1. Project information

Title:
The sea and land routes of southern Euboia, ca. 4000–1 BC. A case study in Mediterranean interconnectivity.

Summary:
Over the last decade, Mediterranean archaeologists and historians have shifted from models emphasizing small, static units and rigid structures towards a new paradigm emphasizing fluidity and Mediterranean connectedness – almost to the point that mobility and ever-expanding networks are taken as gospel truth. This research project deliberately takes a step back: its aim is to give a firmer empirical basis to the Mediterranean interconnectivity model but also to critically examine some of its basic tenets by refocusing the attention on local and regional systems of communication (in addition to supra-regional networks) and on land-based interconnections (in addition to maritime communications).

The southern part of the island of Euboia (Greece) builds an ideal case to conduct this type of research. A detailed analysis will be made of its connections and connectedness at various scales and over a long period of time (ca. 4000–1 BC). A novel approach is adopted by analyzing both the terrestrial and maritime environment. Cutting-edge research is performed by combining remote-sensing techniques to detect ancient structures and land-route systems, and model visibility at sea and maritime routes using sensor performance models developed for the Dutch navy. In the final synthesis the research results are related to wider, Mediterranean developments and to the Mediterranean interconnectivity paradigm.

Another aim of the project is to contribute to the preservation and protection of the archaeological sites in the study area. Knowledge utilization will be accomplished by redesigning the project's Spatial Data Infrastructure into a tool for heritage management.

2. Principal applicant:
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3. Other applicants:
None

4a. Discipline code Humanities:
26.10.00 prehistory, 26.20.00 antiquity and late antiquity

4b. Infrastructural component: No

4c. Previous and future submissions: No

5. Institutional setting
VU University Amsterdam: Department of Archaeology, Classics and Near Eastern Studies / CLUE – Research Institute for the Heritage and History of the Cultural Landscape and Urban Environment

6. Period of funding: 5 years
Start date: 1 September 2014
End date: 31 August 2019

7. Composition of the research group

Applicant:
Dr J.P. Crielaard, associate professor of Mediterranean Archaeology, Department of Archaeology, Classics and Near Eastern Studies, VU University Amsterdam

Advisers:
Prof. Gert-Jan Burgers, Professor of Mediterranean Archaeology, Department of Archaeology, Classics and Near Eastern Studies, VU University Amsterdam
Dr Maria Chidiroglou, National Archaeological Museum , Athens (GR)
Dr Donald Keller, American Centre of Oriental Research, Boston (USA)
Maurice de Kleijn, SPINlab (Spatial Information laboratory)/Faculty of Economics and Business Administration, VU University Amsterdam
Dr. Sjoerd Kluiving, Department of Archaeology, Classics and Near Eastern Studies/ Faculty of Earth and Lifesciences, VU University Amsterdam
Maria Kosma, 11th Ephorate of Prehistoric and Classcial Antiquities for Euboia, Chalkida (GR)
Dr Žarko Tankosić, Norwegian Institute Athens (Gr)/Indiana University, Bloomington (USA)
Prof. Lex van Eijk, TNO Defence, Security and Safety, The Hague / École Centrale de Nantes (FR)
Dr Philip Verhagen, Department of Archaeology, Classics and Near Eastern Studies, VU University Amsterdam
Prof. Frank Vermeulen, Department of Archaeology, Ghent University (B)

PhD researchers:
The PhD researchers will not be recruited via an open competition. Specific skills and competences are required to conduct the research. As a form of time and risk management, candidates have been selected who already possess the necessary competences:

- **Anke Stoker** (MA in Mediterranean Archaeology, Groningen University, 2006) received practical training in aerial archaeology within the framework of the Archaeolandscapes Europe Project (Portugal, 2010; Denmark, 2011; Turkey, 2012). She works in the Netherlands, Italy and Greece as a certified, self-employed archaeological researcher in non-destructive landscape-archaeological research, remote sensing and digital mapping. She was responsible for the remote sensing research within the Zakynthos Archaeology Project (University of Amsterdam, 2008-10), where she combined interpretation of historical and recent aerial photographs, historical maps and multispectral satellite imagery with landscape-archaeological reconnaissance and applied spatial analysis using GIS.

- **Stefan Kooi** (MA in Mediterranean Archaeology, VU University, 2012) worked during and after his studies as an AutoCAD, database and GIS/SDI specialist for several private companies in the Netherlands and archaeological projects in Turkey and Italy. In Rome, he did courses and traineeships in geophysical prospection methods and flying GPS-controlled gliders, drones and remote controlled quadrocopters, and in processing and analysing low-altitude aerial photography (LAAP). He served as a glider and quadrocopter pilot, applying LAAP to archaeological surveys and geophysical prospection, and acted as survey field supervisor for a number of projects in Italy.

- **Ruben Brugge** (MPhil Ancient Studies, VU University, 2013) during his studies, specialized in artificial intelligence and GIS archaeology, following seminars at Wageningen and Rome. He followed a post-grad course in the anthropology of island communities in Athens and Skyros. For his thesis, he made a GIS analysis of the cultic land- and seascapes of southern Euboia. He works with Crielaard and van Eijk on the reconstruction ancient searoutes using sensor performance models developed by TNO for the Dutch navy.

8. Structure of the proposed research

Project title: 'The sea and land routes of southern Euboia, ca. 4000–1 BC. A case study in Mediterranean interconnectivity'.

Subproject 1: 'Air: an aerial archaeological contribution to the study of settlements, landscapes and spatial interconnections in southern Euboia'. PhD researcher: Anke Stoker

Subproject 2: 'Earth: Landroutes and overland communications in southern Euboia'. PhD researcher ('AiO'): Stefan Kooi.

Subproject 3: 'Water: Maritime landscapes, sea routes and seaborne communications around southern Euboia'. PhD researcher ('AiO'): Ruben Brugge.

Subproject 4: 'Fire: Knowledge utilization – from SDI to knowledge hub'. Coordinator: Maurice de Kleijn, SPINlab.

Subproject 5: 'Synthesis: South Euboia as a case study in Mediterranean interconnectivity'. Researcher: Dr J.P. Crielaard (applicant).

Host institution of all five subprojects: Faculty of Humanities, Department of Archaeology, Classics and Near Eastern Studies, VU University Amsterdam.

Contribution of research group to proposed research:					
	Subproject 1 Air	**Subproject 2** Earth	**Subproject 3** Water	**Subproject 4** Fire - Knowledge utilization	**Subproject 5** Synthesis
Dr J.P. Crielaard	Supervisor/ co-promotor	Supervisor/ co-promotor	Supervisor/ co-promotor	Adviser	Researcher
Anke Stoker	PhD researcher			PhD researcher	
Stefan Kooi		PhD researcher		PhD researcher	
Ruben Brugge			PhD researcher	PhD researcher	
Prof. Gert-Jan Burgers	Promotor / co-supervisor Adviser landscape archaeology	Promotor / co-supervisor Adviser landscape archaeology	Promotor / co-supervisor	Adviser landscape and heritage	Sparring partner
Dr Donald Keller	Adviser surveys southern Euboia	Adviser surveys southern Euboia			Sparring partner
Dr Žarko Tankosić,	Adviser surveys southern Euboia	Adviser surveys southern Euboia			Sparring partner
Dr Maria Chidiroglou		Adviser excavations southern Euboia			Sparring partner
Maria Kosma				Adviser heritage Euboia	
Dr. Sjoerd Kluiving,	Adviser geology and physical landscape	Adviser geology and physical landscape	Adviser geology and physical landscape	Adviser landscape and heritage	
Prof. Fank Vermeulen	Adviser remote sensing				
Prof. Lex van Eijk			Adviser		

			modelling sea routes and visibility		
Dr Philip Verhagen	Adviser GIS	Adviser GIS	Adviser GIS	Adviser GIS, value maps	
Maurice de Kleijn,	Geospatial information education, Spatial Data Infrastructure	Geospatial information education, Spatial Data Infrastructure	Geospatial information education, Spatial Data Infrastructure	Development of knowledge hub for heritage management purposes	

9. a. General description of the proposed research

1. Scientific context of the project
The aim of this project is to contribute to the current discussion about Mediterranean interconnectivity. The southern part of the Greek island of Euboia forms a suitable study area to make a detailed analysis of ancient land and sea routes and route systems, and to learn in this way more about how people in the ancient Mediterranean were interconnected to others, to their gods, to the landscape around them, to the sea and to communities overseas.

