



# Discovering & recording new graffiti within project INDIGO

Geert Verhoeven | Jona Schlegel  
Martin Wieser | Stefan Wogrin

[projectindigo.eu](http://projectindigo.eu)

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



goals



create

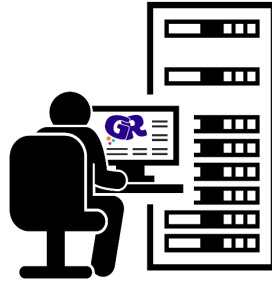


document

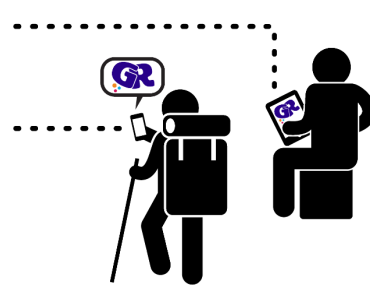


inventory

archive



disseminate



analyse



goals

create



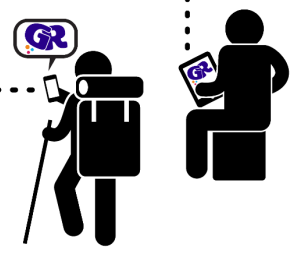
document  
inventory



archive



disseminate



analyse



research  
pillars

creation



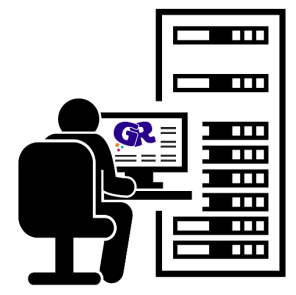
acquisition



processing



management



dissemination



analysis





goals

create



document



inventory

archive



disseminate



analyse



research pillars

creation



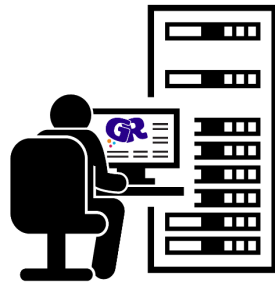
acquisition



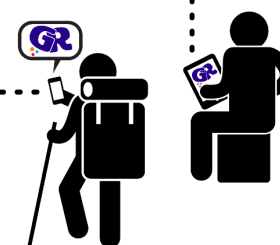
processing



management



dissemination



analysis



research  
pillars

creation



acquisition



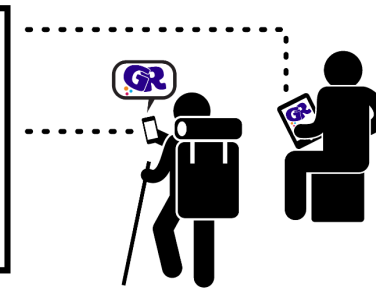
processing



management



dissemination



analysis



creation



this talk

acquisition



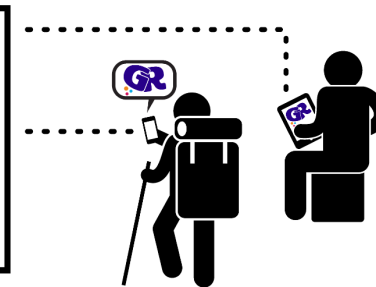
processing



management

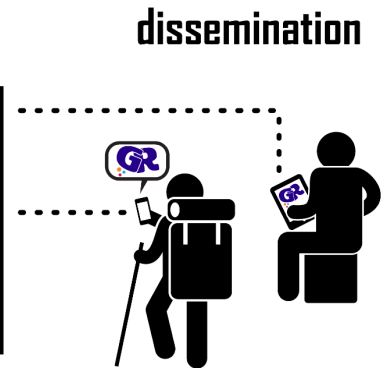
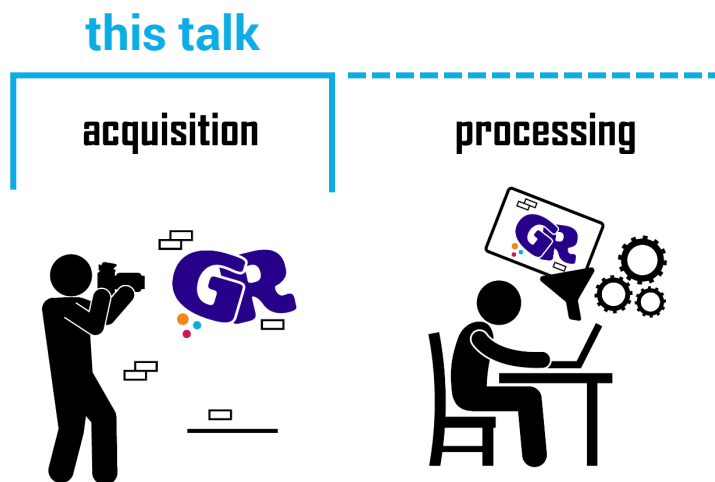


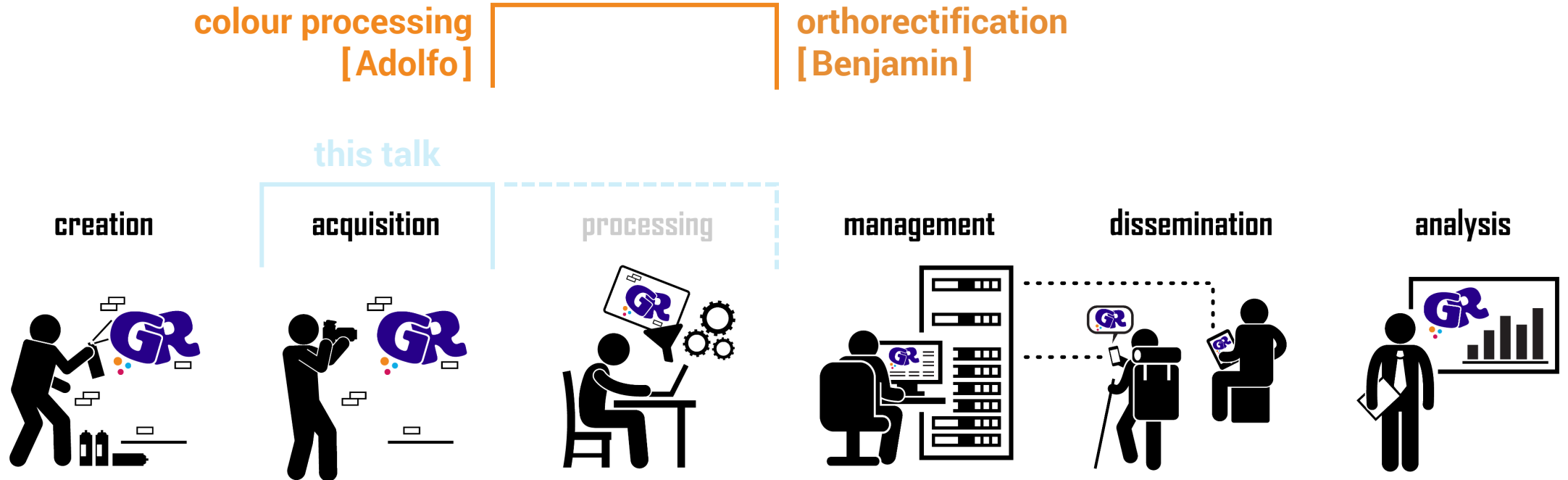
dissemination



analysis









thesaurus  
[Jona & Massimiliano]

ontology & spatial database  
[Nina]

colour processing  
[Adolfo]

orthorectification  
[Benjamin]

this talk

creation



acquisition



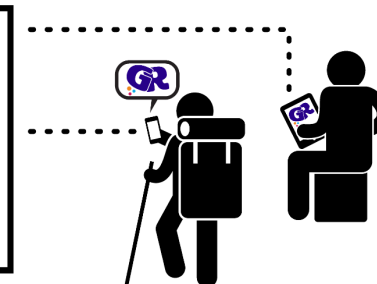
processing



management



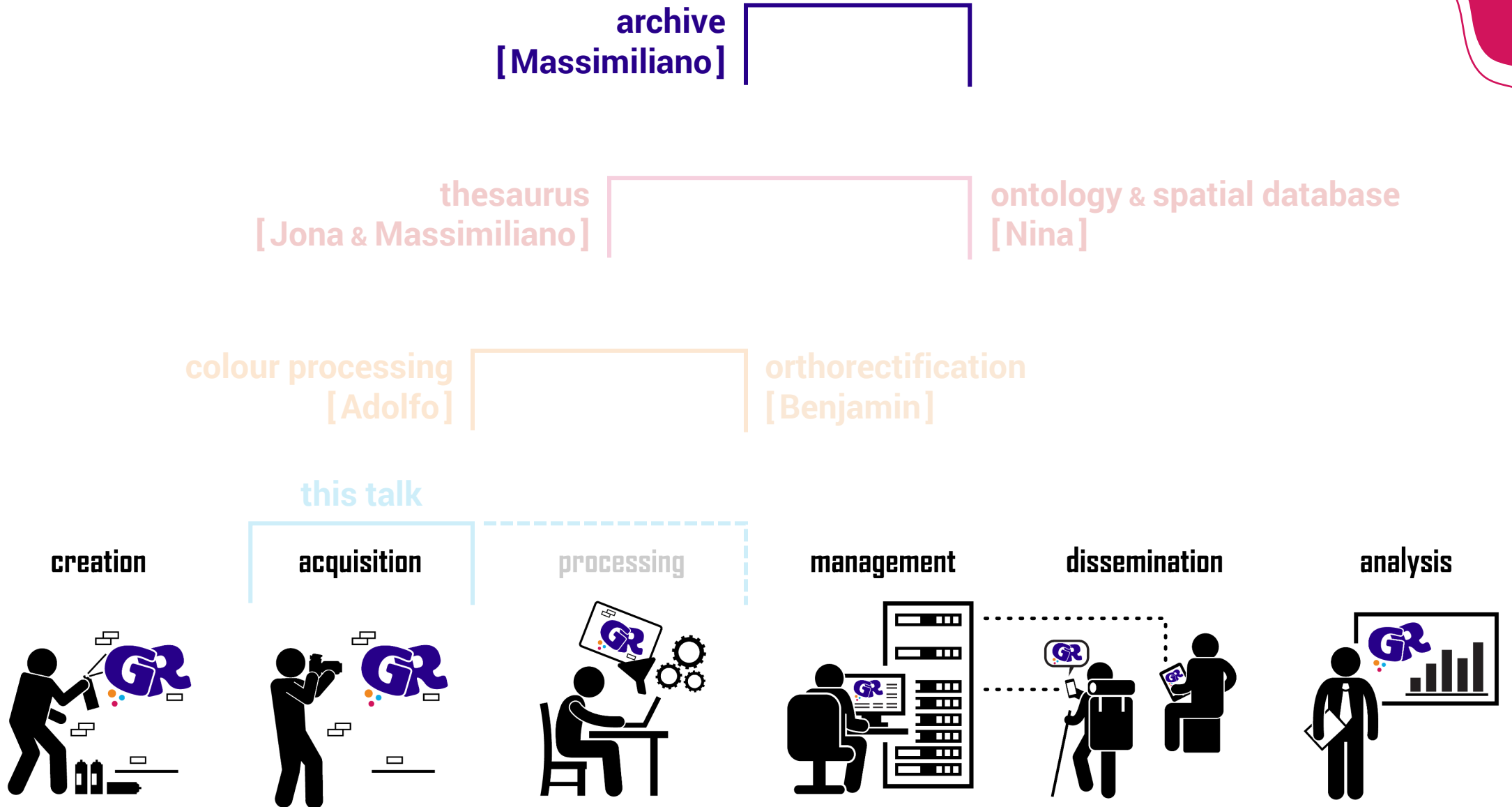
dissemination

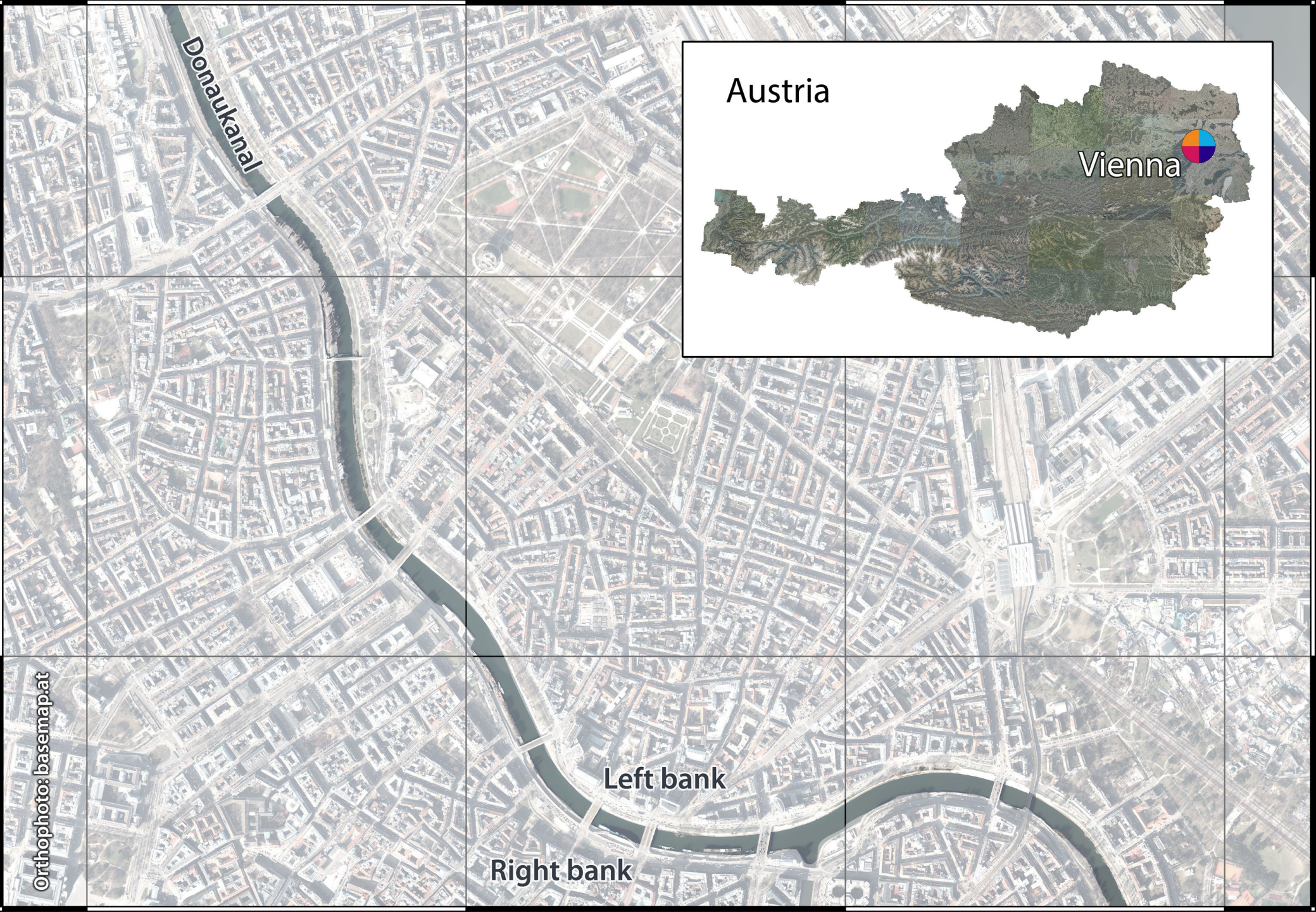


analysis



research  
pillars





Donaukanal

Austria

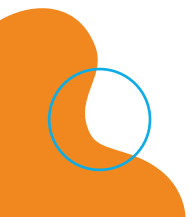
Vienna

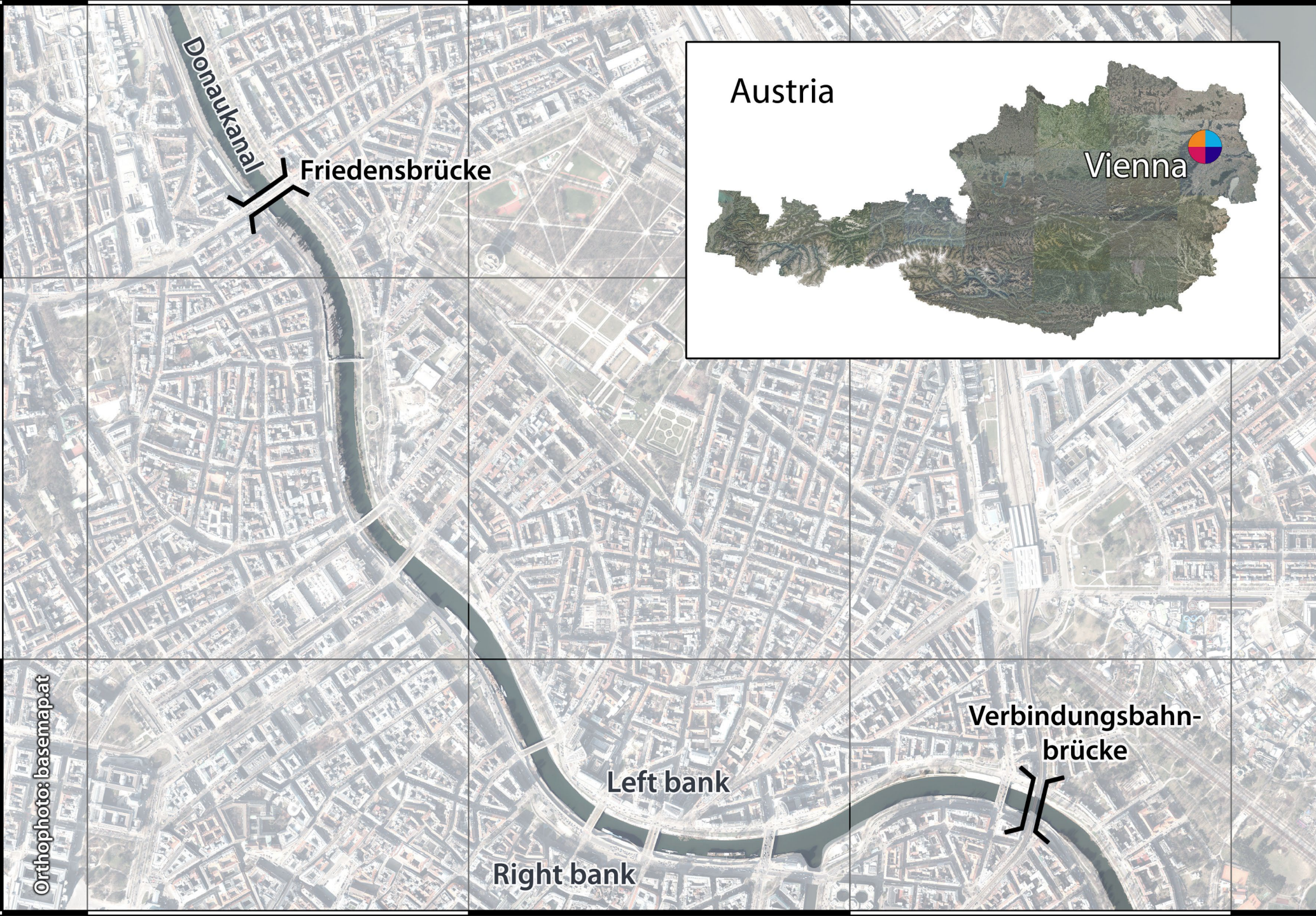


Orthophoto: basemap.at

Left bank

Right bank





Orthophoto: basemap.at

Donaukanal

Friedensbrücke

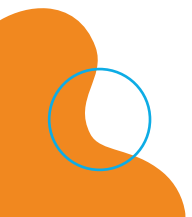
Left bank

Right bank

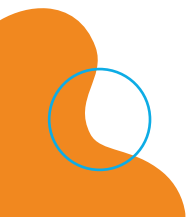
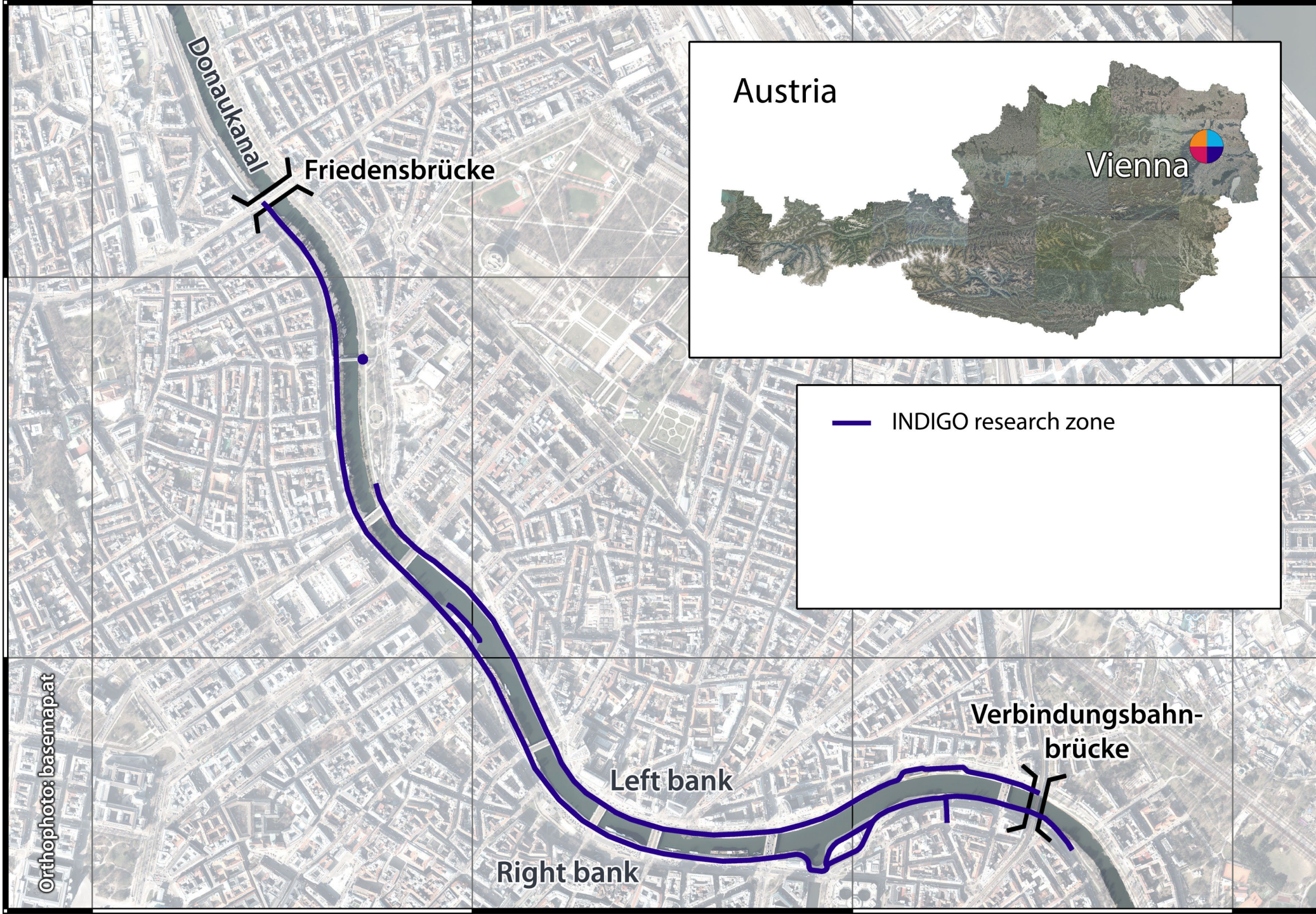
Verbindungsbahnbrücke

