

project indigo

an overview in numbers

Geert Verhoeven | *project leader*
projectindigo.eu

*The INDIGO graffiti project is funded by the Heritage Science Austria
programme of the Austrian Academy of Sciences (ÖAW)*





graffiti is

unique

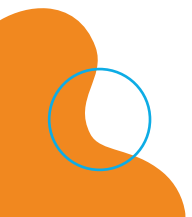
complex

short-lived

socially relevant

cultural heritage

**In
di
g
o**



Inventory and
disseminate
graffiti along the
d **O** naukanal

Inventory and
disseminate
graffiti along the
do naukanal

WHAT

Inventory and
disseminate **WHAT**
graffiti along the
do naukanal **WHERE**

Inventory and
disseminate
graffiti along the
do naukanal

WHAT

WHERE

digitally preserve
and
analyse

WHY

Inventory and
disseminate
graffiti along the
dokumentation

WHAT

WHERE

digitally preserve
and
analyse

WHY

WHO



LUDWIG
BOLTZMANN
INSTITUTE
Archaeological Prospection and Virtual Archaeology

Inventory and
disseminate
graffiti along the
dokumentation

WHAT

WHERE

digitally preserve
and
analyse

WHY

WHO



LUDWIG BOLTZMANN
INSTITUTE
Archaeological Prospection and Virtual Archaeology



Stadt
Wien



WHY

digitally preserve
and
analyse

WHAT

HOW?

