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

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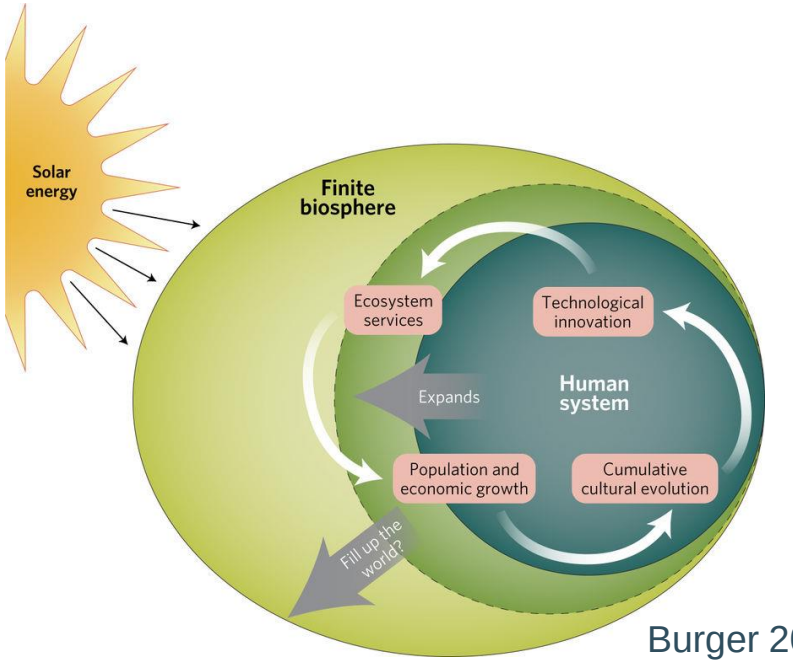
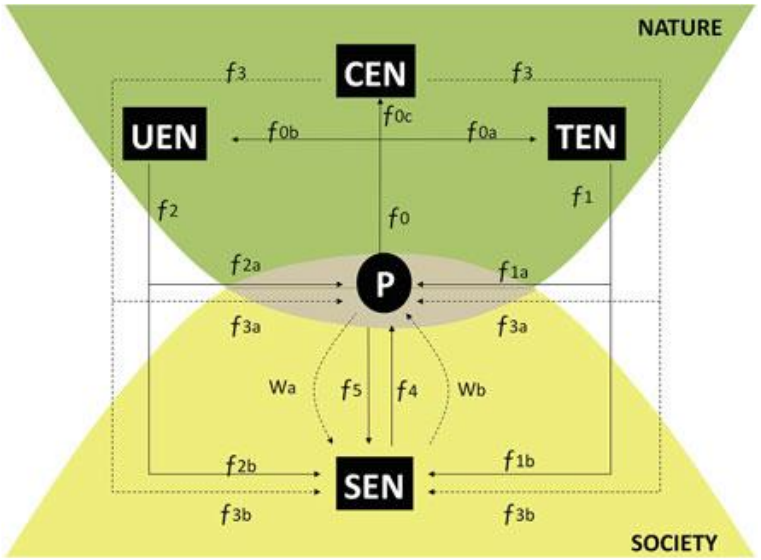
Human-environment interactions

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



Burger 2018

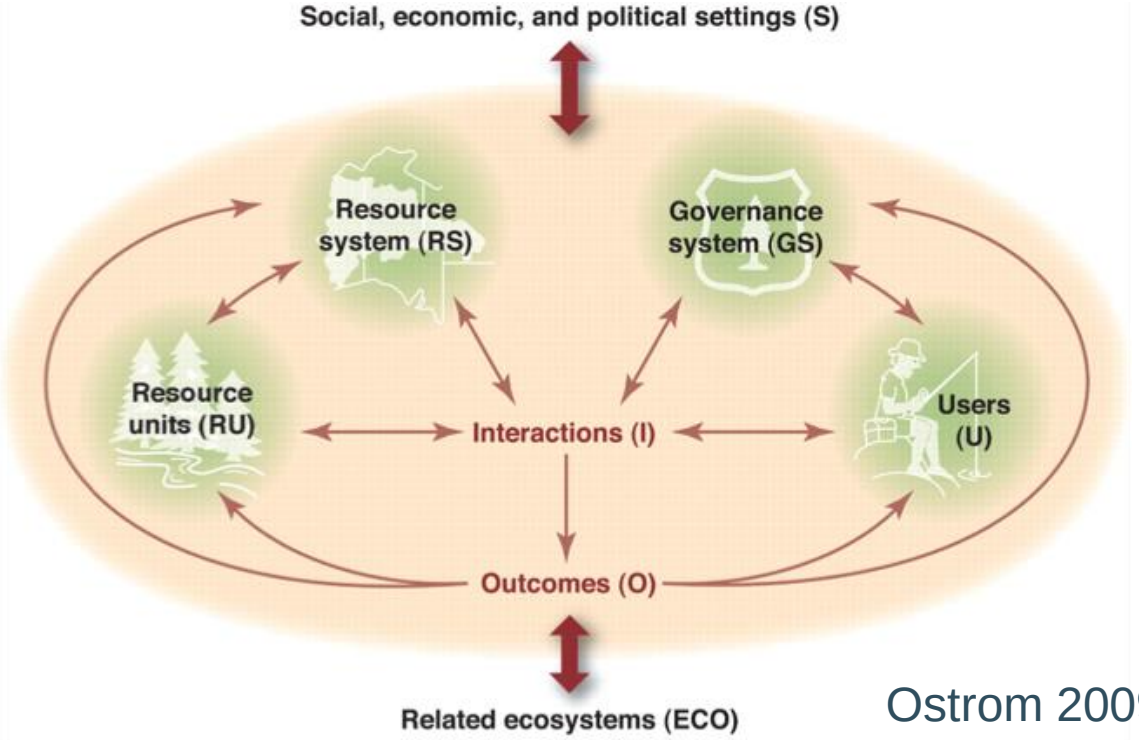


De Molina & Toledo 2014

Burger (2018) Modelling humanity's predicament. *Nature Sustainability.*
de Molina & Toledo (2014) The Social Metabolism: A Socio-Ecological Theory of Historical Change

Sustainability and resilience

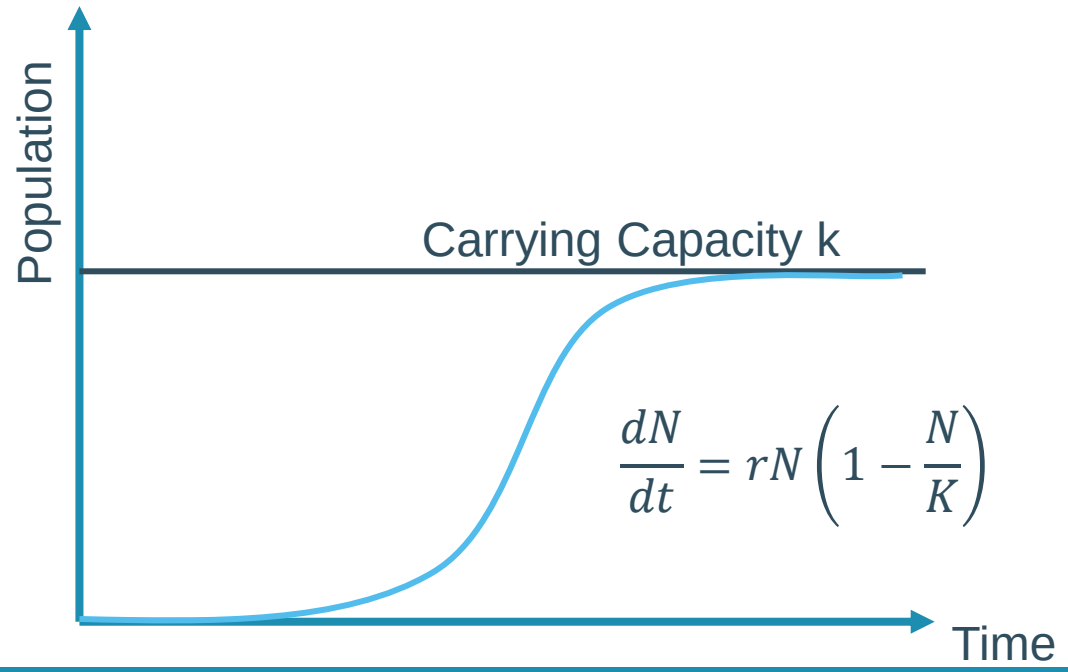
- Sustainable resource exploitation?
- Resources as part of interconnected socio-ecological system
- Different impacts of resource procurement strategies
- Resilience of communities

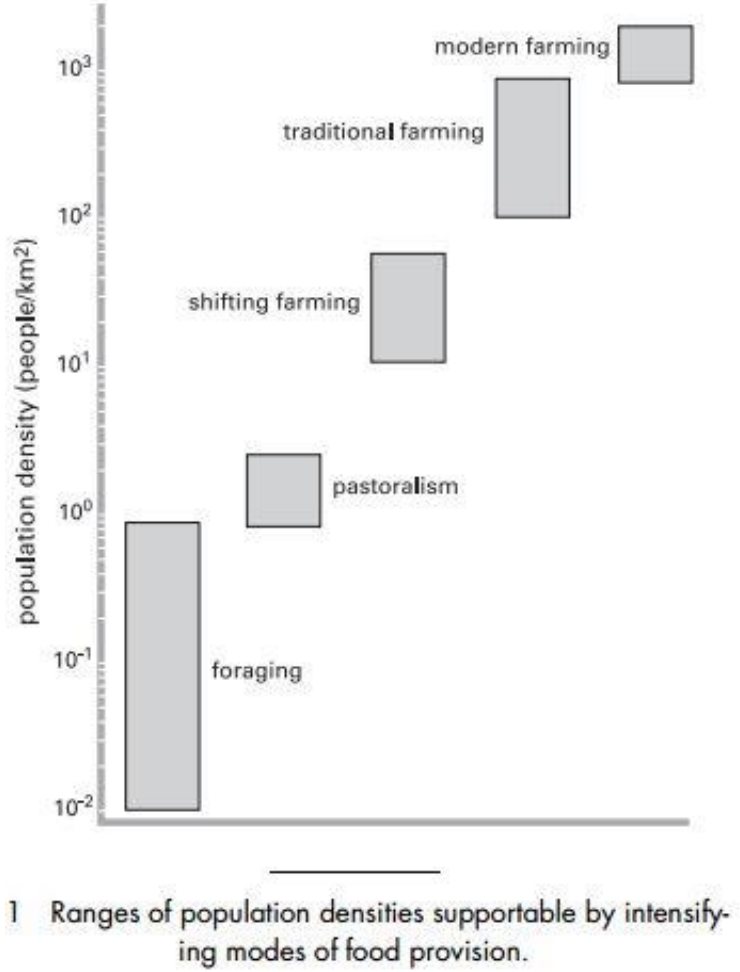


Ostrom 2009

Catchment areas

- Carrying capacity of environment
- Resource exploitation and community organization