Over the last decade, interconnectivity has perhaps been the single most important issue in Mediterranean archaeology and, indeed, in many other historical disciplines. The publication of Horden and Purcell's *The Corrupting Sea* (2000) was a landmark in this development. Its effect was no less than a paradigm shift: whereas isolation, fragmentation, immobility and 'cellular self-sufficiency' had been considered the dominant traits in Mediterranean history, the emphasis is now on the connectedness and the fluidity of the movement of people, goods and ideas (Morris 2003). Other sources of inspiration for this interconnectivity paradigm are today's network society and information economy, and such related phenomena as globalization and increased economic interdependence. Analogies with the World Wide Web (Crielaard 1998) and the current internet culture and its discourse, provide a conceptual framework that emphasizes integration, connectivity, mutability, limitless expansion, loss of sense of place and a breakdown of spatially bounded cultures (cf. Appadurai 1996). The last decade has yielded a host of literature on the Mediterranean (Abulafia 2011; Blake/Knapp 2005; W.V. Harris 2005; Broodbank 2013), Mediterranean interconnectivity (LaBianca/Scham 2005; Antoniadou/Pace 2007; Maran 2007; Van Dommelen/Knapp 2010), Mediterranean networks (Malkin 2011; Knapett et al. 2011), ancient globalization (A. Harris 2006; Jennings 2011) and glocalization (e.g. Kistler 2012).
The interconnectivity paradigm has opened new venues for analysing long-term developments in Mediterranean history. At the same time, the underlying concepts and models need critical assessment and emendation (cf. contributions in Antoniadou/Pace

2007; Crielaard 2009). For instance, the thesis that mobility is part of the human condition (Purcell 1990, 41) is open to debate. As Knapp (2007) rightly points out, the ability and will to connect is intimately related to maritime technology, socioeconomic resources, and mentality. Also, there are clearly periods of progressive and regressive tendencies in interconnectivity, and periods of expansion and contraction of Mediterranean culture and unity (e.g. Tabak 2008). What is more, there is regional variation in connectedness, as well as in the effects of increased interconnectivity; its positive and negative effects may have created 'winners and losers', as they do in the modern world (Morris 2003, 40-44).

2. Research problems and questions
Two further criticisms may be put forward:
1. The interconnectivity paradigm has led to all kinds of sweeping statements about mobility, ever-expanding networks, small worlds, cultural homogenization, etc. – almost to the point that interconnectivity is taken as gospel truth and is becoming a new ideology. A problem is that 'networks' and 'interconnectivity' are used mainly as metaphors and as descriptive and heuristic terms (e.g. Malkin 2011, 9, 16). Relatively little effort has been made to provide these concepts with a firm empirical basis.
2. The shift in academic interest from small, cellular entities towards Mediterranean-wide connections and networks has resulted in a broadening of the scale of analysis i.e. from local or regional perspectives to a now dominant supra-regional, Mediterranean perspective. It has also led to a stronger research focus on seaborne communications and mobility. As a result, terrestrial connections and communication systems on a local or regional level have remained underexposed.

This research project deliberately takes a step back in order to address a set of fundamental questions: How did all this work on the ground? How were people interconnected to others, to their gods, to the landscape, to the sea and communities overseas? How did they move through the landscape and how did they find their way over the seas? What role did the physical environment or the presence or absence of infrastructural elements play? What were the technological, political and socio-cultural possibilities to connect, and the restraints on connecting? What do we know about local or regional ramifications of larger communication systems, and how were terrestrial networks organized and connected to these larger systems? Can we detect long-term preferences for regional interrelations and tendencies towards regionalism? What evidence is there for interconnectivity and isolation at various levels (local, regional, 'global') and how did this fit in with developments over time? Are we entitled to speak of a 'small Greek world' (Malkin 2011), and how small (or big) was this world?

3. Study area
It is not feasible, of course, to take into account the entire Mediterranean in an attempt to answer these questions. Instead, the focus will be on a well-defined micro-region. It will thus be an example of what Horden and Purcell call history *in* the Mediterranean. At the same time, however, it will contribute to history *of* the Mediterranean 'for the

understanding of which a firm sense of place and a search for Mediterranean-wide comparisons are both vital' (Horden/Purcell 2000, 43).

The micro-region of choice is the southern part of the Greek island of Euboia (see map below). Southern Euboia encompasses a variety of landscapes (coastal and alluvial plains, marshes, well-watered foothills, and arid low and high mountain ranges in the hinterland), suitable for a range of sustenance activities, including fishing, agriculture, horticulture, stock-breeding and transhumance. Moreover, it contains iron and marble deposits that were extensively exploited in Antiquity (Vanhove 1996; Chidiroglou 2010). The study area is confined on three sides by the sea, and on one by inhospitable mountain ranges.

In 2010 the applicant started a multidisciplinary fieldproject in southern Euboia,[1] focussing on the site of Karystos-Plakrari and its immediate environment. Interconnectivity is one of the issues this fieldproject aim to address, particularly the question how during the first millennium BC the Plakari settlement and sanctuary functioned in regional and interregional networks (Crielaard et al. 2011-2012, 96-7). With the present research project a wider geographical and chronological framework will be created to research long-term patterns in regional and interregional connectivity and to contextualize and problematize the outcomes of the Plakari excavations.

There are three good reasons why southern Euboia is eminently suitable as the context in which to tackle the above questions regarding maritime and terrestrial interconnections and communications:

1. Geographical position: southern Euboia lies at a juncture of major maritime routes between the Cyclades and the Euboian Gulf region and is thus closely linked to both the Greek mainland and the Aegean archipelago and coastal Anatolia (Crielaard 2006; Papageorgiou 2008, 10).

2. State of preservation: the landscape of southern Euboia has remained relatively untouched. After Antiquity, large parts were used only extensively. Also modern tourism and land development has thus far had limited effects on the landscape. As a result, archaeological sites and features, including ancient land routes, are well preserved.

3. State of research: a large quantity and variety of find places dating from ca. 4000 BC to the present day have been identified, thanks to excavations and, especially, surface surveys that have been carried out during the last 40 years (Karystia: Keller 1985; Paximadi peninsula: Keller/Wallace 1986, 1987. Bouros-Kastri peninsula: Wallace et al. 2006; Wickens 2011. Kampos: Tankosič/Chidiroglou 2010; Katsaronio plain: http://norwegiansurveykarystia.wordpress.com/). The large quantity and variety of known find places (>400 sites and many more findspots, ranging from isolated farmsteads to fortified prehistoric settlements) provide a firm base for the type of research outlined in this proposal.

The project will cover the first four millennia BC, from the first human occupation during the Final Neolithic period to the first century of the Roman occupation. Within this broader time frame, the focus will be on the first millennium BC. For this period a relatively large and varied dataset is available, not in the least thanks to

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[1] www.plakariproject.com

the recent investigations in and around the site of Plakari. During the first millennium BC, the study area corresponds roughly to the territory of ancient Karystos (Cullen et al. 2013, 2-3), a medium-size city and polis (200–500 km²) that may be considered representative of a large number of other Greek poleis of comparable size (Hansen/Nielsen 2004, 71, 1321).

4. Project aims

The main aim of the project is to make a fundamental contribution to the new interconnectivity paradigm by investigating infrastructures, communication systems and a number of other 'practical aspects' of interconnectivity. More specifically, the project aims to give a firmer empirical basis to theories about interconnectivity, networks, mobility, etc., and to critically examine some of the basic tenets of the interconnectivity paradigm. Another aim is to arrive at a more complete picture of Mediterranean interconnectivity by refocusing the attention on local and regional systems of communication (in addition to supra-regional networks) as well as land-based systems of communication (in addition to maritime interconnections).

With respect to southern Euboia –the region of choice to study interconnectivity– the aim is to analyse ancient routes and route systems and their relation to the physical and human landscape. The project explicitly focuses on both overland and overseas communications, and on terrestrial and maritime landscapes. The project's key objectives are:

1. To contribute to a long-term settlement history of southern Euboia explaining the interrelationship between habitation patterns, landscape and land use.

2. To make a diachronic study of landroutes and overland interconnections in relation to habitation patterns, landscape, land use, economic resources, and symbolic and cultural dimensions of the landscape.

3. To make a diachronic study of searoutes and maritime interconnections by analysing the physical maritime landscape, the visibility of coastlines and landmarks, as well as the myths and narratives that are part of the cultural maritime landscape and play a role in cognitive mapping and wayfinding.

