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Part 1: Mobile-based digital infrastructure – the Living Danube Limes App

Part 2: Web-based digital infrastructure – the Living Danube Limes Database

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A stream of cooperation



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1. Introduction

The paper summarises the activities to develop common digital infrastructure of the Living Danube Limes project to increase visibility and dissemination of the information to the broad public. During the third and fourth period of the project the digital infrastructure, meaning the application for mobile phones and web-based version were developed. These were harmonised by using common database with all stored information.

2. Mobile-based digital infrastructure – the Living Danube Limes App

2.1. Definition of the app and its basic features of the app

The aim of the app is to present archaeological sites of Roman fortifications and settlements in the Danube region, with its relations to the museal clusters. The app is publishing remnants and found artefacts of Roman civilisation on the territory of 10 countries by the form of texts, images, interactive 3D models and virtual reality reconstructions. By this virtual presentation the touristic attractivity of these significant and fascinating places will be increased together with public cultural and historical knowledge about the Roman empire in the Danube region.

The data from 8 pilot archaeological sites and around 371 secondary sites were gathered by the online form till the publication of the application. These data are still possible to update and widen with additional sites as the application is connected to the structured database with its online interface with forms – content management system.

Application presents these locations on the interactive map, which is a basic motive of its user interface.

Interactive map	Shows the location and basic information of			
	archaeological sites and museums.			
Language localisation	The primary language of the app is English. The sites'			
	texts and historical texts and terms explanations are			
	also in the local languages of each project's country.			
Presented data	The information are presented by various data formats			
	as texts, images, videos, 3D models and VR			
	reconstructions stored in one database.			
VR reconstructions	The app contains VR reconstructions of 8 pilot sites.			
Device compatibility	The app is compatible with Android and iOS			
	smartphones, and it is downloadable through app stores			
	of those platforms.			
Communication and website	The app accessibility is communicated by the related			
implementation	one-paged website on livingdanubelimes.eu with links			
	to the app stores and interactive map with basic			
	information to each archaeological site.			
App sustainability	The app is sustained 5 years after the project. The			
	domain livingdanubelimes.eu is ensured for 10 years.			

Main functionalities of the application



Its sustainability is enabled by the easy-to-use content					
management	system,	stable	hosting	solution	and
continual upda	ates.				

2.2. Interactive map and user interface

The user interface is based on the interactive map built on OpenStreetMap with Mapbox API. On the graphically customed map, the locations of archaeological sites and ship are displayed by the specific icons.



Interface of the app with interactive map and top bar. Source: Authors

The map is zoomable to show different details. The points with numbers are grouped sites, the number indicates the number of sites hiding in the group. As the user is zooming the map the clusters of sites are exploded showing the individual sites. The app is displaying different type of each site by 9 different icons for castell, city, legionary fortress, road, vicus, watchtower, wooden fort, or question mark for not identified type of the site. The ship is displayed by the icon of the ship.





Zooming of the map - the clusters of sites are exploded showing the individual sites by different icons. Source: Authors

In the top of the interface the bar with few icons is displayed. The icon with two lines represents the so-called hamburger menu for mobile phones with Information about the project, Historical Information, Project Websites, ability for Scanning the QR codes on sites for VR reconstructions and downloading the offline data for visiting sites without the connection.



The hamburger menu in the top interface bar and Historical information texts

Source: Authors, PLUS

The second icon in the top interface bar is a magnifier, which is for searching for specific site by its name.

The third icon in the bar - the clock is the icon for choosing the time period. The archaeological sites are displayed in layers according to the Roman Limes historical periods in years. It is possible to change the currently displayed year period to show the Roman Limes development and changes by appearing and disappearing of the icons according to the chosen period.



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		200 CE		
ldsdorf Aödling		300 CE		/
Ome		400 CE		this map

By tapping the icon of the clock, the window for choosing of the year period is opened. Source: Authors

The last icon of Arrow in the top interface bar is the button for locating the user on the map by GPS localisation.

By touching the icon of the object on the map, the basic information with the title image is displayed with another optional data available as Basic information, media Gallery, Archaeological remains, Remarks and Virtual reconstructions. Each item is possible to open, containing its related media.





Tapping on the icon of the object on the map will display menu with additional information and media. Source: Authors

The map is using GPS localisation to show the current location of the user and will display also the location of the ship Danuvina Alacris on her cruise across the Danube.

Main functions of the map:

Customed interface	Customed interface built on OpenStreetMap and Mapbox		
	API, displaying objects by specific icons.		
Zooming	Shows different details of the archaeological sites according		
to the current zoom.			
Historical periods	Present development and changes by appearing and		
	disappearing of the icons according to the chosen period		
Display basic info	Touching the icon will display basic info and another		
optional media to examine.			
GPS localisation	Shows the current location of the user and the ship		

2.3. Language localisation

The primary language for the app is English. Selected information (Information of archaeological sites, Historical information & important terms) are in local national languages of the countries participating in the project. The media and virtual reconstructions are in English. Each partner provided the data of the sites in English and his national language. The language is possible to change by tapping on the icon of specific flag in upper right corner of the screen.



Menu with basic information about the site in English and local – Serbian language. Source: Authors

English	Primary language for the app
Partners' national languages	Archaeological site information, Historical information &
	important terms



2.4. Presented data

As the app presents various data in various media, the data are stored in the structured database, collected by all the partners of the project. The app is loading the data from this database online, which ensures that data can be updated or added later by the partners with content management system.

The app is displaying the information about the project, historical information and terms, and important links to the project websites. However, the main part of the presentation are data related to the archaeological sites and their museums.

