

ISTER: Connecting Historical Danube Regions Roman Routes with a GIS-based Territorial Atlas and an Online Interactive Tool

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1 ABSTRACT

ISTER project addresses the challenge of Roman heritage discontinuity. Stepping further the isolated Roman settlements heritage, ISTER tackles the territorial dimension of the Roman Routes, as a contiguous transnational element that passes national borders across the Danube region and provides a relevant scale for exchange and joint development. Therefore, ISTER's main objective focuses on rediscovering and revitalizing the ancient Roman Roads Network along the Danube river as a key driver in promoting territorial development based on sustainable use of cultural and natural heritage.

During the project, data from all local and regional partners were collected, sorted and harmonised. Based on a user requirements survey, a strategy for the deployment of the ISTER Interactive Tool was developed. The interactive tool uses the collected data and geodata for an open orientation and information platform which aims to foster knowledge about the Roman cultural heritage in the broad public.

The ISTER Interactive Tool is set up as a responsive website to be used with mobile devices like smartphones or tablets. The central element of the interactive tool is a map, all information is queried from a central database as location-based service. The tool does not only provide information about the cultural heritage elements (monuments, milestones), but also provides other information which can be useful when planning a trip, like places to eat or drink, accommodation facilities, public transport stops, or supermarkets. It is available not only in English, but also in the local languages of the ISTER project partners.

Keywords: Roman Routes, Interactive Tool, Cultural Heritage, Sustainable Tourism, Regional Development

2 ISTER GENERAL ISSUES

2.1 Project idea

ISTER project firstly addresses the challenge of Roman heritage discontinuity, which reflects both in a territorial dimension related to a low level of investment and connection between heritage resources and local/regional productive sectors, as well as in visualisation and attractiveness dimensions regarding the promotion and awareness raising on the importance of heritage resources as drivers for regional development. Stepping further the isolated/detached Roman settlements heritage, ISTER tackles the territorial dimension of the Roman Routes, as a contiguous transnational element that passes Danube Region state borders and provides a relevant scale for exchange and joint development. Therefore, ISTER's main objective focuses on rediscovering and revitalizing the ancient Roman Roads Network along the Danube Region as a key driver in promoting territorial development based on sustainable use of cultural and natural heritage (specifically, Roman routes). ISTER promotes this Roman roads and settlements network as a catalyst for touristic development, as well as an opportunity for territorial competitiveness and sustainable growth of Danube crossed-regions. To increase local attractiveness, ISTER is leveraging on three key assets:

(1) Adopting a multi-layered governance chain aimed at strengthening knowledge framework and institutional capacities of Danube Region actors through capacity building and collective knowledge mapping;

(2) Using advanced tools and technologies for enhancing non-physical accessibility, visibility and valorisation of Roman routes and settlements network, laying the foundation for a thematic cultural route based on Roman heritage with a narrative function, reviving ancient assets and promoting non-renewable and fragile, but yet unexplored and unexploited Roman legacy;

(3) Acquiring the shift from old policy approaches (protection through isolation) to new, integrative methods for improving the policy and regulatory framework in Danube crossed-regions.

2.2 ISTER GIS-based Atlas of Roman Routes in the Danube Region

ISTER GIS-based Atlas of Roman Routes in the Danube Region (<https://ister.gis.si/>) is an open-source, user-friendly online inventory and platform that provides a spatial representation of the Roman routes legacy in Danube Region.

The GIS-based Territorial Atlas is the central collection, administration and storage point for georeferenced information on Roman Heritage in the Danube region, including descriptions, photos and illustrations of Cultural Heritage Sites. Systematically collecting information about Roman Routes and sites in a co-ordinated, georeferenced way and build information systems on this basis is one of the central elements of ISTER. The status of the available data is very different throughout the whole Danube Region – whereas for example in Carnuntum (Austria) there are very extensive and systematic databases and information systems and also online tools available, there are some other – remote – regions, where data has to be collected by remote sensing (aerial photography, satellite imagery, ...), even some field surveys and excavation works will have to be done.

