BITS
Bicycles and Intelligent Transport Systems

State of the Art

Report

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Project coordinated by:

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Interreg North Sea Region BITS
European Regional Development Fund

EUROPEAN UNION

Preface

An overview of existing applications, knowledge on ITS in cycling, and cyclists' needs has been made to serve as a solid starting point to specify the applications in the 6 demonstration sites. All partners used their networks and experience to guarantee enough information.

This report is the result of market research on applications on ITS and cycling.

Disclaimer:
In the datasheets contact persons are mentioned to facilitate gathering information on the ITS systems and services. If you are mentioned as a contact person and you want to have your contact details removed, please send an e-mail to bits.interreg@gmail.com .

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1 The BITS project

1.1 The project

Bicycles and ITS (BITS) - A new multi stakeholder project on Bicycles and ITS (Intelligent Transport Systems) aiming to reduce CO2 emissions by 9% and increase bicycle use by 10% within target groups!

Under the BITS project ten partners from top cycling countries (NL, DK, BE) or those about to become (UK, DE) came together in a consortium to raise awareness of best practices of "Smart Cycling", and to provide implementers with ready-to-use information and evidence from different regions.

This project is believed to be the only one of its kind in the world. The BITS project, co-funded by the North Sea Region (NSR) Programme, has a budget of 5 million of euros over 3 years (2019 to 2022).

1.2 Partners

The following organizations are part of the BITS consortium:

- Province of Overijssel, Netherlands
- City of Zwolle, Netherlands
- City of Bruges, Belgium
- East Riding Council of Yorkshire, United Kingdom
- City of Aarhus, Denmark
- Baron Mobility, Germany
- Cycling Industries Europe
- VIVES, Belgium
- Province of Antwerp, Belgium
- University of Oldenburg, Germany

1.2.1 Objective

The purpose of the state of the art is to create a common picture, for the partners and stakeholders, of the market of ITS applications in cycling.

2 State of the art – approach

The research has been carried out to create a common picture of applications and experiences, that can be brought into the pilot projects. Pilot projects planned to be implemented by the project partners over the coming years.

The state of the art lays the foundation for the partners in the BITS project and gives them a starting point of knowledge of the ITS applications available in the market.

Disclaimer: This state of the art is not a complete picture of all bicycle and ITS applications. Therefore, there will be other applications on the market that don't appear in this report.

To make an overview of the applications, they have been structured in 4 overall categories. Per category, one BITS partner was responsible for the collection of input. The partners that collected the input are: City of Bruges, City of Zwolle, Baron mobility and East Riding of Yorkshire council. Almost one hundred different applications have been found in this market research. Most of these applications are further described in their own data sheet. These sheets describe the applications in detail, with information on supplier, description, function etc.

The applications are sorted in these four categories:

- Infrastructure-based
- Bicycle data
- Information provision to cyclists
- Interactive ITS for cyclists

To further form an overview of the apps, there are for each of them information on these general objectives:

- Improve speed
- Increase of safety
- Increase cyclist comfort
- Facilitate bicycle parking
- Facilitate routing
- Gamification
- Provide feedback to road operator
- Nudging
- Tracking/tracing/counting
- Rewarding cyclists

3 State of the art – results

The State of the art resulted in almost one hundred different ITS systems or applications. For most of these systems there are filled out data sheets with information about the system.

All completed templates can be found under section 6 “Data Sheets” in this document.

3.1 Navigation in Excel

For easy navigation and sorting of the applications, the applications are listed in an Excel file (that can also be found on the website). The Excel file contains additional products for which no template was completed.

In this file, filters can be applied to sort on:

- One of the 4 main categories
- Country of origin
- Public or private supplier
- One of the 10 general objectives
- Phase of the application, planned, pilot, implantation or stopped

4 Data Sheets

No	Name
1.	MyTripper
2.	Camera (video)
3.	Radar
4.	Wi-Fi-detection
5.	Bluetooth-detection
6.	Hybrid Cycle Data Radar
7.	GSM-tracker
8.	Actime bicycle counter
9.	Diverse apps, e.g. MaxS, or 'Ritje van de zaak'
10.	Many apps, e.g. Routenet, Locator
11.	SESAMO – SEnsing and SAmpling for MObility
12.	Fairytrail
13.	Human
14.	CrossCycle/Give me green
15.	Smart
16.	Schwung
17.	Ring-Ring®
18.	Strava Metro
19.	Bikesharing: Swapfiets
20.	Bikesharing: PBSC
21.	Nazza Mobility driven by Intelligence
22.	Bicycle parking guiding system Utrecht (P-route fiets)
23.	Mezuro
24.	Thermal imaging camera for traffic monitoring (FC T2 series)
25.	Traffic management of bicycle flow by camera based speed and volume measurement adjusted by Bikesim simulation
26.	Flexradar
27.	See.sense
28.	Data collection bicycle (meetfiets)
29.	Sniff bicycle (snuffelfiets)
30.	Bicycle tracker Tailit
31.	Mobilock
32.	Liberty Bell
33.	Smart Grips
34.	Ping if you care
35.	Why Cycling Matters in Smart Cities
36.	Whim
37.	Variable Message Signs (VMS)
38.	P-Route Cycle
39.	OV-Fiets
40.	Naviki
41.	Mywindsock
42.	Next Generation of Journey Planner in a Smart City (JPlanner)
43.	Donkey Bikes
44.	Cycle Specific Green Waves
45.	Brighton Cycle Hub
46.	BikeCitizen
47.	Komoot

48.	Strava
49.	Locus map
50.	Bikemap
51.	Radfahren - Fahrrad Tracker
52.	mapmyride
53.	Poliscan LIDAR-based traffic surveillance
54.	Eco-DISPLAY Classic, Compact en Classic+
55.	SolarPath
56.	Thermopath
57.	Green Wave
58.	LaneLight in BikeSafe system
59.	Cyclemeter
60.	SolarRoad
61.	Ice Alert
62.	M100BR Radar Bicycle Detector
63.	Traffic Light Countdown Timer
64.	Bikescout
65.	Crosscover

GENERAL INFORMATION	
Name of service/system/project	**1. MyTripper**
Supplier of service/system/project	Best4UGroup BV
Name of operator/organisation	Best4UGroup BV
Service delivery	☐ Public ☒ Private
Main category	☐ Infrastructure-based ☒ Bicycle data ☒ Information provision to cyclists ☐ Interactive ITS for cyclists ☐ Other
Contact for more information	https://www.mytripper.nl/contact/

GEOGRAPHICAL ASPECTS	
Country	The Netherlands
Region/city of implementation	The Netherlands, worldwide

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☒ Gamification ☐ Provide feedback to road operator ☐ Nudging ☒ Tracking/tracing/counting ☒ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	An RFID-tag is placed in one of the wheels of a bicycle. The tags are helpful when monitoring of the commuting behaviour of a selected group of people, e.g. employees, is required.

Main technologies used	RFID-detection
How does the system collect/generate data (if any)	RFID-tag on bicycle, every time when the bicycle passes a registration unit (RFID-receiver) the bicycle is noticed
How does the system use data (if any)	As well employer as employee can have access to the data about the frequency of the trips. This may be helpful in a program that seeks to enhance the use of the bicycle among the target group.

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	2014
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learned / factor of success (technical, legal, organisational, financial, geographic, …)	
Impacts assessment / results (if available)	
Other important information	

REFERENCES	
Documentation available on the project	
Web link(s)	https://www.mytripper.nl

GENERAL INFORMATION	
Name of service/system/project	**2. Camera (video)**
Supplier of service/system/project	Connection Systems
Name of operator/organisation	Connection Systems
Service delivery	☐ Public ☒ Private
Main category	☐ Infrastructure-based ☒ Bicycle data ☐ Information provision to cyclists ☐ Interactive ITS for cyclists ☐ Other
Contact for more information	Frank.wagemans@connectionsystems.nl

GEOGRAPHICAL ASPECTS	
Country	The Netherlands
Region/city of implementation	The Netherlands, worldwide

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☒ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other:
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	With only a camera flow characteristics can be determined. In combination with other techniques (wi-fi, bluetooth), other aspects can be established as well: - Origin and destination of bicycles - Multiple directions - Real-time monitoring - Bicycles routes determination

	- Travel time - Waiting time (e.g. at traffic lights)
Main technologies used	Camera
How does the system collect/generate data (if any)	The camera detects a mobilist. With software is determined which type it is.
How does the system use data (if any)	

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learned / factor of success (technical, legal, organisational, financial, geographic, …)	Combining the camera with other techniques results in a much broader range of opportunities to generate traffic data.
Impacts assessment / results (if available)	
Other important information	

REFERENCES	
Documentation available on the project	
Web link(s)	https://connectionsystems.nl/index.php/en/methods-articles

ILLUSTRATIONS
 

GENERAL INFORMATION	
Name of service/system/project	**3. Radar**
Supplier of service/system/project	Connection Systems
Name of operator/organisation	Connection Systems
Service delivery	☐ Public ☒ Private
Main category	☐ Infrastructure-based ☒ Bicycle data ☐ Information provision to cyclists ☐ Interactive ITS for cyclists ☐ Other
Contact for more information	Frank.wagemans@connectionsystems.nl

GEOGRAPHICAL ASPECTS	
Country	The Netherlands
Region/city of implementation	The Netherlands, worldwide

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☒ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	With only radar, speed measurement and classification of mobilists is possible.

Main technologies used	Radar
How does the system collect/generate data (if any)	The mobilist is detected by the radar. With software is determined what 'type' of mobilist is detected.
How does the system use data (if any)	

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learned / factor of success (technical, legal, organisational, financial, geographic, …)	
Impacts assessment / results (if available)	
Other important information	

REFERENCES	
Documentation available on the project	
Web link(s)	https://connectionsystems.nl/index.php/en/methods-articles

ILLUSTRATIONS


GENERAL INFORMATION	
Name of service/system/project	**4. Wi-Fi-detection**
Supplier of service/system/project	Connection Systems
Name of operator/organisation	Connection Systems
Service delivery	☐ Public ☒ Private
Main category	☐ Infrastructure-based ☒ Bicycle data ☐ Information provision to cyclists ☐ Interactive ITS for cyclists ☐ Other
Contact for more information	Frank.wagemans@connectionsystems.nl

GEOGRAPHICAL ASPECTS	
Country	The Netherlands
Region/city of implementation	The Netherlands, worldwide

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☒ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Wi-Fi can scan Mac-addresses of mobile (smart)phones for multiple purposes like track-trace, waiting/travel time and intensities.

Main technologies used	Wi-Fi
How does the system collect/generate data (if any)	With Wi-Fi, a connection is made with phones. Subsequently can be determined how fast they move and what their Mac-address is.
How does the system use data (if any)	

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learned / factor of success (technical, legal, organisational, financial, geographic, …)	Wi-Fi detection is of great help when combined with other technologies as cameras. Then, a broad range of traffic data can be determined.
Impacts assessment / results (if available)	
Other important information	

REFERENCES	
Documentation available on the project	
Web link(s)	https://connectionsystems.nl/index.php/en/methods-articles

GENERAL INFORMATION	
Name of service/system/project	**5. Bluetooth-detection**
Supplier of service/system/project	Connection Systems
Name of operator/organisation	Connection Systems
Service delivery	☐ Public ☒ Private
Main category	☐ Infrastructure-based ☒ Bicycle data ☐ Information provision to cyclists ☐ Interactive ITS for cyclists ☐ Other
Contact for more information	Frank.wagemans@connectionsystems.nl

GEOGRAPHICAL ASPECTS	
Country	The Netherlands
Region/city of implementation	The Netherlands, worldwide

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☒ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Bluetooth can scan Mac-addresses of mobile (smart)phones for multiple purposes like track-trace, waiting/travel time and intensities.

Main technologies used	Bluetooth
How does the system collect/generate data (if any)	With Bluetooth, a connection is made with phones. Subsequently can be determined how fast they move and what their Mac-address is.
How does the system use data (if any)	

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learned / factor of success (technical, legal, organisational, financial, geographic, …)	Bluetooth detection is of great help when combined with other technologies as cameras. Then, a broad range of traffic data can be determined.
Impacts assessment / results (if available)	
Other important information	

REFERENCES	
Documentation available on the project	
Web link(s)	https://connectionsystems.nl/index.php/en/methods-articles

GENERAL INFORMATION	
Name of service/system/project	**6. Hybrid Cycle Data Radar**
Supplier of service/system/project	Cycle Data BV, The Netherlands
Name of operator/organisation	Cycle Data BV, The Netherlands
Service delivery	☐ Public ☒ Private
Main category	☒ Infrastructure-based ☒ Bicycle data ☐ Information provision to cyclists ☐ Interactive ITS for cyclists ☒ Other
Contact for more information	support@cycledata.nl

GEOGRAPHICAL ASPECTS	
Country	The Netherlands
Region/city of implementation	The Netherlands, worldwide

ITS SERVICE DESCRIPTION	
General Objectives	☒ Improve speed ☒ Increase of safety ☒ Increase cyclist comfort ☐ Facilitate bicycle parking ☒ Facilitate routing ☐ Gamification ☒ Provide feedback to road operator ☐ Nudging ☒ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	The Hybrid Cycle Data Radar is adjusted on location after installation and activated by a smartphone. After a successful quality check, the radar is registered as active in the central system. Built-in GPRS communication makes data reception and online remote communication possible. Via a user-friendly web-based interface, the bicycle mobility data can be monitored,

	viewed and analysed 24/7 from a workstation or tablet by means of a user login. The data provide 24/7 insight into bicycle traffic flows and others such as e-bike, speed pedelecs, light mopeds, etc. on bicycle paths. The online web-based interface provides real-time the desired data about how many vehicles are riding on the cycle path at what speed, in which direction and at what time. The use of the Hybrid Cycle Data Radar provides a better insight into bicycle traffic flows and as a result the policy in the field of bicycle mobility and infrastructure can be better geared to the actual needs and in particular for the safety of cyclists.
Main technologies used	Radar laser technology including patented software for processing into readable data in any form. By using Hybrid Cycle Data Radar and integrated software technology accurate and reliable bicycle racks of 98-99% can be reached.
How does the system collect/generate data (if any)	The raw data is sent to the central server by the built-in GPRS modem, and subsequently translated into readable data by the developed software in a web-based interface.
How does the system use data (if any)	The 24/7 data report is stored on the central server and can, if desired, also be sent to the client via CSV or XML files.