WHERE

WHO

Inventory and
disseminate
graffiti along the
Danubian canal



LUDWIG
BOLTZMANN
INSTITUTE
Archaeological Prospection and Virtual Archaeology



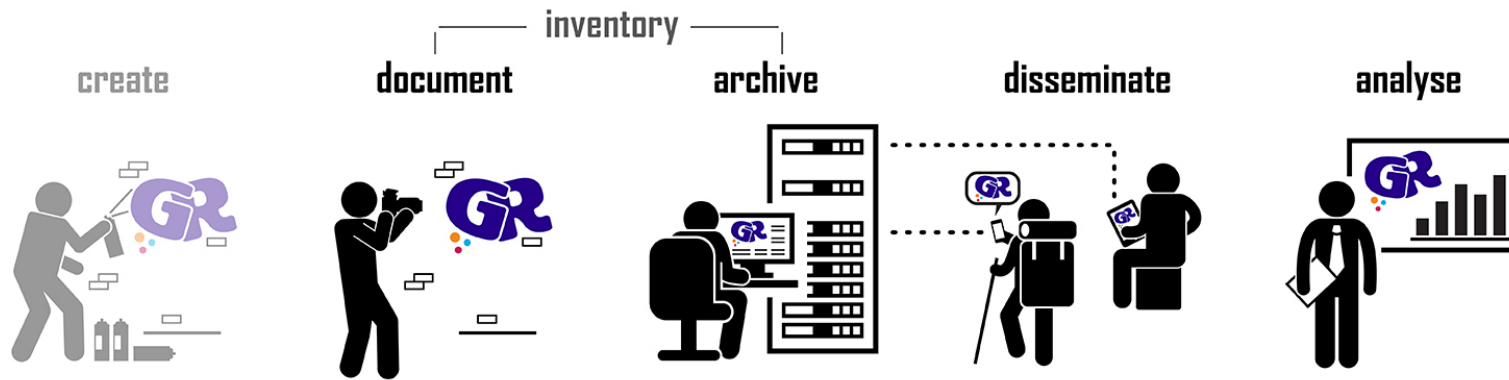
Stadt
Wien



INDIGO approach



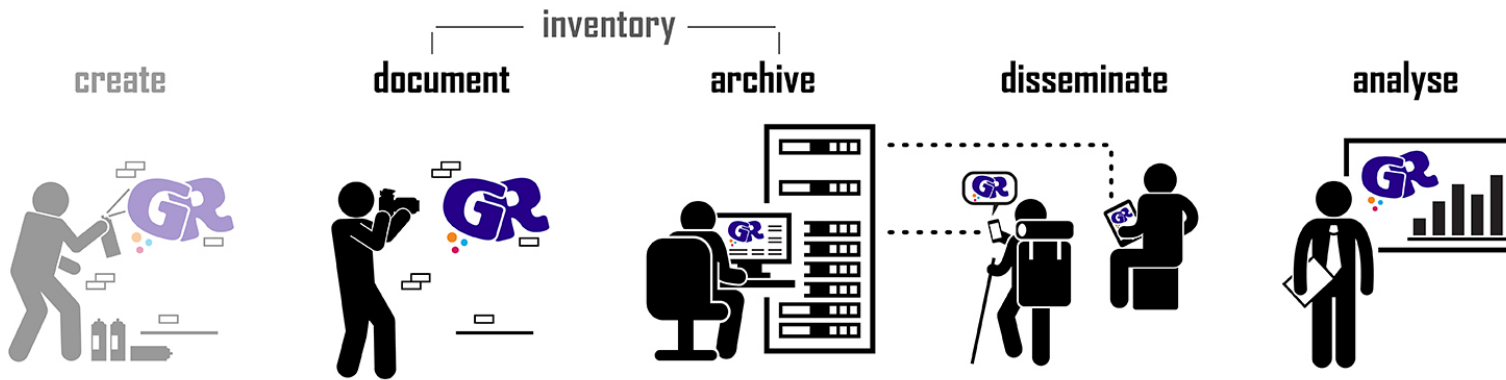
4 goals



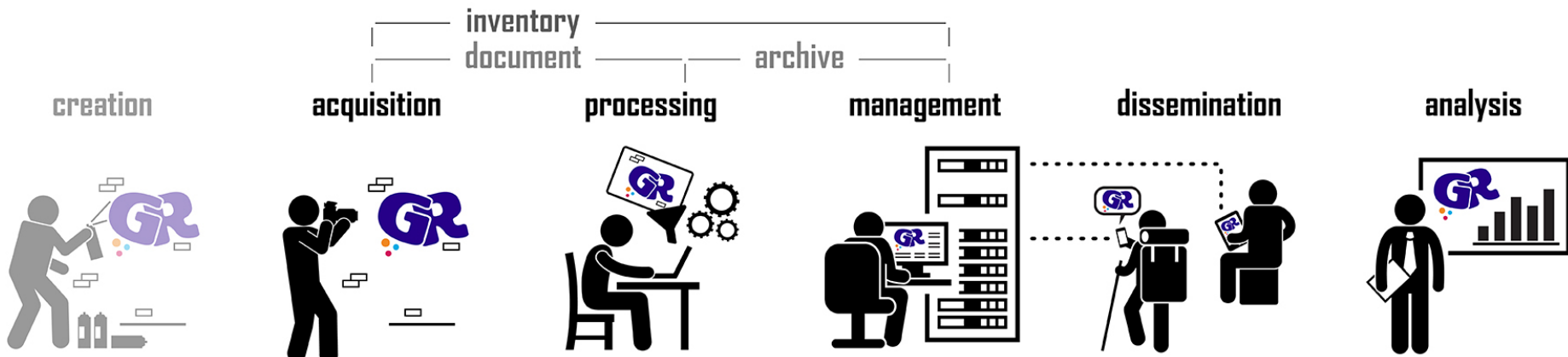
INDIGO approach



4 goals



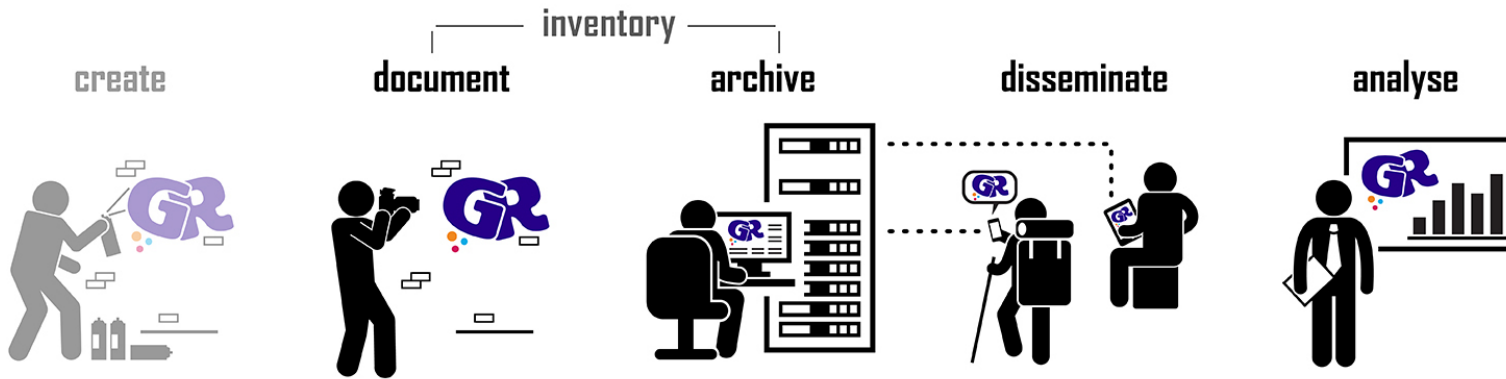
5 research pillars



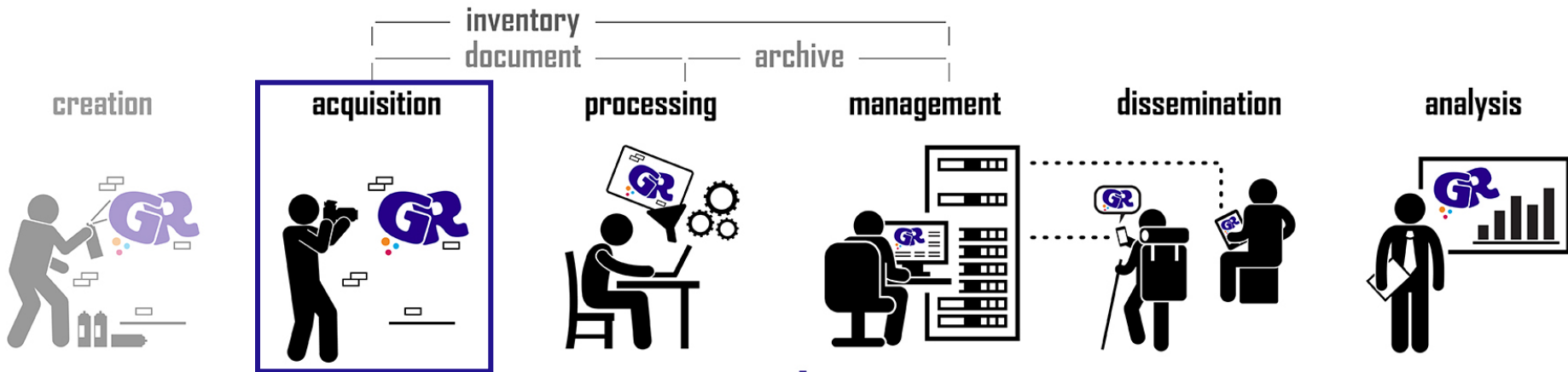
INDIGO approach

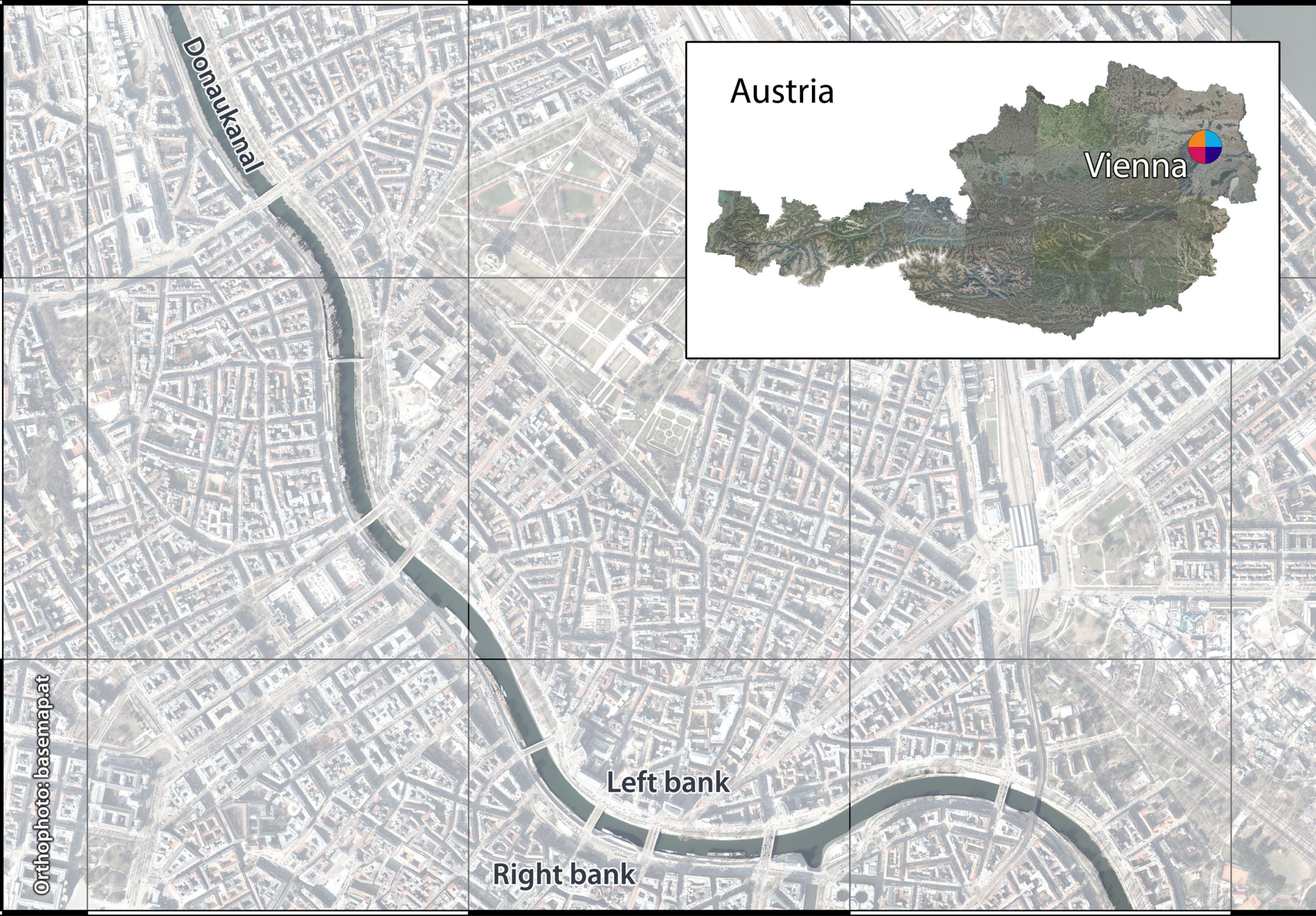


4 goals



5 research pillars





Donaukanal

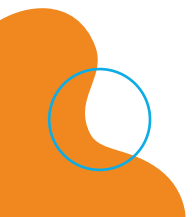
Austria

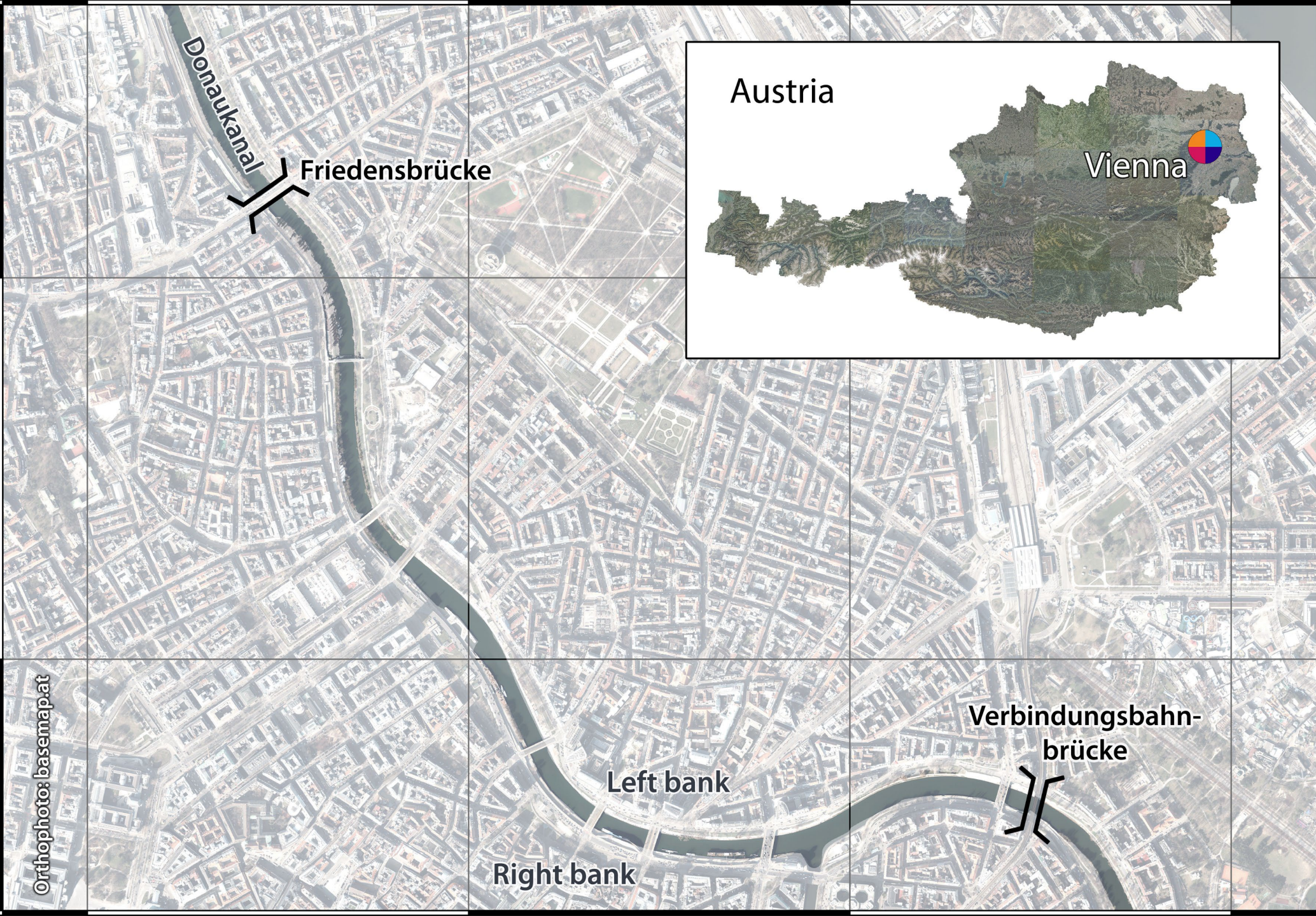
Vienna

Orthophoto: basemap.at

Left bank

Right bank





Orthophoto: basemap.at

Donaukanal

Friedensbrücke

Left bank

Right bank

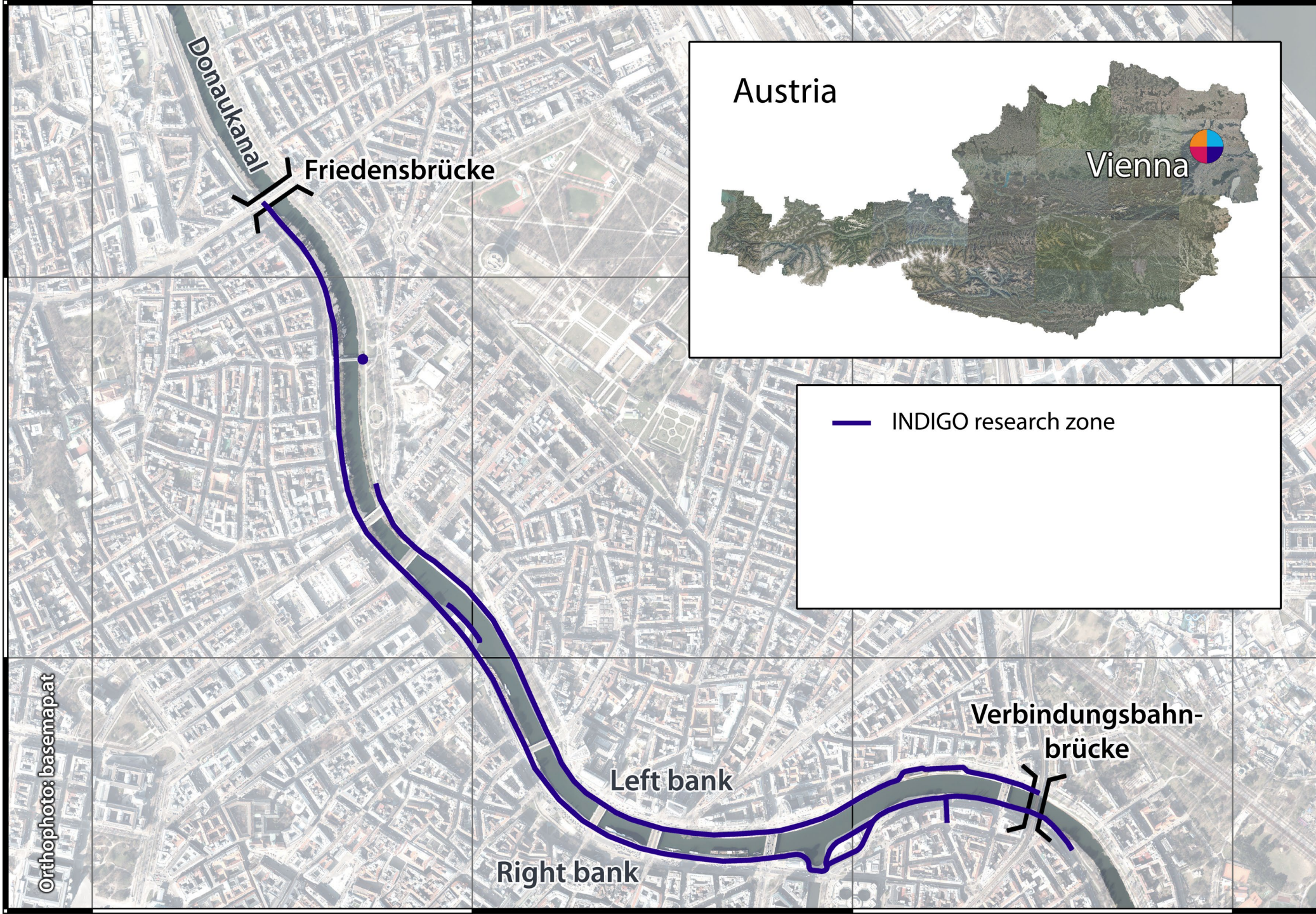
Verbindungsbahnbrücke

Austria

Vienna

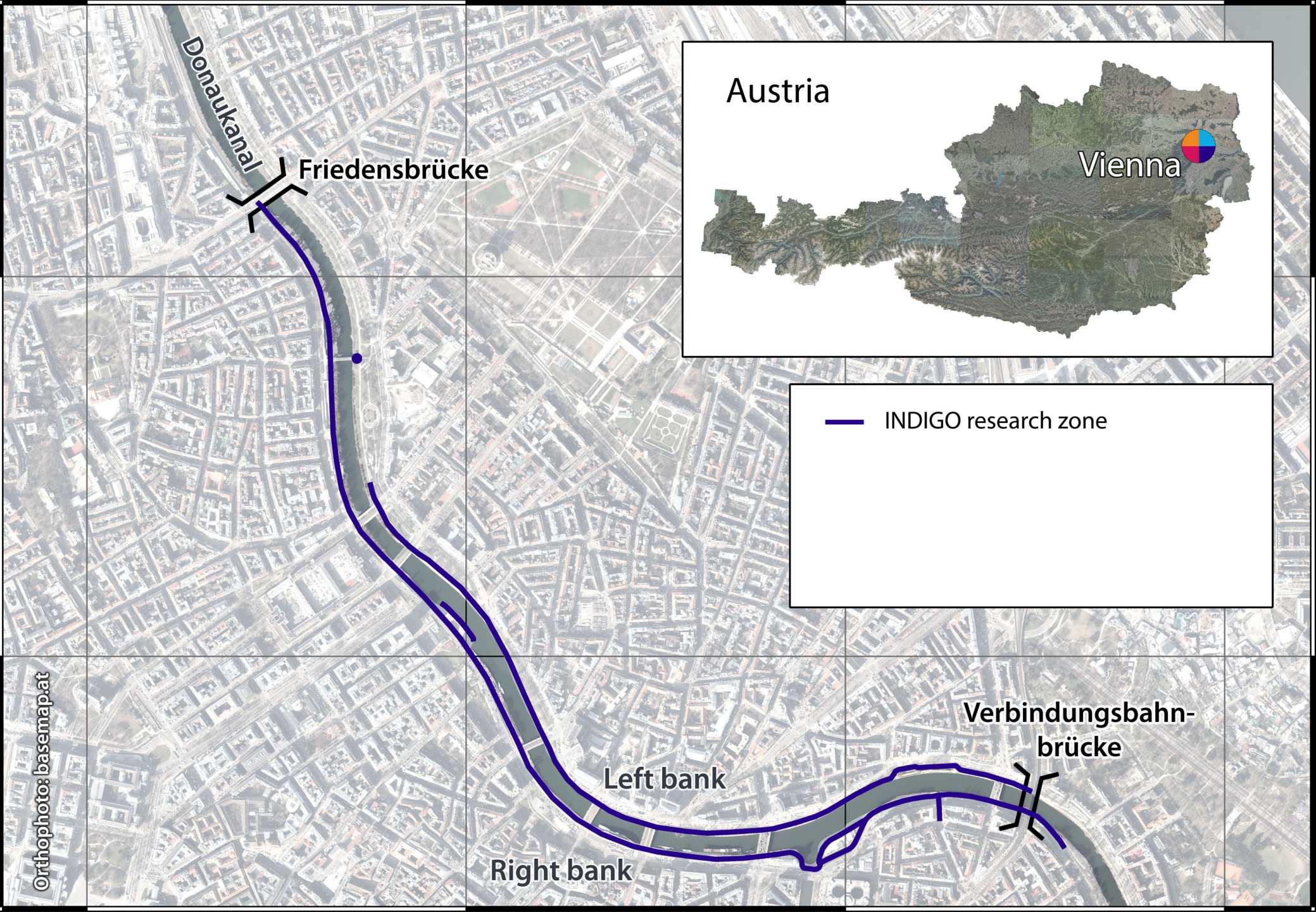


STRETCH
3.3 km



STRETCH
3.3 km

LEFT RIGHT



Austria

Vienna

— INDIGO research zone

Orthophoto: basemap.at