Austria

Vienna

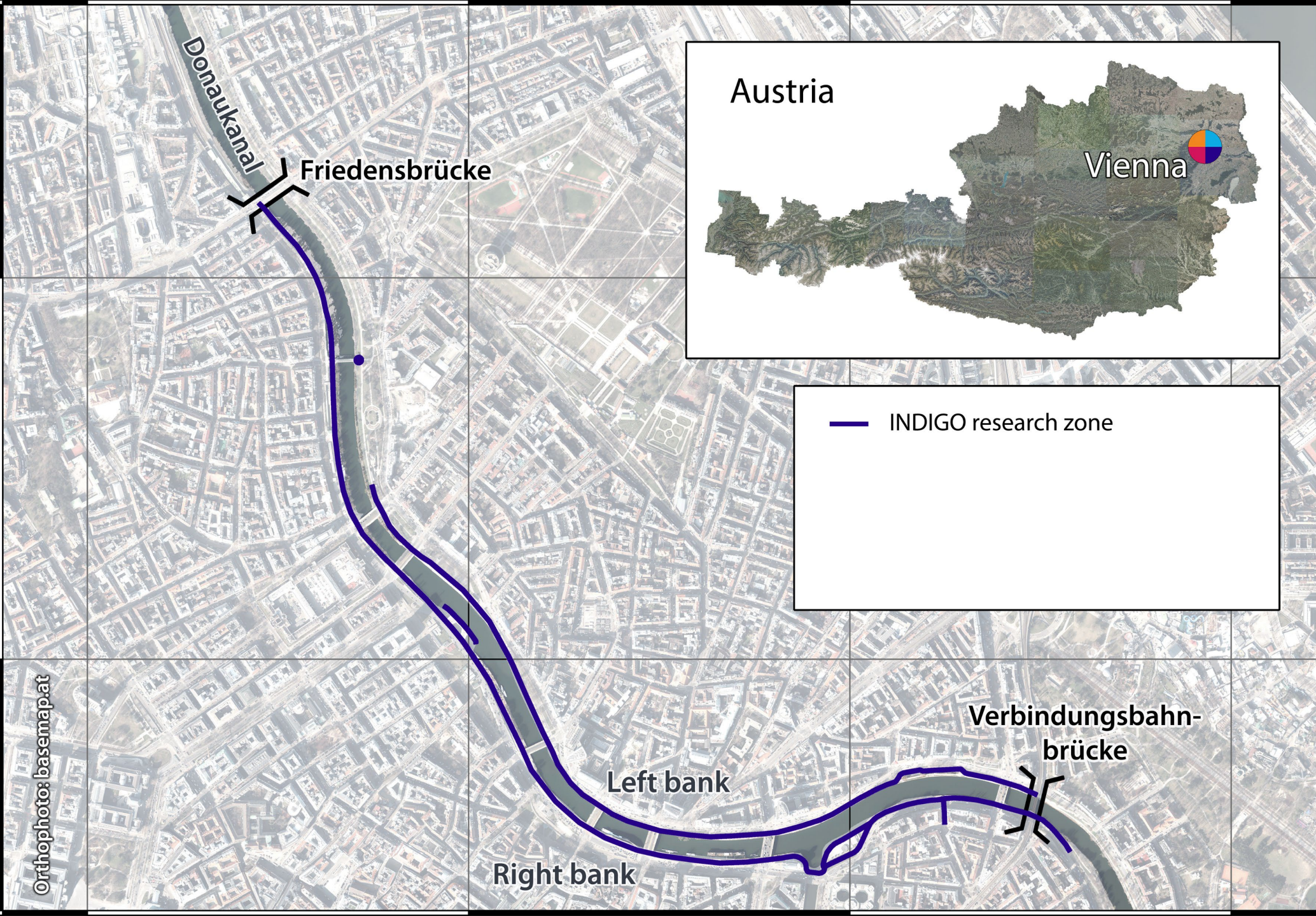


**STRETCH**  
3.3 km



**STRETCH**  
3.3 km

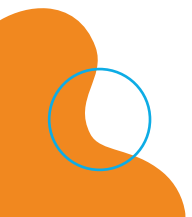
**LEFT    RIGHT**



**STRETCH**

3.3 km

**LEFT    RIGHT**

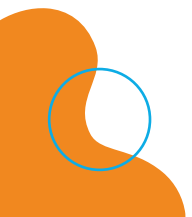


# STRETCH

3.3 km

LEFT UP  
RIGHT UP

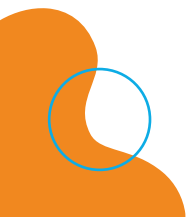
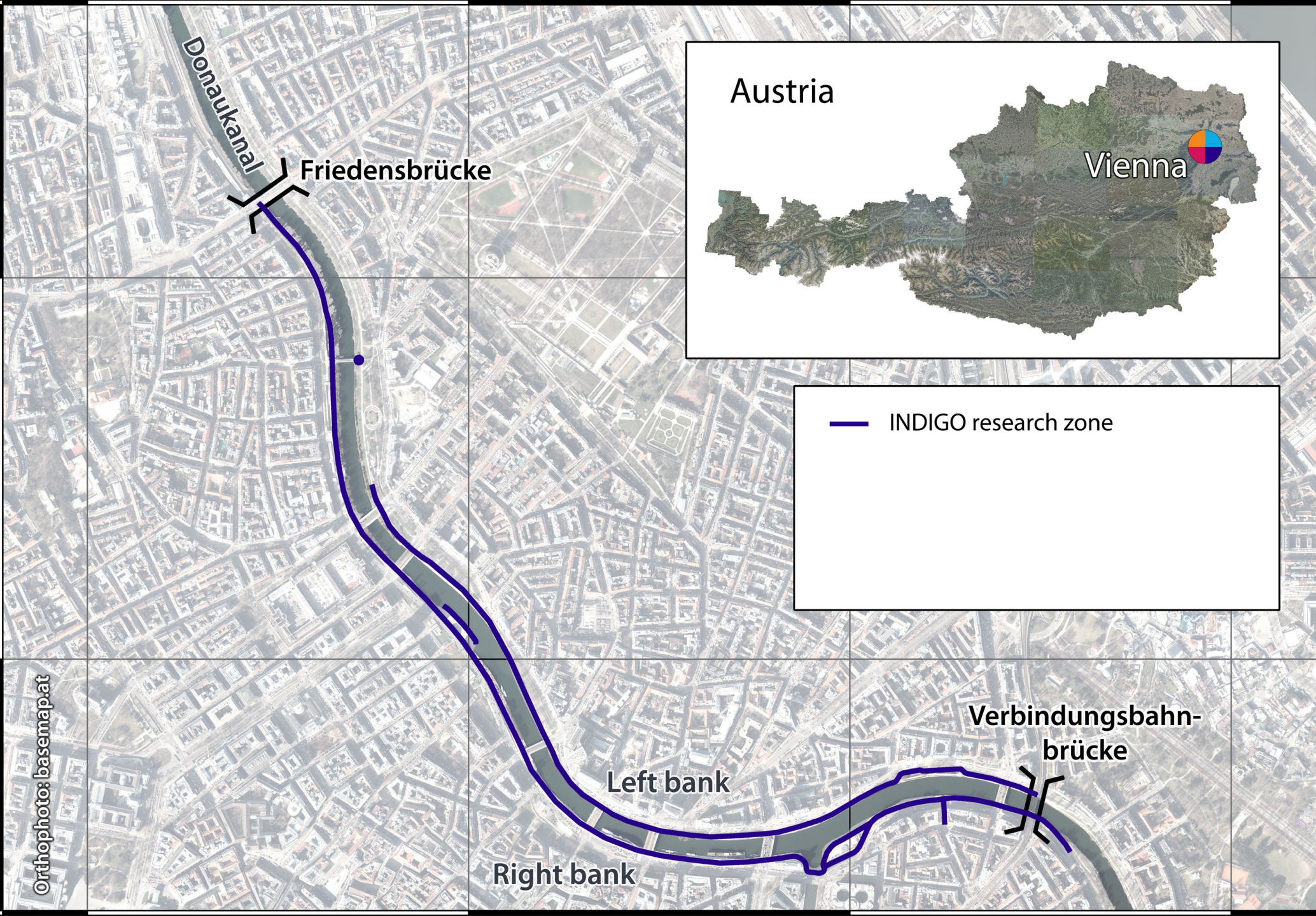
DOWN DOWN





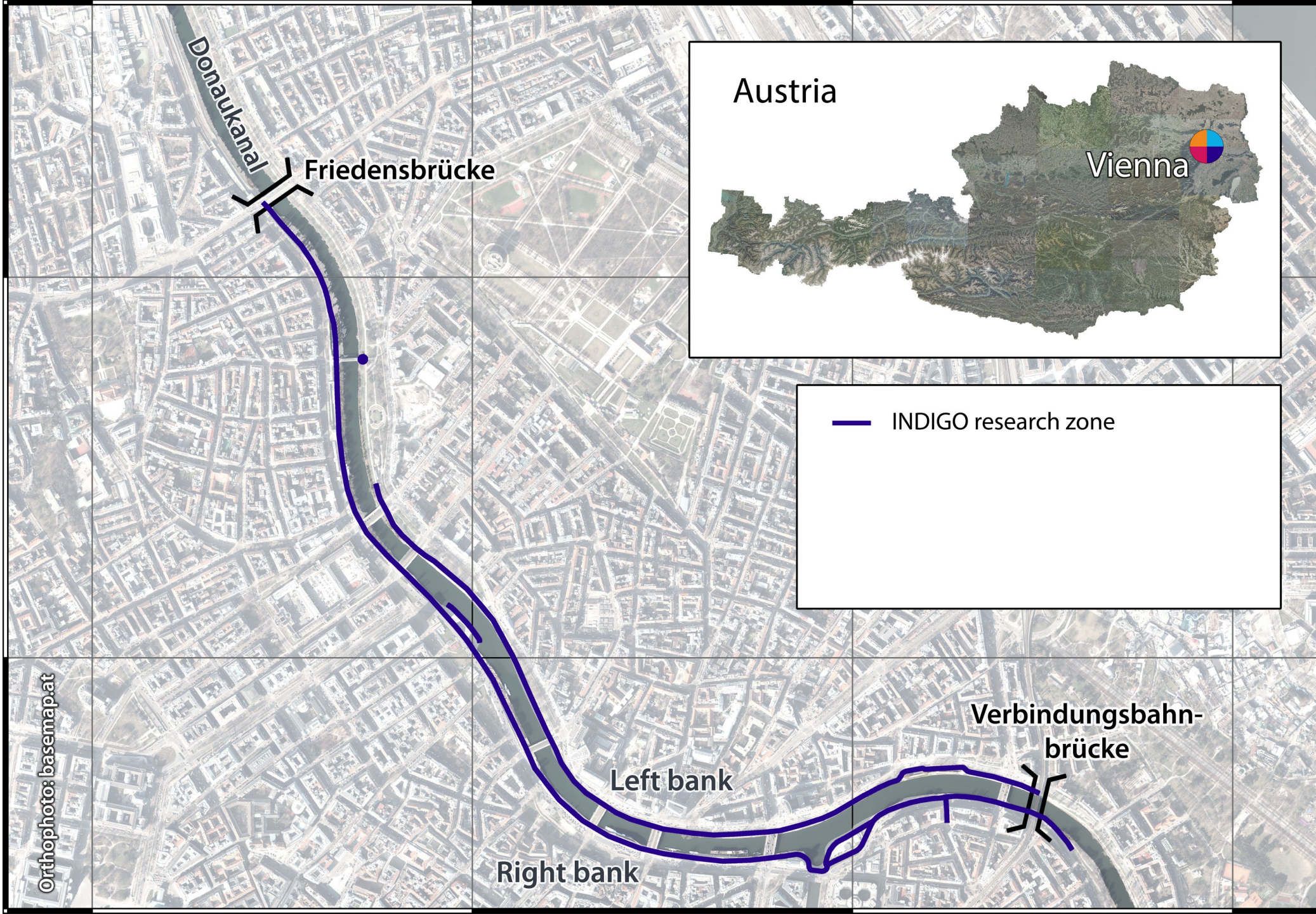
**STRETCH**  
3.3 km

<b>LEFT</b>	<b>RIGHT</b>
UP	UP
3.2 km	5.3 km
DOWN	DOWN



**STRETCH**  
3.3 km

<b>LEFT</b>	<b>RIGHT</b>
UP	UP
3.2 km	5.3 km
<b>DOWN</b>	<b>DOWN</b>
2.1 km	2.3 km



## STRETCH

3.3 km

LEFT RIGHT

UP UP

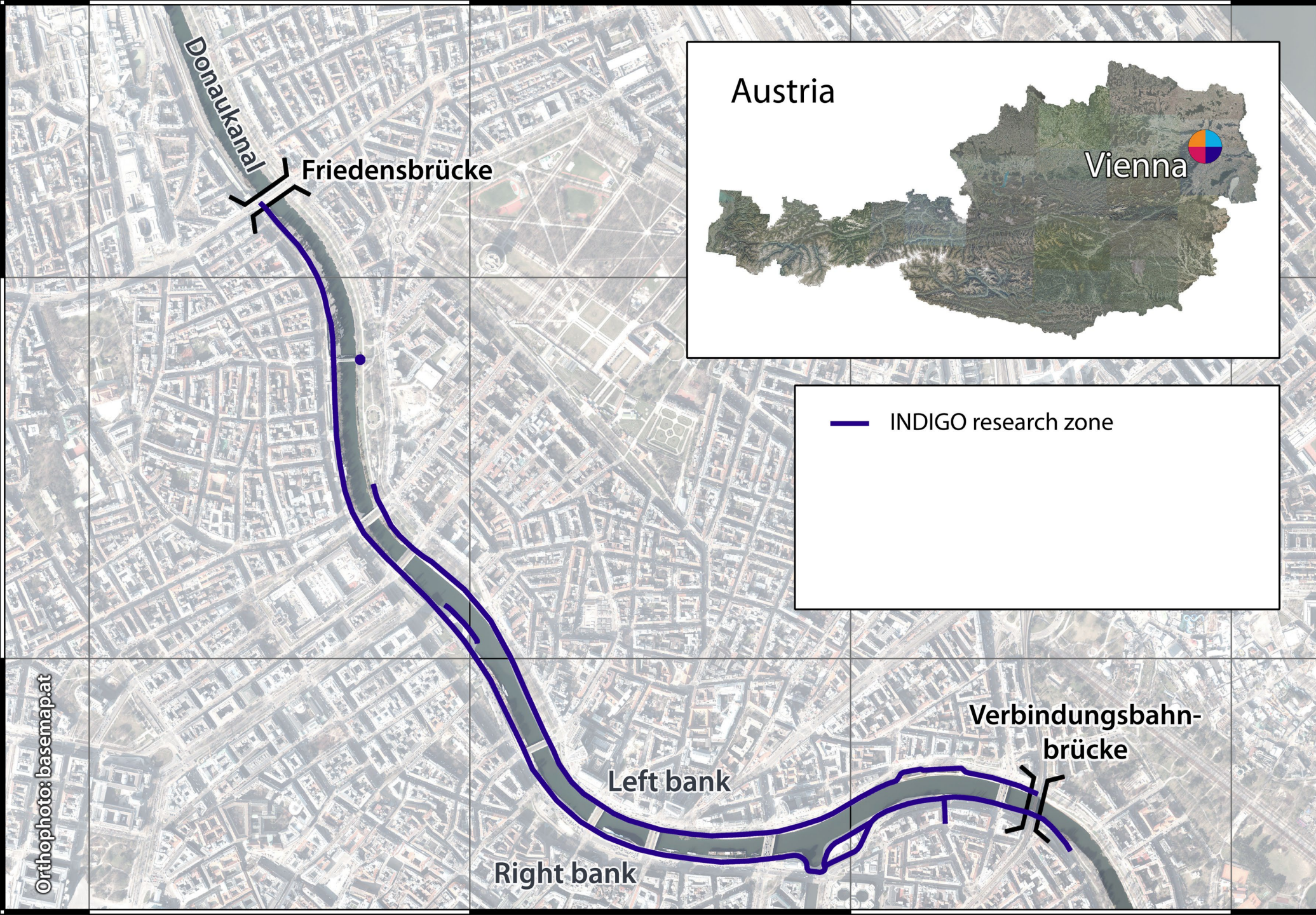
3.2 km 5.3 km

DOWN DOWN

2.1 km 2.3 km

## MONITORED SURFACES

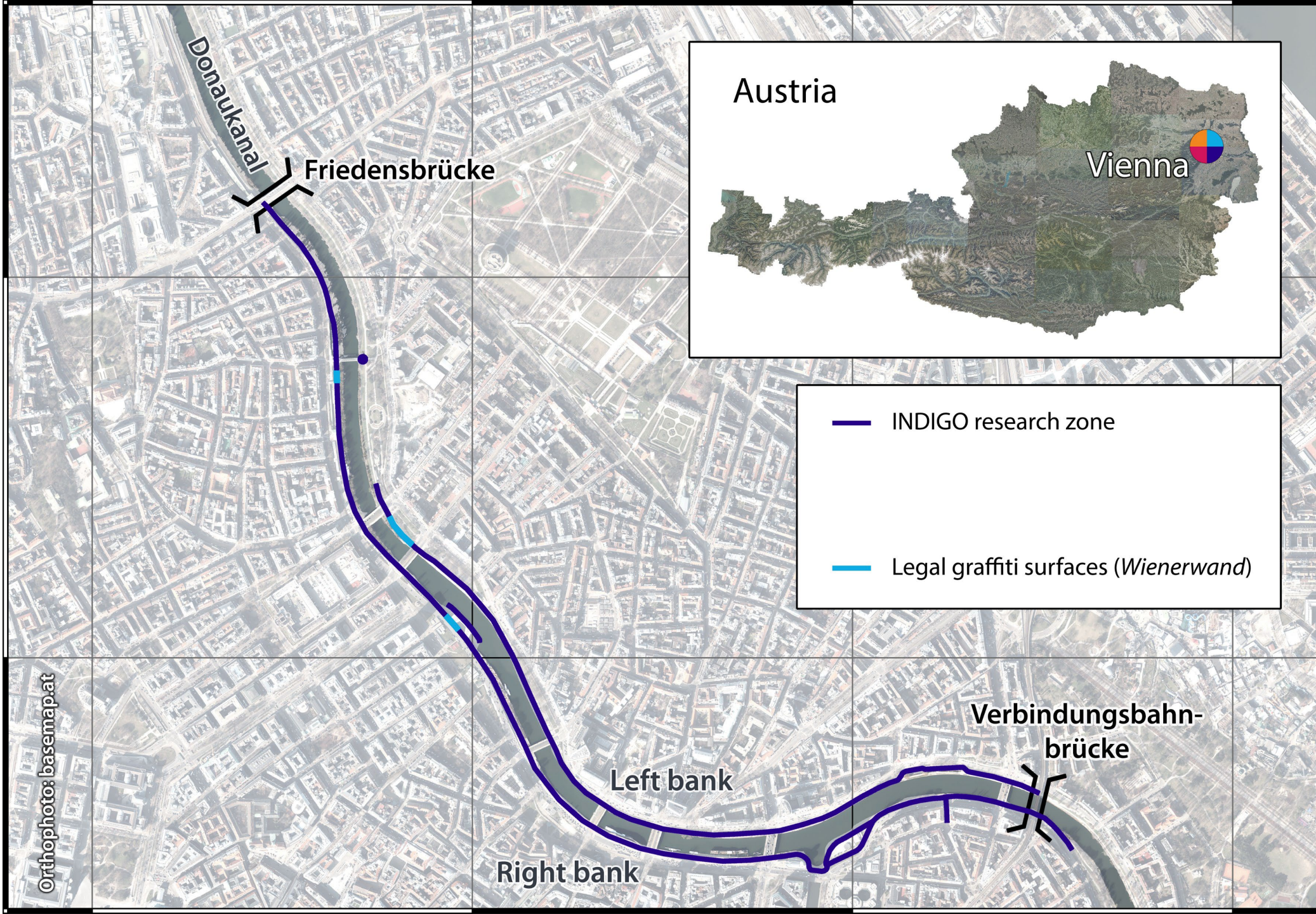
12.9 km



# MONITORED SURFACES

12.9 km

Orthophoto: basemap.at



Austria

Vienna

- INDIGO research zone
- Legal graffiti surfaces (*Wienerwand*)