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

Smil 2008

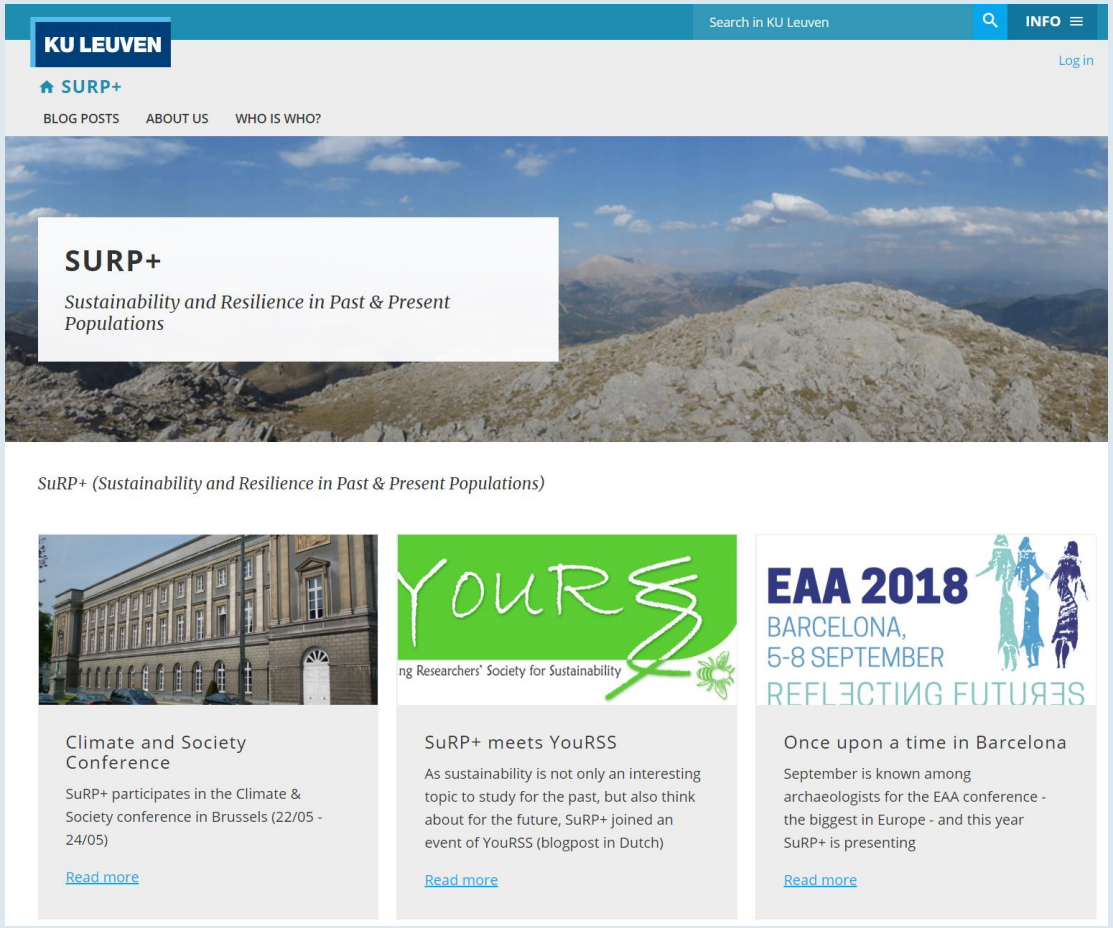
Resource exploitation in the area of Sagalassos

A diachronic perspective

SuRP+

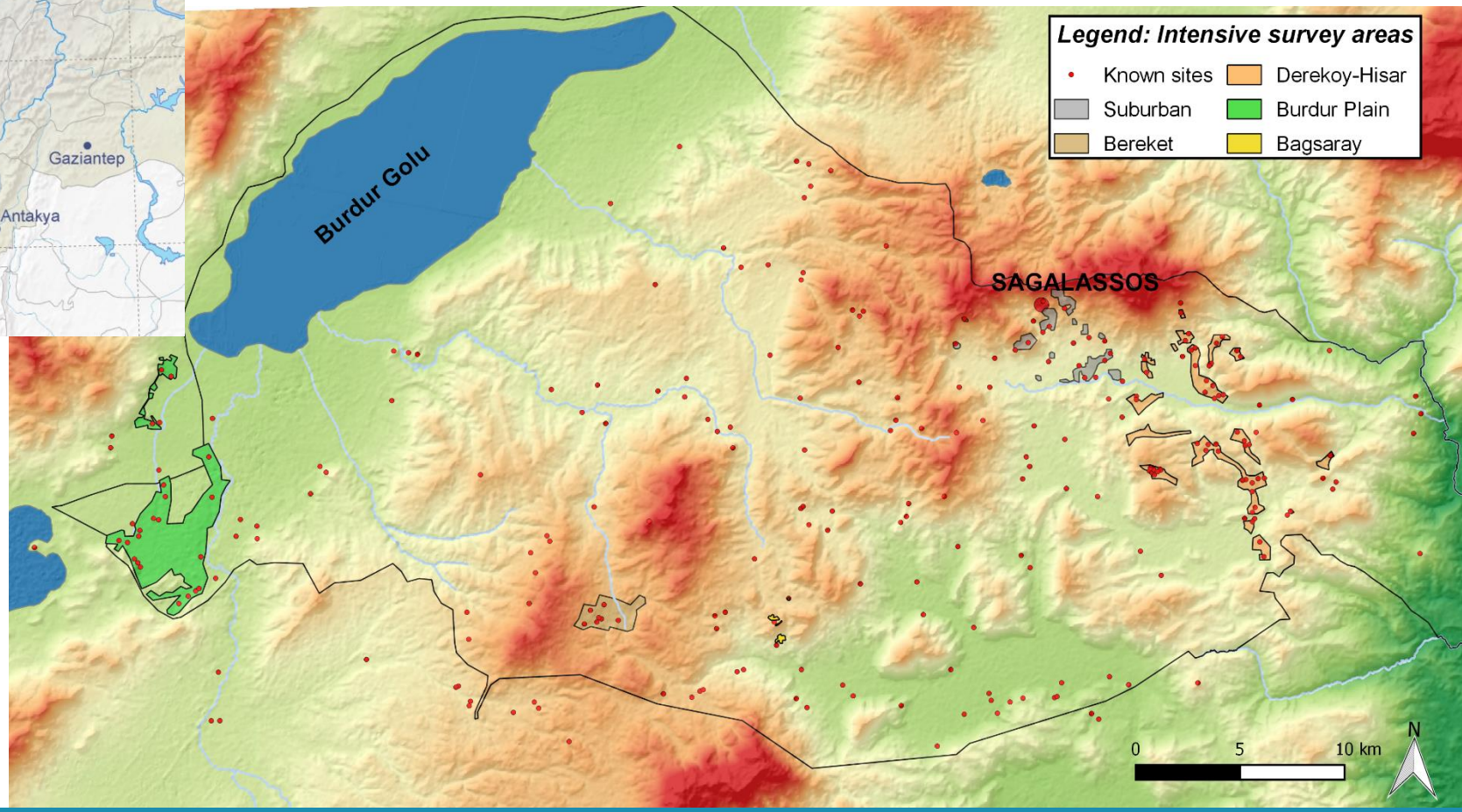
Sustainability & Resilience in Past and Present Populations

