

# Climate change as a threat to health in Europe: focus on infectious diseases

**Eline Vanuytrecht**  
**11 May 2023**





# European Environment Agency



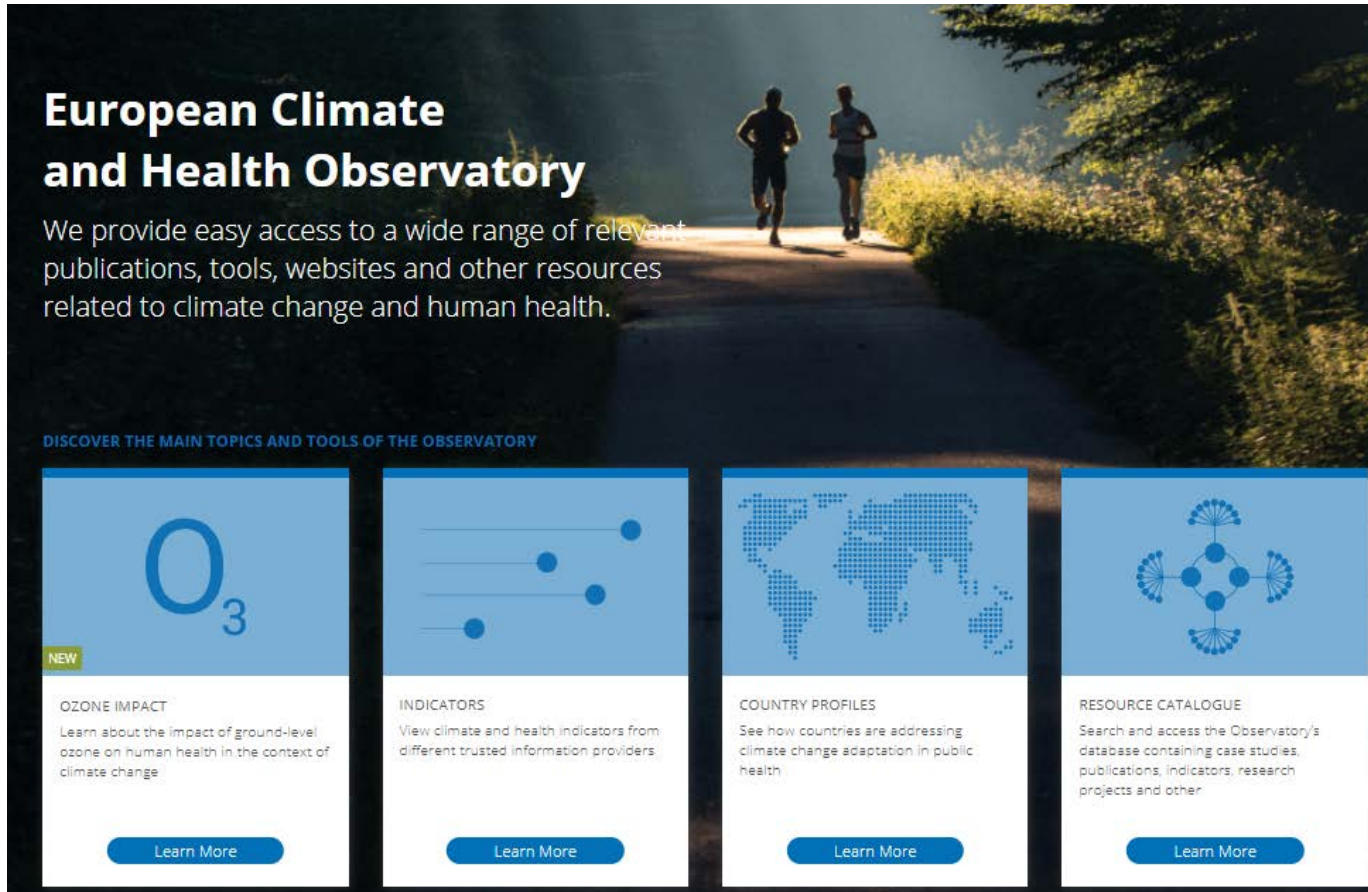
EEA member and cooperating countries, 1 February 2020

- Member countries
- Cooperating countries

\*Kosovo under UNSCR 1244/99

- An independent EU agency
- Analysing, assessing and providing information about the environment
- An interface between science and policy

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# Focus on infectious diseases



- **2021-2022 workplan**  
heat and infectious diseases
- ↓
- **2022 EEA report**
  - Trends and projections of climate hazards
  - Impacts – mortality and morbidity
  - Who is likely to be most affected
  - Solutions in policy and practice
- **2023-2024 workplan**  
water + ctd. infectious diseases

# Why focus on infectious diseases?























# Sensitivity to climate change

Dis

nature > nature

Climate-sensitive

Flooding-sensitive

Disease (references, see Annex 1)		Climatic factors, aggravated to diminished ratio (a)		Modes of transmission	
Viral diseases	Chikungunya (4, 5, 6)	  	50:3	 	
	Dengue (7, 8, 9, 41)	   	163:3	 	
	Tick-borne encephalitis (25, 26, 27, 28, 29)	  	42:0	 	
	West Nile fever (13, 14)	   	119:4	 	