4. To make a synthesizing study for southern Euboia that provides a *longe durée* perspective on interconnections and connectedness by land and sea, and explain how these communicative systems functioned on a local and regional scale and how these were related to Mediterranean-wide developments.

5. To contribute to the preservation and protection of the archaeological sites in the study area by making the project data available for heritage management as a form of knowledge utilization.

5. Methodology

The first step will be data collection. During this phase of the project, the three PhD researchers will collaborate closely. Together with the SPINlab[2] they will design a spatial

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[2] SPINlab: centre for research and education in geo-information science at VU University Amsterdam; see http://www.feweb.vu.nl/gis/home/

database to systematically register all the known sites and structures in southern Euboia. This database will be built by the PhD researchers, using the data that have been assembled over the last 40 years through excavations and surface surveys in the region. Next, site re-visits will be made to record the present state of the sites by means of short descriptions and visual imagery and taking GPS coordinates.

The PhD researchers will also make an inventory of the historical and environmental cartographic sources. Historical maps, elevation models, geomorphological maps, (historical) aerial photographs, satellite images, LiDAR, geological maps, and detailed topographical and nautical maps will, if necessary, be elaborated for inclusion in a geographic information system (GIS). Both the archaeological spatial database and the cartographic sources will be accessible through a spatial data infrastructure (SDI) that will be designed and implemented in close collaboration with SPINlab. This digital environment will make it possible for the three researchers to store, share and process large datasets without having to worry about versioning and the memory limitations of their hardware and software. The SDI can build on the knowledge and tools that have been developed by VU University's Geoplaza SDI and webportal.[3]

After assembling these data, the dataset will be augmented, using aerial archaeology. This constitutes the main part of subproject 1, although targeted remote sensing also plays a role in subproject 2. Each of the subprojects will analyse and interpret its own dataset, for which a specific methodology has been designed. These methods are described in detail in the following section.

h. Coherence between sub-projects
The sub-projects are strongly interwoven not only by subject matter but also by research methods and methodology. The three PhD researchers will collaborate closely, for instance in data collection, and are encouraged to exchange data and ideas during the entire project. The SDI will create a proper digital environment facilitating collaboration. The outcomes of subprojects 1-3 will be highly complementary, given their specific research foci. Subproject 5 will synthesize the outcomes and will use these for a critical reflection on current Mediterranean interconnectivity models.

5. Embeddedness of the project and quality of the research group
VU University Amsterdam will be the host institution. Its Department of Archaeology, Classics and Near Eastern Studies has a long-standing tradition in field archaeology in Italy and Greece and particularly in landscape archaeology. The project will be embedded within the broader framework of CLUE – the VU Research Institute for the Heritage and History of the Cultural Landscape and Urban Environment. Within CLUE it will be linked to the interdisciplinary research cluster 'A New Mediterranean Panorama' (see Crielaard 2009). CLUE and the members of the research group bring together a wealth of experience with regional archaeological research and heritage issues, including the use

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[3] http://geoplaza.ubvu.vu.nl/cms/

of a wide variety of methods and techniques from different disciplines, especially archaeology, geoarchaeology ancient history, and geospatial informatics.

6. Local, national and international collaboration
The directors of the field surveys in southern Euboia (Dr D. Keller, Dr Z. Tankosić and Dr M. Chidiroglou) have agreed to pool their survey data and make them accessible in the shared SDI. The 11th Ephorate of the Greek state archaeological service will act as a partner in the aerial and field reconnaissance and will provide the necessary permission. Prof. Lex van Eijk (TNO/ École Centrale de Nantes) will assist in the visibility analyses. Prof. A. Sarris (University of Crete, Rethymnon) has invited Mrs Stoker to use his university's remote sensing laboratory facilities for her study of the aerial and satellite imagery.

A small conference will be organized in Athens at the end of third year of the project, in order to exchange information and discuss preliminary research results with the members of the research group and a selected number of specialists in various fields.

9. b. Description of the subprojects
The words 'Air', 'Earth', 'Water' and 'Fire' (borrowed from the pre-Socratic philosophers) feature in the titles of the constituent subprojects: 'Air' refers to aerial archaeology, a research technique that plays a central role in subproject 1, while 'Earth' and 'Water' refer to the two main research topics of subprojects 2 and 3, which deal with communications over land and sea, respectively. Subproject 4 ('Fire') differs substantially from the other subprojects, as it is directed towards knowledge utilization. However, it is defined as a subproject as all three PhD researchers make contributions to it. Like the other subprojects, it has its own budget, aims, methods and deliverables, which are detailed below. Subproject 5, finally, is the synthesis to be written by the applicant.

Subproject 1: 'Air: an aerial archaeological contribution to the study of settlements, landscapes and spatial interconnections in southern Euboia'.
One of the main aims of this research project is to understand how Mediterranean interconnectivity worked on a local and regional level. The first thing to do to achieve this aim is to identify the places or areas in our study region that potentially played a role in interconnectivity networks. In other words, we need to compose a comprehensive picture of the location and distribution of settlements, cultplaces, agricultural land, economic resources, harbours etc. On top of that, we need to identify the changes through time in settlement patterns, subsistence and cultic geography. As a contribution to the project's main objectives, this subproject therefore aims to
a. maximize the number of known settlements and structures in the study area
b. analyse settlement patterns and land use
c. identify long-term developments in habitation patterns, land-use and subsistence
d. identify and interpret spatial interconnections between places and areas.

Aerial archaeology will play a leading role in achieving these aims. Traditional field surveys are very useful for the type of regional research that we wish to accomplish, but the problem is that ancient sites and structures are sometimes hard to detect. They may be covered by vegetation, or submerged under water or in wetlands. Moreover, specific features, including ancient roads, tend to escape notice as they are fragmentarily preserved over long distances (Cantoro/Sarris 2012; Kaimaris et al 2009). All this also applies to southern Euboia, despite the favourable conditions for site preservation.

For this subproject the following methodology will be pursued:

1. Data collection:

A variety of airborne and spaceborne data will be assembled, including multi-spectral satellite images, high-resolution aerial photographs, and airborne laser scanning data (ALS/LiDAR). A small aircraft will be employed to make high-resolution orthophotos and near-infrared aerial photographs (see Verhoeven 2008, 2007), while an unmanned aerial vehicle (UAV, or 'drone') will be used to literally zoom in on specific sub-regions and sites. These data will be digitized and digitally enhanced to generate new information about exposed and hidden archaeological remains, and provide new insights into the landscape context of known sites. Special attention will be paid to coastal regions where submerged sites, harbour installations and ancient coastlines may be detected (see Liritzis et al. 1983; Tartaron 2013, 176). Ground-truth reconnaissance and specific site visits will be carried out to check the remotely sensed information and establish the site chronology and function. Historical aerial photographs from the 1930s and later (see Stoker 2010) will be used to detect sites that were destroyed in sub-recent times, and establish whether there are areas that have been subject to recent landscape changes because of human agency (for southern Euboia: De Vliegher 1990, 1992, 1993). The chances of detecting hidden archaeological features or anomalies in vegetation indicative of subsurface structural remains (Kaimaris et al 2012) are good, given that the landscape of southern Euboia is relatively unaffected by modern interventions.

2. Data analysis:

These data will be integrated in the GIS environment for spatial analysis. This will also include a variety of cartographic and other spatial data (geological, geomorphological, bathymetric and historical maps) and information from historical sources, such as maps or reports on landscapes and ancient sites by 19th- and early 20th-century travellers to the region (Chidiroglou 2010 for refs.). A next step is the identification of patterns in habitation and land use, both per period and through time. A detailed comparison with the outcomes of other regional studies and surveys projects in the Aegean is essential here. Patterns in the location and distribution of sites and patterns of connection between sites will be determined using e.g. Proximal Point Analysis and Rank-Size analysis.

3. Interpretation:

A last step is to interpret these patterns in terms of interconnectivity. Do we find preferences for coastal or inland modes of existence? Did coastal settlements concur and connect with settlement systems in the hinterland or can they be linked to coastal settlements outside the region? Are there differences between coastal and inland sites, e.g. regarding size and function? Do the location and distribution of defensive sites reflect a

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maritime or terrestrial orientation? What does the distribution of settlements tell us about local or regional variations in interconnectivity and isolation? How does all this fit in with developments in other regions in the Aegean? The answers to this type of questions will be contextualized by relating them to socio-economic and political developments, institutional and governmental changes, and ecological dynamics that can be reconstructed on the basis of archaeological and historical sources (outline with refs. in Crielaard et al. 2011-2012, 91-95). What this final phase of analysis thus has to produce is a regional biography of the connected landscape.