One of the core tasks of ISTER project is the Development of a GIS-based territorial Atlas of Roman routes legacy in the Danube Region.

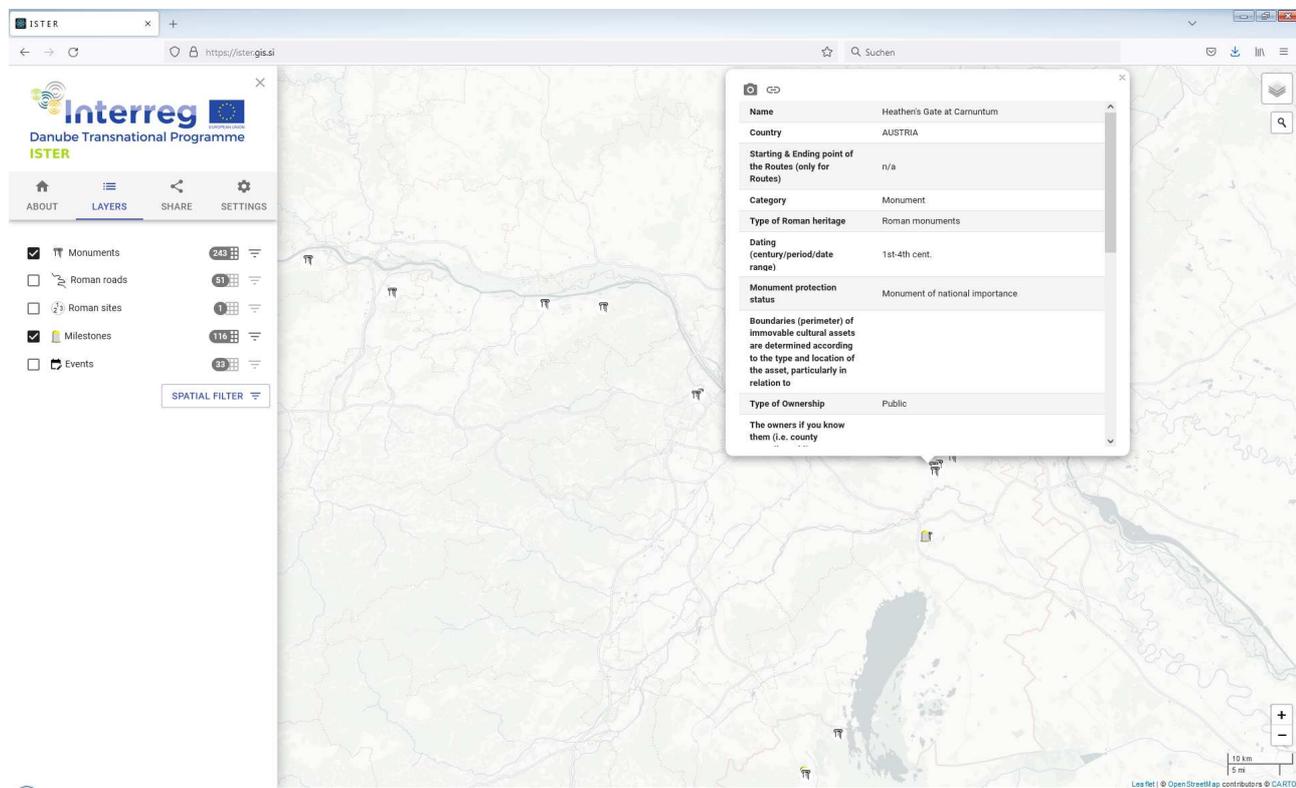


Fig. 1: The ISTER Atlas implemented by the Geodetic Institute of Slovenia. Source: Geodetic Institute of Slovenia.

The GIS Atlas provides the following functionalities:

- landing page,
- language selector,
- layer selector,
- table view:
 - layer attributes data table,
 - layer filter,
 - sharing filtered data.