Shigellosis

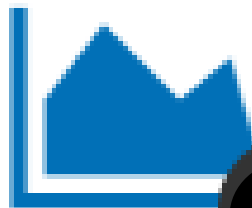
# Observatory platform

## Impact



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Evidence



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Indicators



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Policy analysis



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Case studies



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Guidance



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Information  
portals



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Publications and  
reports



12

Research and  
knowledge  
projects



3

Tools



# Impacts



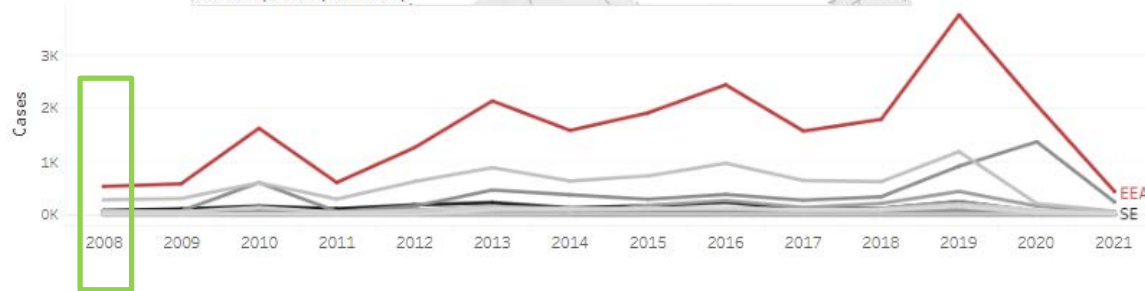
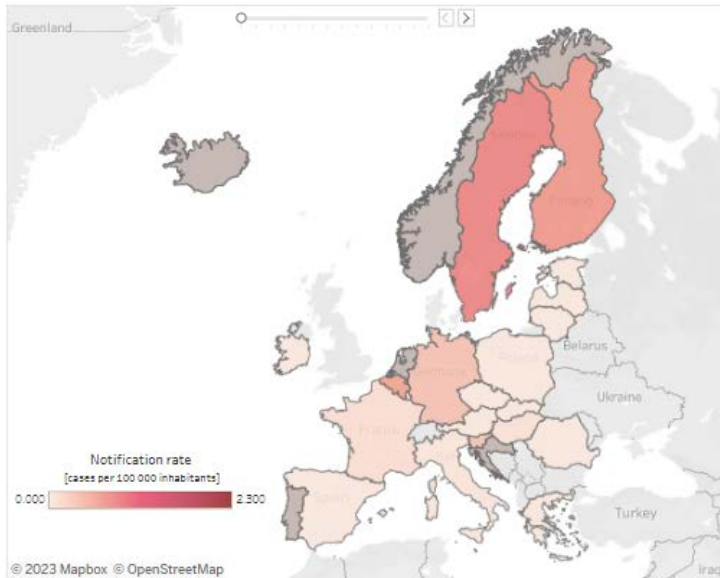


# Evidence: reported cases and notification rate

## Dengue

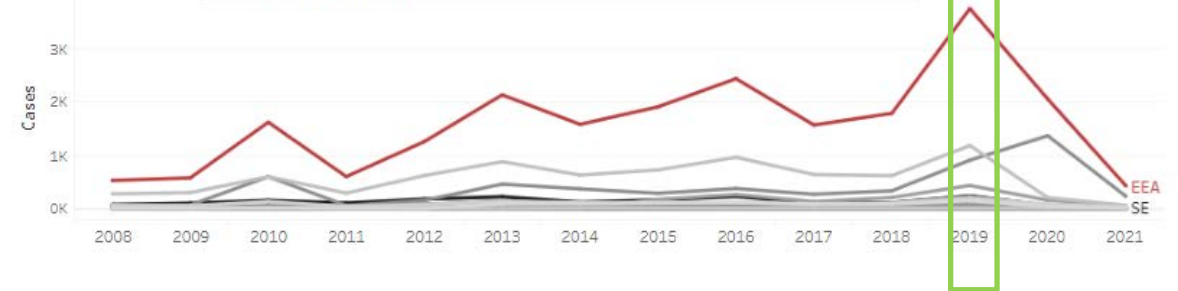
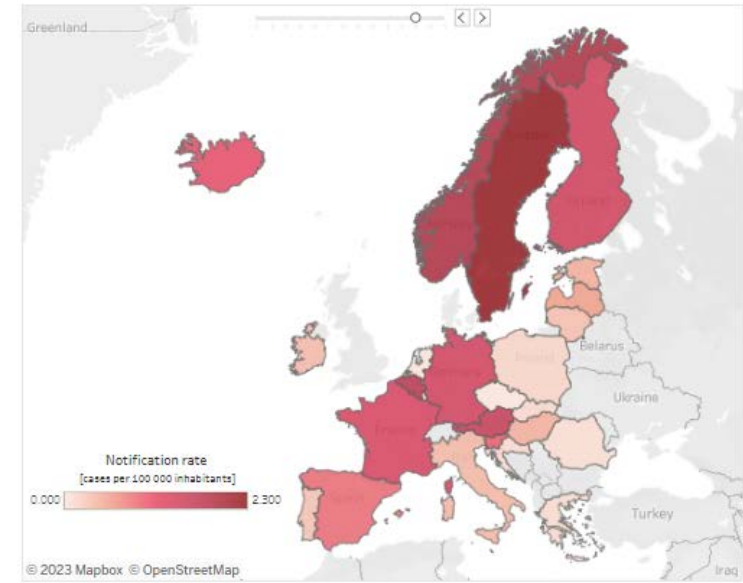
Dengue notification rate and reported cases in Europe

