

# Insights from Interdisciplinary Research on Planetary Dynamics

## — How early societies adapted to climatic changes

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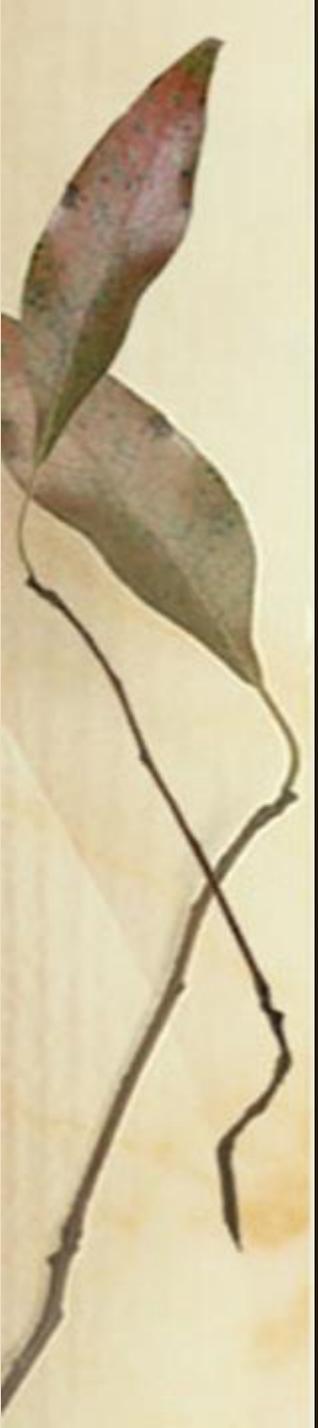
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Climatology, Climate  
Dynamics & Climate Change



# Outline

- The scholarship “History of Climate and Society”
- Methodological challenges
- A research framework for HCS
- The five pathways of resilience