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	2018
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learned / factor of success (technical, legal, organisational, financial, geographic, …)	Through successful location placements at major Dutch cities and proven 98-99% accuracy and reliability of the bicycle counts, meanwhile received a final award for the next 4 years for above-ground roadside systems issued by the organization NDW (National Road Traffic Data Database).
Impacts assessment / results (if available)	Through successful location placements at major Dutch cities and proven 98-99% accuracy and reliability of the bicycle counts.

Other important information	The HCDR can be installed (semi) permanently at the desired location and the energy is supplied via a solar panel.

REFERENCES	
Documentation available on the project	
Web link(s)	https://cycledata.nl/

GENERAL INFORMATION	
Name of service/system/project	**7. GSM-tracker**
Supplier of service/system/project	Many, e.g. bicycle manufacturers as Van Moof
Name of operator/organisation	Van Moof
Service delivery	☐ Public ☒ Private
Main category	☐ Infrastructure-based ☐ Bicycle data ☒ Information provision to cyclists ☐ Interactive ITS for cyclists ☐ Other
Contact for more information	http://support.vanmoof.com/customer/portal/emails/new?q=email,

GEOGRAPHICAL ASPECTS	
Country	The Netherlands
Region/city of implementation	The Netherlands, worldwide

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☒ Tracking/tracing/counting ☐ Rewarding cyclists ☒ Other: anti-theft
Short narrative description of your best practice including e.g.	The bicycle can be connected to an app in the smartphone. This means the owner can always find it where he/she left it. Or where someone else left it. Via the app, users can learn how

geographical dimension, numbers, target group, costs etc.	many kilometres they drove. Moreover, the average speed is displayed.
Main technologies used	GSM, smartphone
How does the system collect/generate data (if any)	GSM-sensor in bicycle
How does the system use data (if any)	The system uses data as a service to users. Information about speed and travelled distances are provided for 'fun'-reasons.

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learned / factor of success (technical, legal, organisational, financial, geographic, …)	
Impacts assessment / results (if available)	
Other important information	

REFERENCES	
Documentation available on the project	
Web link(s)	https://www.vanmoof.com/en_nl/smart-bikes, https://www.gazelle.nl/gazelle-connect

GENERAL INFORMATION

Name of service/system/project	**8. Actime bicycle counter**
Supplier of service/system/project	Actime traffic count services
Name of operator/organisation	Actime traffic count services
Service delivery	☐ Public ☒ Private
Main category	☐ Infrastructure-based ☒ Bicycle data ☐ Information provision to cyclists ☐ Interactive ITS for cyclists ☐ Other
Contact for more information	+31 (0) 85 0471 497, info@actime.nl

GEOGRAPHICAL ASPECTS	
Country	The Netherlands
Region/city of implementation	The Netherlands

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☒ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other:
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Standalone camera that counts cyclists in both directions, with an accuracy of 98 percent

Main technologies used	Camera detection
How does the system collect/generate data (if any)	A cyclist is detected by the camera. After the period of counting, reports can be produced by the software that Actime has available.
How does the system use data (if any)	

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	?
Phase	☐ Planned ☐ Pilot ☐ Implementation ☒ Stopped
Lessons learned / factor of success (technical, legal, organisational, financial, geographic, …)	
Impacts assessment / results (if available)	
Other important information	The bicycle counter is no longer available.

REFERENCES	
Documentation available on the project	
Web link(s)	https://www.actime.nl/diensten/verkeersmetingen-fietsers/

GENERAL INFORMATION	
Name of service/system/project	**9. Diverse apps, e.g. MaxS, or 'Ritje van de zaak'**
Supplier of service/system/project	Innovactory
Name of operator/organisation	Innovactory
Service delivery	☐ Public ☒ Private
Main category	☐ Infrastructure-based ☒ Bicycle data ☒ Information provision to cyclists ☐ Interactive ITS for cyclists ☐ Other
Contact for more information	https://innovactory.com/#contact, Thijs Muizelaar +31 6 15104870

GEOGRAPHICAL ASPECTS	
Country	The Netherlands
Region/city of implementation	The Netherlands

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☒ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☒ Gamification ☐ Provide feedback to road operator ☐ Nudging ☒ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____

Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	With the apps of Innovatory, technology is available for collecting bicycle data. The apps aren't developed for this purpose, so their effectiveness is limited. Innovatory has the know-how to develop a dedicated app for collecting bicycle data via smartphone.
Main technologies used	App, GPS in smartphone
How does the system collect/generate data (if any)	
How does the system use data (if any)	

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	2018
Phase	☐ Planned ☒ Pilot ☐ Implementation ☐ Stopped
Lessons learned / factor of success (technical, legal, organisational, financial, geographic, …)	
Impacts assessment / results (if available)	
Other important information	Innovatory starts a MaaS-pilot in the province of Utrecht.

REFERENCES	
Documentation available on the project	
Web link(s)	https://innovactory.com

GENERAL INFORMATION	
Name of service/system/project	**10. Many apps, e.g. Routenet, Locator**
Supplier of service/system/project	Locatienet
Name of operator/organisation	Locatienet
Service delivery	☐ Public ☒ Private
Main category	☐ Infrastructure-based ☒ Bicycle data ☒ Information provision to cyclists ☐ Interactive ITS for cyclists ☐ Other
Contact for more information	https://www.locatienet.com/contactformulier.html

GEOGRAPHICAL ASPECTS	
Country	The Netherlands
Region/city of implementation	The Netherlands

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☒ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☒ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Routenet helps customers with their navigation. This can also be used by cyclists. Locator helps customers of companies to travel to the companies' offices. The focus is on persons in cars. It is not clear if data can be retrieved. Focus is on users in cars.

Main technologies used	?
How does the system collect/generate data (if any)	It is not clear if the system generates data at all
How does the system use data (if any)	

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learned / factor of success (technical, legal, organisational, financial, geographic, …)	
Impacts assessment / results (if available)	
Other important information	

REFERENCES	
Documentation available on the project	
Web link(s)	https://www.locatienet.com

GENERAL INFORMATION	
Name of service/system/project	**11. SESAMO – SEnsing and SAmpling for MObility**

Supplier of service/system/project	Mobidot
Name of operator/organisation	Mobidot
Service delivery	☐ Public ☒ Private
Main category	☐ Infrastructure based ☒ Bicycle data ☐ Information provision to cyclist ☒ Interactive system ☐ Other
Contact for more information	Frank.Ophuis@mobidot.nl

GEOGRAPHICAL ASPECTS	
Country	The Netherlands
Region/city of implementation	The Netherlands, worldwide

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☒ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Sesamo is an app that facilitates the registration of trips of individual cyclists. Moreover, with Sesamo qualitative data can be collected, as users can be approached via Sesamo with questionaires.
Main technologies used	Smartphone

How does the system collect/generate data (if any)	The app collects data by registration of the movements of the user. Qualitative data are collected by sending users a survey.
How does the system use data (if any)	Data are collected and forwarded to the stakeholder that is interested in the information. Sesamo can be linked to a unit that rewards the cyclists for sharing the data, eg by giving priority at signalised intersections.

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	2016
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	Sesamo is a powerful, easy-to-use tool to collect high quality data on cyclist behaviour. Due to the automated, non- obtrusive nature of the data acquisition relevant travel data over longer periods can be gathered without respondent burden.
Impacts assessment / results (if available)	
Other important information	

REFERENCES	
Documentation available on the project	
Web link(s)	www.mobidot.nl; www.sesamo.nl

ILLUSTRATIONS

GENERAL INFORMATION	
Name of service/system/project	**12. Fairytrail**
Supplier of service/system/project	Heijmans
Name of operator/organisation	
Service delivery	☒ Public ☐ Private
Main category	☒ Infrastructure based ☐ Bicycle data ☐ Information provision to cyclist ☐ Interactive system ☐ Other
Contact for more information	

GEOGRAPHICAL ASPECTS	
Country	The Netherlands
Region/city of implementation	The Netherlands

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☒ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☐ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Fairytrail has an impact absorbing surface made of rubber and is mixed with fluorescent and glow-in-the-dark effects. It makes places where we move, sports and play safer and more beautiful. It goes against light pollution. Made in a concrete surface, Fairytrail is ideal for use on squares, pedestrian areas, cycle paths and hiking trails.

Main technologies used	Absorbing surface made of rubber mixed with fluorescent and glow in-the-dark effects.
How does the system collect/generate data (if any)	
How does the system use data (if any)	

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	
Impacts assessment / results (if available)	
Other important information	

REFERENCES	
Documentation available on the project	
Web link(s)	https://www.heijmans.nl/nl/expertises/fairytrail/

ILLUSTRATIONS

GENERAL INFORMATION	
Name of service/system/project	**13. Human**
Supplier of service/system/project	Human
Name of operator/organisation	Human
Service delivery	☐ Public ☒ Private
Main category	☐ Infrastructure-based ☒ Bicycle data ☒ Information provision to cyclists ☐ Interactive ITS for cyclists ☐ Other
Contact for more information	-

GEOGRAPHICAL ASPECTS	
Country	The Netherlands, United States
Region/city of implementation	Worldwide

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☒ Tracking/tracing/counting ☐ Rewarding cyclists ☒ Other: enhance exercise
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	With the Human-app, tracking of movement is possible. The app facilitates comparison with other individuals. The aim is to inform individuals about their physical activity. The app hopes to enhance the physical activity of individuals.

Main technologies used	Smartphone
How does the system collect/generate data (if any)	GPS-tracking via app/smartphone
How does the system use data (if any)	

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	?
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learned / factor of success (technical, legal, organisational, financial, geographic, …)	
Impacts assessment / results (if available)	
Other important information	The information is available for individual users, not for third parties.

REFERENCES	
Documentation available on the project	
Web link(s)	http://human.co/index.html#

GENERAL INFORMATION	
Name of service/system/project	**14. CrossCycle/Give me green**
Supplier of service/system/project	Dynniq/Sensys Networks
Name of operator/organisation	Dynniq/Sensys Networks
Service delivery	☐ Public ☒ Private
Main category	☐ Infrastructure-based ☒ Bicycle data ☒ Information provision to cyclists ☒ Interactive ITS for cyclists ☐ Other
Contact for more information	info@dynniq.com, Sensys Networks: phone: +1.510.548.4620

GEOGRAPHICAL ASPECTS	
Country	The Netherlands, US
Region/city of implementation	Worldwide

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☒ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☒ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: enhance exercise
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	With the CrossCycle/Givemegreen-app, tracking of cyclists is possible. By using the app, a cyclist can be recognized by the system when he or she approaches a signalled intersection. It gives the opportunity to prioritize the cyclist when he or she arrives at the intersection.

Main technologies used	Smartphone, gps,
How does the system collect/generate data (if any)	GPS-tracking via app/smartphone
How does the system use data (if any)	When a cyclist arrives in the vicinity of a signalled intersection, he or she is detected and can get priority at the intersection.

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	2018
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learned / factor of success (technical, legal, organisational, financial, geographic, …)	
Impacts assessment / results (if available)	
Other important information	Dynniq cooperates closely with Sensys Networks. Dynniq is reseller of products of Sensys Networks in EU/the Netherlands. Therefore, the description of the two products is taken together.

REFERENCES	
Documentation available on the project	
Web link(s)	https://dynniq.com/nl/producten-en-services/mobility/crosscycle/, https://sensysnetworks.com/givemegreen

GENERAL INFORMATION	
Name of service/system/project	**15. Smart**
Supplier of service/system/project	Mobidot B.V. operates the SMART app; The SMART app provides mobility service in the project.
Name of operator/organisation	Municipality of Enschede
Service delivery	☒ Public ☐ Private
Main category	☐ Infrastructure based ☒ Bicycle data ☒ Information provision to cyclist ☒ Interactive system ☐ Other
Contact for more information	

GEOGRAPHICAL ASPECTS	
Country	The Netherlands
Region/city of implementation	Twente (NL)

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☒ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☒ Gamification ☐ Provide feedback to road operator ☒ Nudging ☐ Tracking/tracing/counting ☒ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	By using SMART, Enschede municipality provides cycling challenge every month for two weeks. It started in March 2017 and is still ongoing. The focus of the app is on all travellers. The SMART app is used to register the mobility pattern of travellers through their smartphone. Based on the collected

	information, they are stimulated to use the 'active travel modes' such as cycling more often. From March 2017 to June 2018, 1868 SMART users that joined the challenge at least once. In total, 5525 users that had the SMART app on their phone.
Main technologies used	• Tracking individual trips and distinguish transport mode (based on GPS, Wi-Fi and GSM cells). • Provide feedback, information to the target groups • Provide challenge, reward to target groups. • Mange experience sampling
How does the system collect/generate data (if any)	Based on GPS, Wi-Fi and GSM cells, data on individual trips and mode split information is generated. Only anonymous information is collected, no name, gender, age, home and work address and email address information.
How does the system use data (if any)	Show historical trip data in the app. Based on historical data personal information is provided. Data for academic research purposes.