These data are structured to basic information of archaeological sites, remains of the Roman objects on the sites, the image gallery, remarks and VR reconstructions.

The Basic Information represent structured textual data gathered about the site and information relevant to tourists as Location, Roman name, Type of the site, Dating, List of remains, Today's coverage, Museum with its link, Connection to the modern infrastructure.



Structured basic information about the site. Source: Authors, DUK

Gallery of media is displaying the images of the site in the intuitive image viewer with abilities to browse the images or zooming them.





Image gallery and browsing the images. Source: Authors

Under the menu item Gallery the item Archaeological remains is placed. This item provides information about the individual objects found on the site with its dating and images.



Left: Information to the specific remains on the site with objects' images. Right: Browsing the specific object's images. Source: Authors

Next item in the Site's menu are Remarks, which is a short textual description of the site provided by partners.



The last item in the list are Virtual reconstructions, which is currently available only for the pilot sites, but it can be enabled to other sites, when their models or virtual tours will be provided.

There are two types of VR reconstructions available through the app. When the site has a largescale virtual reconstruction (e.g. whole fort), the virtual reconstruction is presented as a virtual tour with spots made of spherical panoramas. The visitor can teleport between those spots and examine the virtual site. The second type of presentation was dedicated rather for small-scale objects found on the site. These objects are presented as zoomable and rotatable 3D objects within the app. The specific VR reconstruction could be also opened by the scanning of the QR code located on the site by the menu item Scan QR code in the main hamburger menu of the app.



Left: Virtual reconstruction of Lederata site within the app. Right: Presentation of small finds from Zeiselmauer. Source: Authors

A different information is displayed after tapping the icon of the ship. This information contains name of the ship, title image, short description, type of boat, number of rowing crew members, length, height of mast, material the ship is from, construction methods, number of members in the leadership team, normal speed, maximum speed and relink to the site of the ship on the official project website. The ship has its own Gallery with images.

Except the currently presented data, relevant mainly to the visitors and tourists, the additional data, relevant rather for archaeology experts were gathered and stored in the database through the online forms and are still possible to gather by content management system. These data are explorable and editable by web-based solution. According to the needs, these data can be also loaded to the app by the further updates.

Another currently hidden field in the site's menu are events happening on the site. This field contain name of the event, date of the event and title image of the event. These sites' events will be displayed when the required data will be updated in the database.

Updates of data and the sites' events are base for the push notification system which will be available in the planned update of the app.

Presented data briefly

About the project	Basic information about the project		
Historical information	Historical modules provided by the partners, available also in 7 national languages of participating countries		



Project websites	Links to the official project website, social media websites		
	and links to the app stores.		
Archaeological site data	Available by tapping the site's icon		
Basic information about the	Name of the site		
site	Location		
	Roman name of the site		
	Type of the site		
	Dating		
	List of remains		
	Today's coverage		
	Museum with its link		
	Connection to the modern infrastructure		
Gallery of each site	Media gallery containing images with image browser		
	freun ganery containing images with image browser		
Archaeological remains of	Name of the remain		
each site	Dating of the remain		
	Belonging to complex		
	Images of the remain with image browser		
Remarks of each site	Textual description about the site		
Virtual reconstructions of	Virtual reconstruction of the site as virtual tour of the site or		
pilot sites	3D models of the found objects		
Events happening on the	Name of the event		
site	Title image of the event		
	Dating of the event		
Data about the ship	Name of the ship		
	Title image		
	Short description		
	Type of boat		
	Number of rowing crew members		
	Length		
	Height of mast		
	Material of the ship		
	Construction methods		
	Number of members in the leadership team		
	Normal speed		
	Maximum speed		
	Link to the site of the ship on the official project website		
Gallery of ship's images	Media gallery containing images with image browser		

2.5. Data collecting and data hosting

Data were formerly collected by Google form and were stored in the structured Google Drive and by Excel sheets. These data were imported to the structured database, editable by online forms. The purpose of this content management system is to add and edit existing content easier by project partners. Nevertheless, the app is downloading these data online, it has also



the ability to download the partial data for the offline use on the locations without the connection.

2.6. Device compatibility

The app is compatible with Android and iOS smartphones, and it is downloadable through the app stores of those platforms.

2.7. Communication and website implementation

The app accessibility is communicated by the web-based solution with interface similar to the app's interface with its map interface and links to the app stores.

2.8. App sustainability

The app will be sustained at least 5 years after the project. Its sustainability is ensured by the easy-to-use web-based content management system for updating the content, stable hosting solution and push-notification system informing users about updates of the content and new events on the sites.

2.9. Links

IOS App Store:

https://apps.apple.com/sk/app/living-danube-limes/id1630798794

Google Play:

https://play.google.com/store/apps/details?id=io.ldl.symbios&gl=SK

3. Web-based digital infrastructure – the Living Danube Limes Database

3.1. Definition of the web-based digital infrastructure

The aim of the web-based digital infrastructure is to connect partners of all 10 participating countries by the common online system for gathering, sharing, editing, and publishing the database of archaeological sites of Roman fortifications and settlements in the Danube region, with their relations to the museal clusters.

The second but also very significant aim is to present these data and Living Danube Limes app through the website for the wide public in the form of map, texts, and images. By this online presentation the touristic attractivity of these significant and fascinating places will be increased together with public cultural and historical knowledge about the Roman empire in the Danube region.



The data from 8 pilot archaeological sites and around 371 secondary sites were gathered to the database. This database is still possible to update and widen with its online interface with easy-to-use forms – content management system. The database is directly connected to the Living Danube Limes app and publicly visible website.