An IdeaLab Network

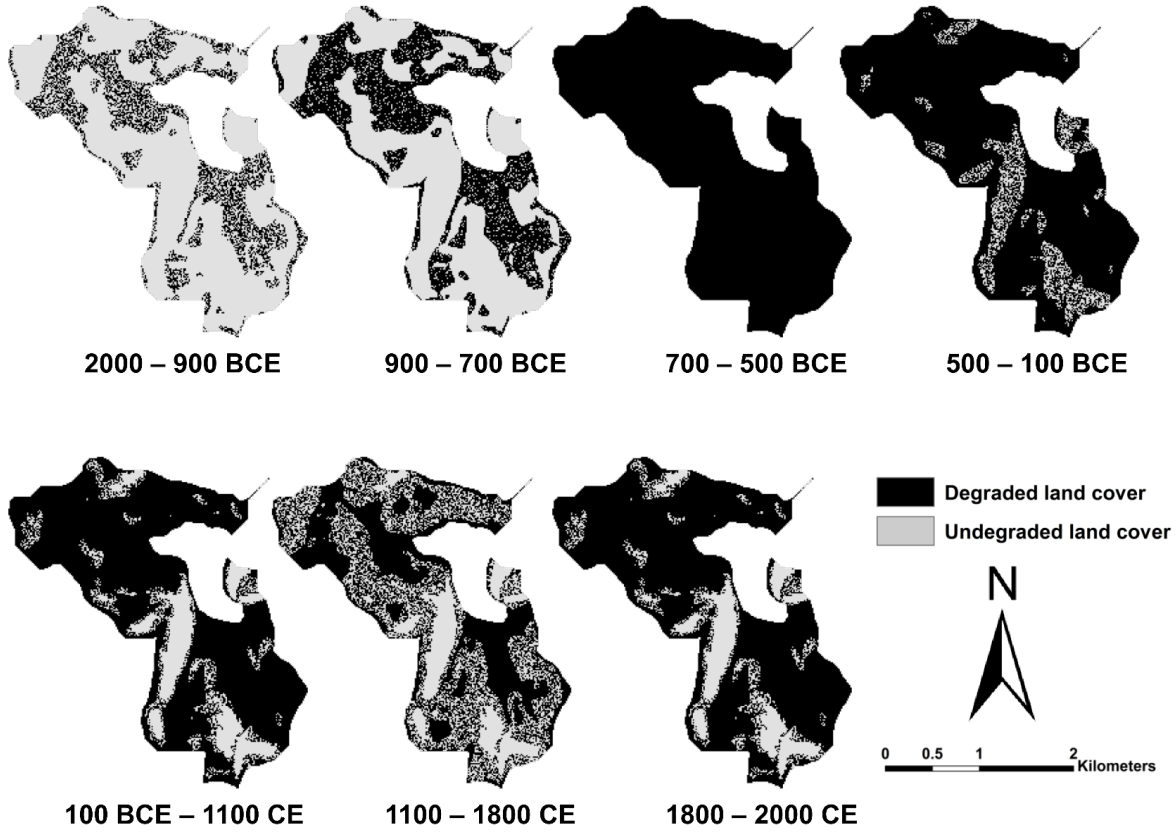


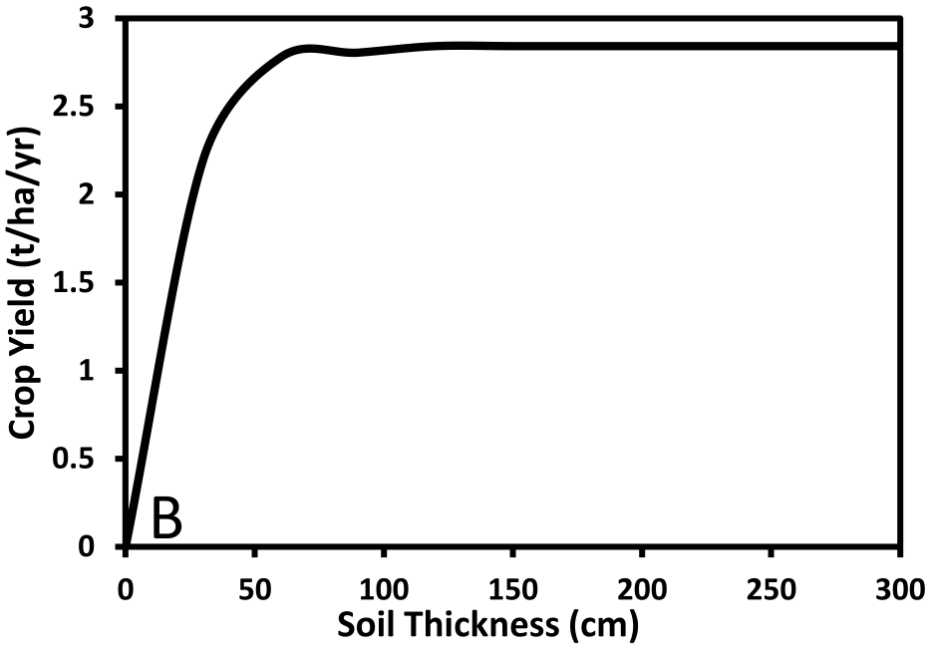
https://www.arts.kuleuven.be/surplus


Black Sea
Istanbul
Samsun
Adapazarı
Troy
Bursa
Eskişehir
Ankara
Gordion
Turkey
Pergamon
Dokimeion
Kayseri
Izmir
Sardes
Yalvaç
Ephesus
Aphrodisias
Konya
Sagalassos
Miletus
Kremna
Selge
Termessos
Perge
Adana
Gaziantep
Antalya
Side
Antakya
Mediterranean Sea
0
100
200
400 Kilometers


Legend: Intensive survey areas
Known sites
Derekoy-Hisar
Suburban
Burdur Plain
Bereket
Bagsaray
Burdur Golu
SAGALASSOS
0
5
10 km
N

Environmental impact





Van Loo et al. 2016

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

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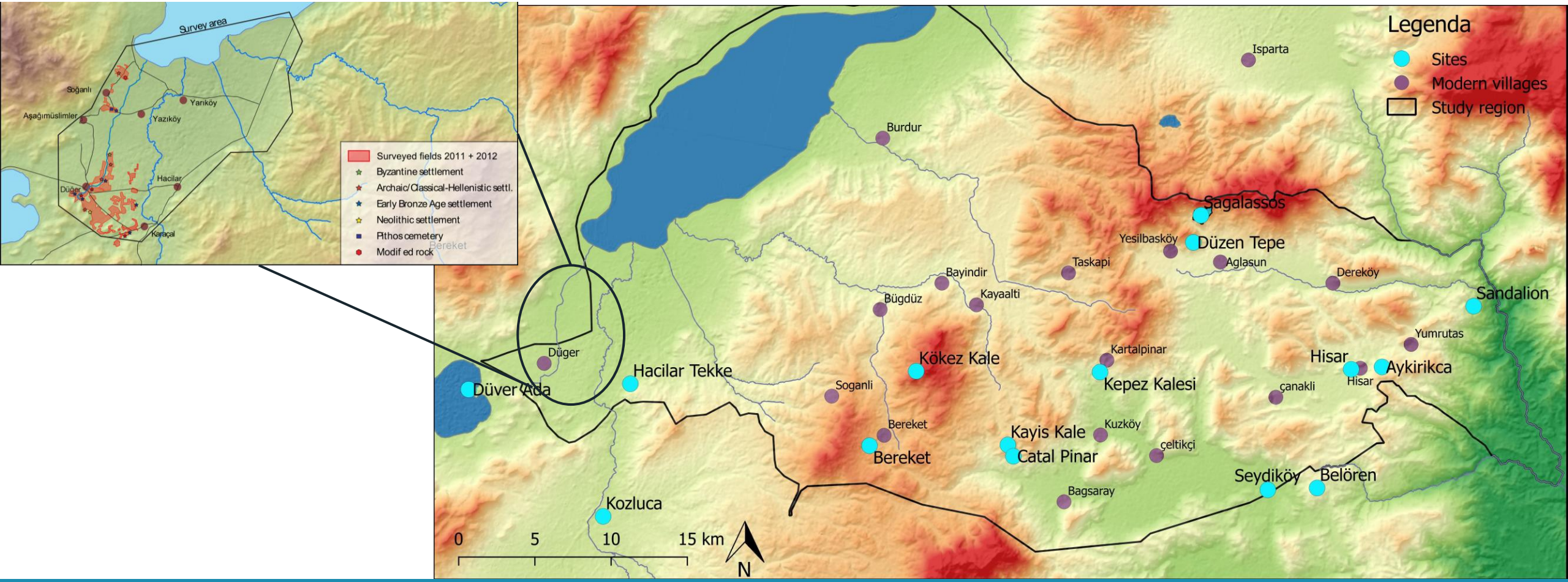
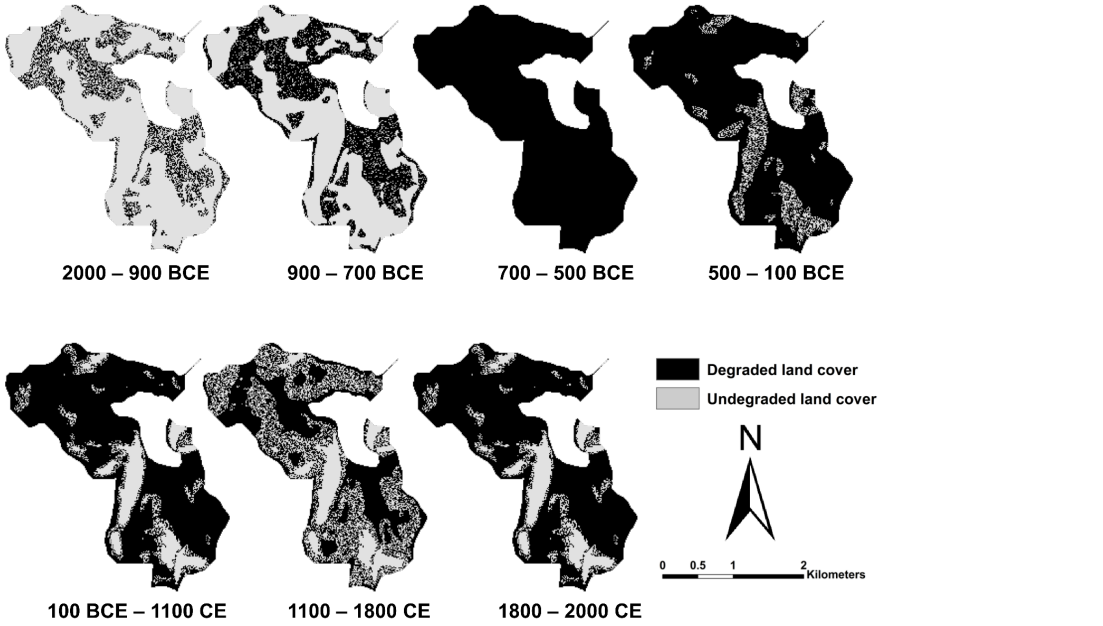
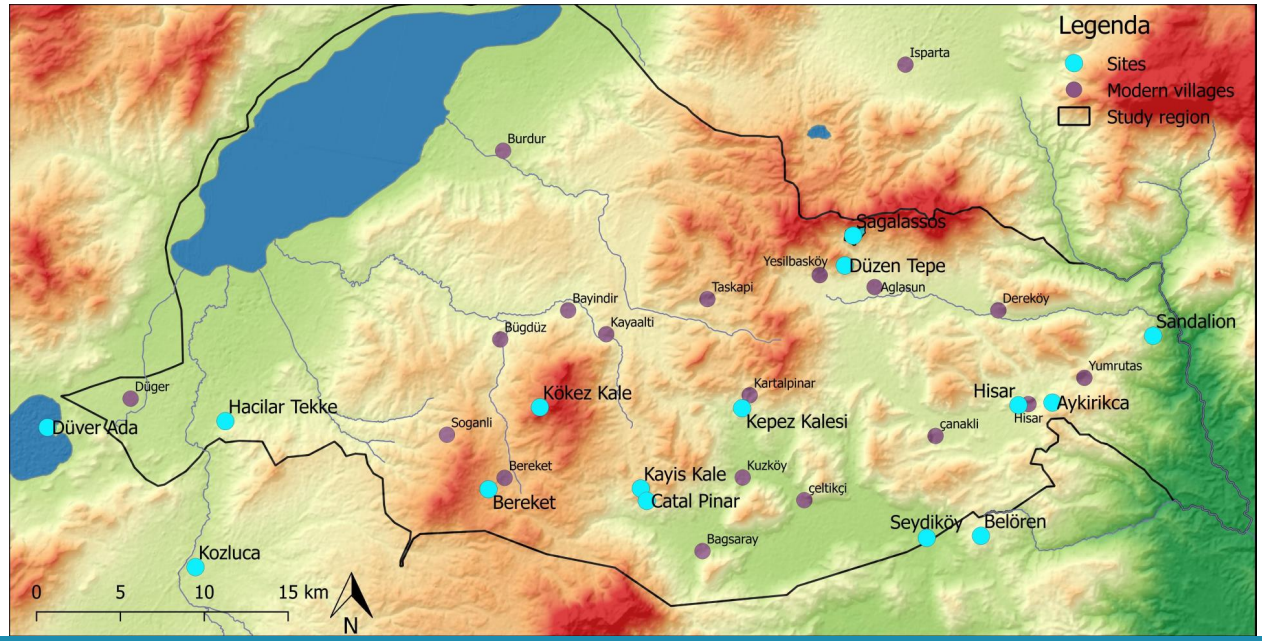
Iron Age settlements



