



## RESEARCH ACTIVITY

### FINAL REPORT

REPORTING PERIOD 01.10.2016.–30.04.2017.

Contract No.	<b>NFI/R/2014/062</b>
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**Title of the Project:**

**Technology transfer in the processing of mineral resources in earlier times**

**Submitted by the University of Latvia**

**In consortium with:**

**Museum of Cultural History, Universitetet i Oslo**

<b>Type of research</b>	X Basic Applied
<b>Thematic area</b>	X Social sciences and humanities Health
<b>Sub-field</b>	H340 Archaeology H341 Prehistory H230 Modern History H220 Medieval history

## II. Implementation progress

### 2.1. INDICATORS

#### Mandatory outcomes and outputs generated by the Project

Outcome 1: Increased research cooperation between Norway and the Beneficiary State	<i>Outcome indicator:</i> Number of joint publications authored by project participants from both BS and DS (published or accepted for publication) <u>(REFERS TO 1.2. in Project Application)</u> <b>Target total 1</b> <b>Actual Interim Report 1 0</b> <b>Actual Interim Report 2 0</b> <b>Actual Final Report 5</b> <b>ACTUAL TOTAL ALL REPORTS 5</b>
	<i>Output 1:</i> Institutional cooperation at the level of higher education and science between Latvia and Norway <i>Output 1 indicator:</i> Number of cooperating research institutions within the programme <b>Target total 2</b> <b>Actual Interim Report 1 2</b>

	<p><b>Actual Interim Report 2 2</b>  <b>Actual Final Report 2</b>  <b>ACTUAL TOTAL ALL REPORTS 2</b></p>
Outcome 2: Strengthened research capacity in the Beneficiary State and increased application of research results through research cooperation between Norway and the Beneficiary State	<p><i>Outcome indicator:</i> Number of published international peer reviewed publications (<u>REFERS TO 1.1. in Project Application</u>)  <b>Target total 3</b>  <b>Actual Interim Report 1 0</b>  <b>Actual Interim Report 2 1</b>  <b>Actual Final Report 1</b>  <b>ACTUAL TOTAL ALL REPORTS 2</b>  <b>(A greater than planned number of publications have been authored by experts from both BS and DS, and so are counted in 1.2 rather than 1.1)</b></p>
	<p><i>Output 1:</i> Increased application and dissemination of research results internationally  <i>Output 1 indicator:</i> Number of international publications in preparation  <b>Target total 0</b>  <b>Actual Interim Report 1 0</b>  <b>Actual Interim Report 2 4</b>  <b>Actual Final Report 0</b>  <b>ACTUAL TOTAL ALL REPORTS 0</b>  <b>(all publications completed)</b></p>
	<p><i>Output 2:</i> Increased training of early stage researchers  <i>Output 2 indicators:</i>  2.1.Number of PhD students and postdocs trained within the projects  <b>Target total 2</b>  <b>Actual Interim Report 1 2</b>  <b>Actual Interim Report 2 4</b>  <b>Actual Final Report 4</b>  <b>ACTUAL TOTAL ALL REPORTS 4</b>  2.2.Percentage of female PhD students and postdocs trained within the projects  <b>Target total 50%</b>  <b>Actual Interim Report 1 50%</b>  <b>Actual Interim Report 2 75%</b>  <b>Actual Final Report 75%</b>  <b>ACTUAL TOTAL ALL REPORTS 75%</b></p>
	<p><i>Output 3:</i> Number of scientific publications (published or approved publication) (<u>REFERS TO 1.3. in Project Application</u>)  <i>Output 3 indicator:</i> Number of scientific publications:  <b>Target total 1</b>  <b>Actual Interim Report 1 0</b>  <b>Actual Interim Report 2 0</b>  <b>Actual Final Report 2</b>  <b>ACTUAL TOTAL ALL REPORTS 2</b></p>

