TED4LAT

Twinning in Environmental Data and Dynamical Systems Modelling for Latvia

Human-Environmental Interactions and Well-being Modelling

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22.10.2024. Paris,

TED4LAT workshop and doctoral school - 21-25 October 2024

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Dominant approach

The dominant approach is **anthropocentric** (ecosystem, nature is only a tool or service for human well-being). A holistic approach (human as part of the ecosystem) or an **ecocentric** approach as a research goal is hard to find in the reviewed articles.

Vitolina I., Mathias J-D., Krutova U., Gorbunovs A., Kapenieks A., Kapenieks (Sen.) J., Kapenieks (Jun.) J., Jakobsone-Snepste G. (2024). Human - Environment interactions and well-being monitoring: a Systematic Review. Submited for publication

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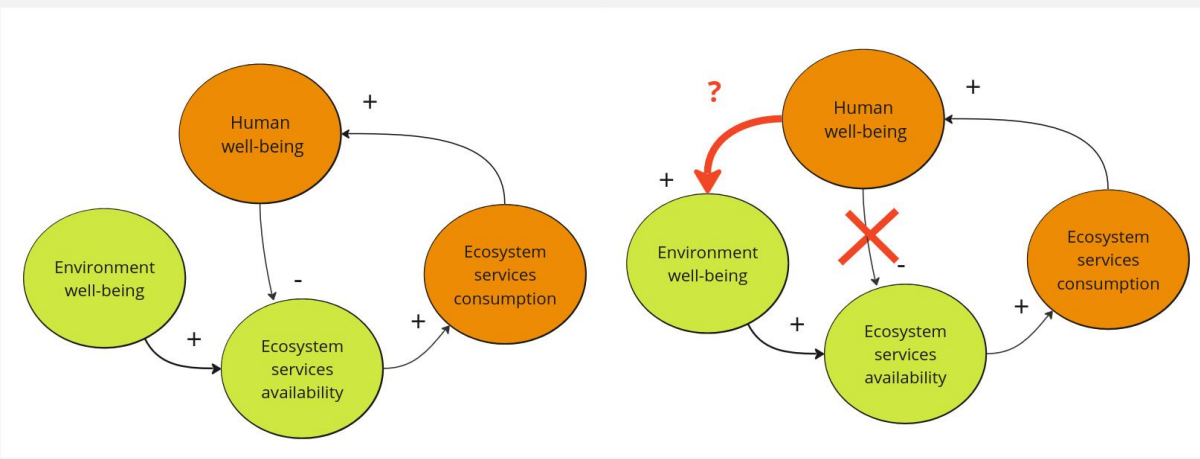
Human-environment interactions

A conceptual perspective on human-environment interactions and the causal relationships of well-being. Black lines are conclusions about theoretical links from the reviewed literature, red lines are links where quantitative causation studies are needed.

a - Current situation

b - Desired future situation



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Our aim is to find out **how to balance human interests with non-human well-being**, how to organize such systems that satisfy human needs but do not threaten the integrity of the Earth system and ecosystem processes.

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Concept of well-being

Well-being is the **functional integrity** of each particular system and depends on **inputs provided by other systems** (Kortetmäki et al. 2024).

Input that **satisfies the needs** of the specific system must be provided.

Need satisfiers are essential for ensuring the integrity of the system's critical processes or well-being of a particular system

Planetary well-being

According to Kortetmäki et al. (2024):

- **Planetary well-being** is "a state in which the integrity of Earth system and ecosystem processes remains unimpaired to a degree that lineages can persist to the future as parts of ecosystems , and organisms (including humans) can realize their typical characteristics and capacities".
- The concept of planetary well-being does not deny that human needs must be taken into account, but this concept draws attention to the fact that it is necessary ***to be able to distinguish the basic needs of people from the desires and wills of people***, which negatively affect non-human nature or the environment.

Kortetmäki, T., Puurtinen, M., Salo, M., Aro, R., Baumeister, S., Duflot, R., ... & Kotiaho, J. S. (2024). Planetary well-being 1. In Interdisciplinary Perspectives on Planetary Well-Being (pp. 9-25). Routledge.

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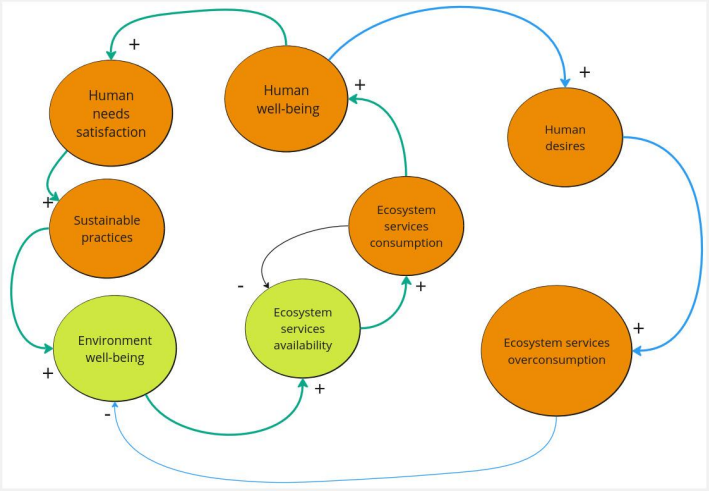
Assumptions for Agent Based Modeling of well-being



(1) Higher environmental well-being enhances the availability of ecosystem services.

