



Enriching data from IoT devices for tourism

Dr. Urška Starc Peceny

Chief Innovation Officer and Lead of Tourism
4.0 Department, Arctur

Tomi Ilijaš

CEO, Arctur

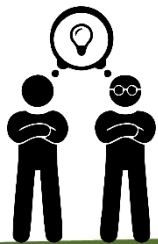
Date: 21. 6. 2022



Arctur

where creativity meets experience. Since 1992.

- 30+ years of experience
- Hi-Tech innovation driven culture
- the largest private-owned HPC provider in CEE, breaking the barriers in bringing HPC to SMEs



Industry 4.0

Key enabling technologies

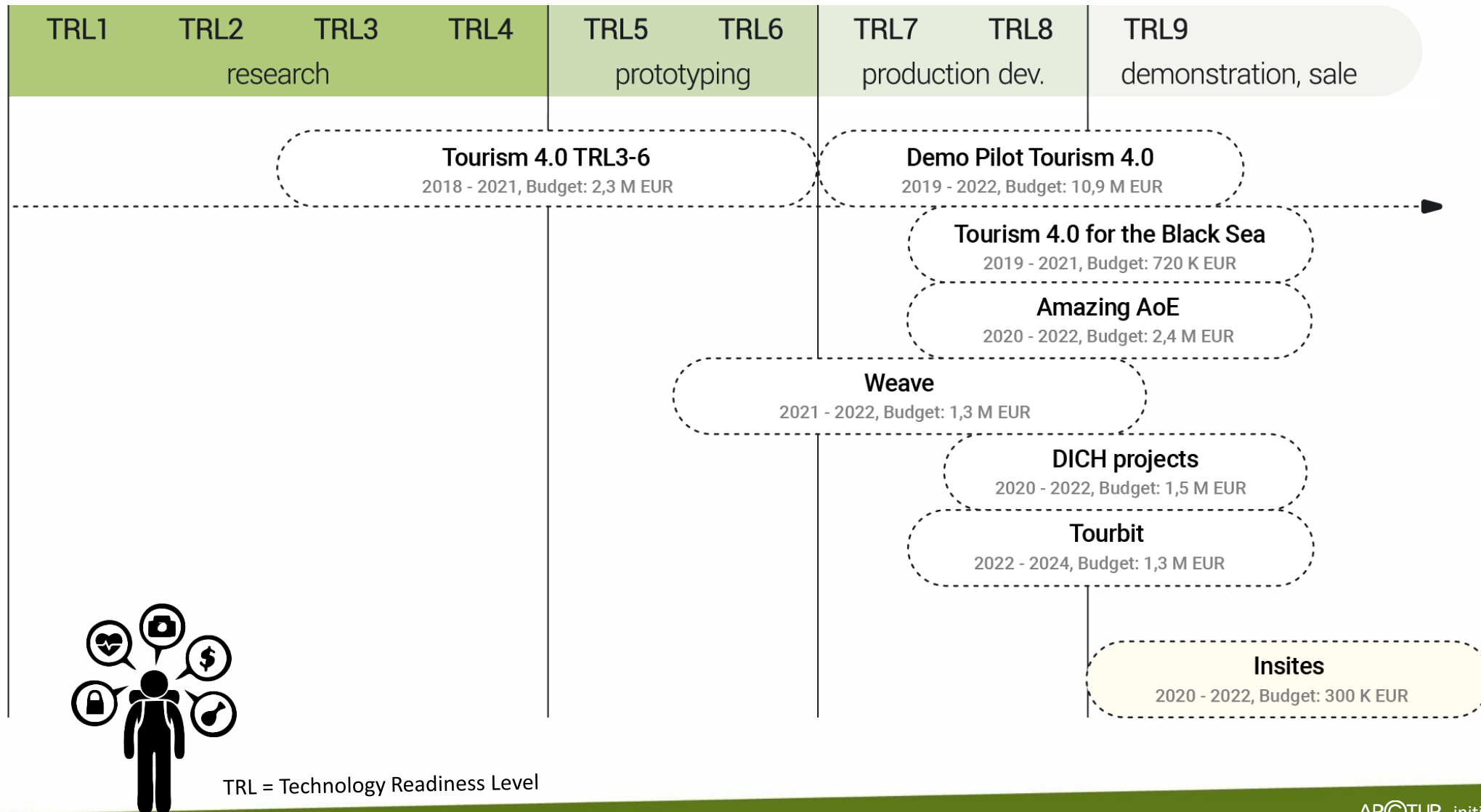
High Performance Computing Internet of Things Big Data Analytics Blockchain

Artificial Intelligence Additive Manufacturing Augmented Reality

Simulations 3D Scanning and printing Virtual Reality



R&D into tourism



changing the perception of tourism



“

Tourism can only be sustainable, when it

**improves quality of life of the
local community.**

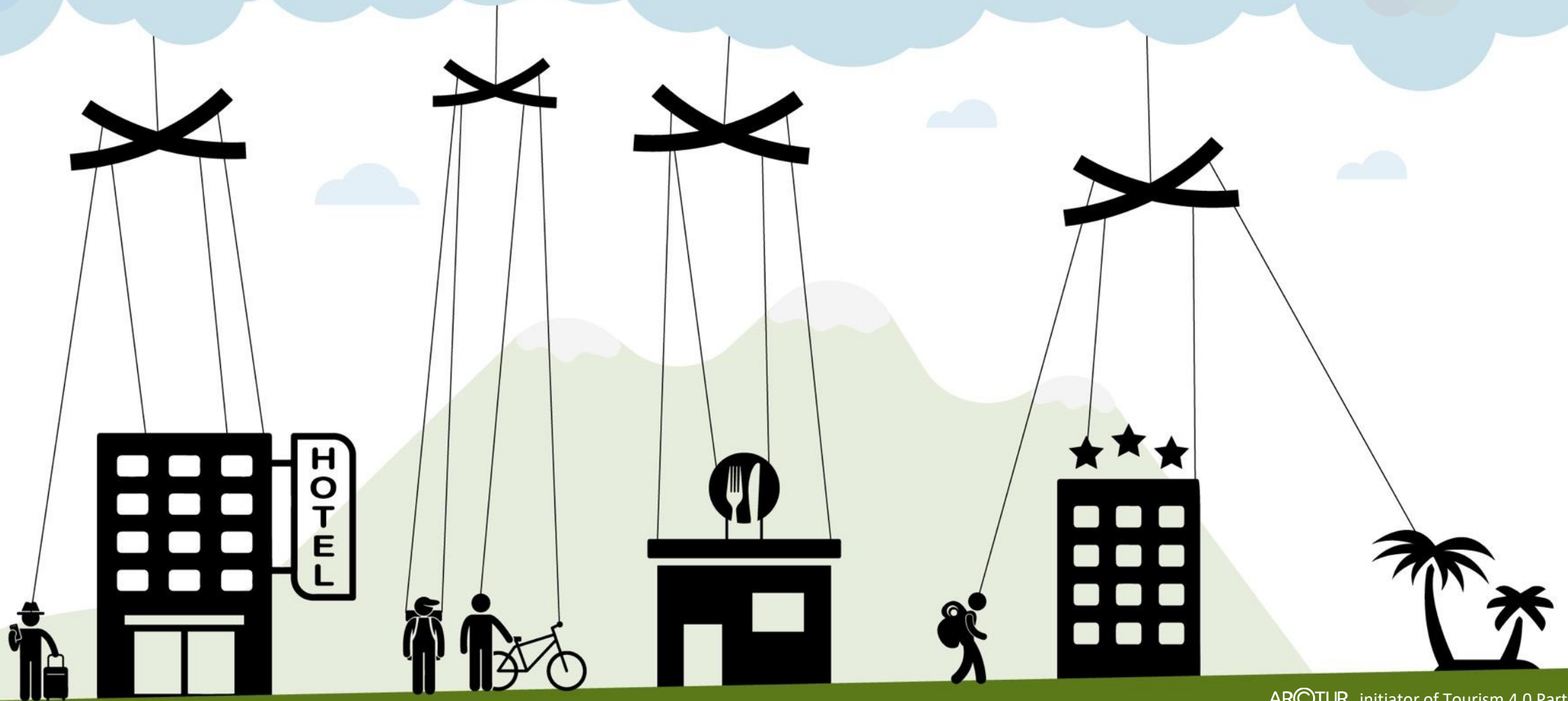








Big Data Analytics, Deep Learning, Artificial Intelligence, HPC, ...