Left bank

Right bank

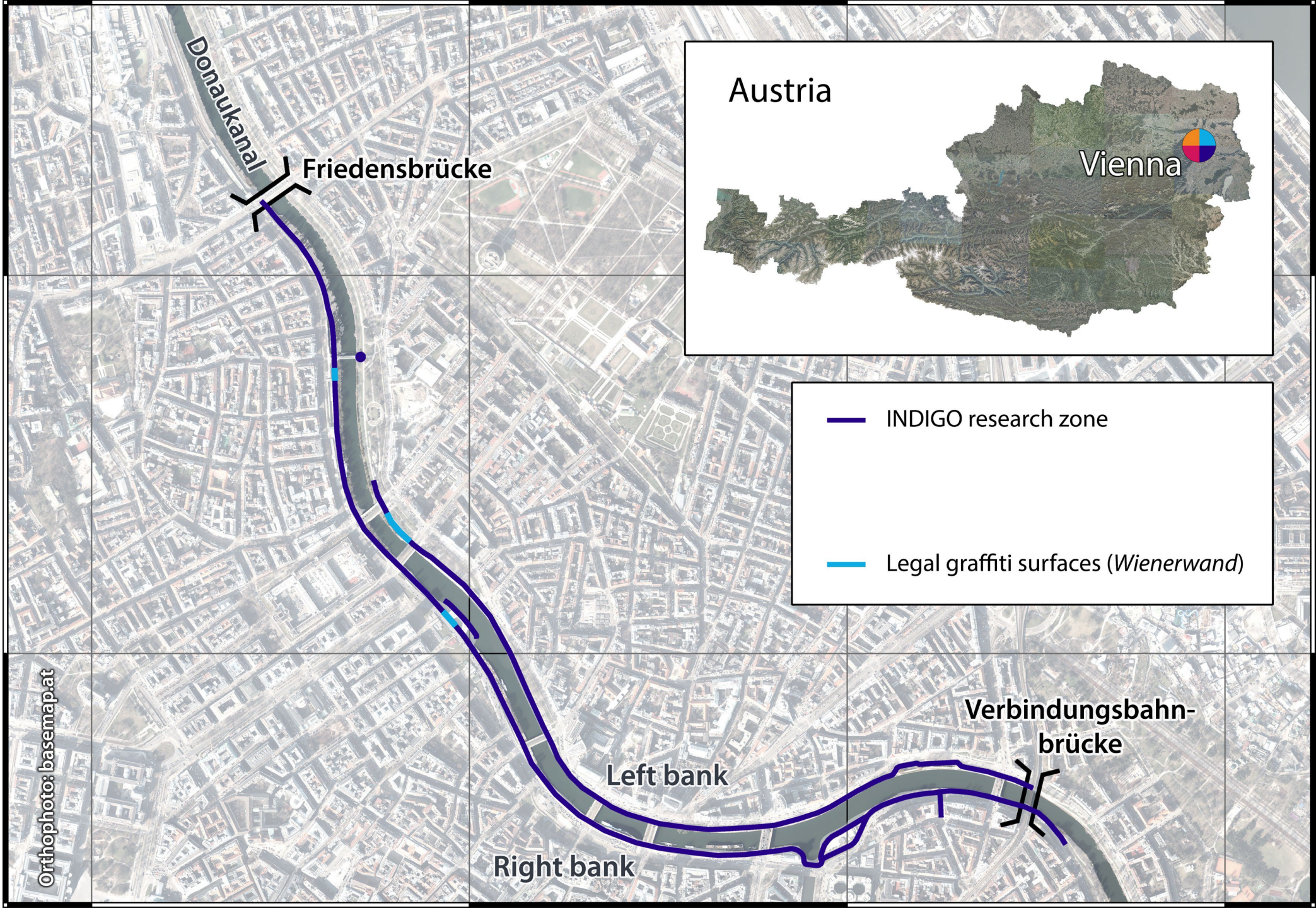
Verbindungsbahnbrücke

**LEGAL SURFACES**

0.3 km

**MONITORED SURFACES**

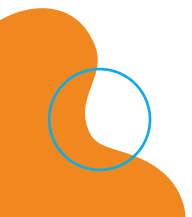
12.9 km



— INDIGO research zone

— Legal graffiti surfaces (*Wienerwand*)

Orthophoto: basemap.at



**TOTAL  
COVERAGE**

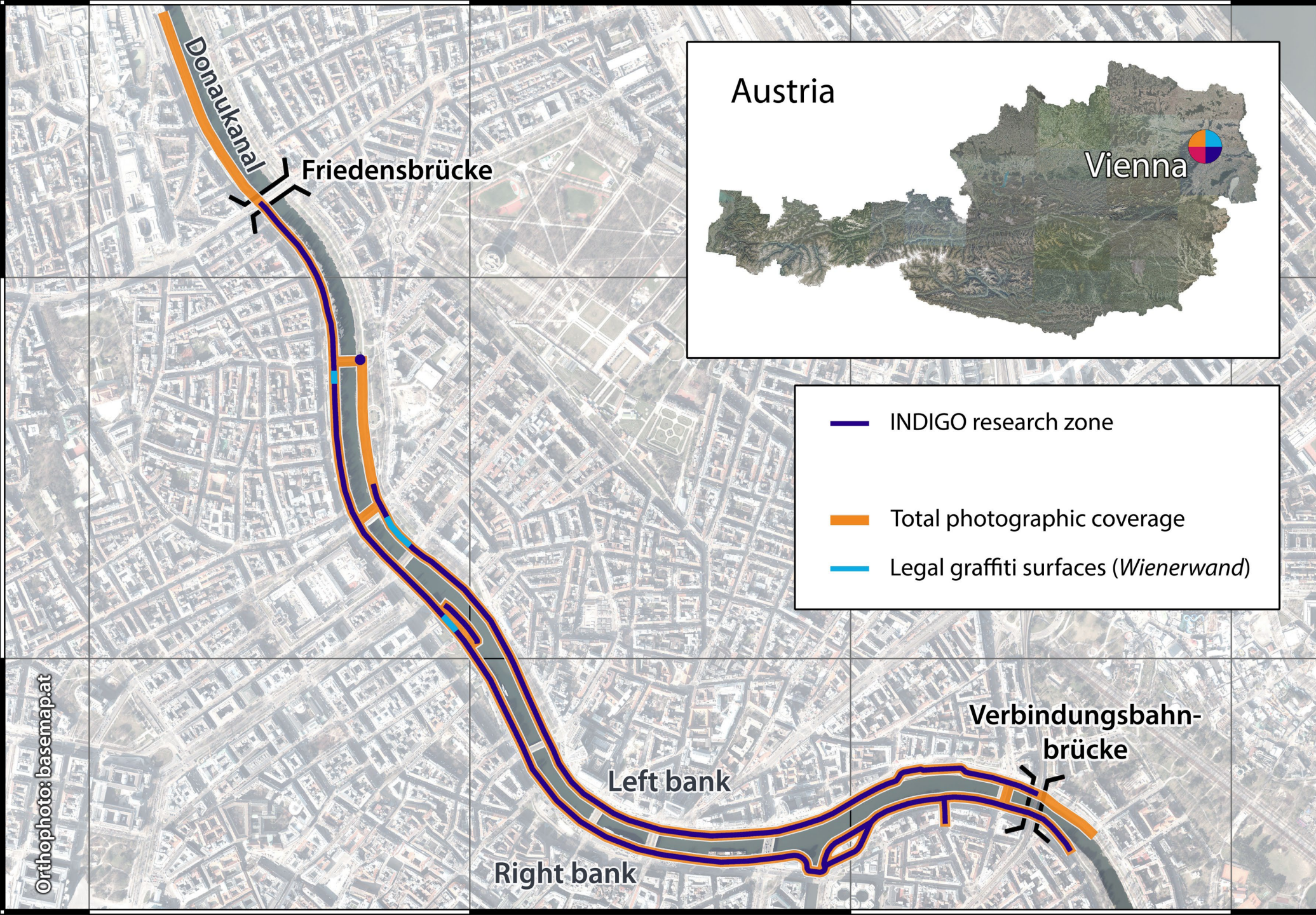
14.0 km

**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

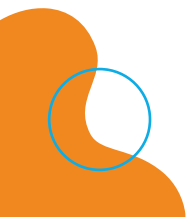
Right bank

Verbindungsbahn-  
brücke

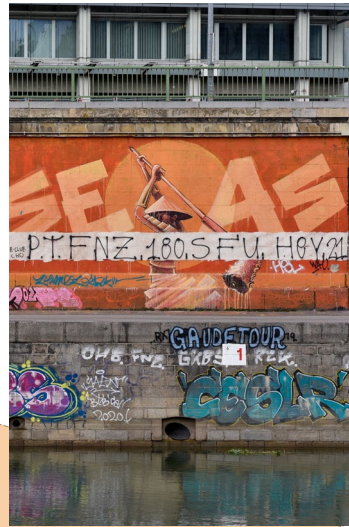
Austria

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
------	--------	------	----------	------------------	-------------

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
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27/10/2021				7 h 45 min	6591
28/10/2021				3 h 40 min	2856
29/10/2021				7 h	6608
<b>Total</b>				<b>32 h 30 min</b>	<b>26706</b>



# 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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27/10/2021				7 h 45 min	6591
28/10/2021				3 h 40 min	2856
29/10/2021				7 h	6608
<b>Total</b>				<b>32 h 30 min</b>	<b>26706</b>

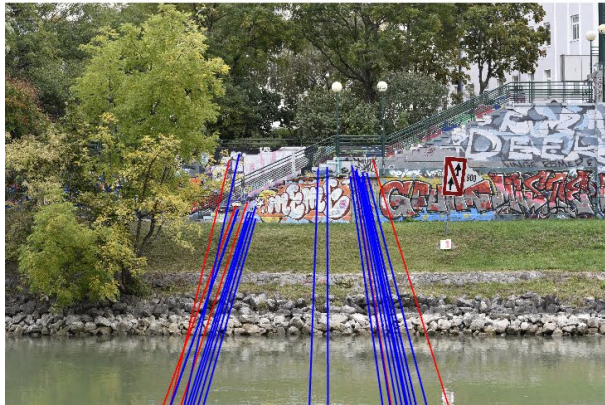


↓  
processing



# TOTAL coverage

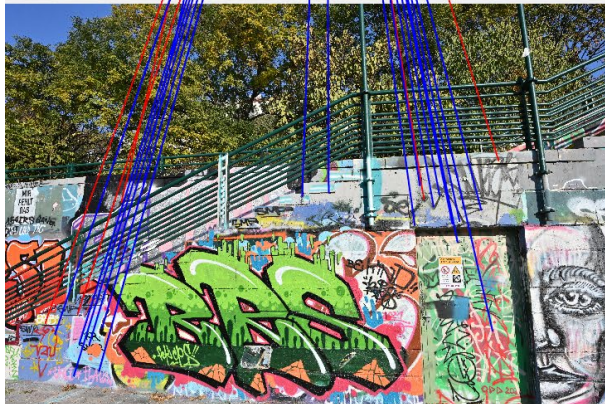
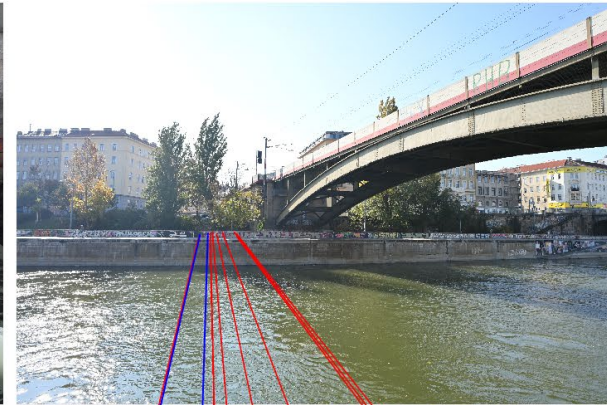
Nikon D750 + 85 mm  
30-09-2021



