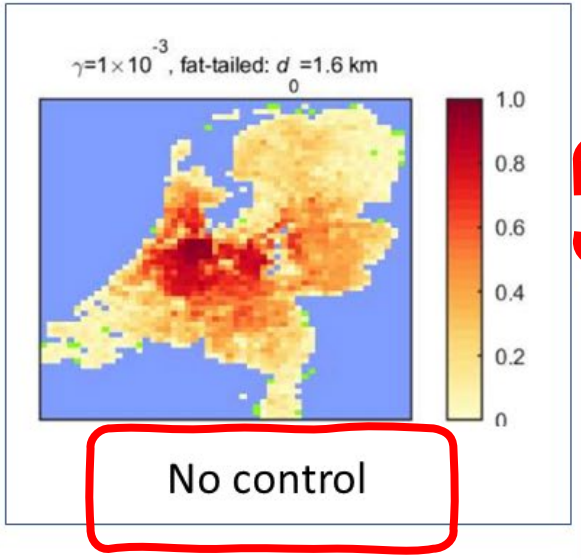
RIFT VALLEY FEVER – CONTROL MEASURES

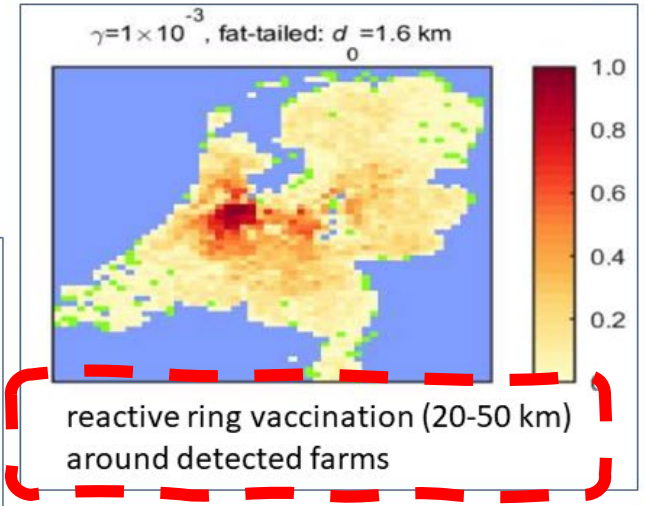
- Diagnostic tests: RT PCR and ELISA
- Vaccines: live and inactivated
- Spread model to explore effectiveness of control measures
- Example of NL

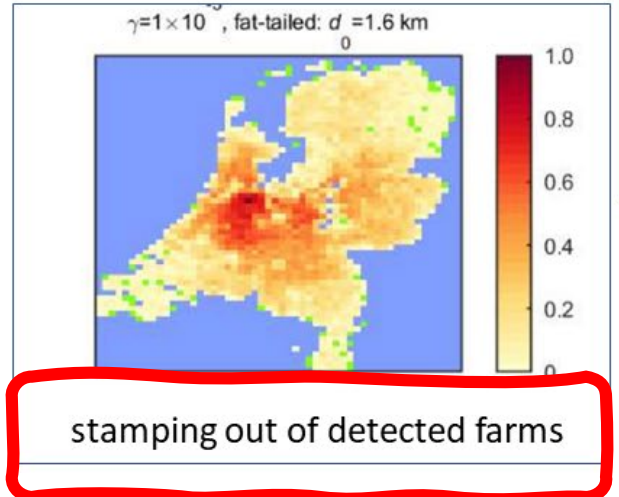
RIFT VALLEY FEVER - CONTROL MEASURES

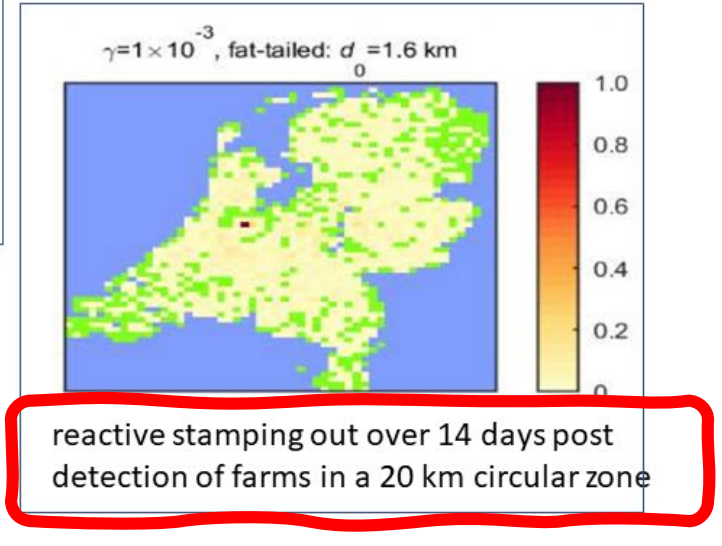
Comparison of some control strategies considering one possible spread scenario











RIFT VALLEY FEVER - CONTROL MEASURES

Probability of spread beyond a certain radius : surveillance zone size

Restriction zone		20 km		50 km		100 km	
Mean vector dispersal	numbers of infected farms detected within the zone when implemented	R0=2	R0=6	R0=2	R0=6	R0=2	R0=6
5 km	1	0.17	0.42	**0.001**	0.003	8.6×10^{-8}	2.6×10^{-7}
	10	0.84	1.0	**0.01**	0.03	8.6×10^{-7}	2.6×10^{-6}
10 km	1	0.56	0.91	0.08	0.22	0.001	0.003
	10	1.0	1.0	0.55	0.91	0.099	0.03

RIFT VALLEY FEVER - CONTROL MEASURES

COMMISSION DELEGATED REGULATION (EU) 2020/687

ANNEX V

MINIMUM RADIUS OF PROTECTION AND SURVEILLANCE ZONES

(as referred to in Article 21 of this Regulation)

Indicated as radius of a circle centred on the establishment

Category A diseases	Protection Zone	Surveillance Zone
Foot and mouth disease	3 km	10 km
Infection with rinderpest virus	3 km	10 km
Infection with Rift Valley fever virus	20 km	50 km
Infection with lumpy skin disease virus	20 km	50 km
Infection with *Mycoplasma mycoides subsp. mycoides SC* (Contagious bovine pleuropneumonia)	Establishment	3 km
Sheep pox and goat pox	3 km	10 km
Infection with peste des petits ruminants virus	3 km	10 km
Contagious caprine pleuropneumonia	Establishment	3 km
African horse sickness	100 km	150 km

RIFT VALLEY FEVER - CONTROL MEASURES

Key points:

- In endemic areas control can be through vaccination
- In free areas: passive surveillance during vector season in risk areas of introduction
- Vaccines: need of DIVA
- Consider size of surveillance zone

ACKNOWLEDGEMENTS

- EFSA Panel on animal health and welfare
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- GD Animal Health, NL
- Mayotte airport, France

THANK YOU FOR YOUR ATTENTION