Outcome 2: Greatly enhanced knowledge base on Stone Age lithic technology in Latvia as a Beneficiary State in the general Northern European context, with potential for comparison with Norway & neighbouring regions and for evaluating role of	<p>Output 2.1: Database of Stone Age lithic material supplemented with results of technological analysis  Output 2.1 indicator: Number of databases 1  <b>Target total 1</b>  <b>Actual Interim Report 1 0</b>  <b>Actual Interim Report 2 0</b>  <b>Actual Final Report 1</b>  <b>ACTUAL TOTAL ALL REPORTS 1</b></p>
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technology transfer	
	<p>Output 2.2: Report of main findings of lithic technology study</p> <p>Output 2.2 indicator: Number of reports 1</p> <p><b>Target total 1</b>  <b>Actual Interim Report 1 0</b>  <b>Actual Interim Report 2 0</b>  <b>Actual Final Report 1</b>  <b>ACTUAL TOTAL ALL REPORTS 1</b></p>
<p>Outcome 3: First comprehensive knowledge base of iron production technologies in Latvia as a Beneficiary State, from prehistory to Early modern Era, offering possibility of regional comparisons and for evaluating role of technology transfer</p>	<p>Output 3.1: General database of iron production sites and technologies in Latvia, prehistoric to early modern</p> <p>Output 3.1 indicator: Number of databases 1</p> <p><b>Target total 1</b>  <b>Actual Interim Report 1 0</b>  <b>Actual Interim Report 2 1</b>  <b>Actual Final Report 0</b>  <b>ACTUAL TOTAL ALL REPORTS 1</b></p>
	<p>Output 3.2: GIS database of ironworking sites of the former Duchy of Courland and Semigallia (W and S Latvia)</p> <p>Output 3.2 indicator: Number of databases 1</p> <p><b>Target total 1</b>  <b>Actual Interim Report 1 0</b>  <b>Actual Interim Report 2 1</b>  <b>Actual Final Report 0</b>  <b>ACTUAL TOTAL ALL REPORTS 1</b></p>
	<p>Output 3.3: Report of main findings of analysis of evidence on prehistoric and early historical ironworking in Latvia collected in databases output 3.1 and 3.2</p> <p>Output 3.3 indicator: Number of reports 1</p> <p><b>Target total 1</b>  <b>Actual Interim Report 1 0</b>  <b>Actual Interim Report 2 1</b>  <b>Actual Final Report 0</b>  <b>ACTUAL TOTAL ALL REPORTS 1</b></p>
	<p>Output 3.4: Report on excavation of early modern ironworking site in Latvia</p> <p>Output 3.4 indicator: Number of reports 1</p> <p><b>Target total 1</b>  <b>Actual Interim Report 1 0</b>  <b>Actual Interim Report 2 0</b>  <b>Actual Final Report 1</b>  <b>ACTUAL TOTAL ALL REPORTS 1</b></p>
	<p>Output 3.5: Report of main results and conclusions from analysis of samples from iron production sites in Latvia</p> <p>Output 3.5 indicator: Number of reports 1</p>

	<p><b>Target total 1</b>  <b>Actual Interim Report 1 0</b>  <b>Actual Interim Report 2 0</b>  <b>Actual Final Report 1</b>  <b>ACTUAL TOTAL ALL REPORTS 1</b></p>
Outcome 4: First comprehensive dataset on this class of archaeological sites in Latvia as a Beneficiary State, facilitating the scheduling and protection of sites as cultural monuments.	<p>Output 4.1: Report on field survey of early historical ironworking sites in Latvia (also submitted to the State Inspectorate for Heritage Protection of the Republic of Latvia)</p> <p>Output 4.1 indicator: Number of reports 1</p> <p><b>Target total 1</b>  <b>Actual Interim Report 1 0</b>  <b>Actual Interim Report 2 0</b>  <b>Actual Final Report 1</b>  <b>ACTUAL TOTAL ALL REPORTS 1</b></p>
Outcome 5: Strengthened research capacity in experimental archaeology in Latvia as a Beneficiary State and supplementation of technical expertise on Iron Age smelting technology; increased public awareness and understanding of archaeology, especially experimental archaeology	<p>Output 5.1: Reconstructed iron smelting furnace (at Ventspils Museum)</p> <p>Output 5.1 indicator: Number of reconstructions 1</p> <p><b>Target total 1</b>  <b>Actual Interim Report 1 0</b>  <b>Actual Interim Report 2 1</b>  <b>Actual Final Report 0</b>  <b>ACTUAL TOTAL ALL REPORTS 1</b></p>
	<p>Output 5.2: Report on experimental reconstruction and operation of iron smelting furnace</p> <p>Output 5.2 indicator: Number of reports 1</p> <p><b>Target total 1</b>  <b>Actual Interim Report 1 0</b>  <b>Actual Interim Report 2 0</b>  <b>Actual Final Report 1</b>  <b>ACTUAL TOTAL ALL REPORTS 1</b></p>
Outcome 6: Broadened research cooperation in the sub-fields of archaeology and history between Norway and Latvia, with exploration of the potential for further joint research in future	<p>Output 6.1: Scientific programme of the joint workshop on technology transfer</p> <p>Output 6.1 indicator: Number of programmes 1</p> <p><b>Target total 1</b>  <b>Actual Interim Report 1 0</b>  <b>Actual Interim Report 2 0</b>  <b>Actual Final Report 1</b>  <b>ACTUAL TOTAL ALL REPORTS 1</b></p>
	<p>Output 6.2: Minutes of the closing discussions of the sessions and joint closing discussion of the workshop</p> <p>Output 6.2 indicator: Number of minutes 1</p> <p><b>Target total 1</b>  <b>Actual Interim Report 1 0</b>  <b>Actual Interim Report 2 0</b>  <b>Actual Final Report 1</b>  <b>ACTUAL TOTAL ALL REPORTS 1</b></p>