Nikon D750 + 85 mm  
30-09-2021



Nikon Z7 II + 20 mm  
28-10-2021

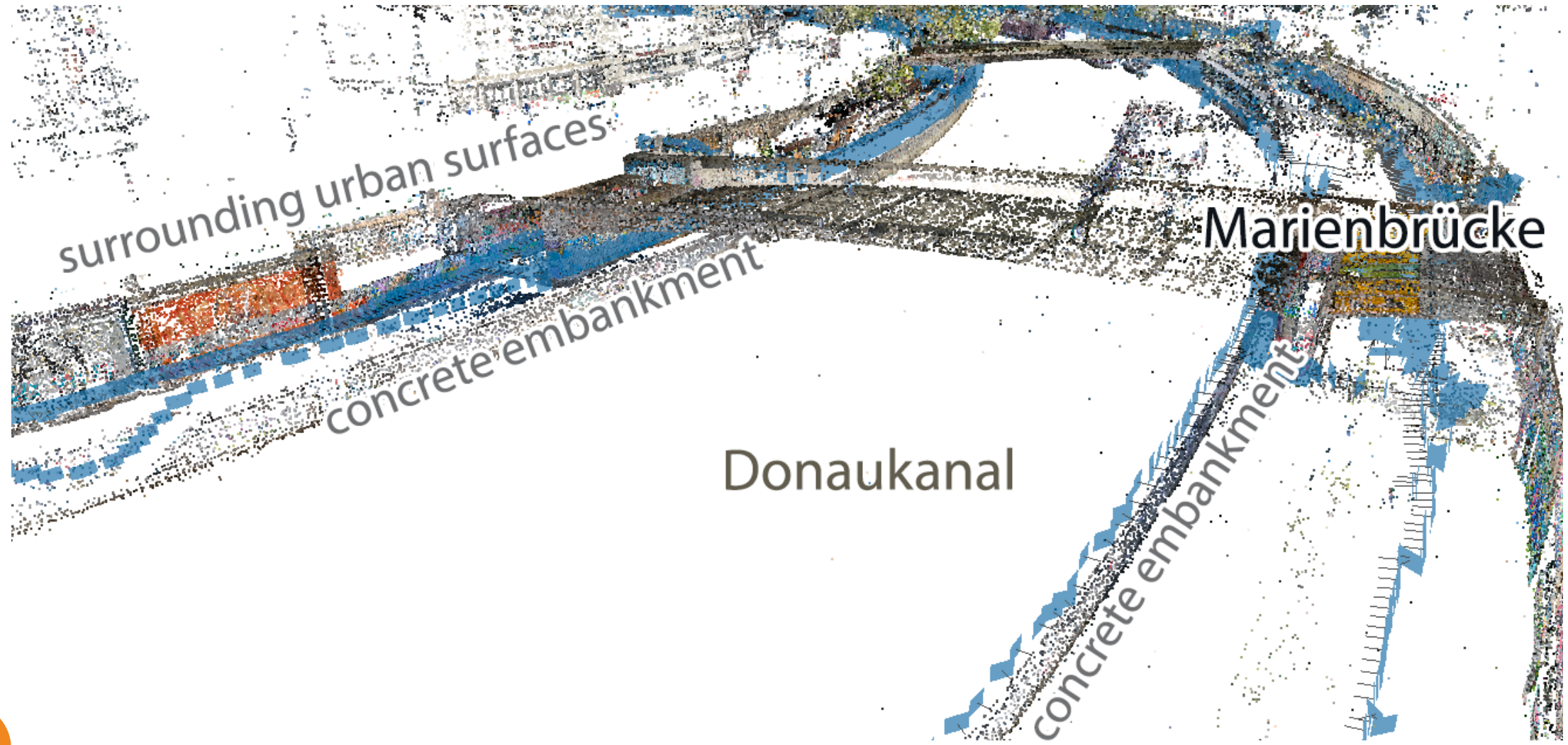


Nikon Z7 II + 20 mm  
29-10-2021

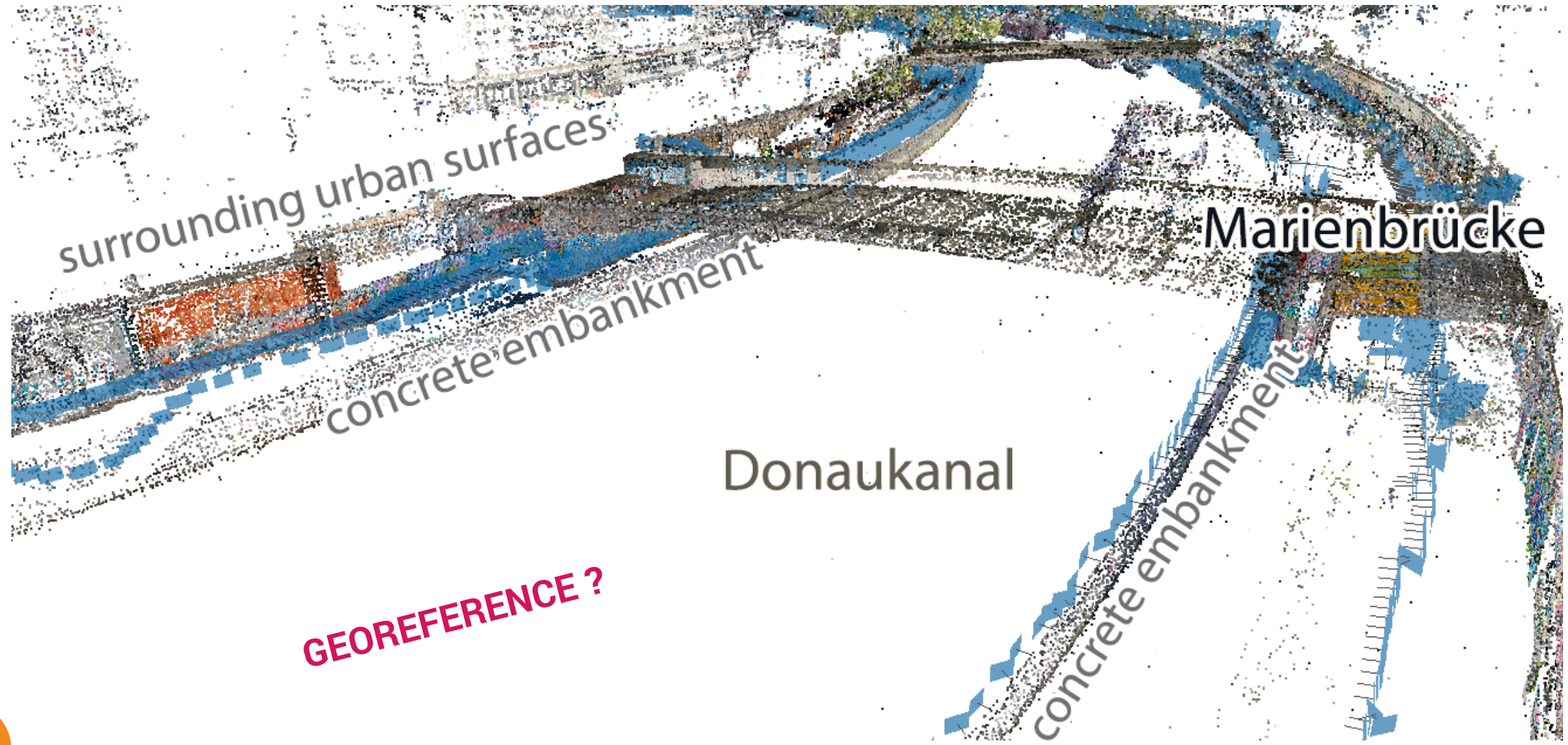
Nikon D750 + 85 mm  
01-10-2021

Nikon Z7 II + 20 mm  
26-10-2021

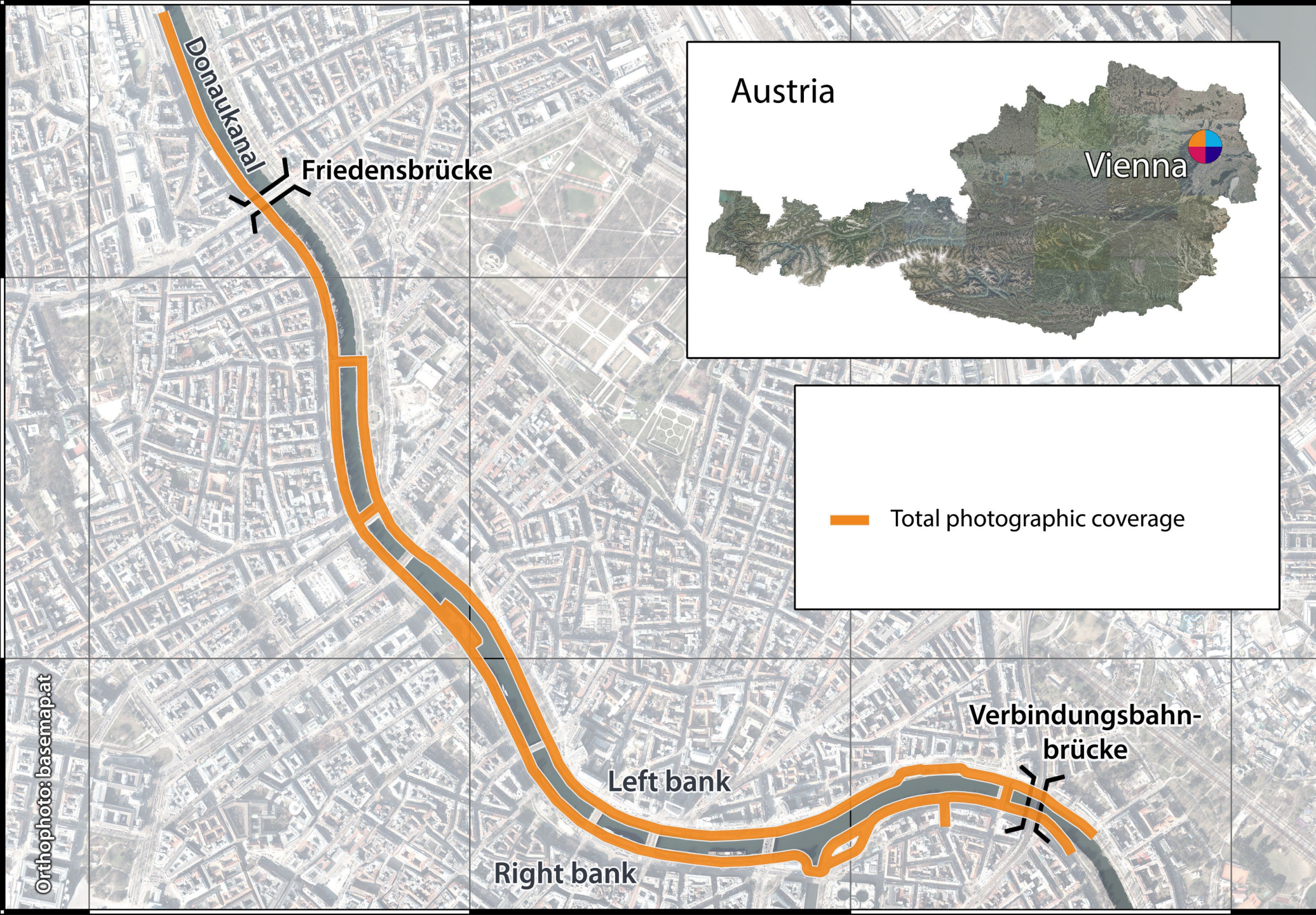
# TOTAL coverage



# TOTAL coverage



**TOTAL  
COVERAGE**  
14.0 km

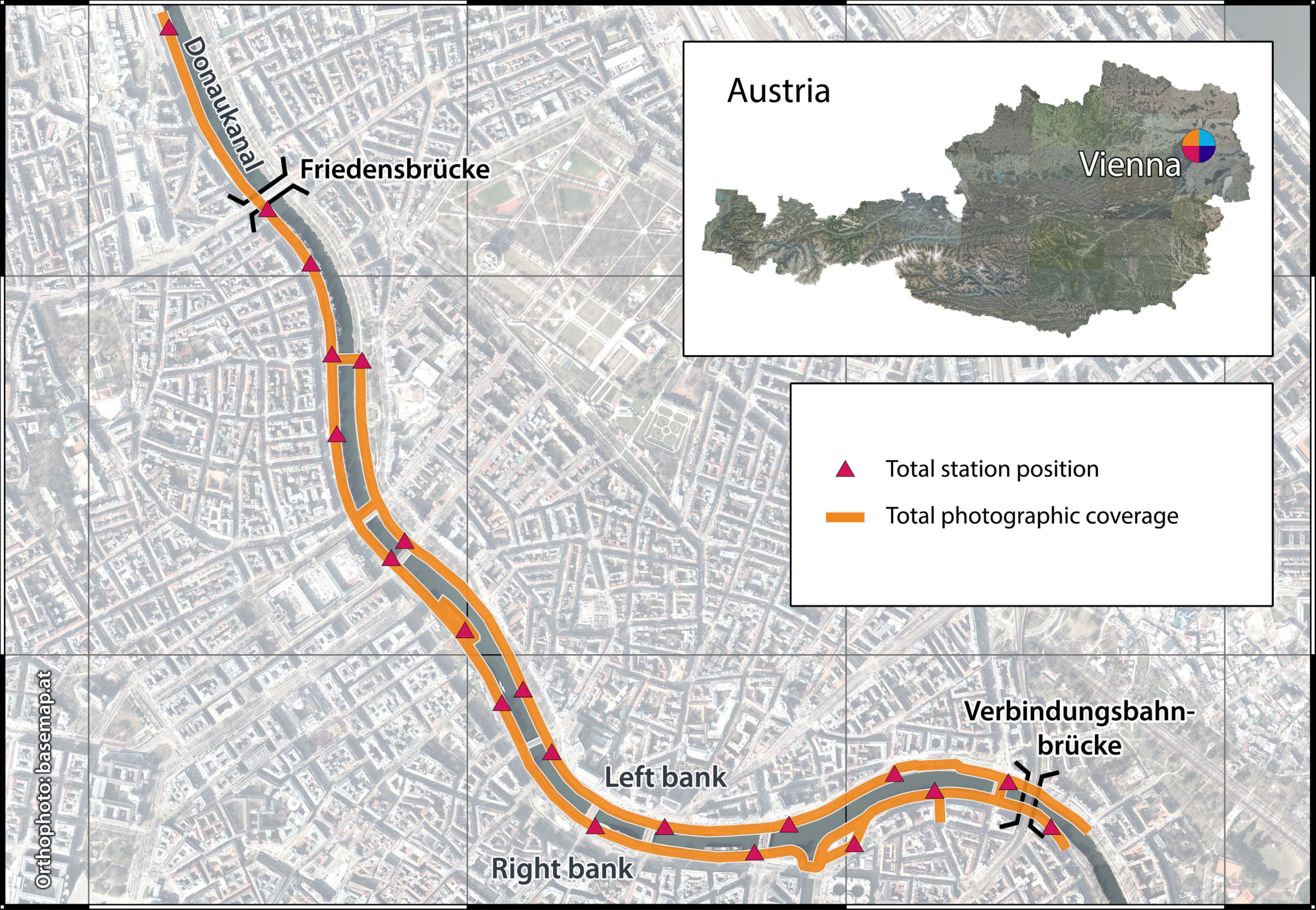


**TOTAL  
COVERAGE**

14.0 km

**TOTAL STATION  
POSITIONS**

21





**TOTAL  
COVERAGE**

14.0 km

**TOTAL STATION  
POSITIONS**

21



**TOTAL  
COVERAGE**

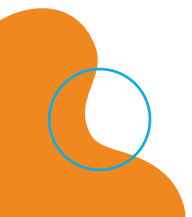
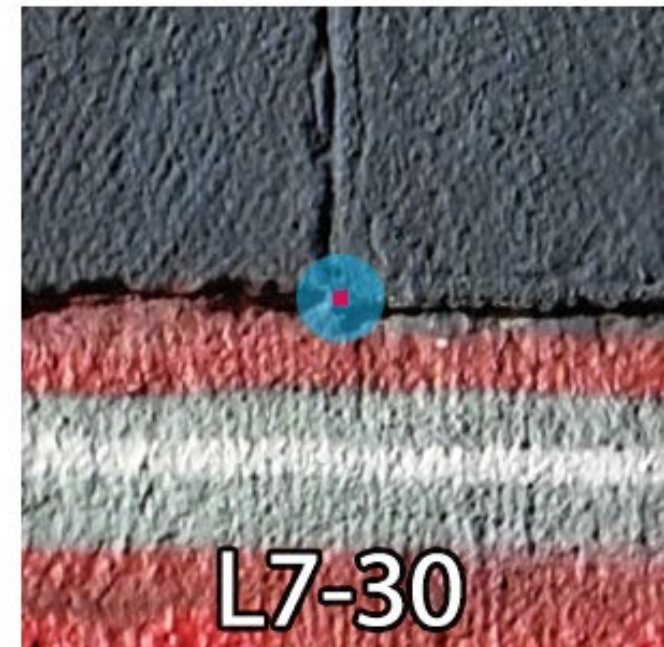
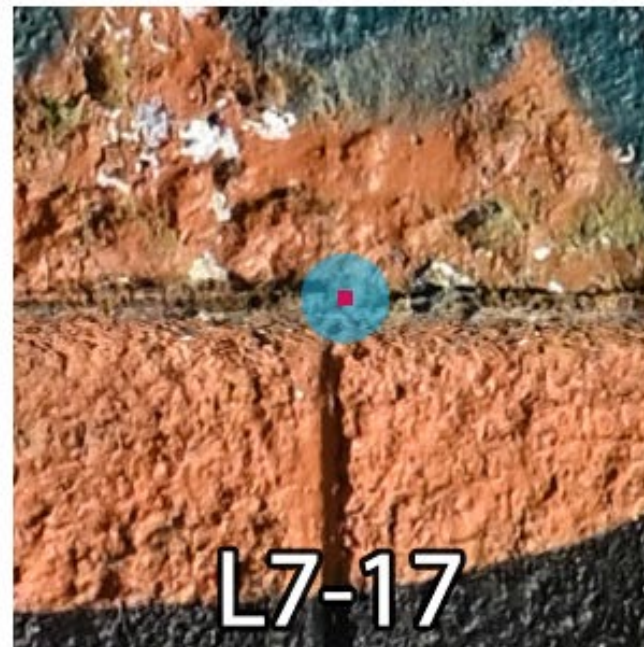
14.0 km