The web-based digital infrastructure therefore consists of two parts:

The interface for wide public, which is very similar to the interface of the app for smartphones, based on the interactive map with all gathered locations.

The second interface is accessible through the login screen and it is dedicated for participating institutions in the project for adding, sharing and editing the content of the database.

Interface for wide public				
Interactive map	Shows the location and basic information of			
	archaeological sites and museums.			
Language localisation	The primary language of the website for public is			
	English. The archaeological sites' texts and historical			
	texts and terms explanations are also in the local			
	languages of each project's country.			
Presented data	The information are presented as texts, images and links			
	to other websites and app stores.			
Device compatibility	The website is compatible with wide range of devices			
	and is openable in the standard widely used browsers.			
Interface for institutions particip	pating in the project			
Login screen	Access is possible with e-mail account and password			
Adding and modifying the	By online forms			
content of the database				
Viewing and sharing content	Online forms with filled data are viewable or editable by			
between the participating	all participants according to the policy of editing rights			
institutions				
Web-based infrastructure	The website is sustained 5 years after the project. The			
sustainability	domain livingdanubelimes.eu is ensured for 10 years.			
	Its sustainability is enabled by the easy-to-use content			
	management system and stable hosting solution.			

Main functionalities of the web-based infrastructure

3.2. Interface for wide public

The publicly accessible interface is running on the domain livingdanubelimes.eu and it is based on the interactive map built on OpenStreetMap with Mapbox API. On the graphically customed map, the locations of archaeological sites and ship are displayed by the specific icons.





Interface of the website accessible by wide public. Interface is made of interactive map and bar placed at top of the screen. Source: Authors

The map is zoomable to show different details. The points with numbers are grouped sites, the number indicates the number of sites hiding in the group. As the user is zooming the map the clusters of sites are exploded showing the individual sites. The website is displaying different type of each site by 9 different icons for castell, city, legionary fortress, road, vicus, watchtower, wooden fort, or question mark for not identified type of the site. The ship is displayed by the blue icon of the ship.



Zooming of the map - the clusters of sites are exploded showing the individual sites by different icons. Source: Authors



In the top of the interface the bar with menu and few icons in the right is displayed. The menu contains Information about the project, Historical Information and Project Websites including the links to the app stores for downloading and installing the Living Danube Limes app.

Close		=
Hist	orical background information & important terms	
Import	ant terms	
Historia	sal Information	
Interes	ting facts and terms on the Roman military	
• <u>Military</u>	<pre>/terms</pre>	
Impo	rtant terms	
	The Limes	
	In archaeology today, we use the term Limes for the mostly fortified outer border of the ancient Roman Empire. The word Limes comes from the ancient language Latin and is related to the Latin word limen (threshold). Originally, it referred to paths that ran between fields, in the forest or along a boarder.	
	From the imperial period onwards, the Romans called their fortified border limes or, if it ran along a river, ripa. However, the limes was not only a border, but also an area in which (along this border) many trade routes ran and many settlements were located. Thus, the original meaning in the sense of "path" was still somewhat preserved.	
	Hinterland	
	In Classical Studies, one speaks of the Roman hinterland when describing the area in front of the Limes within the Roman Empire, but relatively far away from the central large cities.	
	The Romans	
	When you read about the ancient Roman Empire, you often hear the term "the Romans". In ancient times, only those people who had Roman citizenship were considered Romans. This right was either inherited or could be acquired. All other persons were inhabitants of the Roman Empire, but not "Romans" in that sense.	
	The Doman Empire	

Historical information texts with bar interface on the top with flags for switching the language and close button. Source: Authors, PLUS

The first from the right icons in the top interface bar is a magnifier, which is for searching for specific site by its name.

The second icon in the bar - the clock is the icon for choosing the time period. The archaeological sites are displayed in layers according to the Roman Limes historical periods in years. It is possible to change the currently displayed year period to show the Roman Limes development and changes by appearing and disappearing of the icons according to the chosen period.



About Project Historical Information Pro	oject Websites	Q 0 1
eden Roth der Oberpfatz	Select years	X Subice Strakonice
Hilpolistein	O AII 100 BCE	Volyně vodňany *
Berching	600 CE 200 BCE	Viachovo Březi
Weißenburg in Bayern	500 CE 300 BCE	Zwiesel Bavaria/Forest Vimperk Prachatice
	400 CE 400 BCE	gen Nationalizer Franzis
Eichstätt	300 CE	Grafenau
Ne. de	200 CE	Freyung Ceský Krimitov Větřní
Donauwotth Rain Pres	100 CE	Waldkirchen
	1a hssenbarb	Isholen an Hauzenberg
en an Schrobenhausen onau Wertingen Schrobenhausen i Meitingen an der Itm	Ergolding	Fürsterveil
Aichach	Moosburg an der Isar Vilsbiburg	Pfartkirchen
Fre Augsburg	ising Eç	ggenfelden Pocking
	Erding	
Königsbrunn Dachau	Altöttir	ng Braundu am Inn Grieskirchen Ansfelden
Fürstenfeldbruck	and the second sec	Burghausen
		C and
heim Landsberg am Lech Staenberg	Grafing and Inn Trostberg	Vicklabruds Vorchdort

By clicking the icon of the clock, the window for choosing of the year period is opened. Source: Authors

By clicking the icon of the object on the map, the basic information with the title image is displayed with another optional data available as Basic information, media Gallery, Archaeological remains, Remarks and Virtual reconstructions. Each item is possible to open, containing its related media.