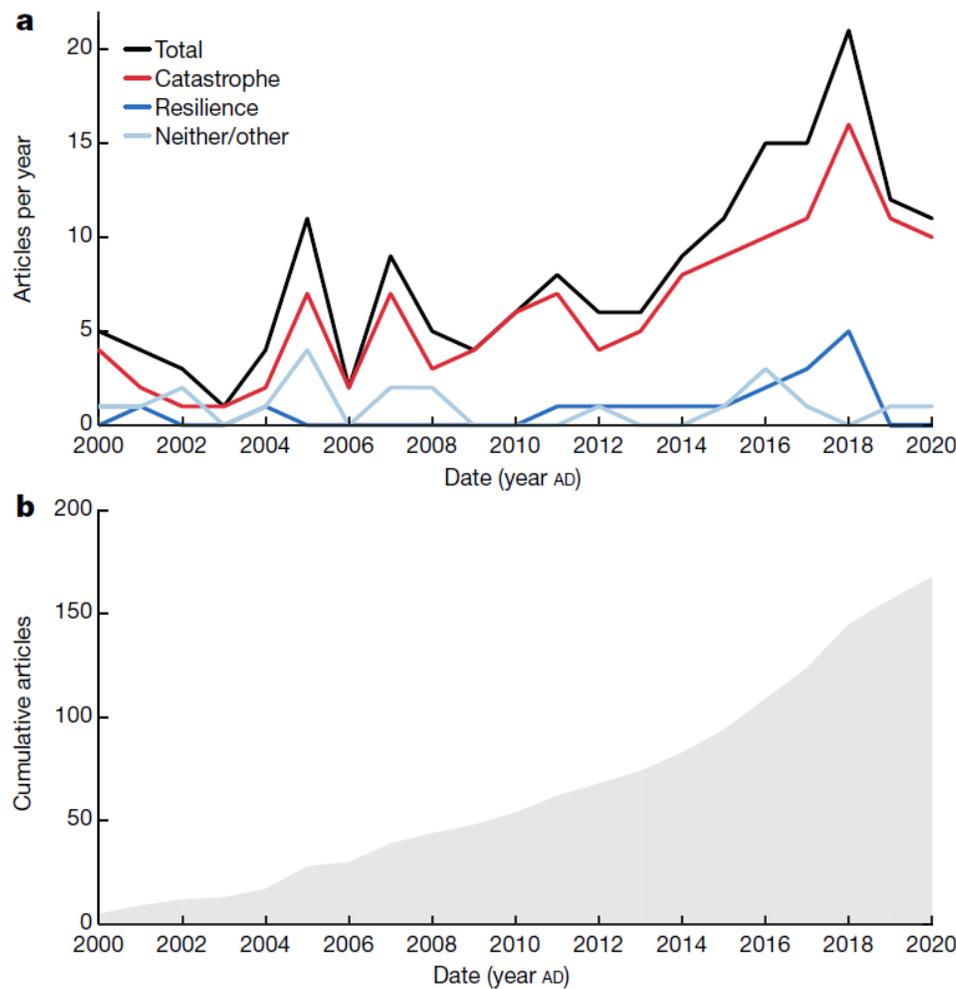


# History of Climate and Society

- ❖ a large, multidisciplinary scholarship that considers how pre-industrial climate changes influenced human history
- ❖ focusing on hydroclimatic anomalies or periods of prolonged cooling
  - ↪ disrupted growing seasons, famines, migrations, conflict within or between polities
  - ↪ disasters, crisis and collapse

# History of Climate and Society

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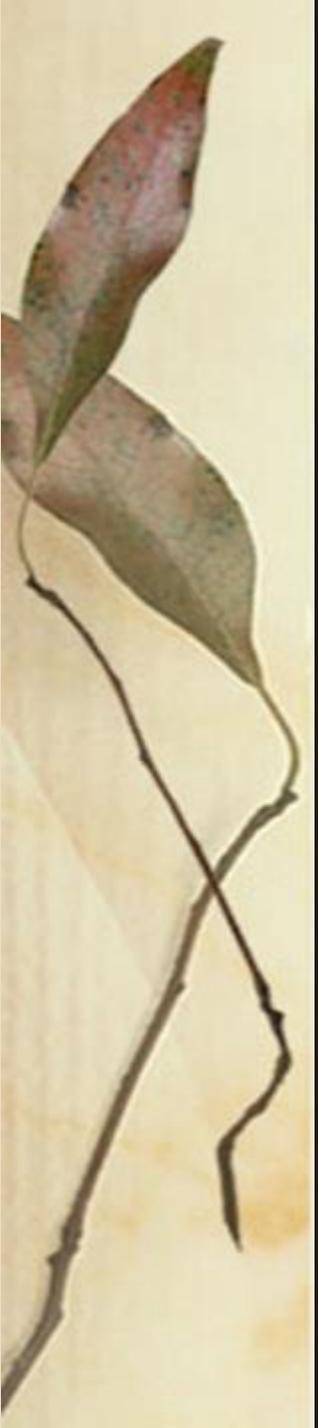


**Fig. 2 | Meta-analysis of HCS studies. a**, Primary emphasis for qualitative and statistical HCS studies on climate–society interactions within Europe during the LIA, from 2000 to October 2020<sup>24</sup>. Of 168 studies, 77% emphasize