TOURISM IMPACT MODEL

MANAGING TOURIST FLOWS

COLLABORATION IMPACT TOKEN

DIGITAL ONLINE TOURIST IDENTITY

LIVING LAB

applications
& solutions
for tourism

SMART
CAMPER
STOP

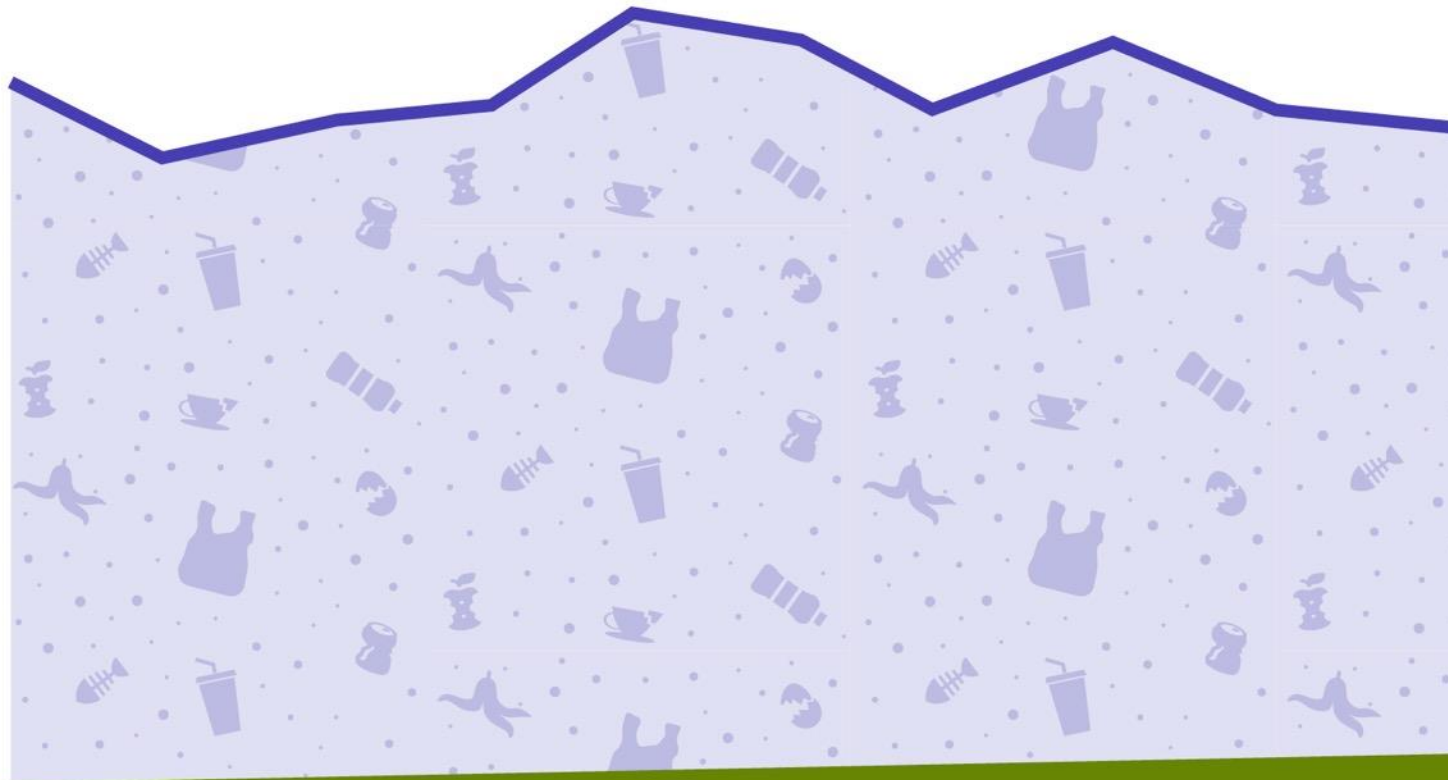
HERITAGE+
Digital Innovation
of Cultural Heritage



your playground for testing, validation & demonstration

Can our perception be wrong?

- Destination in Slovenia with world famous tourist attraction
- Population: ≈ 16.000
- Number of visitors per year: ≈ 850.000
- **Amount of waste (Jan-Dec 18)**



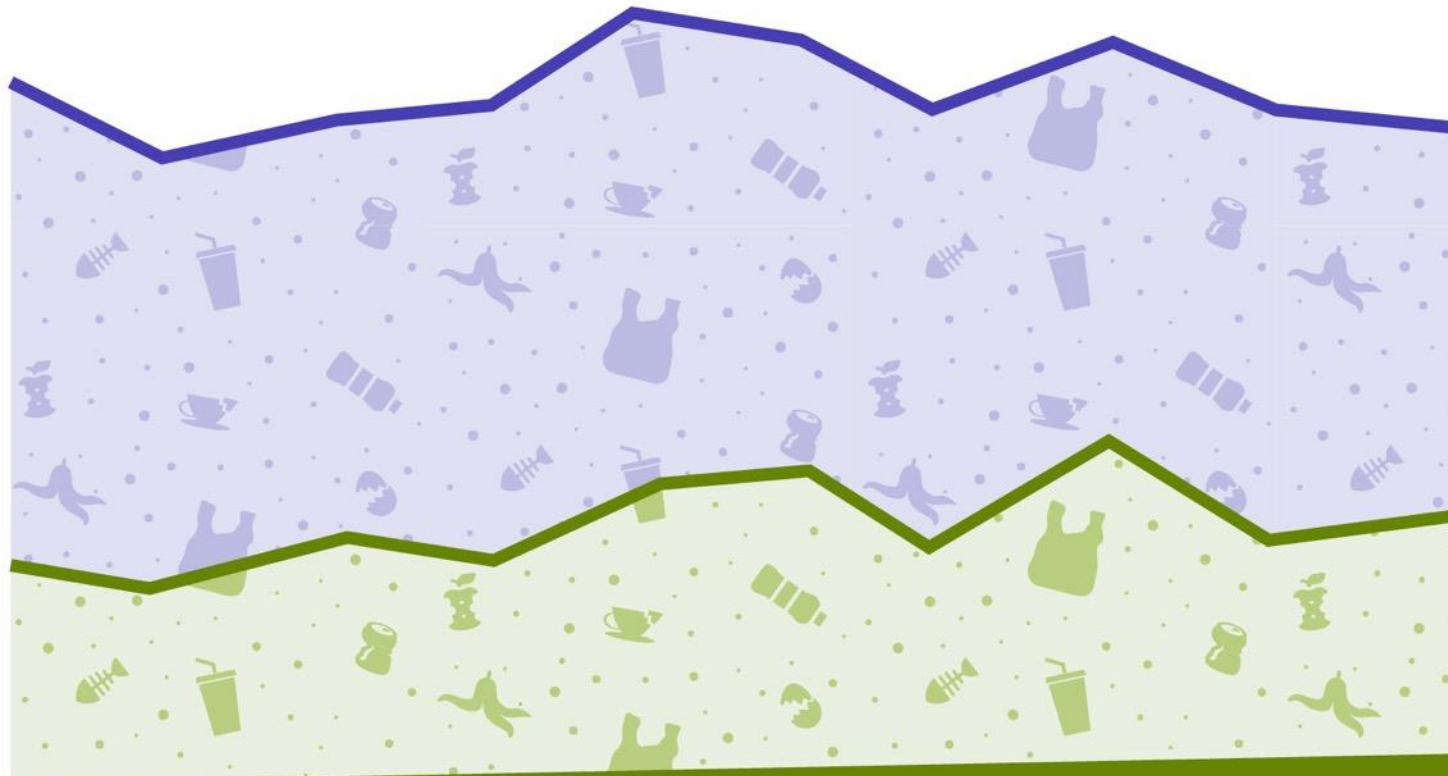
Total amount of waste



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1



Total amount of waste

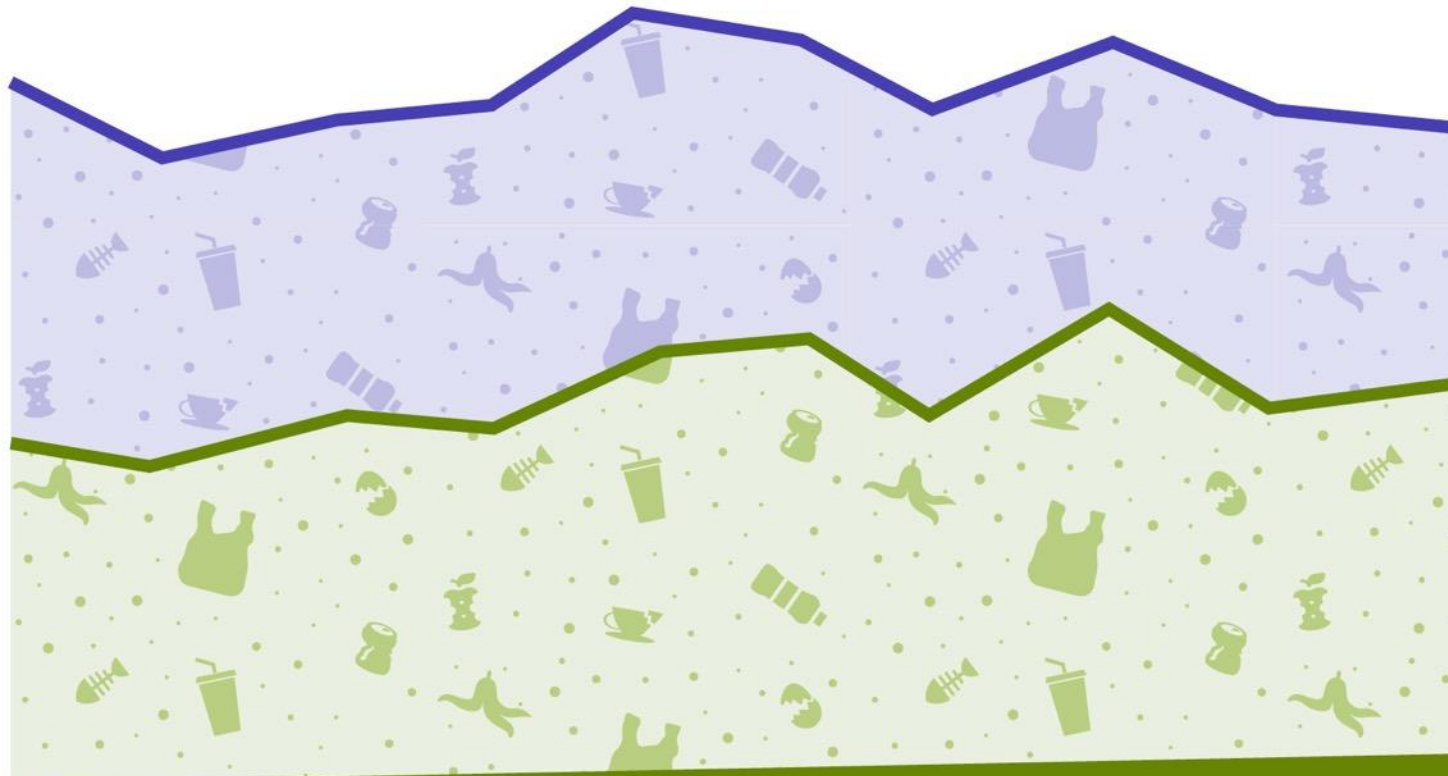
Waste produced by
tourist providers



Can our perception be wrong?