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	March 2017, no end date determined.
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	A good business model to involve third parties to join. Cooperation of the public with private organisations to make the project in a long-run. Data privacy so that users can trust the app.
Impacts assessment / results (if available)	We found cycling challenge has monthly short term impact for behavioural change, and even a long-term behaviour change if users used the SMART app for more than one year
Other important information	

REFERENCES	
Documentation available on the project	http://empowerproject.eu/resources/deliverables/ All deliverables of this project can be found on this website. The detail information about the Enschede SMART cycling challenge project in under review in a Journal, will be available soon.
Web link(s)	https://empowertoolkit.eu/ict-tools/ https://www.smartintwente.nl/

ILLUSTRATIONS


GENERAL INFORMATION	
Name of service/system/project	**16. Schwung**
Supplier of service/system/project	Vialis
Name of operator/organisation	Vialis
Service delivery	☐ Public ☒ Private
Main category	☐ Infrastructure-based ☒ Bicycle data ☒ Information provision to cyclists ☒ Interactive ITS for cyclists ☐ Other
Contact for more information	https://www.vialis.nl/nl/nieuws/detail/sneller-en-langer-groen-met-schwung-voor-fietsers-in-den-bosch, robin.van.wijk@vialis.nl

GEOGRAPHICAL ASPECTS	
Country	The Netherlands
Region/city of implementation	worldwide

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☒ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☒ Nudging ☒ Tracking/tracing/counting ☒ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g.	When cyclists approach a signalised intersection with an iVRI, the arrival of the cyclist is announced and traffic lights turn green as fast as possible.

geographical dimension, numbers, target group, costs etc.	
Main technologies used	GPS-tracking in smartphone
How does the system collect/generate data (if any)	GPS-tracking in smartphone via app
How does the system use data (if any)	By providing green light at intersection with traffic lights

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	2018
Phase	☐ Planned ☒ Pilot ☒ Implementation ☐ Stopped
Lessons learned / factor of success (technical, legal, organisational, financial, geographic, …)	- A thorough and repeated marketing campaign is necessary in order to convince users to download the app. - Many signalled intersections in a city have to be connected. Users aren't interested if they only get advantage at one or two intersections. - The app doesn't work well at all cellphone types - GPS of many cell phones is rather unprecise, with the result that mapmatching has quite large margins
Impacts assessment / results (if available)	Not available. Notwithstanding do many users experience that they get quicker green with the app on their phone.
Other important information	At the moment of writing (early September 2019), the Schwung app works at 200 signalled intersections in 9 Dutch cities.

REFERENCES	
Documentation available on the project	
Web link(s)	https://www.vialis.nl/nl/nieuws/detail/sneller-en-langer-groen-met-schwung-voor-fietsers-in-den-bosch www.schwung.nu http://schwung.nu/faq/ https://www.verkeerinbeeld.nl/nieuws/150317/schwung-lekker-snel-door-groen-zonder-iets-te-doen https://www.ed.nl/eindhoven/eerder-groen-op-de-fiets-in-eindhoven-dankzij-app~abf858ae/?referrer=https://www.google.com/ https://www.bredavandaag.nl/nieuws/algemeen/290110/fietsers-krijgen-sneller-groen-op-bredase-kruispunten-dankzij-de-app-schwung https://flevopost.nl/artikel/1008333/met-fietsapp-van-schwung-gaat-het-verkeerslicht-sneller-op-groen.html?harvest_referrer=https%3A%2F%2Fwww.google.com%2F

GENERAL INFORMATION	
Name of service/system/project	**17. Ring-Ring®**
Supplier of service/system/project	Ring-Ring®
Name of operator/organisation	Ring-Ring BV
Service delivery	☐ Public ☒ Private
Main category	☐ Infrastructure based ☒ Bicycle data ☒ Information provision to cyclist ☒ Interactive system ☐ Other
Contact for more information	janine@ring-ring.nu

GEOGRAPHICAL ASPECTS	
Country	The Netherlands
Region/city of implementation	The Netherlands

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☒ Facilitate routing ☒ Gamification ☒ Provide feedback to road operator ☒ Nudging ☒ Tracking/tracing/counting ☒ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	With the Ring-Ring-app on the smartphones (iOS/ android) of citizens, cyclists are tracked (100% automatically) what distances and routes they cycle and how much carbondioxide they have been saving in what wheather conditions and how much time they are active. The cycle kilometres are the source of rewarding based on geographical area or in a specific private

	group or at shops and stores. These credits can be used to buy goods in local stores. Most used rewarding system with Ring-Ring in more than 6 cities/ regions in The Netherlands is cycling or collective community goals from a local citizens. This circulair value allocation brings bottom-based consciousness about daily mobility choices and the opportunity to help local initiatives to cycle. As an addition the cyclists can give feedback about their cycling experiences and about the road safety. The data (completely anonymised) about where, when and what time frames is shared to learn and innovate and improve the roads used and make it more convenient. Ring-Ring also implements Talking Traffic where cyclists with the app receive a green light in advance. Ring-Ring has a holistic approach that values a healthy mobility choice from 5 perspectives that all benefits from more cyclists. Think about: health, climate, public space, local economy and social interaction.
Main technologies used	Smartphone (iOS/ android), 100% automated sensing/ tracking, application, data anonimised about where, how long, what time, feedback option to learn from cyclists point of view about the experience and safety.
How does the system collect/generate data (if any)	Cyclists are automatically tracked while they ride their bicycles. The distances, times, routes, carbon safed and wheather conditions are being stored. The routes can be reviewed. Plus, several rewarding programs can be added and feedback options.
How does the system use data (if any)	Ring-Ring shares the data (anonimised) through the Ring-Ring Datasheet to third parties that can visualise, analyse, place additional data to the dataset to enrich and comprehend better the choices of cyclists. Since the choices differ often from what professionals think. For example: cyclists do not take the shortest route from A to B. But more over a greener or nicer route. Profits from data are redistributed to loyal users once a year. Users can choose to re-allocate the money to foundations that help climate, safety and public space for people.

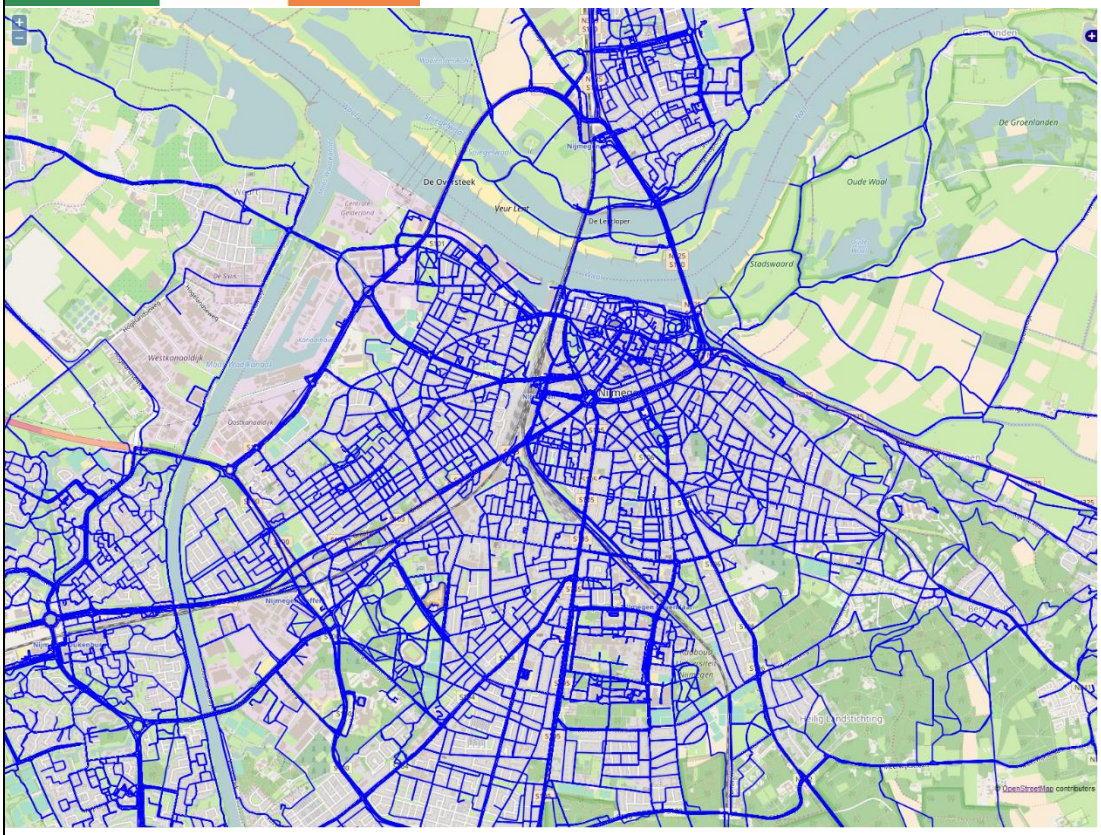
IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	2015 Ring-Ring became a social impact enterprice

Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learned / factor of success (technical, legal, organisational, financial, geographic, …)	Innovation paradox – why should we implement this kind of tool? Ring-Ring helps employers and city governments that really want to act and make action visible based on a vision about where the city wants to be in 10 years. Mistaken in the speed of implementation and launching customers from a government (and employer) point of view. We already have many cyclists, so why more? We already do great things. Scaling the company to get more customers requires a team of people, which needs to be financed. Most revenue is project based. Not reaccuring yet, however happening slowly now. Very happy with the GDPR. European privacy law, which is important for the users. We have implemented a lot of languages on the front side of the app. How to deal with helpdesk in a specific language. Our mission and vision is to spend as much money to local parties and people for the programms we run. So, we ask more motivation from the customers that buys our services. Contstant updates from iOS and android and diversity of smartphones makes it sometimes difficult to make the sensing easy to work. All settings must be right to work properly. Many opportunities from a broader and more intrincic motivation to work with our services that are actually extremely simple and cooperative and broad. These possibilities need to be known for others to work with these possibilities (bottom-based initiatives and shop owners that give discounts in exchange for cycle kilometres or prevention bonus from healthcare).
Impacts assessment / results (if available)	Ring-Ring registered over 12.000 users with a total of > 20.000.000 cycle kilometres in almost 4 million trips. Allocation > 75 citizen projects in several cities in The Netherlands (from

	apple trees in public space, to welcome bags for new inhabitants, monument for the WWII, art route, bicycles for people that cannot afford one, DJ booth in children hospital etc). Besides: Ring-Ring has won many prices and nominations of which the best international start-up at the IASP Moscow 2016. And Accenture Innovation Public Price. Bloomberg Mayor challenge. Also, we were invited to inspire cities around the world of our approach: India, Turkey, Colombia, Russia and Marocco to name a few.
Other important information	Local governments can retrieve useful information on the trips that are made in their cities when a considerable number of the inhanbitants use the Ring-Ring-app. Cities that run programs with Ring-Ring reach a high number of cyclists. Almere, Nijmegen, Hilversum, IJmond region, Amsterdam (IJburg) and Tilburg and Antwerpen (Belgium) reached over 20 million cycle kilometres together from over 12.000 users funding together more then 75 citizen initiatives.