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# Methodological challenges

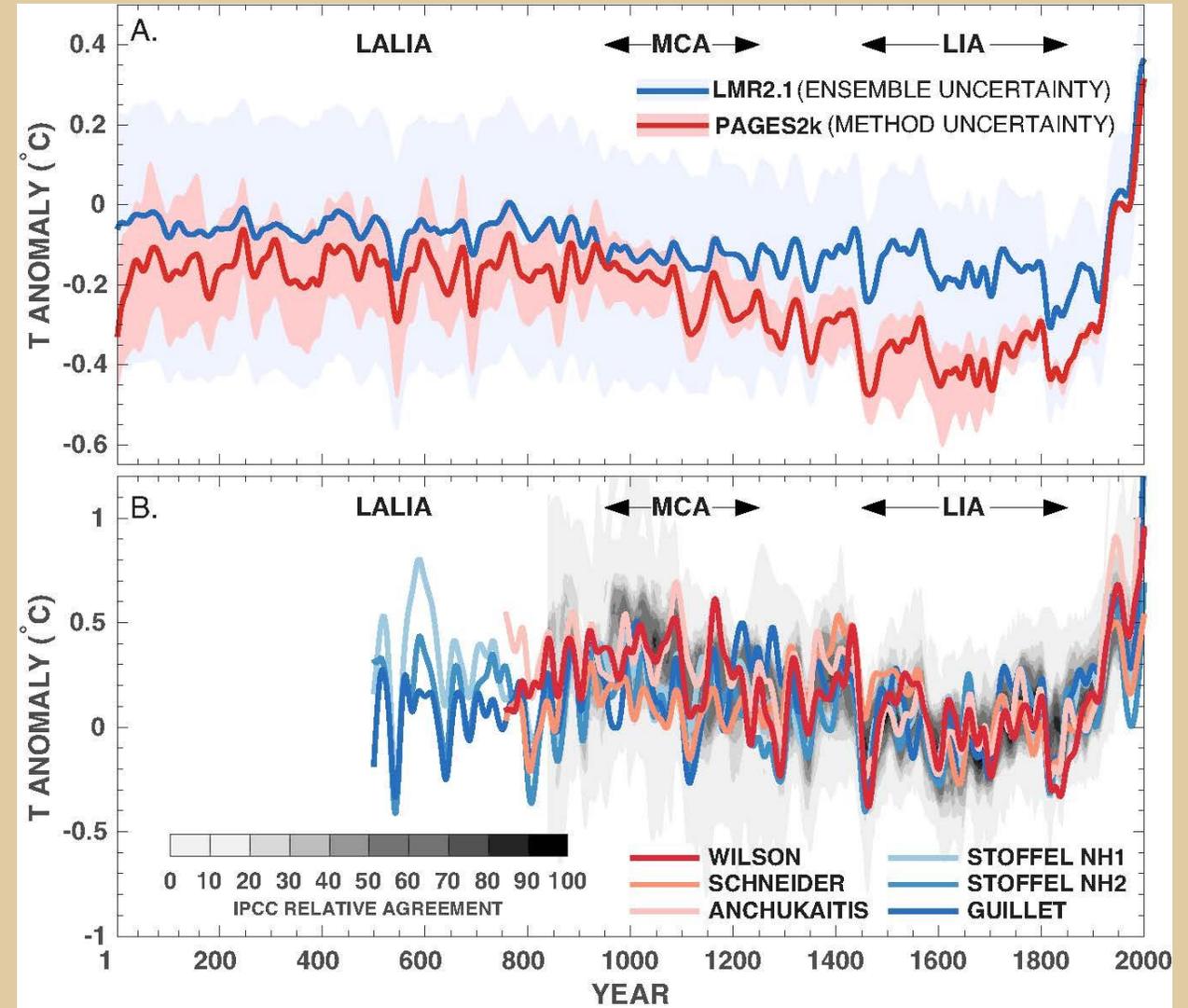
- Use of proxies as direct climate records – no uncertainties at historical spatiotemporal scales
- Changing numbers and composition of proxy records with time in reconstructions
- Fragile statistical methods
- Incorrect identification of the cause, magnitude, timing and character of past climate changes
- Misidentified causal mechanisms, factors
- Unrealistic combinations of climate and human achievements
- Past societies isolated and homogeneous systems vulnerable or not to changes
- Societal vulnerability and resilience straightforward and diametrically opposed concepts
- Climate change: a force that caused societies to rise or fall

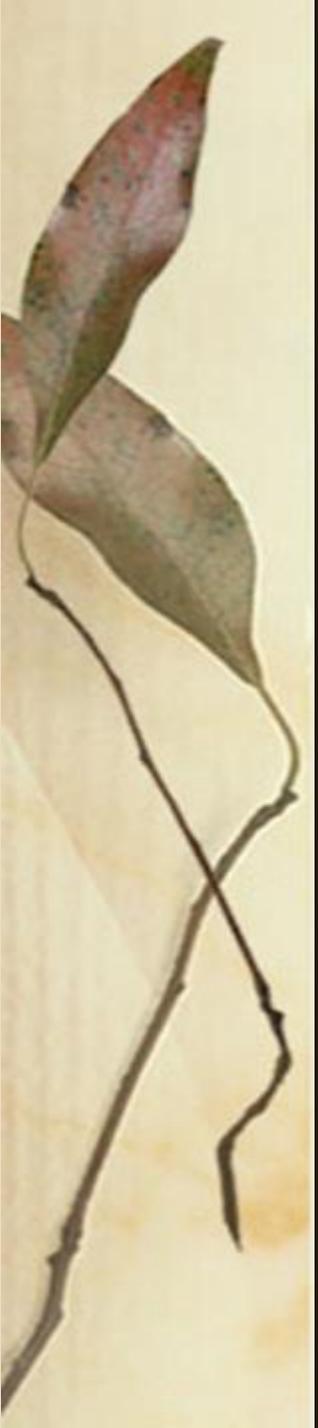
# LATE ANTIQUE LITTLE ICE AGE & LITTLE ICE AGE

