

IMPACT OF ANTIBIOTICS OF ANTHROPOGENIC ORIGIN ON BACTERIAL SOIL COMMUNITIES IN AGRICULTURAL ECOSYSTEMS

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BACKGROUND

Soil is considered to be the most diverse microbiological ecosystem on Earth. Microbial soil biodiversity is substantially influenced by animal husbandry, intensive agricultural practices and soil cultivation (tillage, crop rotation, irrigation, organic and inorganic fertilization, application of pesticides etc.).

Agricultural management practices like application of organic fertilizers (e.g. manure) expose soil microbiota to a variety of hazardous agents of anthropogenic origin including antibiotics, antibiotic resistant bacteria and antibiotic resistance genes which interact with the indigenous soil resistome. Soil mismanagement represents a worldwide topic that impairs natural ecosystem sustainability as a first consequence.

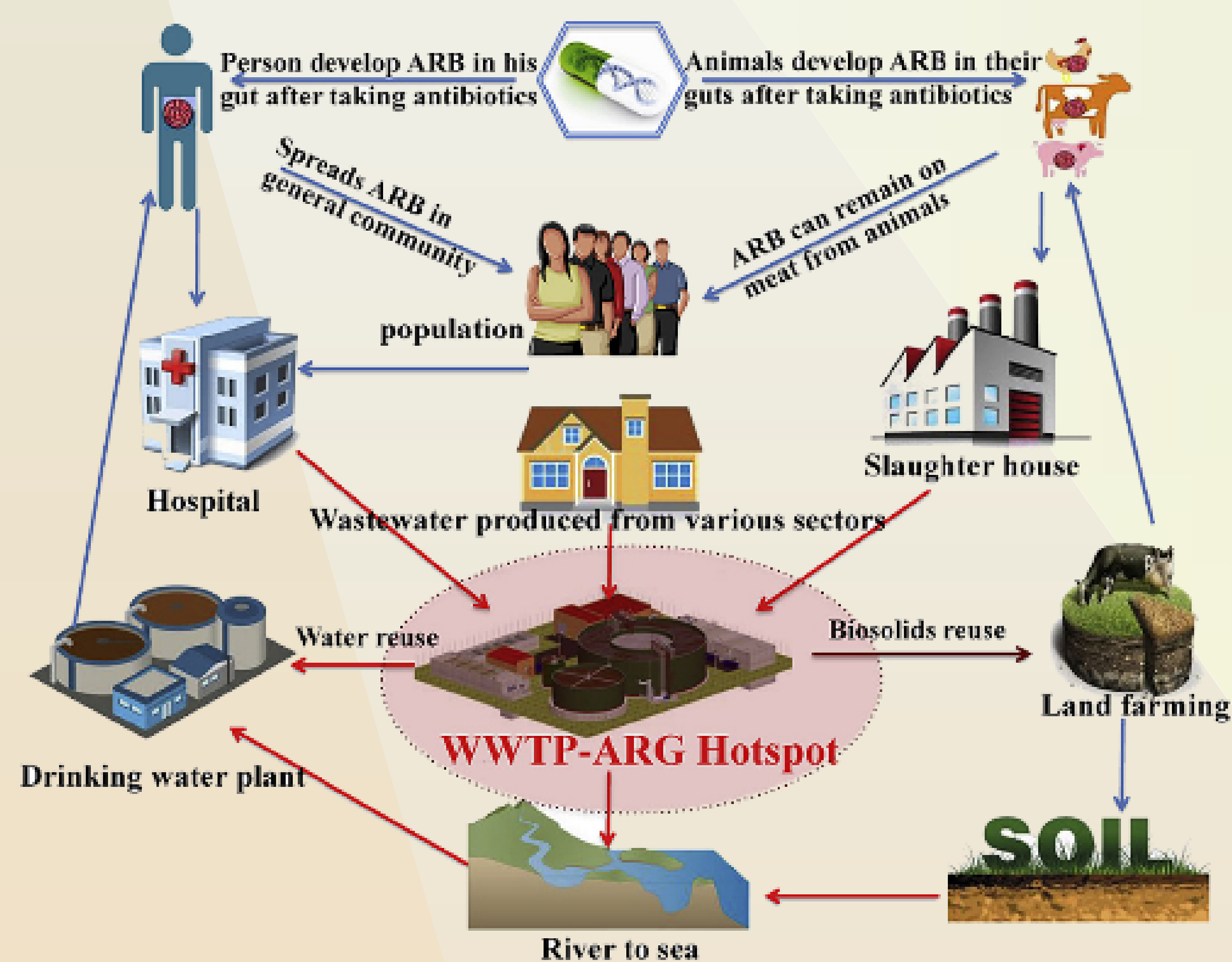
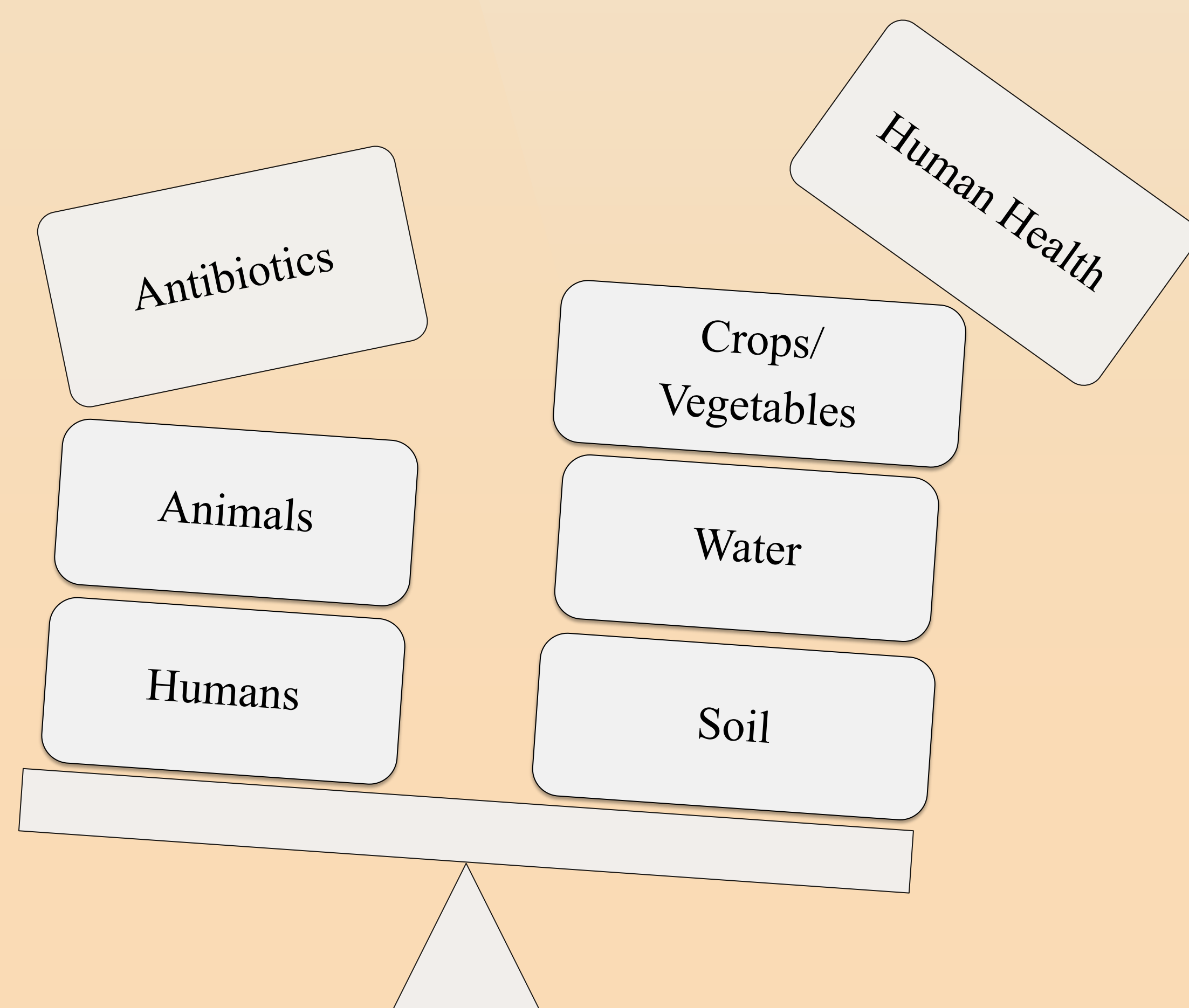