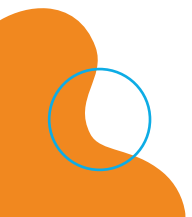
Donaukanal

Friedensbrücke

Left bank

Right bank

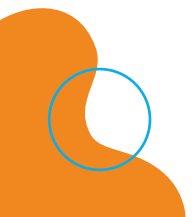
Verbindungsbahnbrücke



STRETCH

3.3 km

LEFT RIGHT

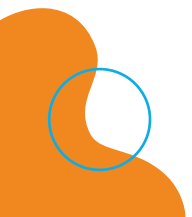


STRETCH

3.3 km

LEFT UP
RIGHT UP

DOWN DOWN



STRETCH

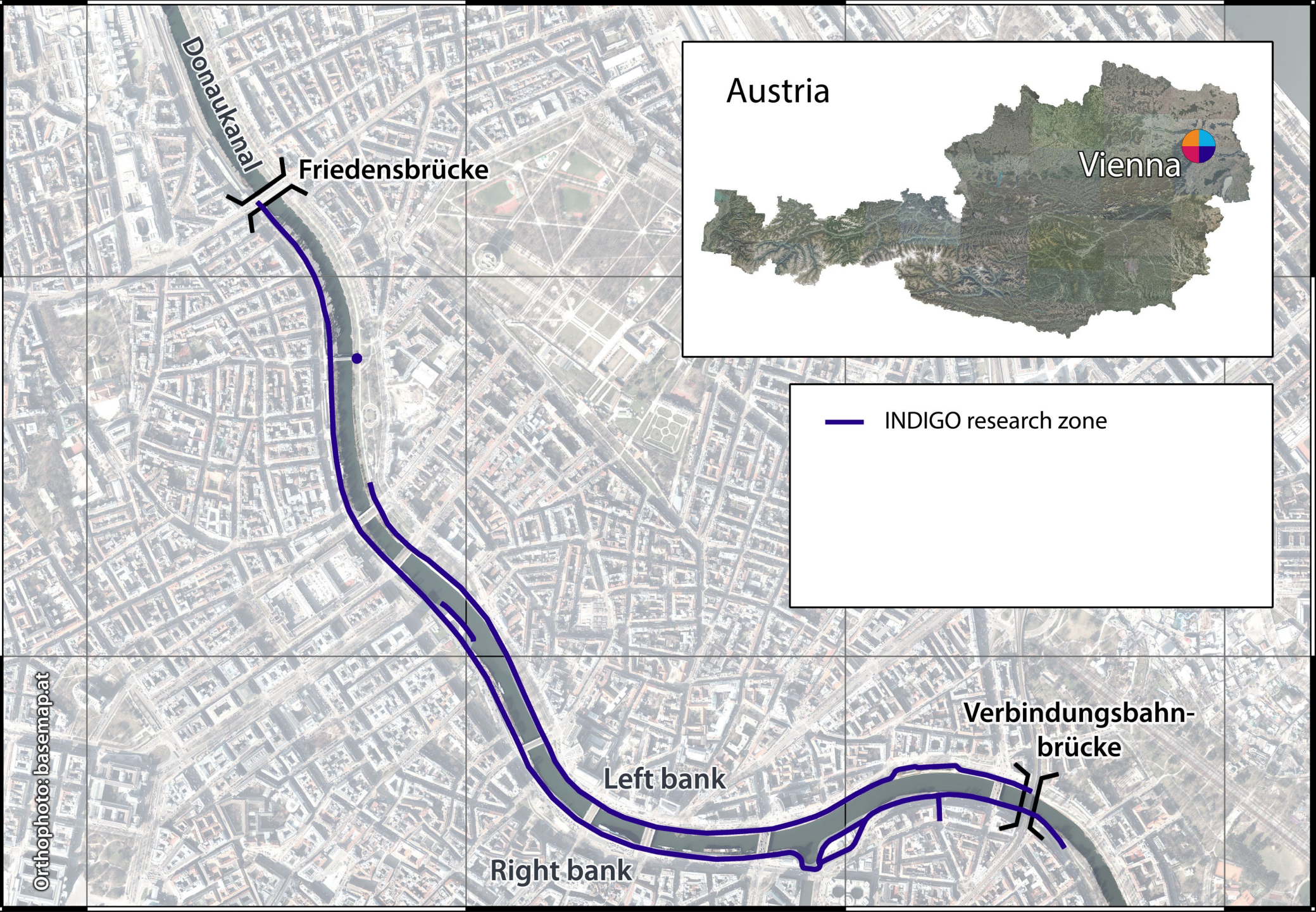
3.3 km

LEFT RIGHT

UP UP

3.2 km 5.3 km

DOWN DOWN



Austria

Vienna

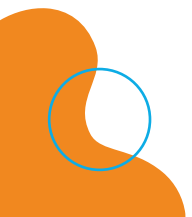
— INDIGO research zone

Orthophoto: basemap.at

Left bank

Right bank

Verbindungsbahnbrücke



STRETCH

3.3 km

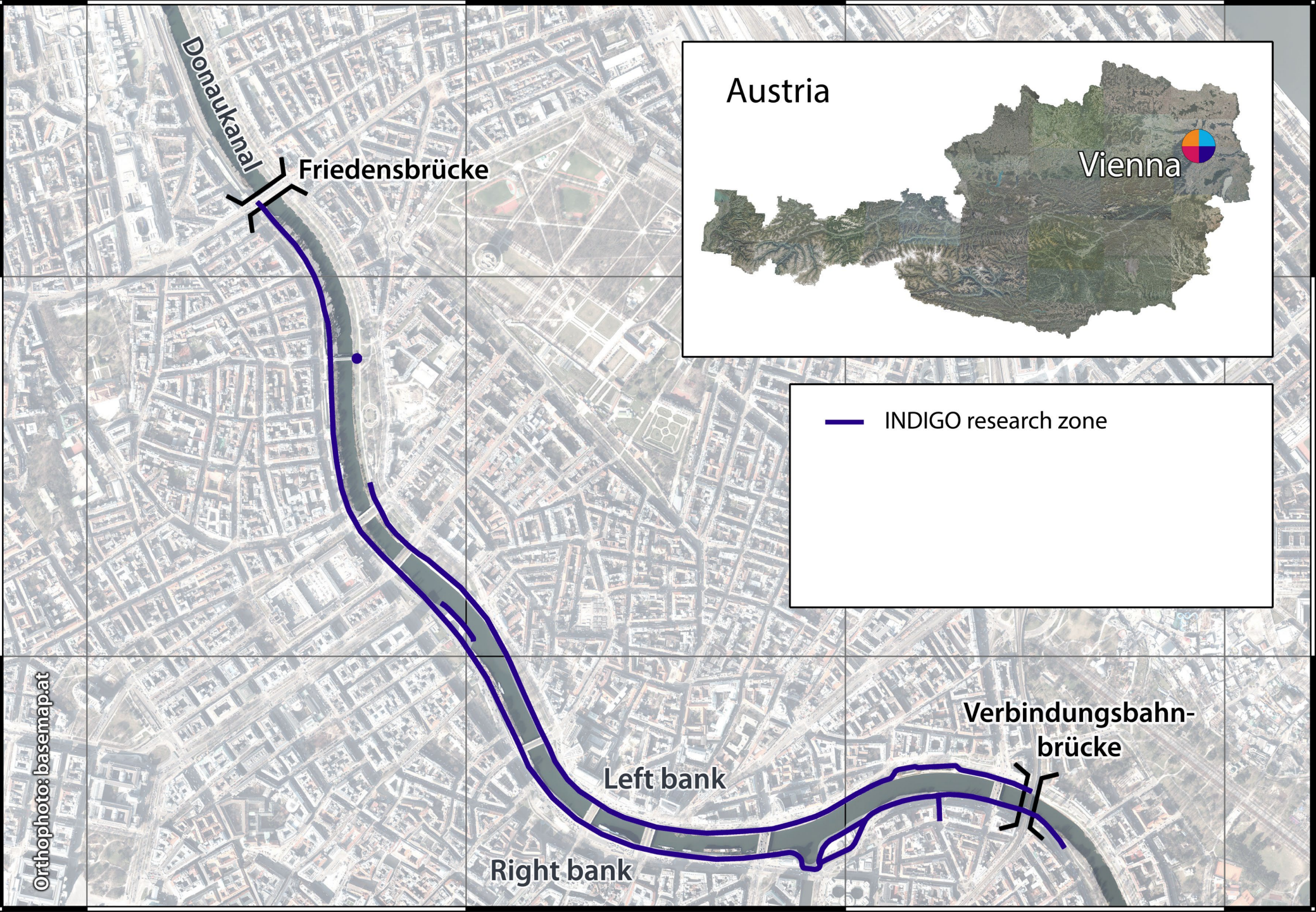
LEFT **RIGHT**

UP **UP**

3.2 km 5.3 km

DOWN **DOWN**

2.1 km 2.3 km



STRETCH

3.3 km

LEFT RIGHT

UP UP

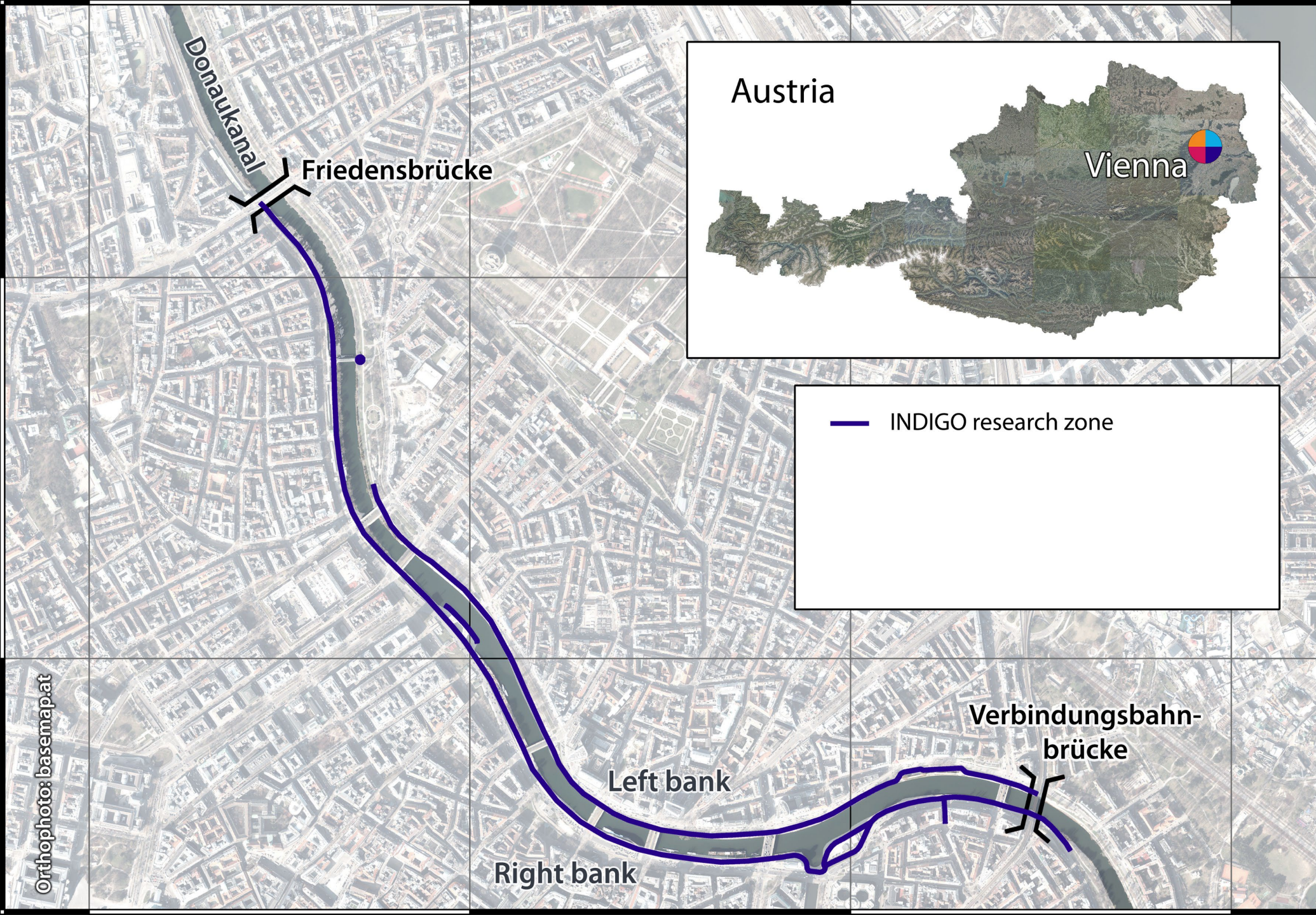
3.2 km 5.3 km

DOWN DOWN

2.1 km 2.3 km

MONITORED SURFACES

12.9 km



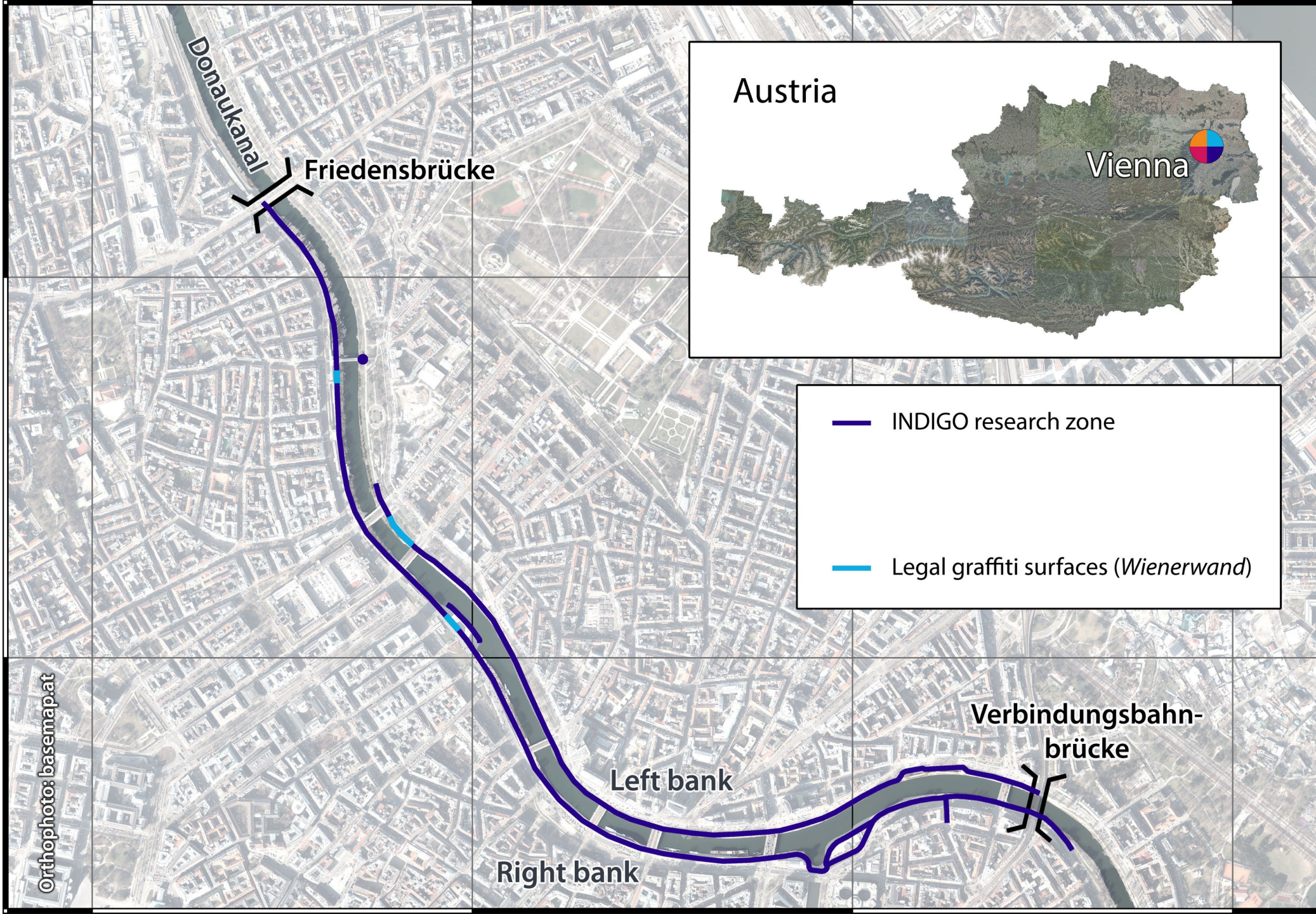
LEGAL SURFACES

0.3 km

MONITORED SURFACES

12.9 km

Orthophoto: basemap.at



— INDIGO research zone

— Legal graffiti surfaces (*Wienerwand*)