2.3 The idea behind the Interactive Tool

Based on the extensive data collection and development of the territorial atlas the ISTER Interactive Tool will be a digital collaborative application, aimed at supporting the Roman eco-cultural route valorisation as well as effective communication and awareness raising on ISTER findings related to the Roman roads and settlements network.

The interactive tool provides a user-friendly interface, loading valuable content on the rich Roman routes' legacy, to be provided through an open-source knowledge portal. Since the interactive tool had to meet both transnational and locally-specific needs and challenges, a user requirements survey was conducted for ISTER territorial partners and external stakeholders to collect all input and expectations.

The survey comprised the following sections:

- Apps' key functions and processes;
- Available web content for the app;
- Target audience;
- Purpose of clients using the app.

The survey template has been prepared by University of Natural Resources and Life Sciences Vienna (BOKU) who is in charge of developing a responsive website which allows for the deployment of a useable mobile application. Therefore, input from different stakeholders is highly necessary to understand common and specific needs for the interactive tool. The interactive tool will continuously receive input from ISTER partners even beyond the official end of the ISTER project.

2.4 Survey results

From the collection of respondents' first thoughts the interactive tool should aim at promoting and fostering visibility of the Roman cultural heritage for mainly touristic and educational purposes. It should have some features which encourage people to use the tool and not Google. And it should support local languages. The most important target audience groups are tourism and travel, the public, and archaeology/museum/cultural heritage sites. Also education/research and recreation/leisure were rated as some kind of relevant. The main purposes, as seen by the survey respondents, should be promotion of tourism, education, and on site information/trip planning – from a content provider's point of view as well as from a client's point of view.

It was noticeable that the evaluation of the relevance of the potential purposes from the client's point of view was generally worse than from the provider's point of view. This may be due to the fact that the respondents found it difficult to put themselves in the role of a client without being able to assess the interactive tool in detail, as the theoretical description of the interactive tool in the project proposal allows for a wide scope of interpretation. Table 1 shows the importance of data and content for the interactive tool as seen by the project partners:

	photos	videos	audio guides	maps, geodata	web links	virtual reality	augmented reality
Roman cultural heritage	16	15	13	15	14	14	13
other cultural sites (museums, monuments, ...)	14	9	6	14	13	6	6
accommodation facilities (hotels, B&B, ...)	12	3	3	13	15	1	1
gastronomy (restaurants, pubs, ...)	10	4	4	12	14	2	1
current and upcoming events	11	8	4	11	15	3	2
public transport	4	3	2	9	13	1	1
leisure facilities	10	5	5	8	10	2	2
arts and crafts	11	7	5	8	12	2	2
other local information (like church services, markets, ... please specify below)	3	3	2	4	10	1	1

Table 1: Data and content considered important for the interactive tool. Source: own representation. Colour interpretation: the more to the red side, the more important; the more to the blue side, the less important.

The actual situation is depicted in table 2 showing all data and content which can be provided by the project partners according to the status quo:

	photos	videos	audio guides	maps, geodata	web links	virtual reality	augmented reality
Roman cultural heritage	11	6	2	9	9	3	4
other cultural sites (museums, monuments, ...)	6	4	0	6	8	0	1
accommodation facilities (hotels, B&B, ...)	4	0	0	4	7	0	0
gastronomy (restaurants, pubs, ...)	5	1	0	3	7	0	0
current and upcoming events	4	1	0	1	7	0	0
public transport	2	1	0	1	7	0	0
leisure facilities	3	2	0	2	4	0	0
other local information (like church services, markets, ... please specify below)	0	0	0	0	2	0	0

Table 2: Data and content available from the project partners for the interactive tool. Source: own representation. Colour interpretation: the more to the red side, the more important; the more to the blue side, the less important.

Comparing tables 1 and 2, it is obvious that the project partners had very high expectations for the interactive tool on the one hand, but were not able to deliver the material and data which would have been necessary to meet these high expectations on the other hand. Therefore, we concentrated on the collection of information regarding the Roman monuments and decided to retrieve all other necessary and useful data from Open Street Map.

