Resourceful communities: Strategies of resource exploitation in the area of Sagalassos

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Human-environment interactions

- Energetic needs to build and sustain societies
- Flows of energy and resources between society and nature
- Human impact on environment


de Molina & Toledo (2014) The Social Metabolism: A Socio-Ecological Theory of Historical Change
Sustainability and resilience

• Sustainable resource exploitation?

• Resources as part of interconnected socio-ecological system

• Different impacts of resource procurement strategies

• Resilience of communities

Ostrom 2009 A General Framework for Analyzing Sustainability of Social-Ecological Systems

Ostrom 2009
Catchment areas

- Carrying capacity of environment
- Resource exploitation and community organization

\[
\frac{dN}{dt} = rN \left(1 - \frac{N}{K}\right)
\]

1. Ranges of population densities supportable by intensifying modes of food provision.

Smil 2008
Resource exploitation in the area of Sagalassos

A diachronic perspective

SuRP+
Sustainability & Resilience in Past and Present Populations
An IdeaLab Network

https://www.arts.kuleuven.be/surplus
Environmental impact

Van Loo et al. (2017) Human induced soil erosion. *Catena*
Iron Age settlements
Iron Age settlements

- Hill-top sites as drivers of environmental changes?
- Beyşehir occupation phase (BOP)
- Primary anthropogenic impact

Van Loo et al. (2017) Human induced soil erosion. *Catena*
Daems et al. (In Press) The social metabolism of past societies. A new approach to environmental changes and societal responses in the territory of Sagalassos
Case study I: Düzen Tepe
Düzen Tepe: Energetic needs

\[ A = \sum_{x=1}^{n} \left( \frac{1}{m_x \cdot E_x \cdot Y_x} \right) \cdot (EN \cdot N) \]

- **A**: Area needed to sustain a population (ha)
- **m_x**: The relative mass of a specific food
- **E_x**: The caloric value of a specific food (kCal/kg)
- **Y_x**: Yield of a specific food (kg/ha)
- **n**: Number of food products
- **EN**: Energy need of a single person per year (kCal/person)
- **N**: The number of people residing in the study area (person)
Düzen Tepe: Catchment area

• Population: c. 454-1461 people
• 4 scenario’s for area needed to sustain population
  • High/low share of animal products
  • High/low yields
  • Scenario 1 most realistic: 523± 279 ha
• Mainly endosomatic energy needs!
  • Exosomatic needs to be included!
Düzen Tepe: Pottery production

• Geochemical & petrographic analysis of Iron Age to Hellenistic pottery
• Eleven sites spanning several geographical regions and sites:
  (1) Ağlasun valley: Düzen Tepe and Sagalassos
  (2) Çeltikçi and Kuzköy valleys: Belören, Kepez Kalesi, Aykırıkça, Hisar and Seydiköy
  (3) Bereket valley: Bereket and Kökez
  (4) Burdur plain: Düver Ada and Kozluca.

Düzen Tepe: Pottery production

Düzen Tepe: Pottery production

Locally oriented productive landscape

- ‘Least effort’ raw material economy
- Limited production infrastructure
- Basic functional assemblage
- Limited import
- Limited distribution
- Subsistence production

Environmental impact

Van Loo et al. (2017) Human induced soil erosion. *Catena*
Iron Age and Hellenistic settlement patterns
Case study II: Sagalassos

- Village community emerged in late 5th c. BCE
- Urbanization phase late 3rd/early 2nd c. BCE
- Primary centre on local and regional scale in Hellenistic and Roman times
Sagalassos: Pottery production

Regionally-oriented productive landscape

- Developed raw material economy
- Specialized production
- Spatial specialization
- Higher production output
- Extended distribution
- Extended import
Sagalassos: Pottery production

Regionally-oriented productive landscape

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Sagalassos: Human impact

![Population estimate chart showing the human population impact at different periods in Sagalassos. The chart includes data points and error bars for Düzen Tepe (5th-3rd c. BC), Late Hellenistic Sagalassos (2nd-1st c. BC), Roman imperial to late Roman Sagalassos (1st-4th c. AD), Early Byzantine Sagalassos (5th-7th c. AD), and Middle Byzantine Sagalassos (11th-13th c. AD).]
Future work: Agent-based modelling

• Small-scale agricultural communities
• Strategies of resource exploitation
  • Subsistence
  • Production
    • Fuel
    • Clay
• Resource properties (Arnold 1985):
  • Quality
  • Distance to settlement
• (Semi-)realistic GIS environment
  • Yields
  • Fertility
  • Altitude

Future work: Agent-based modelling

• Goals
  • Explore strategies of resource exploitation
  • Assess human impact through time
  • Link between resource exploitation and community organization

Thank you for your attention!

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