Iron Age settlements

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

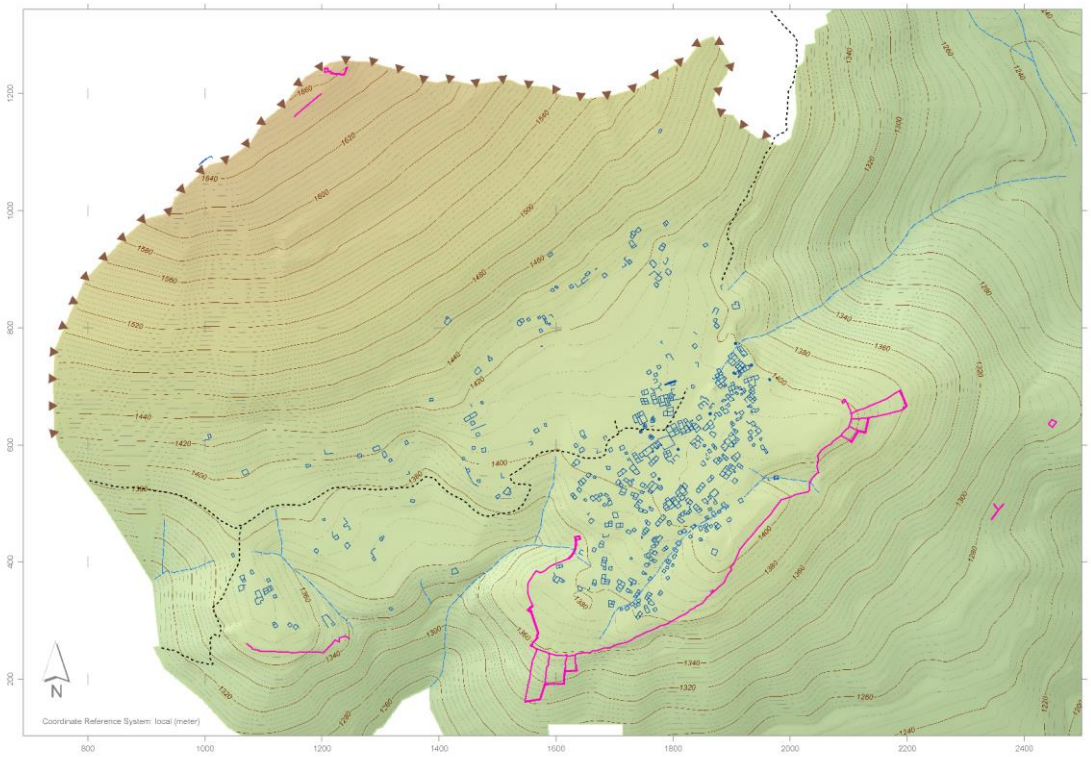




Van Loo et al. (2017) Human induced soil erosion. *Catena*

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

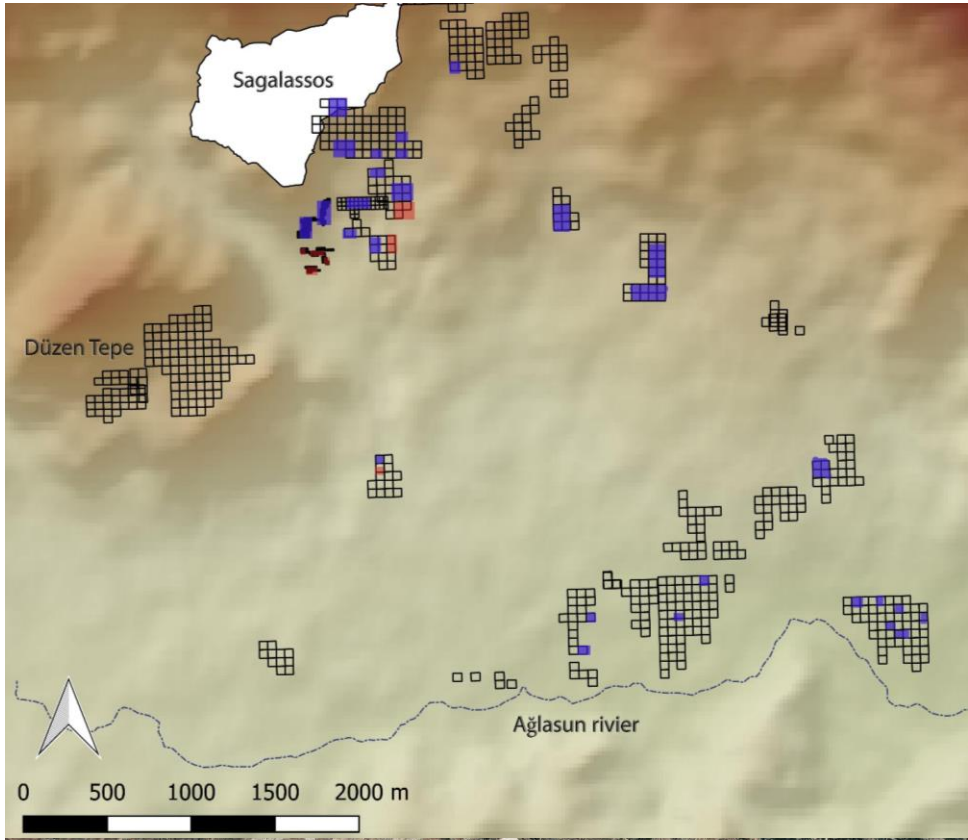
Case study I: Düzen Tepe

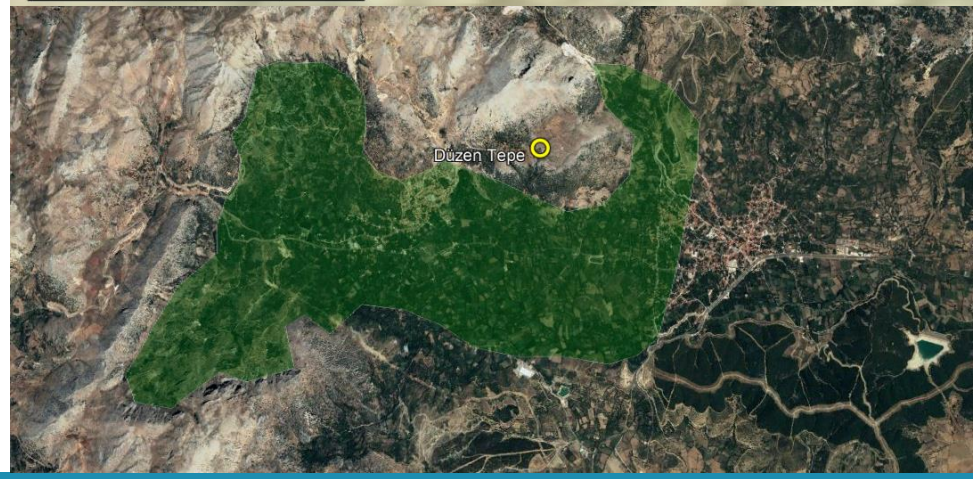


Düzen Tepe: Energetic needs

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

- 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)





Cleymans, Daems and Broothaerts (In prep) Reassessing carrying capacity through the socio-ecological metabolism of Düzen Tepe

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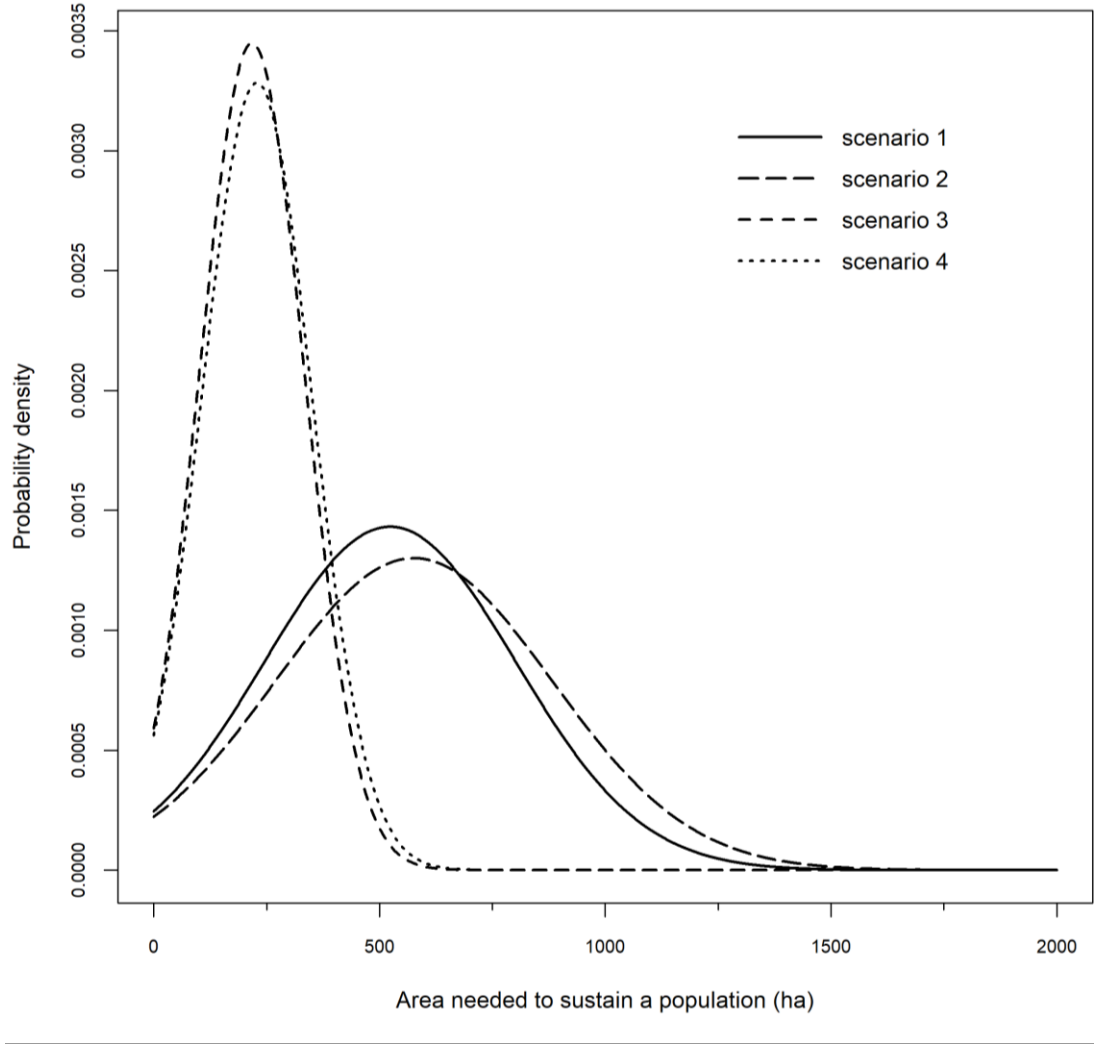
Düzen Tepe: Catchment area

- 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!