3 IMPLEMENTATION OF THE ISTER INTERACTIVE TOOL

3.1 Framework for the ISTER Interactive Tool

The ISTER Interactive Tool combines information from the project's GIS atlas database (ISTER Atlas) with open source data from Open Street Map (OSM), a collaborative project to create a free editable geographic database of the world. The geodata underlying the maps is considered the primary output of the project.¹

The ISTER Atlas is a project-internal tool aiming at collection, input and maintenance of project-related data concerning the ISTER monuments and milestones. Routes were also collected in the ISTER Atlas, but these route data are not used in the Interactive tool due to a lacking accuracy.

3.2 Technical setup

The goal of the Interactive Tool is to make the GIS atlas content accessible to the broad public in a user-friendly way. The initial idea was to create an app. After weighing up all the advantages and disadvantages, the decision was made in favour of a website:

- works on both Android and IOS (Apple) platforms;
- no double development and implementation efforts (for Android and IOS);
- no exclusion of half of the mobile devices (if it were developed as an app, we would had to have a decision for either Android or IOS);
- no installation needed;
- no restrictions through limited user's permissions;
- always up to date, no updates necessary;
- works on any standard internet browser;
- does not use proprietary elements, looks exactly the same on any device;
- designed to behave like an app;
- internet connection necessary, no storage of offline data.

¹ <https://en.wikipedia.org/wiki/OpenStreetMap>

The Interactive Tool frontend consists of these components:

- user interface: classic HTML website generated with PHP;
- map: OpenLayers 6.14 using Open Street Map and own geodata layers;
- stylesheet: responsive CSS for adaptation to any mobile device screen size;
- interactive elements (like a QR code scanner): Javascript code with XMLHttpRequest (AJAX) requests.

In the background, there are a few more elements:

- UMN mapserver to create the project's own geodata layers and excerpts from Open Street Map data;
- PostgreSQL database with PostGIS extension for geodata operations and UMN mapserver data provision;
- PHP scripts for database interaction and the GIS Atlas interface;
- server cronjobs² for automatic database synchronisation between GIS Atlas and Interactive Tool.

3.2.1 Frontend

The Interactive Tool can be reached from any internet browser by opening the URL <https://www.via-ister.eu/> and it is loaded as a website. From the startpage, the user can access a language switcher, some options and the map, which serves as the main interaction point of the tool.

The map shows Open Street Map as background layer and all ISTER monuments (Roman cultural heritage sites collected by all project partners). Additional layers can be added via the options page:

- ISTER milestones,
- places to eat and drink,
- supermarkets,
- accommodation facilities,
- public transport stops.

Additional information can be retrieved at any time by clicking (or tapping) on the map and is displayed in pop-ups directly over the map.

The language of the Interactive Tool can either be automatically detected by checking the internet browser's language, or may be manually set to any of the project consortium's languages. The functions (buttons, headers, warnings, ...) of the Interactive Tool are available in all of the project consortium's languages. The information on monuments and milestones is always available in two languages: English as well as the local language of the monument or milestone location. If the selected language is not available for a milestone or monument, the English information is returned.

One of results of the ISTER project are so-called milestones which are place near Roman cultural heritage places. They have a QR code on them, which directly leads to the interactive tool with information on the respective site.

3.2.2 Background activities

The main background activities in the Interactive Tool are XMLHttpRequest requests which are triggered by the frontend user, e. g. by tapping on the map or entering a search term. User inputs are sent to PHP scripts which initiate PostgreSQL database queries with prepared statements. The query results are returned in JSON, an open standard file format and data interchange format that uses human-readable text to store and transmit data objects consisting of attribute-value pairs and/or array. It is a common and widely used data format in electronic data interchange, including that of web applications with servers.³ When tapping on the map, the amount of database queries is directly dependent on the number of layers shown in the map, so the user can decide which information to retrieve simply by switching layers on or off.