**TOTAL
COVERAGE**

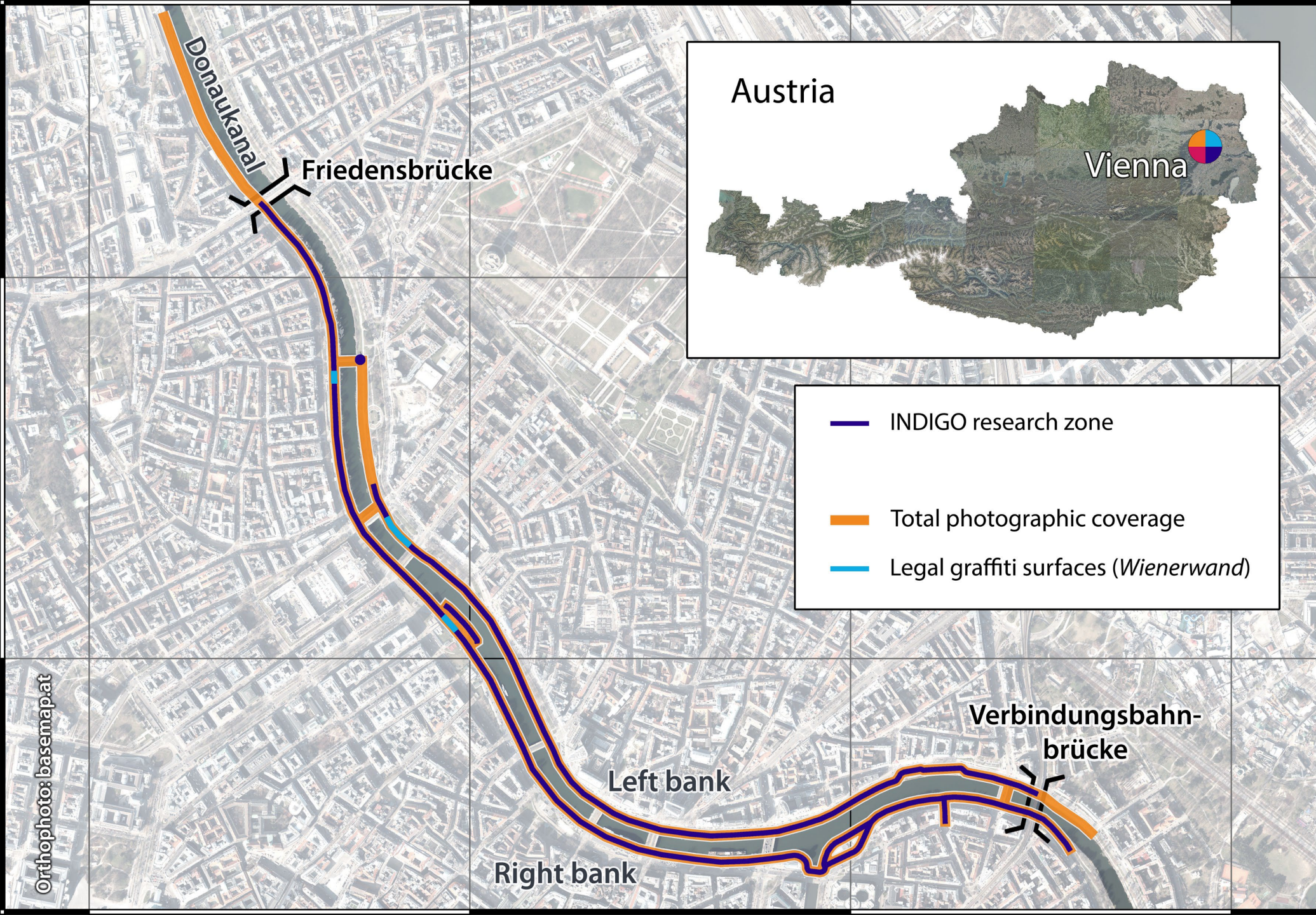
14.0 km

**LEGAL
SURFACES**

0.3 km

**MONITORED
SURFACES**

12.9 km



**TOTAL
COVERAGE**

14.0 km

**LEGAL
SURFACES**

0.3 km

**MONITORED
SURFACES**

12.9 km

Orthophoto: basemap.at

Donaukanal

Friedensbrücke

Left bank

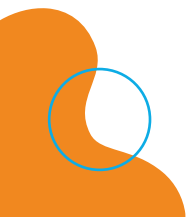
Right bank

Verbindungsbahn-
brücke

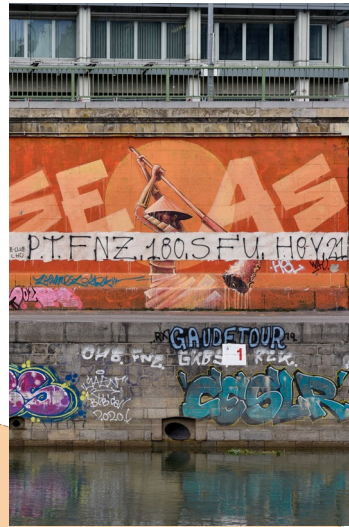
Austria

Vienna

— Total photographic coverage



TOTAL coverage



Date	Camera	Lens	Mean GSD	Acquisition time	Image count
30/09/2021	Nikon D750 (24.2 MP)	Nikon AF-S NIKKOR 85mm	3.6 mm	3 h 45 min	2065
01/10/2021	$p = 5.95 \mu\text{m}$	1:1.8 G @ $f/5.6$		3 h 20 min	2544



TOTAL coverage

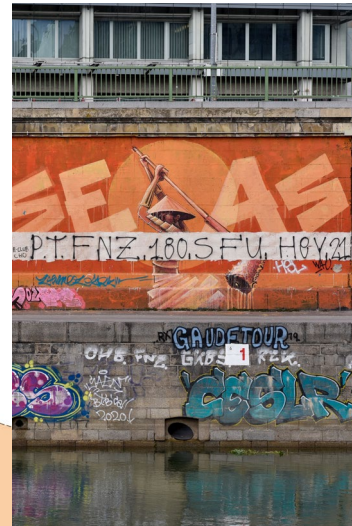


Date	Camera	Lens	Mean GSD	Acquisition time	Image count
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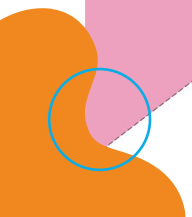
26/10/2021				7 h	6042
27/10/2021	Nikon Z 7II (45.4 MP $p = 4.33 \mu\text{m}$)	Nikon NIKKOR Z 20mm f/1.8 S @ $f/5.6$	0.9 mm	7 h 45 min	6591
28/10/2021				3 h 40 min	2856
29/10/2021				7 h	6608



TOTAL coverage



Date	Camera	Lens	Mean GSD	Acquisition time	Image count
30/09/2021	Nikon D750 (24.2 MP $p = 5.95 \mu\text{m}$)	Nikon AF-S NIKKOR 85mm 1:1.8 G @ f/5.6	3.6 mm	3 h 45 min	2065
01/10/2021				3 h 20 min	2544
26/10/2021	Nikon Z 7II (45.4 MP $p = 4.33 \mu\text{m}$)	Nikon NIKKOR Z 20mm f/1.8 S @ f/5.6	0.9 mm	7 h	6042
27/10/2021				7 h 45 min	6591
28/10/2021				3 h 40 min	2856
29/10/2021				7 h	6608
Total				32 h 30 min	26706



TOTAL coverage



Date	Camera	Lens	Mean GSD	Acquisition time	Image count
30/09/2021	Nikon D750 (24.2 MP $p = 5.95 \mu\text{m}$)	Nikon AF-S NIKKOR 85mm 1:1.8 G @ $f/5.6$	3.6 mm	3 h 45 min	2065
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26/10/2021	Nikon Z 7II (45.4 MP $p = 4.33 \mu\text{m}$)	Nikon NIKKOR Z 20mm f/1.8 S @ $f/5.6$	0.9 mm	7 h	6042
27/10/2021				7 h 45 min	6591
28/10/2021				3 h 40 min	2856
29/10/2021				7 h	6608
Total				32 h 30 min	26706



↓
processing

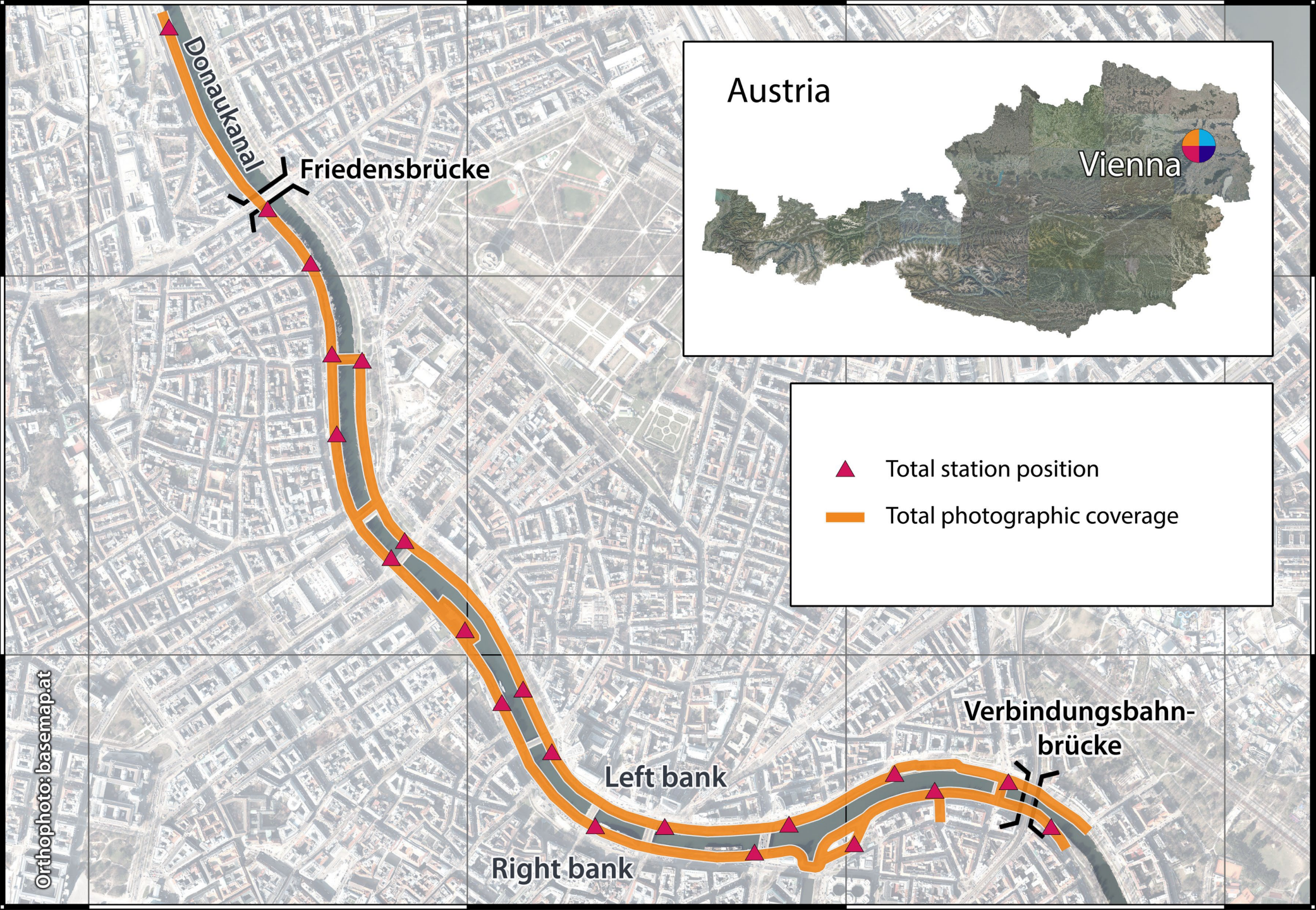


**TOTAL
COVERAGE**

14.0 km

**TOTAL STATION
POSITIONS**

21



**TOTAL
COVERAGE**

14.0 km

**TOTAL STATION
POSITIONS**

21



**TOTAL
COVERAGE**

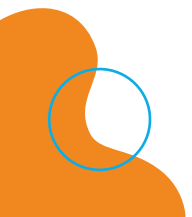
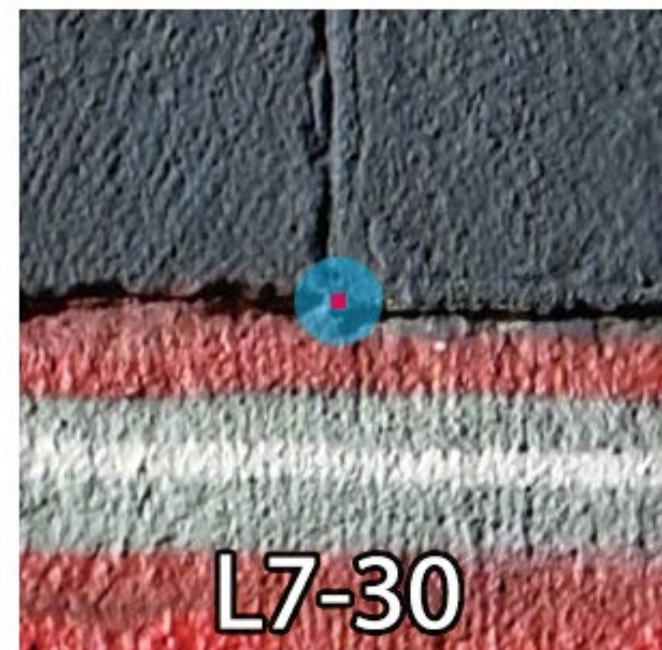
14.0 km

**TOTAL STATION
POSITIONS**

21

**GRAFFITI-SCAPE
POINTS**

624

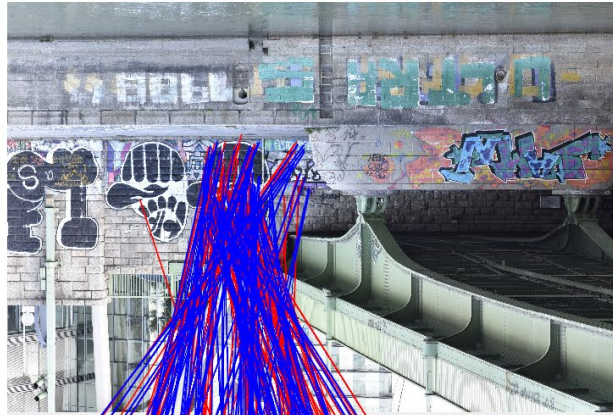


POSITION all images

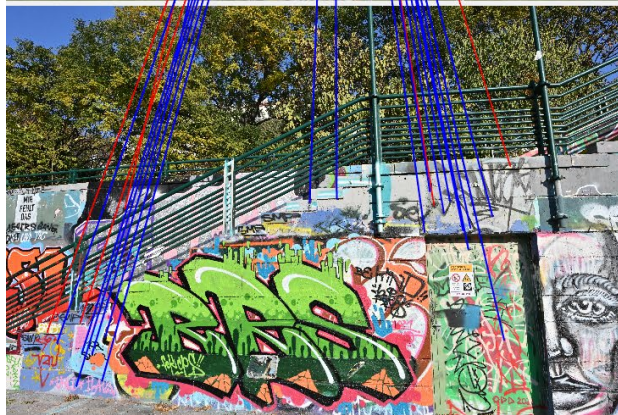
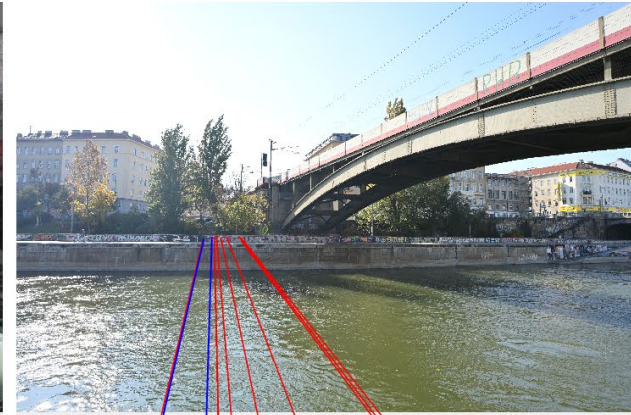
Nikon D750 + 85 mm
30-09-2021