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2



Total amount of waste

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tourist providers



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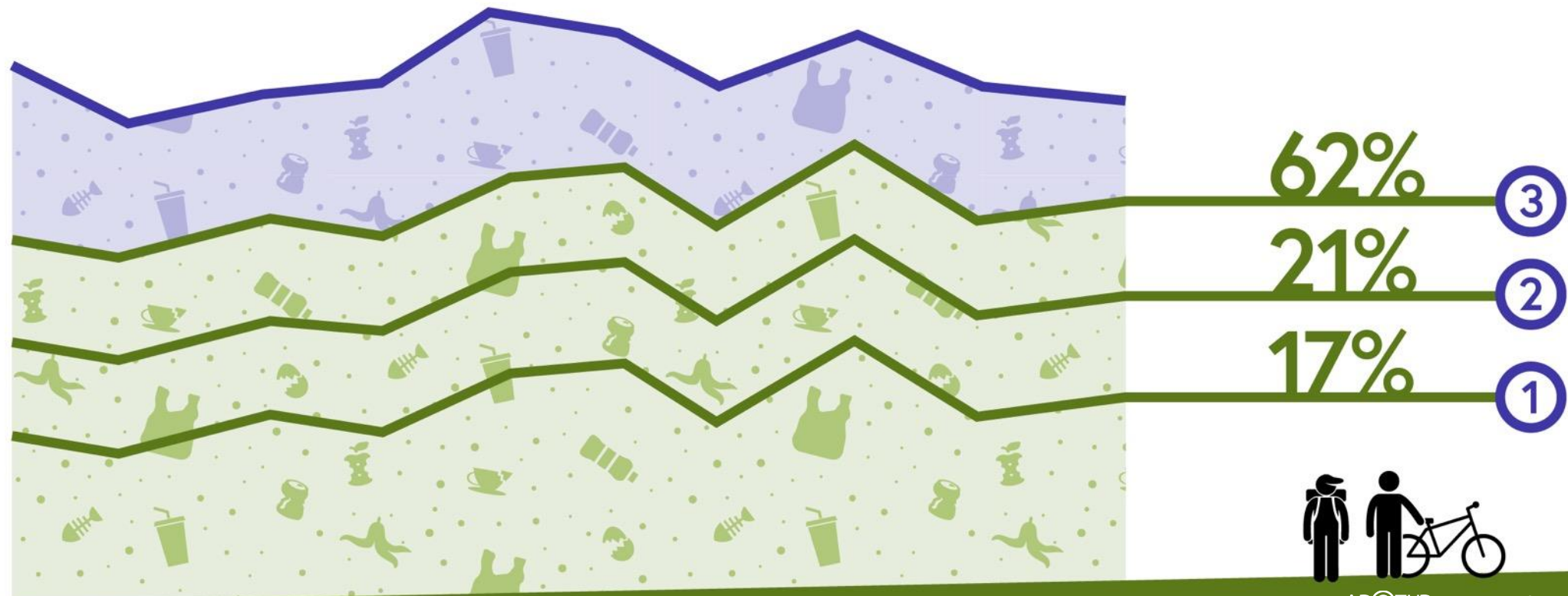
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Waste produced by
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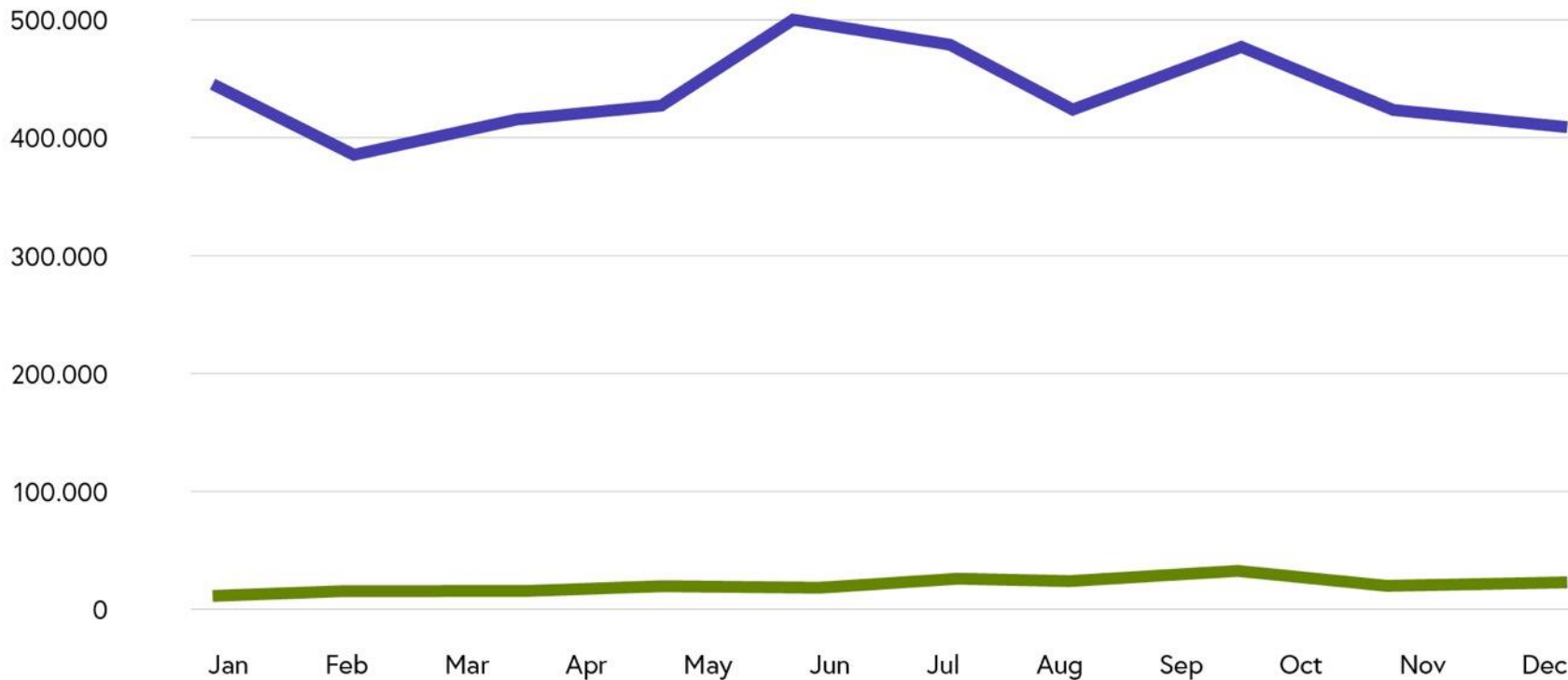
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Total amount of waste

Waste produced by
tourist providers

Tourism Impact Model

Measuring tourism impact



TIS TOURISM
INNOVATION
SUMMIT

The best innovation in
AI and Data Analytics
Award 2020

Gospodarska
zbornica
Slovenije

Chamber of Commerce
and Industry of Slovenia

Golden plaque for
best innovation of
North Primorska 2020

TIM is a tool using **real data** to create
**an objective picture of the impact of
tourism** in a certain micro-location.



300+ indicators

positive and negative effects of tourism

different societal aspects

By modelling the impact using
different scenarios, TIM acts also as a
digital twin of tourist destination and
allows **data driven strategic planning**.



TIS TOURISM
INNOVATION
SUMMIT

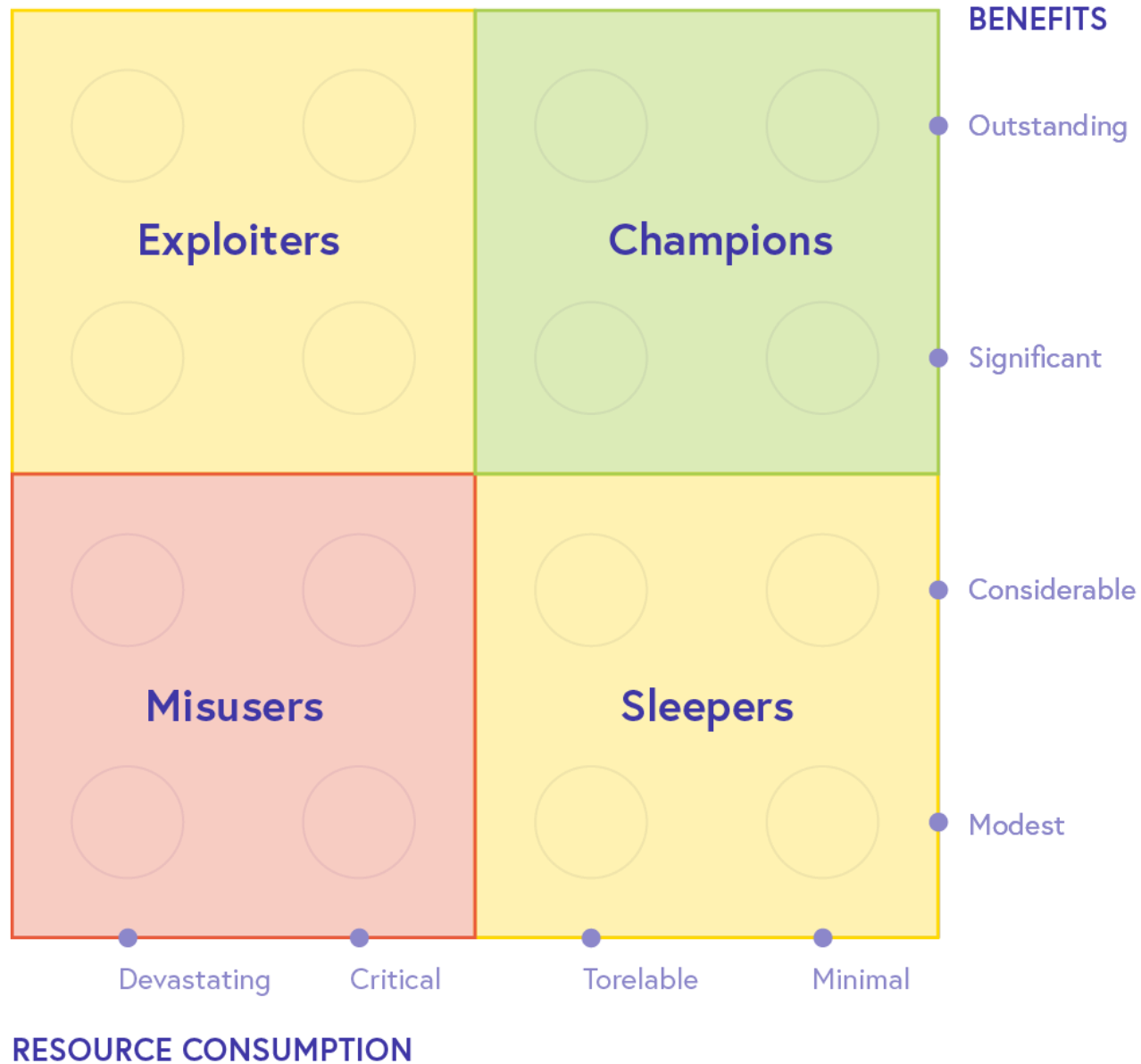
The best innovation in
AI and Data Analytics
Award 2020