² A cronjob is a task which runs automatically on a server. The system regularly issues commands for the execution of these jobs.

³ see also <https://en.wikipedia.org/wiki/JSON>

The Interactive Tool database is automatically synchronised with the GIS Atlas once a day to take over data updates which were made in the GIS Atlas.

3.3 User guide

Even though the Interactive digital tool adopts a user-friendly interface, a user guide is highly necessary, in order to provide a comprehensive explanation of the app's technicalities. Therefore, the user guide will comprise the following sections:

- Presentation of the app's purpose and functionality;
- Navigating the Web app;
- Browsing accommodation, places to eat, etc.;
- Customizable settings (language, notifications, etc).

The user guide will be available in English as a deliverable of the project.

3.4 Web address of the ISTER Interactive Tool

The interactive tool is available at <https://www.via-ister.eu/>.

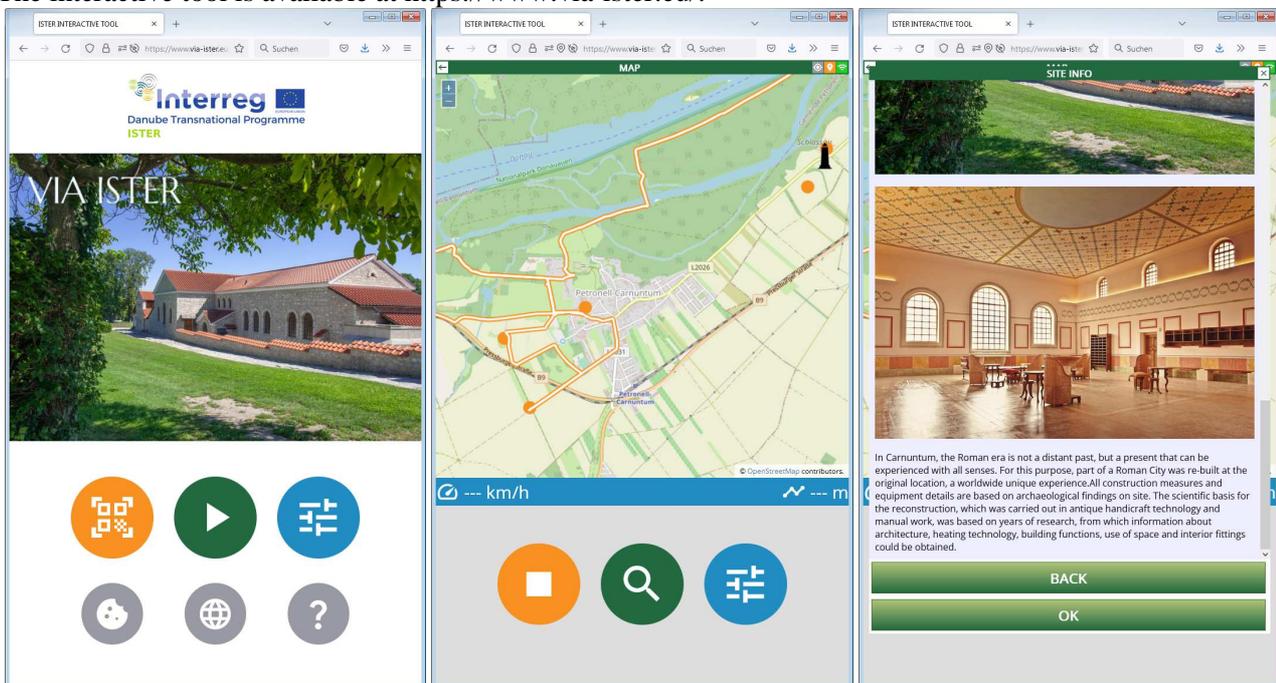


Fig. 2: Some impressions from the ISTER Interactive Tool. Source: <https://www.via-ister.eu>