**TOTAL STATION  
POSITIONS**

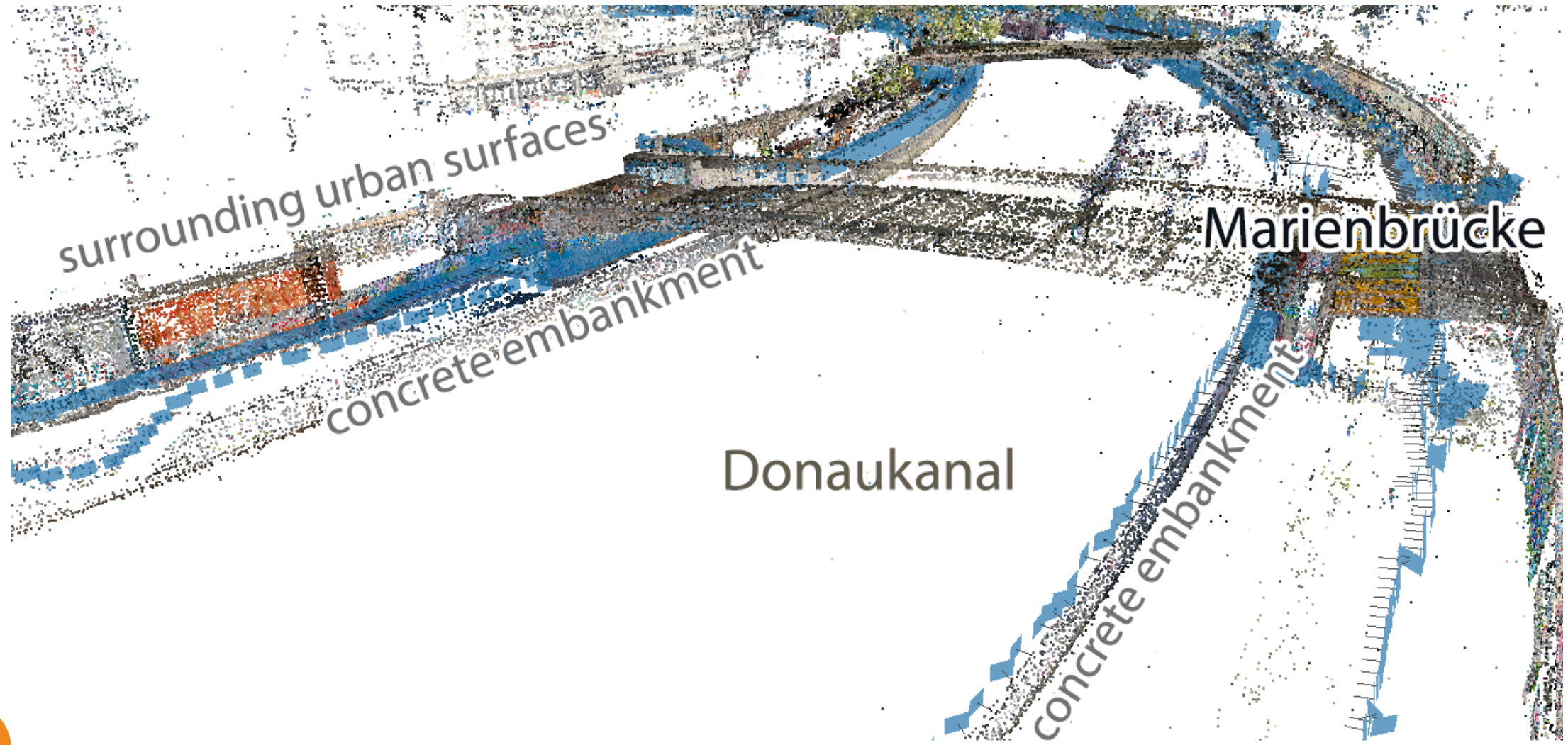
21

**GRAFFITI-SCAPE  
POINTS**

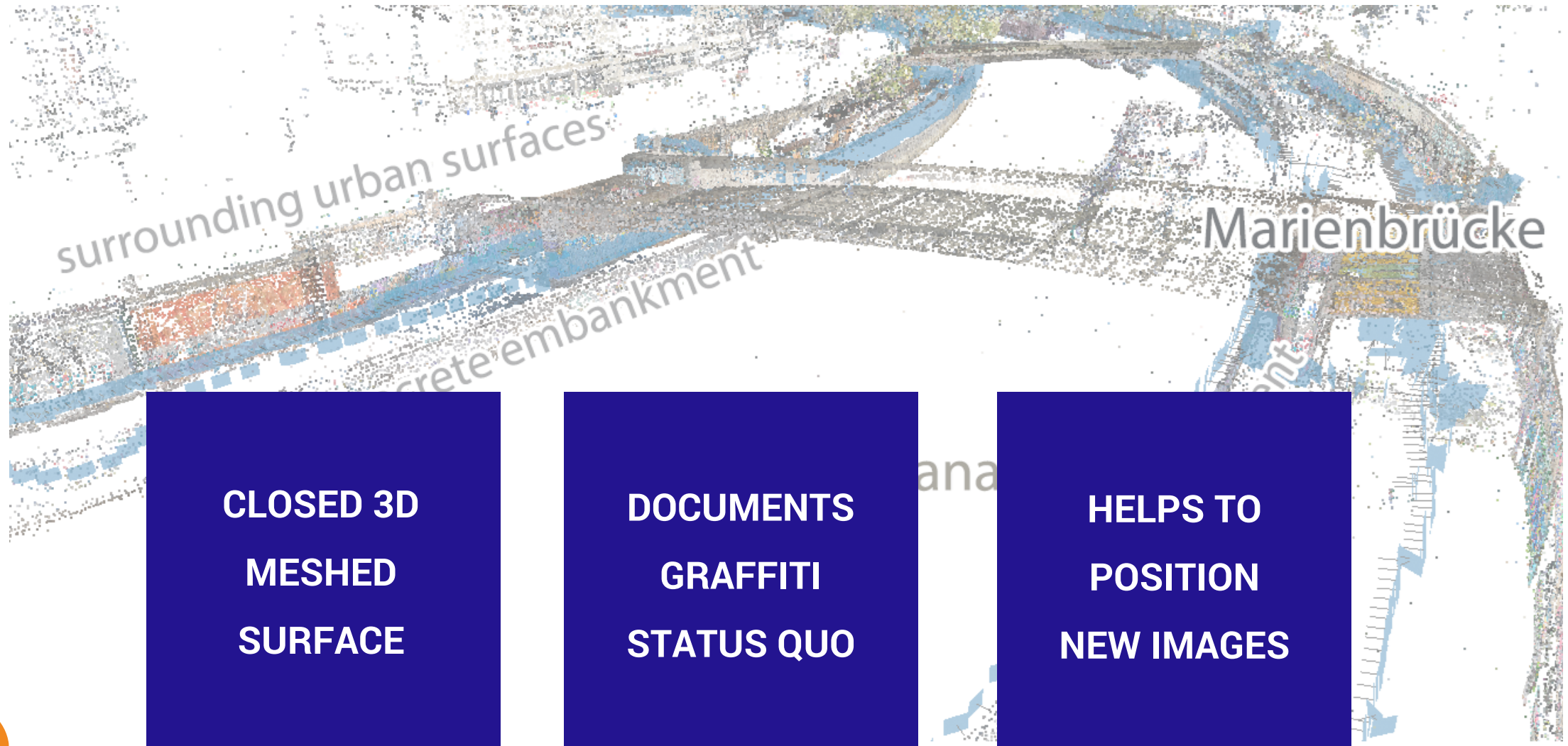
624



# THREE purposes



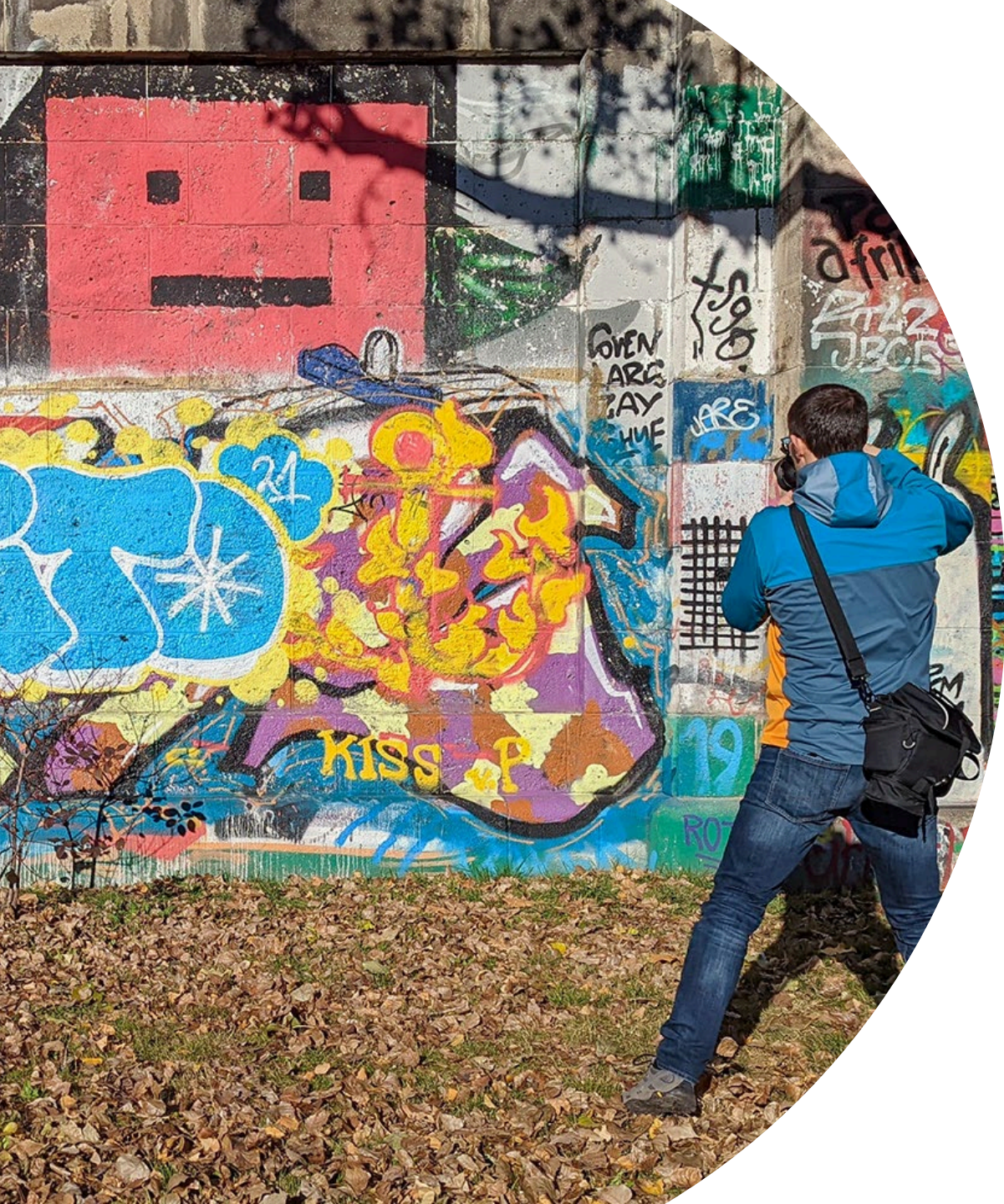
# THREE purposes



CLOSED 3D  
MESHED  
SURFACE

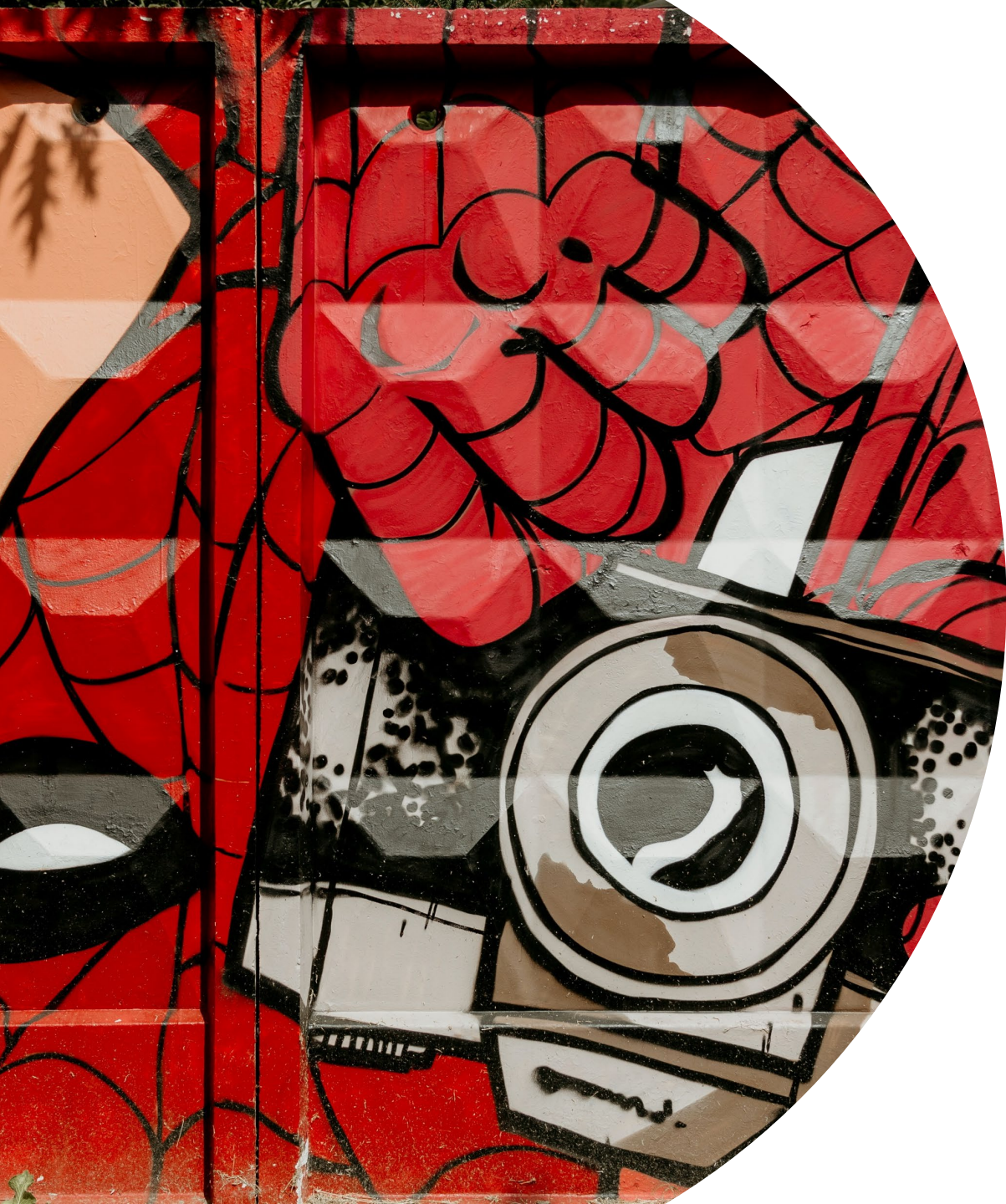
DOCUMENTS  
GRAFFITI  
STATUS QUO

HELPS TO  
POSITION  
NEW IMAGES



# **FOLLOW-UP** **photography**

**3 photographers**



# **FOLLOW-UP** **photography**

**3 photographers**

**2 cameras + 2 spectrometers + 2 tablets**



# **FOLLOW-UP** **photography**

**3 photographers**

**2 cameras + 2 spectrometers + 2 tablets**

**identically programmed**



# **FOLLOW-UP** **photography**

**3 photographers**

**2 cameras + 2 spectrometers + 2 tablets**

**identically programmed**

**fixed acquisition procedure**





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# FOLLOW-UP photography

3 photographers

2 cameras + 2 spectrometers + 2 tablets

identically programmed

fixed acquisition procedure



# **FOLLOW-UP** **photography**

3 photographers

2 cameras + 2 **spectrometers** + 2 tablets

identically programmed

fixed acquisition procedure



# **FOLLOW-UP** **photography**

3 photographers

2 cameras + 2 **spectrometers** + 2 tablets

identically programmed

fixed acquisition procedure

**colour processing**  
**[Adolfo Molada Tebar]**



# **FOLLOW-UP** **photography**

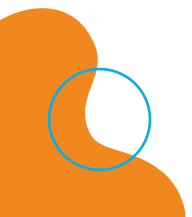
3 photographers

2 cameras + 2 spectrometers + **2 tablets**

identically programmed

fixed acquisition procedure

# **CURRENT** monitoring



# CURRENT monitoring

## BASEMAP

ESRI ArcGIS Field Maps  
areas with overview photos  
cloud-based | tablets





# CURRENT monitoring

## BASEMAP

ESRI ArcGIS Field Maps  
areas with overview photos  
cloud-based | tablets



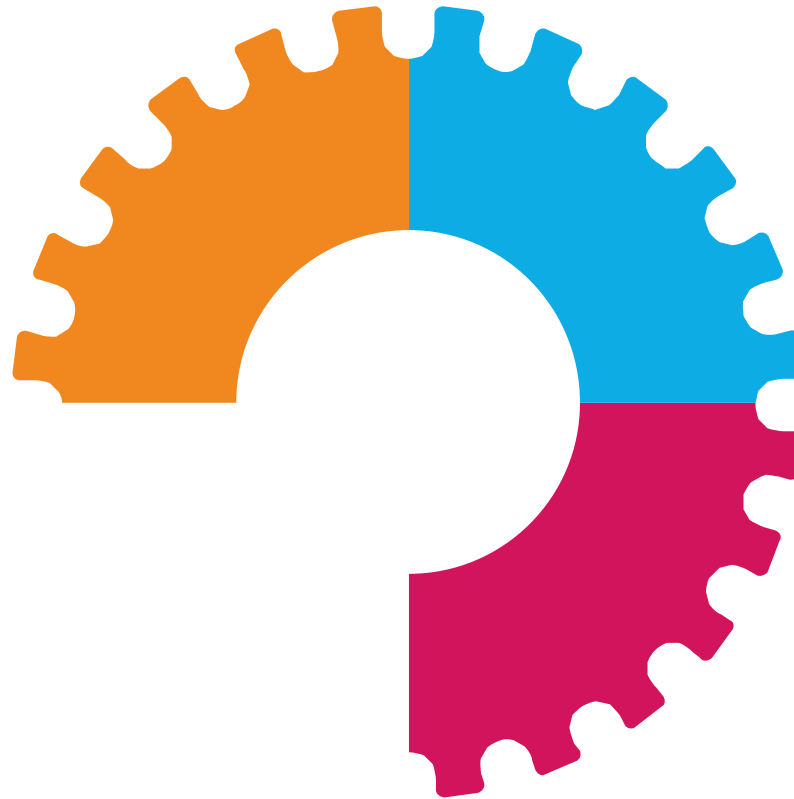
## MONITOR

check social media  
memory  
hashtags + form (unused)

# CURRENT monitoring

## BASEMAP

ESRI ArcGIS Field Maps  
areas with overview photos  
cloud-based | tablets



## MONITOR

check social media  
memory  
hashtags + form (unused)

## ADD TO APP

point: "not photographed"

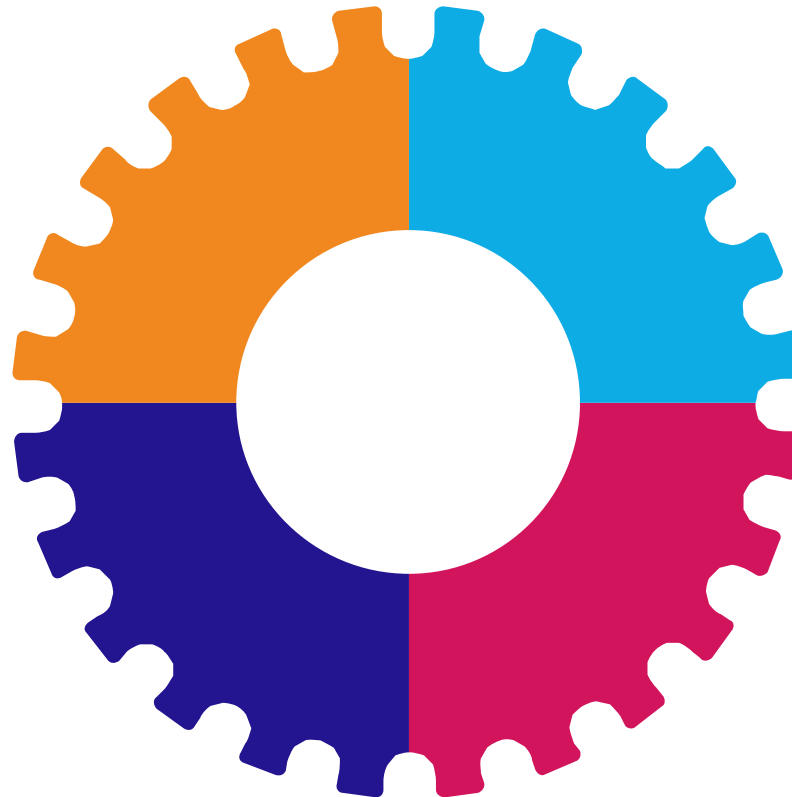
# CURRENT monitoring

## BASEMAP

ESRI ArcGIS Field Maps  
areas with overview photos  
cloud-based | tablets

## DOCUMENT

± 10 photos  
spectrometer reading  
change status point  
new overview photo



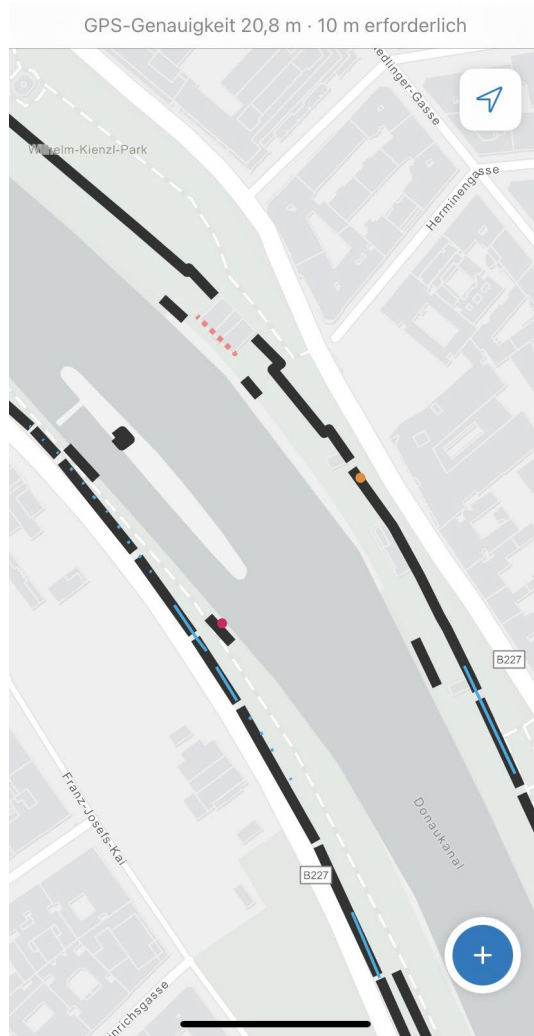
## MONITOR

check social media  
memory  
hashtags + form (unused)

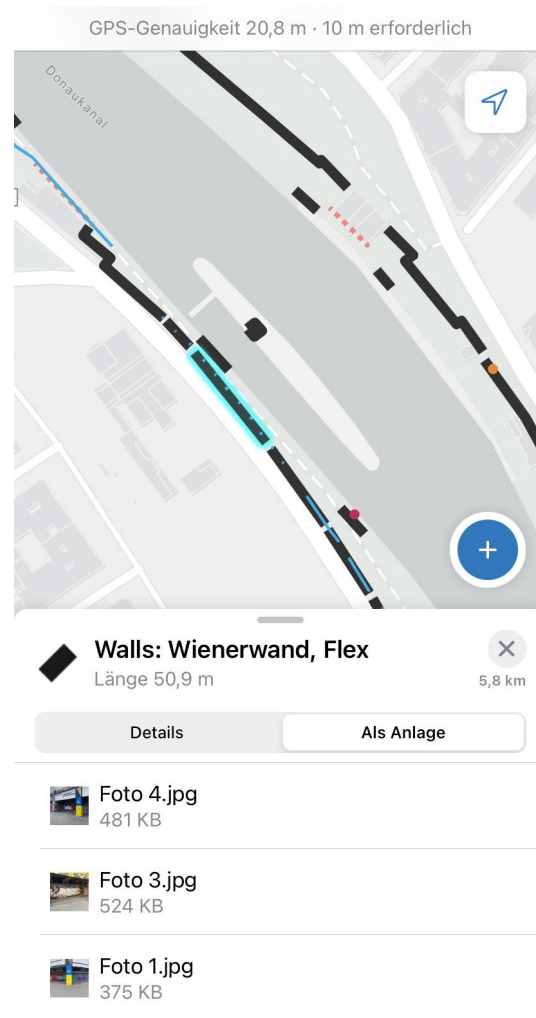
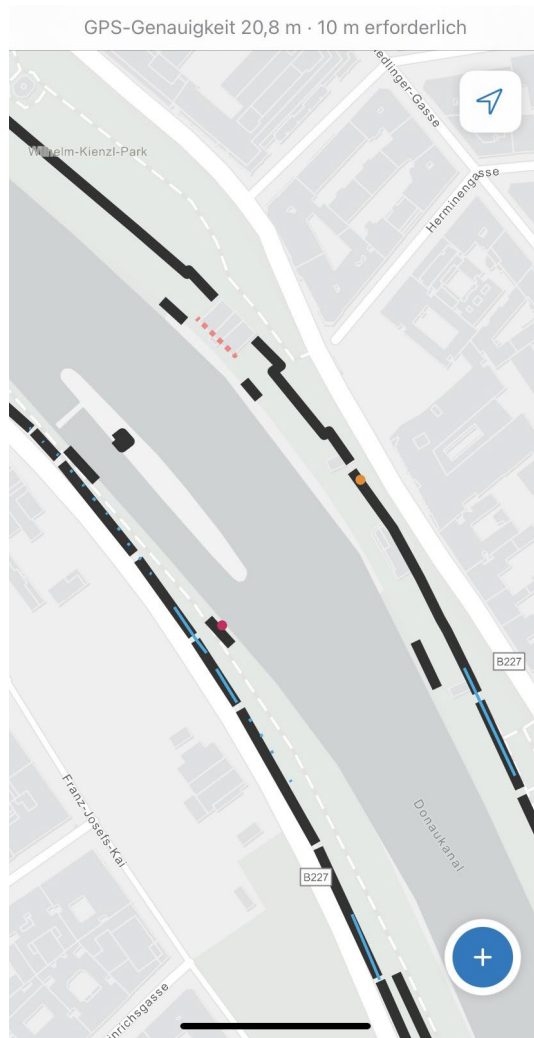
## ADD TO APP

point: "not photographed"

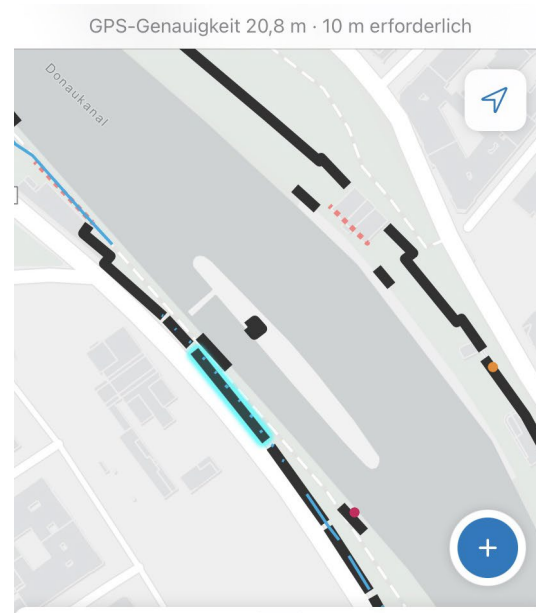
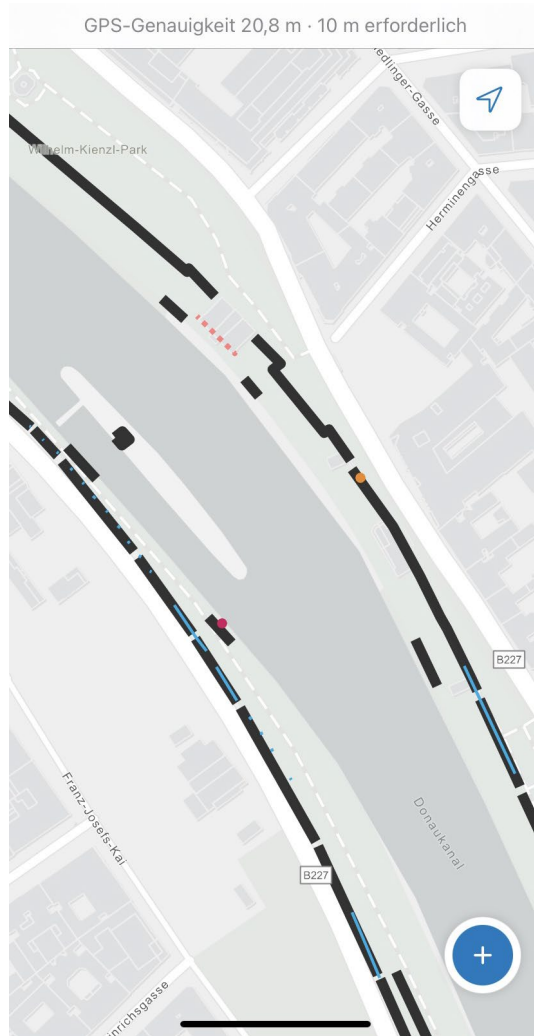
# CURRENT monitoring



