

- **Zoonoses and sustainable urbanisation in the Global South: understanding the risks to prevent them more effectively**

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Background

The growing human footprint on natural habitats is causing significant environmental changes that are having a major impact on the nature of and changes in the relationships between hosts and parasites (a term that encompasses viruses, bacteria, helminths and protozoa that can be pathogenic), with, in particular, increased contact between humans and wildlife that are reservoirs for these parasites. These disrupted environments are conducive to the circulation of zoonoses (infectious diseases transmitted between animals and humans), particularly in regions of the Global South that are facing multi-sectoral challenges brought about by current anthropogenic changes. Intensive urbanisation is a prime example of this situation, where humans are both the protagonists and the victims of environmental disruptions. Preventing and managing zoonotic risks effectively and sustainably in these fast-growing urban areas is therefore a major priority for sustainable development.

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Further reading

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Rodent zoonoses: a major challenge for urbanisation in West Africa

Urbanisation in West Africa, as in the rest of the continent, is a rapid process that is difficult to control. It is often associated with high population density (the urban population is expected to triple to over a billion by 2050), weak public policies and very limited basic services (such as electricity and water supply, sanitation systems and access to health-care). This process leads to the creation and/or expansion of precarious areas, where disturbed and unhealthy habitats exacerbate interactions between human populations and rodents. Rodents are recognised as key bio-indicators of the anthropisation of habitats and are therefore an important taxon when it comes to health issues in the context of urbanisation – in addition to their socio-economic

impact (resulting, for example, from damage to crops) and environmental impact (such as the reduction in biodiversity). They are reservoirs for around 40% of known zoonoses and have been responsible for major epidemics and pandemics throughout history. Zoonoses associated with rodents can be viral (such as smallpox), bacterial (such as plague), helminthic (such as schistosomiasis) or due to protozoa (such as toxoplasmosis). Some of these diseases can evolve into human-to-human transmission, causing more than 400 million illnesses worldwide every year. Furthermore, rodents are undoubtedly carriers of as yet undiscovered parasites that could be the source of new emerging diseases. Their strong preference for urban environments, their phylogenetic proximity to humans, their anthropophilic nature and the subsequent proliferation through global trade of certain



Magnolia Eco Health Framework: The 6 key principles of the Eco Health approach

(based on Orlando L. F. et al., 2022 – Ecohealth Villages:

A Framework for an Ecosystem Approach to Health in Human Settlements. *Sustainability*, 14 (12), 7053.

invasive exotic species – such as the house mouse and the black rat – make rodents key players in the multiscale spread of zoonoses. Recent research in a number of West African countries (including Benin, Niger and Senegal) has shown that rodents carry zoonotic pathogens (such as Lassa virus, leptospirosis, plague bacilli and the infectious agent of typhus), which are responsible for particularly harmful epidemics that are unfortunately often overlooked when it comes to planning for and/or managing them.

The Eco Health approach: co-constructed research for sustainable solutions

Within these socio-ecosystems, the risk of zoonotic infection is modulated simultaneously by the structure of the landscape (such as sanitation networks), socio-economic and cultural components (based on rodents' food consumption, the vulnerability of human populations, etc.) and the bio-ecology of rodents (e.g. spatio-temporal dynamics). The Eco Health approach (i.e. the ecosystemic understanding of health in all its environmental and societal dimensions) therefore appears to be the most appropriate for, firstly, understanding this zoonotic risk and, secondly, identifying and then supporting the implementation of appropriate actions to combat it. Implementing such an approach requires the development of collaborative and concerted research efforts based on shared objectives with local partners at the interface between science and society. By using an approach that is necessarily 1) interdisciplinary between the social, medical and ecological

sciences (surveys, epidemiological monitoring, sampling, etc.), 2) cooperative with various non-academic stakeholders (such as the authorities, public funding bodies and private organisations) and 3) participatory with local citizens, the Eco Health approach provides a holistic understanding of the complexity of the eco-evolutionary mechanisms and societal factors at work in the circulation of zoonoses. The aim is to identify sustainable and operational levers for action at different levels (policymakers, medical organisations and citizen communities). An excellent example of this type of action is provided by community-based Environmentally-Based Rodent Management (EBRM) strategies (see Dobigny G. et al., 2022 – « La gestion communautaire des rongeurs dans les villes africaines ». In *Science de la durabilité*, Marseille, IRD: 42-45).

The aim of these strategies is to improve the environment to mitigate or prevent the proliferation of rodents by, for example, modifying the habitat and certain uses to reduce the attractiveness of breeding sites and refuge areas for rodents.

North Senegal: a textbook case for Eco Health research

North Senegal, with its "secondary" towns far from the major urban centres, is the driving force behind the urban transformation under way in part of the West African Sahel region. The growing human footprint in the region is reflected both in agricultural landscapes (such as agroecosystems) and in areas where major hubs for the exchange of goods and people are located (such as the towns of Saint-Louis

and Dahra). A research project is currently being co-constructed by a multi-stakeholder network of researchers and doctors (from IRD, Gaston-Berger University, the Pasteur Institute, etc.), local authorities (such as the Senegalese High Council for Health Security One Health) and community associations (such as the Association for the Development of Mbarigo [ADEMBA]), with the aim of: 1) identifying the determinants of human-rodent interactions during the urbanisation process; 2) identifying the ecological, sociological and landscape factors underlying zoonotic

infections in urban habitats or those undergoing urbanisation; 3) anticipating zoonotic risks by identifying the most relevant actions to be implemented collectively. The aim of this project is to provide information – so that public policies can be used to develop sustainable, societal actions and practices adapted to local conditions – but also to produce a methodological framework that can be adapted to other West African socio-ecosystems, and even to other settings beyond this region. This project is part of the AfriCam programme, funded by the international PREZODE initiative.

KEY POINTS

One of the keys to meeting the challenges of sustainable cities is to curb the zoonotic health risks associated with the intensive urbanisation under way in regions of the Global South. In this context, the Eco Health approach appears to be fundamental in providing a holistic understanding of the multifactorial mechanisms and processes at work in the relationship between zoonoses and urbanisation. This integrated approach to health (combining interdisciplinary science, political decisions and community action) is primarily based on research carried out in partnership with local stakeholders, from the co-construction of projects through to the contextualised implementation of solutions, and provides a means of identifying the most relevant levers for integrated zoonoses monitoring.

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