2008



Dengue notification rate and reported cases in Europe

2019



# Evidence

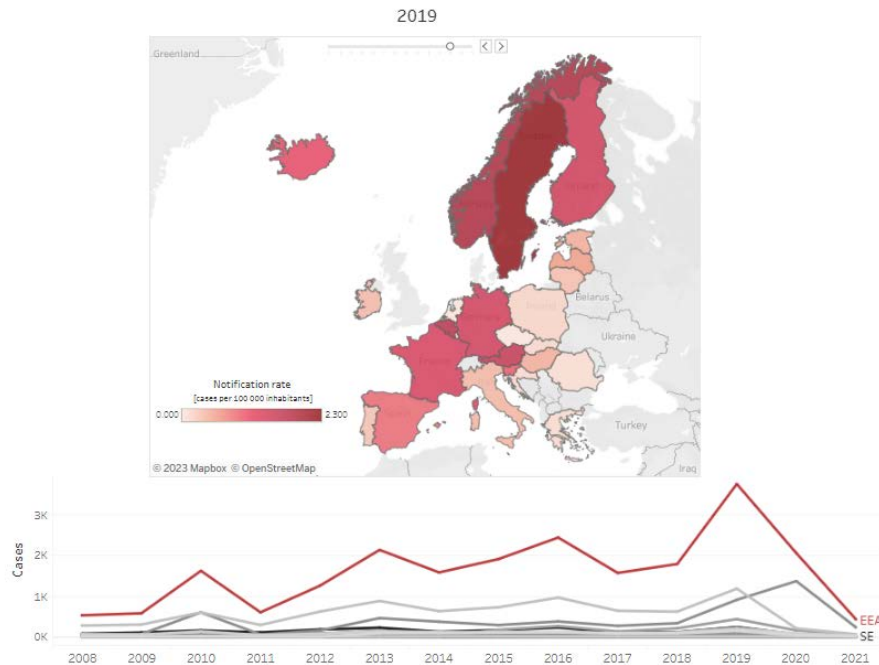
## Dengue

Dengue is a mosquito-borne viral disease, causing at least 390 million infections per year and putting a thousand times higher number of people at risk of contracting an infection (WHO, 2012). The estimated global incidence of dengue has grown 30 times over the past 50 years (Li and Wu, 2015) due to a variety of factors, including globalization, travel, trade, socio-economic factors, human settlement, viral evolution, and possibly climate change (Murray et al., 2013). Travelers often transport the dengue virus (DENV) between countries (WHO, 2022) and in Europe most cases (>99%) are travel related. The climatic suitability for transmission of dengue within Europe is already increasing, and expected higher temperatures in the future will create even more favorable conditions for the dengue carrying mosquitos in several parts of central Europe.



## Notification rate

Dengue notification rate and reported cases in Europe



## Climate sensitivity

### ■ Climatic suitability



→ growth, reproduction, activity of pathogens and vectors

### ■ Seasonality Peaks

### ■ Climate change



# Evidence



Dengue: *Aedes aegypti* + *Ae. albopictus*

Chikungunya: *Ae. aegypti* + *Ae. albopictus*

Zika: *Ae. aegypti* + *Ae. albopictus*

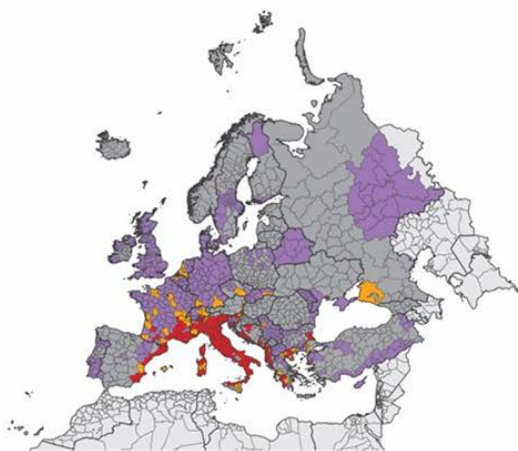
## Establishment of *Aedes albopictus*

*Aedes albopictus* – current known distribution: May 2014

Established  
Introduced  
Absent  
No data  
Unknown

Countries/Regions  
not viewable in the  
main map extent\*

Malta  
Monaco  
San Marino  
Gibraltar  
Liechtenstein  
Azores (PT)  
Canary Islands (ES)  
Madeira (PT)  
Jan Mayen (NO)



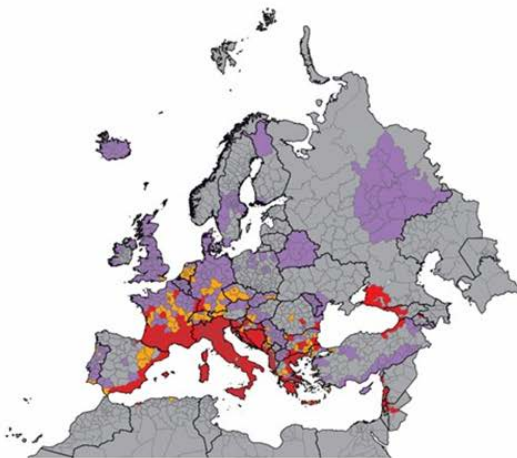
2014

*Aedes albopictus* – current known distribution: May 2018

Established  
Introduced  
Absent  
No data  
Unknown

Countries/Regions  
not viewable in the  
main map extent\*

Malta  
Monaco  
San Marino  
Gibraltar  
Liechtenstein  
Azores (PT)  
Canary Islands (ES)  
Madeira (PT)  
Jan Mayen (NO)



2018

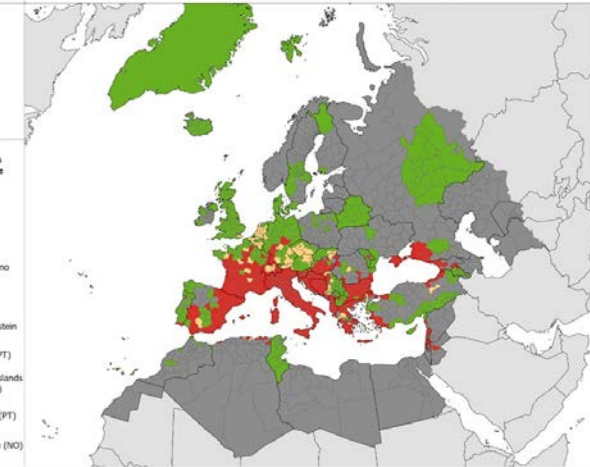
efsa

*Aedes albopictus*, November 2022

Legend  
Established  
Introduced  
Absent  
No data  
Unknown

Countries/Regions  
not viewable in the  
main map extent\*

Malta  
Monaco  
San Marino  
Gibraltar  
Liechtenstein  
Azores (PT)  
Canary Islands (ES)  
Madeira (PT)  
Jan Mayen (NO)

