Science for Environment Policy

Changes in biodiversity can increase risk of infectious human disease

It is increasingly evident that human health is closely linked to the environment, and to biodiversity. A study commissioned by the European Commission summarises the many and varied ways in which disturbances to biodiversity affect the spread of human diseases.

Vector-borne diseases cause 1.4 million deaths every year worldwide. Vectors are organisms that can transmit a disease from one species to another. For example, mosquitoes transmit the malaria parasite, *Plasmodium*, to humans from other animals through their bites. Human-induced changes in ecosystems that affect host or vector species also affect the nature and availability of the pathogens they carry and can therefore increase our exposure to infectious diseases. For instance, in Lake Malawi, the population of *Bulinus* species of freshwater snails has increased to overfishing of their natural predators, and appears to have caused a rise in human infection with schistosomiasis. Many diseases have multiple hosts, so biodiversity changes can influence their spread via many different routes.

The effects of deforestation are complex and have been the subject of considerable study. Deforestation destroys natural boundaries that protect humans against exposure to certain diseases, and it can also create new ecological niches favouring the proliferation of vectors. Increased incidence of malaria has been related to deforestation in Africa, Asia, and South America. Biodiversity changes that affect the interface between wild and agricultural communities are some of the most risky to humans, since the contact rate between vectors and hosts is high. For instance, where deforestation occurs and land at the edge of forests is converted to farmland, people are brought into closer contact with forest species that carry leishmaniasis and tick-borne diseases.

In addition, intensive farming contributes to the risk of deadly new strains of influenza emerging when genes from wild birds mix with those in poultry. The study recommends managing interactions between humans, livestock and wildlife to avert disease risk.

In European countries, the diseases causing the greatest concern are those that have recently reached Europe. The voluntary or involuntary introduction of exotic species into temperate climate countries has increased rapidly, as well as human migration, leading to an increase in the incidence of viral infections and parasitic diseases outside their natural distribution area. Climate change may also be an important influence on the survival of pathogens and host species in areas newly affected by these diseases. For instance, there is widespread discussion of malaria re-emerging in former USSR countries and possibly moving into Western Europe. Cases are monitored under the WHO’s Roll Back Malaria EURO programme. However, research in the Mediterranean region suggests that, although the mosquitoes that usually carry the disease are expanding their range, the malaria parasite is currently absent in this region.

Other diseases potentially of concern include the West Nile virus, which is also transmitted by mosquitoes and has reached the Mediterranean basin, causing outbreaks in Italy in 1998, 2008 and 2009, and Leishmaniasis, which has been endemic to Southern Europe for decades. Leishmaniasis, monitored by the EU LEISH MED network in Mediterranean countries, is starting to occur more commonly in urban areas, with stray dogs acting as hosts. Likely to be influenced by climate change, it is spreading northwards with cases in Germany and the Netherlands also occurring.