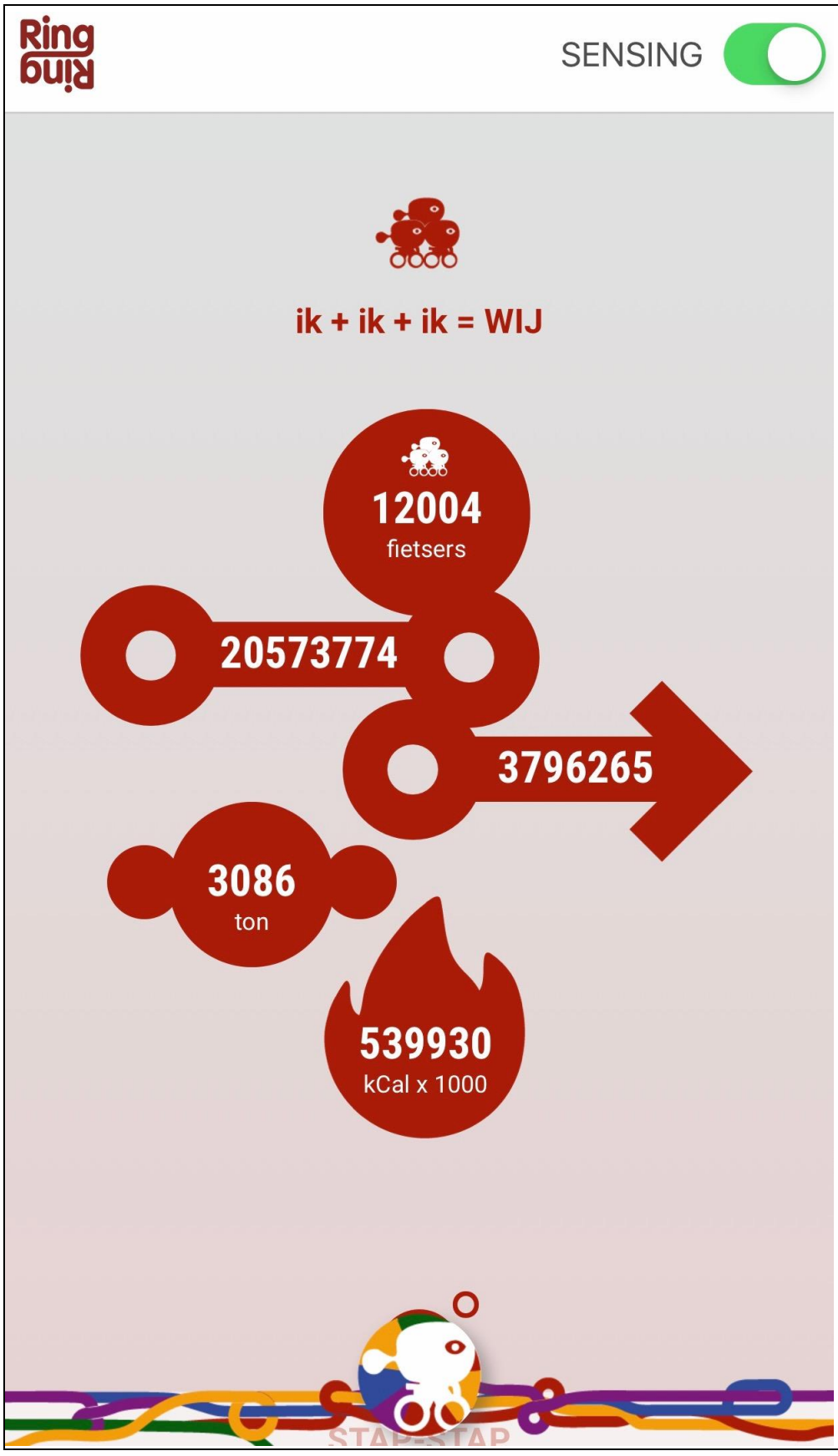
REFERENCES	
Documentation available on the project	https://ring-ring.nu/wp-content/uploads/2015/01/The_Mobile_City_PRPZ_KlikLikeShare.pdf https://ring-ring.nu/wp-content/uploads/2015/01/EcomobilEuropE_stories-of-ecomobility_finalLR.pdf https://stipo.myshopify.com/products/pre-order-our-city-countering-exclusion-in-public-space https://ring-ring.nu/wp-content/uploads/2015/03/Brochure-Bangalore-DEF.pdf
Web link(s)	www.ring-ring.nu https://vimeo.com/301619934

ILLUSTRATIONS




Vodafone NL Wi-Fi
11:55
66%
Ring Ring
SENSING
Onze aanbieding:
Gratis kopje koffie/genieten in de boomgaard
Vanaf zomer 2018 hebben we een heus tuincafé met heerlijke koffie en zitjes in de boomgaard (of binnen als het regent). Fiets je 100 km, dan vinden wij jou een bikkel en serveren graag een kopje koffie. Let op: wel pas vanaf zomer 2018.
100 FKM'S INWISSELEN?
11613


Wifi internet
Ring
GEFELICITEERD!
10.000 FKM
VOOR DE VOEDSELBANK
€300
aan gemeente
Lingewaard
EUROPESE
MOBILITEITS
WEEK
18-22 SEPTEMBER


Ring
SENSING
ik + ik + ik = WIJ
12004
fietsers
20573774
3796265
3086
ton
539930
kCal x 1000


STUDENTS CYCLE
FOR CYCLES
#MAMA AGATHA
Gazelle
Urban Cycling Institute
WE DID IT!
#PCCAMS19
9422
Ring Ring


I+I+I=WE
Health
Cities
Economy
Ring Ring
Insurance
Place
Climate
Employers
Entrepreneurs
Mobility


SENSING
Niels De vries
609
2466
181
91
18
MIJN RITTEN
MIJN RITTEN
22:54 - 23:02 (00:07)
2.1
57
315
* Ik reisde niet met de fiets, maar:
19:55 - 20:07 (00:11)
2.2
08:38 - 09:04 (00:25)
7.2
TOPPERS
1 Josie Dubbeldam 59.7
2 Matthijs Rohde 27.3
3 Janine Hogendoorn 24.0
4 Das Tier 22.4
5 Vrony Rosielle 20.6
6 Amazing Mike 20.4
7 Eric Van heusden 20.4
8 Herbert Tiemens 20.1
9 Bijnanooit 17.6
10 Renate va 17.4
Slim naar Antwerpen
114
476
33
17
3626
meer
CHEQUE
Ter waarde van: € 500,-
Bewonersinitiatief:
Bezinningstuin
GEEF JOUW
BUURT
EEN BOOST
Fiets mee voor je buurt!
Nijmegen-West / Nijmegen-Noord / Dukenburg / Lindenholt
Cycle for Civic Engagement!
DOWNLOAD
RING-RING

GENERAL INFORMATION	
Name of service/system/project	**18. Strava Metro**
Supplier of service/system/project	Strava
Name of operator/organisation	Strava
Service delivery	☐ Public ☒ Private
Main category	☐ Infrastructure based ☒ Bicycle data ☐ Information provision to cyclist ☐ Interactive system ☐ Other
Contact for more information	

GEOGRAPHICAL ASPECTS	
Country	USA
Region/city of implementation	worldwide

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☒ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Users of the Strava-app can be traced during their sports-activity. This can be either running, hiking or cycling. Data of the activity can be analysed via the app or website. Strava Metro aggregates and de-identifies this data and then partners with departments of transportation and city planning groups to improve infrastructure for bicyclists and pedestrians.

Main technologies used	Cell-phone, GPS-tracker in cell-phone. App.
How does the system collect/generate data (if any)	The systems collect data if users allow Strava to register the activity. Metro makes the data available for city planners by aggregating the data and de-indentifying them. Several reports can be drawn from the data, for example a before and after comparison of an infrastructure project.
How does the system use data (if any)	Strava uses primarily data by comparing data from separate individuals. The aim of the app is to motivate users in their activities.

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	2013
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learned / factor of success (technical, legal, organisational, financial, geographic, …)	
Impacts assessment / results (if available)	
Other important information	Strave-data isn't freely available for use in open source environments. Data can be bought from Strava. The app is meant for sporters to register, analyse and compare their activity. Data from Strava are interesting but it's not sure how representative the information is about the active mode movement.

REFERENCES	
Documentation available on the project	http://metro.strava.com/wp-content/uploads/2019/05/Strava-Metro-Comprehensive-User-Guide-Version-8.0.pdf , https://www.theguardian.com/lifeandstyle/2016/may/09/city-planners-cycling-data-strava-tracking-app ,

	https://medium.com/strava-metro/rapides-parish-louisiana-case-study-91ee1ab1620 , http://cdn2.hubspot.net/hubfs/1979139/Strava_Metro___Seattle_DOT_Case_Study.pdf
Web link(s)	http://Metro.strava.com

ILLUSTRATIONS

GENERAL INFORMATION	
Name of service/system/project	**19. Bikesharing: Swapfiets**
Supplier of service/system/project	Many, e.g. Swapfiets
Name of operator/organisation	Swapfiets
Service delivery	☒ Public ☐ Private
Main category	☐ Infrastructure-based ☐ Bicycle data ☐ Information provision to cyclists ☒ Interactive ITS for cyclists ☐ Other
Contact for more information	https://help.swapfiets.nl/hc/nl

GEOGRAPHICAL ASPECTS	
Country	The Netherlands
Region/city of implementation	The Netherlands, Germany, Belgium, Denmark

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☒ Increase cyclist comfort ☐ Facilitate bicycle parking ☒ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☐ Tracking/tracing/counting ☐ Rewarding cyclists ☒ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Swapfiets is a bikesharing / lease system. For a monthly fee, a cyclist can get their own Swapfiets. Swapfiets doesn't use a tracker so users can't be provided with information on their trips or where they can find their bicycle. They have a user app for navigation and reporting bike problems.

Main technologies used	
How does the system collect/generate data (if any)	
How does the system use data (if any)	

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learned / factor of success (technical, legal, organisational, financial, geographic, …)	
Impacts assessment / results (if available)	
Other important information	

REFERENCES	
Documentation available on the project	
Web link(s)	https://swapfiets.nl/

GENERAL INFORMATION	
Name of service/system/project	**20. Bikesharing: PBSC**
Supplier of service/system/project	PBSC Urban Solutions
Name of operator/organisation	PBSC Urban Solutions
Service delivery	☐ Public ☒ Private
Main category	☐ Infrastructure-based ☒ Bicycle data ☐ Information provision to cyclists ☐ Interactive ITS for cyclists ☐ Other
Contact for more information	https://www.pbsc.com/contact/

GEOGRAPHICAL ASPECTS	
Country	Canada
Region/city of implementation	worldwide

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☒ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	With the PBSC bikesharing scheme, data can be collected about the use of the PBSC bicycles in a city.

Main technologies used	GPS
How does the system collect/generate data (if any)	GPS in bicycle
How does the system use data (if any)	?

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	?
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learned / factor of success (technical, legal, organisational, financial, geographic, …)	
Impacts assessment / results (if available)	
Other important information	

REFERENCES	
Documentation available on the project	
Web link(s)	https://www.pbsc.com

GENERAL INFORMATION	
Name of service/system/project	**21. Nazza Mobility driven by Intelligence**
Supplier of service/system/project	Nazza
Name of operator/organisation	Nazza
Service delivery	☐ Public ☒ Private
Main category	☐ Infrastructure-based ☒ Bicycle data ☐ Information provision to cyclists ☐ Interactive ITS for cyclists ☐ Other
Contact for more information	https://nazza.nl/contact , rob.verkerk@nazza.nl

GEOGRAPHICAL ASPECTS	
Country	The Netherlands
Region/city of implementation	The Netherlands

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☒ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Bike sharing system, including app to open smart lock.

Main technologies used	GPS
How does the system collect/generate data (if any)	Via GPS at mobile phone
How does the system use data (if any)	o Direct information about • Location; where is the bike, cycled routes, hotspots • Use; time, driving behavior and driving patterns • Analysis; cycling real-time insight, monitoring, analysis and management • Maintenance; when does the bike need maintenance

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	2019
Phase	☐ Planned ☒ Pilot ☐ Implementation ☐ Stopped
Lessons learned / factor of success (technical, legal, organisational, financial, geographic, …)	Factor of success is creating a White Label application, which can be offert to bicycle operators to use for their business
Impacts assessment / results (if available)	Three different public (business) share programs are making use of our back-office system including App (over 1,000 bicycles)
Other important information	Public bike share programs provide residents and visitors with a sustainable transportation solution, resulting in the reduction of greenhouse gases caused by motor vehicle use. Programs also provide accessibility to healthy activity, resulting in vibrant communities.

REFERENCES	
Documentation available on the project	url: https://wisselfiets.amsterdam/
Web link(s)	https://nazza.nl/

GENERAL INFORMATION	
Name of service/system/project	**22. Bicycle parking guiding system Utrecht (P-route fiets)**
Supplier of service/system/project	Lumi Guide (Nijmegen, Netherlands)
Name of operator/organisation	City of Utrecht (NL)
Service delivery	☒ Public ☐ Private
Main category	☐ Infrastructure based ☒ Bicycle data ☒ Information provision to cyclist ☐ Interactive system ☐ Other
Contact for more information	info@lumiguide.nl

GEOGRAPHICAL ASPECTS	
Country	The Netherlands
Region/city of implementation	City of Utrecht

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☒ Facilitate bicycle parking ☒ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☐ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Cyclists get information on where they can park their bicycle in dedicated parking facilities in the city centre of Utrecht (not in public space). Also, information on the route to the location is provided. Therefore, they have to download an app (P-route Fiets) on their smartphone. The system registers empty spots in the parking facility and communicates that information.

Main technologies used	• sensors and camera's in combination with software/deep learning • digital signposts in public space, DRIPS • app at smartphone
How does the system collect/generate data (if any)	Sensors check the bicycle parking facility for empty spots. Comparison of video-images results in detection of a place where a bicycle can be parked.
How does the system use data (if any)	The collected data (on available parking space) is sent to - signposts at the parking lot - signposts direct outside the parking facility - signposts in the area along cycleroutes - the app that gives information to users about parking space - open-data source to be used by third parties Moreover, data is collected in a management system about the use of the parking facility. With the system, it can be determined how much time a parking spot is occupied, when bicycles come in and when they leave. The system does not collect data of users.

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	2015
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learned / factor of success (technical, legal, organisational, financial, geographic, …)	The use of the parking facilities increased with 15 percent between 2015 and 2018. Important is to provide users with reliable information.
Impacts assessment / results (if available)	The use of the parking facilities increased. Signposts along routes are important. The information in the app to a lesser extent.
Other important information	The app does not collect information on user behaviour. This can be built, but it is currently not off the shelf available.

REFERENCES

Documentation available on the project	https://www.utrecht.nl/fileadmin/uploads/documenten/wonen-en-leven/verkeer/fiets/p-route/2018-10-Factsheet-P-route-fiets.pdf
Web link(s)	https://lumi.guide/en/smart-parking-management/ https://www.utrecht.nl/wonen-en-leven/verkeer/fiets/fiets-stallen/p-route/

GENERAL INFORMATION	
Name of service/system/project	**23. Mezuro**
Supplier of service/system/project	Mezuro
Name of operator/organisation	Mezuro
Service delivery	☐ Public ☒ Private
Main category	☐ Infrastructure based ☐ Bicycle data ☐ Information provision to cyclist ☐ Interactive system ☒ Other: traffic data
Contact for more information	info@mezuro.com, Ron Beute via +31 294 415159

GEOGRAPHICAL ASPECTS	
Country	The Netherlands
Region/city of implementation	The Netherlands

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☒ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Via GSM-data, HB-matrices of travellers are made. Data is derived from 5 million Vodafone-users in the Netherlands. Cyclists can't be determined in the data.