Outcome 7: Development of human resources in research in Latvia as a Beneficiary State and in Norway.	Output 7.1: Participation by doctoral student in research (Latvia) Output 7.1 indicator: Number of doctoral students 1 <b>Target total 1</b> <b>Actual Interim Report 1 2</b> <b>Actual Interim Report 2 2</b> <b>Actual Final Report 2</b> <b>ACTUAL TOTAL ALL REPORTS 2</b>
	Output 7.1: Participation by postdoctoral researcher in project (Norway) Output 7.1 indicator: Number of post-doctoral researchers 1 <b>Target total 1</b> <b>Actual Interim Report 1 0</b> <b>Actual Interim Report 2 0</b> <b>Actual Final Report 1</b> <b>ACTUAL TOTAL ALL REPORTS 1</b>

## 2.2. DESCRIPTION OF PROJECT ACTIVITIES

### Work package No. 1: Analysis of lithic blade technology during the Stone Age in Latvia

Progress reached so far: 100%

Description (work performed during the reporting period):

The data collected on lithic collections from Final Palaeolithic, Mesolithic and Neolithic sites held at the National History Museum of Latvia and at the Institute of History, University of Latvia has been tabulated and analysed, preparing the database and report.

**Key expert:** Almut Schülke

**Other experts involved:** MCH: 1) Inger Marie Berg Hansen, 2) Hege Damlien; from UL: 1) Valdis Bērziņš, 2) Ilga Zagorska, 3) doctoral student Mārcis Kalniņš

**Equipment:** computer hardware & software, photographic, 3D scanning equipment (provided by experts' own institutions)

**Output 2.1.: value to be reached: 1 month due: 21. Current value: 1**

(link: <https://drive.google.com/open?id=0B6d7BqtvsGjKdG95c184bUVRbVk>)

**Output 2.2.: value to be reached: 1 month due: 21. Current value: 1**

(link: <https://drive.google.com/open?id=0B6d7BqtvsGjKTjVlcnBpTFp2Zmc>)

### Work package No. 2: Systematisation and analysis of data on prehistoric and early historical iron production in Latvia

Progress reached so far: 100 %

Description (work performed during the reporting period):

Already completed in reporting period 2

**Key expert:** Mārīte Jakovļeva

**Other experts involved:** from MCH: 1) Bernt Rundberget, 2) Jan Henning Larsen; from UL: 1) Andrejs Vasks, 2) Armands Vijups, 3) Andris Šnē, 4) Gvido Straube, 5) Valda Kļava, 6) Dr Viktorija Bebre, 7) Inga Doniņa, 8) Rūdolfs Brūzis, 9) Valdis Bērziņš, 10) Dita Auziņa (technical personnel)

**Equipment:** Photographic equipment, computer hardware and software provided by the experts' own institutions (GIS database using ArcGIS package at UL)