~ Close		HE CONTRACTOR OF	
ll g	Basic information A		
	Cocation 12a		
	Roman name Iža		
	Roman fort, castellum		
	Date From ISOCE To 400CE		
	Not covered		
	Roman and Ethnographic Museum Kelemantia		
	The site is connected to modern road communication • Road network • Barking available • Bicycle routes • ship transfer / cruises		
✓ Close		68	-
	Basic information V		
	⊡ Gallery ^		

Clicking on the icon of the object on the map will display menu with additional information and media. Source: Authors

Main functions of the map:

Customed interface	Customed interface built on OpenStreetMap and Mapbe						
	API, displaying objects by specific icons.						
Zooming	Shows different details of the archaeological sites according						
	to the current zoom.						
Historical periods	Present development and changes by appearing and						
	disappearing of the icons according to the chosen period.						
Display basic info	Clicking the icon will display basic info and another optional						
	media to examine.						

Language localisation of the publicly accessible website

The primary language for the website is English. Selected information (Information of archaeological sites, Historical information & important terms) are in local national languages



of the countries participating in the project. The media and virtual reconstructions are in English. Each partner provided the data of the sites in English and his national language. The language is possible to change by clicking on the icon of specific flag in upper right corner of the screen.



Menu with basic information about the site in English and local – Serbian language. Source: Authors

English	Primary language for the app
Partners' national languages	Archaeological site information, Historical information &
	important terms

Presented data to the public

As the website presents various data in various media, the data are stored in the structured database, collected by all the partners of the project. The website is loading the specific data from this database online.

The website is displaying the information about the project, historical information and terms, and important links to the project websites, social networks and mainly the links to application stores to download the Living Danube Limes App. However, the main part of the presentation are data related to the archaeological sites and their museums.

These data are structured to basic information of archaeological sites, remains of the Roman objects on the sites, the image gallery, remarks and VR reconstructions.

The Basic Information represent structured textual data gathered about the site and information relevant to tourists as Location, Roman name, Type of the site, Dating, List of remains, Today's coverage, Museum with its link, Connection to the modern infrastructure.



()	Basic information		Date From 81CE To 400CE
0	Location	י 🕻	Remains of archaeological structures
0	Bratislava - Rusovce		 Castellum 1st, 2nd, 3rd construction stage and fortress 4th construction stage
	Gerulata		 Remains of a civil settlement
凸	Type Roman fort, castellum, vicus, necropolis, villa rustica in the countryside		Two temporary camps Fragments of the road Villa rustica and rustic housing
2	Date From 81CE To 400CE		estates • Cemeteries/necropolis • House with hypocaustum
2	Remains of archaeological structures • Castellum 1st, 2nd, 3rd construction stage and fortress 4th construction stage • Remains of a civil settlement		• Sewerage Today's coverage Partly covered with modern superstructures
	Two temporary camps Fragments of the road Villa rustica and rustic housing		Museum City Museum Bratislava Ancient Gerulata
	estates • Cemeteries/necropolis • House with hypocaustum • Sewerage		The site is connected to modern road communication • Road network • Parking available
	Today's coverage Partly covered with modern		Public transportBicycle routes

Structured basic information about the site. Source: Authors, DUK

Gallery of media is displaying the images of the site in the intuitive image viewer with abilities to browse the images or zooming them.



Image gallery and browsing the images. Source: Authors

Under the menu item Gallery, the item Archaeological remains is placed. This item provides information about the individual objects found on the site with its dating and images.





Left: Information to the specific remains on the site with objects' images. Right: Browsing the specific object's images. Source: Authors

The last item in the Site's menu are Remarks, which is a short textual description of the site provided by partners.

A different information is displayed after clicking the icon of the ship. This information contains name of the ship, title image, short description, type of boat, number of rowing crew members, length, height of mast, material the ship is from, construction methods, number of members in the leadership team, normal speed, maximum speed and relink to the site of the ship on the official project website. The ship has its own Gallery with images.



Ship's information and image gallery. Source: Authors



Another currently hidden field in the site's menu are events happening on the site. This field contains name of the event, date of the event and title image of the event. These sites' events will be displayed when the required data will be updated in the database by the partners.

Presented data to public briefly:

About the project	Basic information about the project
Historical information	Historical modules provided by the partners, available also
	in 7 national languages of participating countries
Project websites	Links to the official project website, social media websites
	and links to the app stores.
Archaeological site data	Available by tapping the site's icon
Basic information about the	Name of the site
site	Location
	Roman name of the site
	Type of the site
	Dating
	List of remains
	Today's coverage
	Museum with its link
	Connection to the modern infrastructure
Gallery of each site	Media gallery containing images with image browser
Archaeological remains of	Name of the remain
each site	Dating of the remain
	Belonging to complex
	Images of the remain with image browser
Remarks of each site	Textual description about the site
Virtual reconstructions of	Virtual reconstruction of the site as virtual tour of the site or
phot sites	3D models of the found objects
Events happening on the	Name of the event
site	Title image of the event
	Dating of the event
Data about the ship	Name of the ship
	Title image
	Short description
	Type of boat
	Number of rowing crew members
	Length
	Height of mast
	Material of the ship
	Construction methods
	Number of members in the leadership team
	Normal speed
	Maximum speed
	Link to the site of the ship on the official project website
Gallery of ship's images	Media gallery containing images with image browser



3.3. Interface for participating institutions

This interface is hidden from the wide public and it is accessible only through the login screen, running on the address livingdanubelimes.eu/login. The editors could log-in with their registered emails and password, which were sent to them. It is possible also to remember the password and request the new password, if it was forgotten.