Main technologies used	GSM
How does the system collect/generate data (if any)	
How does the system use data (if any)	

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	2016
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	
Impacts assessment / results (if available)	
Other important information	Data of cyclists can't be isolated from the dataset.

REFERENCES	
Documentation available on the project	
Web link(s)	www.mezuro.com

GENERAL INFORMATION	
Name of service/system/project	**24. Thermal imaging camera for traffic monitoring (FC T2 series)**
Supplier of service/system/project	Flir
Name of operator/organisation	Flir
Service delivery	☐ Public ☒ Private
Main category	☐ Infrastructure-based ☒ Bicycle data ☐ Information provision to cyclists ☐ Interactive ITS for cyclists ☐ Other
Contact for more information	https://www.flir.eu/about/general-inquiries/

GEOGRAPHICAL ASPECTS	
Country	United States
Region/city of implementation	worldwide

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☒ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	FC-T2 sensors deliver superior image accuracy and reliability for traffic monitoring applications. The FLIR FC-T2 thermal camera can monitor vehicles in a wider variety of conditions than traditional visible-light sensors. By detecting the heat of all

	objects in the scene, the FC-T2 operates in broad daylight or total darkness, poor weather and even light fog
Main technologies used	Infrared camera that detects differences in temperature
How does the system collect/generate data (if any)	By detecting bicycles/cyclists
How does the system use data (if any)	

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learned / factor of success (technical, legal, organisational, financial, geographic, …)	
Impacts assessment / results (if available)	
Other important information	

REFERENCES	
Documentation available on the project	https://www.flir.eu/globalassets/imported-assets/document/it_0004_us.pdf

Web link(s)	https://www.flir.eu/about/general-inquiries/

GENERAL INFORMATION	
Name of service/system/project	**25. Traffic management of bicycle flow by camera based speed and volume measurement adjusted by Bikesim simulation**
Supplier of service/system/project	Technolution
Name of operator/organisation	Technolution
Service delivery	☐ Public ☒ Private
Main category	☐ Infrastructure-based ☒ Bicycle data ☐ Information provision to cyclists ☐ Interactive ITS for cyclists ☐ Other
Contact for more information	https://www.technolution.eu/en/contact/ , paul.van.koningsbruggen@technolution.nl

GEOGRAPHICAL ASPECTS	
Country	The Netherlands
Region/city of implementation	worldwide

ITS SERVICE DESCRIPTION	
General Objectives	☒ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☒ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☐ Tracking/tracing/counting ☐ Rewarding cyclists ☒ Other: traffic management

Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	The Bikesim model was in Copenhagen connected to realtime data streams from mobile camera-based bicycle volume sensors and from traffic lights on a bicycle corridor. A stable and accurate travel time could be predicted using Monte Carlo simulation using these data. It facilitated traffic management of the flow of cyclists on a busy corridor in the city.
Main technologies used	Camera, loops, computer for modelling
How does the system collect/generate data (if any)	Images that are collected by camera's are combined with data from loops and processed in a simulation that predicts the flow of cyclists
How does the system use data (if any)	For improving the flow and speed of cyclists

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	2017
Phase	☐ Planned ☒ Pilot ☐ Implementation ☐ Stopped
Lessons learned / factor of success (technical, legal, organisational, financial, geographic, …)	Other data collection technologies were tested for the purpose of traffic management. In many cases, data quality falls short. Information of a large number of cyclists is needed to get accurate and stable measurements. Data collection from radar, cellphones (apps), wifi/Bluetooth identification aren't rich enough for traffic management purposes.
Impacts assessment / results (if available)	Users appreciated the efforts to develop traffic management for cyclists. Whether the traffic management was actually effective was not measured. Whether it contributed to an increased number of cyclists is too early to determine.
Other important information	

REFERENCES	
Documentation available on the project	Dubbeldam, M. & Tin, E. (2018). Traffic management for cyclists in Copenhagen. Paper presented at 25th ITS World Congress, Copenhagen, Denmark, 17-21 September 2018. http://ny.trafikogveje.dk/wp-content/uploads/2018/11/Maanedens-artikel-TV_10-2018-2.pdf
Web link(s)	https://www.technolution.eu/nl/mobiliteit/155-bikesim-fietsverkeer-in-beeld-met-slimme-simulatie.html

GENERAL INFORMATION	
Name of service/system/project	**26. Flexradar**
Supplier of service/system/project	Sensys Networks
Name of operator/organisation	Sensys Networks
Service delivery	☐ Public ☒ Private
Main category	☐ Infrastructure-based ☒ Bicycle data ☐ Information provision to cyclists ☐ Interactive ITS for cyclists ☐ Other
Contact for more information	https://sensysnetworks.com/about

GEOGRAPHICAL ASPECTS	
Country	United States
Region/city of implementation	worldwide

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☒ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☒ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	FlexRadar reliably and accurately detects bicycles, differentiates between a bicycle and a motorized vehicle at the stop bar, provides bicycle counts in dedicated bicycle lanes, and provides the most accurate parking space occupancy data available. FlexRadar installs as a supplement to existing wireless detection

	systems, lowering costs by leveraging existing infrastructure and communications.
Main technologies used	microradar
How does the system collect/generate data (if any)	Detection of cyclists at signalled intersections. Detection of numbers in dedicated bicycle lanes. Vehicle presence detection is parking spaces.
How does the system use data (if any)	

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	?
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learned / factor of success (technical, legal, organisational, financial, geographic, …)	
Impacts assessment / results (if available)	
Other important information	FlexRadar also improves safety by allowing agencies to optimize green time based on the needs of cyclists, as well as providing critical bicycle utilization statistics for city planners.

REFERENCES	
Documentation available on the project	• Installation & Configuration Reference Guide • Datasheet - MicroRadar • Quick Start Guide - MicroRadar for Bicycle Counts

	• Quick Start Guide - MicroRadar for Bicycle Presence • Datasheet - MicroRadar for Parking • Quick Start Guide - MicroRadar for Parking • Safe Sensor Handling Instructions
Web link(s)	https://sensysnetworks.com/products/flexradar

GENERAL INFORMATION	
Name of service/system/project	**27. See.sense**
Supplier of service/system/project	See.sense
Name of operator/organisation	See.sense
Service delivery	☐ Public ☒ Private
Main category	☐ Infrastructure-based ☒ Bicycle data ☐ Information provision to cyclists ☐ Interactive ITS for cyclists ☐ Other
Contact for more information	https://seesense.cc/pages/contact-us, team@seesense.cc

GEOGRAPHICAL ASPECTS	
Country	Northern Ireland
Region/city of implementation	worldwide

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☒ Increase of safety ☒ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☒ Provide feedback to road operator ☐ Nudging ☒ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	See.Sense sensors collect various ride insights: on movement patterns, speed and dwell times, road roughness, safety and near-miss events. See.sense offers the opportunity to collect qualitative data from users.

Main technologies used	GPS, movements sensors
How does the system collect/generate data (if any)	sensors in portable light
How does the system use data (if any)	The data can be used for identifying unsafe situations. Accidents can be recognized in the data. Networks improvement is an opportunity with the data from see.sense, if enough users produce enough data.

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	2013
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learned / factor of success (technical, legal, organisational, financial, geographic, …)	Customers (who buy it in retail) first have to be interested in a good light, for safety reasons. The other aspects are interesting, but not the main reason to buy the product. For getting customers to share their data, there has to be a trigger. That can be a dedicated project. If a city is doing a project with See.sense, then users may be interested in how they can help their city with improving conditions for cyclists in the city. In the app, users can give extra information on what they experienced in a situation. That helps with the engagement of the user group. If users can get a See.sense with a discount on it, that may help with forming a user group.
Impacts assessment / results (if available)	The sensors in the light are of good quality. In the data can be noticed when there is change of road surface, or an increasing unsafe situation.
Other important information	In Antwerp, See.sense is testing a new way of sharing data about the use of a bike sharing scheme. Currently, data is collected and transported via an app. The experiment is on send the information directly from the device to the cloud via NBIOT: Narrow Band Internet of Things. If NBIOT is available in other cities, this can be tested as well.

REFERENCES	
Documentation available on the project	Presentations at Velocity and European Transport Conference (no papers available)
Web link(s)	https://seesense.cc/pages/ride-insights

ILLUSTRATIONS

GENERAL INFORMATION	
Name of service/system/project	**28. Data collection bicycle (meetfiets)**

Supplier of service/system/project	Fietsersbond (Dutch Cyclists Union)
Name of operator/organisation	M+P consulting engineers
Service delivery	☐ Public ☒ Private
Main category	☐ Infrastructure-based ☒ Bicycle data ☐ Information provision to cyclists ☐ Interactive ITS for cyclists ☐ Other
Contact for more information	ArdKuijpers@mp.nl

GEOGRAPHICAL ASPECTS	
Country	The Netherlands
Region/city of implementation	The Netherlands

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☒ Increase of safety ☒ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☒ Provide feedback to road operator ☐ Nudging ☐ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	The Data Collection Bicycle is a bicycle equipped with sensors to detect location, sound, vibration and air quality. These variables are measured to assess the cycling comfort that is experienced while riding a normal bicycle. The Data Collection Bicycle was used by the Dutch Cyclists Union (Fietsersbond) to be able to evaluate and compare the cycling infrastructure in various cities in the Netherlands (Fietsbalans programme). The Data Collection Bicycle measures GPS-position, speed, vibration level, sound level and particulate matter. The bicycle was developed

	by M+P, an expert consultancy company in the field of noise, vibration and air quality. The Data Collection Bicycle was one of the first bicycles to measure cyclist comfort and the concept was copied by parties in other European countries.
Main technologies used	• Class 1 sound level meter • Vibration transducers on steer and saddle position • CPC and DustTrak air quality measurement instruments • GPS receiver for position and speed, augmented with wheel rotation sensor • Video camera to record visual environment • Tailor-made data collection and processing software running on a portable computer
How does the system collect/generate data (if any)	The bicycle measures the vibration level, sound level and air particle count at a one second interval and stores these together with speed and position in an internal database. The data is collected during a measurement ride where the cyclist is instructed to cycle as a normal commuter. After the ride, the data is transferred and further analysed.
How does the system use data (if any)	Based on the measurement data of several rides, a cycling comfort map can be generated. This uses the sound and vibration data to derive a comfort score. The score depends on the road surface texture and sound levels. Averaging the scores produces a general score for the cycling climate in a city,

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	1999-2010
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	When the Data Collection Bicycle was developed, there were quite a lot of technical challenges. However, the technology has advanced since then, so these technical challenges are currently much smaller. Because there are less technical challenges, everybody can now produce a bicycle with microphones and accelerometers. But measuring is only half of the story. For the success of assessing

	cycling comfort, it is important to have a good model that relates measurement values to comfort. You need to gain experience with the measurement method to be able to finetune the model and get relevant results. Thirdly, to improve the cycling comfort, one needs to know what to do on the cycling infrastructure to improve the comfort score. For instance, what can a road builder do on the cycle path surface to reduce the vibrations while maintaining safety and durability. This means that involvement of road manufacturers is necessary in the process of improving the cycling climate in a city.
Impacts assessment / results (if available)	We're referred to the Fietsersbond.
Other important information	The Fietsersbond used the bicycle during several years in the Fietsbalans campaign. This campaign stopped

REFERENCES	
Documentation available on the project	See web links
Web link(s)	https://www.mp.nl/oplossingen/mp-en-fietsersbond-maken-de-ultieme-meetfiets https://www.fietsberaad.nl/Kennisbank/Fietsbalans-meet-en-vergelijkt-fietsbeleid-van-gem https://vroegevogels.bnnvara.nl/nieuws/fietsbalans-2008 https://www.fietsersbond.nl/nieuws/nieuwe-metingen-fietsbalans-van-start/

GENERAL INFORMATION	
Name of service/system/project	**29. Sniff bicycle (snuffelfiets)**
Supplier of service/system/project	Province of Utrecht, Civity, Sodaq and RIVM
Name of operator/organisation	Jonge honden
Service delivery	☒ Public ☐ Private
Main category	☐ Infrastructure-based ☒ Bicycle data ☐ Information provision to cyclists ☐ Interactive ITS for cyclists ☐ Other
Contact for more information	Mick van Reem via mick@jongehonden.com, Klaas Schouwenaar at Province of Utrecht

GEOGRAPHICAL ASPECTS	
Country	The Netherlands
Region/city of implementation	Province of Utrecht (NL)

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☒ Provide feedback to road operator ☐ Nudging ☐ Tracking/tracing/counting ☐ Rewarding cyclists ☒ Other: Monitoring air quality, comfort of cyclists
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	In the project, 550 'sniff boxes' are attached to bicycles of volunteers in order to collect data about trips, air quality, quality of pavement and the temperature. The project is planned from May 2019-May 2020.

Main technologies used	'Sniff box' with a sensor for air quality (particulate matter), a sensor for vibrations, a thermometer and a GPS. The box is attached to the bicycle of a volunteer
How does the system collect/generate data (if any)	The data is realtime sent to a dataplatform. Data-collection starts when movement is registered by the vibration sensor. When it notices that the trip is over, the system turns off.
How does the system use data (if any)	The pilot is started in order to learn how such data collection can work and what its yield can be.

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	2019
Phase	☐ Planned ☒ Pilot ☐ Implementation ☐ Stopped
Lessons learned / factor of success (technical, legal, organisational, financial, geographic, …)	
Impacts assessment / results (if available)	
Other important information	At the website, information is shared. This gives an interesting view at the opportunities of this configuration.