Nikon D750 + 85 mm
30-09-2021



Nikon Z7 II + 20 mm
28-10-2021



Nikon Z7 II + 20 mm
29-10-2021

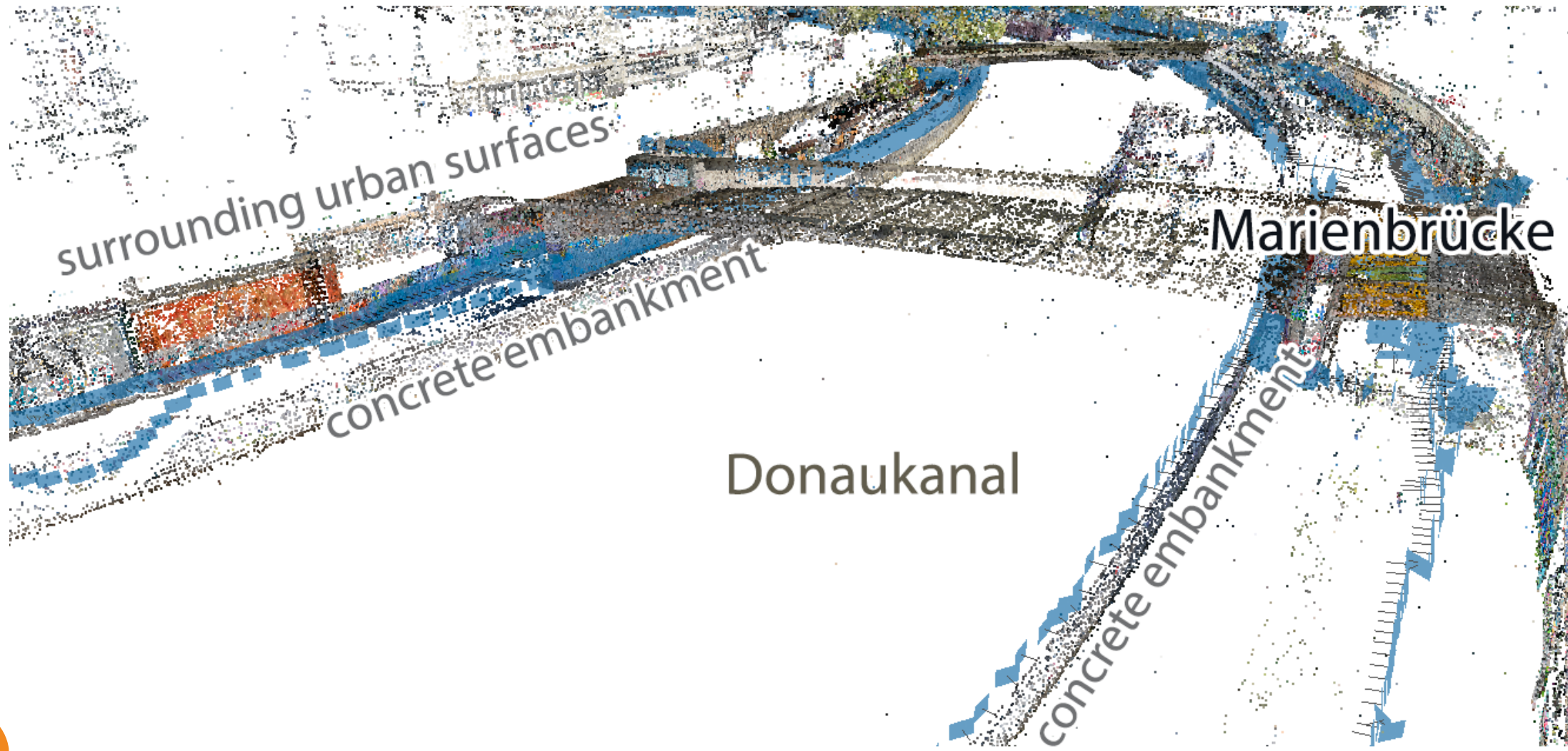


Nikon D750 + 85 mm
01-10-2021

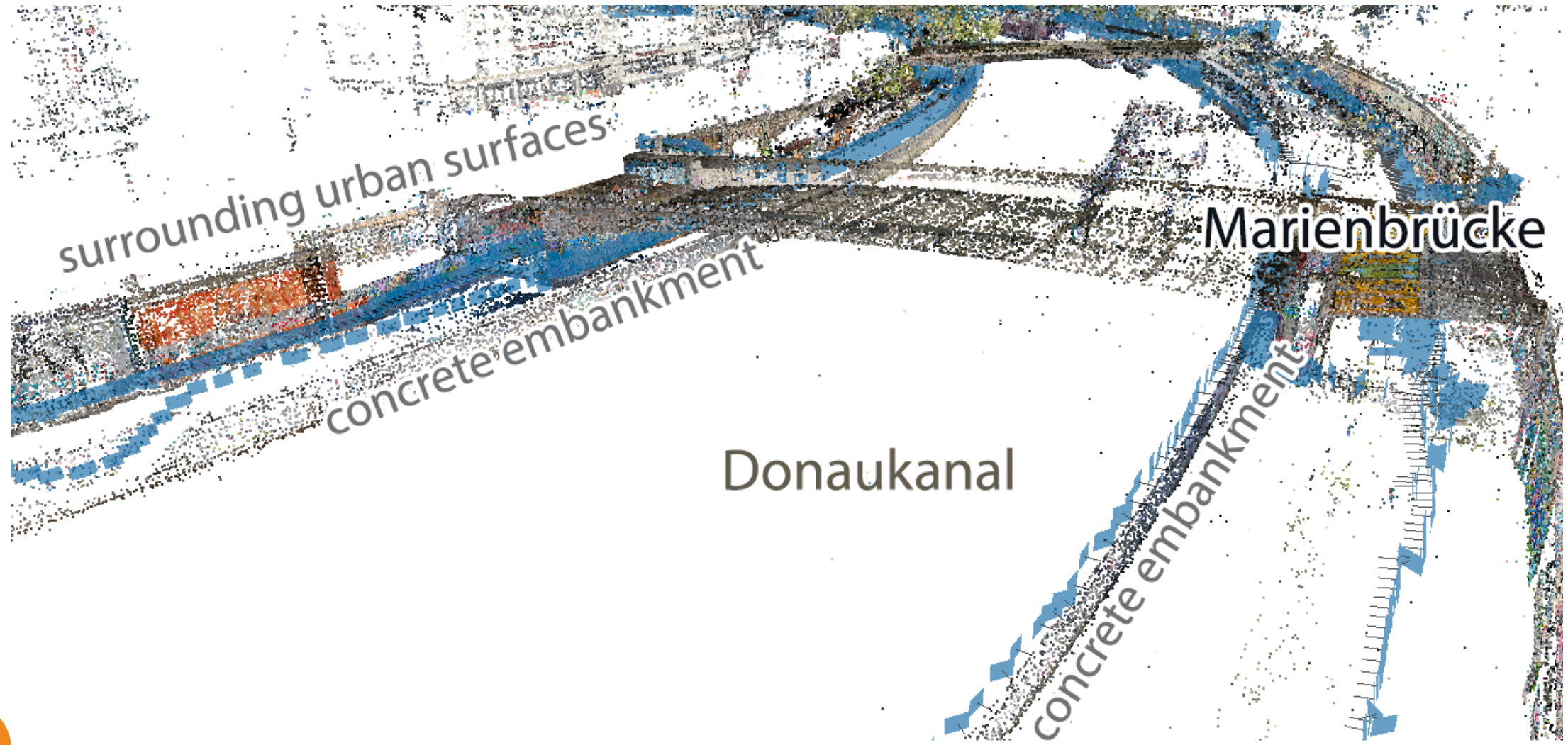


Nikon Z7 II + 20 mm
26-10-2021

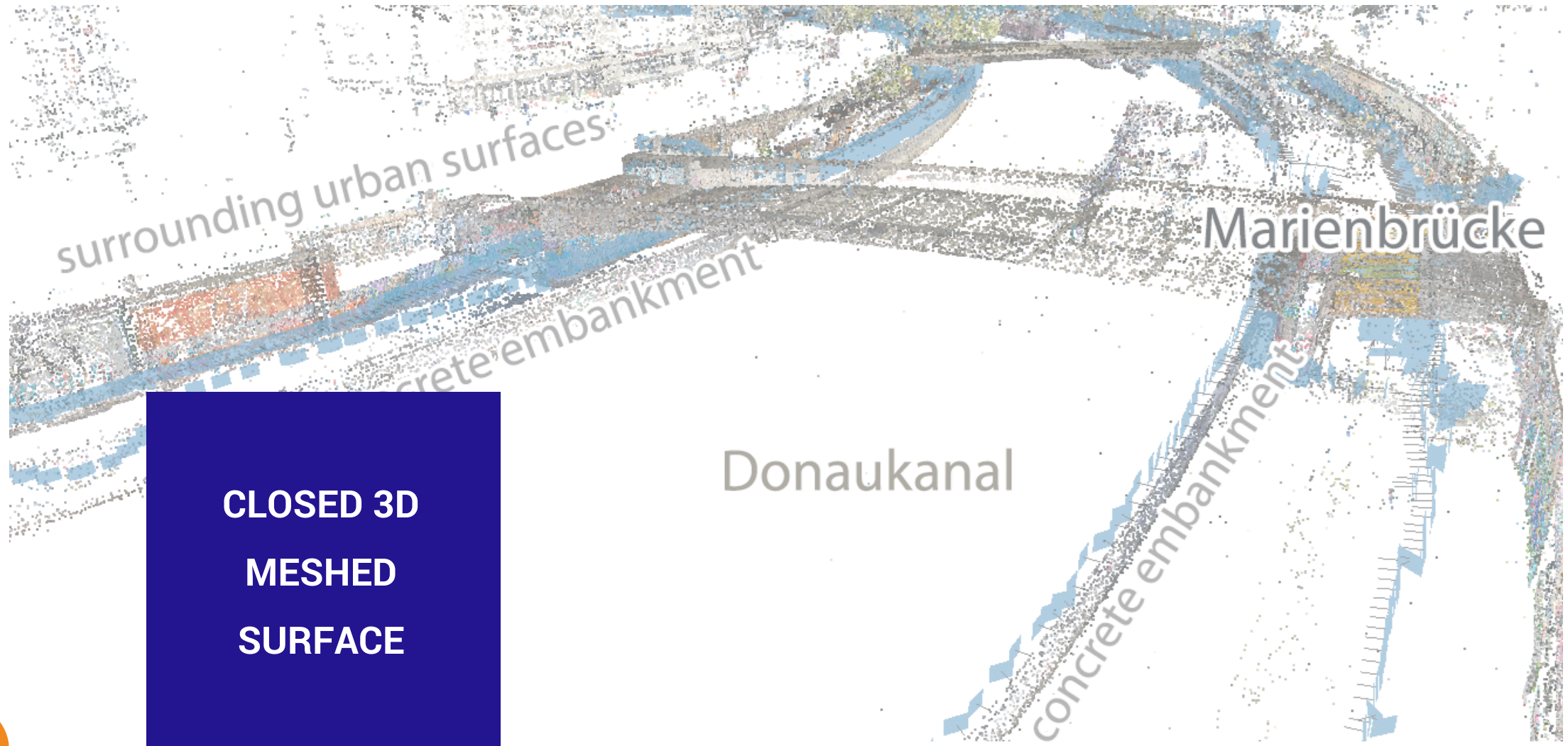
POSITION all images



THREE purposes

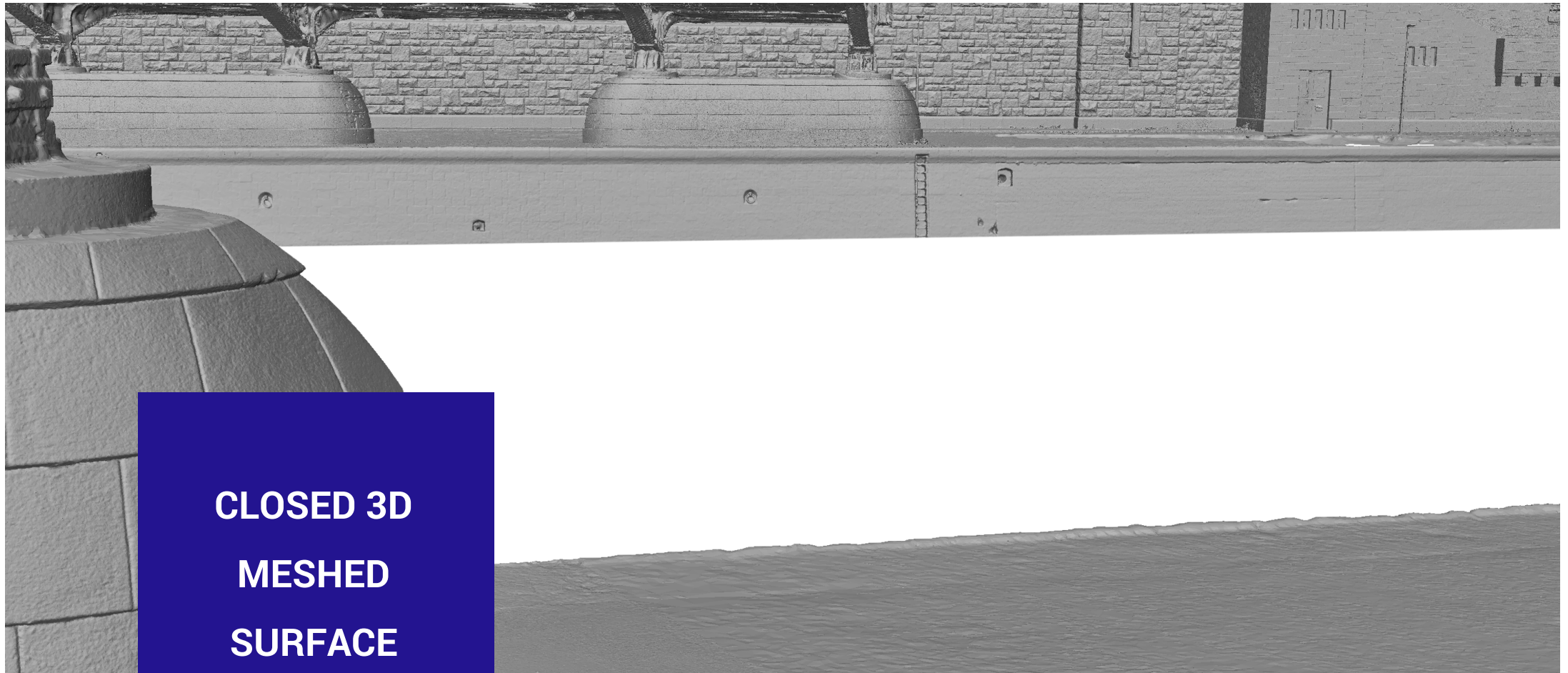


THREE purposes



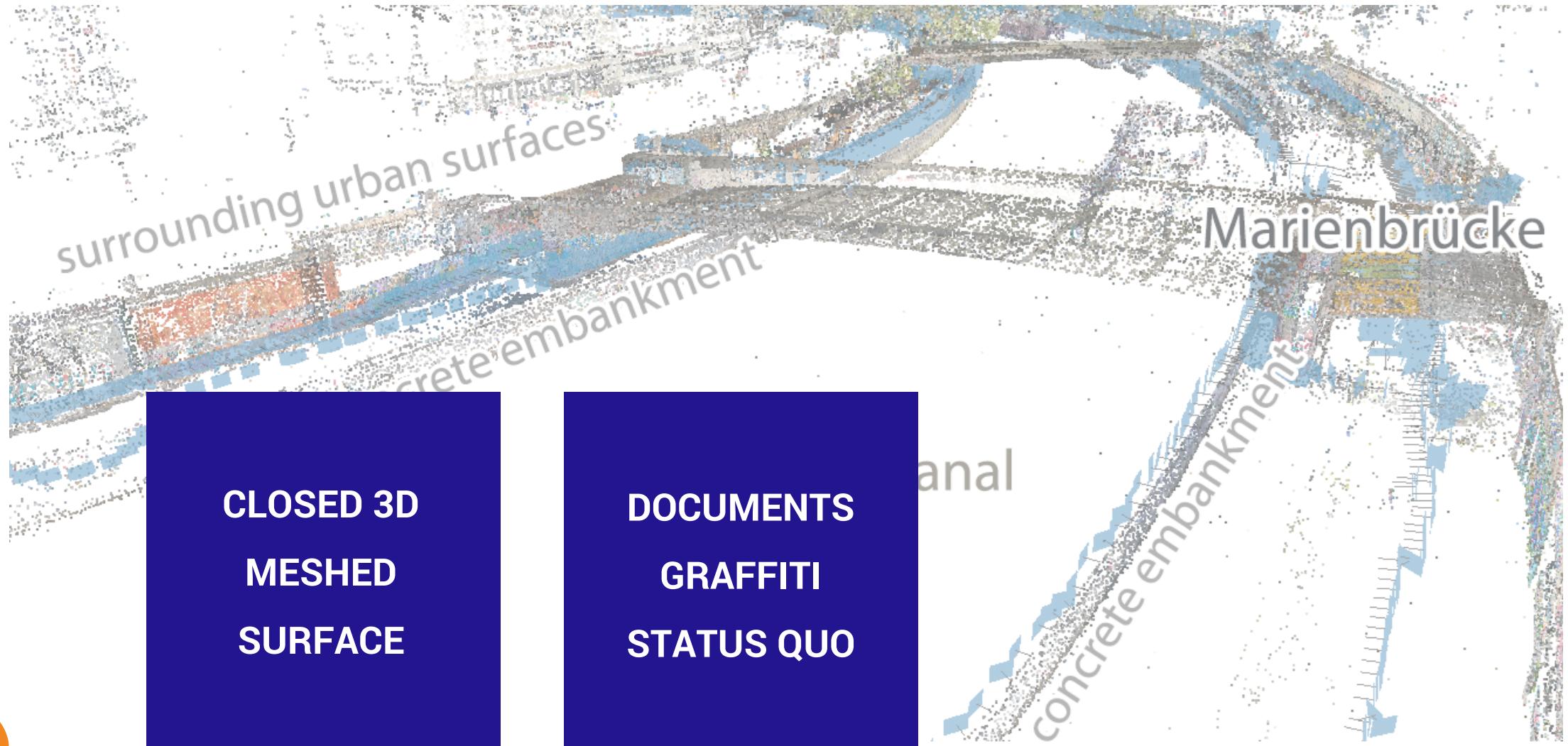
CLOSED 3D
MESHED
SURFACE

THREE purposes



CLOSED 3D
MESHED
SURFACE

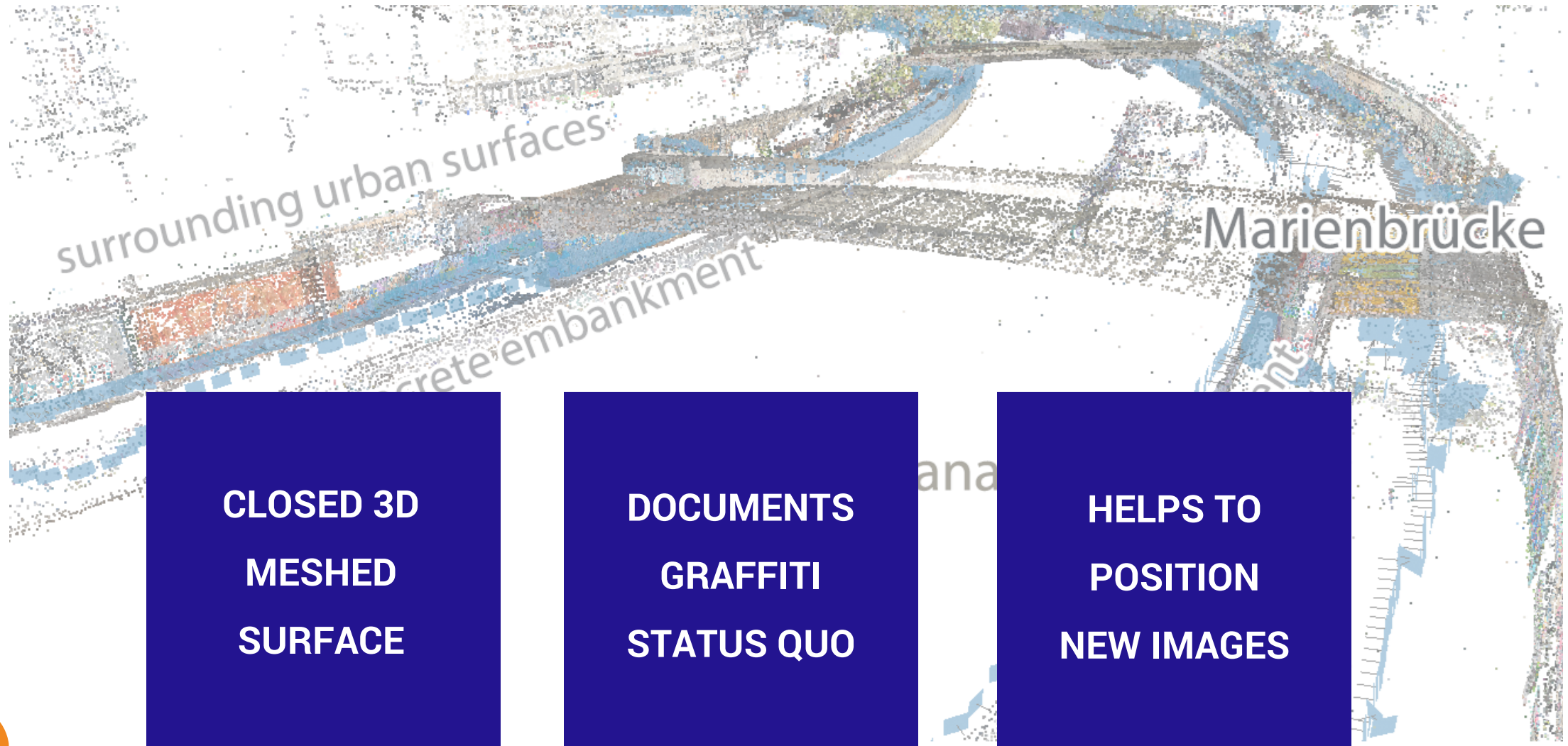
THREE purposes



CLOSED 3D
MESHED
SURFACE

DOCUMENTS
GRAFFITI
STATUS QUO

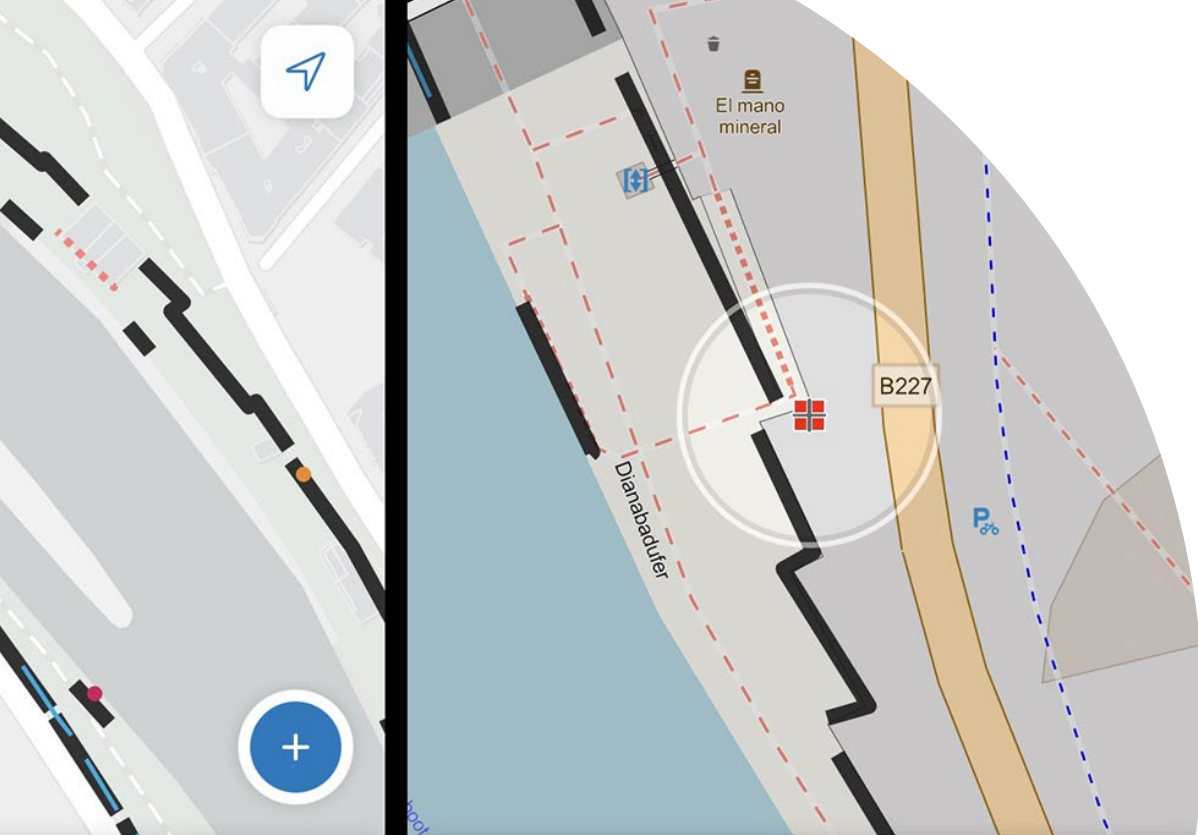
THREE purposes



CLOSED 3D
MESHED
SURFACE

DOCUMENTS
GRAFFITI
STATUS QUO

HELPS TO
POSITION
NEW IMAGES



nd, Flex ✕
5,8 km

Als Anlage

INDIGO - Monitoring - Graffiti ⋮

48,214117°N 16,375703°O

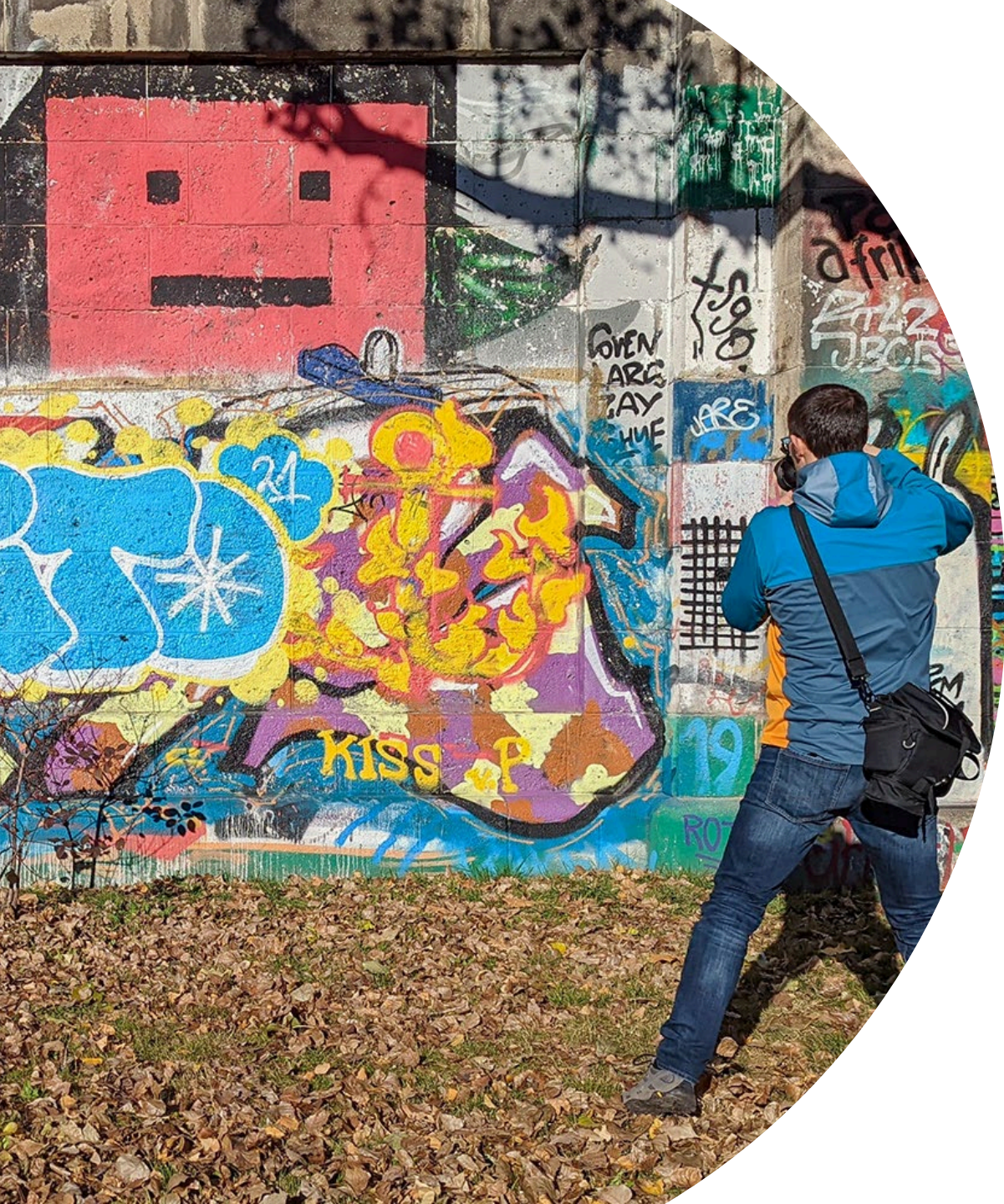
Punkt aktualisieren

Foto aufnehmen Anfügen

Notes

FOLLOW-UP photography

Instagram + monitoring app



FOLLOW-UP **photography**

Instagram + monitoring app

2 photographers



FOLLOW-UP **photography**

Instagram + monitoring app

2 photographers

2 cameras + 2 spectrometers + 2 tablets

identically programmed



FOLLOW-UP **photography**

Instagram + monitoring app

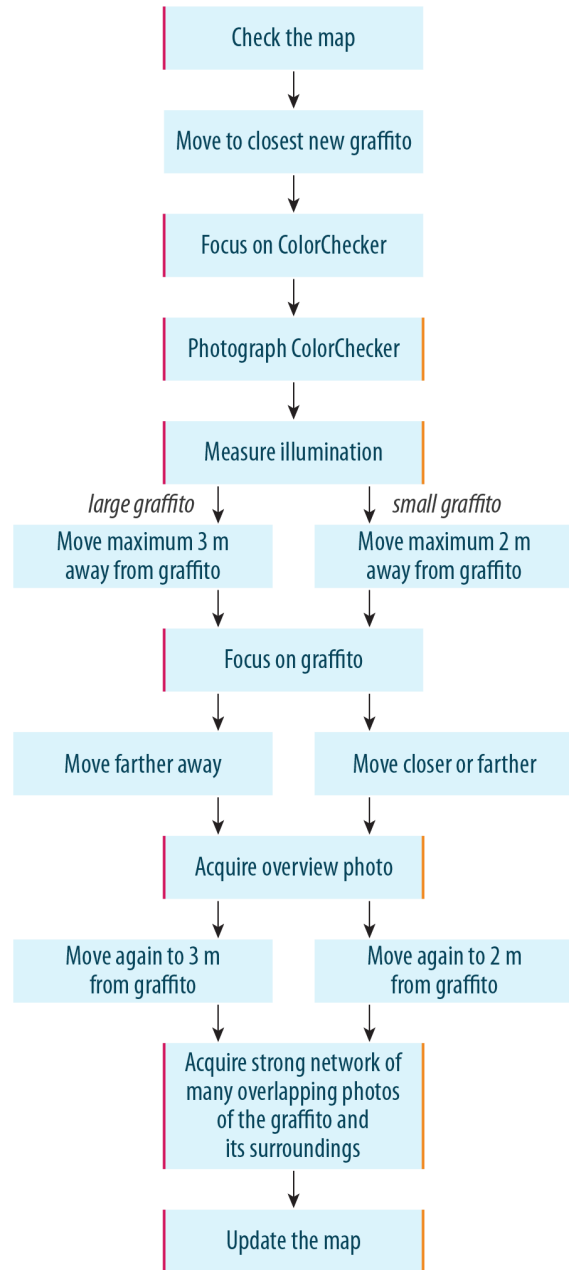
2 photographers

2 cameras + 2 spectrometers + 2 tablets

identically programmed

fixed acquisition procedure

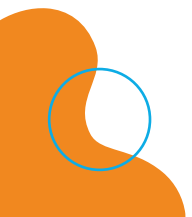
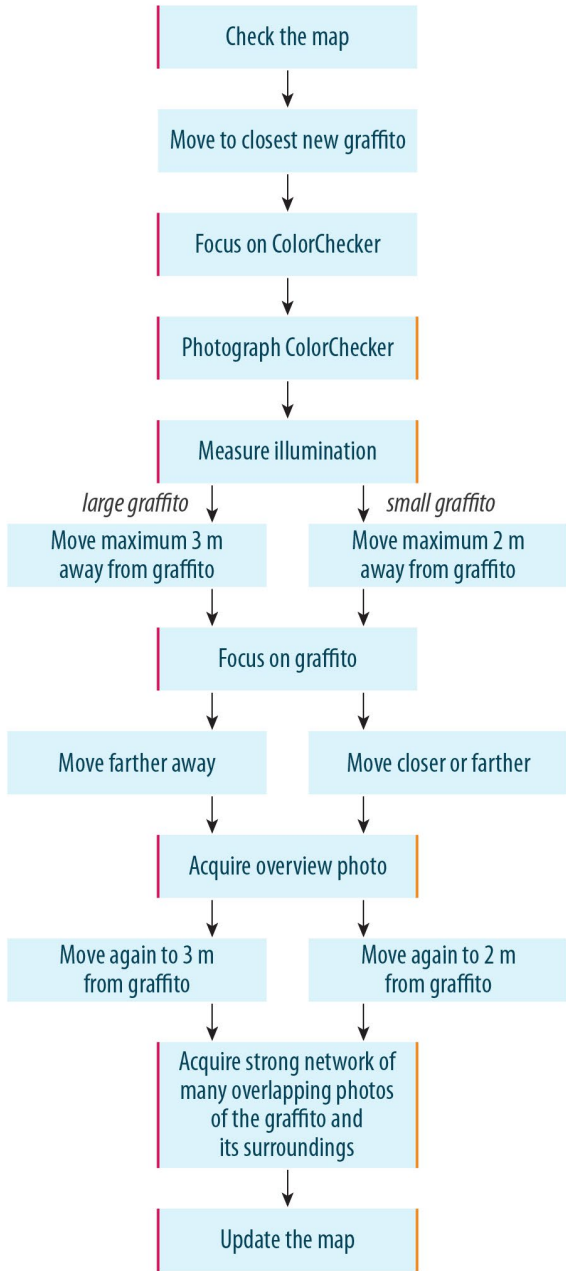
'Follow-up' workflow



Hardware

← relies on

'Follow-up' workflow



Hardware

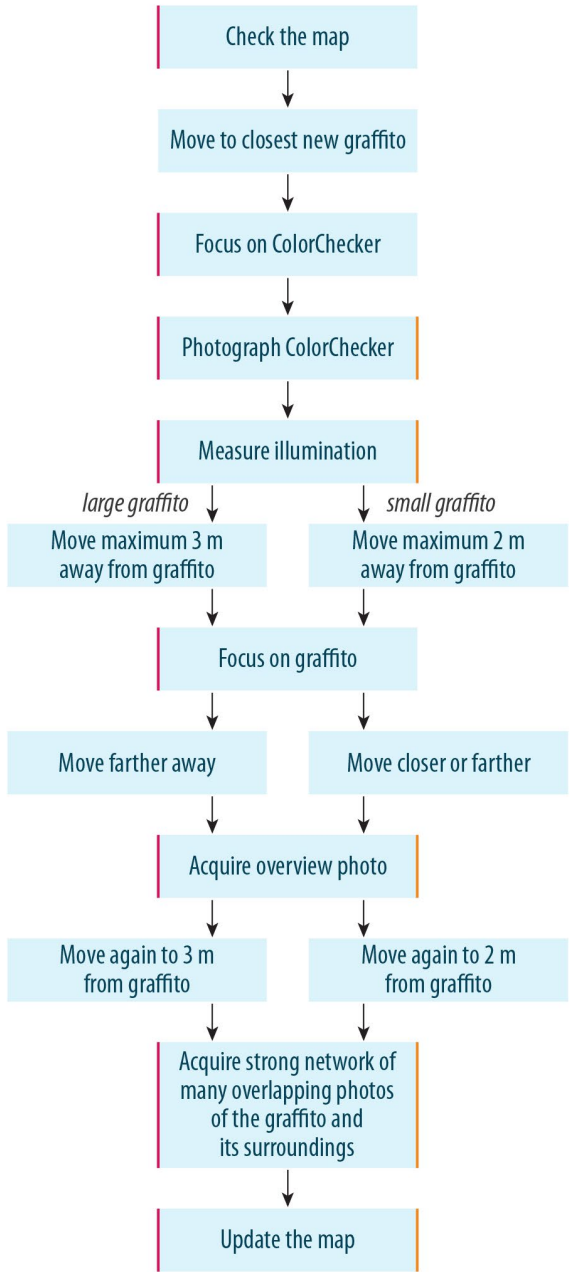


← relies on

'Follow-up' workflow

→ generates

Output



1 ColorChecker photo



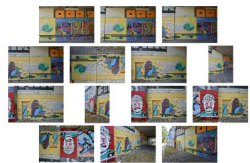
1 illumination spectrum



1 overview photo



[5, ∞[detailed graffito photos



Updated monitoring map



Hardware



← relies on

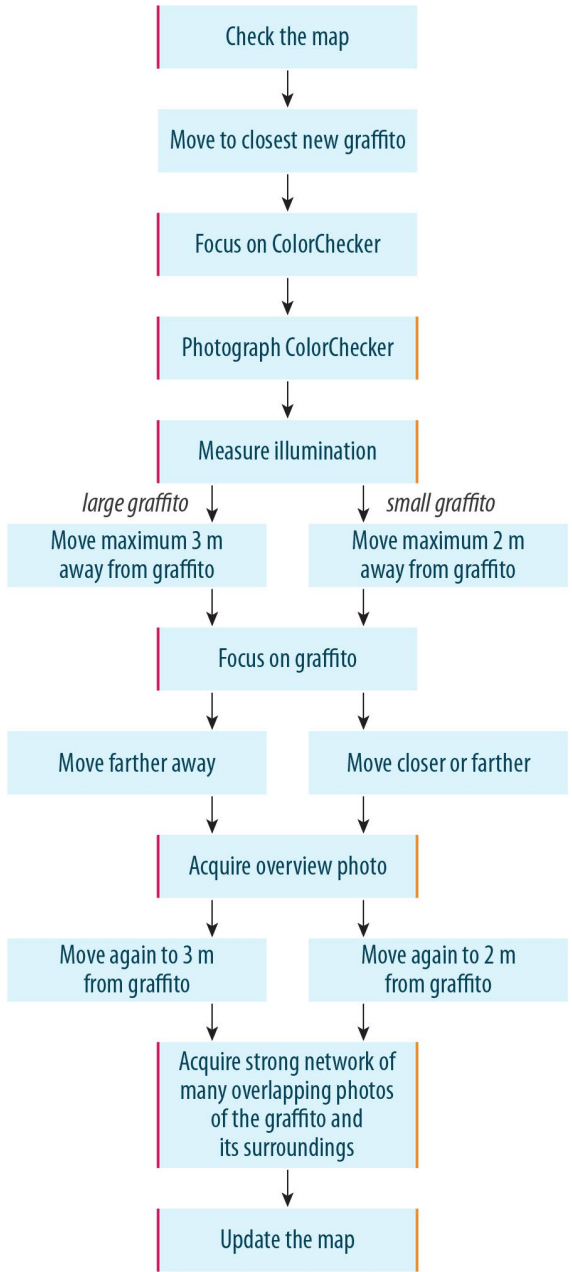
'Follow-up' workflow

→ generates

Output

→ has

Purpose



1 ColorChecker photo



1 illumination spectrum



- 1. Subdivide photo series
- 2. Establish link with spectrometer file
- 3. Generate correct photo colours (backup)

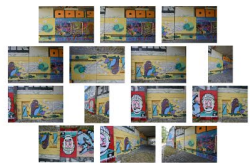
Generate correct photo colours

1 overview photo



- 1. Extract graffiti outlines
- 2. Generate tour overview photos
- 3. Estimate interior & exterior camera orientations

[5, ∞[detailed graffiti photos



- 1. Estimate interior & exterior camera orientations
- 2. Produce 3D model texture
- 3. Generate orthophoto mosaic

Updated monitoring map

Guide follow-up photography

ACCURATE positioning



ACCURATE positioning



Scene2Map NTRIP-Client

NTRIP CLIENT ACTIVATION Data

OFF **POSITION** 3d

RTK STATUS NO

Status

WiFi Network Client Access Data

This NTRIP Client requires access to an Internet enabled Network!

If access fails, an accesspoint will be created ("NTRIP_Client_" with PW:"NTRIP")

Address: Save

Password:

NTRIP Caster Settings

Network Name: Save

Port:

Mountpoint:

Username:

Password:

Send my Position

(Required if your Caster provides VRS (Virtual Reference Station))

