



D5.9 Vector-borne Disease

Climate and biodiversity changes have direct and indirect effects on the conditions that support human and animal (zoonotic) infectious diseases and new diseases in humans are emerging more frequently from animals.

Characterisation of impact of climate change on vector-borne disease

Intensity	Likelihood	Duration	Intensity	Likelihood	Duration
Positive impacts/opportunities			Negative impacts		
			 short to medium term in long term		to

Confirmed
 Probable
 Possible
 Major
 Moderate
 Minimal
 Short term
 Medium term
 Long term

? How does climate change impact vector-borne and zoonotic disease?

Positive impacts / opportunities	Negative impacts
<ul style="list-style-type: none"> • None identified 	<ul style="list-style-type: none"> • Possible increase in Lyme disease via ticks • Possible increase in mosquito and culex transmitted diseases

🌐 Pathways of impact arise from

- Higher temperatures
- Increased rainfall
- Psychosocial and behavioural factors

Higher temperatures and increased rainfall

Climate has direct and indirect effects on the conditions and behaviours that support occurrence and spread of human and animal (zoonotic) infectious diseases (Semenza and Paz, 2021). There is a potential impact of new and emerging pests and diseases as well as extension to the range of some diseases due to warmer, wetter conditions arising as a result of climate change (Brown, 2019; Semenza and Paz, 2021). The UK Climate Change Risk Assessment states that:

“Climate change is projected to increase the risk of vector-borne diseases in the UK ...hot summers have already affected transmission dynamics for vector borne disease” and “there is a major risk of lock-in for vectors and pathogens. Once introduced, it extremely difficult for a zoonotic pathogen to be eradicated” (Kovats and Brisley, 2021).

Climate change is identified as impacting on vector-borne and zoonotic disease in Wales, in particular, via;

- Tick-borne disease
- Mosquito and culex transmitted diseases
- Environmental and biodiversity changes in the UK and internationally

The National Adaptation Plan in Wales (Welsh Government, 2019) committed to:

- Increase understanding of the increased risk of vector-borne pathogens.
- Continuation of monitoring at ports and airports for mosquitoes.
- Raise awareness about Lyme disease amongst health care professionals and the general public.

Tick-borne disease

Lyme disease (transmitted via certain ticks) is present throughout the UK, although for most of England and Wales the incidence of confirmed cases is relatively low in comparison with the most of Western Europe (Tulloch et al., 2019). The areas with highest incidence in the UK are in the southeast of England (Tulloch et al., 2019). However, incidence is rising, and likely to be higher than the laboratory confirmed rate, as cases presenting to primary care in the UK are estimated to be between two and six times the number confirmed by laboratories (Tulloch et al., 2019).

Milder winters and higher temperatures could increase the exposure of people to ticks carrying Lyme disease or other pathogens (Kovats and Brisley, 2021; Medlock and Leach, 2015). A number of indirect effects of climate change on outdoor activities (see Section D2.1), tourism or changes to land management strategies (see Section D5.6) may be more significant than temperature alone in increasing transmission rates (Baylis, 2017; Semenza and Paz, 2021).

Mosquito and culex transmitted diseases

The risk of mosquito and culex transmitted diseases is likely to increase in the UK through longer transmission seasons (Netherwood, 2021). Key diseases of concern include:

- **Malaria:** effective surveillance and control, along with health service treatment are likely to prevent re-establishment in the UK, although imported cases from overseas remain a risk (Kovats and Brisley, 2021).

- **Arboviruses of concern that affect humans include chikungunya, dengue and Zika viruses:** the Asian tiger mosquito vector for these viruses is not yet established in the UK, but has been found in Kent, and this species is widely established in Southern Europe (ADAS, 2019; Kovats and Brisley, 2021). Climate modelling indicates that Southern England could be warm enough currently for establishment of this mosquito and within 50 years much of England and Wales may have a suitable climate (Baylis, 2017; Kovats and Brisley, 2021).
- **West Nile Virus:** the *Culex modestus* mosquito is a vector for this disease and has been found in Southern England, although there have been no cases of West Nile Virus to date in the UK (Kovats and Brisley, 2021). The risk of West Nile Virus outbreaks in the UK may increase with increasingly warm summers, most likely via virus carrying migratory birds (Public Health England, 2020).

