Monitoring biodiversity for human, animal, plant and environmental health

Francis Banville[1], Colin Carlson[2], Andrea Paz Velez[1] and Timothée Poisot[1]

[1] Université de Montréal, Département de Sciences Biologiques, Montréal Québec, Canada;
[2] Yale University, Yale School of Public Health, New Haven Connecticut, USA

Correspondence to Francis Banville — francis.banville@umontreal.ca

Abstract: The One Health approach promotes collaboration across disciplines to enhance the health of humans, animals, plants, and the environment. The Quadripartite organizations, which include the Food and Agriculture Organization of the United Nations (FAO), the United Nations Environment Programme (UNEP), the World Organisation for Animal Health (WOAH), and the World Health Organization (WHO), developed the One Health Joint Plan of Action (OH JPA) to support countries in achieving One Health. This plan consists of six action tracks, each consisting of a set of actions for implementing One Health. By requiring knowledge on zoonotic diseases (tracks 2 and 3), food and agriculture (track 4), antimicrobial resistance (track 5), and environmental health (track 6), most of these tracks directly concern biodiversity. However, there are currently no indicators for monitoring the OH JPA. Our research examines the extent to which all six tracks are covered by the Kunming-Montreal Global Biodiversity Framework (KM-GBF) of the Convention on Biological Diversity (CBD), which contains many indicators at the intersection of biodiversity and health. We assessed (1) the link between each indicator of the KM-GBF and human, animal, plant, and environmental health and (2) the usability of these indicators for monitoring One Health actions. We found that 75% of indicators are associated with health, and that a similar proportion can be used for monitoring One Health actions. Overall, our work aims to strengthen collaboration between the CBD Secretariat and the Quadripartite Organizations by highlighting the need for shared data, policy, and governance practices.

Keywords: biodiversity indicators, Kunming-Montreal Global Biodiversity Framework, One Health, One Health Joint Plan of Action, Quadripartite Organizations

Introduction

- The One Health approach
  - Interconnection between human, animal, plant, and environmental health
  - Zoonotic diseases, non-communicable diseases, food safety, antimicrobial and antiparasitic resistance, climate change, pollution
  - Collaboration across disciplines
- The One Health Joint Plan of Action
  - Quadripartite Organizations
  - 6 action tracks, many actions, even more activities
  - No indicators
- The Kunming-Montreal Global Biodiversity Framework
  - Convention on Biological Diversity
  - Protecting biodiversity by working towards targets and goals
  - Global Action Plan recognizes that biodiversity is linked with health
- Monitoring framework of the KM-GBF
  - Types of indicators (headline, binary, component, complementary)
  - Many indicators are linked with health (examples)
  - Reusing indicators decreases the workload of countries
- Objectives of our study
  1. Assess the link between biodiversity indicators and human, animal, plant, and environmental health
  - Strengthens the link between biodiversity and health
  - Reinforces the need for collaboration across disciplines
  - Highlights the need for shared policy and governance practices between the CBD Secretariat and the Quadripartite Organizations
  2. Evaluate the usability of indicators for monitoring One Health actions
  - Highlights the need for data sharing between Parties, organizations, and other stakeholders
  - Reduces the workload on countries

Evaluation of indicators

- Qualitative assessments
  - Total of 204 indicators
  - Two evaluators for each indicator
  - Assessments based on expert knowledge
  - Finding a consensus between the evaluators

Assessing the link between biodiversity indicators and health

- Qualitative assessments
  - Assessing the link between each indicator and human, animal, plant, and environmental health
  - Direct connection if there is a direct causal relationship between the indicator and health (e.g., the indicator could directly measure the state or a risk factor of health)
  - Indirect connection if there is a single intermediary factor between the indicator and health
  - Potential connection if there are two or more intermediary factors between the indicator and health, or if they are likely connected but we are not sure how
  - No connection if the connection between the indicator and health is far-fetched, unlikely, or absent
  - Require categorizing species and defining health
- Categorizing species within One Health
  - Animals
    - Include pets, livestock, fisheries, and aquaculture, i.e. species currently looked after by veterinarians and food inspectors
    - Exclude humans and wildlife
    - Are taken care of by the World Organisation for Animal Health (WOAH)
  - Humans
    - Are taken care of by the World Health Organization (WHO)
  - Plants
    - Include species used for food, fuel, and medicine, i.e. cultivates plants
    - Are taken care of by the Food and Agriculture Organization of the United Nations (FAO)
  - Environment