Queen Letizia of Spain



Tomi Ilijaš, CEO of Arctur,
Reyes Maroto, Minister for
Industry, Commerce and
Tourism of Spain, **Juan
Espadas**, the Mayor of Seville
and **Urška Starc Peceny**, CIO
and lead of Tourism 4.0
Department at Arctur.



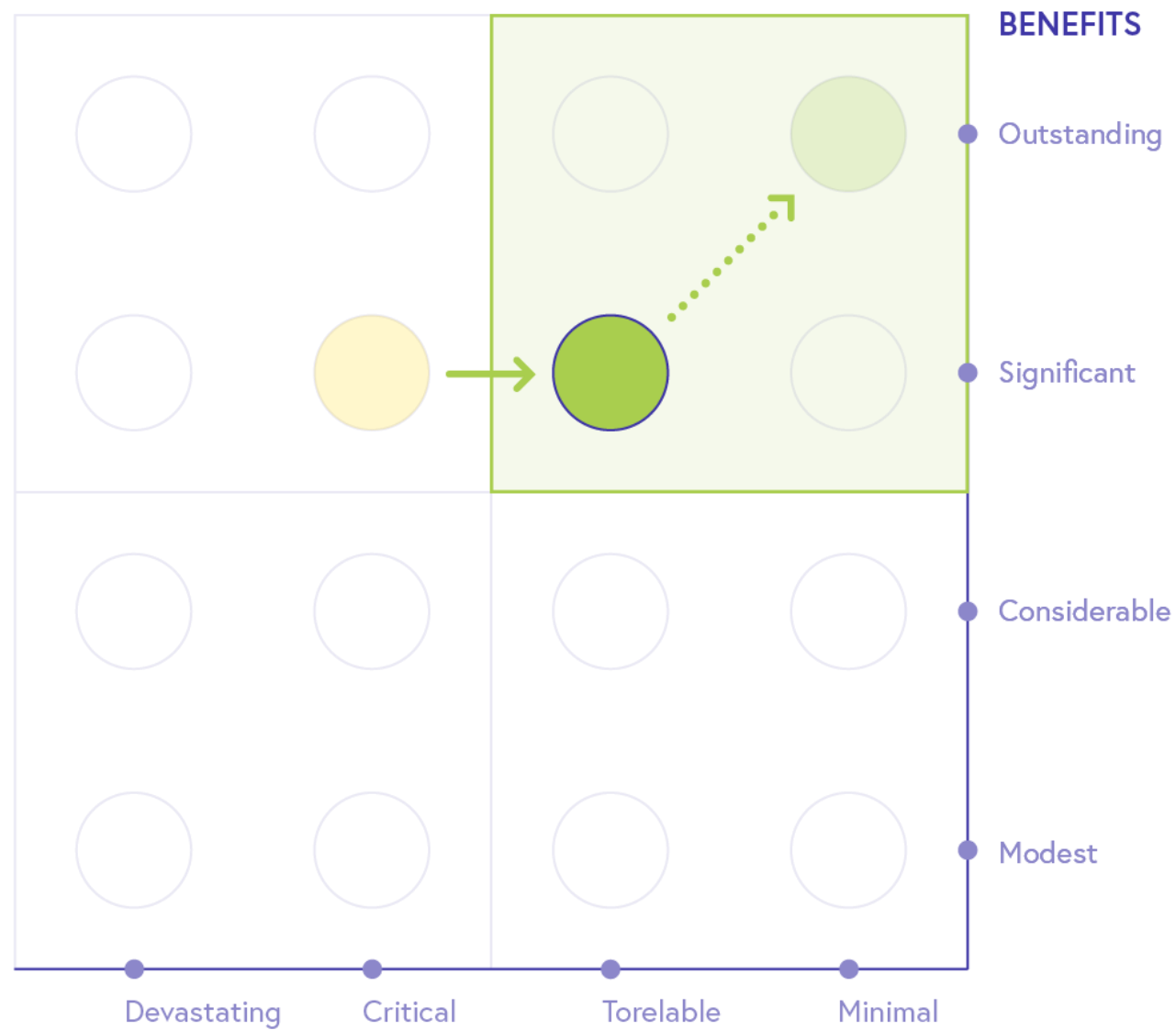


Destination Character Chart™

4 groups of primary characters

4 positions for each

You are: **Sustainable champion**



Destination Character Chart™

Final result – Destination character

How it works



Definition of the most appropriate geographical Micro-location



Mapping the data sources



Completing the questionnaire and launching the Automated Assessment Tool



Automatic report generation



Validation of the results and detailed recommendations by experts (optional)

Data Collecting Tool

300+ indicators used
(Impact and Collaboration)

5 groups

23 categories

67 question sets

138 SDAQ question sets

Min 2000 up to 100.000 data inputs

BASIC QUESTIONS ENVIRONMENT AND SPACE ECONOMY SOCIETY & CULTURE COLLABORATION | OVERVIEW (55%)

ALMOST PARADISE
Claire Schmidt | Logout

Society & Culture / D2 Health and Safety

D2.2 Safety

Please provide information about your mollis pellentesque mattis id, tincidunt et ipsum. Vestibulum imperdiet nec mauris.

[DOWNLOAD DOCUMENTATION](#)

[CONTACT EXPERT](#)

A. What is the number of visitors that filed a police report at your location? ⓘ

☒ Insert data (at least last two years)

☐ Not measured

◀ 2019 ▶					
JAN	FEB	MAR	APR	MAY	JUN
12	134	0	7		
JUL	AUG	SEP	OCT	NOV	DEC

[NEXT](#) [SKIP](#)

← Previous step
D2.1 (SDAQ3) How accurate is the data?

D2.2 ● ● ●

TOURISM
IMPACT
MODEL
by
tourism 4.0

Report

300+ indicators used
(Impact and Collaboration)

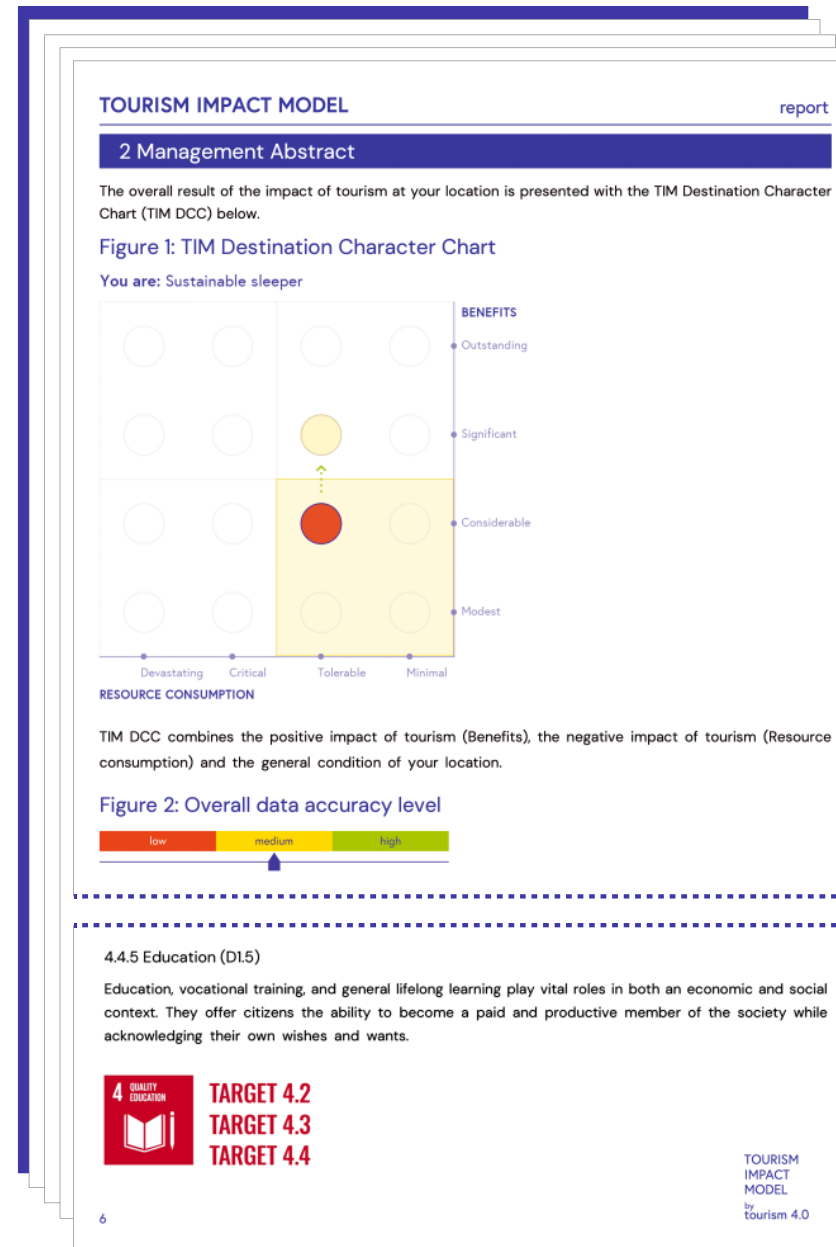
5 groups

23 categories

67 question sets

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Min 2000 up to 100.000 data inputs