The volcanic, solar and internal forcings that were primarily responsible for the LALIA (6<sup>th</sup> century) and LIA (13<sup>th</sup>-19<sup>th</sup> century) rendered the climate of those centuries spatially and temporally heterogeneous, and ensured that on large scales cooling never reached even the present-day magnitude of anthropogenic warming.

LALIA: varying duration

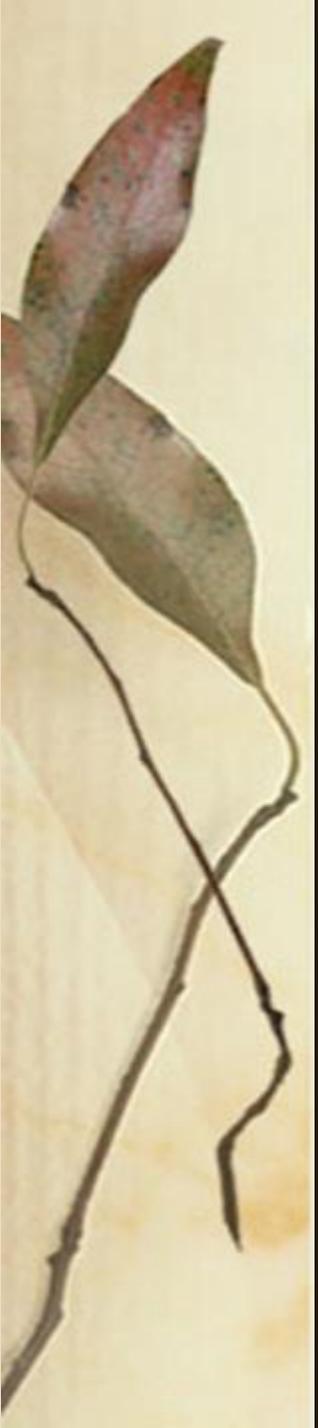
LIA: spatial and temporal variability