    - Includes ecosystems and all species not considered in the human, animal, or plant categories
    - Includes forestry and fisheries
    - Being taken care of by the United Nations Environment Programme (UNEP)
- Defining health
    - Human and animal health
        - Overall wellbeing of an individual, i.e. the extent to which it is able to function physically, mentally, and behaviorally
        - Diseases are deviations from the normal functioning of an individual, often leading to pain, suffering, and death
    - Plant health
        - The extent to which an individual is able to function physically
        - Diseases are deviations from the normal physiological functioning of an individual, often leading to death
    - Environmental health
        - The extent to which the environment is able to function, maintain biological and chemical processes, and adapt to change
        - Disturbances are degradations that lead to a decline in the functioning of ecosystems and biological communities
        - Environmental health include wildlife health

Assessing the usability of indicators for monitoring the OH JPA

- Qualitative assessments
    - Evaluating each action track independently
    - Identifying the main action that can be monitored for each relevant action track
    - Directly usable indicators can already be used to monitor an action in the action track
    - Indicators usable after adaptation need to be slightly modified (e.g., changes in scale of measurement, data resolution, or taxa) before being used to monitor an action in the action track
    - Not usable indicators need to be greatly modified before being used to monitor the actions in the action track, or they monitor something outside the scope of the action track

Link between biodiversity indicators and health

- Most indicators are linked with health
  - How many indicators are directly or indirectly linked with human, animal, plant, and environmental health?
  - Description of Figure 1
  - Examples of indicator linked with human, animal, plant, and environmental health
- Figure 1: Bar chart
  - x-axis: Human, animal, plant, and environmental health
  - color bars: Directly, indirectly, potentially connected and no connection
  - y-axis: number of indicators
- Link between biodiversity and health
  - The state of biodiversity impacts health
  - Ecosystem services benefit health
  - Biodiversity and health have similar pressures
  - Biodiversity and health are protected with similar actions

Usability of indicators for monitoring the OH JPA

- Most indicators can be used to monitor the OH JPA
  - How many indicators for each action track?
  - Description of Table 1
  - Importance of directly reusing indicators
  - Indicators usable after adaptation are based on similar and robust methodologies, which minimizing training requirements
- Table 1:
  - Lines: All actions in the OH JPA
  - Columns: Directly usable, usable after adaptation, not usable
- Many usable indicators are headline and binary indicators
  - How many?
  - Presentation of important gaps
  - Description of Figure 2
  - Important because these are mandatory indicators that are more likely to be measured

- Figure 2: Sankey diagram
  - Left: Indicator categories (headline, binary, component, and complementary indicators)
  - Right: Six action tracks (including no action track)
- Usable indicators are in all categories of the Action Plan
  - The KM-GBF addresses many dimensions of health
  - Presentation of important gaps
  - Description of important categories and their connection with health
- Figure 3: Sankey diagram
  - Left: Categories of the Global Action Plan on biodiversity and health (including no assigned category)
  - Right: Six action tracks (including no action track)

Conclusion

- Monitoring Frameworks
  - The monitoring framework of the OH JPA can be based on indicators of the KM-GBF
  - Importance of reusing indicators to decrease workload on countries
  - Importance of sharing data, methodologies, and expertise
- Gaps in indicators
  - Indicators
- Other indicators could be identified in other monitoring frameworks (e.g. SDG)
  - New indicators can be developed after identifying gaps
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- Collaboration
  - Sharing policy and governance practices
  - The CBD Secretariat should join the Quadripartite Organizations

Bibliography