Sign in to your account	
Don't have an account? Register here	
Password	Danube Transnational Programme Living Danube Limes
Remember me Forgot your password?	
Log in	

Login screen to the content management interface. Source: Authors

After logging in, the Dashboard with brief information about recent updates and project stats is displayed. Project stats is showing how many sites are currently created in the system, how many countries are participating, how many editors are involved in total and how much content from the filled sites' information was already covered.

Under the stats, the recent updates could be found with name of the updated site and name of the editor.

On the left side of the window, the blue bar with three icons is displayed. The icon with house means back to home – to the introductory Dashboard. The second icon the Fort is for editing and viewing the added sites' data. The last icon is for editing the user's account as changing name, email, password and deleting account. In the bottom of this blue bar, the button for Log Out is located.



Dashboard	
Project Stats	
Archeological Stee Countriles Involved Total Users 100 10 45	24.57%
Living Danube Limes	
- Lorem ipsum dolor sit amet consectetur adipisicing, elit. Dolorum ratione ame	t, ex. mollitia facere corporis aliquam
commodi blanditiis inventore iusto aut eveniet voluptatem ullam atque delen consectetur adipisicing elit. Dignissimos perferendis magni repellendus.	ti. Lorem, ipsum dolor sit, amet
Recently updated sites	
NAME	TITLE
Abbach Abbach	Regional Paradigm Technician Optimization
Ad Mures auxiliary castellum Ad Mures auxiliary castellum	Regional Paradigm Technician Optimization
Ad Statuas auxiliary castellum Ad Statuas auxiliary castellum	Regional Paradigm Technician Optimization
Albing Albing	Regional Paradigm Technician Optimization
Alisca auxiliary castellum and vicus Alisca auxiliary castellum and vicus	Regional Paradigm Technician Optimization
Alkofen Alkofen	Regional Paradigm Technician Optimization
Almus Almus	Regional Paradigm Technician Optimization
A second s	1011 100 100 million

Introductory Dashboard screen with right control bar. Source: Authors

After clicking on the icon of the Fort the screen with added archaeology sites is displayed. This view provides the user with basic information about the added sites as name of the site, status of the site, user's role in the editing of the site and button to show the details of the site.

The role of the user in the editing of the site can be Admin to have all rights of editing the site's content, then the Member of the editing team, which can also edit the site. User can be then only Viewer of the site and he is unable to edit it. This role enables participating members to also view sites' data of all participating partners, the sites which he did not added.

The view can also search for a specific site by the name of the site and to add new sites.

Arheological Sites						
Lorem ipsum dolor sit amet consectetur adipisicing, elit. Dolorum ratione amet, ex, mollitia facere corporis aliquam commodi blanditiis inventore iusto aut eveniet voluptatem ullam atque deleniti. Lorem, ipsum dolor sit, amet consectetur adipisicino elit "Dinoisiomos onefferendis manoi proplandus".						
consecterur adipisking ein. Dignissi nus penerenuis magin reperendus.						
Q. Search sites			+ Add Site			
NAME	STATUS	ROLE				
Abbach Abbach	Active	Admin	> Show			
Ad Mures auxiliary castellum Ad Mures auxiliary castellum	Active	Admin	> Show			
Ad Statuas auxiliary castellum Ad Statuas auxiliary castellum	Active	Admin	> Show			
Albing Albing	Active	Admin	> Show			
Alisca auxiliary castellum and vicus Alisca auxiliary castellum and vicus	Active	Admin	> Show			
Alkofen Alkofen	Active	Admin	> Show			
Almus Almus	Active	Admin	> Show			
Altinum auxiliary castellum Altinum auxiliary castellum	Active	Admin	> Show			
Ancient settlement, Tsar Simeonovo Ancient settlement, Tsar Simeonovo	Active	Admin	> Show			
Annamatia auxiliary castellum and vicus Annamatia auxiliary castellum and vicus	Active	Admin	> Show			
Aquincum auxiliary castellum 1 Aquincum auxiliary castellum 1	Active	Admin	> Show			

Screen with the list of Archaeological Sites. Source: Authors

After clicking on the button of adding the new site or showing the details of a site in the list, the screen for site's editing is opened. The forms with fields are visible for all participating



members, thus they see and share all data in the database. If the role of the user is Admin or Member, he can also edit or fill these forms.

On the left side of the view, the bar with summary of all forms is displayed. The forms for gathering and editing content are Site Settings, Events, Basic Information, Media, Considerations for touristic exploitation, Remarks, Archaeological Remains, Construction Phases, Military Forces and Research History. This bar also shows which forms are already filled and which are still missing some data.

Languages

Some of the gathered data are bilingual. Primary language is English for all sites, the secondary language is based on the site's Country in the Site Settings. The example on the images shows Country of the site Slovak and then Slovak flags next to the field for Slovak translations.