**Output 3.1.: value to be reached: 1 month: 15 Current value: 1**

(link: <https://drive.google.com/open?id=0B6d7BqtvsGjKbVd3V3VUODNiV2M>)

**Output 3.2.: value to be reached: 1 month: 15 Current value: 1**

(link: <https://drive.google.com/open?id=0B6d7BqtvsGjKSGJYN1FQNDJtdVvk>)

**Output 3.3.: value to be reached: 1 month: 15 Current value: 1**

(links: English - <https://drive.google.com/open?id=0B6d7BqtvsGjKOTU0X3psMkIzODA>

Latvian - <https://drive.google.com/open?id=0B6d7BqtvsGjKc0tpUjdsTDFSRnc>)

### **Work package No. 3: Survey and field investigation of historical iron production sites**

Progress reached so far: 100%

#### Description

The reports on the ironworks survey and on the excavation of the Asari ironworks site have been completed.

**Key expert:** Rūdolfis Brūzis

**Other experts involved:** from MCH: 1) Bernt Rundberget, 2) Jan Henning Larsen; 3) Ingar Mørkestøl Gundersen; from UL: 1) Mārīte Jakovļeva, 2) Inga Doniņa 3) Viktorija Bebre 4) Dita Auziņa (technical personnel), 5) Armands Vijups, 6) Mārcis Kalniņš (PhD); 15 student excavation assistants

Equipment: Field equipment for survey and excavation provided by UL.

Other: Transport and accommodation during fieldwork, bus hire for student transport during excavation

**Output 3.4.: value to be reached: 1 month due: 21. Current value: 1**

(link: <https://drive.google.com/open?id=0B6d7BqtvsGjKcEpFT3o0S0JkdVU>)

**Output 4.1.: value to be reached: 1 month due: 21. Current value: 1**

(link: <https://drive.google.com/open?id=0B6d7BqtvsGjKNjYzc1N0VHV1Sms>)

### **Work package No. 4: Analysis and interpretation of samples from iron production sites**

Progress reached so far: 100%

#### Description

X-ray diffraction, X-ray fluorescence, spark optical emission spectrometry, scanning electron microscope and metallographic analysis of samples of iron ore, iron and slag from prehistoric ironworking sites and from the excavated Asari ironworks site has been carried out, tabulating, analysing and interpreting the results.

In the frame of the work package, Norwegian experts B. Rundberget and J. H. Larsen visited Latvia (27.02.–01.03.2017) to assess the results of analyses, discuss them with the Latvian experts and decide on the utilisation of these results in the publications.

**Key expert:** Bernt Rundberget

**Other experts involved:** Jan Henning Larsen

Equipment: -

Other: subcontracting – laboratory analyses.

**Output 3.5.: value to be reached: 1 month due: 21 Current value: 1**

(link: <https://drive.google.com/open?id=0B4oEoDbLvqahalRGYm1YUDFqR0k>)

**Work package No. 5: Experimental reconstruction of bloomery furnace**

Progress reached so far: 100%

Description

A report has been written detailing the preparations for the experiment, construction of the bloomery furnace, the course of the experiment and the conclusions.

**Key expert:** Armands Vijups

**Other experts involved:** from MCH: 1) Jan Henning Larsen; from UL: 1) Andrejs Vasks, 2) Andris Šnē

Equipment: Photographic and other recording equipment for the experimentation will be provided by the experts' own institutions.

Other: Experimental site will be made available at Ventpils Museum, Latvia.

Other: Subcontract – experimental archaeology expert in iron-smelting reconstruction: T.H.B. Haraldsen

Experimental site made available at Ventpils Museum, Latvia.

**Output 5.1.: value to be reached: 1 month due: 18 Current value: 1**

(link: <https://drive.google.com/open?id=0B6d7BqtvsGjKMWZnNTZPYjdPb2c>)

**Output 5.2.: value to be reached: 1 month due: 19 Current value: 1**

(link: <https://drive.google.com/open?id=0B6d7BqtvsGjKQ2pQRWRRMGk2Q00>)

**Work package No. 6: Joint workshop on the technology transfer in the processing of mineral resources**

Progress reached so far: 100%

Description

The joint workshop was held at the University of Latvia on 24.–28.10.2016. It included a conference open to the public on 25.10 entitled “Flint and iron in the course of history: technology transfer in the processing of mineral resources in earlier times”, presenting 14 papers on research carried out in the project on lithic technology and iron production, and concluding with a demonstration of flint knapping techniques. The workshop also included a meeting of the project experts, group discussions on the sub-themes of the project and a trip by the experts studying lithic technology to view Stone Age sites in western Latvia that have provided archaeological collections studied in the frame of the project.