# CURRENT monitoring



# CURRENT monitoring



**Walls: Wienerwand, Flex** ✕  
Länge 50,9 m 5,8 km

Details

Als Anlage

 **Foto 4.jpg**  
481 KB

 **Foto 3.jpg**  
524 KB

 **Foto 1.jpg**  
375 KB



**INDIGO - Monitoring - Graffiti** ⋮  
48,214117°N 16,375703°O

Punkt aktualisieren

 Foto aufnehmen

 Anfügen

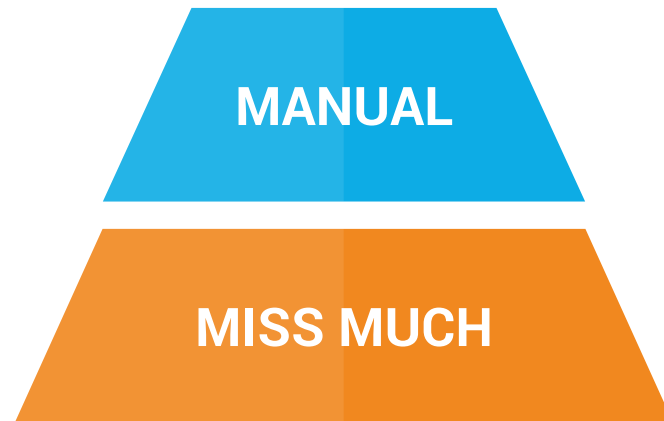
Notes

Photographer

# THREE problems

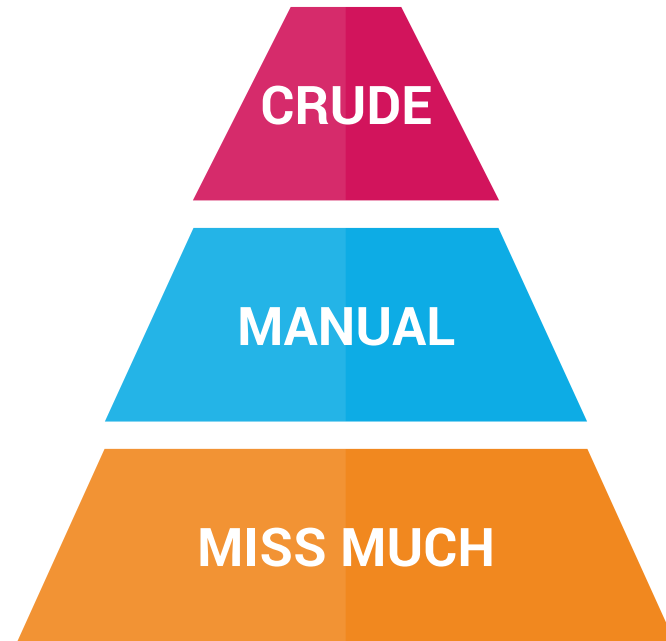
MISS MUCH

# THREE problems





# THREE problems



# POSSIBLE solutions



MONTHLY TOURS

CRUDE

MANUAL

MISS MUCH

# POSSIBLE solutions



MONTHLY TOURS

CRUDE

MANUAL

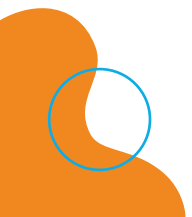
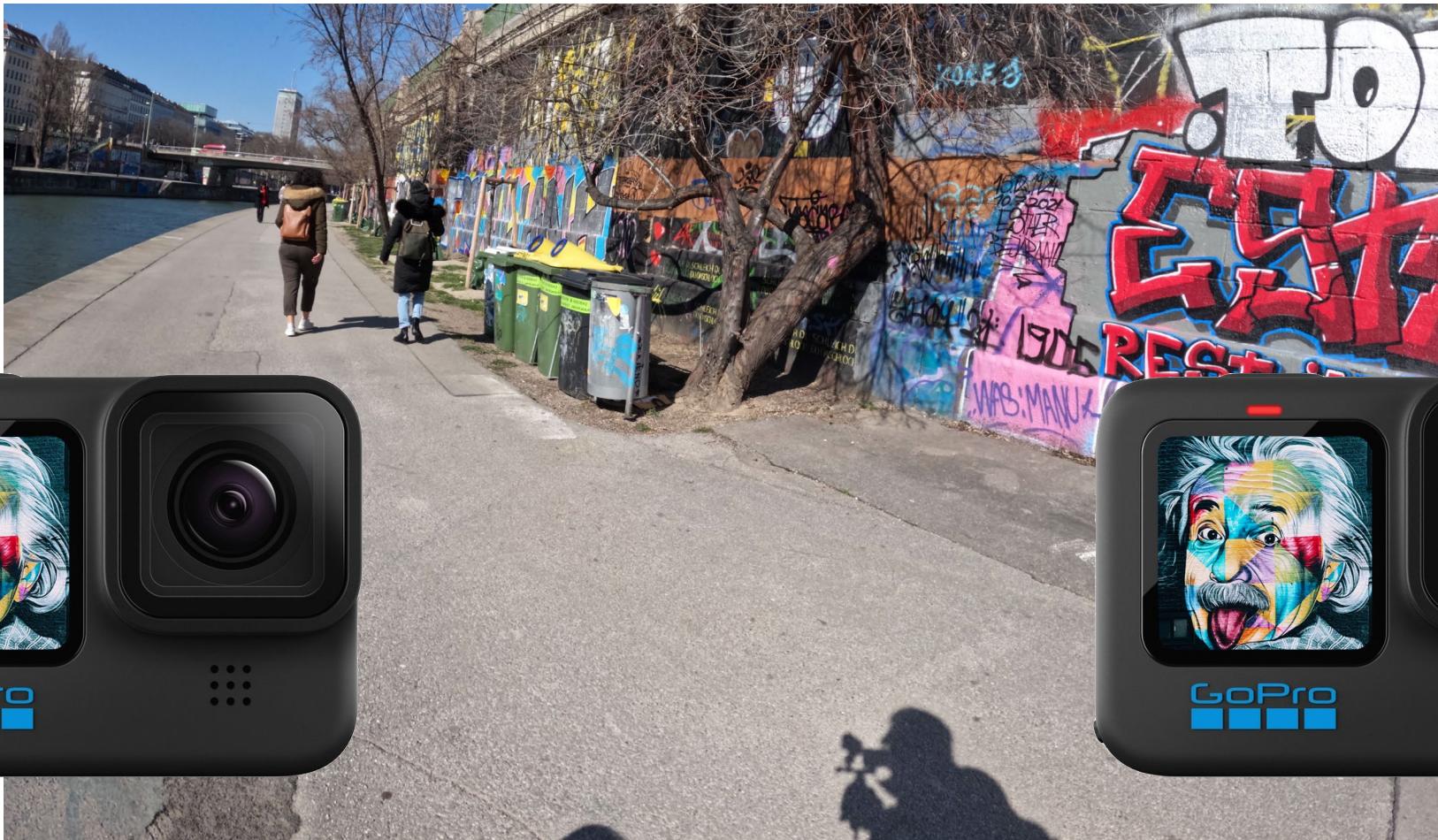
MISS MUCH

DETAILED

AUTOMATED

IMAGE

# MONITORING idea



# MONITORING idea



# MONITORING idea



# MONITORING idea



# MONITORING idea





# MONITORING idea



# MONITORING idea



# MONITORING idea



# MONITORING **idea**



# MONITORING idea



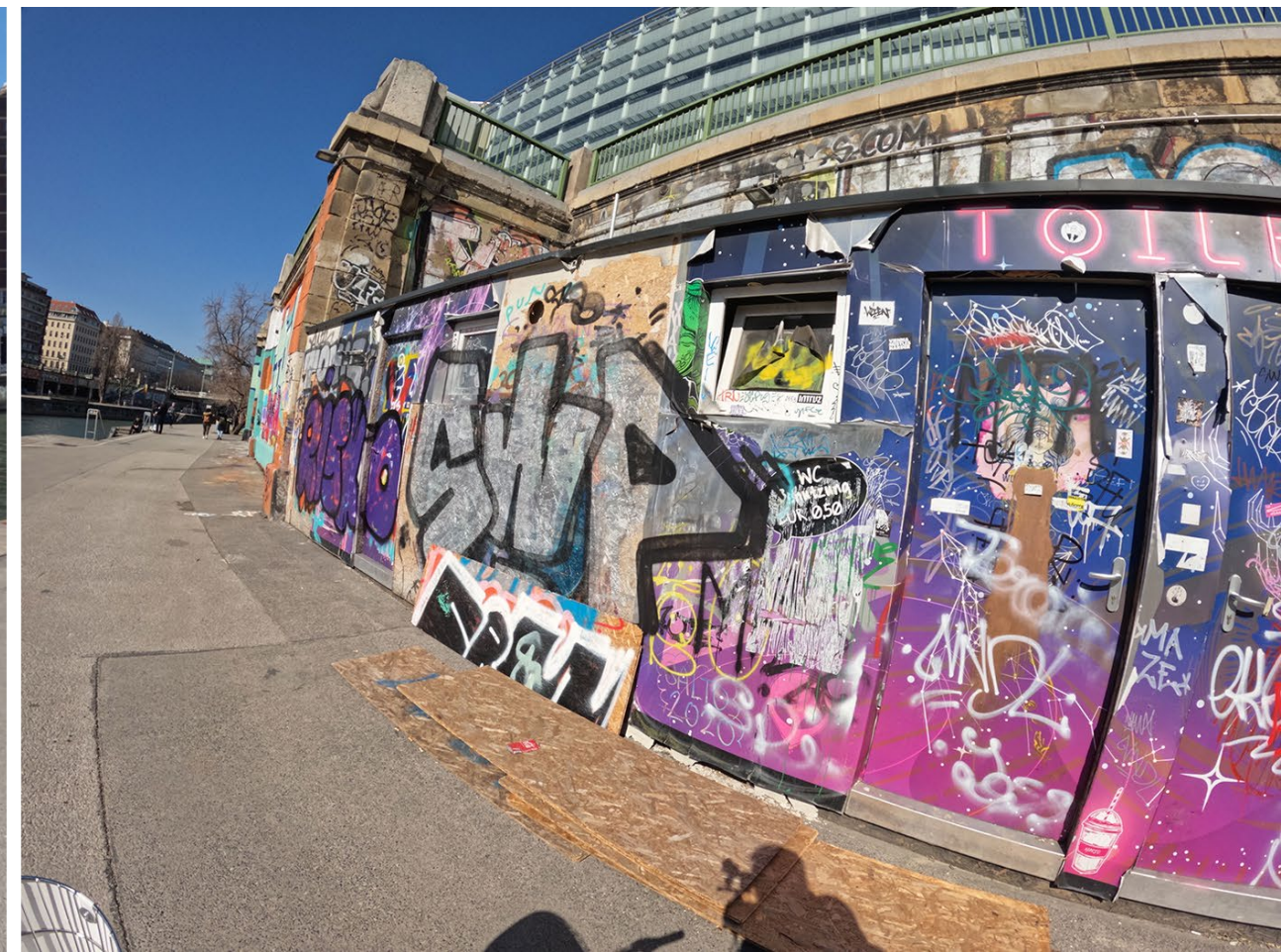
# MONITORING idea



# MONITORING idea



# MONITORING idea

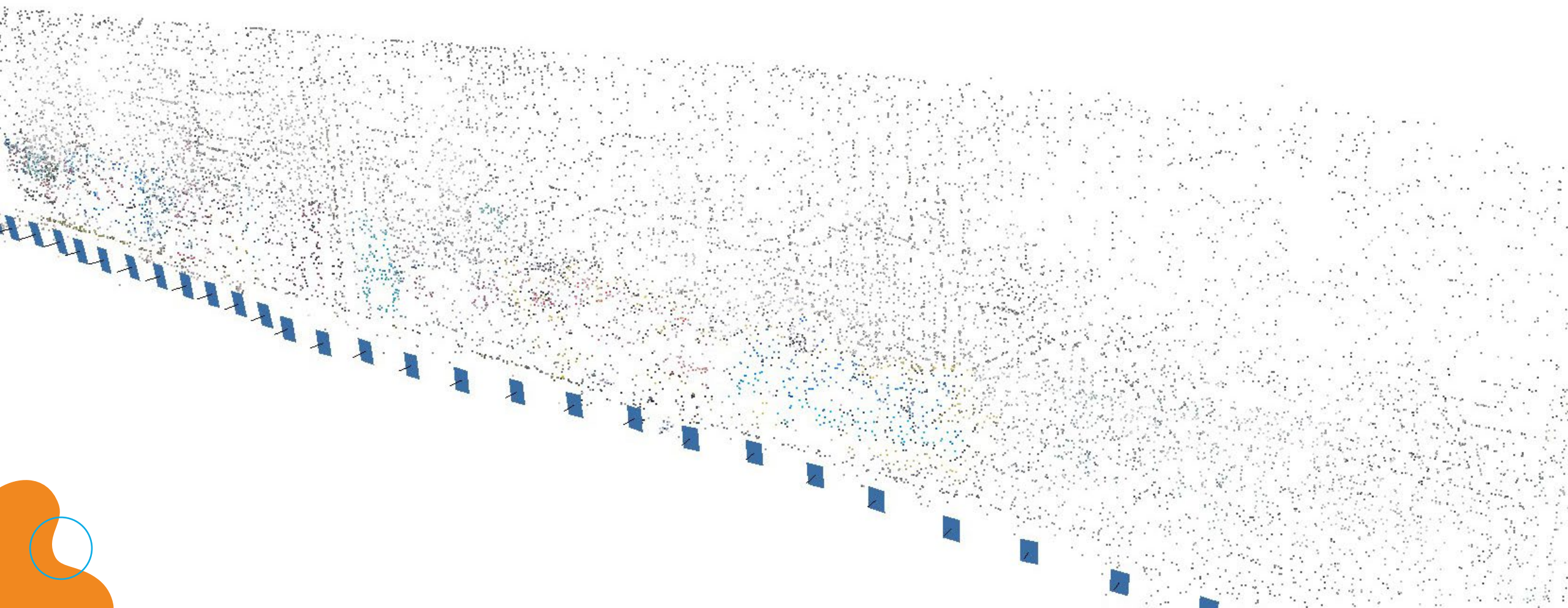




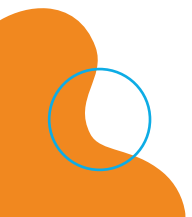
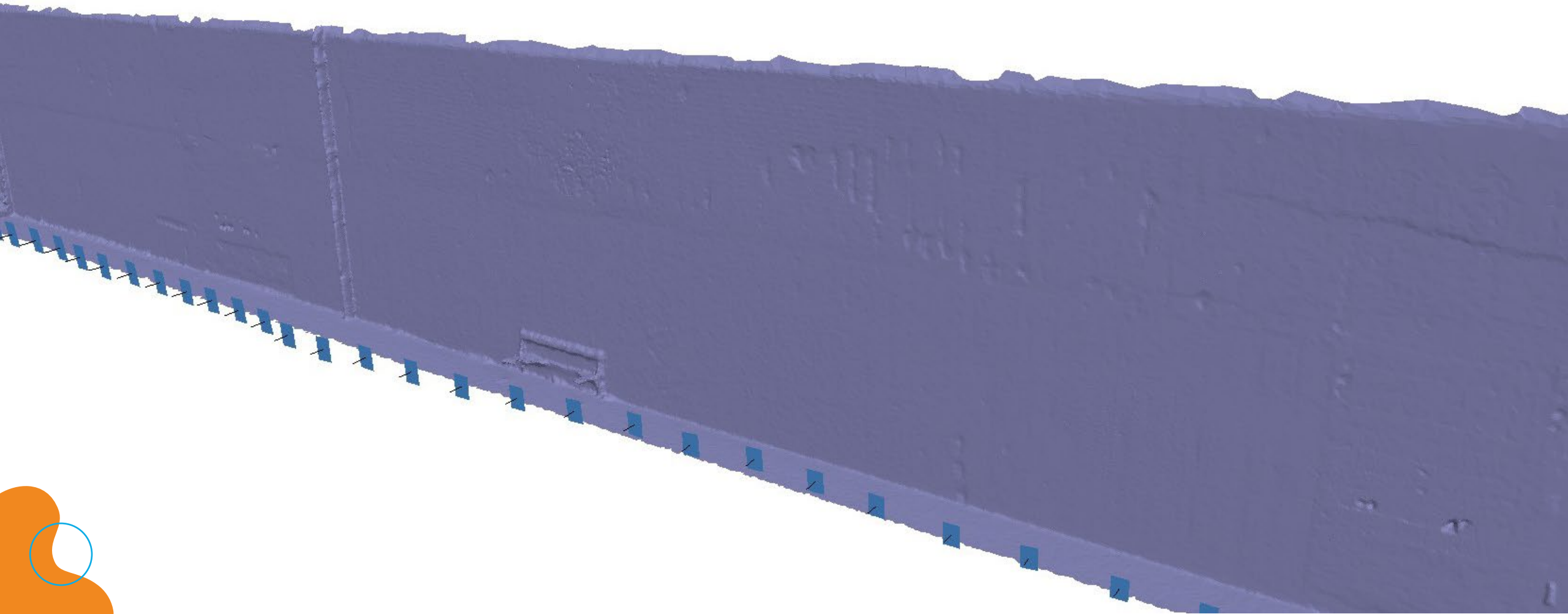
# MONITORING idea