Data Collecting Tool

data accuracy assessment

SDAQ (Standard Data Accuracy Questions):

1. **Source:** What is the source of your data?
 - A. "digital" (by device)
 - B. "analogue" (by hand)
2. **Frequency:** How frequently is the data collected?
 - A. Hourly
 - B. Daily
 - C. Monthly
 - D. Yearly
 - E. ...
3. **Accuracy:** How accurate is the data?
 - A. data precisely represents the real world situation: real values
 - B. data is based on estimations: ie. flat rate

Overall data accuracy level



TIM Data Accuracy Report

data accuracy assessment

Basic questions data accuracy level



A1.1e) Number of residents

- Source of the data: **Third party source**: SURS (www.stat.si)
- Frequency of data collection: **Once per year**
- Accuracy of data: **Data is accurate**

A1.1f - A1.1i) Number tourism service providers, types and scale of tourism

- Source of the data: **Third party source**: Internal database of organizational unit for Tourism
- Frequency of data collection: **Monthly**
- Accuracy of data: **Data is not accurate**

A1.1l) Number of one-day visitors

- Source of the data: **Expert estimation**
- Frequency of data collection: **Once per year**
- Accuracy of data: **Expert estimation**

A1.1m) Number of overnight stays

- Source of the data: **Third party source**: AJ PES
- Frequency of data collection: **Monthly**
- Accuracy of data: **Data is not accurate**

Tourist Flows

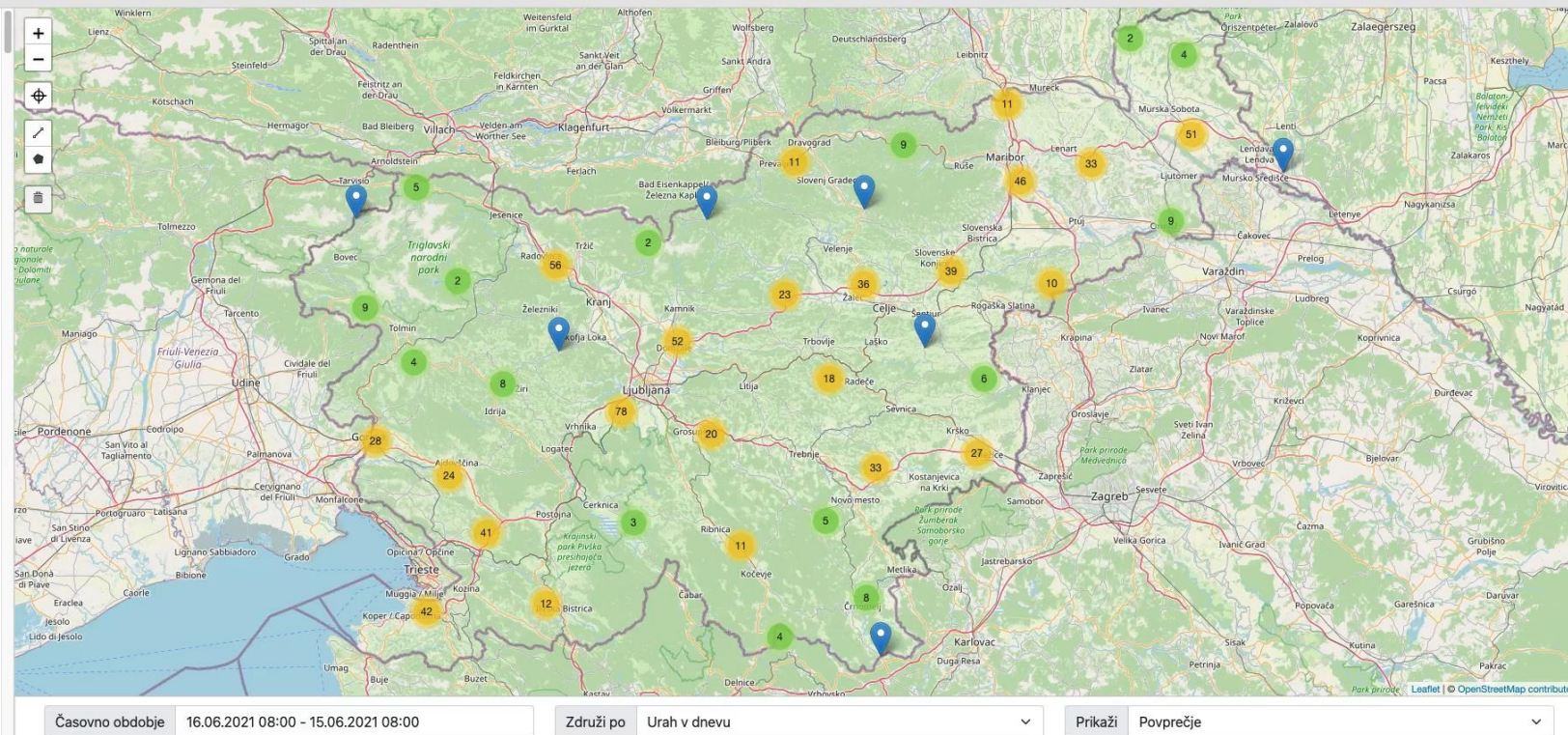
Influencing tourist flows & behavior



Tourism 4.0 road traffic flows

Iskanje po imenu

AC-A1, Arja vas AC : smer LJ (p)
AC-A1, Arja vas AC : smer LJ (v)
AC-A1, Arja vas AC : smer MB (p)
AC-A1, Arja vas AC : smer MB (v)
AC-A1, Čebulovica AC : Gabrk - Senožeče (p)
AC-A1, Čebulovica AC : Senožeče - Gabrk (p)
AC-A1, Čebulovica AC : Senožeče - Gabrk (v)
AC-A1, Celje Center - Vzhod : smer LJ (p)
AC-A1, Celje Center - Vzhod : smer LJ (v)
AC-A1, Celje Center - Vzhod : smer MB (p)
AC-A1, Celje Center - Vzhod : smer MB (v)
AC-A1, Dekani AC : Črni Kal - Srmin (p)
AC-A1, Dekani AC : Črni Kal - Srmin (v)
AC-A1, Dekani AC : Srmin - Črni Kal (p)
AC-A1, Dekani AC : Srmin - Črni Kal (v)
AC-A1, Dolinsko AC : smer HUN (Pince) (p)
AC-A1, Dolinsko AC : smer MB (p)
AC-A1, Dolinsko AC : smer MB (v)
AC-A1, Drenov Grič AC : Brezovica - Vrhnika (p)
AC-A1, Drenov Grič AC : Brezovica - Vrhnika (v)
AC-A1, Drenov Grič AC : Vrhnika - Brezovica (p)
AC-A1, Drenov Grič AC : Vrhnika - Brezovica (v)
AC-A1, Goli vrh AC : smer KP (p)
AC-A1, Goli vrh AC : smer KP (po)