REFERENCES	
Documentation available on the project	
Web link(s)	https://snuffelfiets.nl/

GENERAL INFORMATION	
Name of service/system/project	**30. Bicycle tracker Tailit**
Supplier of service/system/project	Tail it Technologies AS
Name of operator/organisation	Tail it Technologies AS
Service delivery	☐ Public ☒ Private
Main category	☐ Infrastructure-based ☐ Bicycle data ☒ Information provision to cyclists ☐ Interactive ITS for cyclists ☐ Other
Contact for more information	+47 73 02 11 99, mbh@tailit.com (Martin Berg Hagen)

GEOGRAPHICAL ASPECTS	
Country	Norway
Region/city of implementation	Norway, Germany, The Netherlands, Denmark, Poland

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☒ Tracking/tracing/counting ☐ Rewarding cyclists ☒ Other: Anti-theft
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Tail it uses GSM, GPRS, Wi-Fi and LBS to detect the location of a bicycle for better accuracy indoor and in urban areas. Tail it also includes location algorithms for significant changes of location and known places. The units are basically sleeping when no location is requested, to save battery and to prevent radiation, which also can be detected by unauthorized persons with the correct measuring instruments. When location is requested the

	unit sends its location through encrypted communication protocols showing accurate location down to 5 meters. It also has a built-in speedometer, allowing the bike to send updates when it's moving (if the user wants to), as well as the option to enable live tracking (allowing the tracker to send position every 5 seconds -2 minutes).
Main technologies used	GSM, GPRS, Wi-Fi and LBS
How does the system collect/generate data (if any)	If a position update is requested, live-tracking is enabled, or if the bike is moving. (Speedometer included in the tracker which will notify you when the bike is on the move).
How does the system use data (if any)	Users have full ownership and are in full control of their data, which means that no party can resell statistics, collect data or use it for marketing purposes. The users can delete all their data or move it from Tail it to another application at any time.

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learned / factor of success (technical, legal, organisational, financial, geographic, …)	
Impacts assessment / results (if available)	
Other important information	

REFERENCES	
Documentation available on the project	
Web link(s)	https://www.tailit.com/bike/

GENERAL INFORMATION	
Name of service/system/project	**31. Mobilock**
Supplier of service/system/project	Mobilock
Name of operator/organisation	
Service delivery	☐ Public ☒ Private
Main category	☐ Infrastructure-based ☒ Bicycle data ☐ Information provision to cyclists ☐ Interactive ITS for cyclists ☐ Other
Contact for more information	info@mobilock.nl

GEOGRAPHICAL ASPECTS	
Country	The Netherlands
Region/city of implementation	The Netherlands, Germany

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☒ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☐ Tracking/tracing/counting ☐ Rewarding cyclists ☒ Other: facilitate bicycle share schemes
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	The Mobilock facilitates bikesharing. With an app, a Mobilock can be unlocked. When a geofence is installed, this can be chosen at dedicated places. The Mobilock is of high quality, which means that theft of bicycles with the Mobilock is hardly possible. Data is generated on where the lock is opened and where it is closed. The technical configuration of app plus lock

	makes it possible to track the ride of the user. For reasons of privacy, this is option is not used.
Main technologies used	Lock with Bluetooth connection to smartphone, operated by an app. Geofence.
How does the system collect/generate data (if any)	Data is generated on where the lock is opened and closed, at what time and by whom.
How does the system use data (if any)	

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	2017
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learned / factor of success (technical, legal, organisational, financial, geographic, …)	The Mobilock is a lock with high quality materials in it, therefore it is hard to demolish it. Theft of a bicycle with a lock isn't easy. So, the Mobilock works well in surroundings where anti-theft measures are important.
Impacts assessment / results (if available)	Fleet management of bikesharing sheme is facilitated by the Mobilock system.
Other important information	

REFERENCES	
Documentation available on the project	
Web link(s)	https://mobilock.nl/

GENERAL INFORMATION	
Name of service/system/project	**32. Liberty Bell**
Supplier of service/system/project	Fluidedge Innovation
Name of operator/organisation	Fluidedge Innovation
Service delivery	☐ Public ☒ Private
Main category	☐ Infrastructure-based ☒ Bicycle data ☐ Information provision to cyclists ☐ Interactive ITS for cyclists ☐ Other
Contact for more information	Tel: +353 1 4100628 Email: innovation@fluidedge.com

GEOGRAPHICAL ASPECTS	
Country	Ireland
Region/city of implementation	Dublin, Ireland, UK

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☒ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Liberty Bell is a platform that helps with gathering quantitative and qualitative data about the movement of people through public spaces. The platform uses connected bicycle bells and pedestrian wristbands to allow participants to log, map and describe their experiences as they walk and cycle.

Main technologies used	?
How does the system collect/generate data (if any)	Logging of sensors on the one hand, while on the other hand data can be retrieved from daily dairy descriptions of participants mobility experiences.
How does the system use data (if any)	

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learned / factor of success (technical, legal, organisational, financial, geographic, …)	
Impacts assessment / results (if available)	
Other important information	Liberty Bell is aimed at generating data for research.

REFERENCES	
Documentation available on the project	
Web link(s)	https://www.libertybell.io/#block-system-main

GENERAL INFORMATION	
Name of service/system/project	**33. Smart Grips**
Supplier of service/system/project	Boréal Bikes
Name of operator/organisation	Boréal Bikes
Service delivery	☐ Public ☒ Private
Main category	☐ Infrastructure-based ☐ Bicycle data ☒ Information provision to cyclists ☐ Interactive ITS for cyclists ☐ Other
Contact for more information	info@borealbikes.com

GEOGRAPHICAL ASPECTS	
Country	Germany
Region/city of implementation	Berlin, Germany

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☒ Increase of safety ☒ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☒ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	With smrtGRIPS, tactile feedback is given to riders via handlebars. This helps with navigation. A sign to the cyclist is given by vibrating on the side the user is expected to turn.

Main technologies used	GPS, bluetooth
How does the system collect/generate data (if any)	
How does the system use data (if any)	

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	2019/2020
Phase	☒ Planned ☐ Pilot ☐ Implementation ☐ Stopped
Lessons learned / factor of success (technical, legal, organisational, financial, geographic, …)	
Impacts assessment / results (if available)	
Other important information	

REFERENCES	
Documentation available on the project	Matviienko, A., Ananthanarayan, S., Sadeghian Borojeni, S., Feld, Y., Heuten, W. & Boll, S. (2018). Augmenting Bicycles and Helmets with Multimodal Warnings for Children. Paper presented at MobileHCI'18, September 3-6, Barcelona, Spain.
Web link(s)	http://smrtgrips.com/, https://www.borealbikes.de/home-2-2-2-3/

GENERAL INFORMATION	
Name of service/system/project	**34. Ping if you care**
Supplier of service/system/project	Mobiel 21 and Bike Citizens
Name of operator/organisation	Mobiel 21
Service delivery	☐ Public ☐ Private
Main category	☐ Infrastructure-based ☒ Bicycle data ☐ Information provision to cyclists ☒ Interactive ITS for cyclists ☐ Other
Contact for more information	ping@mobiel21.be / info@mobiel21.be

GEOGRAPHICAL ASPECTS	
Country	Belgium
Region/city of implementation	Brussels (BE), Amsterdam (NL), München (DE)

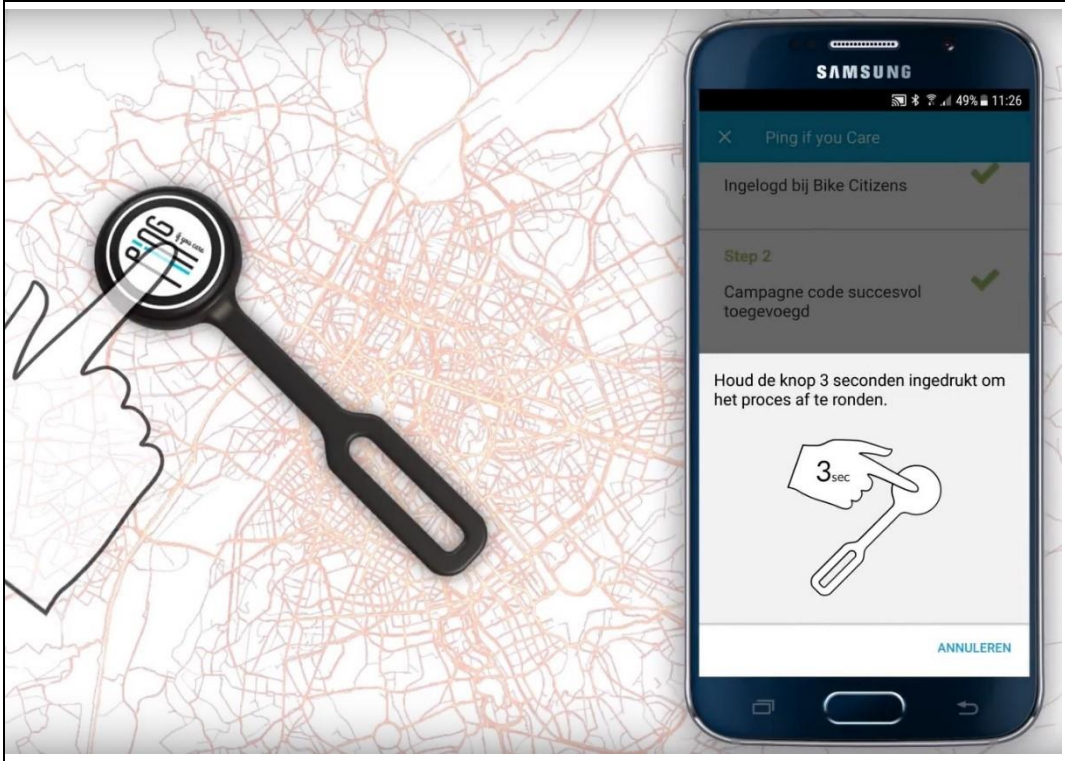
ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☒ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☒ Provide feedback to road operator ☐ Nudging ☐ Tracking/tracing/counting ☐ Rewarding cyclists ☒ Other: interaction possibility of cyclists with government on how they perceive cycling (subjective feelings of safety, comfort, joy,, etc. _____
Short narrative description of your best practice including e.g.	The Ping button is a Bluetooth button that a cyclist can press to indicate a specific spot on their route that they want to comment on. This can be a feeling of unsafety, lacking of good cycling infrastructure, aggressive behaviour of other road users,

geographical dimension, numbers, target group, costs etc.	potholes, etc. The pings are indicated on their route, the cyclists are asked to give feedback on their 'pings' choosing from a drop down category list that is provided by the city. The button can be attached to a bicycle handlebar and is connected to a smartphone app Bike Citizens. The Ping button is easy to use and it doesn't expect a cyclist to stop cycling when wanting to give report on something to the government (like Fix my Street).
Main technologies used	Bluetooth, smartphone-app, Analytics tool to analyse the data.
How does the system collect/generate data (if any)	Routes are tracked when the cyclist either press long on the ping button or when choosing to start tracking with the app on the phone. Tracking is stopped automatically when the cycling is finished or when the cyclist chooses to stop the tracking via the app. Every click on the ping button while cycling is a marker on the route that was tracked. The data is generated by Bike Citizens and is analysed via the BC analytics tool.
How does the system use data (if any)	The app uses open street maps and geo location-based information.

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	2017-2018-2019-…
Phase	☐ Planned ☒ Pilot ☒ Implementation ☐ Stopped
Lessons learned / factor of success (technical, legal, organisational, financial, geographic, …)	The app needs constant updates and bug fixing as this technology is continuously improving and changing. The Ping campaign works best for cities if they decide to invest in the BC analytics tool, so they can use all the results and data that come out of it. It is an important lesson learned that it is best to set out in the beginning what kind of data is collected, what kind of data will be shared and who is the owner of the data.

Impacts assessment / results (if available)	The results are shared with the cities in workshops and in reports, based on the wishes of the cities. The impact for the cyclists: cyclists who have been involved in a ping project miss the opportunity of pinging after the project stops. They literally love the tool and the button to press when something is bothering them, especially because they know that the cities are interested in their opinion and will do something with it if possible.
Other important information	

REFERENCES	
Documentation available on the project	https://www.mobiel21.be/assets/documents/Summary-Results-Ping-campaign-2017-Brussels-Region_EN.pdf
Web link(s)	https://pingifyoucare.eu/

ILLUSTRATIONS


GENERAL INFORMATION	
Name of service/system/project	**35. Why Cycling Matters in Smart Cities**
Supplier of service/system/project	School of Arts, Design & Media, University of Brighton
Name of operator/organisation	School of Arts, Design & Media, University of Brighton
Service delivery	☐ Public ☒ Private
Main category	☐ Infrastructure-based ☐ Bicycle data ☒ Information provision to cyclists ☐ Interactive ITS for cyclists ☐ Other
Contact for more information	School of Arts, Design & Media, University of Brighton

GEOGRAPHICAL ASPECTS	
Country	United Kingdom
Region/city of implementation	Brighton (UK)

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☒ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other:
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Research paper testing the implementation of a “Smart E-bike Monitoring System” (SEMS) in Brighton which collected bicycle use data, including location, rider control and other real-time inputs. A twitter feed regarding the study was later added at the request of participants. A fleet of 35 “smart- e-bikes” were deployed for use in 2012-2013 which were lent to 80 commuters for 6-8 week periods.