Repeat time: 1 sec. 2 sec. 10 sec. 20 sec. Apply

Restart NTRIP client for changes to take effect Restart

@Martin Wieser 2022

COLLECTED photos



COLLECTED photos



TOTAL
COVERAGE

2

COLLECTED photos



TOTAL
COVERAGE

2

TC PHOTOS

26.7 k

42.0 k

COLLECTED photos



TOTAL
COVERAGE

2

FOLLOW-UP

96

TC PHOTOS

26.7 k

42.0 k

COLLECTED photos



TOTAL
COVERAGE

2

FOLLOW-UP

96

TC PHOTOS

26.7 k

42.0 k

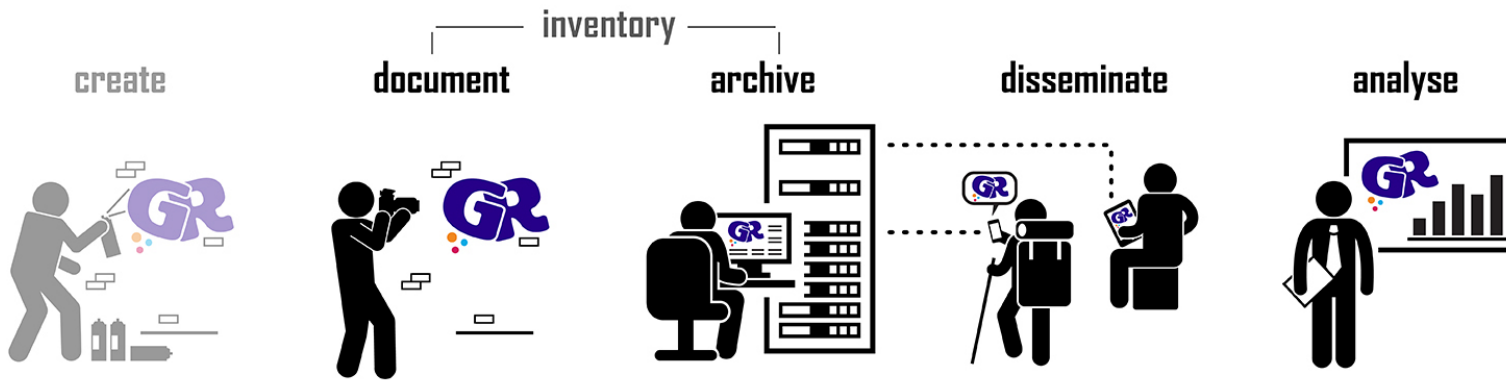
FU PHOTOS

88.3 k

INDIGO approach



4 goals



5 research pillars

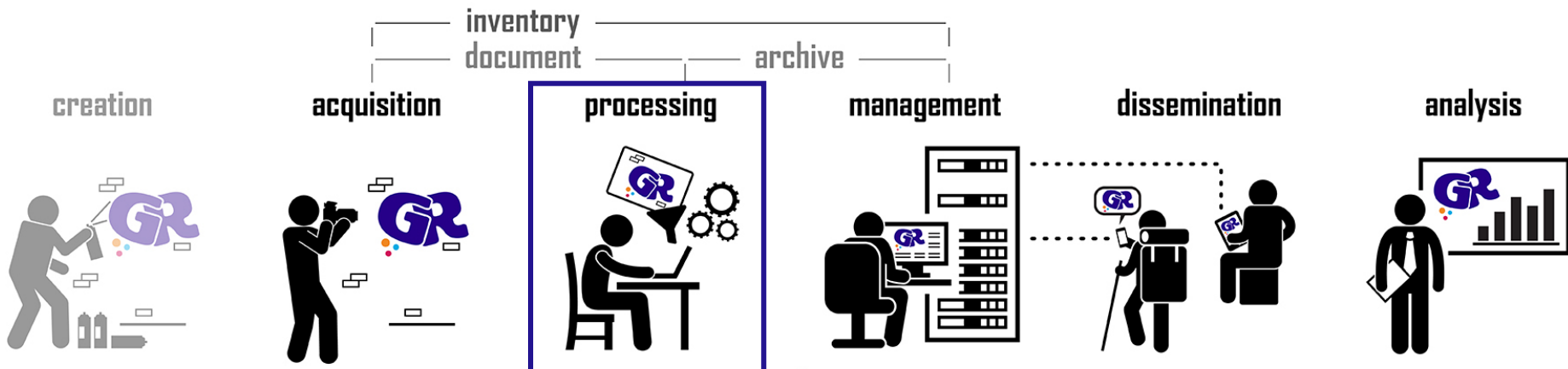


IMAGE positioning

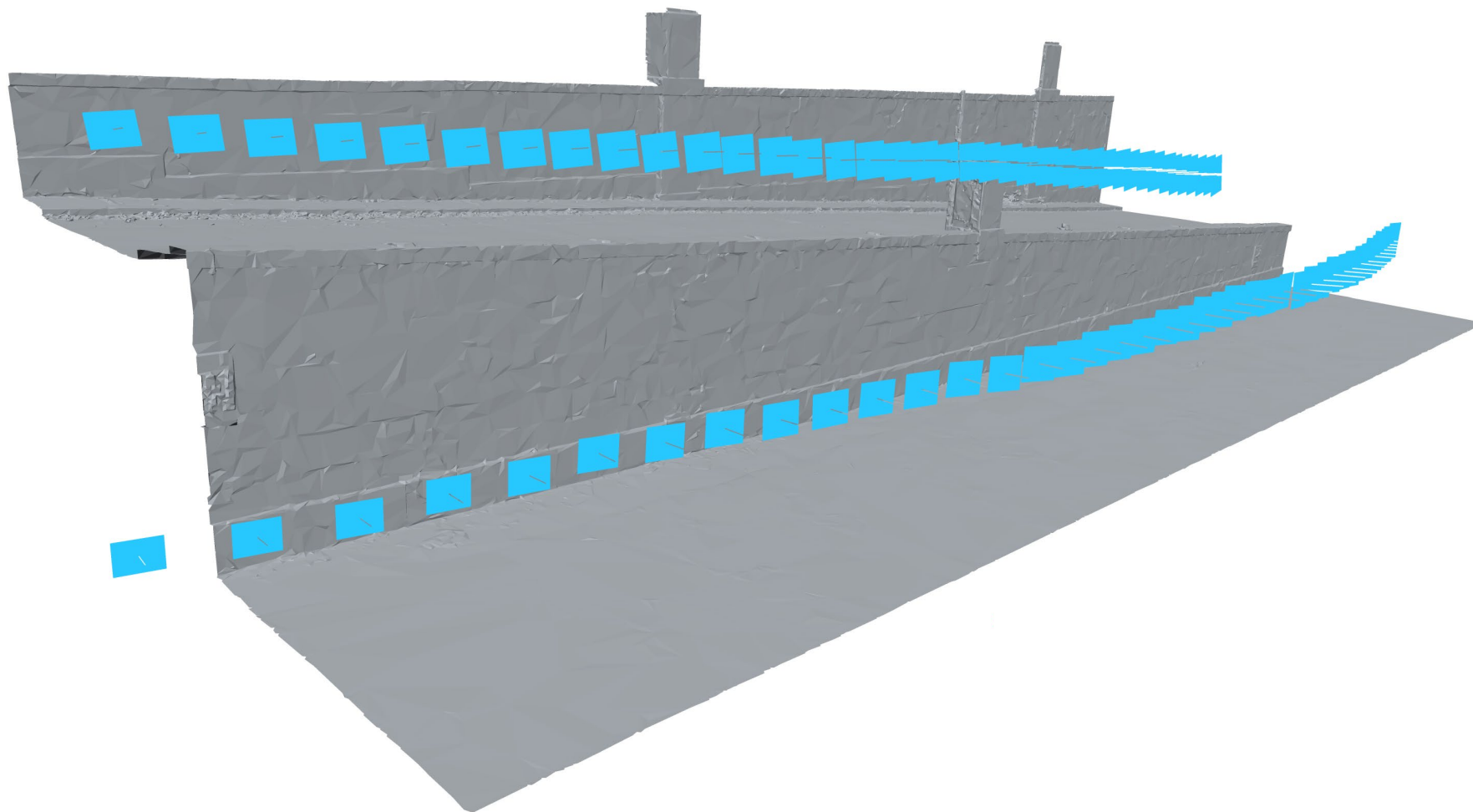


Illustration by Benjamin Wild



IMAGE positioning

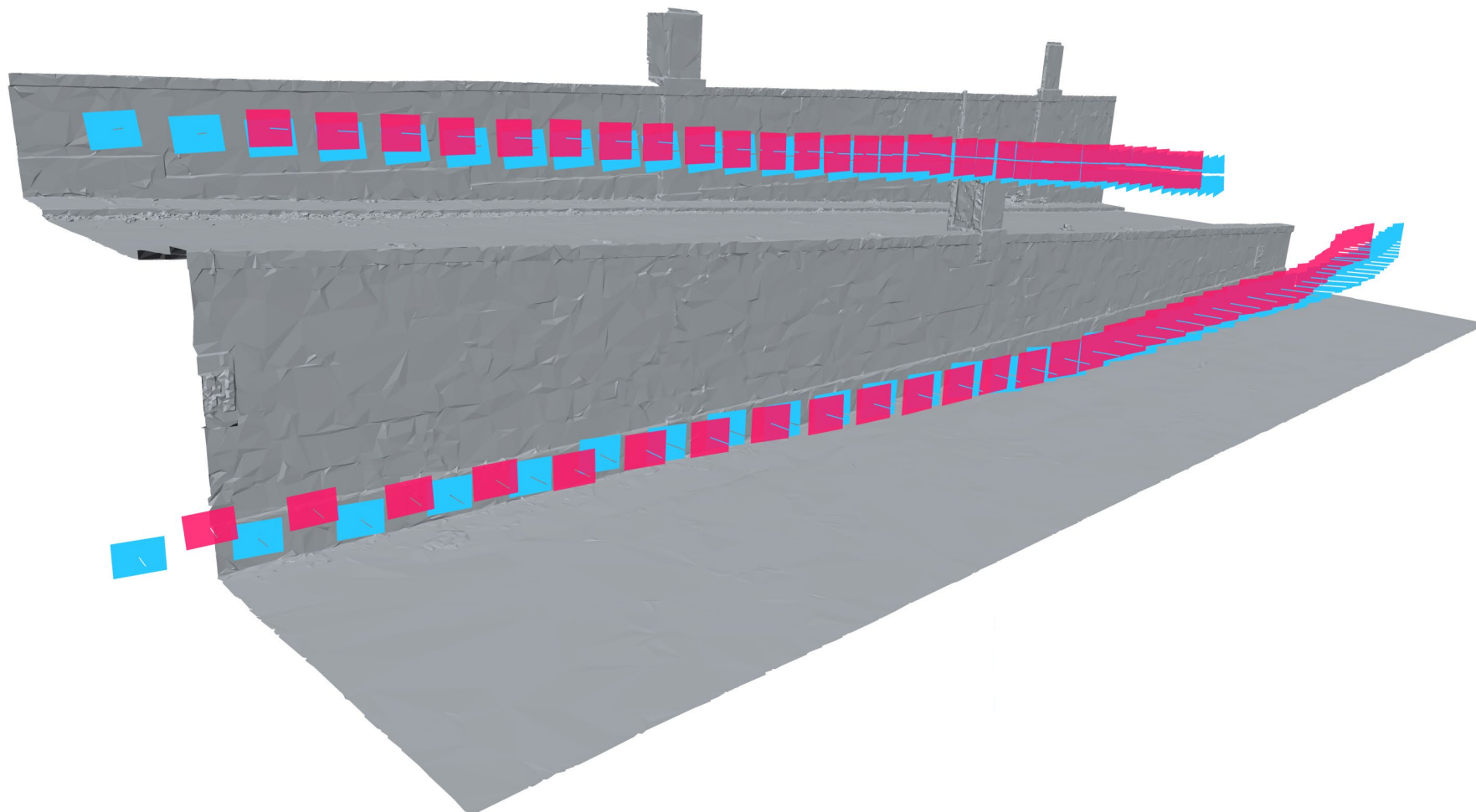


Illustration by Benjamin Wild



IMAGE positioning

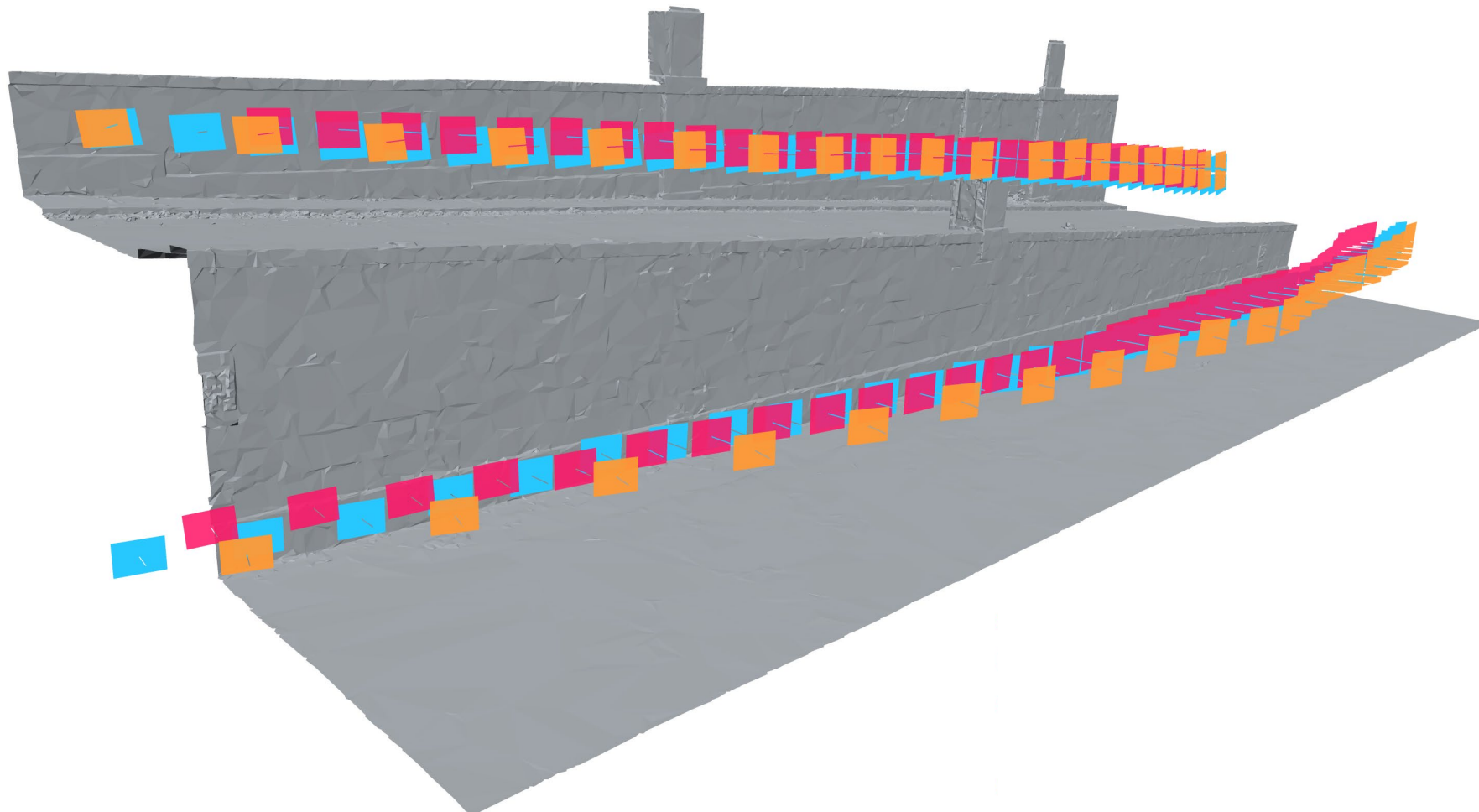


Illustration by Benjamin Wild

IMAGE positioning

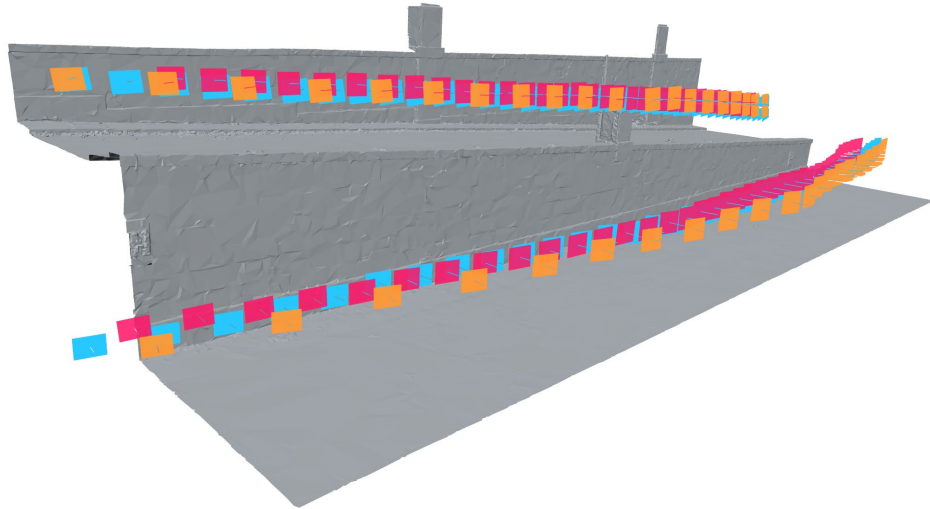
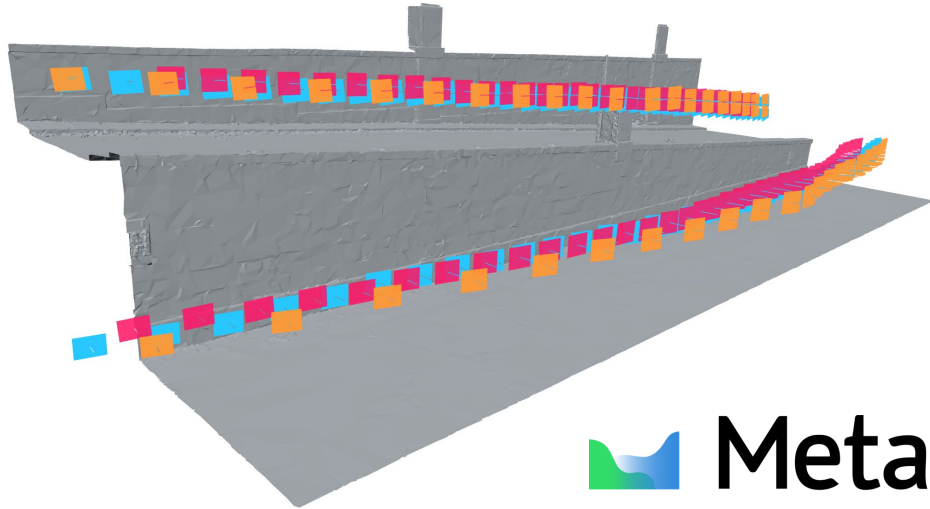


Illustration by Benjamin Wild



IMAGE positioning



 Metashape





INDIGO Toolbox

1. Choose graffito directory to be processed

2. Run

AUTOGRAF

position-accurate pixels



main 1 branch 0 tags

Go to file Code

bewild96 Update README.md	75d27bb 15 days ago	24 commits
Heritage_ClassificationResults	Add files via upload	2 months ago
images	Add files via upload	last month
src	Add files via upload	2 months ago
LICENSE	Initial commit	2 months ago
README.md	Update README.md	15 days ago

README.md



Short Description

AUTOGRAF (AUTomated Orthorectification of GRAffiti photos) is an open-source python-based Metashape add-on which enables the automated orthorectification of graffiti photos at a specific site of interest. It employs state-of-the art photogrammetric computer vision techniques to allow highly accurate georeferencing and orthorectification of large numbers of photographs. A paper detailing AUTOGRAF's methodology will soon be submitted to Heritage (an MDPI journal).

AUTOGRAF is developed as part of the INDIGO project (In-ventory and DI-sseminate G-raffiti along the d-O-naukanal) carried out by the Ludwig Boltzmann Institute for Archaeological Prospection and Virtual Archaeology in close collaboration with the GEO Department of TU Wien University.

How to set up AUTOGRAF

Before AUTOGRAF can be used, the following preparatory steps [1-3] need to be performed:

1 - Install Agisoft's Metashape

About

AUTomatic Orthorectification of GRAffiti photos

photographs graffiti orthorectification

Readme

GPL-3.0 license

6 stars

1 watching

0 forks

Releases

No releases published

Packages

No packages published

Contributors 2

bewild96

BeyondConventionalBoundaries Geert ...

Languages

Python 100.0%

AUTOGRAF

position-accurate pixels



AUTOGRAF

AUTOGRAF

position-accurate pixels



AUTOGRAF

AUTOGRAF

position-accurate pixels



COOLPI

COOLPI
colour-accurate pixels



amolada Add files via upload ● @bbf6c3 on Oct 20, 2022 ⌚ 155 commits		
dist	Add files via upload	9 months ago
docs	Add files via upload	9 months ago
graffiti_image_processing	Add files via upload	9 months ago
notebooks	Add files via upload	10 months ago
src	Add files via upload	9 months ago
tests/coolpi-gui-test	Add files via upload	10 months ago
wpp_data	Add files via upload	10 months ago
LICENSE	Initial commit	last year
LICENSE.txt	Add files via upload	9 months ago
MANIFEST.in	Add files via upload	9 months ago
README.md	Add files via upload	9 months ago
pyproject.toml	Add files via upload	9 months ago

☰ README.md

COOLPI

Description

Colour Operations Library for Processing Images (COOLPI) is an open-source toolbox programmed in Python for the treatment of colorimetric and spectral data. It includes classes, methods and functions developed and tested following the colorimetric standards published by the Commission Internationale de l'Éclairage (CIE, 2018).

The COOLPI package has been developed as part of the INDIGO project (IN-ventory and DI-sseminate Graffiti along the d-O-naukanal) carried out by the Ludwig Boltzmann Institute for Archaeological Prospection and Virtual Archaeology in close collaboration with the GEO Department of TU Wien University.

The achievement of colour-accurate digital images is one of the primary research topics within the INDIGO project. Therefore, the COOLPI package also includes specific procedures for digital image processing and colour correction, particularly from images in RAW format.

About

Colour Operations Library for Processing Images

- Readme
- GPL-3.0, GPL-3.0 licenses found
- 4 stars
- 0 watching
- 1 fork

Report repository

Releases

No releases published

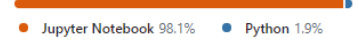
Packages

No packages published

Contributors 2

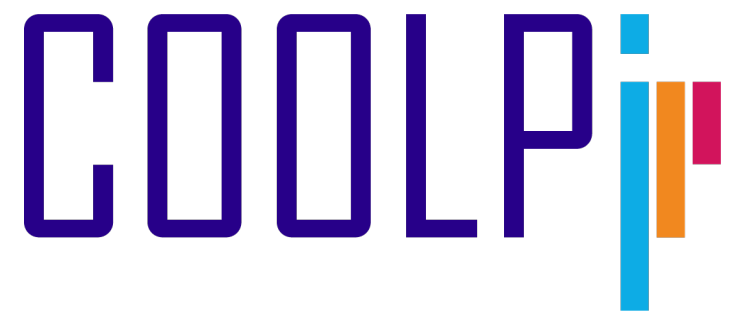
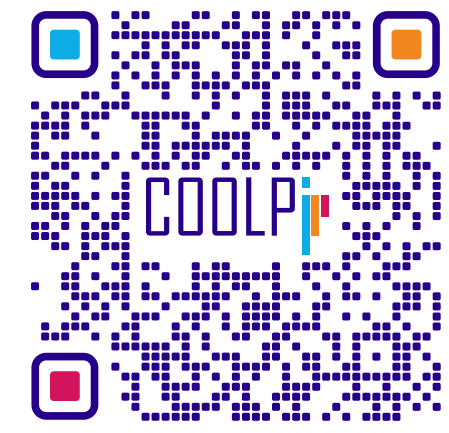
- amolada Adolfo Molada Tebar
- BeyondConventionalBoundaries Geert ...

Languages



COOLPI

colour-accurate pixels



GRAPHIS

storing image regions

The screenshot displays the GRAPHIS web application interface. The main window shows a graffiti image with a yellow polygonal region highlighted around a central figure. The interface includes a left sidebar with 'Database statistics' (1 image, 0 circles, 0 rectangles, 1 polygon), 'Region appearance' (color and shape options), and 'Region operations' (move, zoom, delete). A top-left menu icon is visible. The right sidebar contains 'User information' (Name: Geert Verhoeven, Identifier: 0000-0003-4825-9604) and a 'Region' metadata panel with fields for Region Identifier, Region Name, Region Role, and Region Content Type. A 'Region Creator' tab is also present.

Database statistics

- Nr. of images: 1
- Circles: 0
- Rectangles: 0
- Polygons: 1

Region appearance

- Color: [C] [G] [B]
- Shape: [C] [R] [P]

Region operations

- Move: [↔]
- Zoom: [🔍]
- Delete: [✖]

User information

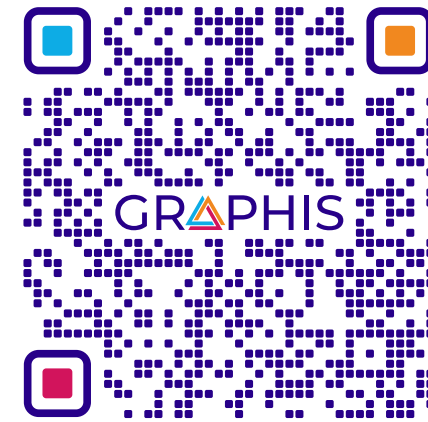
Name: Geert Verhoeven
Identifier: 0000-0003-4825-9604

Region

Region Identifier: INDIGO_20230412_G0001
Region Name: graffito
Region Role: main subject area
Region Content Type: graffito

Region Creator

Identifier: 0000-0003-4825-9604
Name: Geert Verhoeven
Role: https://vocabs.acdh.oeaw.ac.at/graphis-imgreg/imgRegCreator



GRAPHIS

Product Solutions Open Source Pricing Search or jump to... Sign in Sign up

GraffitiProjectINDIGO / GRAPHIS Public Notifications Fork 0 Star 1

Code Issues 12 Pull requests Actions Security Insights

main 1 branch 3 tags Go to file Code

About
Generate Regions and Annotations for Photos using the IPTC Standard
projectindigo.eu/
iptc-metadata
Readme
GPL-3.0 license
1 star
0 watching
0 forks
Report repository

Releases 3
GRAPHIS 2.1.2 - WIN64BIT Latest
on May 30
+ 2 releases

Contributors 2
MartinW-S2M
BeyondConventionalBoundaries Geert ...

Languages
Python 100.0%

File	Commit Message	Time Ago
.github/ISSUE_TEMPLATE	Update issue templates	2 months ago
app	fix #10 Ctrl+S - fix #21 - fix #23	2 months ago
doc/images	changed doc image	2 months ago
.gitignore	using multiprocessing for image loading	3 months ago
Graphis_pyinstaller.spec	fix #10 Ctrl+S - fix #21 - fix #23	2 months ago
LICENSE	Initial commit	5 months ago
files_rc.py	changing to pyside6	2 months ago
graphis.config	changing to pyside6	2 months ago
graphis.py	fix #10 Ctrl+S - fix #21 - fix #23	2 months ago
readme.md	added minimal usage in readme	2 months ago
requirements.txt	changing to pyside6	2 months ago

readme.md

GRAPHIS

Graphis

Table of contents

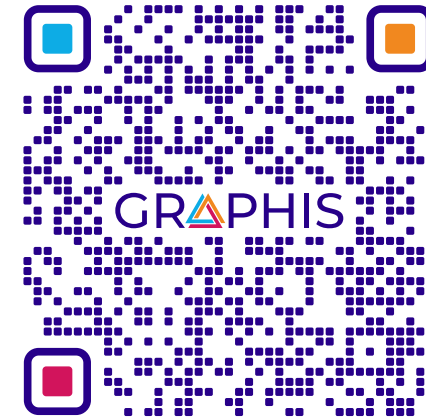
- General info
- Creating binaries with PyInstaller

General info

This project is a little tool written in python and QT to change and view IPTC image region tag from images. The tool should work with all images supported by pyside2 and rawpy. Once images are imported all changes made are directly and immediately stored to the project's sqlite file. Thus image IPTC information is only updated if chosen so in by the menu. All data manipulation happens solely on

GRAPHIS

storing image regions



GRAPHIS

COMBINING tools

GRAPHIS

The screenshot displays the GRAPHIS web application interface. At the top, the title bar shows 'MENU' on the left and 'GRAPHIS' on the right. The main content area features a central image of a graffiti wall with a central figure holding a gun, surrounded by various graffiti tags. A yellow region is highlighted on the image, and a smaller thumbnail of this region is shown at the bottom. The interface is divided into several panels:

- Database statistics:** Shows 'Nr. of images' as 1, 'Circles' as 0, 'Rectangles' as 0, and 'Polygons' as 0.
- Region appearance:** Includes icons for different shapes (circle, square, pentagon) and their corresponding colors (orange, green, blue).
- Region operations:** Contains icons for selection, movement, and deletion.
- User information:** A form with fields for 'Name' (Geert Verhoeven) and 'Identifier' (0000-0003-4825-9604).
- Region information:** A form with fields for 'Region Identifier', 'Region Name', 'Region Role', 'Identifier', 'Name' (set to 'cropping'), and 'Region Content Type'.
- Region Creator:** A table with columns for 'Region Creator', 'Description', and 'Transcription'.
- Welcome message:** A text box at the bottom left that reads: 'Welcome GEERT VERHOEVEN. Enjoy working with GRAPHIS. New database was created: PolygonTest.sqlite. Importing images. Start to import 1 images.'