4. Knowledge utilization:

Another important aim of this subproject is to make the information generated within this project available for heritage management. This will be described in more detail under Subproject 4.

Subproject 2: 'Earth: Landroutes and overland communications in southern Euboia'.

Within the Mediterranean interconnectivity paradigm there is only a limited interest in terrestrial connections and land-based communication systems. More generally, the importance of landroutes in the ancient Mediterranean is underestimated and, thus, understudied (Keller/Wallace 1990). Southern Euboia, however, offers outstanding opportunities to fill this lacuna. Not only has the landscape remained relatively untouched, the region is virtually unique because of the state of preservation of ancient roads and road systems. In various parts of the study region there are fragments of ancient landroutes, possibly of Classical and Hellenistic date (see map below; Keller/Wallace 1990, 197-99: Wallace et al. 2006, 35-38; Keller/Hom 2010).

The aim of this subproject is to make a detailed study of landroutes and overland communication. In a broader sense it also deals with such questions as to how space was used, organized and perceived and how people moved through space. Metric analyses of the physical space using GIS will be important. At the same time, it is acknowledged that space and movement through space are not determined by the physical landscape alone: humans also create space through social practices. Within the domain of cult we see that such practices as processions and pilgrimage can even shape entire landscapes. This subproject will pay ample attention also to this aspect of landroutes.

This subproject will be organized in the following way:

1. Literature study, focused on

a. ancient roads, road systems, sacred and processional roads, overland transport and communication routes, with a focus on ancient Greece (e.g. Goette 2002);

b. the ancient physical landscape of the region (geology, hydrology, natural resources, soils, agricultural areas etc.).

2. Data collection:

a. identification, recording and cataloguing of known pre-modern landroutes in southern Euboia;

b. detection, recording and cataloguing of unknown landroutes with the help of aerial and satellite photos and, especially, a UAV (see subproject 1);

c. classification of the roads and landroutes, based on morphological and technological aspects (retaining walls, stone markers, rock cuttings, etc.), functional criteria (intersite or regional routes) and chronology (relationship of routes to datable archaeological sites).

3. Analysis:

a. relationships between roads and landroutes and the (historical) physical landscape;

b. relationships with human landscapes: relating routes to location, distribution, functioning and chronological development of settlements sites (farms, hamlets, rural towers, etc.), cult sites and cemeteries, agricultural resources (fields, pasture lands), economic resources and production sites (e.g. marble, clay), and other elements of the infrastructure (coastal settlements, ports);

c. network-based analyses using models from geography, integrated into GIS (see Batty 2005); GIS analysis of routes related to least-cost path, visibility, etc. in order to find out more about the rationale of roads and route systems.

4. Interpretation:

a. of landroutes systems in relation to land use, habitation patterns and symbolic dimensions of the landscape (cemeteries, sanctuaries, places of mythical, cultic or historical importance);

b. of regional variations in interconnectivity and ability to connect (e.g. urban vs. rural areas; forelands vs. hinterlands); diachronic variability in interconnectivity (inward vs. outward orientation); reasons for communications and ideological or ideational aspects of interconnectivity/isolation.

Two specific case studies may be singled out, connected to the cultic and economic landscape, respectively (see map below):

a. An Archaic sanctuary located on Karababa hill is connected to the nearby Kazara hill by an access road with retaining walls, identifiable over a length of 85 m. (Keller/Hom (2010, 4). In 2010 and 2011 members of the proposed research team discovered many more road fragments that connect Karababa to Karystos-Plakari with its Early Iron Age – Archaic sanctuary. Both sites are also clearly interlinked through intervisibility and similarities in layout.[4] Systematic mapping of these road fragments, using GPS and data provided by a UAV, will help us to reconstruct how these fragments connect. A next step in the analysis pertains to how this road system linked the two cult sites, how it connected the cultic to the agricultural landscape, how it helped people to experience their territory, what different views on the landscape it offered, etc.

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[4] For photographic documentation of the Karababa roads and sanctuary, see www.plakari.project.com > media > photos > Karababa.
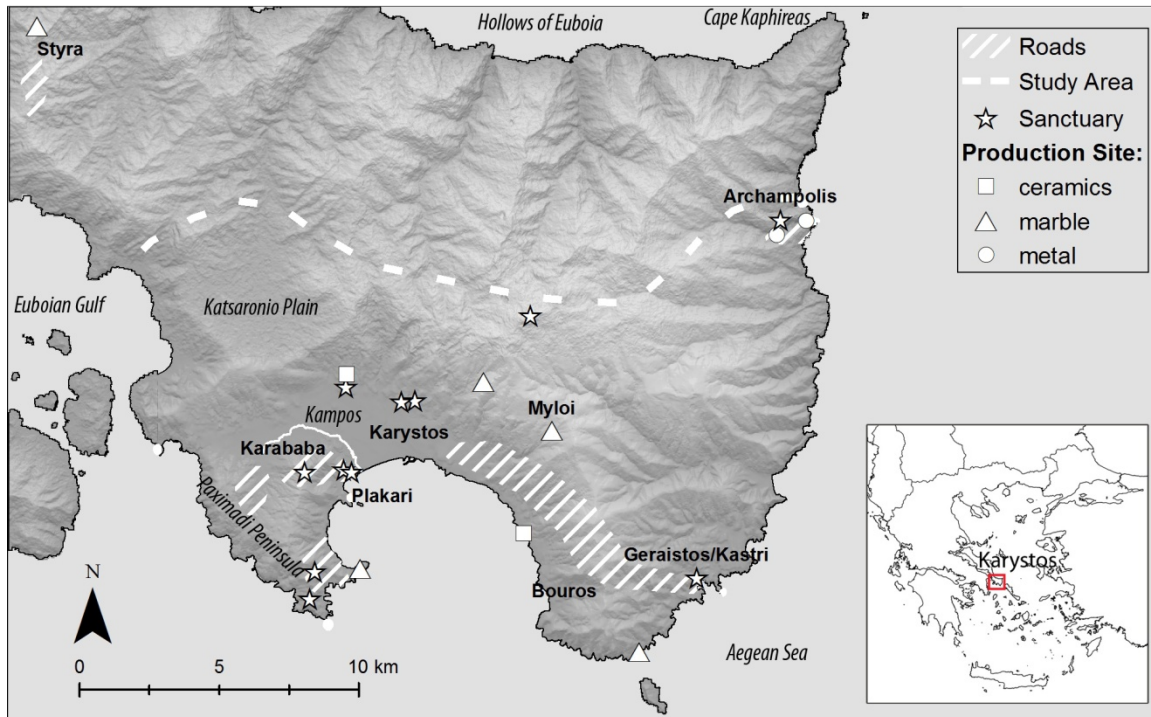
Map of southern Euboia, indicating specific sites relevant to Subproject 2 as well as areas where ancient road systems are found.

b. In antiquity, southern Euboia's deposits of cipollino marble were quarried on a large scale. Although the first evidence for this dates to the Late Bronze Age (Cullen et al. 2013, 103), it was under Roman rule –probably from the early Principate onwards– that the cipollino marble was systematically exploited and transported throughout the empire (Chidiroglou 2010). Not much is known, however, about quarry road networks. It remains a complete mystery how the over 10 m long columns lying in situ at Myloi-Kylindroi (Chidiroglou 2010, 49) were to be transported to the coast. Least-cost path analysis in combination with remote sensing data and comparisons with the better-known marble transportation routes in neighbouring Styra (Vanhove 1996) may throw important new light on this aspect of the economic landscape.

Subproject 3: 'Water: Maritime landscapes, searoutes and seaborne communications around southern Euboia'.

This subproject aims to contribute to a better understanding of Mediterranean interconnectivity by a detailed study of the information that our study area provides about maritime communication systems and their functioning in relation to the physical and cultural maritime landscape. In this manner it will present alternatives to the terracentric approaches prevalent in current landscape studies and contribute to a much needed archaeology of the sea (Broodbank 2000, 35, 58, 363; Berg 2010; Tartaron 2013, 175).

