Supplementary Material

# Synergising decision making and interventions across human health and environment: concepts for designing a model for infectious diseases

## Systematic literature search

The database searches were conducted in December 2020 in Ovid Medline, Embase, Scopus, and Web of Science (all databases). The search terms reported in Table S1 were searched in the title, abstract and keyword fields of all databases, while MeSH and Emtree terms were searched in Ovid Medline and Embase, respectively. The search terms were divided into four categories (ecosystem and ecosystem services terms, infectious disease terms, cross-sectoral terms, and model terms), and terms within each category were combined using the 'OR' Boolean operator, including the MeSH and Emtree terms where applicable. The four categories of terms were then combined using the 'AND' Boolean operator, such that the included studies had at least one term from each category. All searches were limited to articles published in the English language.

Papers identified in the database searches were exported into Endnote X9 for management. Duplicates were manually removed, then the titles and abstracts were screened against the following criteria: the paper had to concurrently model the impact of an environmental-based intervention on environmental and human health outcomes related to an infectious disease, be published in English language, and published in full text in a peer-reviewed journal. We also intended for the full texts of the retained papers to be screened against the same criteria, and the reference and citation lists (from Google Scholar, Scopus, and Web of Science) of all included papers to be screened for potential inclusion, based on the same abovementioned criteria, however all papers were excluded at the title/abstract stage.

The database search yielded 827 articles (84 from Medline, 294 from Embase, 137 from Scopus, and 312 from Web of Science (all databases). In total, 647 unique papers were identified, all of which were excluded on the basis of title and abstract (Figure S1). Of these 647 papers, 615 were excluded from further consideration as they did not specifically evaluate the impact of an environmental-based intervention. Many of these were not relevant and had been selected by the search engines based on different contexts of the word 'environment', for example due to the use of terms such as 'environmental transmission of organisms' or 'condition of occupational environment'. Other excluded papers looked at the drivers and correlations of either an infectious disease or environmental outcome without focusing on a specific intervention. The remaining 32 papers investigated a range of environmental-based interventions, such as restoring urban wetlands (Bateganya et al., 2015), use of pesticides (Feola & Binder, 2010), damming rivers (Gubiani et al., 2011), or culling badgers (Cross et al., 2013). Of these 32 papers, nine considered only environmental impacts, 10 considered only impacts on infectious diseases and 13 considered neither (for example those looking at respiratory diseases); hence all 32 were excluded.

**Table S1: Search terms**

| | Ecosystem and ecosystem services terms | | Infectious disease terms | | Cross-sectoral terms | | Model terms |
|---|---|---|---|---|---|---|---|
| **Title, keyword, abstract** | Ecosystem* OR "environmental service" OR "environmental services" OR river* OR marsh* OR "water reservoir" OR "water reservoirs" OR "vegetation" OR "land cover" OR woodland* OR plantation* OR landscape* OR grassland* OR "harvest" OR "timber" OR "crop" OR "crops" OR "natures service" OR "natures services" OR "natural capital" OR forest* OR aquacultur* OR farm* OR rainforest* OR agroecosystem* OR "land use" OR "land uses" OR "land usage" OR "environmental change" OR "climate regulation" OR "flood regulation" OR "flood mitigation" OR "disease regulation" OR "irrigation" OR "water regulation" OR "water quantity regulation" OR "water quality regulation" OR "air quality regulation" OR "natural hazard regulation" OR "pest regulation" OR "soil retention" OR "pollination" OR "water purification" OR "deforestation" OR "urbanisation" OR "urbanization" OR agricultur* OR wetland* OR fragment* OR "ecotourism" OR biodivers* OR salinisation OR salinization OR desertification OR "cultural services" OR "cultural service" OR "cultural disservice" OR "regulating service" OR "regulating services" OR "regulating disservice" OR "regulating disservices" OR "supporting service" OR "supporting services" OR "supporting disservice" OR "supporting disservices" OR "provisioning service" OR "provisioning services" OR "provisioning disservice" OR " provisioning disservices" OR "nutrient cycling" OR "soil formation" OR "primary production" OR fuel* | ↔ AND | bacteria* OR parasit* OR infect* OR viral OR virus OR helminth* OR "anaplasmosis" OR "ehrilichiosis" OR "tickborne" OR "Chagas disease" OR "vector-borne" OR "vector borne" OR "mosquito borne" OR "mosquito-borne" OR "dengue" OR "malaria" OR "lyssa" OR "rabies" OR "tick-borne" OR "tick borne" OR "zoonosis" OR "zoonotic" OR "zoonoses" OR "ross river" OR "leishmaniasis" OR "leptospirosis" OR "weil's" OR "weils" OR "lyme disease" OR "Hendra" OR "zika" OR "rodent-borne" OR "rodent borne" OR "arbovirus" OR "arboviruses" OR "west nile fever" OR "encephalitis" OR "fruhsommer-meningoenzephalitis" OR "ovine encephalomyelitis" OR "spotted fever" OR "rickettsia" OR "rickettsial" OR "yellow fever" OR "togaviridae" OR "chikungunya" OR "onyong-nyong" OR "semliki" OR "sindbis" OR "henipavirus" OR "hantavirus" OR "emerging infectious" OR "ockelbo" OR "karelian" OR "re-emerging infectious" OR "flaviviridae" OR "rickettsiosis" OR "togavirus" OR "haemorrhagic fever" OR "hemorrhagic fever" OR "lassa" OR "Marburg" OR "monkeypox" OR "rift valley" OR "tularaemia" OR "tularemia" OR "bat borne" OR "bat-borne" OR "insect-borne" OR "insect borne" OR "mite borne" OR "mite-borne" OR "trichinellosis" OR "cysticercosis" OR "echinococcosis" OR "schistosomiasis" OR "trypanosomiasis" OR "infectious disease" OR "infectious diseases" OR "prion" OR "prions" OR "Creutzfeldt-Jakob" OR "fasciola hepatica" OR "liver fluke" | ↔ AND | *sectoral OR *disciplinary OR "one health" OR ecohealth OR "planetary health" OR "environmental health" | ↔ AND | "artificial intelligence" OR "machine learning" OR "system dynamics" OR "neural network" OR "neural networks" OR "belief network" OR "belief networks" OR "Bayesian network" OR "Bayesian networks" OR "integrated model" OR "integrated models" OR "integrated modeling" OR "integrated modelling" OR "hybrid model" OR "hybrid models" OR "hybrid modelling" OR "hybrid modeling" OR "agent based" OR "agent-based" OR "random forests" OR "random forest" OR "decision tree" OR "decision trees" OR "generalized linear" OR "generalised linear" OR "generalized additive" OR "generalised additive" OR "individual based" OR "individual-based" OR "simulation" OR "simulations" |
| | ↕ OR | | ↕ OR | | ↕ OR | | ↕ OR |
| **MeSH and Emtree (all exploded)** | environment | | Infection | | One health OR environmental health | | Machine learning OR artificial intelligence OR models, statistical (Medline only) OR statistical model (Embase only) |