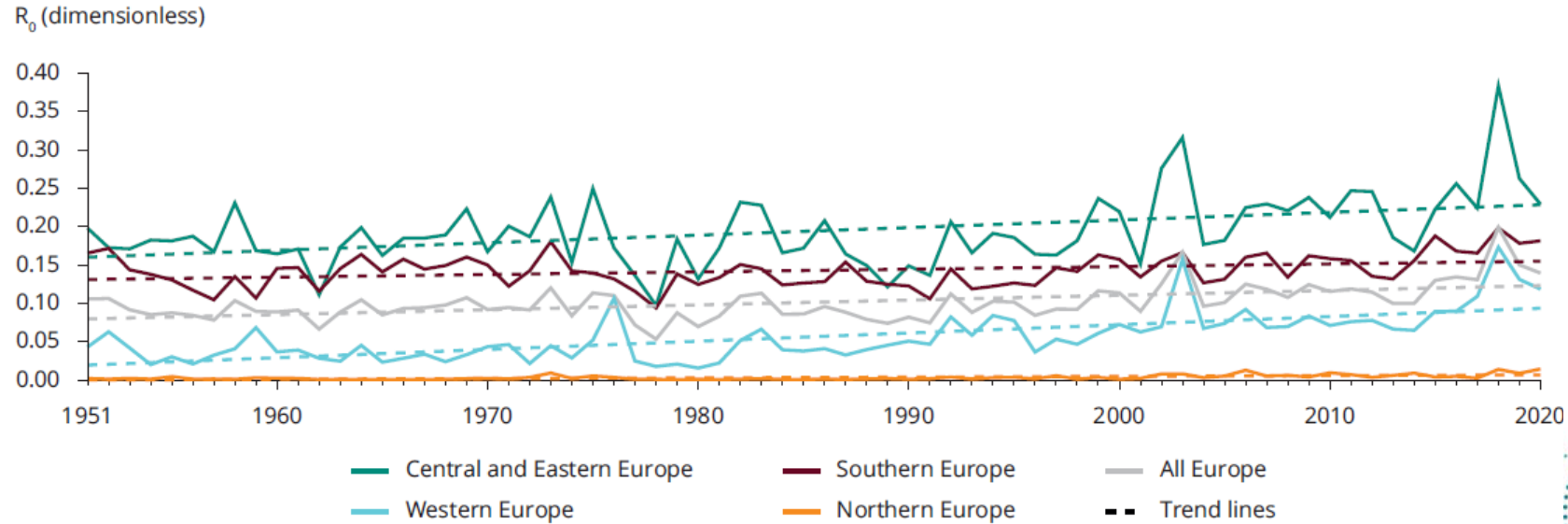


2022



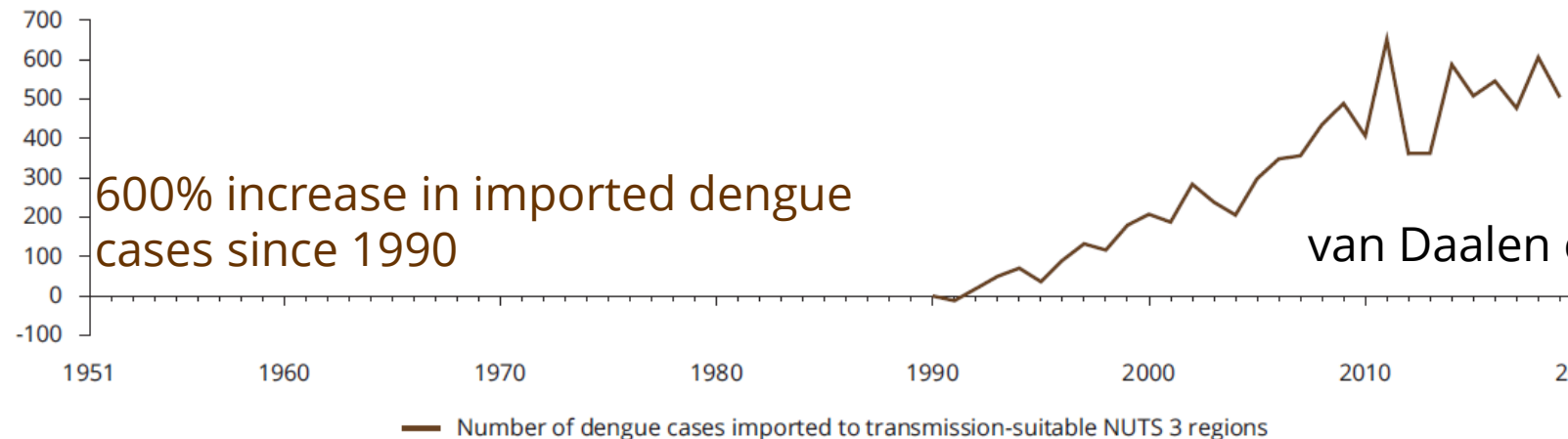
# Indicators: Increasing climatic suitability for disease transmission

Basic reproduction rate ( $R_0$ ) for dengue transmitted by *Aedes albopictus* (1951-2020)