**Key expert:** Andris Šnē

**Other experts involved:** from UL: 1) Andrejs Vasks, 2) Armands Vijups, 3) Gvido Straube, 4) Valda Kļava, 5) Mārcis Kalniņš (Phd student), 6) Ilga Zagorska, 7) Mārīte Jakovļeva, 8) Rūdolfs Brūzis, 9) Viktorija Bebre, 10) Valdis Bērziņš, 11) Inga Doniņa, 12) Dita Auziņa (technical personnel); from MCH: 1) Almut Schülke, 2) Bernt Rundberget, 3) Inger Marie Berg-Hansen; 4) Hege Damlien; 5) Lucia Koxvold; 6) Svein Vatsvåg Nielsen; 7) Jan Henning Larsen; 8) Ingar Mørkestøl Gundersen.

Equipment: rooms and presentation equipment provided by UL

Other: Workshop refreshments, venue etc. organised and paid for by UL.

**Output 6.1.: value to be reached: 1 month due: 20 current value: 1**

(link: workshop programme -

<https://drive.google.com/open?id=0B6d7BqtvsGjKaVQ3ZVY3cE90RHM>

conference programme -

<https://drive.google.com/open?id=0B6d7BqtvsGjKVjVURG1tS1FrWjQ>)

**Output 6.2.: value to be reached: 1 month due: 20 current value: 1**

(link: <https://drive.google.com/open?id=0B6d7BqtvsGjKM0stQk96VTR4XzQ>)

### **Work package No. 7: Preparation and submission of joint publications**

Progress reached so far: 100%

#### Description

A total of 8 publications have been prepared and submitted, 6 of them to international journals and 2 to a Latvian journal (see section 2.7). These will be published or accepted for publication by 29.12.2017.

Three of the publications in English and one in Latvian are on the subject of Stone Age lithic technology in Latvia.

One of the publications in English and one in Latvian are on the subject of prehistoric iron production in Latvia.

Two of the publications in English are on the subject of iron production in Latvia during the historical period.

#### **Key expert: Valdis Bērziņš**

**Other experts involved:** from UL: 1) Andrejs Vasks, 2) Armands Vijups, 3) Andris Šnē, 4) Gvido Straube, 5) Valda Kļava 6) doctoral student: Mārcis Kalniņš (PhD), 7) Ilga Zagorska, 8) Mārīte Jakovļeva, 9) Rūdolfs Brūzis; 10) Viktorija Bebre, 11) Inga Doniņa, 12) Dita Auziņa (technical personnel); from MCH: 1) Almut Schülke, 2) Bernt Rundberget, 3) Jan Henning Larsen, 4) Ingar Mørkestøl Gundersen, 5) Inger Marie Berg-Hansen, 6) Hege Damlien.

Equipment: Computer hardware and software provided by the experts' respective institutions.

#### **Link to publication files and submission confirmation:**

<https://drive.google.com/open?id=0B6d7BqtvsGjKanNPWjc3M295bWc>

**Output 1.1.: value to be reached: 3 month due: 24 Current value: 2**

**Output 1.2.: value to be reached: 1 month due: 24 Current value: 5**

**Output 1.3.: value to be reached: 1 month due: 24 Current value: 2**

**Output 7.1. (doctoral students): value to be reached: 1 month due: 23 Current value: 4**

**Output 7.1. (postdoctoral students): value to be reached: 1 month due: 23 Current value: 1**



### 2.3. SUMMARY OF PROJECT ACTIVITIES (*work performed during reporting period*) – PUBLISHABLE PART

During the final reporting period a five-day project workshop took place in Riga, during which an international scientific conference “Flint and iron in the course of history: technology transfer in the processing of mineral resources in earlier times” was held as an event open to the public, presenting the main results of the project.