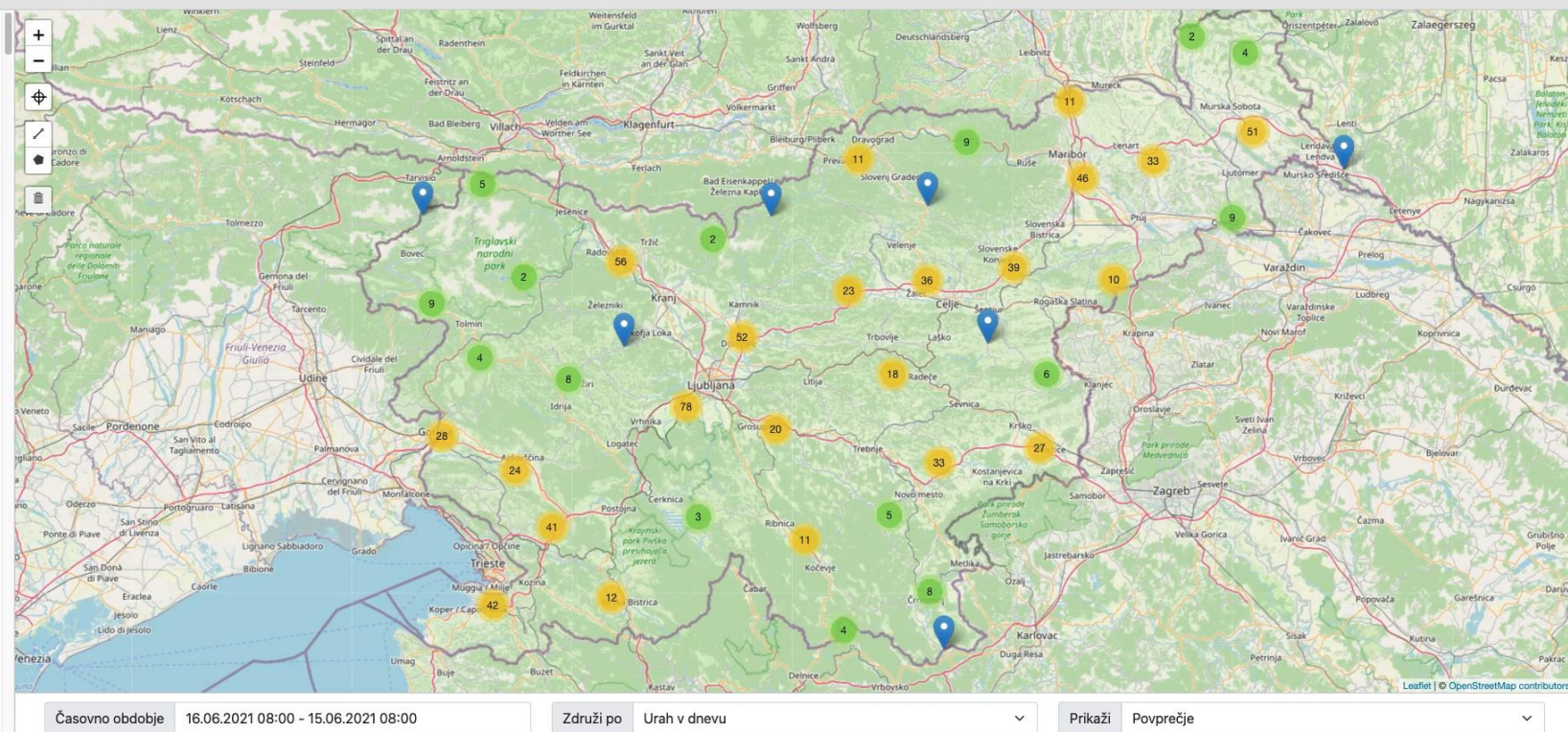
Tourist Flows

Influencing tourist flows & behavior



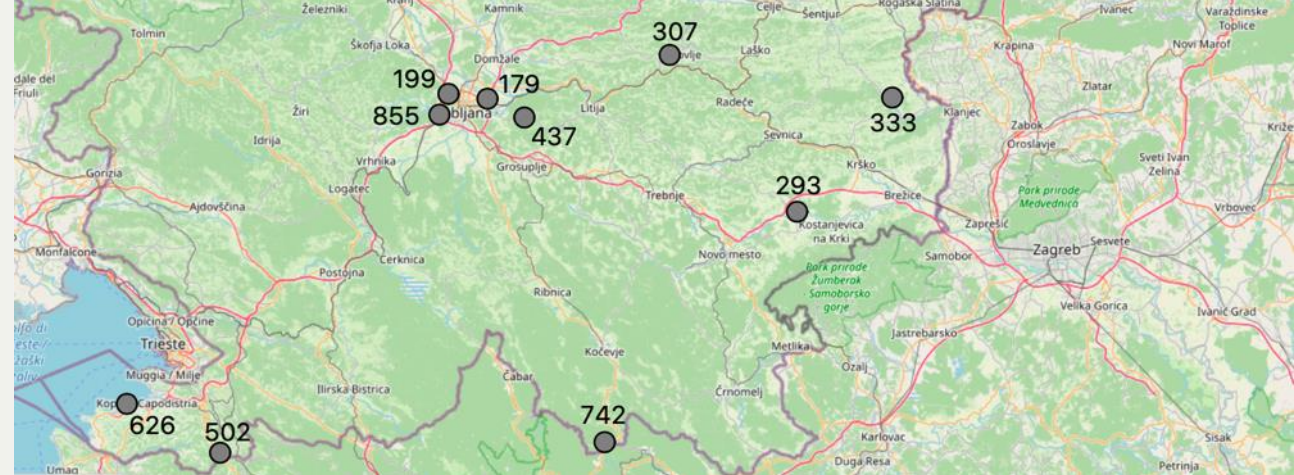
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AC-A1, Goli vrh AC : smer KP (p)
AC-A1, Goli vrh AC : smer KP (po)



