Preparing for Tomorrow

Tools, Skills, and Sensors in Forecasting Climate Change's Health Consequences

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Background

Climate change has important implications for human health. Temperatures continue to rise and extreme weather conditions become more frequent. Resulting changes in ecosystems will impact health in general and more specifically, distribution of communicable, vector-borne and heat-related diseases. It is imperative to adopt proactive measures to anticipate and mitigate the health impact of climate change. New sensors, skills and tools are required to predict impact on human health and conceptualise proactive measures against adverse consequences of rising temperatures.

Objectives

Tools, skills and sensors necessary for enhancing preparedness and forecasting the health consequences of climate change are examined with a **design thinking methodology**. The aims of the present research are

1. Identification of existing and emerging sensors capable of detecting climate related health risks
2. Evaluate the suitability of various tools and skills for predicting and addressing the health impacts of climate change
3. Highlight the importance of proactive strategies in fostering preparedness for the health challenges posed by climate change
4. Anticipate and mitigate the health consequences of climate change

Methodology

A search of the current literature on anticipatory research specific to sensors, skills and tools for prediction was employed. A design thinking model, *the ClimateSense Model* was conceptualised based on the analysis.

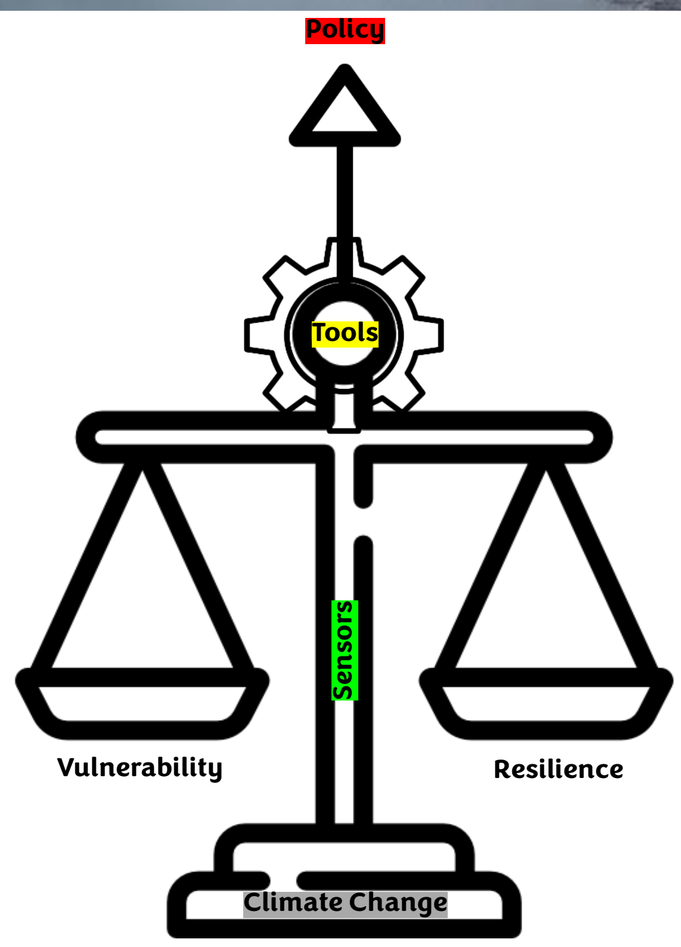

Figure 1: *The ClimateSense Model demonstrates a balance between vulnerability and resilience which can be changed with the right tools based on sensory input. The output is a change of policy which steers climate change into the right direction.*

Results

SENSORS

1. Physical Sensors and Information Technology [1]

Remote Sensing with Satellites & Geospatial Methods: Satellites and Geographical Information Systems (GIS) used to monitor climate variability, environmental conditions and their impact on dynamics of infectious disease distribution (such as vector-borne diseases). Epidemiological data combined with weather and geo-reference (picture) data used to predict vector spread

Remote Sensing with Aircrafts & Drones: Infrared sensors, radiometer and photography devices installed on drones to characterise the earth. Real-time climate information as well as natural resources, agricultural practice, forest fires and water management can be detected

2. Biological Sensors: RNA and DNA Sequencing Technologies: [2] Mobile sequencing labs to detect pathogens and vectors in field research or to assess water or soil quality as an indicator for climate change

3. Chemical Sensors: Greenhouse Gases: Greenhouse gas (CO_2, Methane, N_2, O_3) driven change in the atmosphere detected with chemical sensors such as infrared or absorption spectroscopy, catalytic bead or other electrochemical sensors

TOOLS [1]

1. Mobile Applications & Artificial Intelligence: Classification of mosquitos with optical and acoustic sensors, human activity detected with mobile phone positioning systems to investigate human or environmental health

2. Internet-of-things Technology: Microchip technologies on consumer goods used to measure sperm motility, sweat rate, saliva composition in humans or animals

3. Crowdsourcing: Collection of atmospheric data from public sensors combined with social media information

SKILLS

Digital skills to interpret and communicate sensor-derived data in the form of interactive maps, plots and time series. Analysis of big data with statistical skills or Artificial Intelligence in the future.

Conclusion

Synergistic combination of tools, skills and sensors, as conceptualised in the *ClimateSense model*, are essential to anticipate consequences of climate change for health. By promoting anticipatory preparedness, policymakers, healthcare professionals and communities can better mitigate the adverse health impacts of climate change, build resilience to its effects and define a planetary health strategy.

References

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2. Borhan MS et al. Sensors and Methods for Measuring Greenhouse Gas Emissions from Different Components of Livestock Production Facilities. GEP. 2022;10(12):242-72.

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