- 3	Iža aža	Site settings	
ŵ	Site Settings Update Name, Description, User access	Country and Translations Switch country translations for all national items	a da Basic Information
25	E Dvents E	Country	See Seeings Updare Norma, Description, User access Winne of the site Winne Norma, Description, User access Winne Nodern name in erglish, National or Plansen in Borum
&	Basic Information Archaeological Site and its Location	Sousia v	30 Exems B Exems in Dirights Hanne in Instance (main set of the
	Media Images, object of site		Description and the control for and to location Proceed Activate/operation Activate/operation
	Considerations	Site icon toon for site by category	Hoda
	Bemarks	Castell v	12 Considerations III Region in Kardina III Region IIII
	Further information	• • • • • • • • • • • • • • • • • • •	Intervision municipality Further information Manipulary in Taglish in Manipulary in Taglish in
	Archaeological Remains	Sie Name	Actualitype Immine
	Construction Construction Phases	Site name and owner information.	Construction Type of site
	Military Military forces	Site Owner A0 Admin 001 admin@gmail.com	yyer - Honora W Yyer - Honora W Honora bitta Honora bitta
	Research history Research actions or campaigns	Site Name Da	Research Namy Research Activity or Lemman 1, Architecture Name And Architecture Name Architecture
ے دور میں		ban.	Damp two Damp two 00 00 00 00

Screens of archaeological site editing or addition. Left: Site Settings, Right Basic Information Source: Authors

Gathered and editable content

The first form in the left-side bar are the Site settings, user can change here the Country of the site, but also the Icon of the site, which is displayed on the public map, Site's name and to add new or existing members to the team for editing the site.

The second form in the list are Basic Information. This form is opened by default for viewing or editing the existing site. The Basic Information contains Name of the site, Region and Municipality, Type of site, Dating, Physical coordinates – including Area, Elevation and GPS with preview of the map to show where GPS coordinates are placing the site. The GPS coordinates are also placing the site on the publicly visible map.

According to Dating of the site in this form, the site is displayed or hidden in the public map with the Historical period set.

The further gathered data are current Coverage of the site with buildings, Site visibility and conversation, State of research, UNESCO status and Legal protection of the site.



•2	lža	224	Dating								
ଜ	Site Settings Update Name, Description, User acce	55	Please insert a numerical number here for technical reasons. Naturally, most of the sites are not datable that exactly, E.g. if you want to date a site "from the middle of the 3rd century CE", please write "250", or for "from the 2rd quarter of the 3rd century" write "225".in case you need to indicate a BCE dating, please just insert a negative number, e.g. "50".								
). 193	Events Site Events	8	Dating from Dating to 150 400 e.g: 120 e.g: -50								
20	Basic information Archaeological Site and its Location	۲ ۲	Cordinates Set site cordinates gps,location								
	Media Images, object of site,	8	Area of site	Elevation of the site	GPS coordinates 18.196962.47.74492679						
	Torsiderations		[in ha] e.g.7	[in meters AA] e.g: 6.5	Ng: 47744865618139066 Trave Nata Bratistavi						
	Remarks Further information				ese Oya Oya Oya Oya						
	C Archaeological Archaeological Remains	8			© mented						
	Construction Construction Phases	8	Coverage with building structures								
	Military Military forces	8	Not covered		0						
	Research history Research actions or campaigns	8	Site visibility and conversation								
C) Log Out			 Underground remains not visible Underground remains uncovered and Archaeological remains above surface 	l visible (excavated, conserved) until today							

Basic Information form with Dating and Coordinates. Source: Authors

The third form in the list are Events. On this form, user can create or edit events, which are happening on the site by defining Event title, Date of the event and Short description.

	lža 🖧	Evente	
	Site Settings Update Name, Description, User access	Events and News	
	Events	Q Search	I
	(i) Basic information Archaeological Site and its Location	D	тт.е
	Media Images, object of site,		
	Considerations For touristic exploitation		
	Remarks		
	Archaeological Archaeological Remains		
	Construction Construction Phases		
	Military Military		
	Research history Research actions or campaigns		
out			





The next form in the list is Media. This form is gathering Images, Videos, 3D data or any other documents related to the site. The user is able to view these Media, Edit their properties and Download them. Media should be named as title of media and then author of the media to record and display also copyright information.

- ÷	Iža	181	м	odia							
ŵ	Site Settings Update Name, Description, User access		Mi	e you car	1 upload al	I media for site;			_	Add new media	
253	Events Site Events	ġ		Q Search	TYPE	FILE, NAME	VELKOST	DEFAULT	+ Add	Turse of modia	
žo	Basic information Archaeological Site and its Location	ė	1	130	image	22, IZA, Photo, 1982, from, East, jpg	222.97 KB	0	Edit ± Download Conclusion	image	
	Media Images, object of site,	ė	1	131	image image	24.JZA_Plan_1730s_Sketch_3_Miles.jpg 15_lza_KT_STUDI0727_11.jpg	193.35 KB	0	Edit ± Download	Video JD File	
	Considerations For touristic exploitation	ii.		133	image image	14.Jza.KT_STUDI0727.J0.jpg 07.JZA_3070_Priorato_Map_detail.jpg	178.05 KB	0	Edit ± Download	Browse file for upload	
	Remarks Further information	11	1	130	image	23.1ZA_Photo.1986.SW_area_of_fort.jpg	178.5 KB	0	🕸 Edit 🛓 Download (
	Archaeological Archaeological Remains	e		140	image image	77_1za_K7_STUDI0727_33.jpg 06_COPR8438.jpg	145.84 KB 228.99 KB	0	Edit <u>+</u> Download Belit <u>+</u> Download	Upload a file or drag and drop PNG, JPC, GIF up to 10MB	
	Construction Construction Phases	ġ.	п	142	image	08_IZA_3670_Priorato_Map_detail_pointer	219.5 KB	0	🛞 Edit 🛓 Download		
	Military Military forces	ġ.		143	image image	13, iza, KT, STUDI0727, 08 jpg 21_iza, KT, STUDI0727, 20 jpg	192.77 KB 273.05 KB	0	 ⊕ Edit ± Download ⊕ Edit ± Download 	Add	
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-			1	147	image image	20.128_KT_51UDK0727_19.jpg 26.12A_Plan_1914_3_Toth_Kurucz.jpg	213.26 KB 271.25 KB	0	Edit <u>i</u> Download	CANCEL	
Log Out			n	149	image	05.COPR8420.jpg	501.49 KB	0	Stat 🛓 Download (

Media form to Add, Edit and Download documents related to the site. Source: Authors

The subsequent form is Consideration for touristic exploitation. This form is collecting data relevant to tourists as Access to the site, Connection to the modern road network, related Museum's information, On-site presentation and Service. Museum's GPS coordinates here are placing the museum with its icon on the publicly visible map.