Number of dengue cases imported to transmission-suitable European regions

Percentage change, relative to 1990





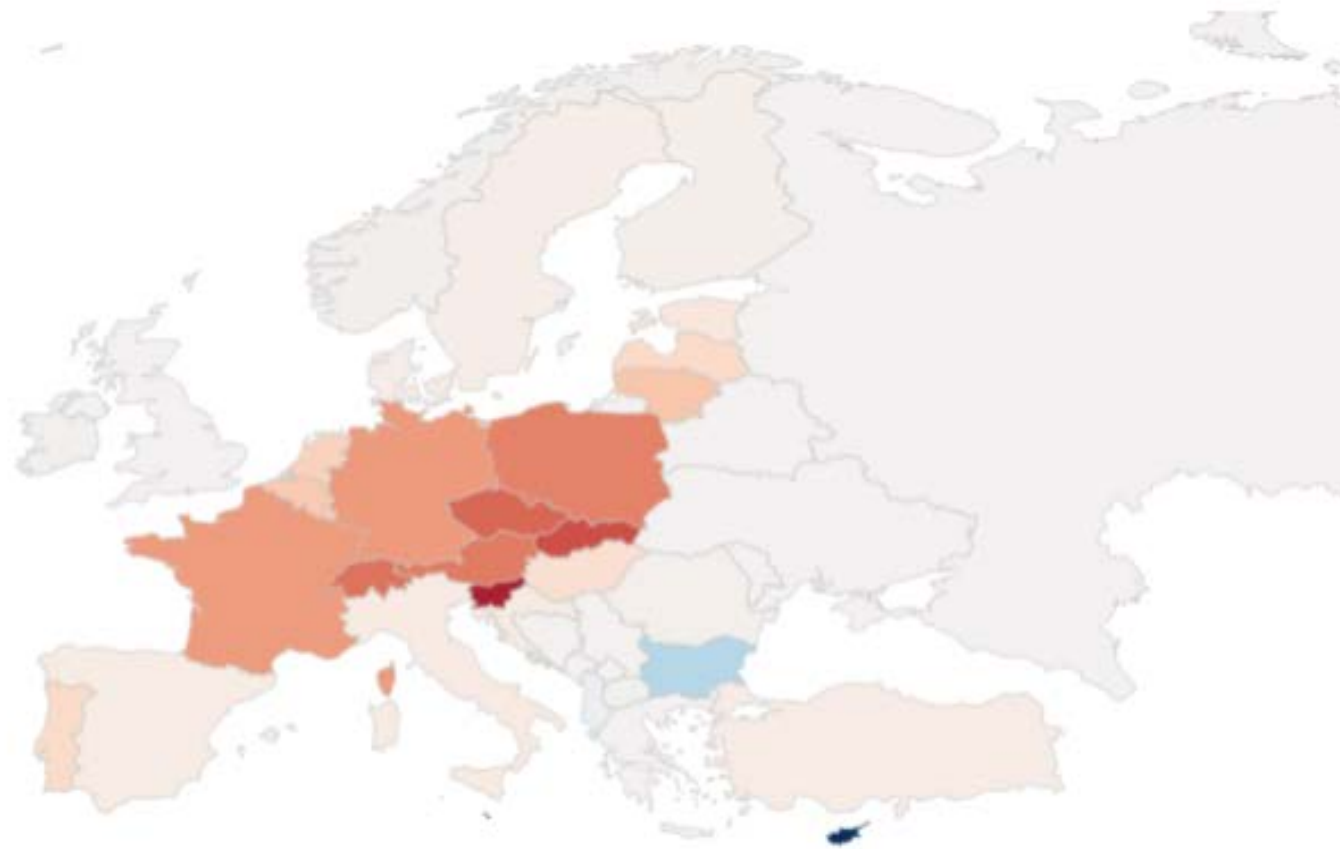
# Indicators: Increasing climatic suitability for disease transmission

Changes in basic reproduction rate ( $R_0$ ) for chikungunya transmitted by *Aedes* mosquitos (1951-85 vs 1986-2020)

Change in  $R_0$

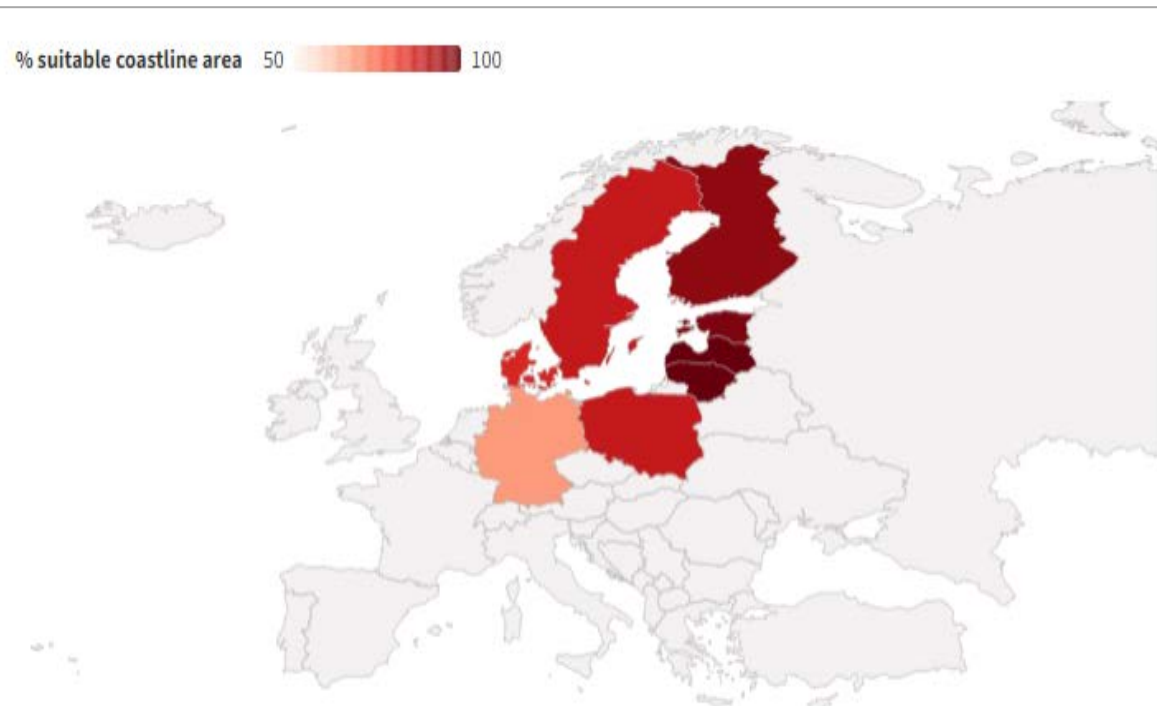
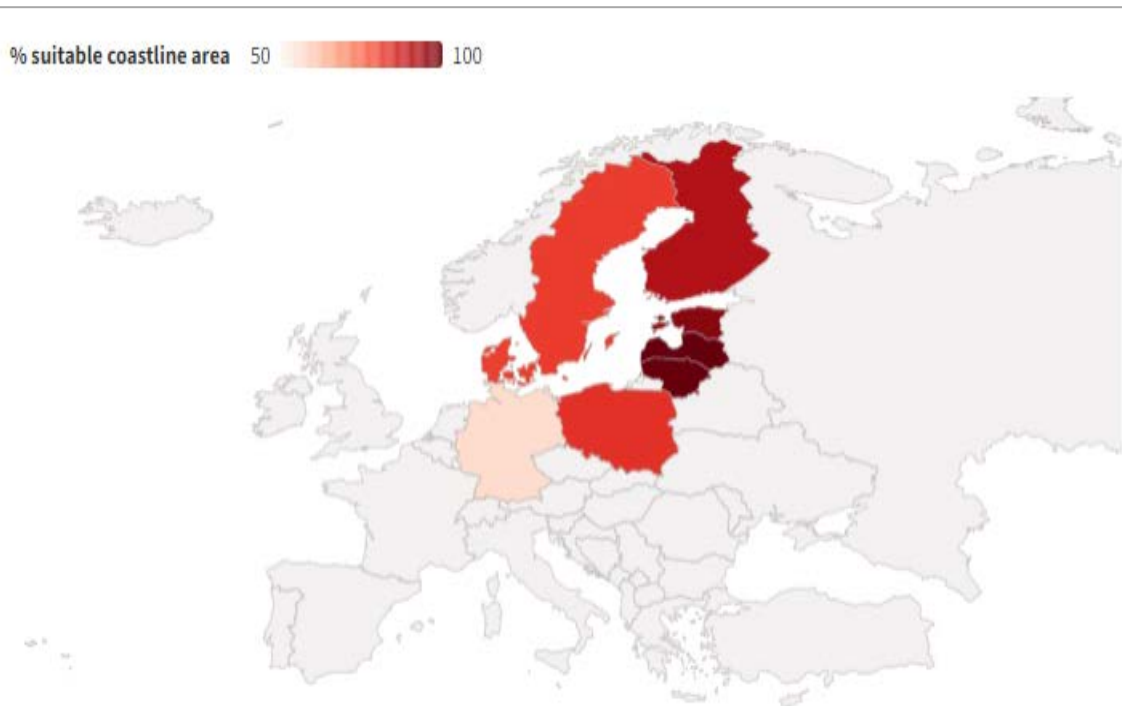