The analysis of ore, slag and metal samples in the frame of iron production studies was completed, as were the project databases and reports.

Eight publications presenting the results and conclusions of research on lithic technology and iron production were prepared and submitted: six of them for international journals, and two for a Latvian journal. Five of these publications were written jointly by the Latvian and Norwegian experts.

### 2.4. TIME SCHEDULE (*actual*)

No	Title of Work package	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
		2015									2016									2017				
		J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A
		1st REPORT									2nd REPORT						FINAL REPORT							
1	Analysis of lithic blade technology during the Stone Age in Latvia	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2	Systematisation and analysis of data on prehistoric and early historical iron production in Latvia	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X							
3	Survey and field investigation of historical iron production sites											X	X	X	X	X	X	X	X	X	X	X		
4	Analysis and interpretation of samples from iron production sites											X	X	X	X	X	X	X	X	X	X	X		
5	Experimental reconstruction of bloomery furnace													X	X	X	X	X	X					
6	Joint workshop on the technology transfer in the processing of mineral resources															X	X	X	X	X				
7	Preparation and submission of joint publications														X	X	X	X	X	X	X	X	X	X

### 2.5. DISSEMINATION ACTIVITIES of RESEARCH RESULTS

No	Activity	Description (topic, aim, communication tools)	Target groups	Time-frame	Venue	Organiser	Partners/parties involved	Contact person	Assessment of the activities
None in reporting period.									

### 2.6. PUBLICITY MEASURES

No	Activity	Description (topic, aim, communication tools)	Target groups	Date and place	Organiser	Partners/parties involved	Contact person	Assessment of the activities
1	Conference “Flint and iron in the course of history: technology transfer in the processing of mineral resources in earlier times”	14 papers presented on research in the frame of the project on lithic technology and iron production, concluding with demonstration of flint knapping	General public, media, community of professional archaeologists, museum staff, students	25.10.2016	Project promoter	Partner MCH	Andris Šnē	Attendance register, number of press/radio/TV/internet reports
2	Project closing event	Information about project results, conclusions and publications in preparation	Media, community of professional archaeologists, museum staff, students	26.04.2017	Project promoter		Andris Šnē	Attendance register, number of press/radio/TV/internet reports
3	Dedicated	Information about	General	duration of the	Project	Partner	Valdis Bērziņš	web traffic

	web pages and general information on website	the project, its progress, achievements and results; information about cooperation between partners; information about project publicity	public, media	project; Dedicated web pages: <a href="http://www.lvi.lv/techtrans/en/start.html">http://www.lvi.lv/techtrans/en/start.html</a> General information: <a href="http://www.lu.lv/par/projekti/eez-norvegija/petnieciba/tehnologiju-parnese/">http://www.lu.lv/par/projekti/eez-norvegija/petnieciba/tehnologiju-parnese/</a>	promoter	MCH		statistics
4	Project Facebook profile	highlights of project activities and results, comments	General public, media	duration of the project <a href="http://www.facebook.com">www.facebook.com</a>	Project promoter		Mārcis Kalniņš	No. of likes, comments

EEA and Norway Grants 2009-2014  
Programme LV05  
“Research and Scholarship Programme”