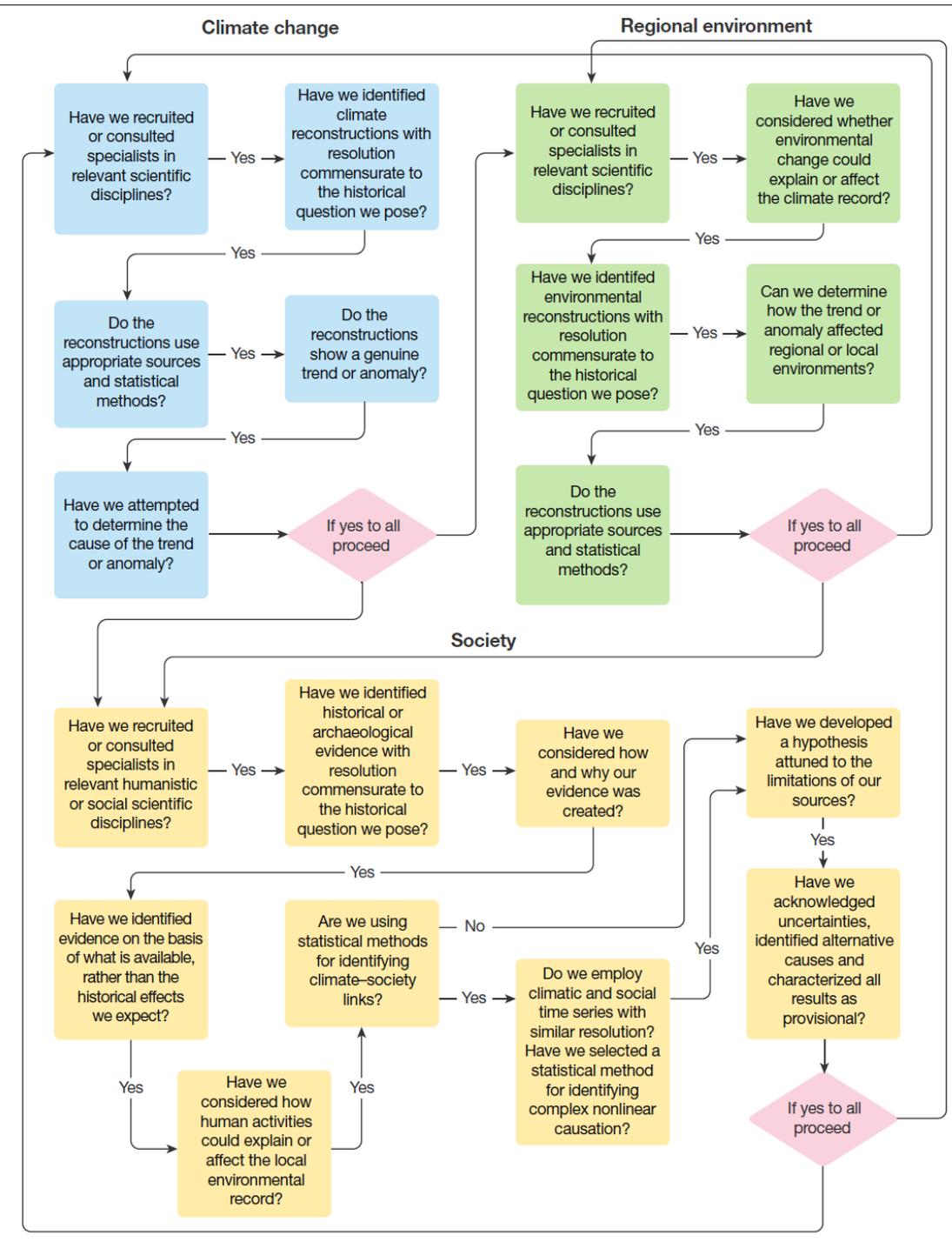
# A research framework for HCS

- Four key challenges:
  - interpreting evidence
  - bridging dynamics across scales
  - establishing causal mechanics
  - estimating uncertainty



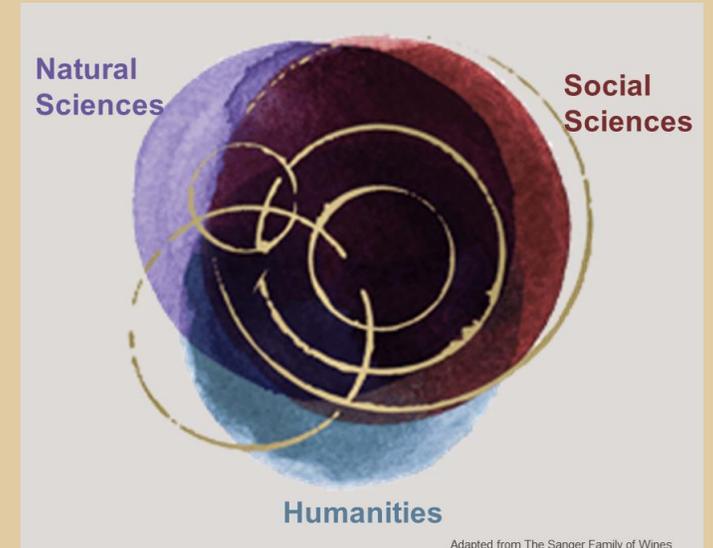
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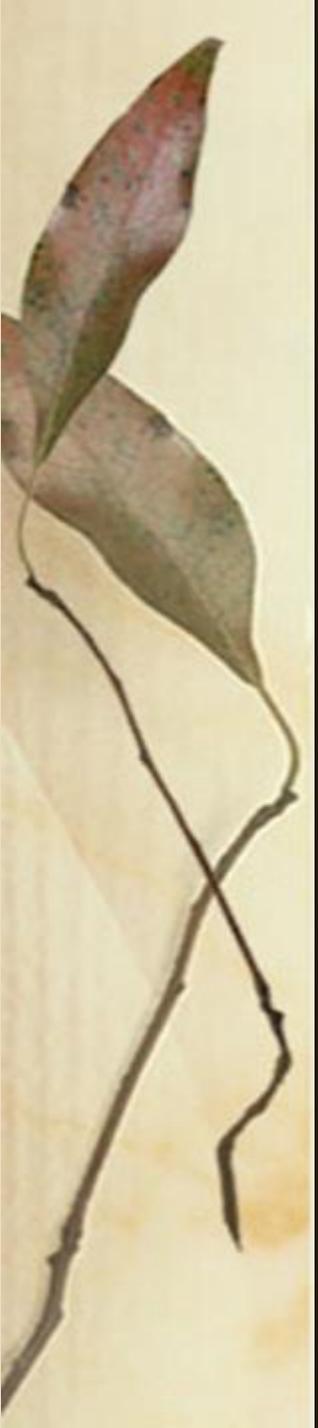
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# A research framework for HCS