As underlined by Parker (cited in Rainbird 2007, 45), for an appreciation of the maritime aspects of the historical landscape it is necessary to adopt a mariner's

perspective. Subproject 3 will focus on four aspects that are especially relevant in this context:

1. The physical maritime landscape. This concerns the marine geology, coastal geomorphology and bathymetry in the past and present, with special attention to alterations of the coastal landscape and submarine topography due to geotectonics, sea-level fluctuations (Poulos et al. 2009), coastal erosion, sedimentation/siltation and anthropogenic impact (Lykiardopoulou 1987; cf. Pavlopoulos et al. 2006; Triantaphyllou et al. 2010). Remote sensing is a potentially helpful tool for reconstructing sea-level fluctuations in interconnectivity with the ancient coastal geography (submerged sites and other archaeological features; see subproject 1). Other important aspects of the physical maritime landscape are paleoclimate and weather, wind, sea surface circulations and seasonal sea current patterns (Agouridis 1997; Berg 2007; Papageorgiou 2008).

2. The cultural maritime landscape. As a point of departure, it is acknowledged that the sea is a knowable, textured place that through senses, observations, skill and mythology can be described and mapped (Rainbird 2007, 47-49; also Westerdahl 1992; Patton 1996, 89-111). Stories and myths are crucial to give meaning to and make sense of the seascape. The spatial information stored in these narratives forms an important element of cognitive mapping that also serves practical purposes when it comes to spatial orientation and wayfinding across the seascape (Lewis 1972; Istomin/Dwyer 2009; Broodbank 2000, 23; Ingold 2000). As Rainbird (2007, 56) stresses, this type of information forms keystones in building narrative maps that could be passed on verbally to seafarers, including those who had not visited the area before. Many such myths, memories and narratives are also found in connection with the seas and coastal areas around southern Euboia. For example, stories about shipwrecked Homeric heroes (*Od*. 3.130-178; Eur. *Hel*. 766 ff., 1126 ff.; Strabo 8.6.2; Dio Chrys. *Or*. 8.2-3, 31-32, with Goette 2012) or the destruction of the Persian fleet (Hdt. 8.13, Phil., *Her*. 1.24, 10.11) helped to warn of the dangers of the area near Cape Kaphireas and the nearby 'Hollows of Euboia' (Mason/Wallace 1972). In this part of the research, information from ancient texts will be systematically collected and analysed, and linked to elements of the physical maritime landscape, particularly to land and sea marks. All this is to achieve two goals: to create a biography of the maritime landscape of southern Euboia, and to analyse what information these narratives contain about searoutes and maritime interconnections.

3. Visibility and visual perception. These aspects are of key importance for experiencing and evaluating the seascape (Horden/Purcell 2000, 393). Visibility at sea, however, is a complex matter – much more dynamic and with greater variability than acknowledged even in recent studies (cf. visibility maps in e.g. Horden/Purcell 2000, 127 fig. 9). Sight is determined by molecules and aerosols in the atmosphere; their density depends on such variables as wind speed and air and water temperature which can vary according to time of day and time of year. We will collaborate with Prof. A.M.J. van Eijk and use his Electro-Optical System Transmission and Ranging model (EOSTAR; designed for the Dutch navy: see van Eijck et al. 2010), calibrated with the help of palaeoclimatic data, to create new visibility maps of the Aegean and the eastern Mediterranean. These will be used to

analyse the relationship between the visibility of coastlines and land and sea marks, on the one hand, and navigation routes on the other.

4. Maritime interconnectivity. This part encompasses the study of imported artifacts and other aspects of material culture from key sites in the region that provide information about interregional social interaction (or the lack of it). The aim is to arrive at a multi-scalar, *longe durée* reconstruction of maritime interconnections and connectedness. It is hypothesized that at a regional level, southern Euboia in different periods maintained preferred interconnections with east Attica and the northern Cyclades (for the Final Neolithic: Cullen et al. 2013, 109). Literary sources suggest that on a larger geographical scale, there existed close links between southern Euboia and the west coast of Asia Minor, starting with Homer and continuing to the Medieval and early modern periods (e.g. Cullen et al. 2013, 5).

Subproject 4: 'Fire: Knowledge utilization – from SDI to knowledge hub'.
Although the landscape of southern Euboia is relatively untouched, there is growing pressure on the landscape and on specific sites, which makes archaeological research in the region urgent. The project intends to make an active contribution to the recording and monitoring of archaeological sites, structures and landscapes, and to take a first step towards developing a heritage management knowledge hub on top of the spatial data infrastructure (SDI; see above, 'Methodology').

Much of the content for the SDI/knowledge hub will be generated within Subproject 1. For instance, the remote sensing data will enlarge the number of known sites in the region (including those in so-called marginal areas), while comparison of historical aerial photographs with the actual situation in the field makes it possible to evaluate site and landscape degradation processes and identify areas that need close monitoring. One of the aims of Subproject 1 is to produce a biography of the landscape (cf. Renes et al. 2013) that describes not only the present state of, but also the future threats to archaeological sites, structures and landscapes. In addition, it seeks to determine the archaeological and historical value of sites and landscapes. This information will be visualized in the form of archaeological value maps marking valuable archaeological sites and landscapes, and maps marking vulnerable archaeological sites and landscapes.

At the beginning of the project, SPINlab will design an SDI to serve as a digital environment for the three researchers to store, share and process their information. During the fourth year, SPINlab will develop a user-friendly knowledge hub on top of the SDI in order to make important parts of the information accessible through the web, taking into account legal issues. Evaluations of site degradation or archaeological value maps that will be part of the knowledge hub can help to decide how intensively the archaeological landscape needs to be researched before interventions take place. This type of information will be highly relevant to spatial planners, heritage policymakers and heritage managers, including those working for the Greek state archaeological service (in this case the 11th Ephorate of Prehistoric and Classical Antiquities for Euboia). It has the potential to become an important tool in decision-making processes regarding the preservation of cultural heritage and in managing archaeological and ecological heritage and touristic developments (cf. Kydonakis et al. 2012). In this manner, Dutch researchers can make an

important contribution to relieving the pressure on various parties in Greece responsible for the preservation of cultural heritage, which after all is often considered as a shared *European* heritage.

The development of the knowledge hub will be iterative and be accomplished in two phases. First, a beta version of the knowledge hub will be developed and then presented and discussed in a small workshop at the Netherlands Institute at Athens. The aim of this workshop is twofold: to bring together potential end-users in Greece and specialists from the Netherlands who already have experience with user-centric SDI frameworks applied to heritage research (De Kleijn et al. forthcoming), and to involve these end-users in the design, implementation and evaluation of the knowledge hub. The second phase will encompass the refining and redesigning the hub according to the needs of the different stakeholders.

The hub will be delivered as a ready to use tool for professionals who will have access to the data but at this point will not be able yet to add content. However, the tool will have the potential to be taken to a next level by expanding the datasets (e.g. incorporating the heritage of more recent periods) as well as its functionality (e.g. developing an interactive webviewer in which data can be manipulated and newly produced data can easily be added). Such a step will have to be realized in a follow-up project. To accommodate this, the project has budgeted finances for hosting the tool for five years after the projected has ended.

SPINlab will assist in storing the project's data and making them available according to the standards and quality marks for data compatibility, accessibility, durability and maintenance of the Dutch Data Archiving and Networked Services (DANS) and the INSPIRE European standards. This will ensure that the valuable datasets produced during this project will remain interoperable and useful for other purposes.

As a last point it may be noted that staff members of the Greek state archaeological service have greeted this plan with great enthusiasm.

Subproject 5: 'Synthesis: South Euboia as a case study in Mediterranean interconnectivity'.
The point of departure for this synthesis is southern Euboia. We will compare and integrate the outcomes of the three subprojects to arrive at a diachronic reconstruction of developments in interconnectivity by land and sea. Key issues are diachronic and regional variations in interconnectivity and ability to connect, the interplay between local, regional and supra-regional systems of communication, and the interplay between terrestrial and maritime networks. As a next step we will try to explain these patterns in interconnectedness or isolation by making connections with socio-political and economic developments that can be reconstructed on the basis of archaeological and historical data for the study area during the periods in question. Important issues in this stage of the analysis concern the opportunities and impediments for interconnectivity, determined by e.g. the physical landscape, available technology, regional and supra-regional socio-political constellations, cultural factors and mentalities. At this point we will also discuss ideational aspects of interconnectivity (and isolation), motivations for land and sea movement, the valuation of interconnectivity, the social use and context of

interconnectivity at different spatial levels (local, regional, supra-regional), and the effects of increased or decreased interconnectivity, for instance on socio-political structures. From here we will proceed by making comparisons with other regions in the Aegean. The aim is to find clues to determine to what extent our data and analyses are comparable to those from other regions in order to estimate the representativity of our case study for more general patterns and trends in Aegean and Mediterranean interconnectivity.