# MONITORING **idea**



# MONITORING **idea**



# MONITORING **idea**



# MONITORING **idea**



# MONITORING **idea**



# MONITORING **idea**



# MONITORING **idea**

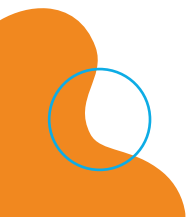




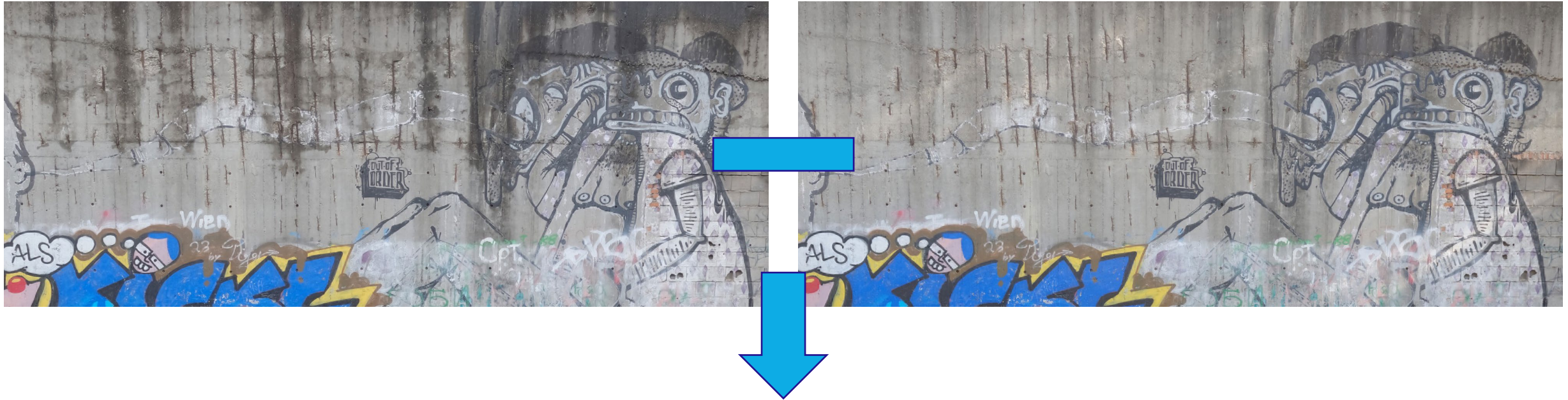
# MONITORING idea



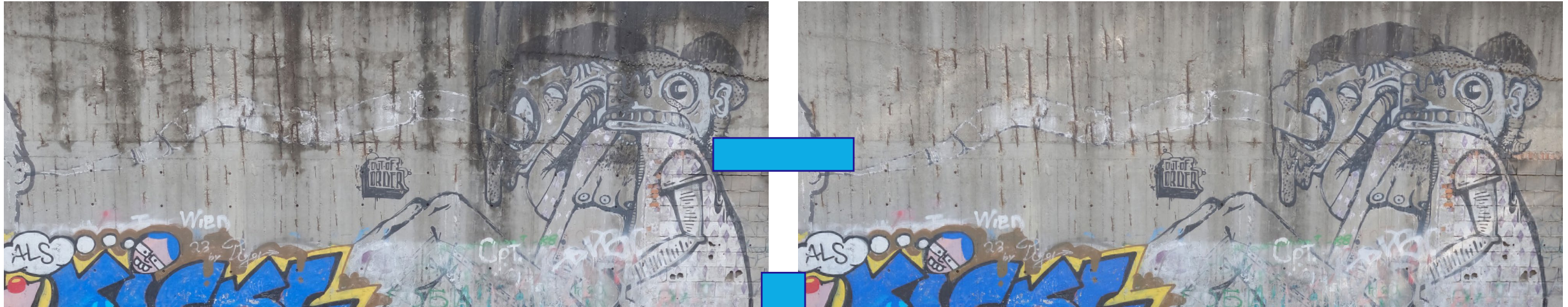
# MONITORING **idea**



# MONITORING **idea**

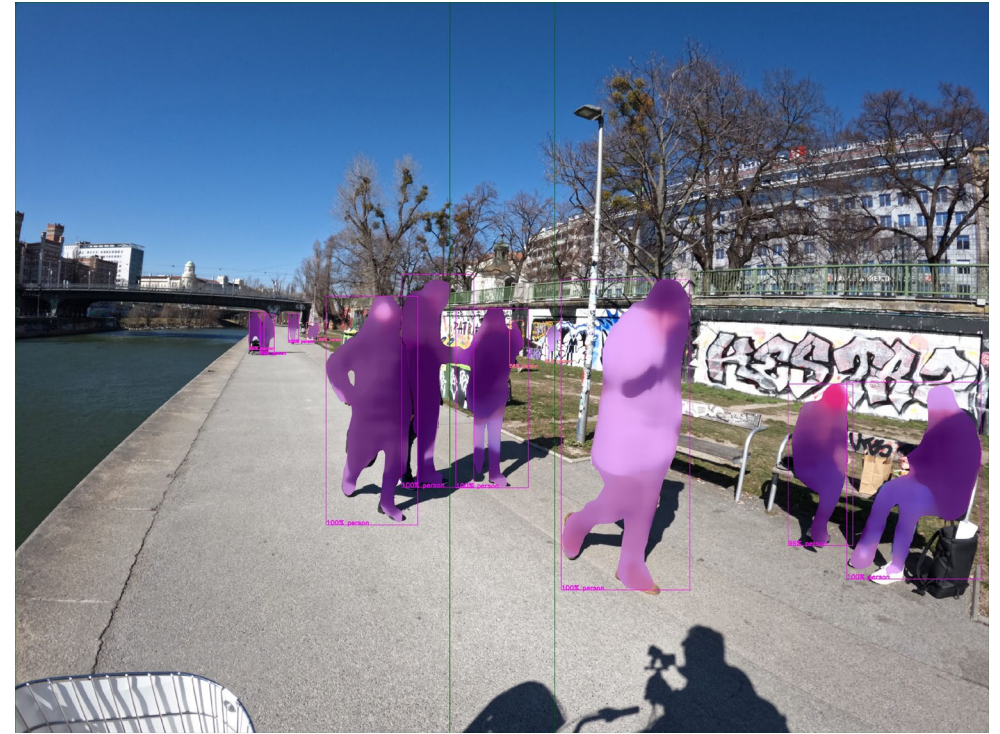


# MONITORING **idea**

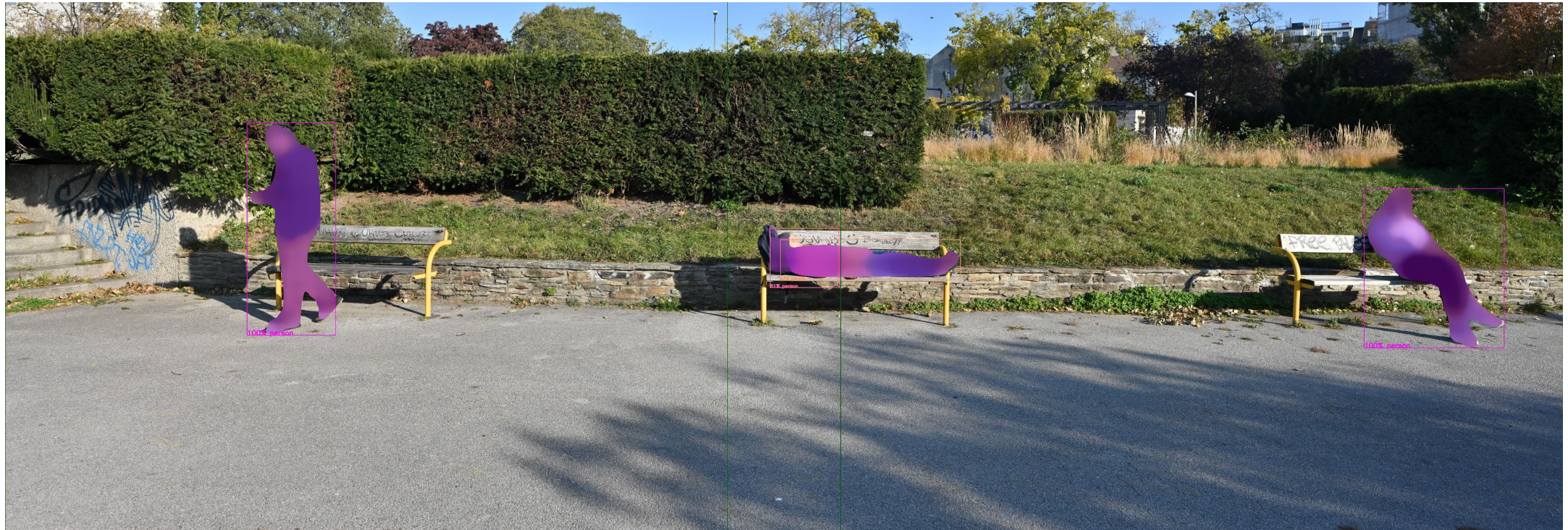


CHANGE MAP

# IMAGE anonymisation



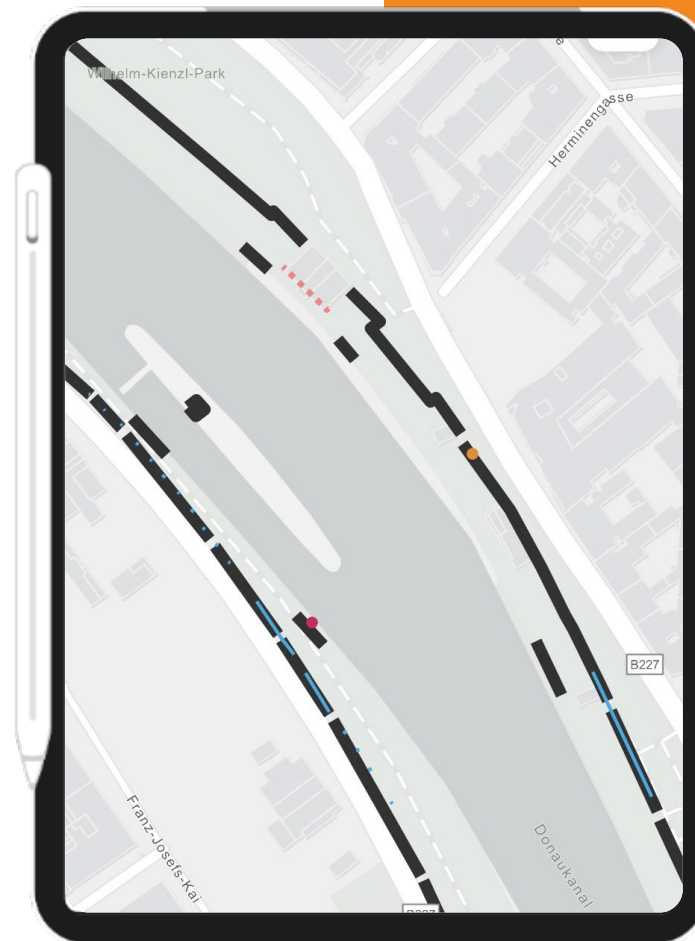
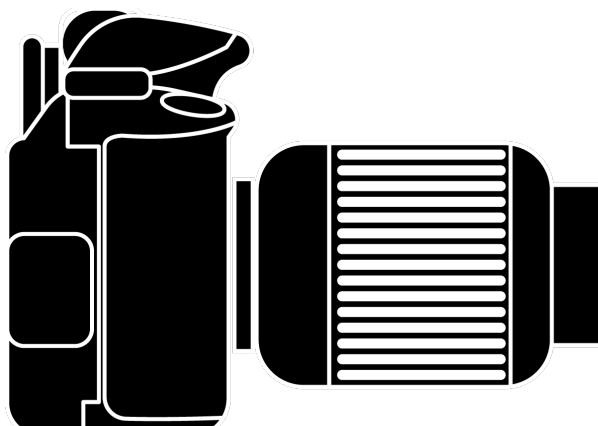
# IMAGE anonymisation



# IMAGE anonymisation

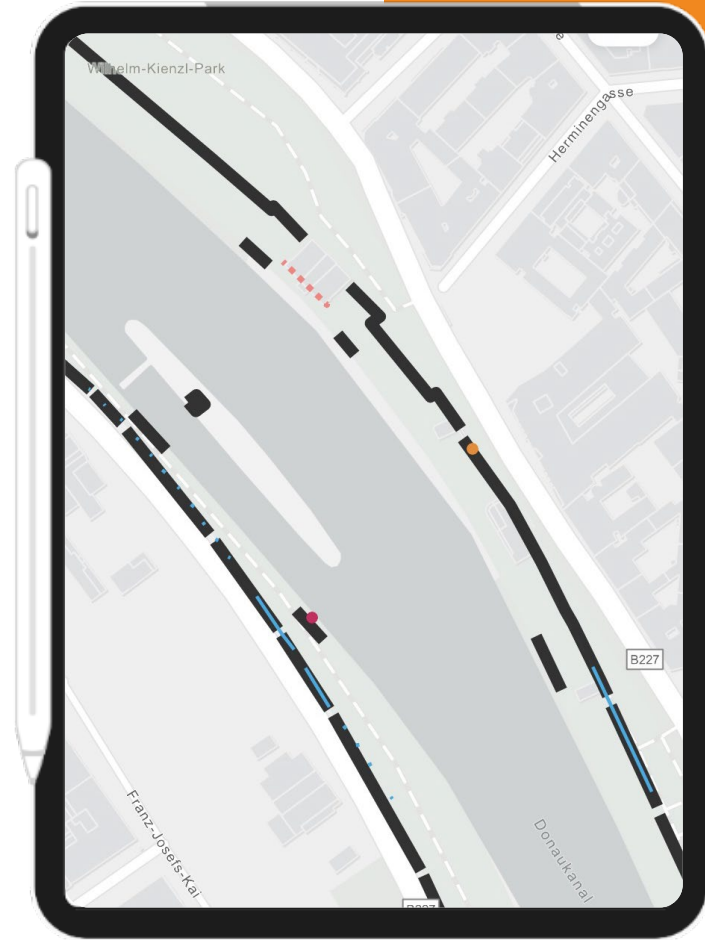
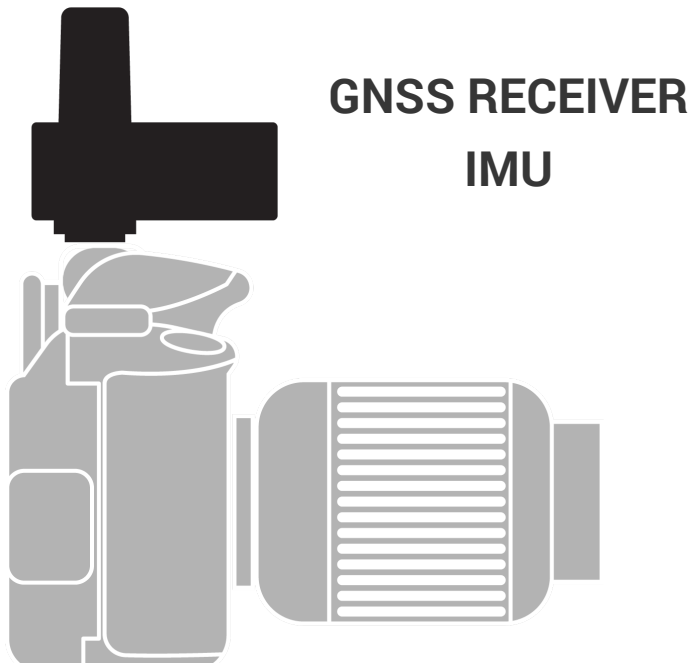


# BETTER positioning

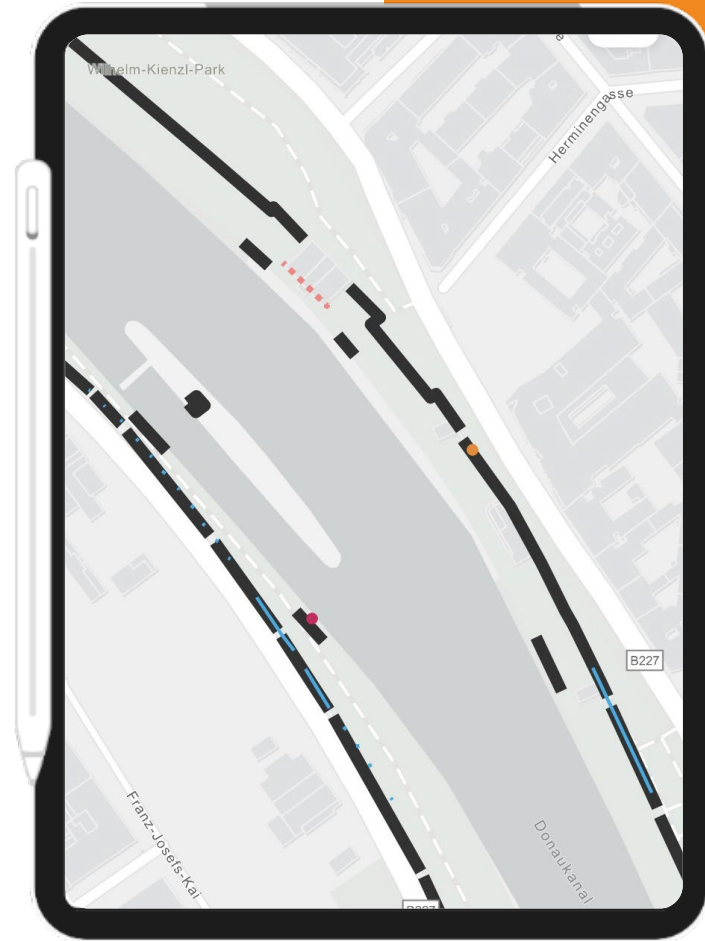
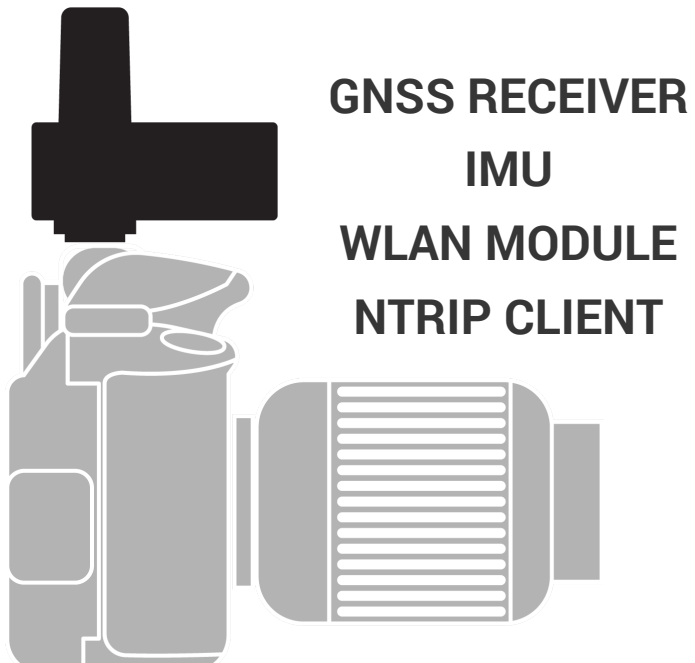




# BETTER positioning

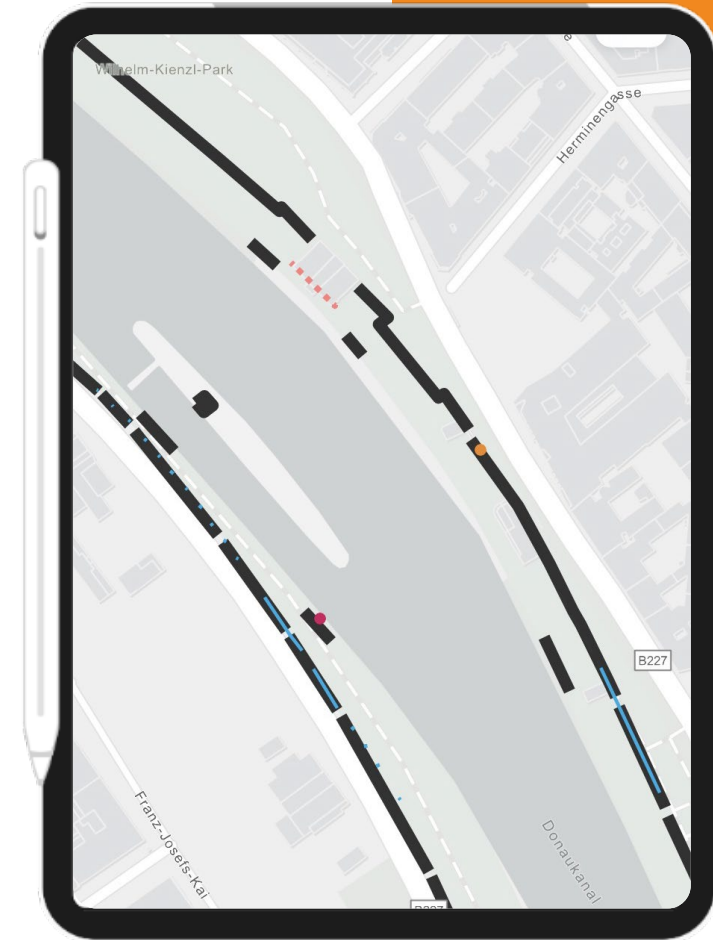
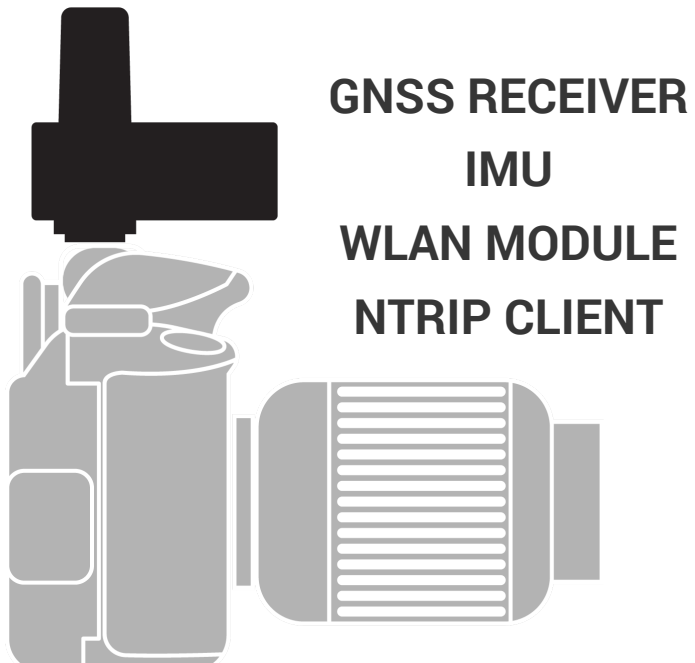


# BETTER positioning



# BETTER positioning

NTRIP SERVICE  
(EPOSA)

