



## OPEN ACCESS

## EDITED AND REVIEWED BY

Matjaž Perc,  
University of Maribor, Slovenia

## \*CORRESPONDENCE

Setsuya Kurahashi,  
✉ kurahashi.setsuya.gf@u.tsukuba.ac.jp

RECEIVED 23 May 2023

ACCEPTED 25 May 2023

PUBLISHED 08 June 2023

## CITATION

Kurahashi S, Chappin E, Jager W and  
Takahashi H (2023), Editorial: Tipping  
points in societies.  
*Front. Phys.* 11:1227555.  
doi: 10.3389/fphy.2023.1227555

## COPYRIGHT

© 2023 Kurahashi, Chappin, Jager and  
Takahashi. This is an open-access article  
distributed under the terms of the  
[Creative Commons Attribution License  
\(CC BY\)](https://creativecommons.org/licenses/by/4.0/). The use, distribution or  
reproduction in other forums is  
permitted, provided the original author(s)  
and the copyright owner(s) are credited  
and that the original publication in this  
journal is cited, in accordance with  
accepted academic practice. No use,  
distribution or reproduction is permitted  
which does not comply with these terms.

# Editorial: Tipping points in societies

Setsuya Kurahashi<sup>1\*</sup>, Emile Chappin<sup>2</sup>, Wander Jager<sup>3</sup> and  
Hiroshi Takahashi<sup>4</sup>

<sup>1</sup>Graduate School of Business Sciences, University of Tsukuba, Tokyo, Japan, <sup>2</sup>Technology Policy and Management, Delft University of Technology, Delft, Netherlands, <sup>3</sup>University College Groningen, University of Groningen, Groningen, Netherlands, <sup>4</sup>Graduate School of Business Administration, Keio University, Yokohama-city, Japan

## KEYWORDS

tipping points, phase transitions, social simulation, computational social science, network dynamics

## Editorial on the Research Topic Tipping points in societies

The Research Topic of Tipping Points in Societies gathers different contributions highlighting essential Research Topic in physical and socio-economic, and ecological phenomena. In the information society, the phenomenon of accelerated information propagation on social media, etc., is strongly related to the discovery of tipping points in social networks. In the economic society, it should be noted that the analysis of tipping points, such as rapid fluctuations in financial markets, does not occur due to a single factor but occurs in a complex interaction.

The modern society is now at the tipping point. Climate change requires a shift in the energy of our society, and the COVID-19 pandemic visualizes the problem of social inequality and calls for a shift in traditional social structures, including economic and medical systems. When considering the information society, the phenomenon of accelerated information propagation on SNS, etc., is strongly related to the discovery of tipping points in social networks. When considering the economic society, it should be noted that the analysis of tipping points such as rapid fluctuations in financial markets does not occur due to a single factor, but occurs in a complex interaction. This Research Topic focuses on data analysis, modeling, and theoretical efforts targeting various systems such as society, economy, management, climate, biology, and nature, with tipping points as the main topic.

The first article on this Topic [Okada et al.](#) introduces tipping points of political and social opinions in groups using a physics-based opinion dynamics approach. The authors propose the extended model to take into account neighborhood relations in a small-world network and show that the opinions of two parties gradually attract each other, and when a certain threshold is exceeded, the opinions are integrated at once, as in a phase transition. This paper provides valuable insight into tipping points of opinions.

The second article [Sakahira and Tsumura](#) deals with an archaic society. It performs an obsidian social network analysis to investigate the dynamics of trade networks in ancient Japan. The results reveal a tipping point in the obsidian trade network, which can be attributed to population decline and migration due to climate change. This research has valuable implications for us today.

The third article [Uchida and Yoshida](#) presents a brute-force approach to analyze the concept drift behind time sequence data. The authors propose a new method for detecting concept drift in machine learning and forecasting, where the correct label of data changes. They show that this approach can contribute to detecting tipping points of variation, such as stock price data due to the Lehman Brothers collapse or the spread of variants in COVID-19 data.

The next article [Kikuchi et al.](#) proposes approaches using actual data and social simulations to address economic and social problems. The study proposes a method to predict pre- and post-retirement asset sustainability to avoid a tipping point of the asset value. The results of simulations are possibly used not only by model designers and analysts but also by decision-makers in management, administration, and on-site managers.

The article about indirect reciprocity [Yamamoto et al.](#) clarifies the major mechanisms of the evolution of human cooperation. Using a norm knockout method developed to analyze the function of social norms, this paper identifies the norms that are essential for the emergence and maintenance of cooperation in a society where defection is dominant. The results demonstrate the importance of focusing on evolutionary dynamics overlooked in static analyses of evolutionarily stable norms.

The paper that alarms about the COVID-19 risk at home [Kurahashi et al.](#) proposes a model that visualizes the infection risk to family members. This study reveals that disinfection of entryways and bedrooms is the tipping point for infection risk reduction and provides us with suggestions for appropriate

infection control measures.

We hope that the reader will find in this Research Topic a useful reference for the state of the art in the social science field focused on tipping points in societies.

## Author contributions

SK wrote the first draft of the editorial. WJ contributed to the revision, read, and EC and HT approved the submitted version. All authors contributed to the article and approved the submitted version.

## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.