Tourist Flows

Influencing tourist flows & behavior

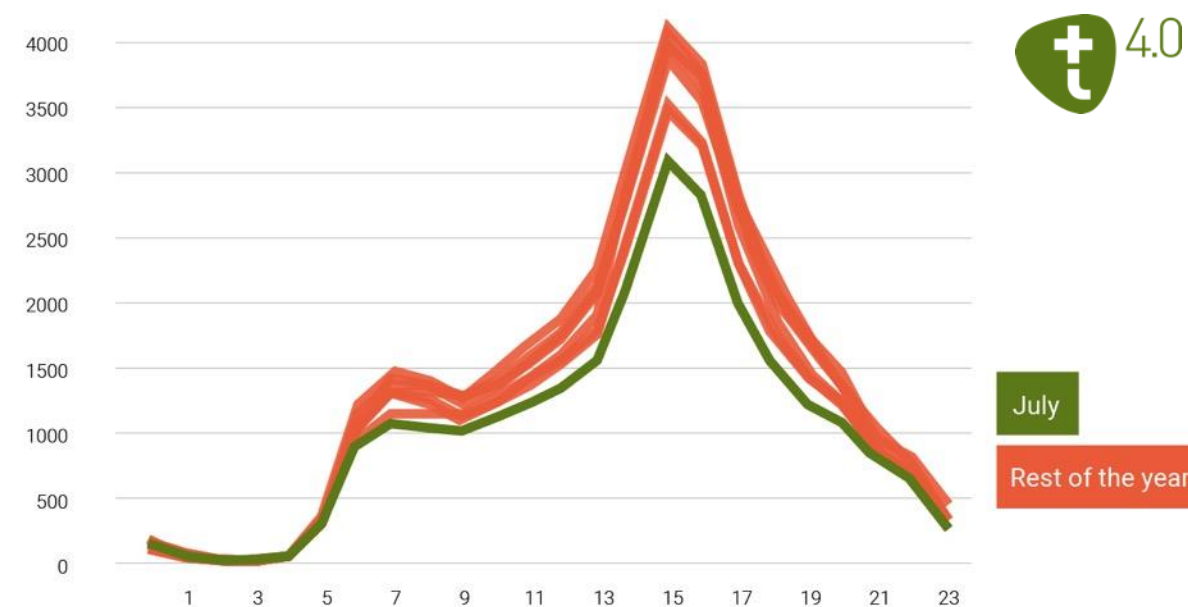


Working days vs. weekend



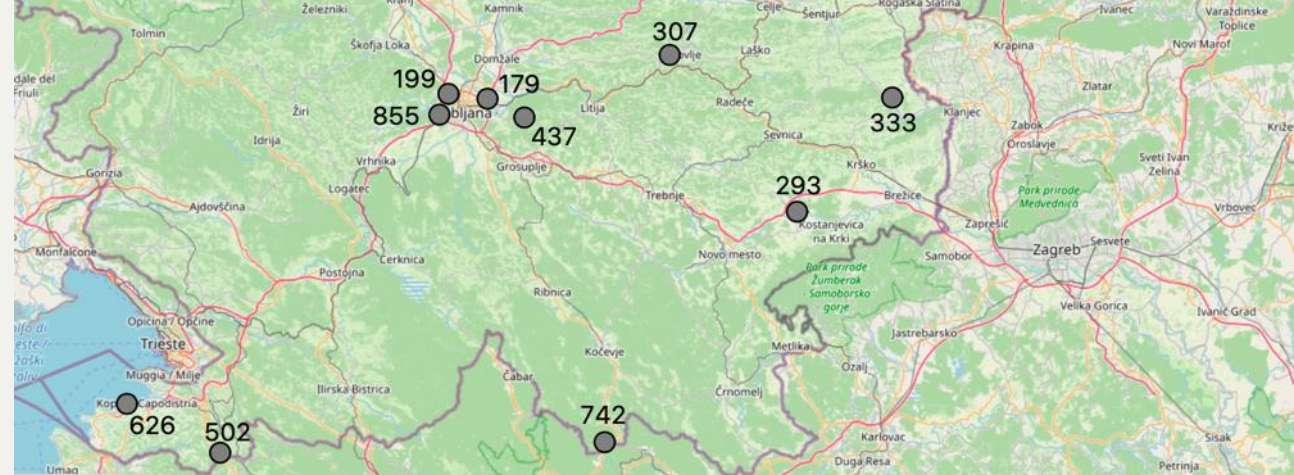
X – Time, Y – Number of cars

Traffic per each month

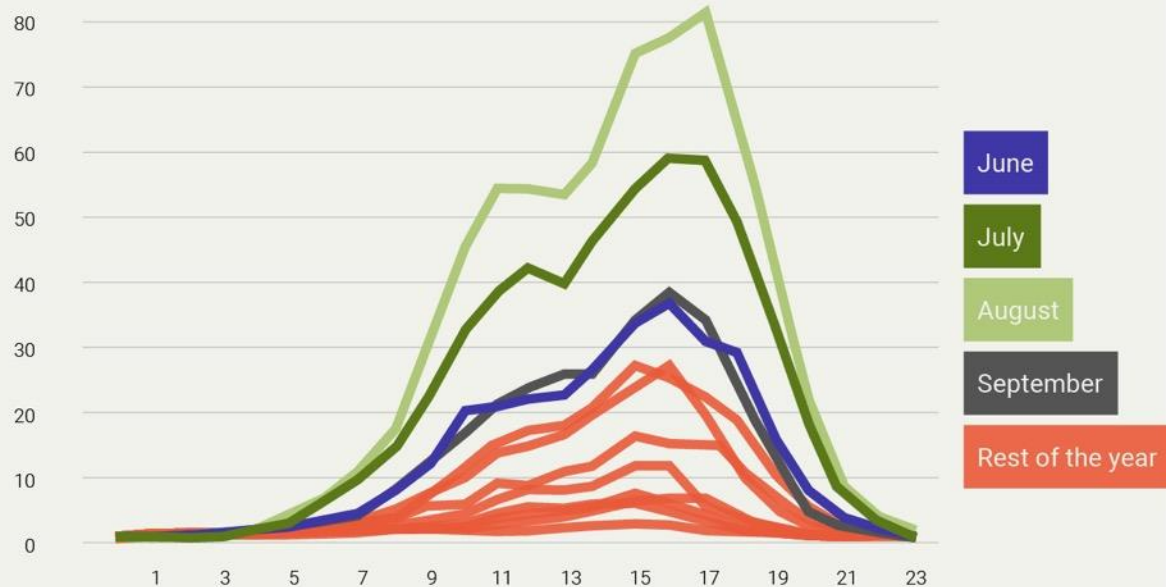


Tourist Flows

Influencing tourist flows & behavior

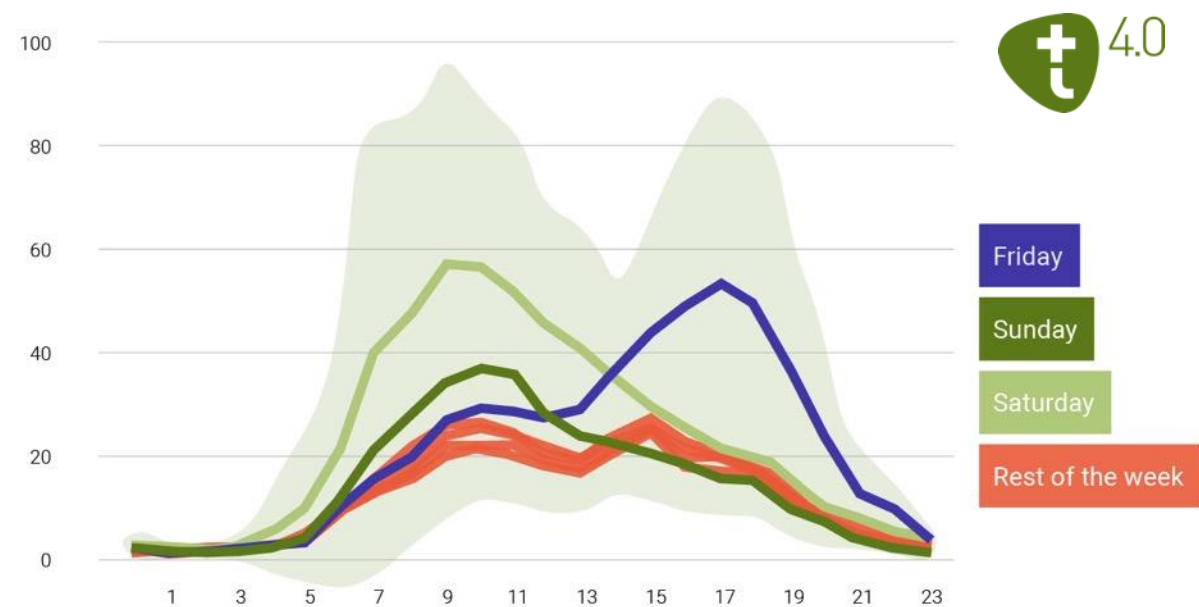


Vršič mountain pass



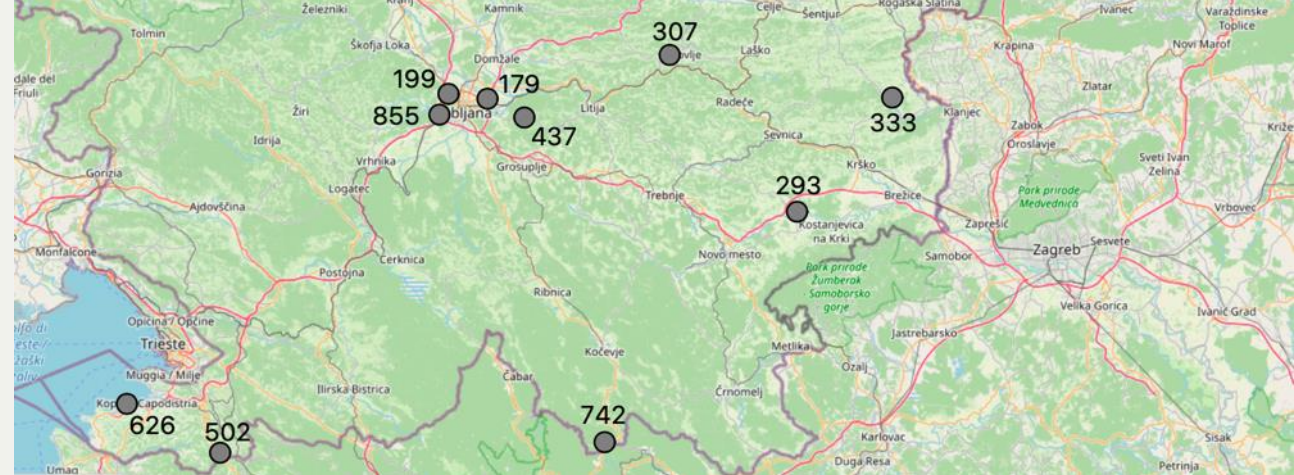
X – Time, Y – Number of cars

Border Slovenia-Croatia (time and day)