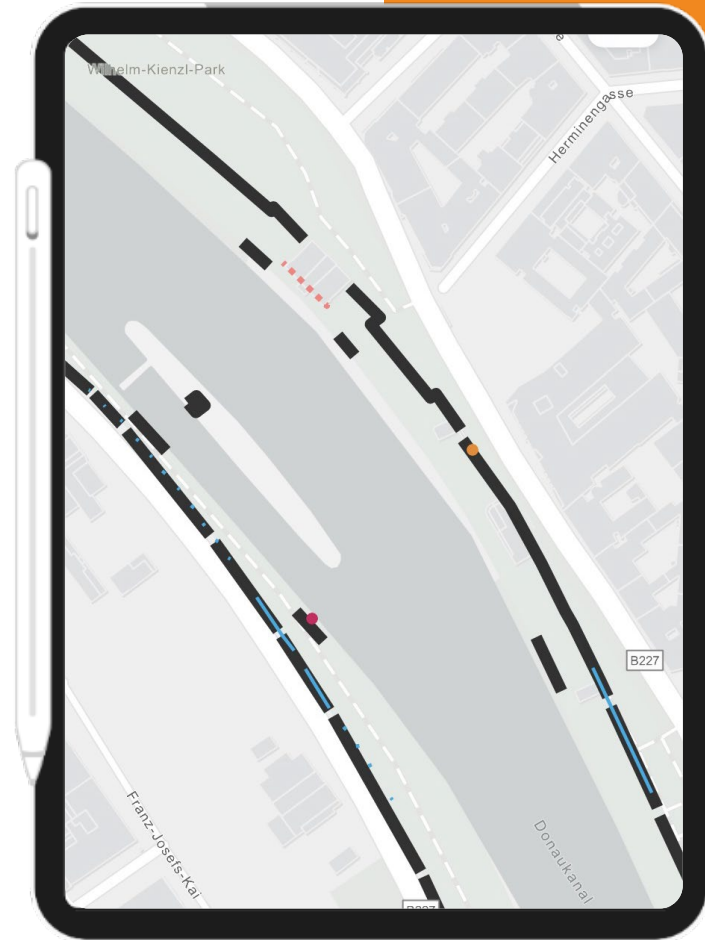


# BETTER positioning

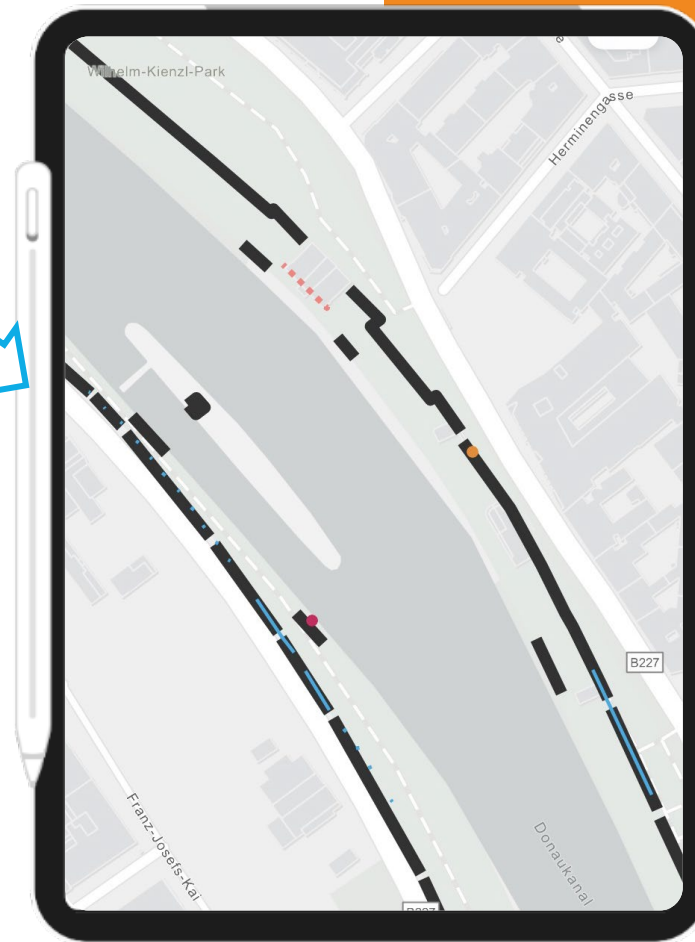
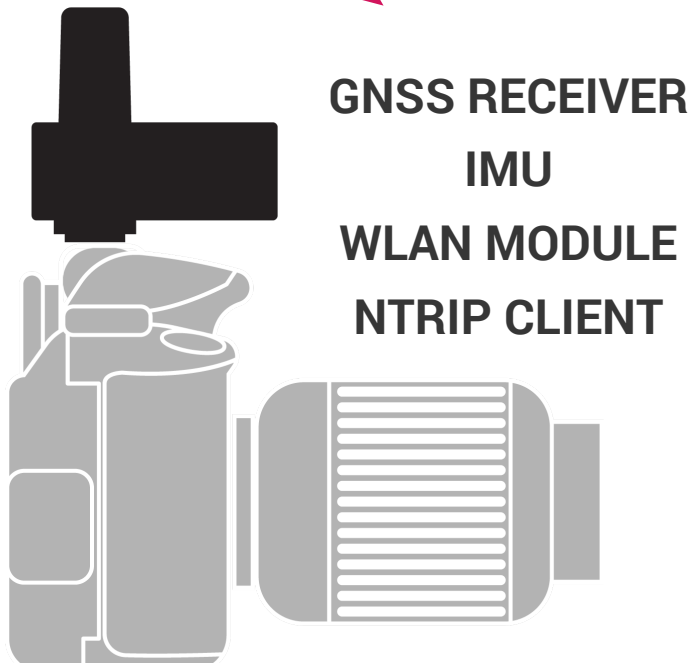
NTRIP SERVICE  
(EPOSA)

REAL-TIME  
CORRECTION DATA

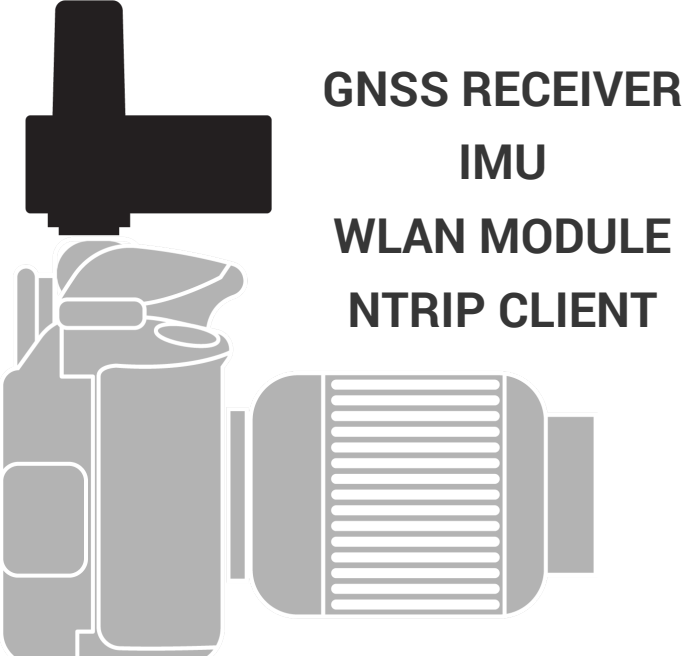
GNSS RECEIVER  
IMU  
WLAN MODULE  
NTRIP CLIENT



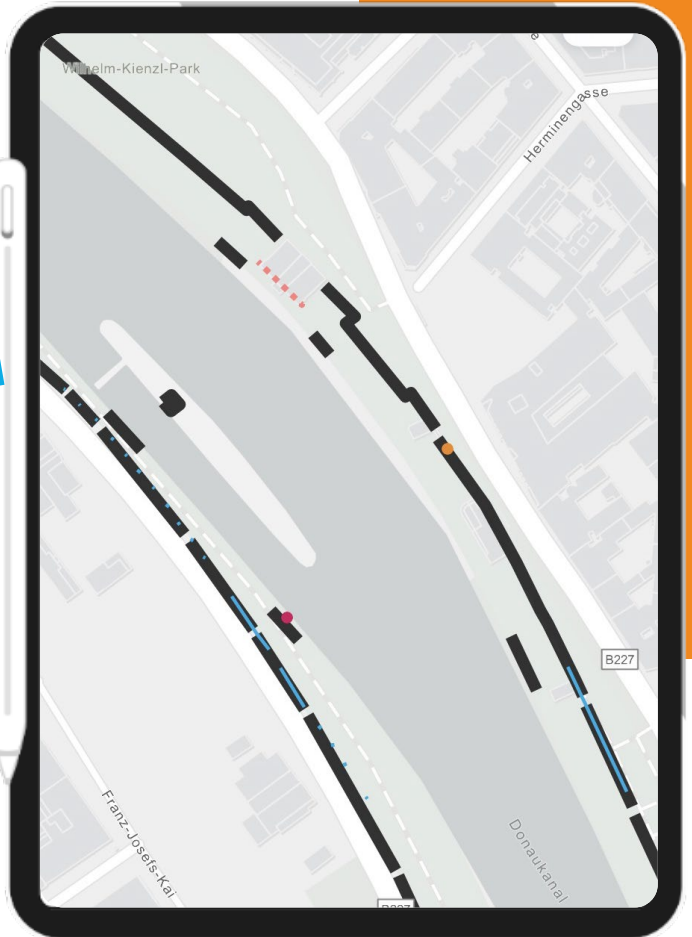
# BETTER positioning



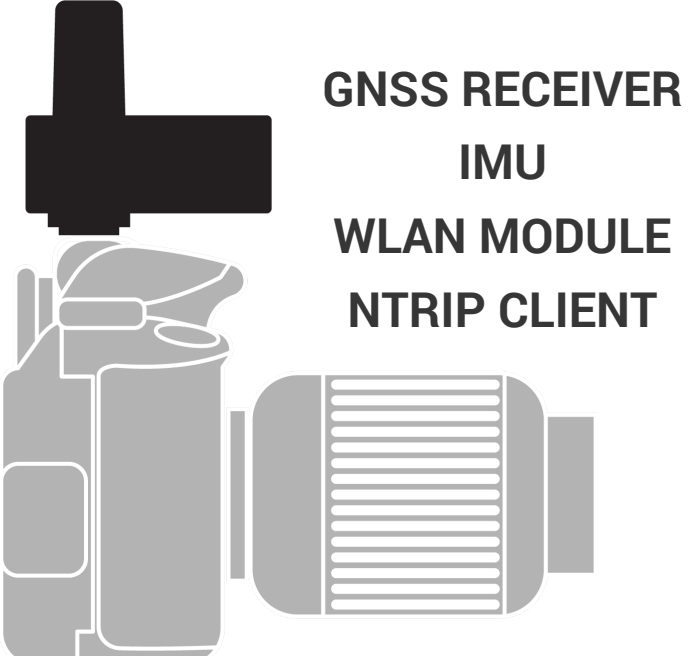
# BETTER positioning



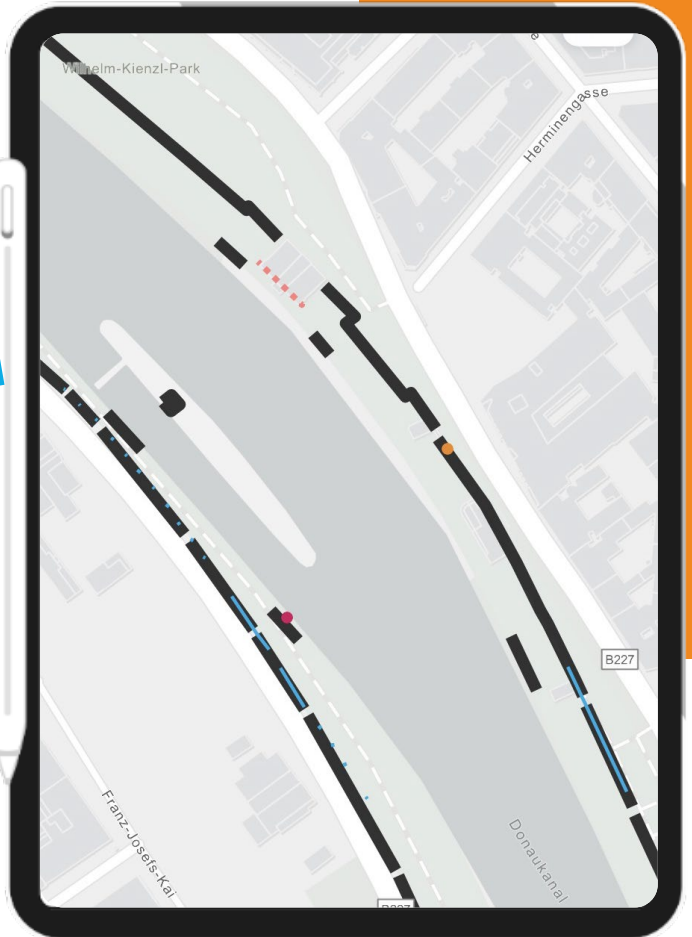
MOBILE  
HOTSPOT



# BETTER positioning



MOBILE  
HOTSPOT

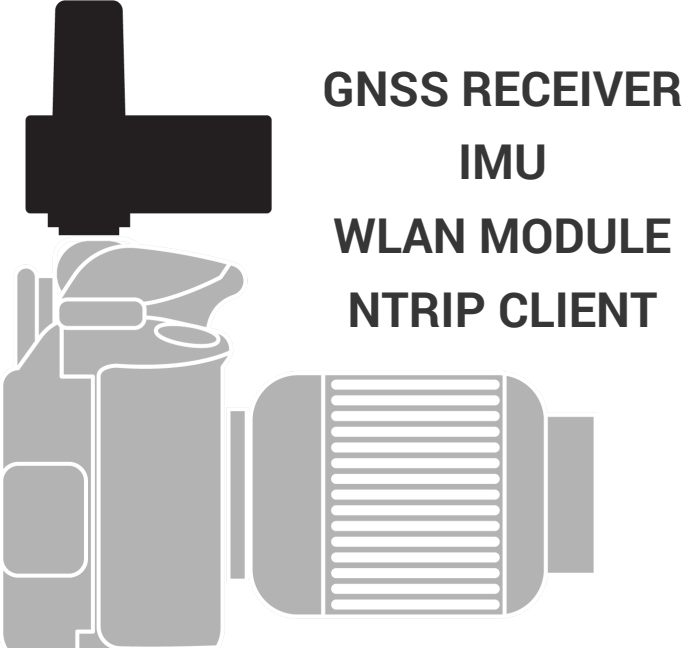


# BETTER positioning



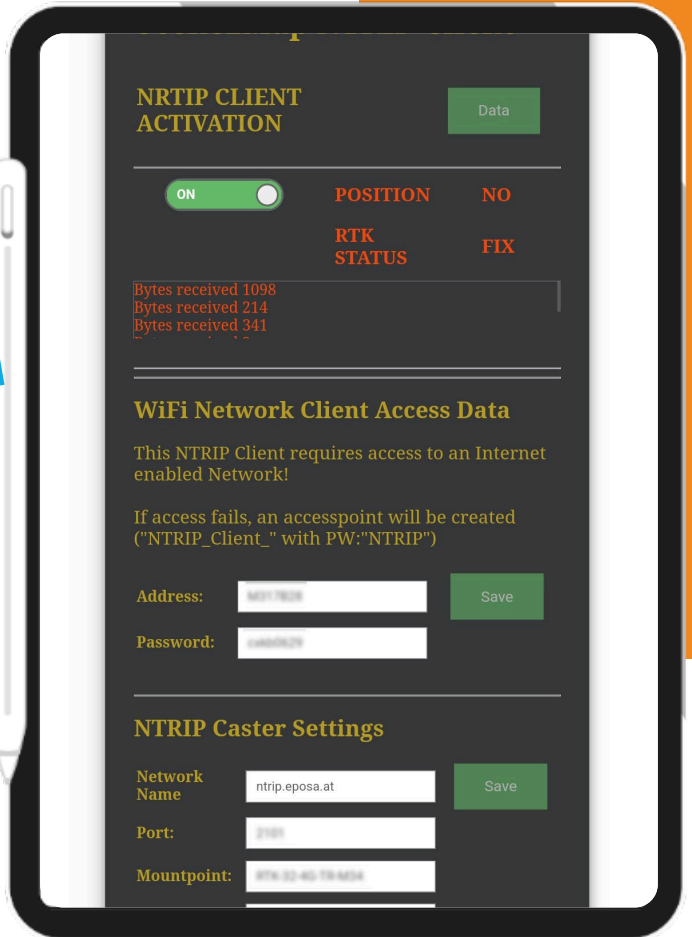
REAL-TIME  
CORRECTION DATA

INTERNET  
ACCESS



INTERNET  
ACCESS

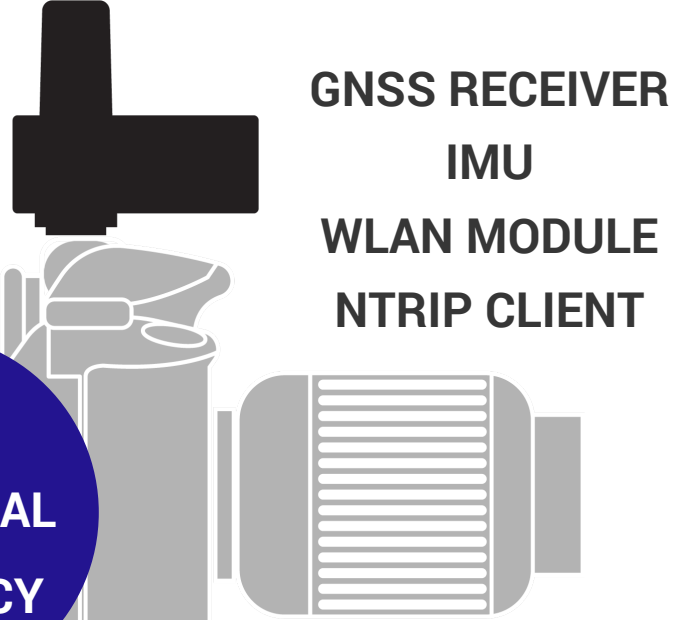
MOBILE  
HOTSPOT



NTRIP SETTINGS



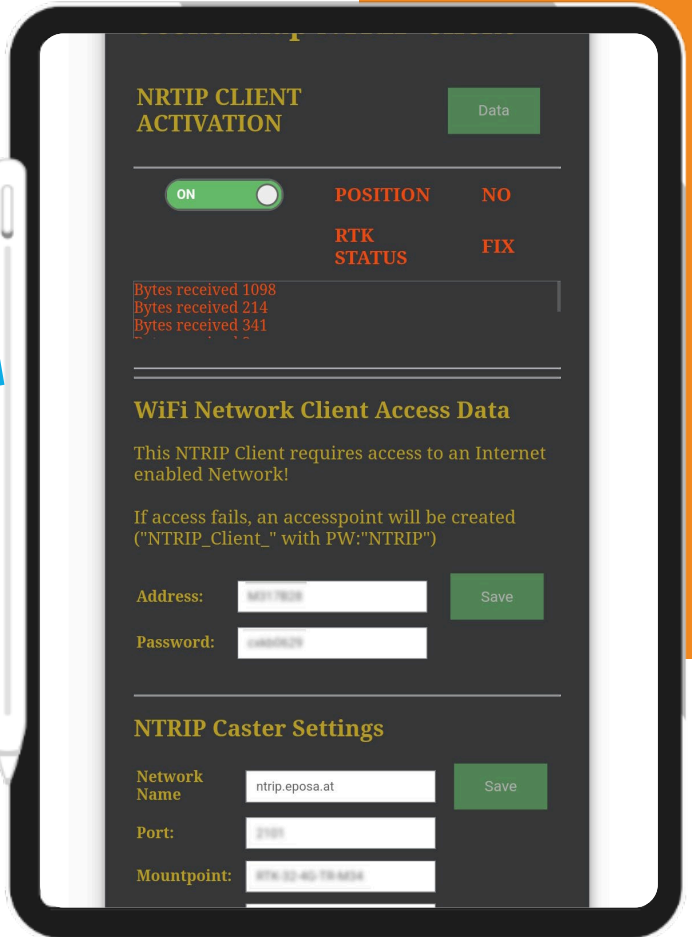
# BETTER positioning



5 CM  
POSITIONAL  
ACCURACY



MOBILE  
HOTSPOT



NTRIP SETTINGS



# Discovering & recording new graffiti within project INDIGO

Geert Verhoeven | Jona Schlegel  
Martin Wieser | Stefan Wogrin

[projectindigo.eu](http://projectindigo.eu)

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