COMBINING tools

GRAPHIS

The screenshot displays the GRAPHIS web application interface. At the top, the title bar shows 'MENU' on the left and 'GRAPHIS' on the right. The main content area features a central image of a graffiti wall with a yellow polygon region highlighting a specific piece. The file name 'INDIGO_2023-04-12_Z7ii-B_0685.jpg' is visible above the image. Below the image is a thumbnail with a '1' icon.

On the left side, there are several tool panels:

- Database statistics:** Shows 'Nr. of images' as 1, 'Circles' as 0, 'Rectangles' as 0, and 'Polygons' as 1.
- Region appearance:** Contains icons for different shapes (circle, square, pentagon) and their corresponding colors (orange, green, blue).
- Region operations:** Includes icons for selection, zoom, and deletion.
- Welcome message:** 'Welcome GEERT VERHOEVEN. Enjoy working with GRAPHIS. New database was created: PolygonTest.sqlite. Importing images. Start to import 1 images.'

On the right side, there is a 'User information' panel with fields for 'Name' (Geert Verhoeven) and 'Identifier' (0000-0003-4825-9604). Below this are tabs for 'Change region info', 'View region info', and 'All region info'. The 'Region' panel includes fields for 'Region Identifier' (INDIGO_20230412_G0001), 'Region Name' (graffito), and 'Region Role' (main subject area). The 'Region Content Type' panel includes fields for 'Identifier' and 'Name' (graffito). At the bottom right, there are tabs for 'Region Creator', 'Description', and 'Transcription', with the 'Region Creator' field showing the identifier 'https://vocabs.acdh.oeaw.ac.at/graphis-imgreg/imgRegCreator'.

COMBINING tools

GRAPHIS

2D polygon (pixel coordinates)

The screenshot displays the GRAPHIS web application interface. At the top, the title bar shows 'MENU' on the left and 'GRAPHIS' on the right. The main content area features a central image of a graffiti wall with a yellow polygon overlaid on a central figure. The file name 'INDIGO_2023-04-12_Z7ii-B_0685.jpg' is visible above the image. Below the image is a thumbnail with a '1' icon. On the left side, there are three panels: 'Database statistics' showing 1 image, 0 circles, 0 rectangles, and 1 polygon; 'Region appearance' with icons for circle, square, and pentagon shapes and their corresponding colors; and 'Region operations' with icons for selection, zoom, and delete. A welcome message for Geert Verhoeven is displayed at the bottom left. On the right side, the 'User information' panel shows the user's name and identifier. Below it, the 'Region' panel contains fields for Region Identifier, Region Name, Region Role, and Region Content Type. At the bottom right, there are tabs for 'Region Creator', 'Description', and 'Transcription', with the 'Region Creator' tab active, showing the user's role.

Database statistics

- Nr. of images: 1
- Circles: 0
- Rectangles: 0
- Polygons: 1

Region appearance

- Circle (C)
- Square (C)
- Pentagon (C)
- Circle (check)
- Square (check)
- Pentagon (check)

Region operations

- Circle
- Square
- Pentagon
- Move
- Zoom
- Delete (X)

Welcome GEERT VERHOEVEN.
Enjoy working with GRAPHIS
New database was created:
PolygonTest.sqlite
Importing images
Start to import 1 images

User information

Name: Geert Verhoeven
Identifier: 0000-0003-4825-9604

Region

Region Identifier: INDIGO_20230412_G0001
Region Name: graffiti
Region Role: Identifier: https://vocabs.acdh.oeaw.ac.at/graphis-imgreg/mainSubjectArea, Name: main subject area
Region Content Type: Identifier: https://vocabs.acdh.oeaw.ac.at/graphis-imgreg/graffiti, Name: graffiti

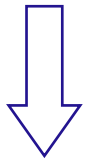
Region Creator

Identifier: 0000-0003-4825-9604
Name: Geert Verhoeven
Role: https://vocabs.acdh.oeaw.ac.at/graphis-imgreg/imgRegCreator

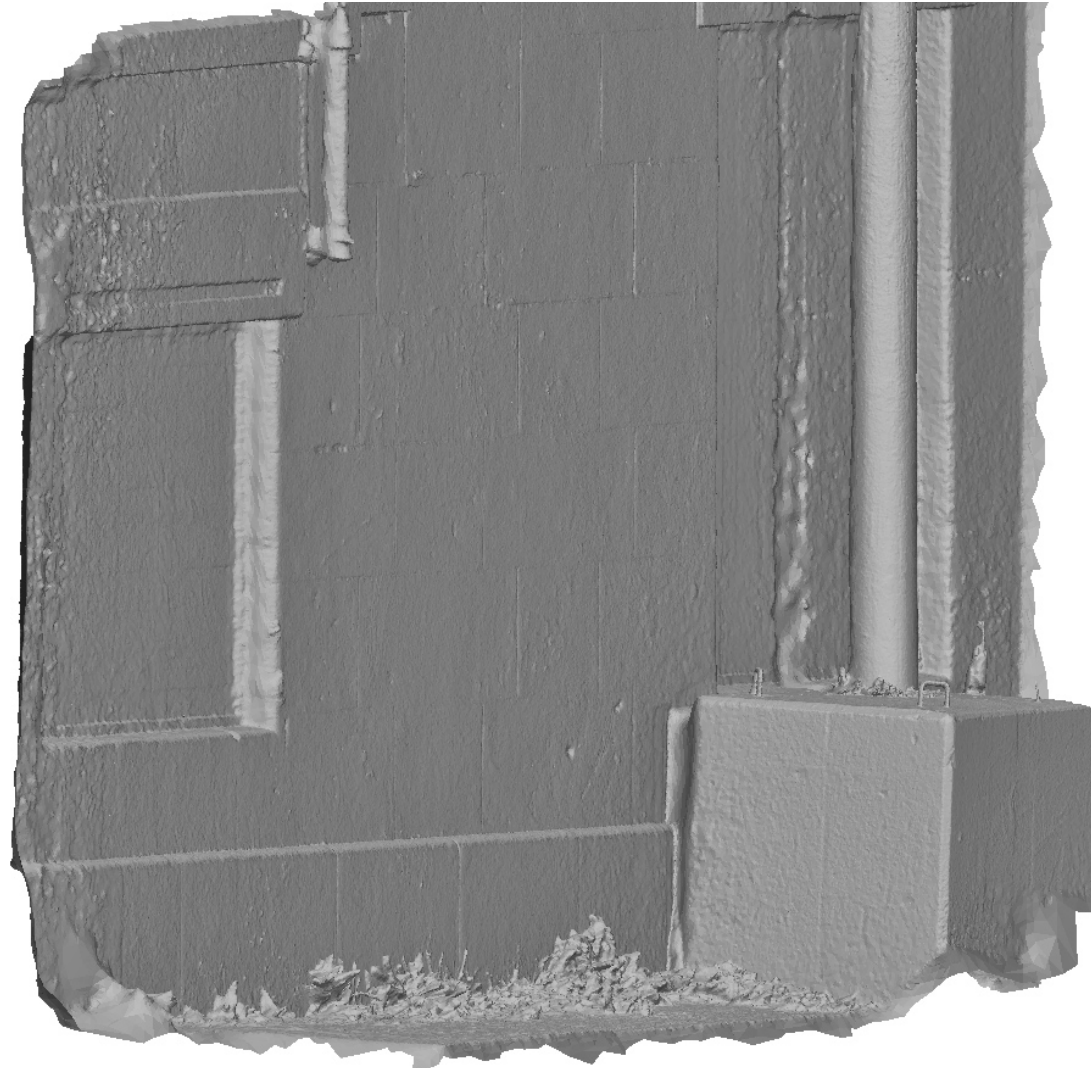
COMBINING tools

GRAPHIS

2D polygon (pixel coordinates)



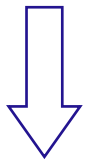
AUTOGRAF



COMBINING tools

GRAPHIS

2D polygon (pixel coordinates)



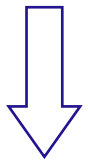
AUTOGRAF



COMBINING tools

GRAPHIS

2D polygon (pixel coordinates)



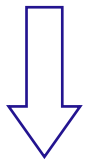
AUTOGRAF



COMBINING tools

GRAPHIS

2D polygon (pixel coordinates)



AUTOGRAF

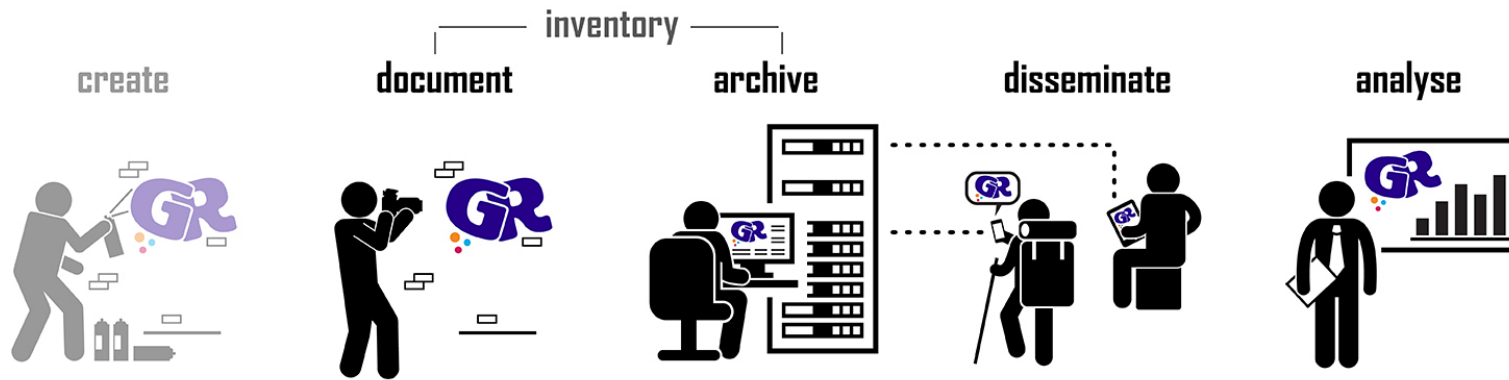
3D polygon (real-world coordinates)



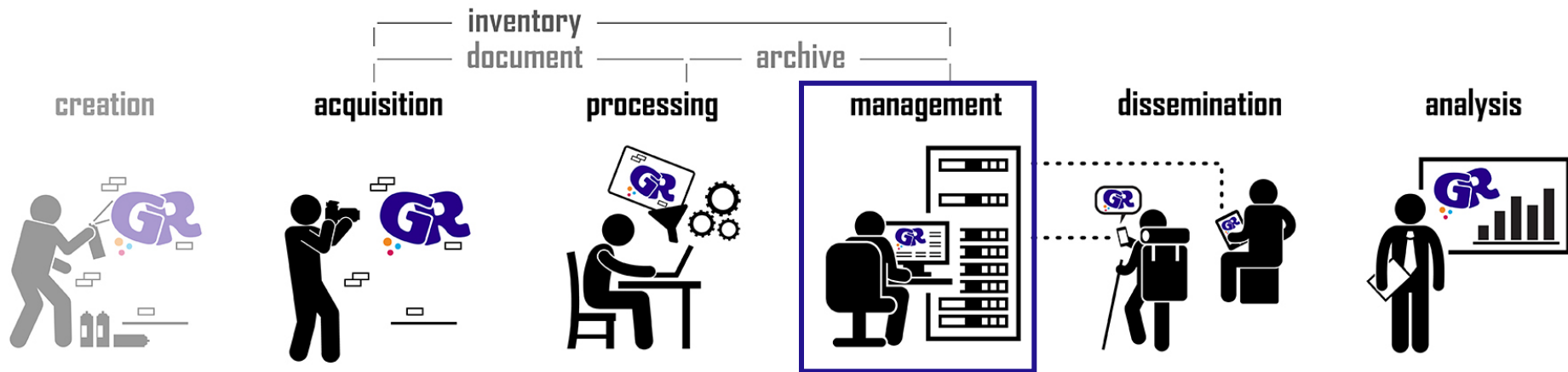
INDIGO approach



4 goals



5 research pillars





oah
oah
austrian centre for
digital humanities
& cultural heritage





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& cultural heritage

OpenAtlas



 **Vocabs**

 **ARCHE**



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digital humanities
& cultural heritage

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database
CIDOC CRM



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thesauri

SKOS



ARCHE



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digital humanities
& cultural heritage

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database

CIDOC CRM



Vocabs

thesauri

SKOS



ARCHE

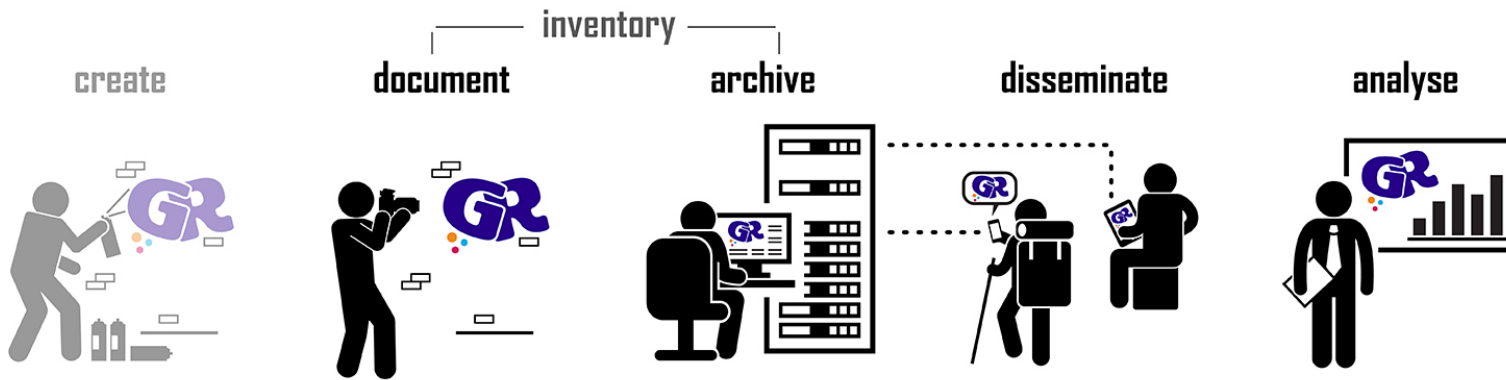
data repository

CoreTrustSeal certified

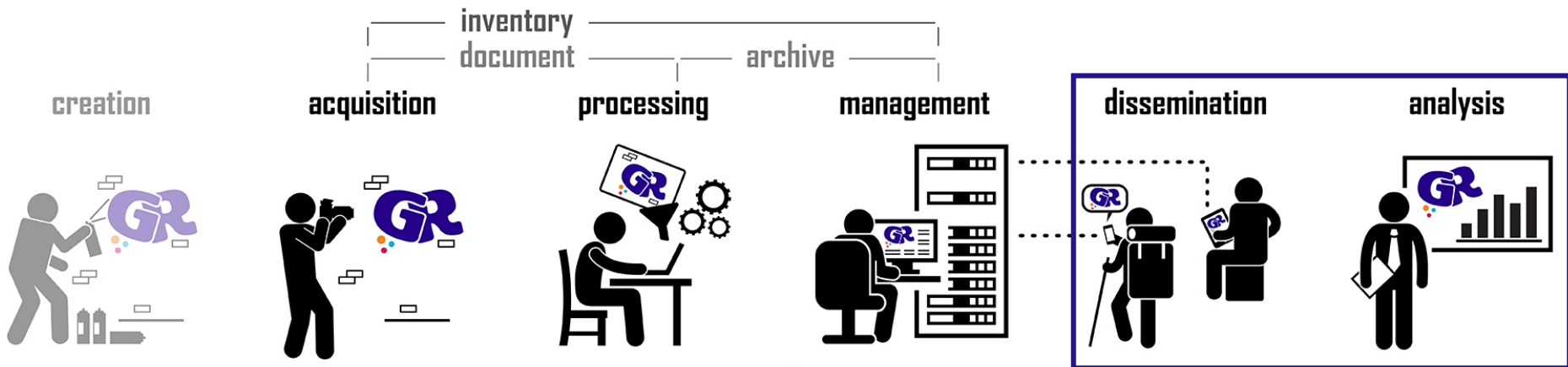
INDIGO approach



4 goals



5 research pillars





INTERACTIVE 3D dissemination

archaeologists / art historians

sociologists / linguists

ethnographers / anthropologists

architects / geographers



INTERACTIVE 3D dissemination

archaeologists / art historians

sociologists / linguists

ethnographers / anthropologists

architects / geographers

ETHICAL + COPYRIGHT aspects

DISSEMINATION **general audience**

NewsLetter 

vol.24 - Week 40 - 03-07 October 2022

VRVis meeting

01 Thursday 06-10-2022
10:00 @ VRVis
discuss collaboration



bot character by DEADBEAT HERO south of the Friedensbrücke on the right Donaukanal bank [21-09-2022]
Nikon Z 7H + Nikon NIKKOR Z 20mm f/1.8 S @ f/5.6 - 1/400 s - ISO 360

 <p>CVL Computer Vision Lab</p>	 <p>UC</p>	
<p>1. CVL meeting Tuesday 27-09-2022 meeting between Sebastian Zambanini of the TU Wien's Computer Vision Lab and Geert to discuss potential thesis subjects</p>	<p>2. Proceedings meeting Wednesday 28-09-2022 the editors of the goINDIGO 2022 proceedings meet to sync info about article submissions and outstanding papers</p>	<p>3. Monthly team meeting Friday 30-09-2022 during monthly team meeting 11, the INDIGO project staff discussed the status quo and talked about upcoming matters</p>

last two weeks

NEWSLETTER

26

DISSEMINATION **general audience**

Gallery Wednesday



NEWSLETTER

26

INSTAGRAM

±500

DISSEMINATION general audience

Die Presse SAMSTAG, 16. JULI 2022

WISSEN & INNOVATION W3

Digital. Ein Forschungsteam entwickelt ein 3-D-Modell der unzähligen Graffiti am Donaukanal: um die kurzlebigen Werke zu bewahren und eine Basis für andere Forschungen schaffen. Zu Besuch bei einer der längsten Graffitiflächen der Welt.

Buntes Erbe zum Lachen, Ärgern und Grübeln

VON ALICE SENARLENS DE GRANCY

Wir haben seit fast vier Jahren einen Hund und gehen mit ihm oft im Prater spazieren, aber auch entlang des Donaukanals“, erzählt Geert Verhoeven von der Idee zu seinem aktuellen Forschungsprojekt. Dabei betrachtete er die Graffiti an den Wänden – „manche waren weniger schön, manche wirkten wie Kunst“ – und bemerkte auch deren Vergänglichkeit: „Sie werden teilweise nach ein paar Stunden oder Tagen übersprüht.“ Der Archäologe begann, die oft kurzlebigen Werke als Kulturerbe zu sehen, das es zu bewahren gilt, und startete gemeinsam mit dem Kunsthistoriker Stefan Wogrin und anderen wissenschaftlichen Partnern das Projekt Indigo (Inventory and Disseminate Graffiti along the Donaukanal).

Der Donaukanal ist heute berühmt für die vielen Graffiti, dabei wissen die meisten nicht, dass Sprays eigentlich nur auf 300 Metern erlaubt ist“, erzählen die beiden Männer an diesem windigen und untypisch kalten Sommertag vor der Kaiserbadschleuse. Hier entstand 1984 neben dem Nachtclub Flex die erste legale Graffiti-Fläche Wiens. Anfang und Ende sind mit einer – bunt besprühten – Reliefplatte markiert, auf der eine Taube zu sehen ist: Die sogenannte Wienerwand sei ein Unikum mit klarer Botschaft, berichtet Wogrin, der sich seit rund 20 Jahren mit Graffiti befasst – und selbst anfertigt: „Man wollte die Sprayer genauso wenig wie die Tauben.“ Dennoch ermöglicht es die Stadt Wien Künstlerinnen und Künstlern aus der Graffiti-Szene so, auf diesen Flächen zu arbeiten, ohne kriminell zu sein.

Thema lässt niemanden kalt
Denn Graffiti polarisieren bis heute. „Die einen lieben sie, die anderen hassen sie“, sagt Verhoeven, der diese Reaktionen auch von wissenschaftlichen Tagungen kennt: „Es gibt jedes Mal 100.000 Fragen.“ Das Interesse gefällt ihm – und auch, dass ein Beitrag aus seiner Forschungsgruppe im März einen Best Paper Award bei einer Konferenz



Außergewöhnlicher Kulturschatz: Geert Verhoeven (l.) und Stefan Wogrin vor einem ihrer Forschungsobjekte.