In the second part of the synthesis we aim to relate the outcomes of the research project to the broader discussion about Mediterranean interconnectivity. First we will identify what insights we have obtained about forms of land use and settlement organization in relation to regional communication networks (subproject 1), about the organization and significance of overland communications and rationale for terrestrial interconnectivity (subproject 2), and about the parameters that determined maritime interconnectivity and mobility (subproject 3). From here we will return to the main aims of the project. We will define on what points we have been able to give a firmer empirical basis to theories about interconnectivity and on what points the basic tenets of the interconnectivity paradigm need revision. Next to that we will indicate how our refocus on local and regional systems of communication and land-based interconnectivity have succeeded in drawing a more complete picture of Mediterranean interconnectivity.

10. Summary in key words
Mediterranean interconnectivity – remote sensing – land routes – sea routes – southern Euboia

11. Work programme
Not yet included in the programme is the obligatory education for PhD offered by the national research school ARCHON (15 ECTS).

Subproject 1: Air		
Year	**Months**	**Activities**
1 *2014* ↓	Sept. - Dec.	Building SDI Working on database, digital cartographic material and GIS. Acquisition of satellite and ALS/LiDAR data. Holidays (2 weeks)
2015 ↓	Jan. - March	Aerial reconnaissance and targeted aerial survey: two 3-hour flights in autumn/winter/ spring with hired small aircraft (Cessna or other) with pilot. Goals: production of approx. 2000 oblique aerial photographs in full colour and high-resolution and the production of orthophotos of the total study area. Processing and interpreting the material. Acquisition of historical aerial photos and maps in Athens.
	April - May	Processing, studying and interpreting satellite images and ALS/LiDAR data. Holidays (1 week)

	June - Aug.	Fieldwork: ground-truth reconnaissance and site visits. Studying 19th- and early 20th-century travelers' reports. Holidays (4 weeks)

Year	Months	Activities
2	Sept. – Oct.	Processing, studying and interpreting historical aerial photos. Building DSM.
	Nov. – Dec.	Aerial reconnaissance/survey: two flights as in year 1. Goals: mainly as year 1 plus tests with near-infrared aerial photography in selective areas. Fieldwork: ground-truth reconnaissance and site visits. Holidays (2 weeks)
2016 ↓	Jan. – Aug.	Data analyses. Holidays (1 week in spring, 4 weeks in summer)
3	Sept. – Oct.	Aerial reconnaissance/survey: two flights as in year 1. Goals: as year 2. Fieldwork: ground-truth reconnaissance and specific site visits.
	Nov. – Dec.	Writing methodological article on integrated use of remote-sensing techniques in landscape archaeology. Holidays (2 weeks)
2017 ↓	Jan. – April	Building photo-realistic 3D model of present, historical and archaeological landscapes. Cataloguing remote sensing data and imagery in relational database and integration in GIS.
	May – Aug.	Writing paper for presentation at project conference (June 2017) Literature study: socio-political and ecological context of spatial data Holidays (1 week)
4	Sept. – Dec.	Literature study: socio-political and ecological context of spatial data Heritage section: evaluation of sites and landscapes; making archaeological value maps Holidays (1 week)
2018	Jan. – Aug.	Writing up thesis Submitting thesis (before 31 August 2018)

Subproject 2: Earth		
Year	**Months**	**Activities**
1 *2014* *2015* ↓	Sept. – Nov.	Building SDI Working on catalogue, database, digital cartographic material and GIS
	Dec. – Feb.	Literature study: roads, road systems, transportation means, etc. Holidays (2 weeks)
	March – April	Literature study: physical landscape of southern Euboia Holidays (1 week)
	May – Aug.	Fieldwork: checking site catalogue: making site visits, taking GPS coordinates in the field, recording present state of site preservation Holidays (4 weeks)
2	Sept. – Oct.	Fieldwork: recording, cataloguing and classifying known ancient landroutes
	Nov.. – Dec.	UAV survey of road systems on Paximadi, Kazara and Karababa (if necessary: survey of specific sites) Holidays (2 weeks)
2016 ↓	Jan. – March	Literature study and analysis of field data
	April –	Data analysis: interrelationships between landroutes, topography, physical and

	Aug.	human landscapes, resources; GIS and network analyses
		Holidays (1 week in spring, 4 weeks in summer)
3	Sept.	UAV survey of road systems in Myloi and Aetos areas, and Bouros-Kastri
		peninsula (if necessary: survey of specific sites)
	Oct..-	Literature study and analysis of field data
2017	May	Writing article on use of UAVs in detection of land routes
↓		Holidays (1 week in winter, 1 week in spring)
	June –	Writing paper for presentation at project conference (June 2017)
	Aug.	Fieldwork: rechecking roads and sites
		Holidays (4 weeks)
4	Sept. –	Interpretation of landroutes systems in relation to land use and habitation
2018		patterns; symbolic dimensions of landscape; interconnectivity: regional
↓	April	variations and diachronic variability; ideational aspects of
		interconnectivity/isolation
		Holidays (2 weeks in winter)
	May –	Writing up thesis
	Aug.	Holidays (1 weeks in spring, 4 weeks in summer)
		Submitting thesis (before 31 August 2018)

Subproject 3: Water		
Year	**Months**	**Activities**
1	Sept. –	Building SDI
	Nov.	Working on catalogue, database, digital cartographic material and GIS
	Dec. –	Literature study: sea craft, searoutes, paleoclimate and weather, wind, sea surface
2015	Feb.	circulations and seasonal sea current patterns
↓		Holidays (2 weeks)
	March –	Literature study: physical maritime landscape: geomorphology, bathymetry,
	April	coastal landscape, sea levels, erosion and sedimentation
		Holidays (1 week)
	May –	Fieldwork: checking site catalogue: making site visits, taking GPS coordinates in
	Aug.	the field, recording present state of site preservation
		Holidays (4 weeks)
2	Sept. –	Fieldwork: recording ancient coastal geography, coastal sites, harbour
	Oct.	installations, etc.
	Nov.. –	UAV survey of coastal geography
2016	Dec.	Holidays (2 weeks)
	Jan. –	Literature study and analysis of field data
↓	March	
	April –	Data analysis: interrelationships between physical maritime landscape, maritime
	Aug.	environment and dominant sea paths.
		Holidays (1 week in spring, 4 weeks in summer)
3	Sept.	Assisting in UAV survey
	Oct..-	Visibility analysis using EOSTAR model
2017	Jan.	Writing article on use of EOSTAR model and searoutes
↓		Holidays (1 week)
	Feb. –	Analysis of the cultural maritime landscape: inventory of narratives as instrument
	Aug.	for cognitive mapping and wayfinding; biography of maritime landscape
		Writing paper for presentation at project conference (June 2017)
		Holidays (1 week in Spring, 4 weeks in Summer)
4	Sept. –	Analysis of maritime interconnectivity: diachronic cultural interconnections; long-

2018 ↓	April	term developments in maritime interconnectivity; relations with the physical landscape (maritime and terrestrial)
		Holidays (2 weeks in winter)
	May – Aug.	Writing up thesis
		Holidays (1 weeks in spring, 4 weeks in summer)
		Submitting thesis (before 31 August 2018)

Subproject 4: Fire: Knowledge utilization

Year	Activities
1	Building of SDI by SPINlab, together with researchers of Subprojects 1-3
1-3	Adding content to SDI by researchers of Subprojects 1-3
4	Developing heritage management knowledge hub (beta version)
	Workshop together with potential end-users and stakeholders
	Refining and redesigning of knowledge hub

Subproject 5: Synthesis

Year	Activities
1-3[1]	Theorizing the project and putting it in the wider context of the interconnectivity discussion. Organizing project conference Athens (June 2017) Writing paper for presentation at project conference
4	Reconstruction of long-term developments in interconnectivity in S Euboia. Relating these to the region's broader archaeological and historical framework. Explaining patterns in regional connectivity
5	Relating project outcomes in relation to Mediterranean connectivity paradigm. Critical evaluation of Mediterranean connectivity paradigm.
	Editing conference papers (Jan. 2018)
	Organizing workshop knowledge hub Athens
	Writing up monograph

[1] During the second and third year of the project the applicant will use his regular research time (0,4 FTE) to start working on this part of the project.