Cleymans, Daems and Broothaerts (In prep) Reassessing carrying capacity through the socio-ecological metabolism of Düzen Tepe

Düzen Tepe: Pottery production

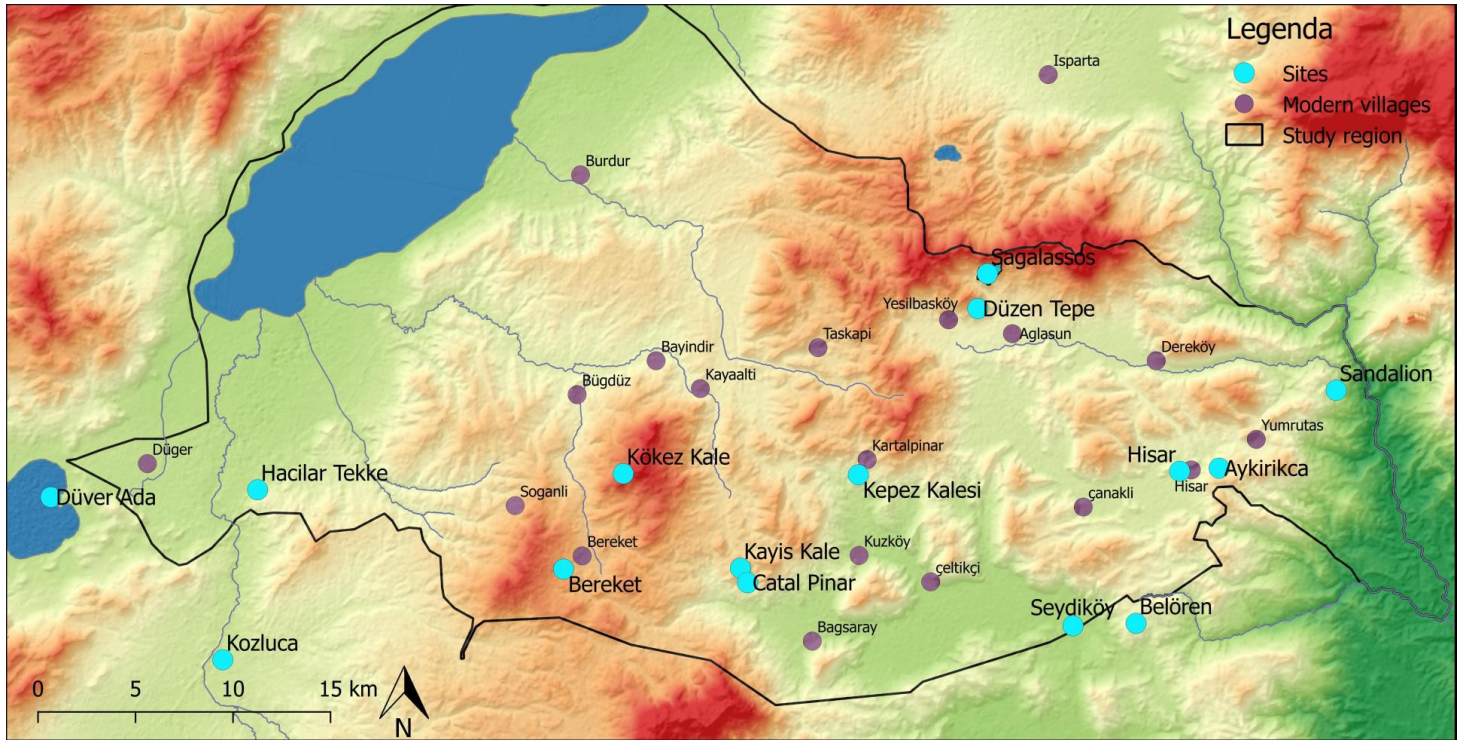
- Geochemical & petrographic analysis of Iron Age to Hellenistic pottery
- Eleven sites spanning several geographical regions and sites:

(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.



Braekmans et al. (2017) Reconstructing Regional Trajectories: The Provenance and Distribution of Archaic to Hellenistic Ceramics in Central Pisidia. *Archaeometry*.

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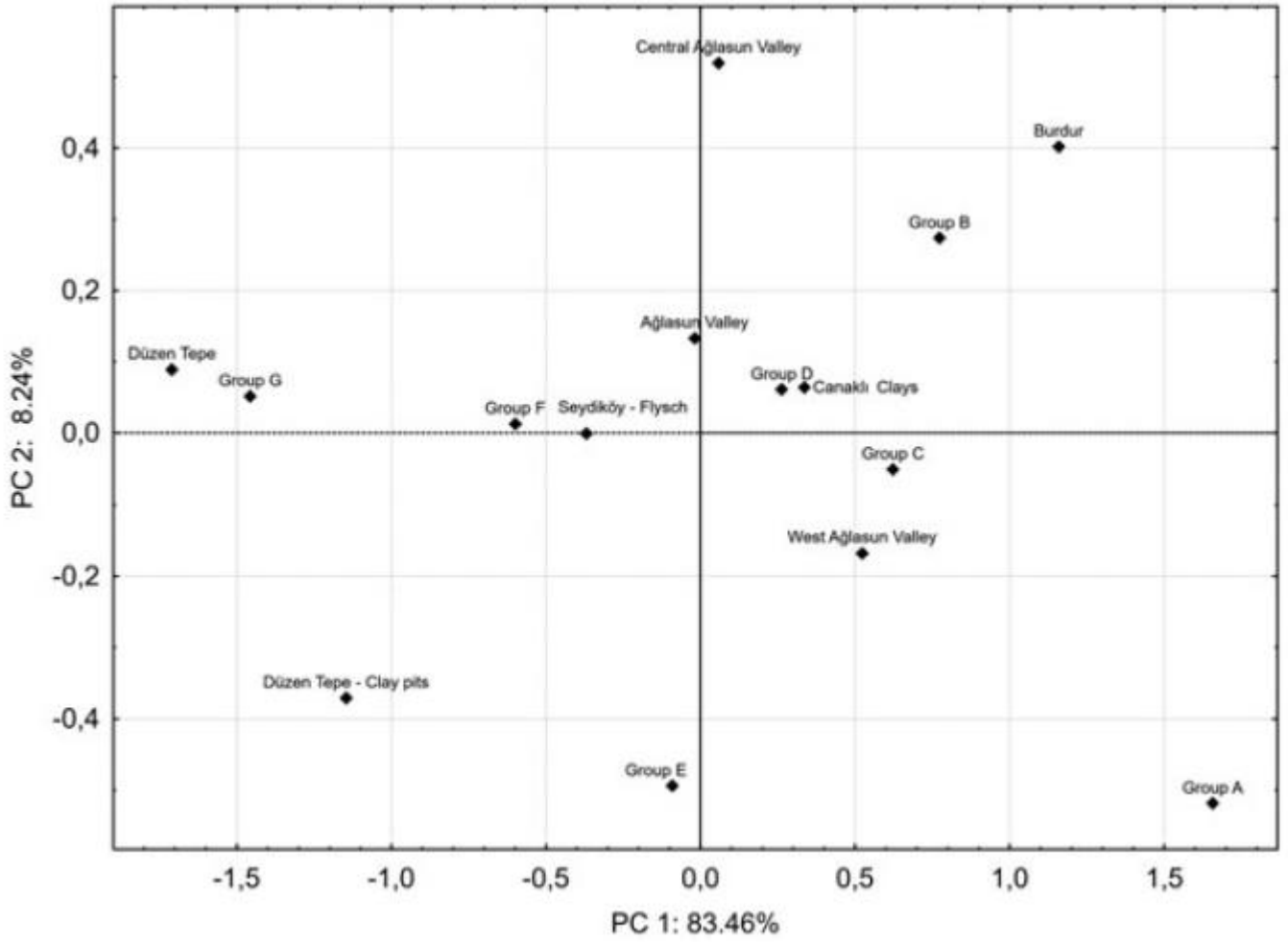
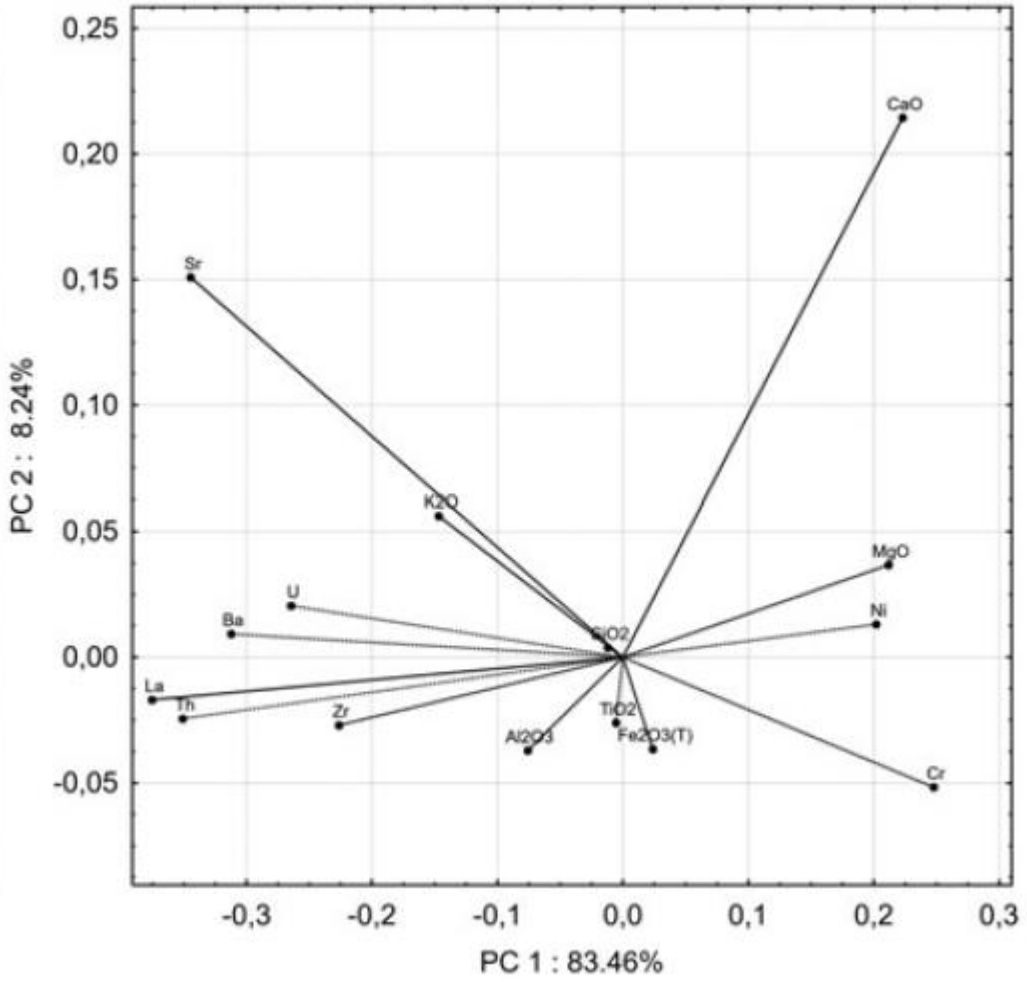
Düzen Tepe: Pottery production





Braekmans et al. (2017) Reconstructing Regional Trajectories: The Provenance and Distribution of Archaic to Hellenistic Ceramics in Central Pisidia. *Archaeometry*.