Figure 1. Pathways of A&ARB&ARG dissemination in the environment (Guo et al., 2017)

WHO presents the implications of antibiotic resistance for human health as being a serious problem – “associated with more frequent and longer hospitalisation, longer illness, a higher risk of invasive infection and a twofold increase in the risk of death ...”

ANTIBIOTICS THAT ARE PRESENT IN AGRICULTURAL ECOSYSTEMS INFLUENCE HUMAN HEALTH



REFERENCES:

1. Grenni P. et al., 2017, “Ecological effects of antibiotics on natural ecosystems: A review”, *Microchemical Journal*.
2. Singer A. C. et al., 2016, “Review of Antimicrobial Resistance in the Environment and Its Relevance to Environmental Regulators”, *Frontiers in Microbiology*, Vol. 7, Art. 1728, pp 1-22.
3. Williams-Nguyen J. et al., 2016, “Antibiotics and Antibiotic Resistance in Agroecosystems: State of the Science”, *J. Environ. Qual.*, vol. 45, pp. 394–406.

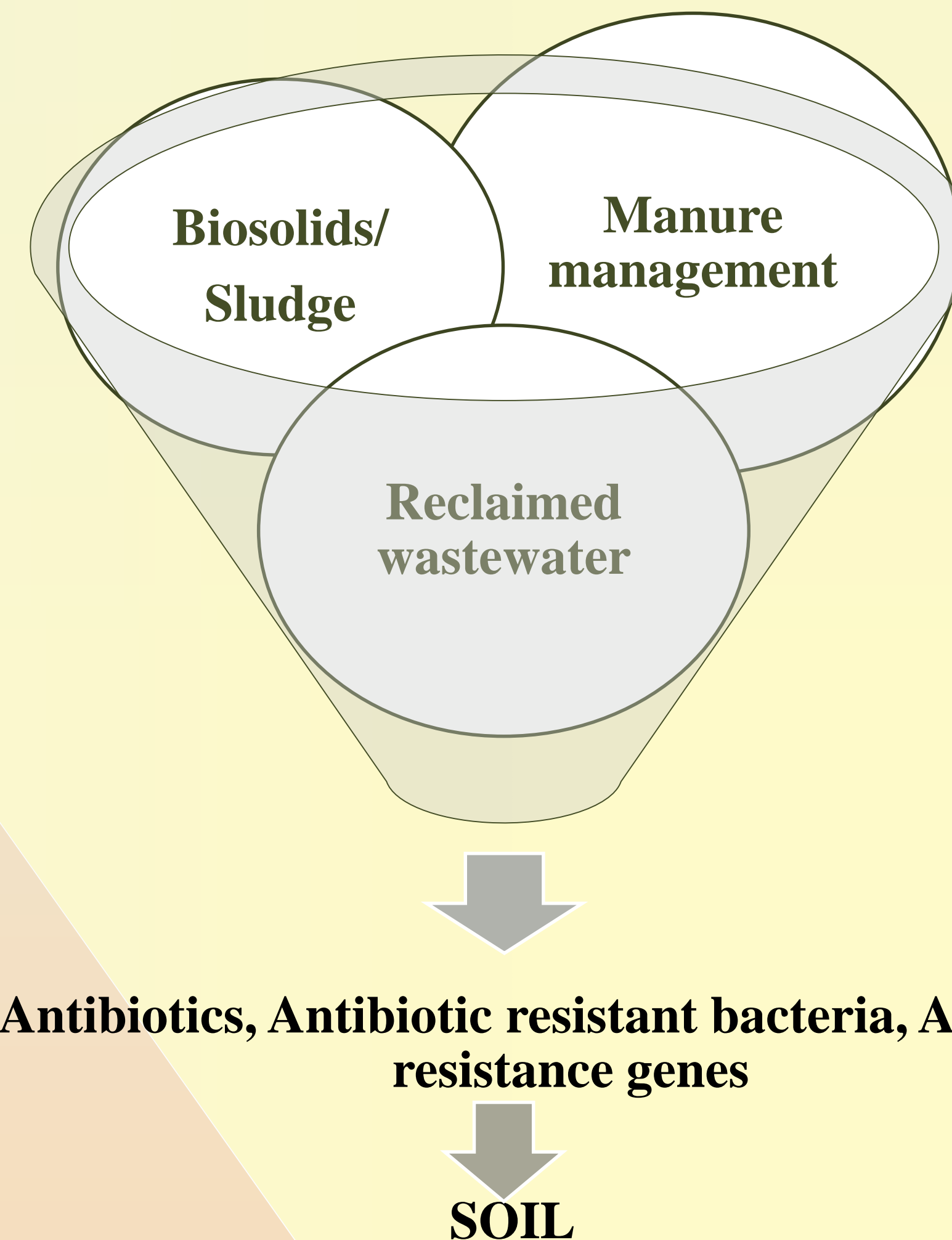
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HIGHLIGHTS

- The impact of human land-use, especially the ecological effects of antibiotics on natural ecosystems such as the increase of antibiotic resistance in soil communities.
- The dissemination of A&ARB&ARG in the environment and their impact on human health.
- Soil mismanagement influence the evolution of antibiotic resistance in different ecological niches.

ECOLOGICAL EFFECTS OF ANTIBIOTICS ON NATURAL ECOSYSTEMS



FUTURE PERSPECTIVES

Additional research will provide new insights for a better understanding of:

- the dynamics of ARB&ARG in natural ecosystems in response to the misuse of pharmaceuticals and pesticides of anthropogenic resources.
- agricultural management practices and the interactions between antimicrobials and resistance towards them.
- the ecological impact of pharmaceuticals and pesticides used in agriculture or animal husbandry on natural environments like soil and water