A horizontal color scale bar ranging from -0.06 to 0.09. The colors transition from dark blue at -0.06, through light blue, white at 0.00, to dark red at 0.09.



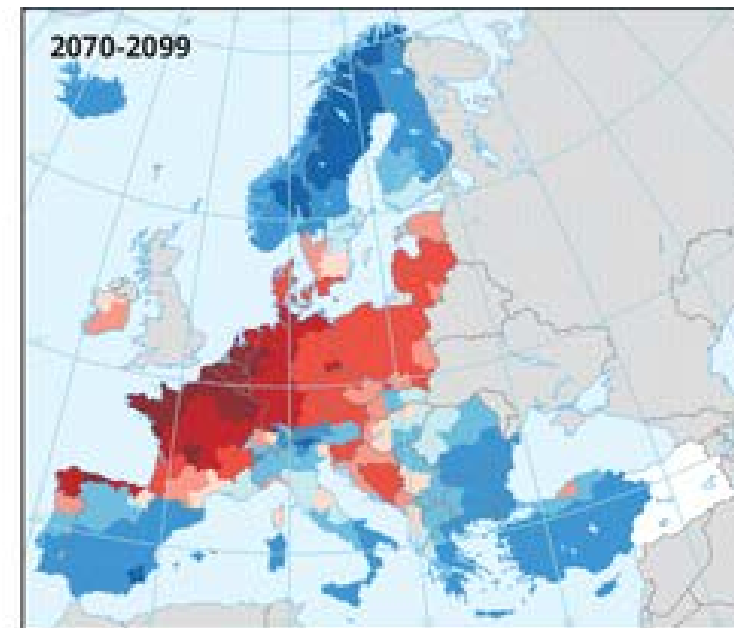
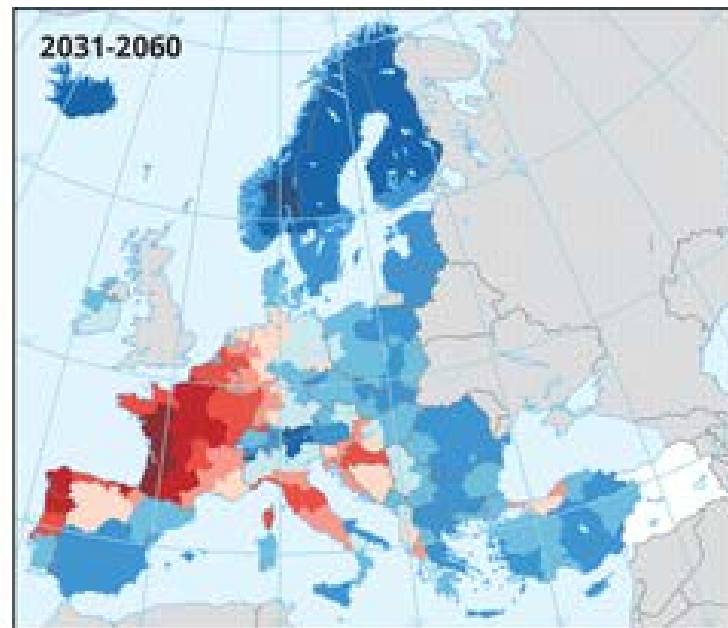
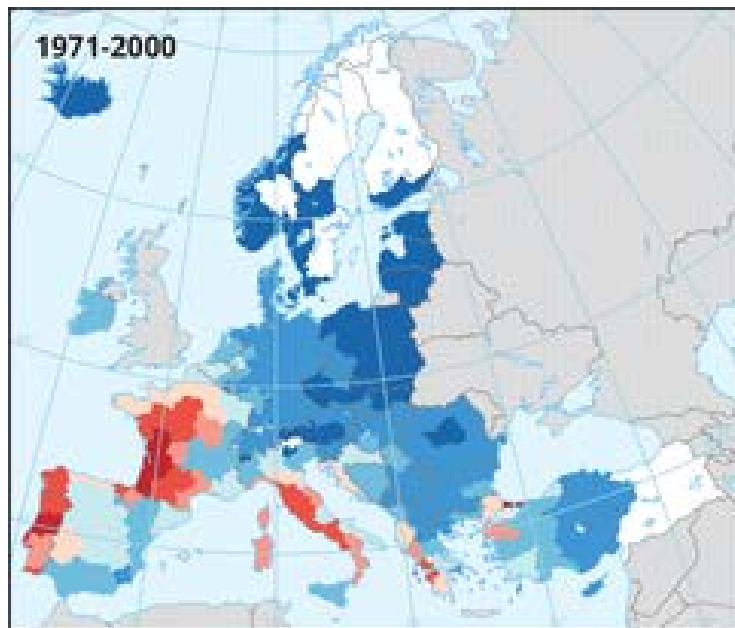
# Indicators: Increasing climatic suitability for disease transmission