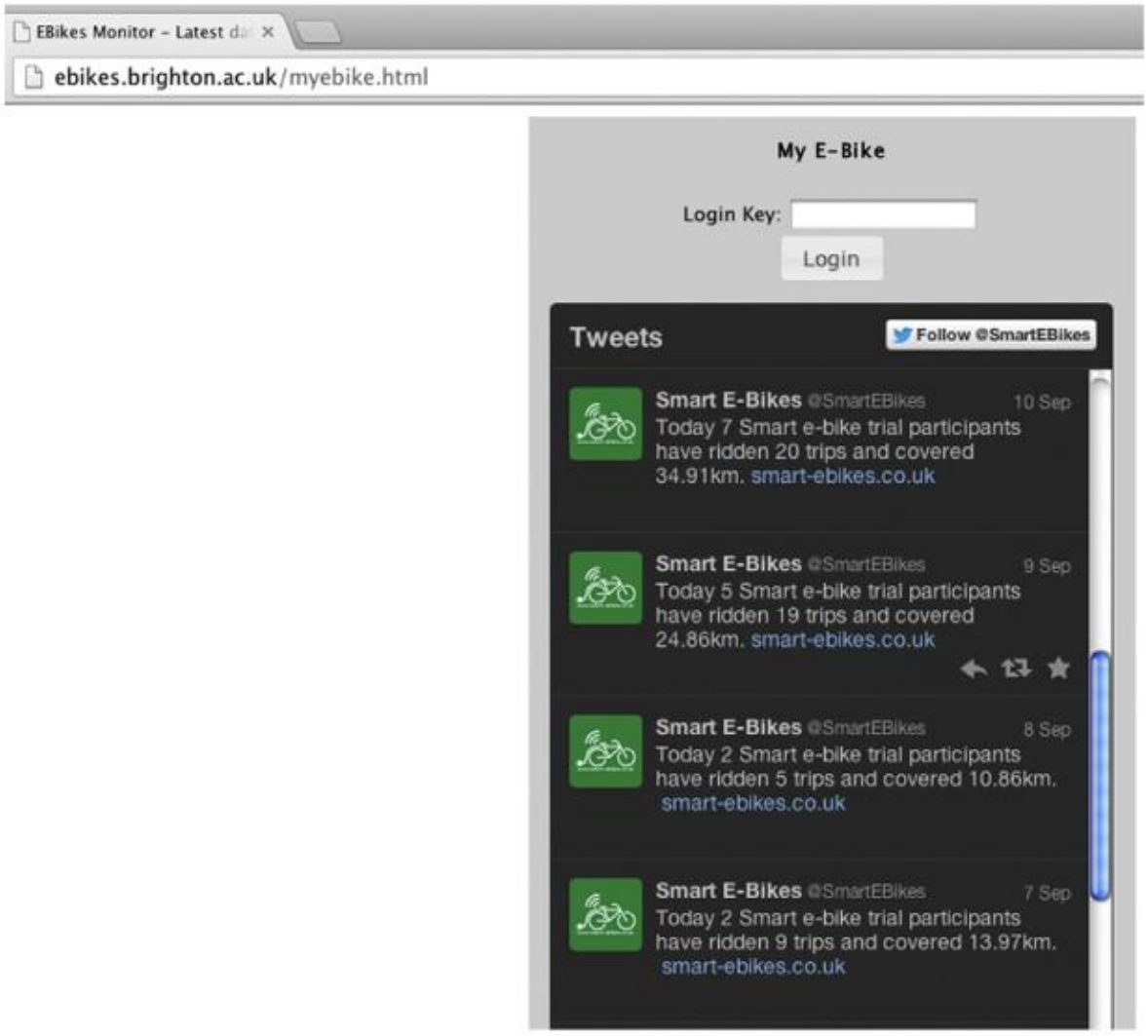
Main technologies used	A “Smart E-bike Monitoring System” (SEMS) which collected bicycle use data, including location, rider control and other real-time inputs. Data fed into an online/phone interface for use by researchers and for participants to view their own data.
How does the system collect/generate data (if any)	SEMS collects bicycle use data (location, etc.)
How does the system use data (if any)	Data collected was used by researchers for analysis and to provide users with feedback as to their cycle usage.

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	Journal published in 2016, research undertaken between 2012 and 2013.
Phase	☐ Planned ☒ Pilot ☐ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	Cycle riders generally found having access to their data rewarding. Several participants were also interested in the sharing of data in order to compare their results with others, however some were worried about how their data could be misused. A twitter feed was produced after user demand, showing the number of e-bike users and aggregate mileage for each day of the study.
Impacts assessment / results (if available)	N/A
Other important information	

REFERENCES

Documentation available on the project	Behrendt, F, 2016. Why Cycling Matters for Smart Cities. Internet of Bicycles for Intelligent Transport. Journal of Transport Geographies 56, pp. 157-164 [online: https://reader.elsevier.com/reader/sd/pii/S0966692316300746?token=5D1AB00AD91ECC35ED650E55B6F50D53805A3AB2907AC28831B3A9E1C30A06B6CF7AE14EDABEDAC6F173301DD3A23014 accessed 19/09/2019].
Web link(s)	https://www.sciencedirect.com/science/article/abs/pii/S0966692316300746

ILLUSTRATIONS



Twitter live feed for the “smart e-bikes fleet” (Behrendt, 2016).

GENERAL INFORMATION	
Name of service/system/project	**36. Whim**
Supplier of service/system/project	Maas Global
Name of operator/organisation	Maas Global
Service delivery	☐ Public ☒ Private
Main category	☐ Infrastructure-based ☐ Bicycle data ☐ Information provision to cyclists ☒ Interactive ITS for cyclists ☐ Other
Contact for more information	N/A

GEOGRAPHICAL ASPECTS	
Country	United Kingdom, Belgium, Finland
Region/city of implementation	West midlands (UK), Antwerp (BE), Helsinki (FI)

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☐ Tracking/tracing/counting ☐ Rewarding cyclists ☒ Other: Facilitate cycle usage (as well as other transport modes) via mapping and payment
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Phone application designed to facilitate the use of multiple types of transport (taxis, cars, trains, share cycle, etc.) as well as allows users to pay for these services through the app. Includes mapping to show users where these facilities are located.

Main technologies used	ITS; GPS mapping; Phone app.
How does the system collect/generate data (if any)	N/A
How does the system use data (if any)	Provides mapping showing locations of available shared cycle facilities as well as providing a method of payment.

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	N/A
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	Incorporates multiple types of transport (taxis, car hire, trains, share cycle, etc.) as well as allowing users to pay for these services through the app.
Impacts assessment / results (if available)	N/A
Other important information	

REFERENCES	
Documentation available on the project	
Web link(s)	Whim, 2019 [online: https://whimapp.com/uk/ accessed 19/09/2019].

GENERAL INFORMATION	
Name of service/system/project	**37. Variable Message Signs (VMS)**
Supplier of service/system/project	Technolution
Name of operator/organisation	City of Copenhagen
Service delivery	☒ Public ☐ Private
Main category	☐ Infrastructure-based ☐ Bicycle data ☒ Information provision to cyclists ☐ Interactive ITS for cyclists ☐ Other
Contact for more information	N/A

GEOGRAPHICAL ASPECTS	
Country	Denmark
Region/city of implementation	Copenhagen (DK)

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☒ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☐ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Deployment of Variable Message Signs (VMS) in order to inform cyclists about cycle lane congestion, with tube counters (and cameras) deployed to inform about disruption on the road.

Main technologies used	Digital panels; ITS; “Floating car data”, as well as other real-time traffic data (congestion, road works, etc); Tube counting stations on cycle lanes (replaced with automatic image recognition cameras due to ineffectiveness – however the usefulness of these is yet to be known).
How does the system collect/generate data (if any)	Data relating to traffic management is already collated via Copenhagen’s central traffic management platform (MobiMaestro). Additional data collated via tube count stations/cameras on cycle lane usage and movements.
How does the system use data (if any)	All data collected is used to inform cyclists via VMS signage as to congestion levels on cycle lanes, travel times for both cycling and car users, as well as potential alternative routes to avoid congestion for cyclists.

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	2017
Phase	☐ Planned ☒ Pilot ☐ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	As noted below, tube counting stations, used to detect congestion on cycle routes, were highly inaccurate, with automatic image recognition cameras now deployed to improve upon this. Copehagen already had a high level of cycle-use and postivie attidue towards cycling before scheme implimentation which likely factored into its success (continous funding, high cycle usage, etc).
Impacts assessment / results (if available)	Survey undertaken approximately 1 year after implementation (2018). (https://ecf.com/news-and-events/news/visionarycities-series-city-copenhagen-introduces-variable-message-signs)

	The questionnaire revealed that a large proportion of cyclist found cycle lane congestion an issue and that the majority cyclists would be willing to take longer routes in order to avoid congestion. Majority of cyclists found that the provided signing had "value" to them. Behavioural measurement was also undertaken to evaluate compliance with warning and suggestions provided through the use of tube counting stations which, when sensing congestion, suggested alternative routes. However, these provided very inaccurate readings and as such automatic image recognition cameras are now deployed to improve upon this.
Other important information	MobiMaestro Traffic Management System: https://www.technolution.eu/en/mobility/mobimaestro/

REFERENCES	
Documentation available on the project	Technolution, 2017. Digital Panels are Stimulating Bike Use in Copenhagen [online: https://www.technolution.eu/en/about-us/news/209-digital-panels-are-stimulating-bike-use-in-copenhagen.html accessed 18/09/2019]. ECF (European Cylists Federation), 2018. The City of Copenhagen Introdcues Variable Message Signs, Exclusively for Cyclists II [online: https://ecf.com/news-and-events/news/visionarycities-series-city-copenhagen-introduces-variable-message-signs accessed 18/09/2019]. ECF, 2017. City of Copenhagen Introduces Variable Message Signs – Exclusively for cyclists [online: https://ecf.com/news-and-events/news/smarter-cycling-series-city-copenhagen-introduces-variable-message-signs-%E2%80%93 accessed 18/09/2019].
Web link(s)	https://ecf.com/news-and-events/news/visionarycities-series-city-copenhagen-introduces-variable-message-signs

ILLUSTRATIONS

Variable Message Sign in Copenhagen (ECF, 2017)

GENERAL INFORMATION	
Name of service/system/project	**38. P-Route Cycle**
Supplier of service/system/project	Lumiguide
Name of operator/organisation	Gemeente Ultrecht
Service delivery	☒ Public ☐ Private
Main category	☐ Infrastructure-based ☐ Bicycle data ☒ Information provision to cyclists ☐ Interactive ITS for cyclists ☐ Other
Contact for more information	https://lumi.guide/en/contact-2/

GEOGRAPHICAL ASPECTS	
Country	Netherlands
Region/city of implementation	Utrecht (NL)

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☒ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☒ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Data is collected on the usage of cycle parking stands/facilities utilising optical sensors across Utrecht and used to provide details regarding this on dynamic routing information panels located across the city, as well as on a phone app. The information panels are also used to direct cyclists to available parking across the city. The collected data is also used to inform

	the council on where temporary "pop-up" cycle parking provision may be needed as well as other management decisions regarding cycling.
Main technologies used	Dynamic route information panels; Cycle parking optical sensors; ITS systems; Phone app.
How does the system collect/generate data (if any)	Collects data on the usage of cycle parking stands/facilities.
How does the system use data (if any)	Uses information on the usage of cycle parking stands to inform cyclists of the availability of parking within the city through signing and an app. This is also used to inform the council on where temporary "pop-up" cycle parking provision may be needed as well as other management decisions regarding cycling.

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	2015
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	A study was undertaken a year after implementation (2016) suggesting those familiar with the system are satisfied with it. However, the following improvements were made in light of this study: • Improved signing (larger with backlighting); • Solar-powered masts; • Additional information within/at the entrance to parking facilities; and • Pop up car parks and new public car parks were also included within the system.

	Utrecht already had a high level of cycle-use and positive attitude towards cycling before scheme implementation which likely factored into its success (continuous funding, high demand for cycle parking, etc).
Impacts assessment / results (if available)	https://www.utrecht.nl/fileadmin/uploads/documenten/wonen-en-leven/verkeer/fiets/p-route/2018-10-Factsheet-P-route-fiets.pdf (Dutch)
Other important information	

REFERENCES	
Documentation available on the project	Gemeente Utrecht, 2019. P-Route Bicycle [online: https://www.utrecht.nl/wonen-en-leven/verkeer/fiets/fiets-stallen/p-route accessed 18/09/2019]. Lumiguide, 2019. P-Route Bicycle – Utrecht [online: https://lumi.guide/en/portfolio-items/p-route-bicycle-utrecht/ accessed 19/09/2019].
Web link(s)	

ILLUSTRATIONS

Photo demonstrating dynamic route information panels (Lumiguide, 2019).

GENERAL INFORMATION	
Name of service/system/project	**39. OV-Fiets**
Supplier of service/system/project	NS
Name of operator/organisation	NS
Service delivery	☐ Public ☒ Private
Main category	☐ Infrastructure-based ☐ Bicycle data ☒ Information provision to cyclists ☐ Interactive ITS for cyclists ☐ Other
Contact for more information	N/A

GEOGRAPHICAL ASPECTS	
Country	The Netherlands
Region/city of implementation	The Netherlands

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☐ Tracking/tracing/counting ☐ Rewarding cyclists ☒ Other: Facilitate rental cycle usage
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Provision of cycle rental locations across the Netherlands, situated to be used for the “last-leg” of journeys (bus stops, metro stops, etc.) with associated mapping provided detailing locations and allowing rentals to be organised online.
Main technologies used	OS (or similar) mapping

How does the system collect/generate data (if any)	N/A
How does the system use data (if any)	Provides mapping to users detailing the location of rental bicycles.

