

Due to climate change certain infectious diseases will move to higher latitudes and altitudes. This may have an impact on human health, agriculture and fisheries.

## Shifting range of pathogens

As global mean temperatures continue to rise, pathogen habitats for several species steadily advance both northward in latitude and upward in elevation. Some species thereby enjoy an expansion of their natural habitat, while for others these changes reduce living environment or result in a movement to areas hostile to life. As for some species there are no areas left to go as they already live at their habitat limits, their risk of extinction increases.

Climate change, along with habitat destruction and pollution, is one of the important factors contributing to species extinction. In their “Fourth Assessment Report”, the Intergovernmental Panel on Climate Change (IPCC) in the US predicted already in 2007 that 20-30% of the plant and animal species evaluated in climate change studies are at risk of extinction if temperatures reach projected levels by the end of this century. Examples of species that are particularly climate sensitive and could be at significant risk of extinction include animals adapted to mountain environments and animals dependent on sea ice.

Climate change will also affect the distribution of infectious diseases both directly and indirectly. Scientific research showed that we must expect certain diseases to move to higher latitudes and altitudes. However, the pathways leading from the presence of pathogens, vectors and host animals to manifestations of infectious diseases in humans are non-linear and complex. Apart from climate change, they are influenced by human immune response, the quality of social and health systems, the development of drug resistance among many other factors. They all exert a strong influence on whether or not diseases will manifest in populations and how they will spread. Industrialised countries in the Western world provide public health infrastructure and programmes to monitor, manage, and prevent the spread of many diseases. The risks for climate-sensitive diseases can be much higher in poorer countries that have less capacity to prevent and treat illness, not to mention the increasing number of failed states and war-torn economies. Nevertheless, as morbidity and mortality may be affected by changing disease patterns, Life & Health (re)insurers must take these developments into consideration.

Changing seasonal characteristics of infectious diseases have been reported for many climate-sensitive diseases including malaria or tick-borne encephalitis. Not surprisingly, inter-annual variability of climate, too, has been shown to have an influence on infectious diseases: increases in the incidence of malaria, dengue fever, cholera and other diseases have been associated with the El-Niño phenomenon. The few studies on possible relationships between infectious diseases and the North Atlantic Oscillation (NAO) have been inconclusive so far.

In addition to climate change and shifts in ecological conditions, an increasing density of global travel networks allows many pathogens, parasites and diseases to further expand and/or shift their range. In agriculture, this factor plays an especially important role for Avian Influenza, where outbreaks can be observed to travel at an extremely rapid rate around the globe. The expansion rate is influenced not only by wild bird migrations but also can be linked directly to human travelling activity. Both factors, climate change and increasing network density, therefore may have potentially serious effects on human health, agriculture and fisheries.

The damage potential of Avian Influenza can be devastating for poultry industries worldwide, as this business in most industrialised countries is highly concentrated in certain regions. Another important factor is that humans may contract the disease as well. Therefore, disease fighting measures in terms of stamp out zones (eliminating all animals in a certain radius and all farms that were in contact with one of the farms that evidences the disease), leads to entire poultry populations being eradicated. Even the farmers whose animals are spared suffer severe losses due to price drops, transport restrictions, etc. As a consequence, there is demand for business interruption and price protection insurance, measures that protect farmers from the side effects of such an event. As aquaculture industry faces problems similar to the livestock industry, there is need for comparable insurance covers.