## 2.7. SCIENTIFIC PUBLICATIONS

No	Title	Authors	Name of journal	Citation index	Submitted/ Accepted/ Published	Link (if relevant)
<b>Output 1.1: Number of internationally refereed scientific publications – value: 2</b>						
1.	Priedaine: a Neolithic site at the head of the Gulf of Riga. 23: 12–37	V. Bērziņš, A. Ceriņa A., M. Kalniņš, L. Lōugas, H. Lübke, J. Meadows	Archaeologia Baltica (Vol. 23: 12–37)	-	published	<a href="http://journals.ku.lt/index.php/AB/issue/view/87/showToc">http://journals.ku.lt/index.php/AB/issue/view/87/showToc</a>
2.	From archive records to airborne laser scanning: the potential of an interdisciplinary approach in the study of 16th–17th century iron production and ironworking in Vidzeme (the example of Ropaži Manor)	V.Kļava, G.Straube, R.Siliņa-Piņķe, E.Guščika, V.Bērziņš, U.Urtāns, R.Upmalis, D.Bērziņš.	Journal of Baltic Studies	SNIP (2015) 0.496; SJR (2015) 0.224	submitted	<a href="https://drive.google.com/drive/folders/0B6d7BqtvsGjKRWlzMjAzbUhJS2s">https://drive.google.com/drive/folders/0B6d7BqtvsGjKRWlzMjAzbUhJS2s</a>
<b>Output 1.2: Number of scientific publications co-authored by one or more researcher in Latvia together with researchers from Norway – value: 5</b>						
1.	Technological trajectories and social networks in Stone Age Latvia 10,500–2900 BC	I.M.Berg-Hansen, H.Damlien, M.Kalniņš, I.Zagorska, A.Schülke, V.Bērziņš.	Cambridge Archaeological Journal	SNIP (2015) 0.699; SJR (2015) 0.743	submitted	<a href="https://drive.google.com/drive/folders/0B6d7BqtvsGjKYmhYdDM3dGZoUFk">https://drive.google.com/drive/folders/0B6d7BqtvsGjKYmhYdDM3dGZoUFk</a>
2.	A technological crossroads: exploring diversity in the pressure blade technology of Mesolithic Latvia	H.Damlien, I.M.Berg-Hansen, I.Zagorska, M. Kalniņš, S.V.Nielsen, L.U.Koxvold, V.Bērziņš, A.Schülke	Oxford Journal of Archaeology	SNIP (2015) 1.508; SJR (2015) 0.807	submitted	<a href="https://drive.google.com/drive/folders/0B6d7BqtvsGjKVUFrN2JfZ3IUWU0">https://drive.google.com/drive/folders/0B6d7BqtvsGjKVUFrN2JfZ3IUWU0</a>
3.	The bloomery in Latvia – Iron Age and medieval technologies in a comparative study. Historical Metallurgy	B.Rundberget, A.Vasks, J.H.Larsen, V.Bebre, R.Brūzis, I.Doniņa, I.M.Gundersen, A.Vīksna	Historical Metallurgy	-	submitted	<a href="https://drive.google.com/drive/folders/0B6d7BqtvsGjKaWhFaHVEcW1hREU">https://drive.google.com/drive/folders/0B6d7BqtvsGjKaWhFaHVEcW1hREU</a>
4.	Gone to smelt iron in Courland: technology transfer in the development of an early modern industry	M.Jakovļeva, D.Auziņa, R.Brūzis, I.M.Gundersen, B.Rundberget, V.Bebre, I.Doniņa, V.Kļava, G.Straube, V.Bērziņš, A.Vīksna, A.Actiņš, R.Meija, K.Popovs, R.Upmalis, A.Parfentev	Post-Medieval Archaeology	SNIP (2015) 0.341; SJR (2015) 0.196	submitted	<a href="https://drive.google.com/drive/folders/0B6d7BqtvsGjKREowc3E0WVZDa0U">https://drive.google.com/drive/folders/0B6d7BqtvsGjKREowc3E0WVZDa0U</a>

No	Title	Authors	Name of journal	Citation index	Submitted/ Accepted/ Published	Link (if relevant)
5.	The environmental impact of iron production. The case study of 17th-century iron production sites in the Duchy of Courland	D.Auziņa, M.Jakovļeva, V.Bērziņš, B.Rundberget, A.Pujāte, R.Upmalis	Holocene	JIF (2015/2016) 2.135; SNIP (2015) 0.765; SJR (2015) 1.407	submitted	<a href="https://drive.google.com/drive/folders/0B6d7BqtvGjKWlJGaHZ5VEJWXzg">https://drive.google.com/drive/folders/0B6d7BqtvGjKWlJGaHZ5VEJWXzg</a>
<b>Output 1.3: Number of scientific publications – value 2</b>						
1.	Krama apstrādes tehnoloģiju terminoloģija [Terminology of flint technology]	M.Kalniņš, I.Zagorska, V.Bērziņš.	Latvijas Vēstures Institūta Žurnāls	-	submitted	<a href="https://drive.google.com/drive/folders/0B6d7BqtvGjKTXZaRUZWelBuUmc">https://drive.google.com/drive/folders/0B6d7BqtvGjKTXZaRUZWelBuUmc</a>
2.	Dzelzs ieguve no purva rūdas: 2016.gada arheoloģiskā eksperimenta rezultāti Piejūras brīvdabas muzejā un tā priekšvēsture [Iron production from bog ore: the results of an archaeological experiment at the Open Air Museum of the Coast in 2016 and the lead-up to the experiment]	A.Vijups	Latvijas Vēstures Institūta Žurnāls	-	submitted	<a href="https://drive.google.com/open?id=0B6d7BqtvGjKdExGUXVmLW10ZU0">https://drive.google.com/open?id=0B6d7BqtvGjKdExGUXVmLW10ZU0</a>