(2) More available ecosystem services lead to greater human well-being as basic needs are met effectively.

(3) As human well-being improves, there can be greater investment in sustainable practices or restoration efforts, enhancing environmental well-being. This can occur through policy changes, conservation initiatives, or a cultural shift towards environmental stewardship.

(4) The model differentiates between basic needs, which have a positive impact on well-being, and desires, which can lead to overconsumption and thus pose risks to or reduce environmental well-being. By controlling desires, people can reduce negative impacts on environmental well-being and support a sustainable loop.

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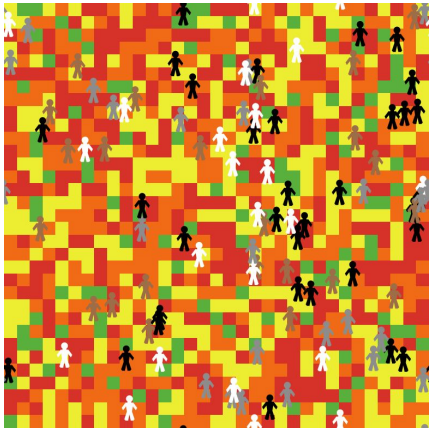
The 1st draft version for the planetary well-being concept

Multi-agent programmable modeling environment Netlogo (https://ccl.northwestern.edu/netlogo/)



a) Setup

The background color represents environmental well-being: green – very high; yellow - high, orange – low; red - very low

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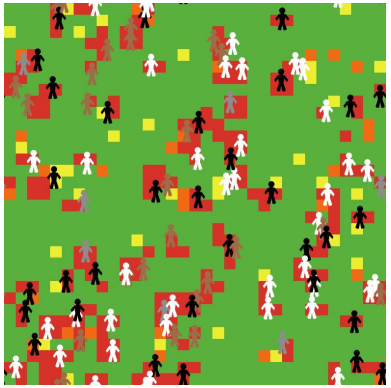
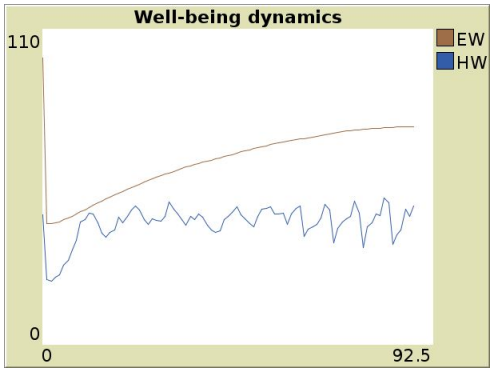
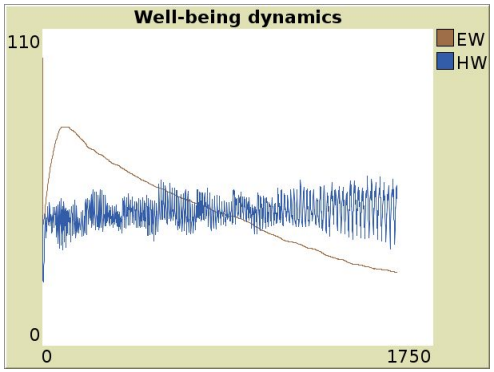
b) after 88 ticks

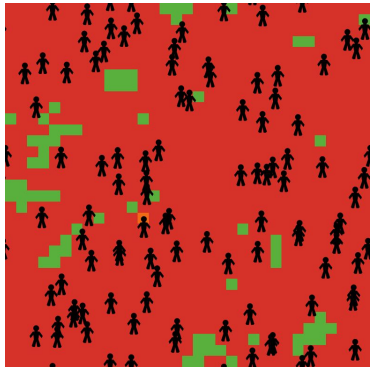


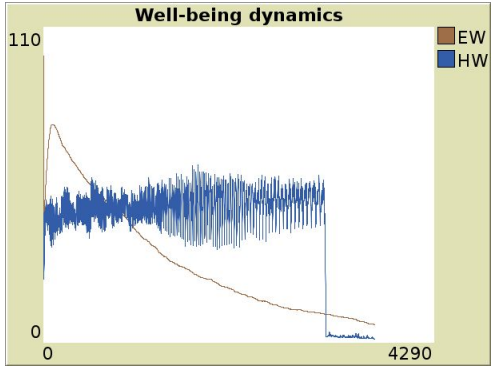


c) after 1590 ticks



d) after 3636 ticks





blue line represents average human well-being, brown line represents average environmental well-being

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Next steps

Development and validation of agent-based model equations for well-being dynamics monitoring

Application of the model to specific cases

Scenario development, depending on people's behavior (pro-environmental, low-high need or desire level..)

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Acknowledgments

This research has been funded by the European Union. Project ”Twinning in Environmental Data and Dynamical Systems Modelling for Latvia”. TED4LAT, No. 101079206. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Research Executive Agency. Neither the European Union nor the granting authority can be held responsible for them.

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References

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