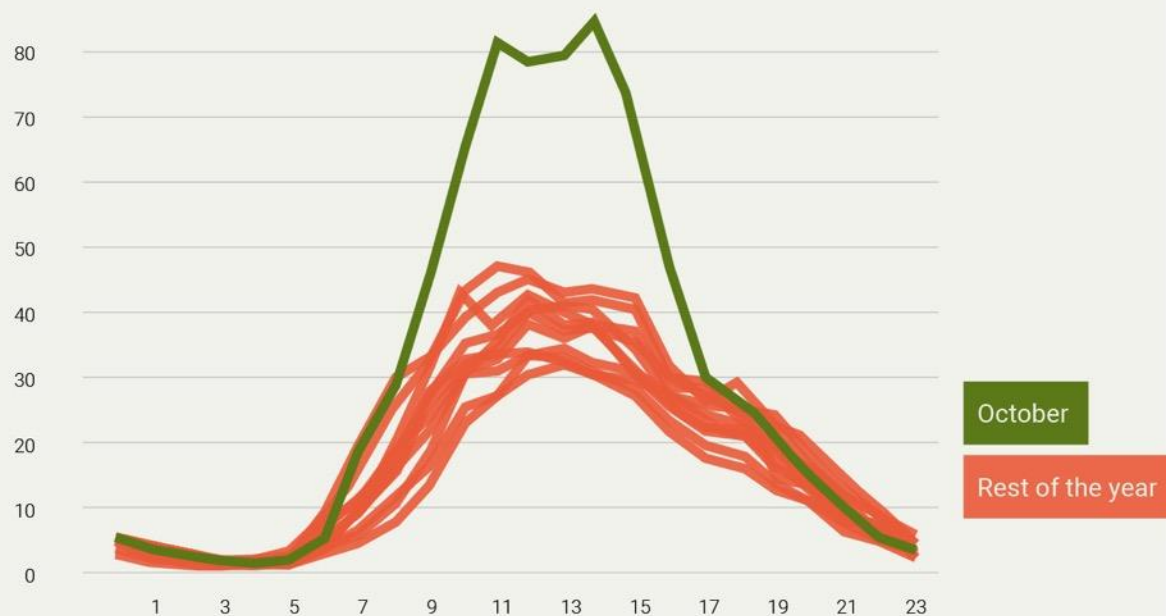


Tourist Flows

Influencing tourist flows & behavior

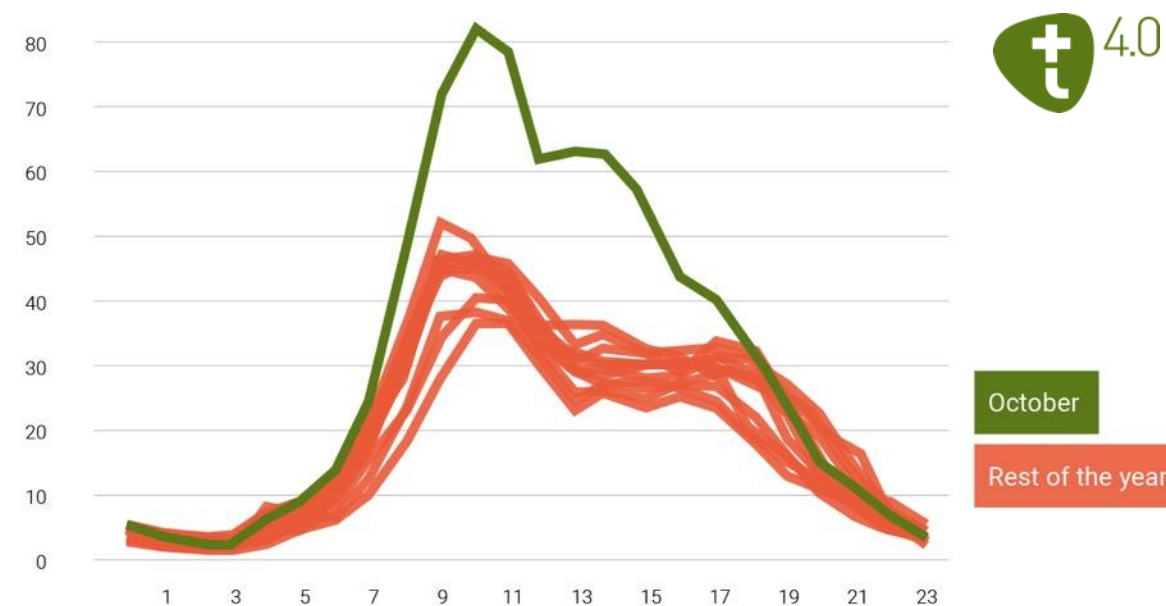


Festival of chestnut, Šmartno pri Litiji



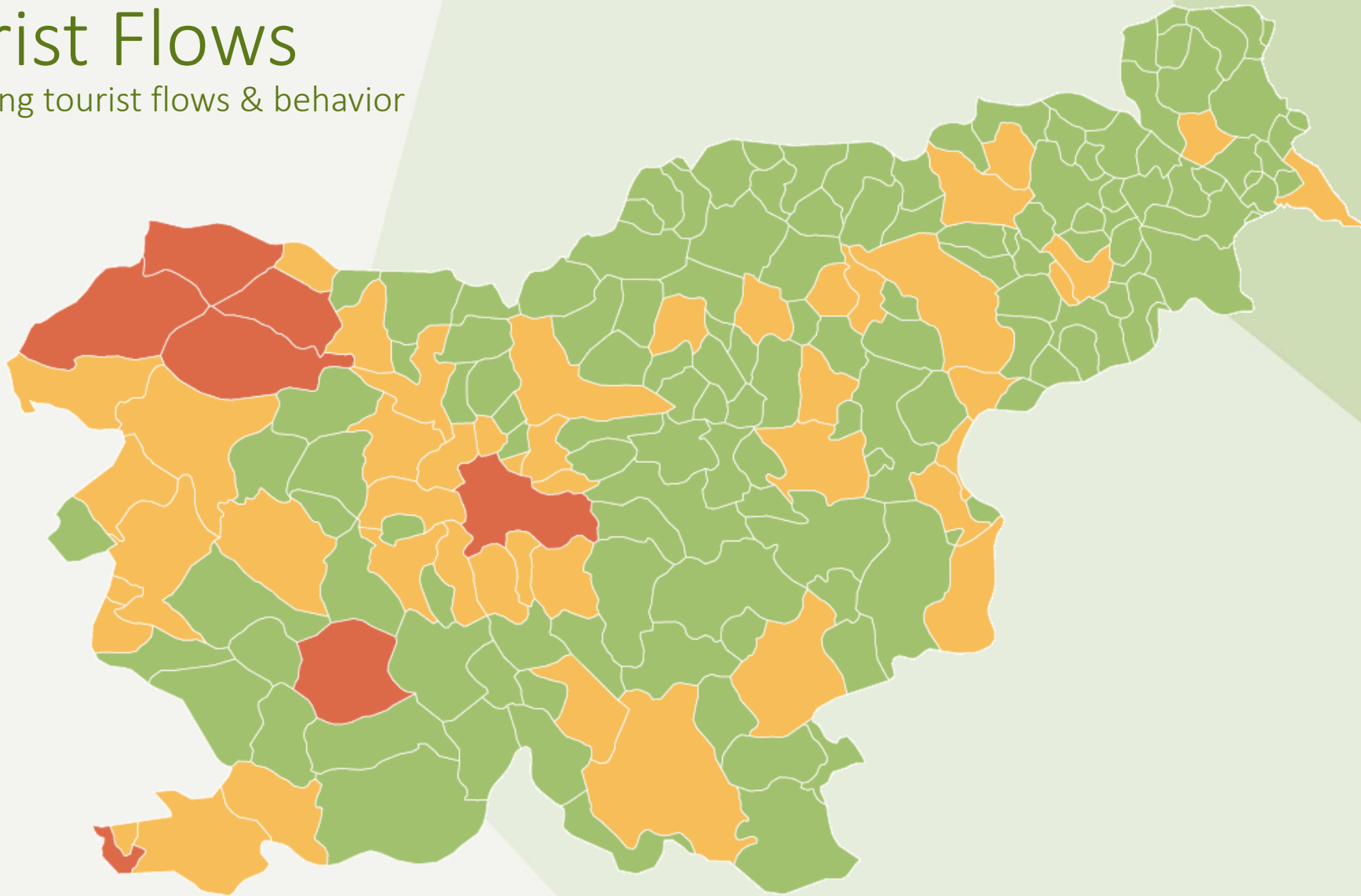
X – Time, Y – Number of cars

Festival of Kozjansko apple



Tourist Flows

Influencing tourist flows & behavior



Vršič

Storžič

Lovrenška
jezera

Kum

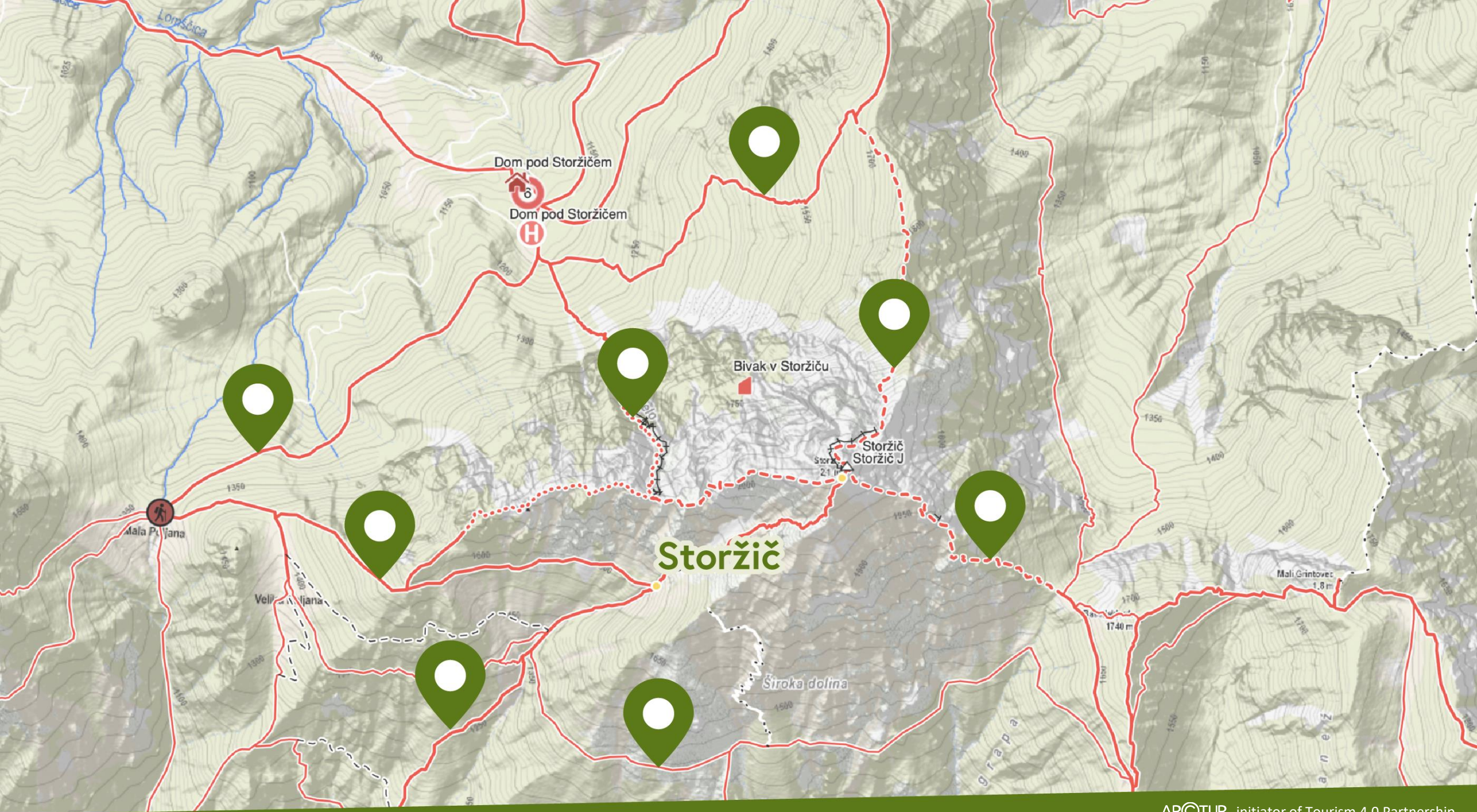
Osp

T4.0 Alpine Flows



CIPRA
LIVING IN
THE ALPS





T4.0 Alpine flows



Sensors

- **LoRaWan** Sensors
- **Narrow Band** Sensors

Other data

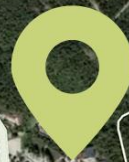
- **Weather data** (Slovenian Environment Agency)
- **Mobile signal** (Telekom Slovenia)
- **Traffic** (Traffic Information Centre for Public Roads, DARS d.d.)
- **Paid tourist tax** in mountain huts
- **Bookings** in mountain huts (the Alpine Association of Slovenia)
- **Accidents** in mountains

T4.0 Alpine flows

Project potential

- Measuring of the visit in the mountains **based on real data**
- **Analytics and forecast** of visit flows
- Better experience
- Better safety
- Better **decision making** at DMO based on real data
- **Open data** for the use in other sectors

Postojna cave



SD4TIM

AR©TUR

esa



REPUBLIKA SLOVENIJA
MINISTRSTVO ZA GOSPODARSKI
RAZVOJ IN TEHNOLOGIJO



Measuring air quality indicators

by combining geospatial data (2019-2022):

- **Traffic flows** (IoT),
- **Overnight stays**,
- **Air quality data** (satellite data),
- **Meteorological data** (satellite data).

Currently validating in Postojna.

Goal

A solutions that uses and analyses complex data and presents in a straightforward manner.

We want you!

Become a member of
Tourism 4.0 Partnership

Sign up:

joinus.tourism4-0.org



 www.tourism4-0.org

 info@tourism4-0.org

 www.facebook.com/tourism4.0

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 www.linkedin.com/company/tourism4-0