*Note:* *indicated truncation. Embase doesn't permit * at the beginning of a term, hence (cross-sectoral OR cross-disciplinary OR crossdisciplinary OR multi-sectoral OR multisectoral OR multi-disciplinary OR multidisciplinary OR inter-sectoral OR intersectoral OR inter-disciplinary OR interdisciplinary OR trans-sectoral OR transdisciplinary OR trans-disciplinary OR sectoral OR disciplinary OR "one health" OR ecohealth OR "planetary health" OR "environmental health") was the search terms used for the cross-sectoral terms in Embase.
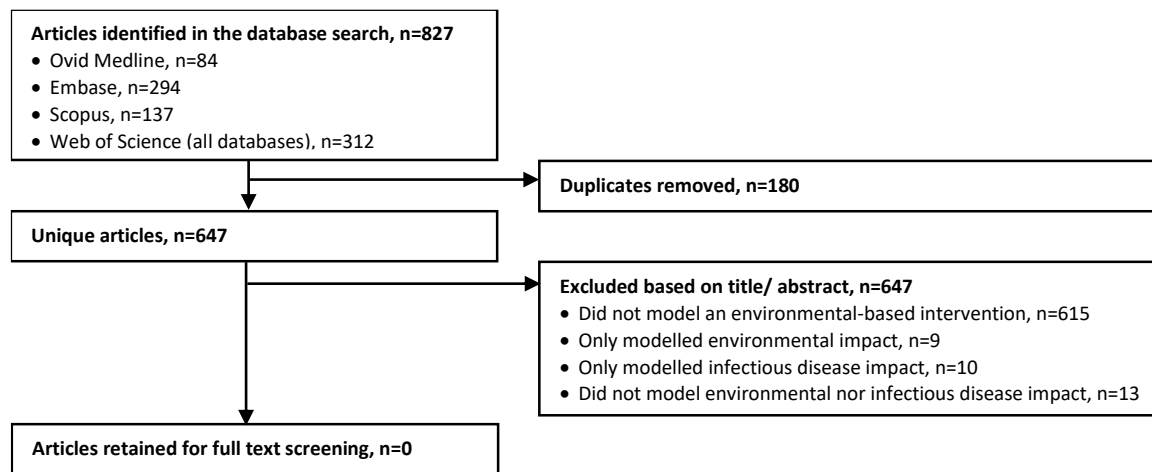
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│ Articles identified in the database search,  │
│ n=827                                         │
│  • Ovid Medline, n=84                        │
│  • Embase, n=294                             │
│  • Scopus, n=137                             │
│  • Web of Science (all databases), n=312     │
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Duplicates removed, n=180

Unique articles, n=647

Excluded based on title/ abstract, n=647
• Did not model an environmental-based intervention, n=615
• Only modelled environmental impact, n=9
• Only modelled infectious disease impact, n=10
• Did not model environmental nor infectious disease impact, n=13

Articles retained for full text screening, n=0

**Figure S1: Flow chart of inclusion/ exclusion for the articles identified in systematic search**

## Supplementary Material References

Bateganya, N. L., Nakalanzi, D., Babu, M., & Hein, T. (2015). Buffering municipal wastewater pollution using urban wetlands in sub-Saharan Africa: a case of Masaka municipality, Uganda. Environmental Technology, 36(17), 2149-2160. doi: 10.1080/09593330.2015.1023363

Cross, P., St. John, F. A. V., Khan, S. & Petroczi, A. (2013). Innovative techniques for estimating illegal activities in a human-wildlife-management conflict. PLoS One, 8(1), e53681. doi: 10.1371/journal.pone.0053681

Feola, G., & Binder, C. R. (2010). Identifying and investigating pesticide application types to promote a more sustainable pesticide use. The case of smallholders in Boyacá, Colombia. Crop Protection, 29(6), 612-622. doi: 10.1016/j.cropro.2010.01.008

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