Schedule visualizing specific research activities

	2015												2016												2017											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Stoker	▓	▓	▓		▓	▓	▓			▓	▓	▓									▓	▓			■						░					
Kooi				▓	▓	▓		▓	▓	▓	▓								■		▓	▓								▓						
Brugge				▓	▓	▓		▓	▓	▓	▓										▓	▓				■					░					
Crielaard					▓	▓			▓	▓	▓										▓	▓				■					░					

▓ Periods reserved for field work (including preparations and first data analysis)
■ Submission articles
░ Conference

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12. Word count

9a: General description of research project: 2346 words (max. 2500).

9b   Subproject 1: 800 words (max. 800)
      Subproject 2: 784 words (max 800)
      Subproject 3: 784 words (max 800)
      Subproject 4: 728 words (max 800)
      Subproject 5: 400 words (max. 400)

Total number of words for 9a (2346) + 9b (3496) = 5842 words

13. Planned deliverables

Planned research results	Date of submission / venue
Subproject 1:	
Methodological article on integrated use of remote-sensing techniques in landscape archaeology Journal: *Journal of Archaeological Science*	January 2017
Dissertation	31 August 2018
Subproject 2:	
Article on use of UAVs in detection of land routes Journal: *Journal of Archaeological Science*	June 2016
Dissertation	31 August 2018
Subproject 3:	
Article on use of EOSTAR model in relation to sea routes and cultural maritime landscape (with Crielaard and Van Eijk) Journal: *International Journal of Nautical Archaeology*	February 2017
Dissertation	31 August 2018
Subprojects 4:	
Workshop: presentation and evaluation of beta version of knowledge hub involving end-users and stakeholders	Spring 2018 Netherlands Institute at Athens
Launch knowledge hub	31 August 2018
Subprojects 5:	
Preliminary synthesizing article Journal: *BABESCH*	December 2017
Monograph	August 2019
Subprojects 1-3, 5:	
Short preliminary reports on Plakari Project website (www.plakariproject.com)	Jan 2015-August 2018
Database of archaeological sites in S Euboia	May 2017
Conference: discussion preliminary research results with members of research group and invited specialists	June 2017 Netherlands Institute at Athens
Conference papers and discussion Journal: *Pharos. Journal of the Netherlands Institute at Athens* – Special Issue	Dec. 2017

14. Concise Curriculum Vitae principal applicant

Jan Paul Crielaard (1964) is associate-professor of Mediterranean archaeology. He studied Classical Archaeology at the University of Amsterdam (1988, cum laude), where he received his PhD in 1996 (cum laude) on a dissertation titled "The Euboeans overseas. Long-distance contacts and colonization as status activities in Iron Age Greece". Between 1991 and 1993 he was acting director of the Netherlands Institute at Athens. In 1996 he obtained a post-doc grant from ARCHON-Netherlands Interuniversitary Research School for Archaeology and UTOPA foundation for a research project titled "Elite, elite culture and ideology in the Aegean in Mediterranean perspective (c. 750 - 650 BC)". Since 2000 Crielaard is affiliated to the department of archaeology of VU University Amsterdam, first as assistant-professor and since 2011 as associate-professor. Between 2006 and 2010 he replaced Prof. Douwe Yntema as chair of the department.

Crielaard's main research interest concerns Mediterranean long-distance exchanges in the Early Iron Age Mediterranean, Greek colonialism in southern Italy, elites and elite behaviour, Homeric archaeology, ethnicity, and the archaeology and history of Euboia. He is the initiator and coordinator of the interdisciplinary research cluster 'A New Mediterranean Panorama', which is part of CLUE. Research Institute for the Heritage and History of the Cultural Landscape and Urban Environment of VU University. He is a longstanding member of the editorial boards of *Pharos. Journal of the Netherlands Institute at Athens* and *BABESCH. Annual Papers on Classical Archaeology.*

Crielaard excavated in Greece, Italy, Cyprus and Turkey. Between 2003 and 2009 he directed excavations at Muro Tenente, an indigenous site near Brindisi, and at L'Amastuola, an Archaic indigenous-Greek settlement in the periphery of the Greek colony of Taras (Taranto). Since 2010 he is project-director of the multidisciplinary Plakari Archaeological Project and co-director of excavations at Karystos-Plakari, which is a collaboration between VU University and the 11th Ephorate of Prehistoric and Classical Antiquities for Euboia. The Plakari project combines systematic excavations of a settlement and cult site of the 11th to 4th centuries BC with geo-archaeological landscape research, archaeobotany and zooarchaeology, including studies of long-term developments of coastal landscapes and marine palaeo-ecology.

Recent PhD projects under his supervision include "Warfare and society in early Greece. Regional developments in warfare, urbanization and delineation of territory (J. Brouwers, 2010), 'Planting the seeds of change. A bioarchaeological approach to long-term developments in landscape and land use in 1st millennium BC southeast Italy' (D. Lentjes, 2013), and "Keeping in touch in a changing world. Network dynamics and the connections between the Aegean and Italy during the Bronze Age – Iron Age transition (ca. 1250 – 1000 BC)" (K. van den Berg, 2015).

Selected publications:

Titels marked with * can be found on http://vu-nl,academia.edu/JanPaulCrielaard

*2006   Basileis at Sea: elites and external contacts in the Euboian Gulf region from the end of the Bronze Age to the beginning of the Iron Age, in: S. Deger-Jalkotzy & I.S. Lemos (eds.), *Ancient Greece: from the Mycenaean palaces to the age of Homer*, Edinburgh, 271-297.

*2007　Eretria's West Cemetery revisited: burial plots, social structure and settlement organization during the 8th and 7th centuries BC, in: A. Mazarakis Ainian (ed.), *Oropos and Euboea in the Early Iron Age. Acts of an International Round Table, University of Thessaly, June 18-20, 2004, University of Thessaly*, Volos, 169-194.

*2009　The Ionians in the Archaic period: shifting identities in a changing world, in: A.M.J. Derks & N.G.A.M. Roymans (eds.), *Ethnic constructs in antiquity: the role of power and tradition*, Amsterdam, 37-84.

*2009　Cities, in: K.A. Raaflaub & H. van Wees (eds.), *A companion to Archaic Greece*, Malden & Oxford, 349-372 (paperback version published in 2013).

2010-11　(with F. Songu, M. Chidiroglou & M. Kosma), The Plakari Archaelogical Project. Project Outline and Preliminary Report on the First Field Season (2010), *Pharos* 18-2, 83-106.

2011:　(with G.-J. Burgers) *Greci e indigeni a L'Amastuola*, Mottola.

*2011　The 'wanax to basileus model' reconsidered: authority and ideology after the collapse of the Mycenaean palaces, in: A. Mazarakis Ainian (ed.), *The 'Dark Ages' revisited: acts of an international symposium in memory of William D.E. Coulson, University of Thessaly, Volos, 14 -17 June 200*7, Volos, 83-111.

*2012　(with G.-J. Burgers) Greek colonists and indigenous populations at L'Amastuola, Southern Italy – II, *BABESCH* 87, 69-106.

*2013　Keleutha hygra. Maritime matters and the ideology of seafaring in the Greek epic tradition, in: *Alle origini della Magna Grecia. Mobilità, migrazioni, fondazioni. Atti del 50° Convegno di Studi sulla Magna Grecia, Taranto, 1-4 ottobre 2010*, Taranto, 135-157.

2013　(with E. Barbetsea, X. Charalambidou, M. Chidiroglou, M. Groenhuijzen, M. Kosma and F. Songu), The Plakari Archaelogical Project. Preliminary Report on the second field season (2011), *Pharos* 19-2, 35-55.

15. Summary in Dutch for non-specialists (799 woorden; max. 800)

In de afgelopen 10 jaar heeft er een ingrijpende omslag plaats gevonden in het denken over de antieke Mediterrane wereld. Waar voorheen uitgegaan werd van kleine, naar binnen gerichte sociaal-economische eenheden die in relatieve afzondering van elkaar functioneerden, wordt er tegenwoordig vooral gedacht in termen van interconnectiviteit. Binnen dit nieuwe paradigma is veel aandacht voor immer uitdijende netwerken, mobiliteit, veranderlijkheid en culturen die niet meer plaatsgebonden zijn. Deze nieuwe denktrant heeft enerzijds veel verhelderende inzichten opgeleverd, anderzijds heeft interconnectiviteit bijna de status van een nieuw evangelie bereikt waarbij kritische reflectie soms ontbreekt. Het voorgestelde onderzoeksproject wil een stap terug doen en heeft als doel het interconnectiviteitsparadigma van een meer solide, empirische basis te voorzien en beoogt tegelijkertijd een aantal belangrijke uitgangspunten van dit paradigma kritisch te bekijken.