**Suitable coastal** area for non-cholera **Vibrio** outbreaks (Baltic area, 2003-2005 vs 2018-2020)



# Indicators: Projected changing climatic suitability for vectors

Projected climatic suitability index for *Aedes albopictus* under RCP 8.5 scenario



Reference data: ©ESRI

Projected climatic suitability index for *Aedes albopictus* under RCP.8.5 scenario, NUTS2 level



No data Outside coverage

<20 20-40 40-60 60-70 70-75 75-80 80-85 85-90 90-95 95-100

0 500 1,000 1,500 km



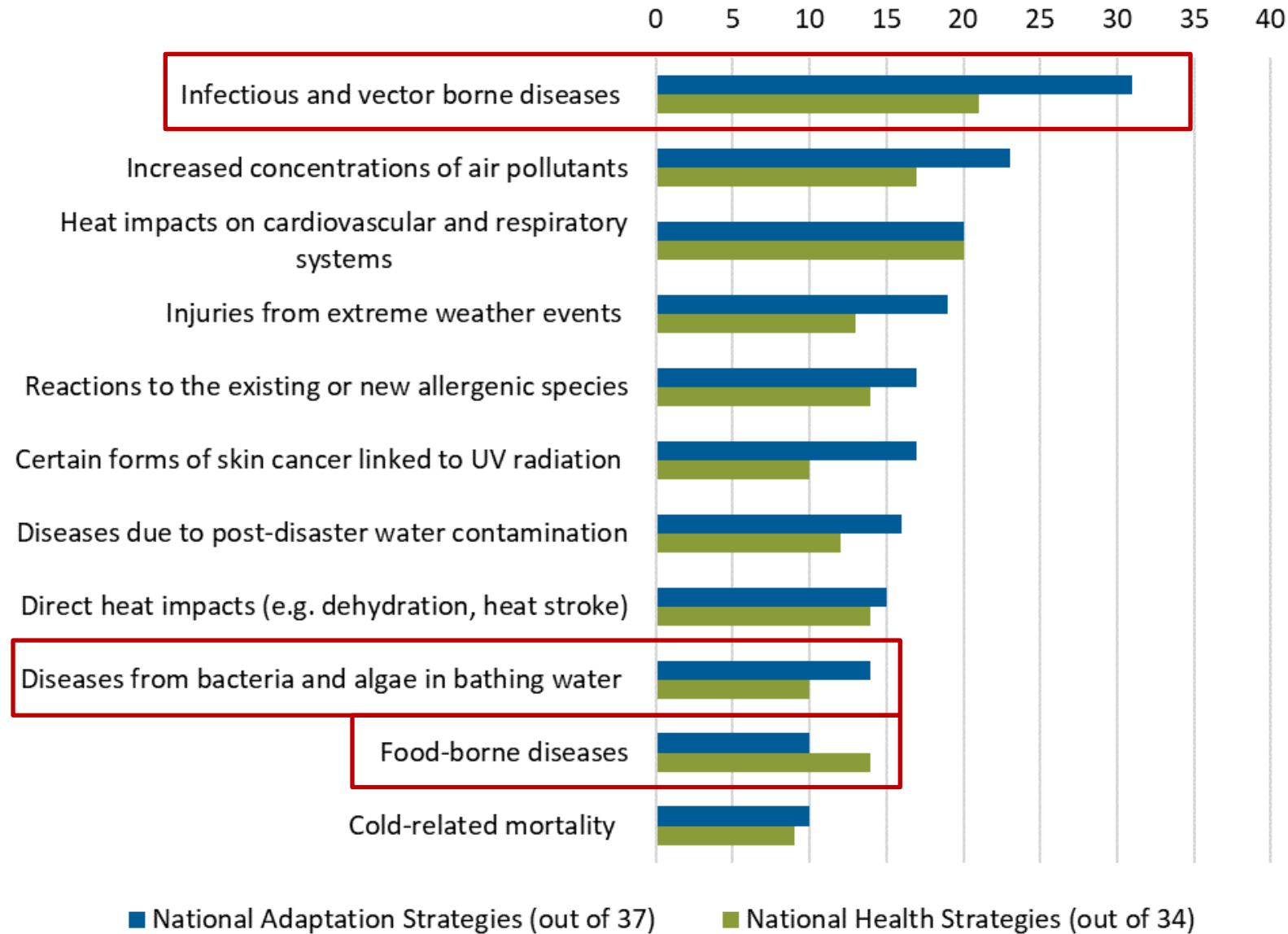
# Indicators

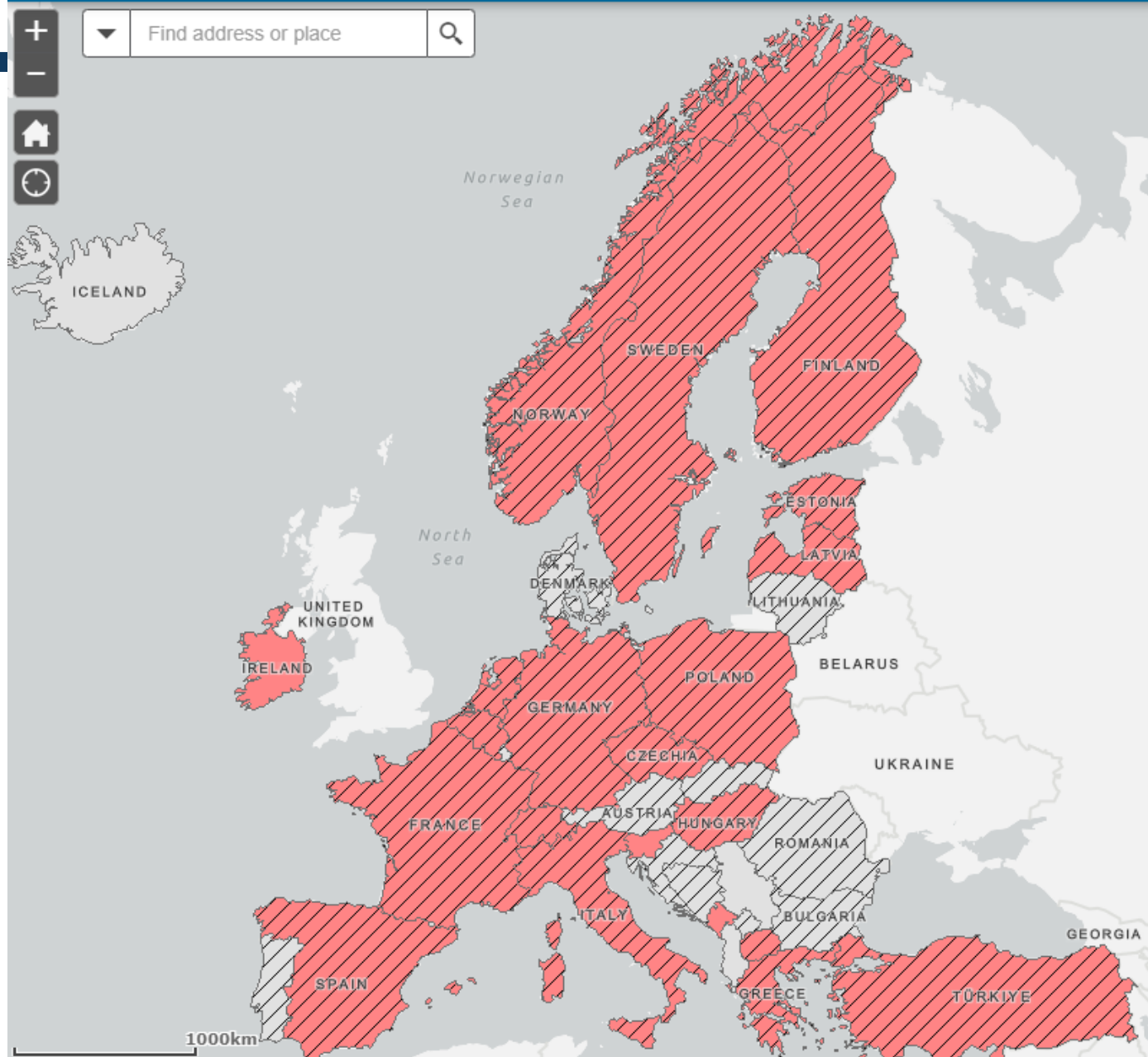
Disease	Climatic suitability tracking (Lancet Countdown Europe)	Climatic suitability projection (Copernicus C3S)
Dengue	✓	✓
Chikungunya	✓	✓
West Nile virus	✓	✓
Malaria	✓	
Vibriosis	✓	
Zika	✓	
Tick-borne encephalitis	Planned for 2023	
Leishmaniasis	Planned for 2023	



# Responses

# Policy analysis: climate-sensitive diseases in national policies





- ✓ Infectious and vector borne diseases \*\*\*
- Not covered in policy documents reviewed
- National adaptation policy
- National health policy
- National adaptation policy & National health policy

# Responding to climate risks to health in national policies

**Adaptive and  
preparatory  
measures  
planned**





# Case studies: examples of responses in practice

**Managing mosquito borne disease through EYWA: a European tool to support public health authorities in preventing epidemics**



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**West Nile virus infection prevention and control measures in Greece**



© ECDC

**'Mückenatlas': A citizen science project for mosquito surveillance in Germany**



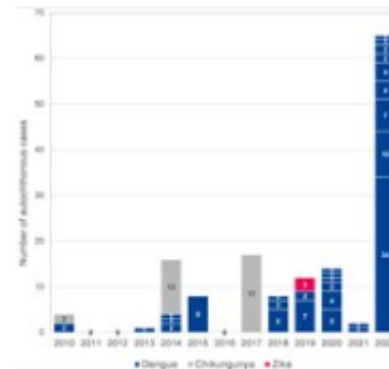
© Monique Luck  
ZALF (2013)