**2.8. SYNERGY MEASURES (detailed description including measurable indicators)**

A Scholarship Activity application intended to provide synergy with this project did not receive funding.

However, two doctoral students of the Faculty of History and Philosophy of the University of Latvia and two doctoral students of the University of Oslo participating in the project have been able to significantly supplement their knowledge of their respective research areas in the frame of the project. During the reporting period, Inga Doniņa (University of Latvia) has gained experience through participation in WP2, contributing significantly to the general database of iron production sites and technologies in Latvia (outputs 3.1, 3.3) and has taken part in the ironworks survey and excavation. Mārcis Kalniņš (University of Latvia) has developed his knowledge of lithic technology through his involvement in compiling the database of Stone Age lithic material (output 2.1) and has developed his methodology through joint study of the material with the lithics experts from the Museum of Cultural History. Inger Marie Berg-Hansen and Hege Damlien (University of Oslo) have both supplemented their knowledge and experience through intensive study of lithic material as project experts in cooperation with the Latvian experts. Hege Damlien has defended her dissertation during the time of the project and has written one of the project articles in the frame of a post-doc position.

Excavation of the Asari ironworks site was organised as a 3-week field course for 15 students of the Faculty of History and Philosophy, during which they received comprehensive training in archaeological field methods.

**2.9. HORIZONTAL PRIORITIES**

Good governance: provision of data for scheduling heritage sites, helping to fill a major gap in heritage management in Latvia (direct positive impact)

Environmental considerations: focus on cultural heritage in relation to past resource use and landscape change (indirect impact)

Economic and social sustainability: strengthening of research collaboration and scientific capacity (direct impact); development of heritage values, with positive effect on local communities (indirect impact)

Gender equality: women researchers are well represented in the project, including among key experts.

**2.10. STUDENTS and POST-DOCS**

Names of Students and Post-Docs trained	Activities carried out (incl. reference to work package and bachelor/master/PhD theses drafted based on research results)
Inga Doniņa	Participation in archaeological fieldwork (ironworks survey and Asari excavation), supervising students in the field and writing field reports (WP3)
Mārcis Kalniņš	Collection and analysis of data on Stone Age lithic technology (WP1). Work within project contributes to PhD thesis on lithic technology of the Neolithic in the Baltic region. Also participated in archaeological excavation of ironworks (WP3).
Hege Damlien	Collection and analysis of data on Stone Age lithic technology; communicating expertise on lithic analysis (WP1). PhD awarded during the reporting period, project publication written in the frame of post-doc.
Inger Marie Berg-Hansen	Collection and analysis of data on Stone Age lithic technology; communicating expertise on lithic analysis (WP1). Work within the project contributes to PhD thesis on humans, technology and communication in the Early Mesolithic – technological strategies in a

pioneer settlement
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## 2.11. RISKS IDENTIFIED

Out- come no.	Outcome	Description of risk	Assessment	Risk mitigation plan
No risks identified in this reporting period				

## III. FINANCIAL SUMMARY *(attached in Excel file)*

Herewith I confirm that the information given in the report is true and corresponds to the actual work done within the Project and the copies added correspond the originals.

### Principal Investigator:

Name

Valdis Bērziņš

Signature

Date

### Executive Director, Faculty of History & Philosophy, University of Latvia:

Name

Inta Briede

Signature

Date

### Vice-Rector of Humanities and Educational Sciences, University of Latvia (legal representative of the Project Promoter):

Name

Ina Druviete

Signature

Date