Een ander probleem van het interconnectiviteitsdenken is dat door de nieuwe aandacht voor de grotere, Mediterrane netwerken en de rol van de zee als communicatiemiddel lokale en regionale netwerken en communicatie en verkeer over land uit beeld zijn verdwenen. Daarom is een ander belangrijk doel van dit project om het blikveld van het interconnectiviteitsperspectief te verbreden. Geanalyseerd wordt hoe interconnectiviteit functioneerde op een kleinere, lokale of regionale schaal, hoe het verkeer over land verliep, en hoe continentale met maritieme netwerken verbonden waren. Daarbij is er ook aandacht voor heel basale aspecten van interconnectiviteit, zoals hoe mensen zich in het verleden door het landschap verplaatsten en hoe ze zich oriënteerden op zee.

Het is onmogelijk om deze aspecten voor het Mediterrane gebied als geheel te bestuderen. Daarom is gekozen voor een specifiek onderzoeksgebied dat als case-study kan

dienen. Gekozen is voor het zuidelijke deel van het eiland Euboia in Griekenland. De project-aanvrager doet sinds 2010 archeologische opgravingen in Karystos-Plakari in Zuid-Euboia, waarbij een van de onderzoeksdoelstellingen is om lokale, regionale en bovenregionale netwerken in kaart te brengen. Het voorgestelde onderzoek maakt het mogelijk deze problematiek op een grotere ruimtelijke schaal en gedurende een langere tijdsperiode te bestuderen (ca. 4000-1 v.Chr.). Zuid-Euboia vormt een zeer geschikt studiegebied omdat het aan een knooppunt van zeewegen ligt en omdat stelsels van antieke landwegen relatief goed bewaard zijn. Verder zijn door m.n. veldverkenningen vele honderden vindplaatsen bekend, variërend van geïsoleerde boerderijen uit de klassieke periode tot versterkte nederzettingen uit de prehistorie.

Het onderzoek bevat drie subprojecten die door promovendi worden uitgevoerd. In de eerste fase van het project werken zij nauw samen om de reeds bekende nederzettingen in te voeren in een database, die gekoppeld is aan een GIS. Binnen subproject 1 wordt dit databestand vervolgens geoptimaliseerd met behulp van zgn. *remote sensing*: gebruikmakend van historische luchtfoto's, satellietopnamen en laser scanning data, maar ook luchtfoto's die speciaal voor dit doel vanuit een klein vliegtuig of door een *drone* gemaakt zijn, kunnen meer vindplaatsen worden gelokaliseerd. Vervolgens worden ruimtelijke patronen in de locatie en verspreiding van nederzettingen geanalyseerd. Deze laten bijvoorbeeld zien of en hoe kustgebieden en binnenland met elkaar verbonden zijn en of er in verschillende perioden sprake is van oriëntatie op de zee of juist op het binnenland.

Subproject 2 is gericht op het opsporen van landroutes en reconstrueren van wegensystemen, o.a. met behulp van een *drone*. Gekeken wordt of de loop van wegen gerelateerd is aan het natuurlijke of juist aan het culturele landschap, dat gevormd wordt door betekenisvolle plaatsen, zoals heiligdommen of begraafplaatsen. Dit moet inzichtelijk maken wat het belang van interconnectiviteit op land is en hoe deelgebieden in de verschillende perioden 'interconnected' of juist geïsoleerd waren.

In subproject 3 worden zeeroutes rond Zuid-Euboia gereconstrueerd. Niet alleen wordt gekeken naar de rol van de natuurlijke omgeving (maritiem landschap, zeestromen, windpatronen etc.), maar ook worden de culturele dimensies van het maritieme landschap in kaart gebracht aan de hand van mythen en verhalen die verbonden zijn met de zee of kustlocaties. Deze functioneren als *mental maps* voor oriëntatie op zee en routebepaling. De zichtbaarheid van deze plaatsen is daarbij van belang. Deze wordt bepaald aan de hand van geavanceerde computermodellen die TNO voor de Nederlandse marine gemaakt heeft.

In een afrondende synthese door de projectaanvrager worden de resultaten van de deelprojecten aan elkaar gerelateerd. Wat betreft Zuid-Euboia wordt een reconstructie gemaakt van diachrone ontwikkelingen in interconnectiviteit via land en zee en worden verschillen in intensiteit in interconnectiviteit bepaald per periode of deelgebied. Vervolgens wordt besproken op welke punten het project het Mediterrane interconnectiviteitsdenken van een meer solide, empirische basis voorziet en op welke punten het bijstelling behoeft. Verder wordt bepaald welke rol lokale en regionale communicatiesystemen en verkeer over land kunnen spelen binnen het bredere kader van Mediterrane interconnectiviteit.

Als laatste wordt de verzamelde kennis gedeeld met erfgoedinstanties ter plaatse. Via een speciaal te creëren digitale omgeving worden databestanden en kaarten toegankelijk gemaakt. Deze informatievoorziening zal gelden als een belangrijk nieuw instrument ten behoeve van het behoud en beheer van de archeologische vindplaatsen in het studiegebied.

16. Research budget

Some preliminary remarks:
Some of the budget will be spent on the purchase of a fixed-wing drone and a camera and lenses. These items will be used intensively during the entire research period and are indispensible means to carry out the field research. It is likely that at the end of the project the items will be written off for depreciation.

A. Personnel

Type of appointment	Duration	Percentage	Salary	Bench fee	
Sub-project 1: PhD researcher	4 years	1.0 fte	€201,600	€5,000	**€ 206,600**
Sub-project 2: PhD researcher	4 years	1.0 fte	€201,600	€5,000	**€ 206,600**
Sub-project 3: PhD researcher	4 years	1.0 fte	€201,600	€5,000	**€ 206,600**
Subtotal A, personnel and bench fee					**€ 619,800**

B. Other costs of personnel

Type of appointment	Name	Commence-ment date	Duration	Per-centage	Standard amount
Replacement[1]	J.P. Crielaard	1-9-2017	2 years	0.4 fte	**€ 40,000**
Subtotal B, other personnel					**€ 40,000**

[1] The applicant requests a grant to cover the costs of replacement to take over the non-research part of his duties during the period that the applicant works on the synthesis.

C. Internationalization

Internationalization	Break down and itemize	Year	Amount
Conference	Venue: Netherlands Institute at Athens	4	**€ 6.300**
Subtotal C. Internationalization			**€ 6.300**

D. Materials

Materials	Break down and itemize	Year	Amount
Fieldwork	1. 11 Fieldtrips by PhD researchers, 3 by applicant: a Travel	1-4	€ 6,500
	b Accommodation	1-4	€ 4,000
	c Car rent	1-4	€ 5,000
	2. Drone [1]	1	€ 14,500
	3. Hiring small aircraft (18 flights) [2]	1-3	€ 2,500
	4. Cameras and lenses [3]	1-3	€ 2,600
	Subtotal		**€ 35,100**
Other, *viz.*	1. Satellite images	1	€ 1,000
	2. Historical air photographs	1	€ 1,200
	3. Various maps	1	€ 600
	4. Correction of English manuscripts: 3 PhD theses, 1 synthesis and 2 articles		€ 3,000
	Subtotal		**€ 5,800**
Subtotal D, Fieldwork / other cost			**€ 40,900**

[1] Zephyr2UAV (fixed wing, with gyro stabilized digital camera); budget for this item includes spare parts / contingencies.
[2] Hiring small aircraft (e.g. Cessna C172) for aerial survey together with René Pelegrin (Leuven University) from Stavros/Ag. Thomas-Ven. Airport, Athens at € 420 for a 3h. flight.
[3] Semiprofessional camera and lens, camera geotagger, and low-cost modification for near- infrared photography.

E. Knowledge utilization

	Break down and itemize	Year	Amount
Knowledge utlization activities	1. SPINlab: development SDI	1	€ 20,000
	2. SPINlab: development knowledge hub	4	€ 15.000
	3. Workshop Athens	4	€ 5,000
	4. Hosting costs SDI and knowledge hub (5 years after end of project)	-	€ 3,000
Subtotal D. Knowledge utilization			**€43,000**

Total programme budget

Subtotal A personnel and bench fee	€ 619,800
Subtotal B replacement	€ 40,000
Subtotal C internationalization	€ 6,300
Subtotal D materials	€ 40,900
Subtotal E knowledge utilization	€ 43,000
Total amount requested	**€ 750.000**

Appendix: Selected biography

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