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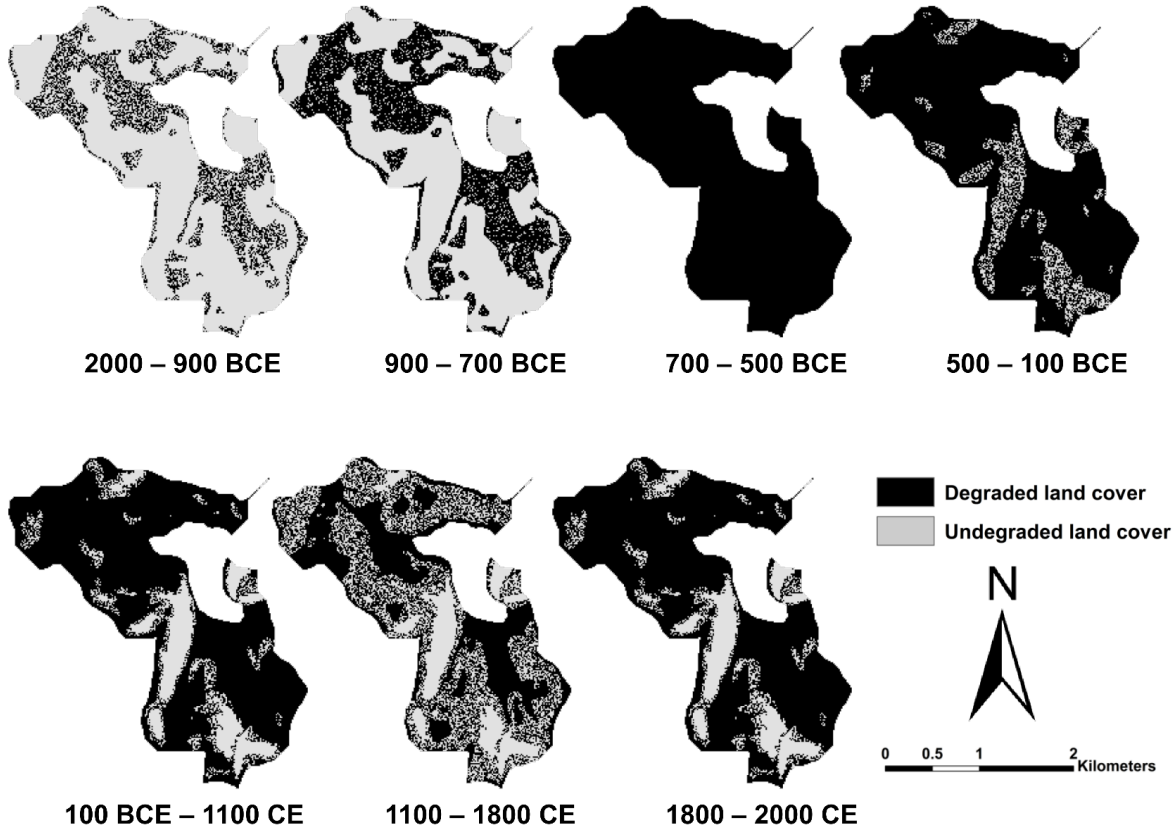
Düzen Tepe: Pottery production

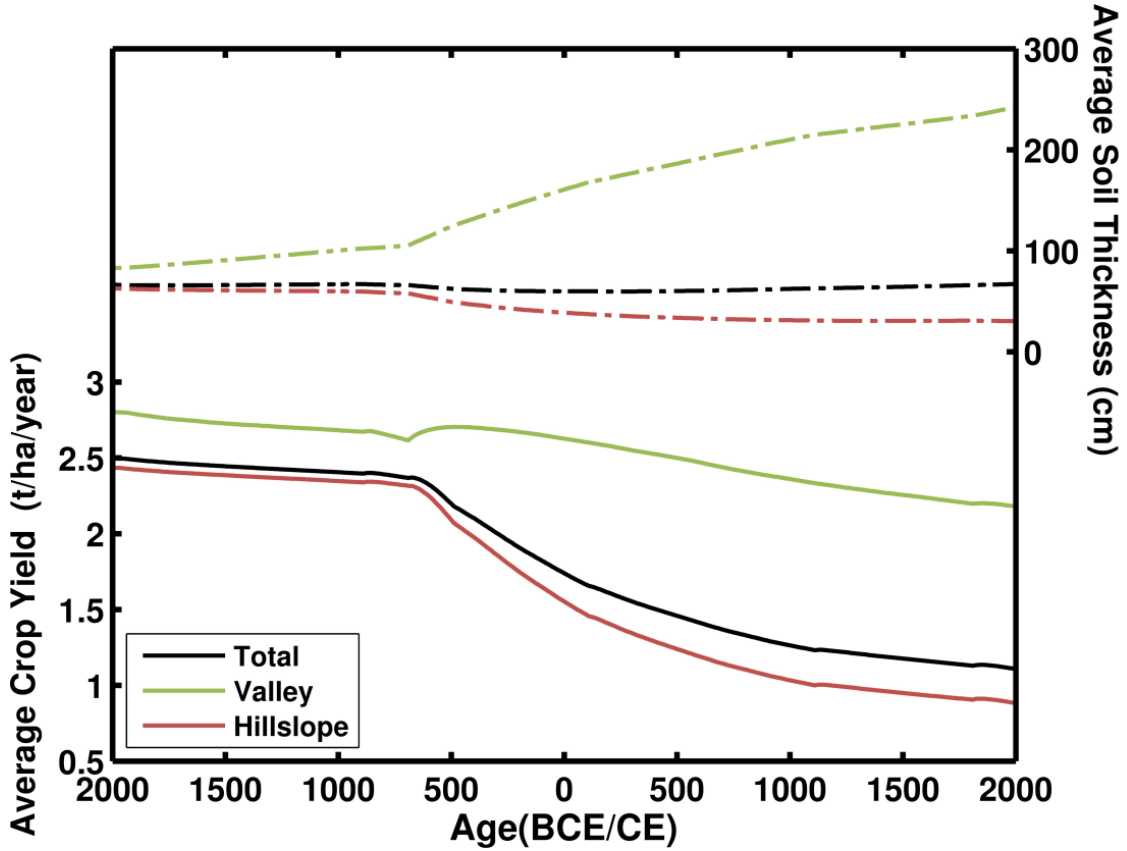
Locally oriented productive landscape

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

Daems et al. (2017) Late Achaemenid and Early Hellenistic Material Culture from Düzen Tepe. *Herom.*
Daems and Poblome (2016) Adaptive Cycles in Communities and Landscapes: The Case of Sagalassos and Düzen Tepe During the Classical/Hellenistic Period.

Environmental impact





Van Loo et al. 2016

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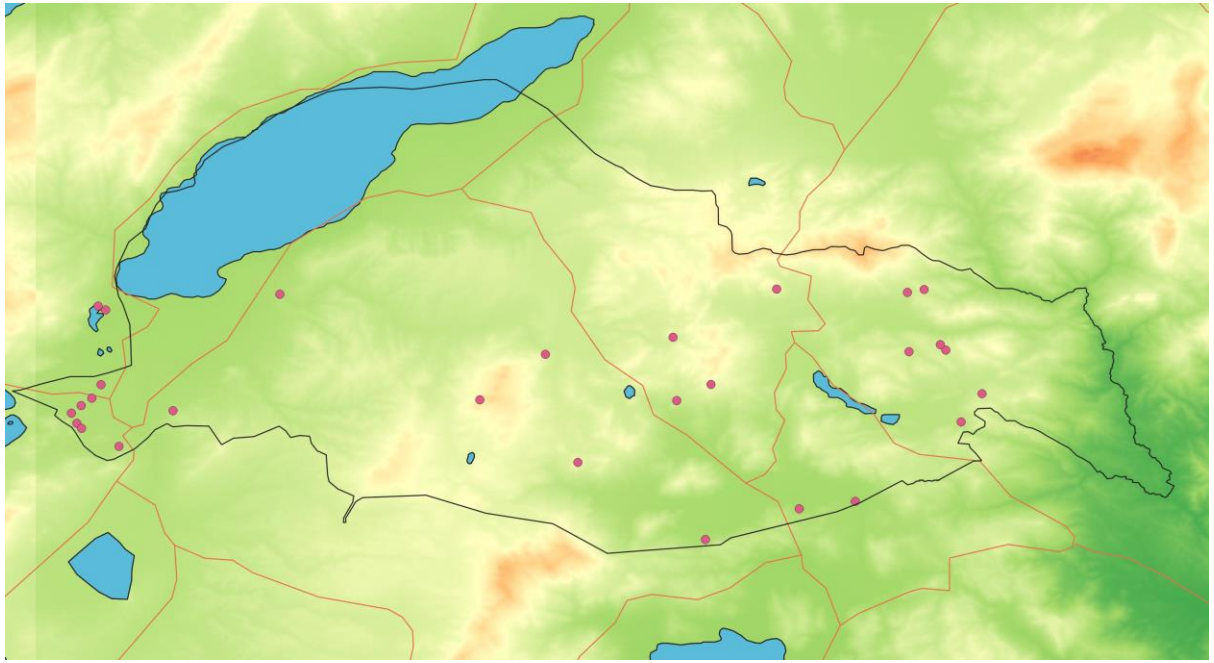
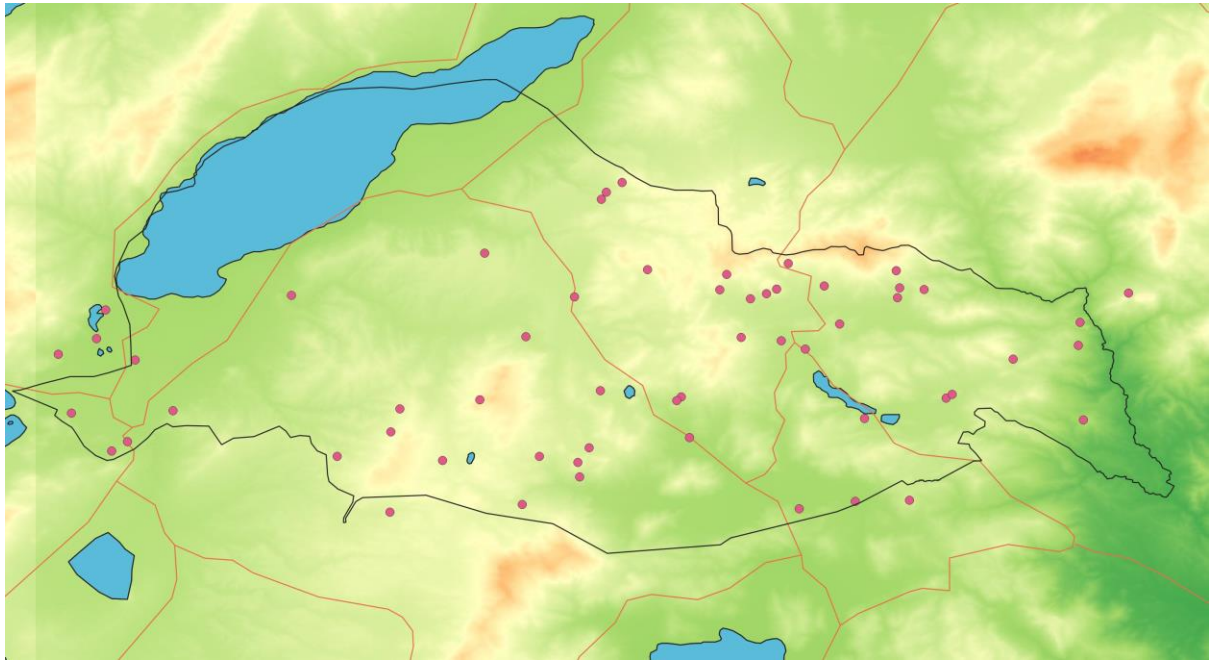
Iron Age and Hellenistic settlement patterns