- Four key challenges:
  - interpreting evidence
  - bridging dynamics across scales
  - establishing causal mechanics
  - estimating uncertainty
- integrating data and knowledge between mutually unfamiliar academic disciplines
- form 'consilient' teams

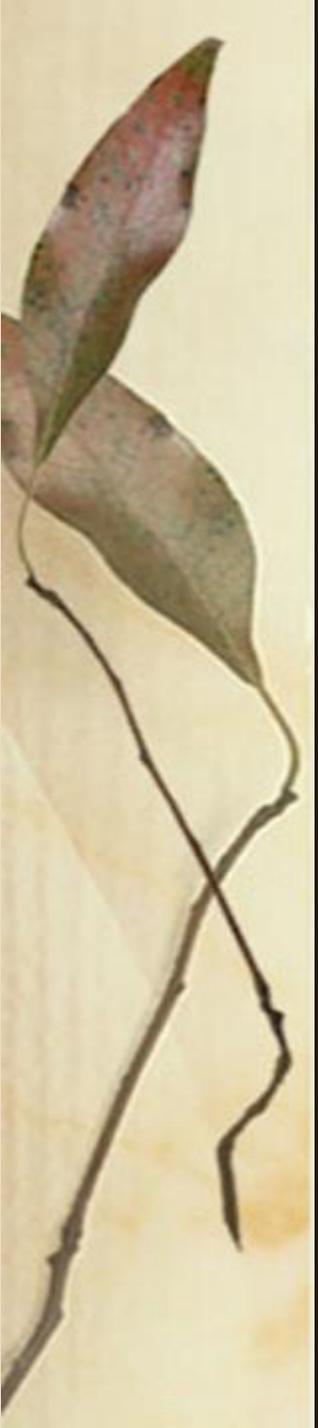




# Resilience & adaptation

‘the capacity of a given system to absorb energy and to redirect or to convert it, without losing the fundamental features and shape of the system as a whole’ &

the ‘process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities’



Case studies

# **THE FIVE PATHWAYS OF RESILIENCE**

# Exploiting new opportunities

Climatic trends helped to make some regional environments easier to exploit for economic or military ends



The success story of  
Roman Eastern  
Mediterranean, LALIA

# Resilient energy systems

Societies could also prosper if they used sources of energy for subsistence or industry that were resilient to climatic variability



Adapting to the new conditions – innovations  
Finland, LIA

# Resources of trade and empire

Gradual integration of regional, and global, grain markets buffered grain prices from climate trends and anomalies



Jan Abrahamszoon Beerstraten, Slag bij Ter Heijde. 1653–1666

Public Domain

Trading acquired grains in diverse ports across the Baltic Sea, Dutch commercial empire, LIA

# Political and institutional adaptations

Trade was only one among many tools that authorities used to avoid or recover from climate-related disasters during the LIA



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Communal grain reserves  
Bologna and Siena LIA

# Migration and transformation

Mobility often fostered resilience to climate change



From Ming to Qing  
Dynasty – the Jurchen  
polity, China, LIA

# Better histories for better futures