Consideration for Touristic Exploitation screen. Source: Authors



Sixth form in the left-side list is Remarks. This is a short textual description of the site displayed on the public website and in the app.



Remarks - further information form. Source: Authors

The next form Archaeological Remains contains editable list of objects found on the site. User can add new or view the existing archaeological remains.

•2	Iža	221					
ଜ	Site Settings Update Name, Description, User acces	5	Archaeological remains Please, add information about remains of the Roman structures found on the site. It is possible to add information about 20 found objects.				
يبر ۲	Events Site Events	e de la companya de la company	Q, Search + Add				
ć0	() Basic information Archaeological Site and its Location	Ċ.	ID TITLE				
	Media Images, object of site,	B	201 III Indudrick barraces 202 Two V shape ditches in the North				
	The Considerations		203 Outer fortification - S V- shaped ditches, 4 corner towers, and 8 intermediate towers, 4 Gates located in the midlle of the 204 Baths				
	Remarks		205 Barracks				
	Archaeological Archaeological Remains	8	206 Headquarters 207 Granary				
	Construction	U	208 Stables				
	Military Military forces	e e	209 Roman temporary camps 210 4 Bridge pillars, 30 x 20 m				
	Nesearch history Research actions or campaigns	8					
C) Log Out							

Screen for viewing and editing the list of remains. Source: Authors



By clicking the View of the remain, user will open the details of this remain, where it is possible to add or edit the Title of the remain, Dating, GPS coordinates, Belonging to complex and list of Media of the remain.

		Archo	alagias	Inomain		
Site Settings Update Name, Description, User a	ICCOSS	Arche	ologica	remain		
A		Title of th	Title of the remain site			
Site Events	8	Title in Er	nglish 🌐	Title	in National 💼	
Desis information		11 mudi	brick barracks	11 b	parakov z hlinených tehál	
Archaeological Site and its Location	on 💆	Tote in Eng	pian			
Media Images, object of site,	8	Dating Please insert date a site "fi you need to	a numerical nun om the middle o indicate a BCE da	nber here for technical r f the 3rd century CE", pi ting, please just insert r	reasons. Naturally, most of the site lease write "250", or for "from the : a negative number, e.g. "-50".	is are not datable that exactly. E.g. if you want to 2nd quarter of the 3rd century" write "225".In case
P Considerations For touristic exploitation		Dating fr	om Dat	ng to		
Remarks		e.g:-50	e.g: -	9		
		GPS cool	dinates			
Archaeological Archaeological Remains	8	if are availab	le			
Construction Construction Phases	8	Gps Coor 18,1989 ec 49,1263	dinates 52,47.74492679 457.17.9830944.11.67			
III Additional						
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multiary Military forces Research history Research actions or campaigns	8	Belongin Eg. Corner to Belongin Earth-a Media (Ir Havalable, p. HR, RS, BC, AT_DLABOSC Q. S ID ID	ig to complet www.er of a camp o g in English and timber fort mages, Vide lease, add some k. ViennaVester earch type image	X Cate of a camp would Cate of a camp would Belon Dr Dos, 3D Files of ob chotos of the archaeole chotos of the archaeole photos of the archaeole photo	both belong to the complex of th nging in National Prozemny tabor Project) gical object packed in 21P indicat ngilsh name of the site and the tit Im size 100 MB. rom_mudbricks.jpg	e military camp fortification structures.
military Military forces Research history Research actions or campaigns	8	Belongin Eg. Coner tr Belongin Earth-a Media (Ir If available, g. HR, RS, BC, F AT, DLABOS ID 1197 1197	ag to complet g in English # nad-timber fort mages, Vide lease, add some in earch vestor type image image	X Cate of a camp would Cate of a camp would Des, 3D Files of ob Des, 3D Files of ob Correctioner: Descrite File (D, the E File, NAME File, NAME SK_002_IZA_wall_f SK_002_IZA_wall_f	both belong to the complex of th nging in National vecenmy tabor jgect) gical object packed in ZIP indicat gical packed in ZIP indicat gical base of the site and the til im size 100 MB. rom_mudbricks.jpg in_of_the_mudbrickswall	e military camp fortification structures.
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military forces Military forces Research history Research actions or campaigns	8	Belongin Eg. Coner tr Belongin Earth-a Hr. InSuble. AT. DLABOSC ID 1157 1159 1150	ag to complet g in English 😫 ind-timber fort mages, Vide lease, add some in earch type image image image image	Cate of a camp would Cate of a camp would Des, 3D Files of ob Des Des, 3D Files of ob Des	both belong to the complex of th nging in National vozernny tabor joct) gical object packed in ZIP indicat gical object packed in ZIP indicat gical object packed in ZIP indicat m size 100 MB. rom_mudbricks.jpg in_of_the_mudbrickswall id_plan.jpg	e military camp fortification structures.