Iron Age sites

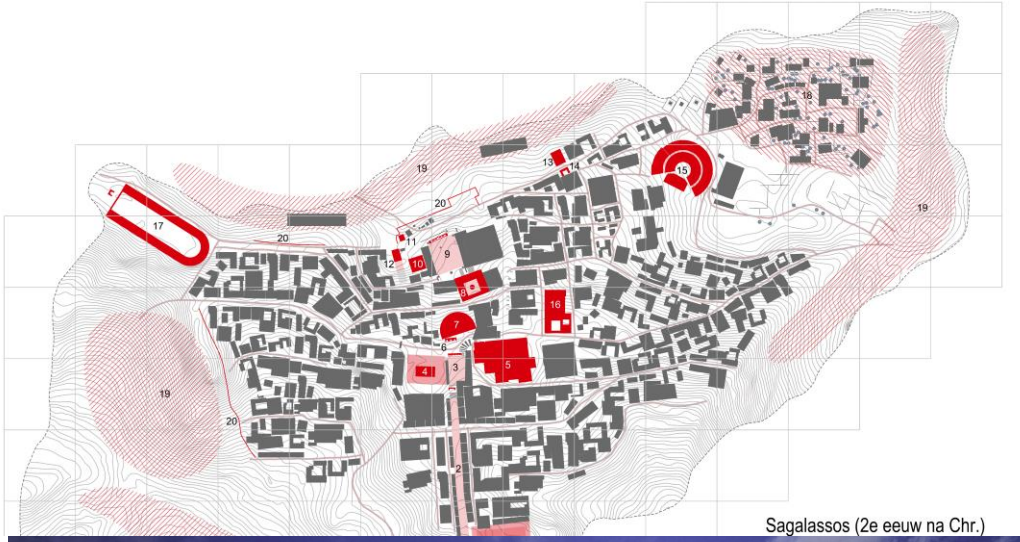


Hellenistic sites

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 II: Sagalassos

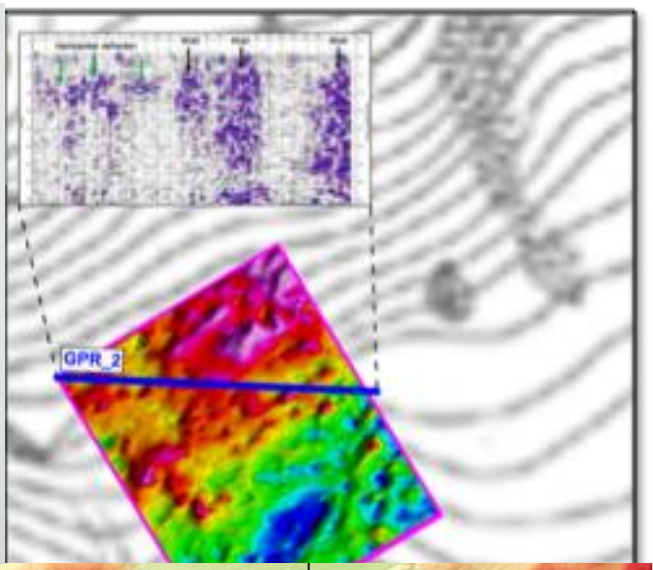
- Village community emerged in late 5th c. BCE
- Urbanization phase late 3rd/early 2nd c. BCE
- Primary centre on local and regional scale in Hellenistic and Roman times