The report of the Chief Medical Officer for Wales (Welsh Government, 2021) states that *“Recent global changes in the interaction of humans with animals and the environment, has meant that new diseases in humans are emerging more frequently from animals”* (p.36).

The growing use of nature-based solutions to mitigate climate change and some land management strategies has the potential to influence the habitat for vectors such as ticks and mosquitos (Farming Connect, n.d; Kovats and Brisley, 2021; Medlock and Leach, 2015; W1¹). This highlights the need for consideration of health and equity impacts in the design of adaptation and mitigation interventions, for example, by using Health Impact Assessments (EASAC, 2017).

The triple challenge: cumulative impacts with COVID-19 and Brexit

The COVID-19 pandemic has demonstrated the major and severe impacts on health in Wales that can arise from imported zoonotic disease. The Chief Medical Officer for Wales (Welsh Government, 2021) states that *“the drivers of pandemics are similar to those that contribute to climate change and biodiversity loss”* (p.36) including land-use change, eco-system degradation and intensive livestock production (Kawler et al., 2021).

Brexit has changed the systems through which Wales and the UK operate to tackle infectious diseases through international cooperation (Cresswell and Petchey, 2022). The potential for reduced access to international surveillance systems arising from Brexit may affect responses to Vector-borne disease control (Kovats and Brisley, 2021). However, the COVID-19 pandemic led to an enhanced level of global cooperation on infectious diseases, and the UK Government has entered into new agreements to enable monitoring and early detection of infectious disease globally (Cresswell and Petchey, 2022). Therefore, mitigation and surveillance is actively being established and continued where in existence.



Population groups affected

- **Outdoor workers in agriculture/forestry**
- **People undertaking outdoor activity in natural environments**
- **Rural communities**

1 Evidence from stakeholders is referenced in the appraisal sections as W1 and W2 for insights from participatory workshops, and Int.1 etc for evidence from expert interviews.



Relevant statistics

- **There were 14 laboratory confirmed acute cases of Lyme disease in Wales in 2020, and 18 in 2021** (UK Health Security Agency, 2022)
- **In England and Wales, the incidence of laboratory-confirmed Lyme disease rose from 1.62 cases per 100,000 in 2013 to 1.95 cases per 100,000 in 2016** (Tulloch et al., 2019)
- **In Wales from 2013 to 2016, a higher number of cases of Lyme disease were identified in people who lived in rural areas and areas of low deprivation, which may be linked to leisure activities** (Tulloch, 2019)



Key Policy Documents

- **Prosperity for All: A Climate Conscious Wales** (Welsh Government, 2019) includes actions to increase monitoring at ports and airports, and efforts to increase understanding of the risk, particularly from Lyme disease, with healthcare professionals. The plan commits to research what other action is needed and to survey where vectors are entering Wales in the future.
- **International Health Regulations (2005) (IHR)** provide an overarching legal framework that defines countries' rights and obligations in handling public health events and emergencies that have the potential to cross borders (WHO, n.d.).
- **The Health Security (EU Exit) Regulations 2021 came into force on 1 September 2021.** The regulations establish a standalone regime, which will ensure all parts of the UK continue to coordinate on data sharing, epidemiological surveillance, and their approach to the prevention and control of serious cross-border threats to health (Welsh Government, 2022).
- **The UK-EU Trade and Collaboration Agreement;** the UK and the EU have both committed to informing each other of an infectious disease threat if it has spread, or has the potential to spread, across the border of the UK and an EU member state – a so-called “serious cross border threat to health” (Cresswell and Petchey, 2022).
- **The Communicable Disease Outbreak Plan for Wales** (NHS Wales, 2022).

Reference for this document

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