Screen of Remain details. Source: Authors

The eighth form is dedicated to the Construction phases of the site. User can add or edit the list of the phases. After clicking the button for Adding the new phase or the button for viewing the existing one, the form with details is opened. Here the data as Phase title, Short description and Dating of the phase are collected.



			- (2)	(120	ala.	
8	lža al	Construction phase	۵	Bite Tentings. Update Partice Description, Loss acce		Construction phase
•	Site Settings Update Name, Description, User access	Please, add information on this construction phase	101			Phase title
5	Evens Evens	Q, teach	* ANT 20	the form	ė.	Title in Explain (#) Title in Explanation Title in
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	Hedia imagas, object of site	307 stane fort	> View	Fragministration and	8	Description in Frights (# Description in Netional #
	P Considerations For touristic exploitation			P Conditions for fourball, each factor		Devergement trade
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	Construction Construction Phases			Construction Construction Phases	8	4 (1 (1 (1 (1 (1 (1 (1 (1 (1 (
	E Millary Millary Tarcas			F Silvey silvey house		Seck.
	Research history Research actions or campaigns			Exceptibilities	8	
			Contraction of the second			

List of construction phases and screen with details of construction phase. Source: Authors

Similar structure has also the form of Military forces. The first screen is list of Military forces for adding and editing. After clicking Add or View, the screen with details appears. The collected details are Name of the military force, Dating of stationing and Evidence of stationing.

Sale Sellings		Military forces	the startings		Military force	
Update Name, Description, User access		Has the evidence of stationing of any Roman military force been found on the site 7	Define Name, Development Name	ans.	Name of stationed Roman mili	tary force
Events Site Events	•	Q, Sauch	20 🕀 Derm Tes Derm	8	Defense to evidence in English 👺 The gardian at this fact has not been	Reference for evidence in National 🗰 Readina subto staces ette estacia los
Basic information Archaeological Site and its Location	1	0 NAME The guerison of this fort has not been identified yet, but it is generally believed to have been either a cavaity with (sia), or	Descriptionation Archaeological Star and telecode	. 8	Stationed	
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Considerations For touristic exploitation			 Conscionante Remaining suprimation 	34 (H)	Stationed From	Statistics To
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Military Military forces	1		T Miney siling base		East	
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Left: List of Military forces. Right: Form collecting details of Military forces, which stationed on the site. Source: Authors

The last form collects information about Research history of the site. The form again consists of list of Research campaigns with ability for Adding new items and Viewing/editing the existing ones. The collected details here are Type of the campaign, Central objects of the campaign, Dating of the campaign and Outputs.



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Site Settings Update Name, Description, User ac	Dess
Events Site Events	e
Basic information Archaeological Site and its Location	8
Media	
nages, object of site,	-
Considerations For touristic exploitation	
Remarks	
Archaeological	8
Construction Construction Phases	8
Military	
Military forces	8
Research history Research actions or campaigns	8

Form for editing the Research history with details of each campaign. Source: Authors

Gathered data briefly:

Site Settings	Country			
	Site icon			
	Site name			
	Add existing members of editing team			
	Register new member of editing team			
	List of editing members			
Basic information	Name in English and national language			
	Name in Roman language			
	Region of the site in English and national language			
	Municipality in English and national language			
	Type of the site in English and national language			
	Dating from			
	Dating to			
	Area of the site			
	Elevation of the site			
	GPS coordinates			
	Coverage with buildings in English and national language			
	Site visibility and conversation in English and national			
	language			
	State of research in English and national language			
	UNESCO status in English and national language			
	Legal protection in English and national language			
Events	Add event			
	View event			
	Event title			
	Event dating			
	Short description in English and national language			
Media	List of media			
	Type of media			
	Add media			
	Edit media			



	Delete media
Consideration for touristic	Access to the site in English and national language
expoitation	Connection to modern road network in English and national
	language
	Museum name in English and national language
	Museum website
	Museum GPS coordinates
	On-site presentations in English and national language
	Service in English and national language
Remarks	Remarks in English and national language
Archaeological remains	List of remains
	Add remain
	View remain
	Title of remain in English and national language
	Dating
	GPS coordinates
	Belonging to complex in English and national language
	List of Media to Edit, Download, Remove
Construction phase	List of construction phases
	Add phase
	View phase
	Phase title in English and national language
	Short description in English and national language
	Dating
Military forces	List of forces
	Adding forces
	Viewing forces
	Name of the force in English and national language
	Dating of stationing
	Evidence for stationing in English and national language
	Reference of stationing in English and national language
Research history	List of research campaign
	Add campaign
	View campaign
	Type of campaign in English and national language
	Central objects of the campaign in English and national
	language
	Researchers conducting the explorations in English and
	national language
	Dating of the campaign
	Outputs of the campaign in English and national language

3.4. Updates and correctness of the gathered data

As the gathered data are extensively large and they are collected and editable by all partners, it is planned that they will be updated continually. The updates of the data are automatically presented also on the public website and within the Living Danube Limes app by their regular updates. The responsibility for the correctness of these data, copyright information and



authorship information are therefore on all participating partners. STUBA is not responsible for any incorrections, missing information or copyright issues, which are not related to the technical processing of the data. It is planned that incorrections or additions will be managed by a specific partner of the project.

3.5. Web-based infrastructure sustainability

The web-based infrastructure will be sustained at least 5 years after the project. The domain of the website livingdanubelimes.eu is subscribed for 10 years. Sustainability of the web-based solution is ensured by direct link between the database, publicly visible website and Living Danube Limes app, very compatible easy-to-use web-based content management system for updating the content and stable hosting solution.

3.6. Link

www.livingdanubelimes.eu