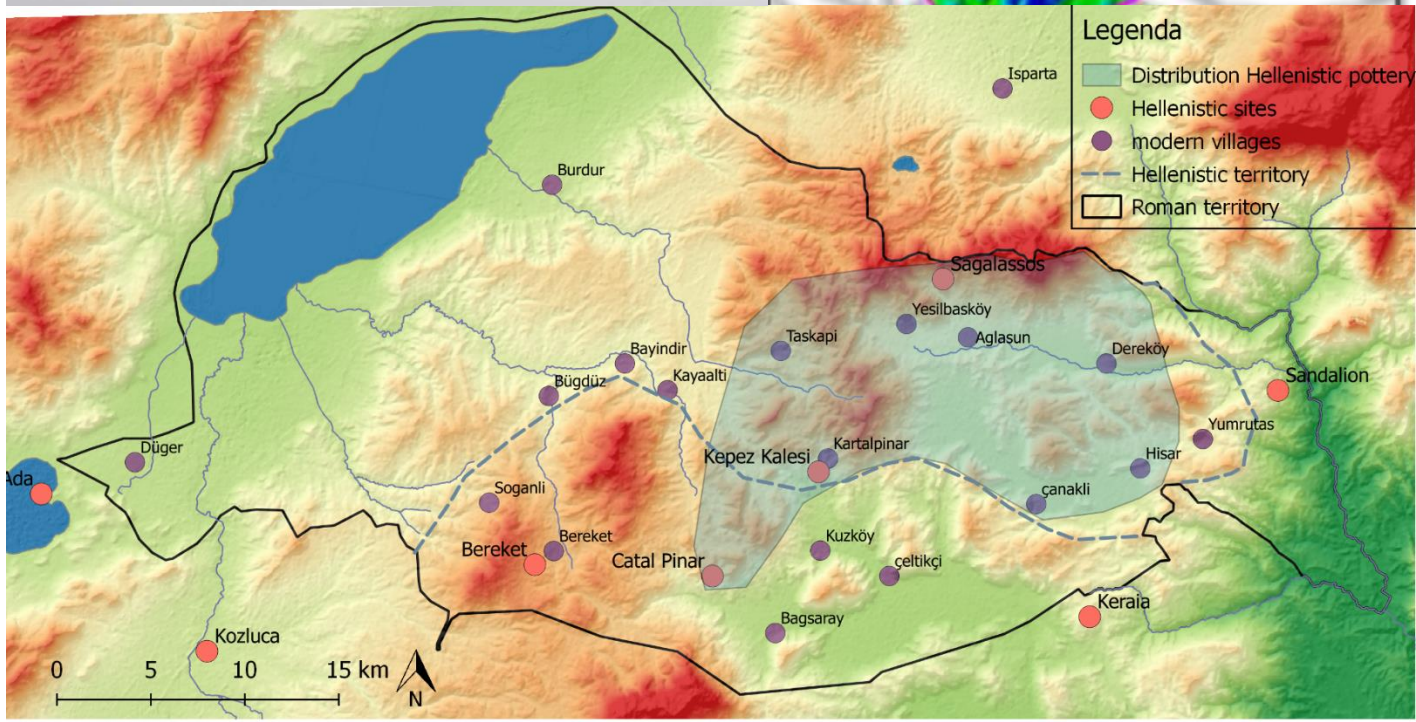


Sagalassos: Pottery production

Regionally-oriented productive landscape

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



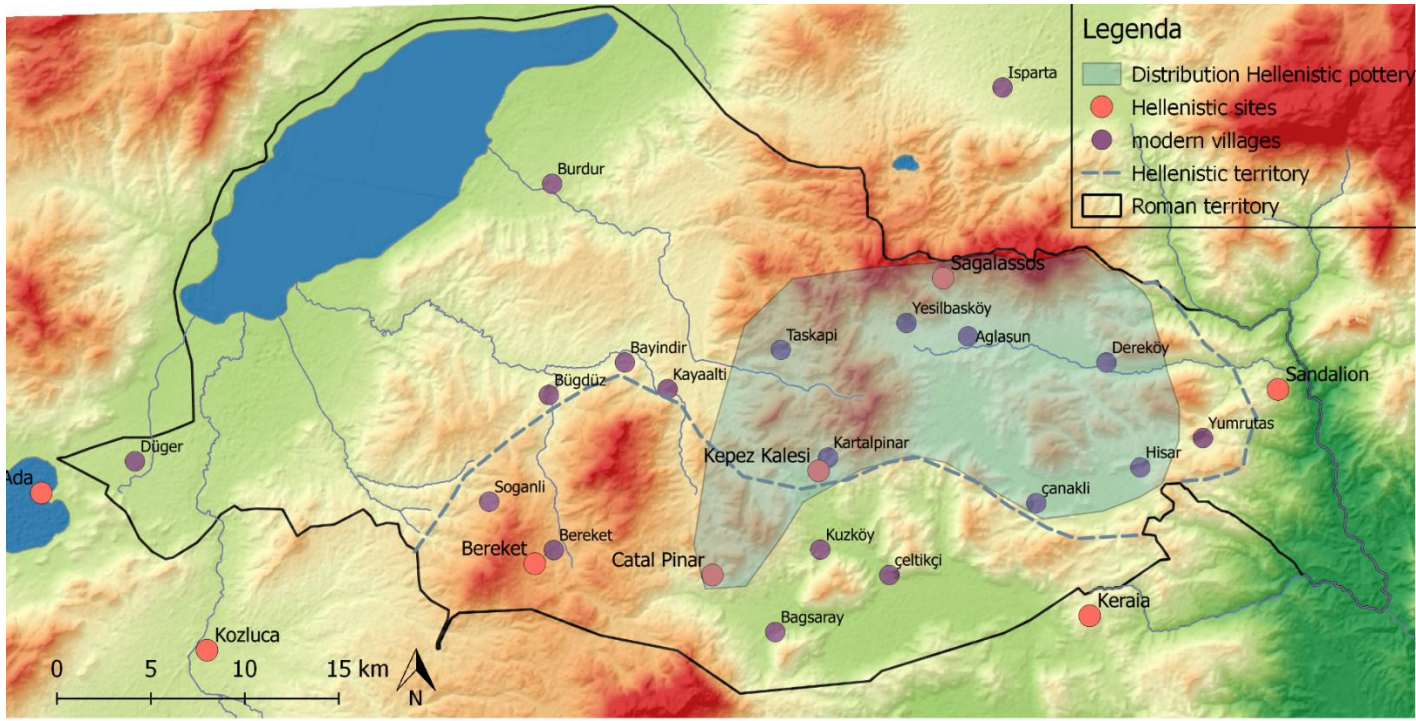


Sagalassos: Pottery production

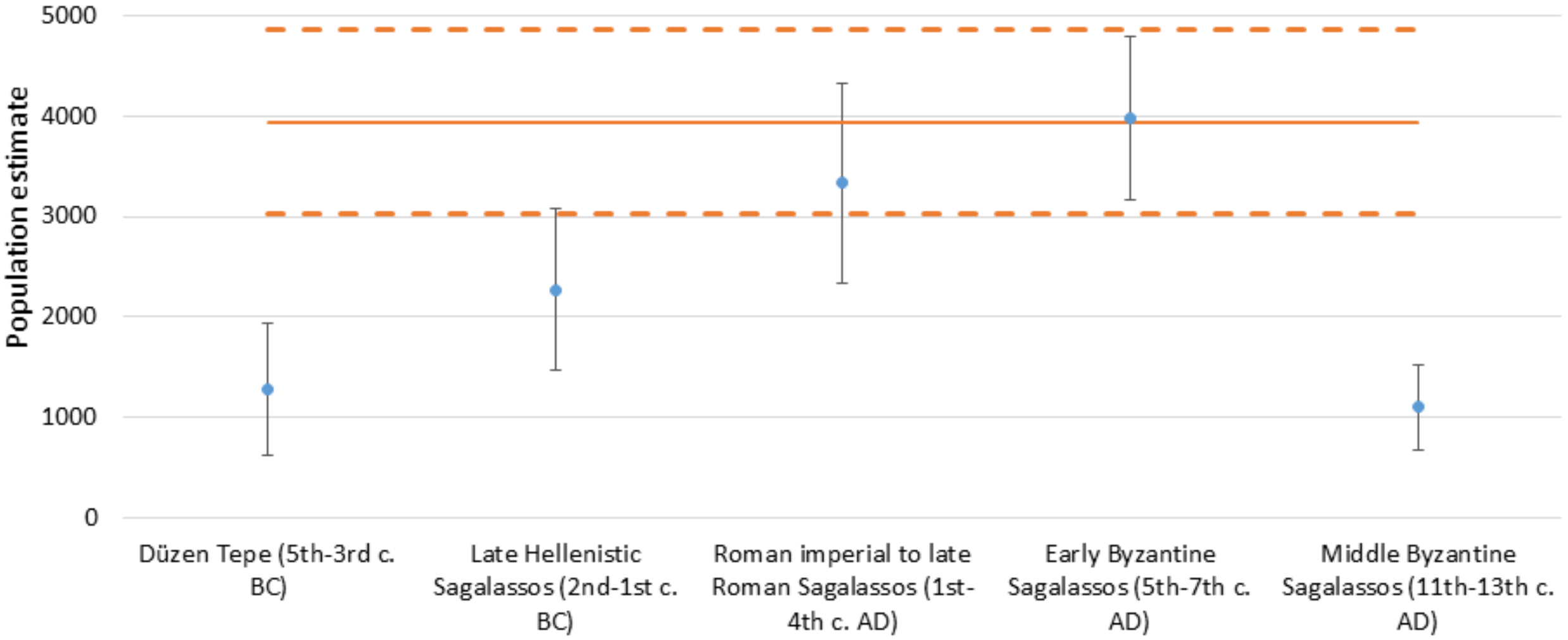
Regionally-oriented productive landscape

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

Traits	*Household production*	*Household industry*	*Individual workshops*	*Nucleated workshops*
Raw material procurement	Immediate availability	Immediate availability	Targeted selection	Targeted and specialized
Labour investment	Occasional	Occasional	Seasonal	Seasonal or continuous
Capital investment	Low	Low	High	High
Scale of production	Self-sufficiency	Subsistence production	Limited market exchange	Full market exchange
Degree of specialization	Low	Low	Medium	High
Degree of standardization	Low	Low	Medium	High

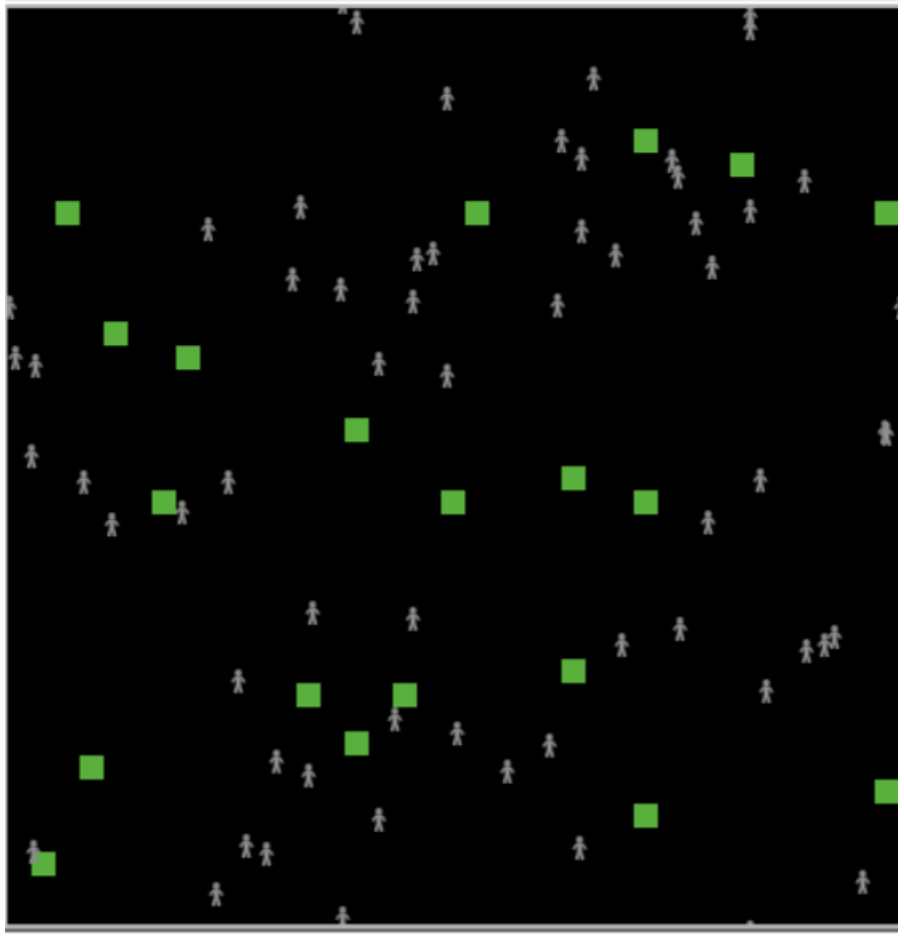


Sagalassos: Human impact



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

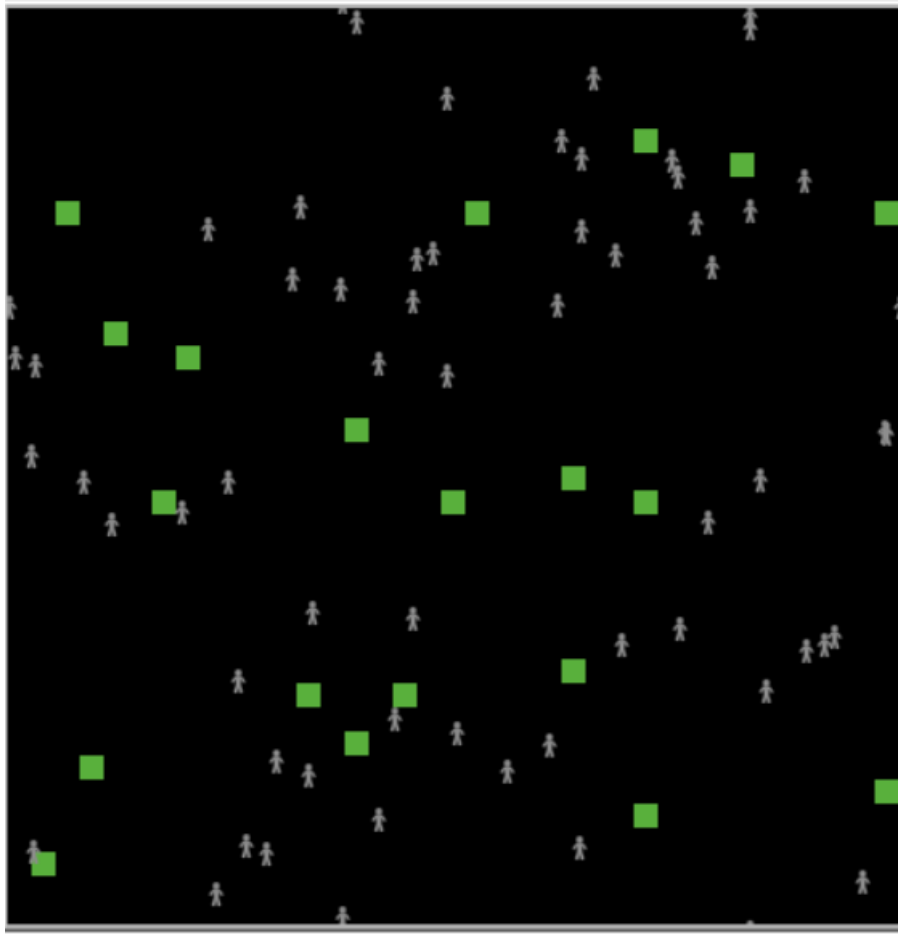


Felsen and Wilensky 2007

Arnold (1985) Ceramic Theory and Cultural Process.
Felsen and Wilensky (2007) NetLogo Urban Suite - Awareness model.

Future work: Agent-based modelling

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



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Thank you for your attention!

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