(Lisa Metzger)

im italienischen Mantua gewonnen hat. Üblicherweise befasst er sich als stellvertretender Leiter des Ludwig-Boltzmann-Instituts (LBI) für Archäologische Prospektion und Virtuelle Archäologie mit ganz anderen Kulturschätzen: Er begleitete die Forschungen rund um das jungsteinzeitliche Stonehenge, war bei den Arbeiten zum römischen Carnuntum oder der Wikinger-

IN ZAHLEN

13 Kilometer lang sind die Flächen am Donaukanal, an denen Wiener Forscher Graffiti fotografisch festhalten und daraus ein 3-D-Modell bauen.

27.000 Fotos verknüpfte das erste Modell. Wöchentlich kommen zwischen 1000 und 3000 neue Bilder dazu.

300 Meter misst der Bereich, in dem Sprays am Wiener Donaukanal legal ist.

Fundstätte Birka dabei. „Und im Stephansdom habe ich Fresken dokumentiert und publiziert“, schildert Geert Verhoeven, der 2010 innerhalb von vier Tagen sein Haus in Belgien verkauft hat und für die Forschungsstelle nach Wien gezogen ist. Die am LBI genutzten und weiterentwickelten Messsysteme und Simulationsmethoden bilden die Klammer über die verschiedenen Themen. Ziel ist stets, Kulturerbe digital festzuhalten.

Digitaler Spaziergang am Kanal
Diese virtuellen Werkzeuge sollen nun auch helfen, die Graffiti am Donaukanal darzustellen – auch Anwendungen für den Tourismus sind denkbar: Den Forschern schwebt ein digitaler Spaziergang am Donaukanal vor, bei dem man auch ältere, an einer Stelle vorhandene Graffiti anschauen und mehr über sie erfahren kann.

Doch noch sind große technische Hürden zu nehmen: Die Far-

ben bei ständig wechselnden Lichtverhältnissen richtig abzubilden, sei sehr schwierig, führt das Duo aus. Auch die Orte ändern sich. „Die Container da drüber waren vor fünf Monaten noch nicht da“, sagt Wogrin und zeigt auf die bunt besprühten Quader am anderen Ufer. Zumindest einmal pro Woche geht er daher den Kanal ab dem Hundertwasserhaus bis zur Friedensbrücke auf beiden Seiten ab, sichtet Neuheiten und macht unzählige Fotos, die später zum großen Ganzen kommen.

Rund 27.000 Fotos bildeten das Basismodell. Seither werden – wie bei einem Puzzle – ständig neue hinzugefügt und beschrieben: Welche Figuren sind dargestellt, was steht geschrieben? Gewalttätige Datenmengen müssen richtig verknüpft werden. Dabei unterstützen auch Forschungssteams der TU Wien und der Universität Politècnica de València in Spanien. Auch das VRRV, das Zentrum für Virtual-

Reality und Visualisierung in Wien, soll künftig helfen, das Neuland zu ergründen. „Es gibt noch keine Projekte, die können, was wir brauchen“, erläutert Verhoeven.

Schließlich soll, unterstützt vom Förderprogramm Heritage Science Austria der Österreichischen Akademie der Wissenschaften, ein öffentlich zugängliches Archiv entstehen, das weltweit kein Pendant findet. Der Donaukanal sei, zusammen mit der Berliner Mauer, wohl die längste ununterbrochene Graffitifläche der Welt, so Verhoeven – und in Bezug auf die Graffiti-Forschung „definitiv die längste“. Die Daten sollen dann Disziplinen wie Soziologie, Linguistik, Kriminologie oder Kunstgeschichte für ihre Forschung offenstehen.

Putin, dargestellt als Hitler

Inhaltliche Analysen folgen also später, doch aus seinen Beobachtungen weiß Wogrin schon heute: „Die Motive haben oft einen Bezug zum Kanal. Man sieht viele Fische oder Fischeskelette oder auch Oktopusse.“ Für politische Botschaften werde meist mit Schablonen gearbeitet, so ließen sich Parolen schnell aufsprühen. Darin habe man zuletzt auch den Beginn des Ukraine-Kriegs gespürt, fand Putin als Hitler dargestellt und einzelne Säulen mit den Farben der Ukraine gelb-blau bemalt. Aber es gibt Graffiti, die für noch mehr Diskussionen sorgen: „Was tun mit homophoben oder nationalsozialistischen Botschaften“, fragt Verhoeven. „Als Forscher wollen wir alle Daten anbieten, aber freilich keine Bühne für Neonazis sein.“

Überdies soll ein Thesaurus entstehen, der die Terminologie erklärt und vereinheitlicht. „Ist es Street-Art oder Graffiti? Sind es Writers, Creators oder Künstler, die hier wirken?“, verdeutlicht Wogrin offene Fragen. Bis zum Projektende im Juli 2023 wird die Datenbank jedenfalls noch ordentlich wachsen. Er hoffe, dass das Projekt dann immer noch gefördert werde, sagt Verhoeven. Denn er will das Neuland hier am Kanal, auf das ihn einst sein Hund geführt hat, weiter für die Nachwelt dokumentieren.

NEWSLETTER

26

PRESS

2

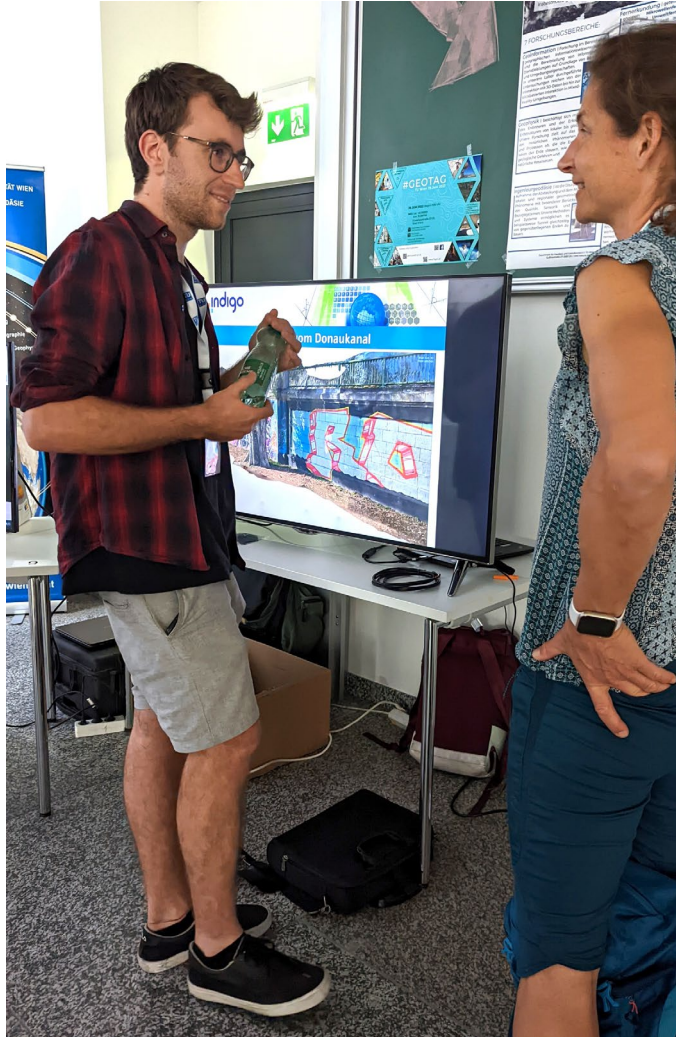
INSTAGRAM

±500

Die Presse 16/07/2022

DISSEMINATION **general audience**

Lange Nacht Der Forschung 2022



NEWSLETTER

26

PRESS

2

INSTAGRAM

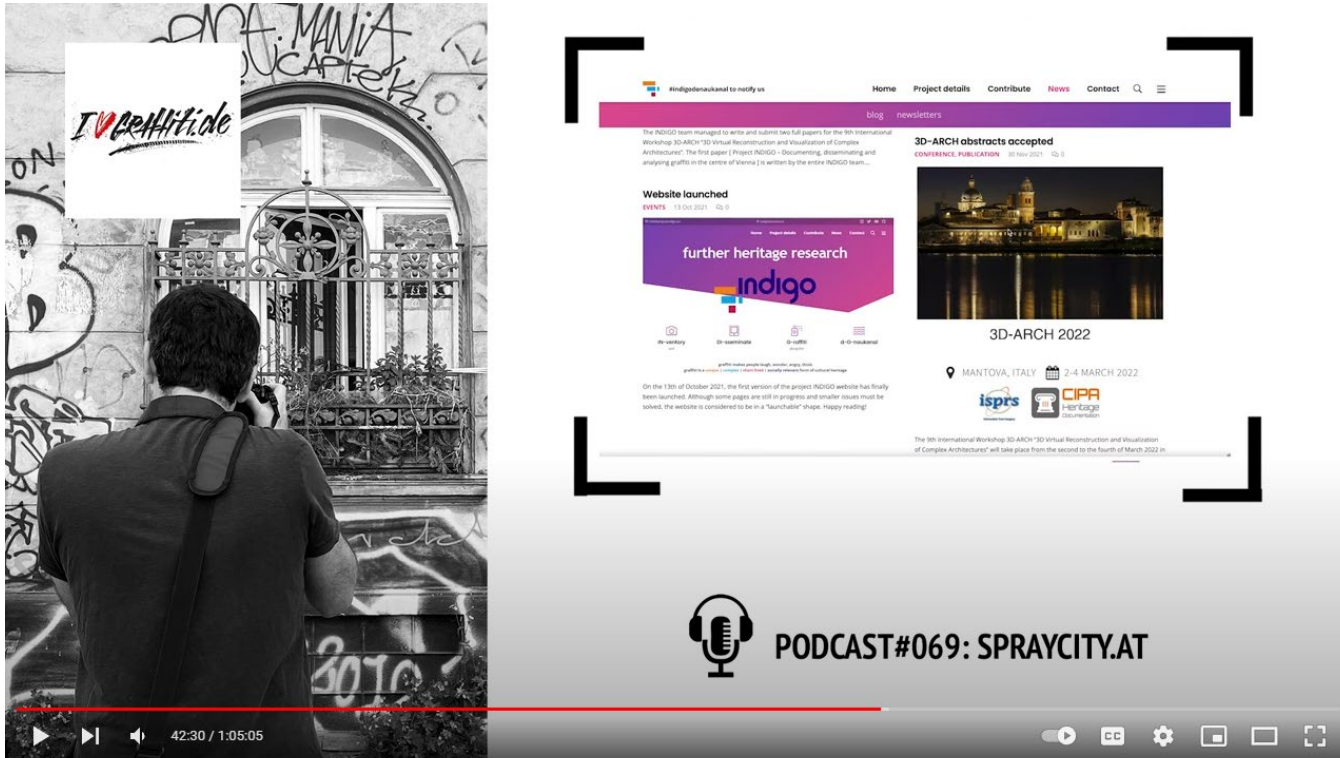
±500

EVENTS

4

DISSEMINATION **general audience**

ILOVEGRAFFITI.DE Podcast 69



PODCAST #069 – Graffiti in WIEN und ÖSTERREICH - SPRAYCITY.AT

5,502 views May 31, 2022

ILOVEGRAFFITI.DE
45.3K subscribers

SUBSCRIBE

128 Dislike Share Download Clip Save ...

Bevor wir euch in einigen Tagen eine frische 5MINUTES Episode aus Wien servieren, wollen wir uns im Podcast mit jemandem unterhalten, der auf dem Gebiet Graffiti in Österreich wirklich ein Experte ist: Stefan von SPRAYCITY.AT (<https://spraycity.at>) Als wir im März 2008 angefangen haben ...more

Comments

19

Add a comment...

PODCASTS

2

DISSEMINATION **general audience**

CIPA Heritage Documentation



Visualisation of present-day Bassianae using an image fusion of the UAS imagery-based orthophoto with a particular relief rendering, PC: Geert Verhoeven

Interview with Geert Verhoeven, CIPA Expert

...



CIPA Heritage Documentation Emerging Professionals

Published Oct 4, 2022

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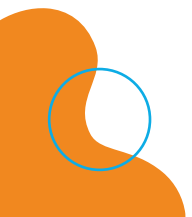
PODCASTS

2

BLOGS

2

DISSEMINATION scientific audience



DISSEMINATION **scientific audience**

AUTOGRAF

COOLP 

GRAPHIS 

SOFTWARE

3

DISSEMINATION **scientific audience**



SOFTWARE



3

HARDWARE

1

DISSEMINATION **scientific audience**

Heritage [open-access]



Article

AUTOGRAF—AUTomated Orthorectification of GRAffiti Photos

Benjamin Wild ^{1,*}, Geert J. Verhoeven ², Martin Wieser ³, Camillo Ressel ¹, Jona Schlegel ², Stefan Wogrin ⁴, Johannes Otepka-Schremmer ¹ and Norbert Pfeifer ¹

¹ Department of Geodesy and Geoinformation, TU Wien, 1040 Vienna, Austria
² Ludwig Boltzmann Gesellschaft—LBI ArchPro, 1190 Vienna, Austria
³ Independent Researcher, Vienna, Austria
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Abstract: Admired and despised, created and destroyed, legal and illegal: Contemporary graffiti are polarising, and not everybody agrees to label them as cultural heritage. However, if one is among the steadily increasing number of heritage professionals and academics that value these short-lived creations, their digital documentation can be considered a part of our legacy to future generations. To document the geometric and spectral properties of a graffiti, digital photographs seem to be appropriate. This also holds true when documenting an entire graffiti-scape consisting of 1000s of individual creations. However, proper photo-based digital documentation of such an entire scene comes with logistical and technical challenges, certainly if the documentation is considered the basis for further analysis of the heritage assets. One main technical challenge relates to the photographs themselves. Conventional photographs suffer from multiple image distortions and usually lack a uniform scale, which hinders the derivation of dimensions and proportions. In addition, a single graffiti photograph often does not reflect the meaning and setting intended by the graffitiist, as the creation is frequently shown as an isolated entity without its surrounding environment. In other words, single photographs lack the spatio-temporal context, which is often of major importance in cultural heritage studies. Here, we present AUTOGRAF, an automated and freely-available orthorectification tool which converts conventional graffiti photos into high-resolution, distortion-free, and georeferenced graffiti orthophotomaps, a metric yet visual product. AUTOGRAF was developed in the framework of INDIGO, a graffiti-centred research project. Not only do these georeferenced photos support proper analysis, but they also set the basis for placing the graffiti in their native, albeit virtual, 3D environment. An experiment showed that 95 out of 100 tested graffiti photo sets were successfully orthorectified, highlighting the proposed methodology's potential to improve and automate one part of contemporary graffiti's digital preservation.

Keywords: graffiti; cultural heritage; orthophoto; photogrammetry; street-art; structure from motion; georeferencing

1. Introduction

Grffiti are an ephemeral yet ubiquitous phenomenon. Although sometimes only existing for several hours or days, one cannot avoid seeing graffiti in urban environments. Graffiti are polarising. They upset, please, provoke, and sometimes even insult individuals or societies. Often graffiti creators do not even intend to infuriate, but the mere existence of their works triggers human emotions.


Despite or maybe even because of their omnipresence and polarising nature, documentation of 'contemporary' graffiti, in contrast to 'ancient graffiti' such as inscriptions on the urban walls of Roman Pompeii, has never received much scientific attention [1,2]. Even in their overview and position paper on the academic legitimacy of

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SOFTWARE

3

ARTICLES

4+9

HARDWARE


1

DISSEMINATION **scientific audience**

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Molada-Tebar, J. Otepka-Schremmer, C. Ressler, M. Trognitz, and
A. Watzinger*

For the paper titled

**PROJECT INDIGO – DOCUMENT, DISSEMINATE & ANALYSE A GRAFFITI-
SCAPE**


Luigi Fregonese


Francesco Fassi


Fabio Remondino

SOFTWARE

3

ARTICLES

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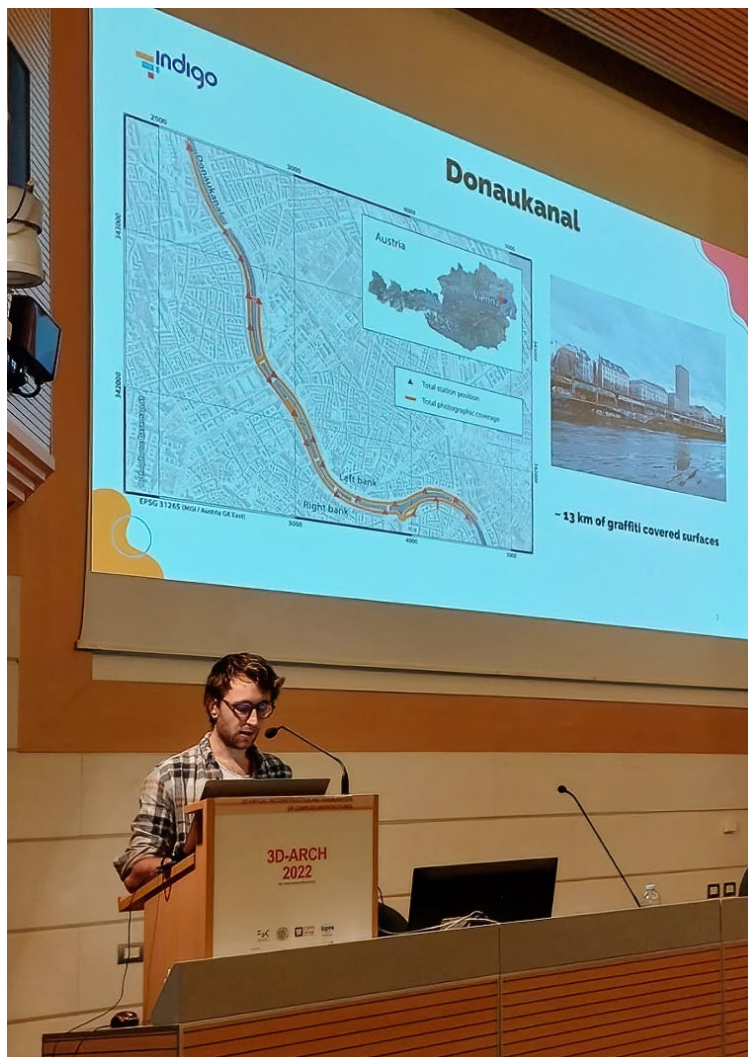
HARDWARE

1

AWARDS

1

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TALKS


17

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Acquiring centimetre-accurate camera coordinates in project INDIGO

Martin Wieser | Independent researcher | scene2map@gmail.com
 Geert Verhoeven | LBI ArchPro | geert.verhoeven@archpro.lbg.ac.at
 Benjamin Wild | Technische Universität Wien | benjamin.wild@geo.tuwien.ac.at


3rd Heritage Science Austria meeting: 23 September 2022



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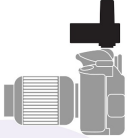
(7) Create products

From the georeferenced photo network a 3D mesh, point cloud or orthophotos can be produced in the desired CRS




(1) Mount device

The camera's hot shoe is used for mounting and camera synchronisation



(2) Configure RTK


Input RTK provider (e.g. EPOSA)
Provide settings for correction data



RTK GNSS receiver
GPS & Galileo satellites
L1/L2/L5 multi-band
RTK


IMU
3-axis gyroscope
3-axis accelerometer
3-axis magnetometer

Position **Rotation**



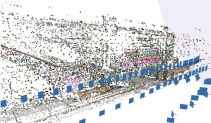
(3) Prepare camera

Set and fix focusing
Deactivate electronic and optical image stabilisation




(6) Process device data & photos

Use the logged camera positions to georeference and scale the photo network
With many photos, centimetre accuracy is achievable



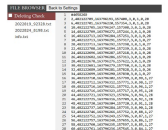
(4) Acquire photos

Follow a specific set of rules:
- oblique & perpendicular photos
- no change in focus or zoom
- different subject distances
- cover entire image sensor




(5) Download device data









Download camera positions & rotations over WiFi from the device's webservice via a browser



Feedback
LEDs & status display



GNSS: Global Navigation Satellite System
EPOSA: Echtzeit-Positionierung-Austria
CRS: Coordinate Reference System
IMU: Inertial Measurement Unit
GPS: Global Positioning System
RTK: Real-Time Kinematic

TALKS

17

POSTERS

3

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TALKS

17

SYMPOSIUM

2

POSTERS

3

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17

SYMPOSIUM

2

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3

EDITED VOLUME

1

INDIGO website



<https://projectindigo.eu>

#indigodonaukanal to notify us

Home **Project details** Contribute News Contact

software hardware publications presentations posters symposia

INDIGO is an open-data and open-access project, operating according to the **FAIR principles**. Whereas all project data will become available at the project's end via the **ARCHE data repository**, any scientific output can be found at different locations:

- INDIGO's **Zenodo community**
- **here!** Below, one finds all relevant info and links to INDIGO's soft- and hardware, oral and poster presentations, publications and symposia. Each section is directly accessible via the menu above.

software

The INDIGO team created **AUTOGRAF**, **COOLPI** and **GRAPHIS**, three software packages that are free to download from **INDIGO's GitHub account**.

- **AUTOGRAF (AUTomated Orthorectification of GRAffiti photos)** is an open-source python-based Metashape add-on to automatically orthorectify (graffiti) photos. Its source code can be found **here**.
- the **COlour Operations Library for Processing Images (COOLPI)** is an open-source Python toolbox including procedures for the colour correction of RAW photos. The **code** comes with an extensive **manual**.
- **GRAPHIS (Generate Regions and Annotations for Photos using the IPTC Standard)** is an open-source python-based software to create, visualise and annotate image regions and store them inside the image metadata according to the IPTC photo metadata standard. The source code is available **here**.

AUTOGRAF

COOLPI

GRAPHIS

Indigo



Stadt
Wien



LUDWIG
BOLTZMANN
INSTITUTE

Archaeological Prospection and Virtual Archaeology