**Communal action group to control mosquitoes – Upper Rhine Plain, Germany**



© Björn Pluskota,  
e.V.

**Reducing the risk of local dengue transmission in France**



© Amandine Cochet

The risk of local outbreaks of dengue is growing in many areas across Europe due to increasing urbanisation and globalisation. In addition, the global warming increases climatic suitability in Europe for *Aedes albopictus*, an invasive mosquito species acting as a vector for the dengue virus. In France, *Aedes albopictus* is already widespread. In 2022, its presence was detected in the majority of the French mainland administrative districts (*départements*).

Dengue is a mandatory notifiable disease in France since 2006. This allows monitoring the number of cases and outbreak events. The number of autochthonous transmissions of dengue has been increasing since the first detection of autochthonous cases in 2010, and achieved a record high in 2022, raising a public health concern. To prevent the risk of transmission of dengue (as well as other diseases carried by *Aedes albopictus*, such as chikungunya and Zika), enhanced surveillance is implemented in the administrative districts

A photograph of a sunlit forest path. Sunbeams (crepuscular rays) stream down through the dense canopy of tall trees, illuminating a paved path that leads into the distance. Two runners are visible on the path, their figures silhouetted against the bright light at the end of the path. The foliage is lush and green, with some leaves catching the sunlight and appearing bright yellow-green.

# Thank you

<https://climate-adapt.eea.europa.eu/observatory>

[climate.adapt@eea.europa.eu](mailto:climate.adapt@eea.europa.eu)

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**11 May 2023**