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	N/A
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	A large number of rental locations across the Netherlands (almost 300). Situated to be used for the "last-leg" of journeys (bus stops, metro stops, etc.) facilitating usage.
Impacts assessment / results (if available)	N/A
Other important information	N/A

REFERENCES	
Documentation available on the project	NL, 2019a. OV-Fiets [online: https://www.ns.nl/en/door-to-door/ov-fiets accessed 19/09/2019]. NL, 2019b. OV-Fiets Mapping [online: https://www.ns.nl/deur-tot-deur/ov-fiets/huurlocaties/ accessed 19/09/2019].
Web link(s)	https://www.ns.nl/en/door-to-door/ov-fiets

ILLUSTRATIONS

Excerpt of OV-Fiets mapping (NL, 2019b).

GENERAL INFORMATION	
Name of service/system/project	**40. Naviki**
Supplier of service/system/project	
Name of operator/organisation	beemo GmbH
Service delivery	☒ Public ☒ Private
Main category	☐ Infrastructure based ☐ Bicycle data ☐ Information provision to cyclist ☒ Interactive system ☐ Other
Contact for more information	Phone +49 251 49099902, Mobile +49 176 99195760, medien@naviki.org

GEOGRAPHICAL ASPECTS	
Country	Germany
Region/city of implementation	Germany

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☒ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☒ Gamification ☒ Provide feedback to road operator ☒ Nudging ☒ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Route planner. Features – Turn-by-turn navigation, everyday routing, leisure routing, mountain bike routing, racing bike routing, s-pedelec routing, round trips, points of interest, offline maps, height profile, speed profile, connect fitness devices, convenient cockpit, record trips, turn by turn instructions for

	recorded routes and memorise routes. Gamification – Height profile. For all routes Naviki provides a height profile, the highest and lowest points and the total altitude to be cycled upwards.
Main technologies used	Mobile app
How does the system collect/generate data (if any)	OpenStreetMap (OSM) collects free editable geographic data, which can be used for creating maps. Naviki fully supports the OSM project. Naviki applies OSM map data to decide about the suitability of paths and roads for cycling. You are allowed and permitted by licensing rights to process Naviki data on OSM. By this option Naviki helps contributing to the further improvement of OSM. You can report suspected errors in the map directly on the OSM main page. Changes made to OSM are added to Naviki shortly afterwards. Naviki does not treat or interpret OSM data in a uniform manner, but gives preference to routes that are especially attractive for cycling. In doing so, Naviki distinguishes between the different needs of everyday, mountainbike, racing, leisure and e-bike cyclists.
How does the system use data (if any)	Via OSM

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	Since February 2009
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	Naviki is a new type of navigation system based on OSM data as well as on tracks contributed by Naviki users. Naviki is specialised on bike routing. With Naviki it is possible to find ideal bike routes, even in unfamiliar areas - conveniently and quickly on www.naviki.org
Impacts assessment / results (if available)	-

Other important information	-

REFERENCES	
Documentation available on the project	https://www.naviki.org/en/naviki/
Web link(s)	https://www.naviki.org/en/naviki/

ILLUSTRATIONS

GENERAL INFORMATION	
Name of service/system/project	**41. Mywindsock**
Supplier of service/system/project	Mywindsock
Name of operator/organisation	Mywindsock
Service delivery	☐ Public ☒ Private
Main category	☐ Infrastructure-based ☐ Bicycle data ☒ Information provision to cyclists ☐ Interactive ITS for cyclists ☐ Other
Contact for more information	https://mywindsock.com/page/contact/

GEOGRAPHICAL ASPECTS	
Country	United Kingdom
Region/city of implementation	United Kingdom

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☒ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☐ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Application that provides users with wind speed/direction information along their chosen route, as well as feedback as to the impact this may have had on their journey. Colour coding informs the user of the impact of wind along a chosen route (red indicating lots of headwind, with blue indicating light wind).

Main technologies used	Wind and routing information provided within an app.
How does the system collect/generate data (if any)	Collects data on user movements.
How does the system use data (if any)	Uses ITS to inform cyclists of local wind conditions, as well as track users to inform them of the impacts of this on their journey.

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	N/A
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	N/A
Impacts assessment / results (if available)	N/A
Other important information	Ability to integrate with Strava cycle app.

REFERENCES	
Documentation available on the project	Mywindsock, 2019 [online https://mywindsock.com/#blocks-routes accessed 19/09/2019].
Web link(s)	

GENERAL INFORMATION

Name of service/system/project	**42. Next Generation of Journey Planner in a Smart City (JPlanner)**
Supplier of service/system/project	Institute for Infocomm Research
Name of operator/organisation	Institute for Infocomm Research
Service delivery	☐ Public ☒ Private
Main category	☐ Infrastructure-based ☐ Bicycle data ☒ Information provision to cyclists ☐ Interactive ITS for cyclists ☐ Other
Contact for more information	Institute for Infocomm Research

GEOGRAPHICAL ASPECTS	
Country	Singapore
Region/city of implementation	Singapore

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☒ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☐ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other:
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Research paper regarding an alternative multi-modal journey planner in Singapore, includes other forms of transport outside of cycling. Comparisons also made with alternative solutions such as Google Earth.
Main technologies used	Given that JPlanner provides multi-modal (bus, car, cycle, etc.) information, a plethora of technologies used, however those relating to cycling appear to be GPS/mapping services and

	information regarding cycle parking location and occupancy levels (where available).
How does the system collect/generate data (if any)	Collects traffic data (congestion, etc).
How does the system use data (if any)	Provides users with routing options so uses GPS and other traffic/routing relevant data (congestion, etc).

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	Journal published in 2015
Phase	☐ Planned ☒ Pilot ☐ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	The use of real-time data for planning appeared to be preferred over the use of fixed data (e.g. public transport scheduling). The app supporting multi-modal transport planning likely increases its usefulness.
Impacts assessment / results (if available)	Compared Jplanner functionality with Google Maps and Gothere, suggesting that JPlanner was more useful due to more detailed mapping.
Other important information	For cycle routing, JPlanner prioritised safety over other aspects (e.g. distance).

REFERENCES	
Documentation available on the project	Y, Liang. Shao, D. Wu, H., 2015. Next Geneation of Journey Planner in a Smart City. 1EEE International Conference on Data Mining Workshops [online: https://ieeexplore.ieee.org/abstract/document/7395700 accessed 19/09/2019].
Web link(s)	https://ieeexplore.ieee.org/abstract/document/7395700

GENERAL INFORMATION	
Name of service/system/project	**43. Donkey Bikes**
Supplier of service/system/project	Donkey Republic
Name of operator/organisation	Donkey Republic
Service delivery	☒ Public ☒ Private
Main category	☐ Infrastructure-based ☐ Bicycle data ☐ Information provision to cyclists ☒ Interactive ITS for cyclists ☐ Other
Contact for more information	https://cities.donkey.bike/contact/

GEOGRAPHICAL ASPECTS	
Country	Denmark
Region/city of implementation	Multiple cities across Europe

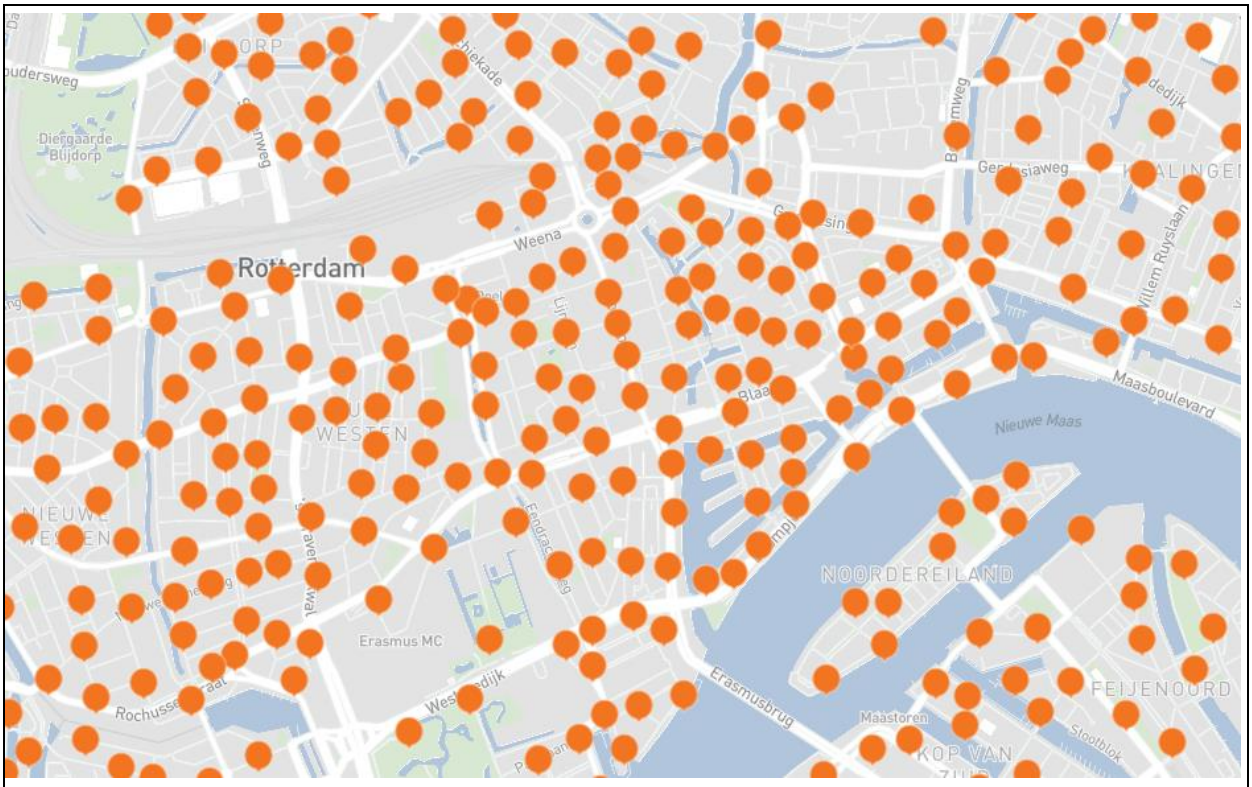
ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☐ Tracking/tracing/counting ☐ Rewarding cyclists ☒ Other: Facilitate rental bike usage through an app and mapping
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Bicycle rental scheme across multiple European cities. Users can pay for and unlock bikes via their phone, with mapping provided to show the locations of these facilities.

Main technologies used	OS (or similar) mapping to provide details on bike and drop-off locations; GPS to track bikes; Phone app; Smart bike locks that can be unlocked via an app.
How does the system collect/generate data (if any)	Will need to track bike usage levels, movements, etc.
How does the system use data (if any)	Uses GPS and mapping technologies to provide information on bicycle and drop-off locations.

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	N/A
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	Large numbers of cycles and drop-off locations available. Combines mapping and payment into one app, simplifying the process for users.
Impacts assessment / results (if available)	N/A
Other important information	Appears to be done in collaboration with cities, suggesting a level of public/governmental involvement.

REFERENCES	
Documentation available on the project	Donkey Republic, 2019 [online: https://www.donkey.bike/ acccessed 19/09/2019].
Web link(s)	

ILLUSTRATIONS



Excerpt demonstrating rental locations within Rotterdam (Donkey Republic, 2019)

GENERAL INFORMATION	
Name of service/system/project	**44. Cycle Specific Green Waves**
Supplier of service/system/project	Likely to have been provided by Swarco (https://www.swarco.com/stories/greenwave-copenhagen-denmark)
Name of operator/organisation	Unknown
Service delivery	☒ Public ☐ Private
Main category	☒ Infrastructure-based ☐ Bicycle data ☐ Information provision to cyclists ☐ Interactive ITS for cyclists ☐ Other
Contact for more information	Unknown

GEOGRAPHICAL ASPECTS	
Country	Denmark
Region/city of implementation	Copenhagen (DK)

ITS SERVICE DESCRIPTION	
General Objectives	☒ Improve speed ☐ Increase of safety ☒ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☐ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other:
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Provision of LEDs embedded in cycle lanes in order to inform cyclists as to whether they will be able to reach the next green light at a set of traffic signals and the pace required. It also includes sensors at junctions in order to prioritise green time at future junctions for groups of cyclists detected.

Main technologies used	LEDs embedded in asphalt; Sensors to detect cyclists.
How does the system collect/generate data (if any)	Collects data on cyclist movements.
How does the system use data (if any)	Uses locations of cyclists in order to time traffic lights to allow them through without stopping ("green wave"). Also provides information to cyclists via embedded LEDs as to the speed they will need to travel at to catch the next green light at an upcoming junction.

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	Implemented over two phases (Green Wave 1.0 & 2.0)
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	Green Wave 2.0 implementing cyclist detection at junctions in order to keep traffic lights green for groups of cyclists. Had to make modifications to the system due to negative impacts on bus travel times.
Impacts assessment / results (if available)	Centre for Public Impact (2016) assessment. Assessed Green Wave 1.0. Cyclist's journey times reduced by 17%, with the average number of stops at junctions reduced from 6 to 1. Negative impact on bus travel times.
Other important information	Similar schemes have been trialled in San Francisco (https://sf.streetsblog.org/2011/01/06/green-wave-becomes-permanent-on-valencia-street/) and Chicago (https://chi.streetsblog.org/2015/06/19/surfing-the-green-wave-cdot-pilots-bike-friendly-signal-timing-on-wells/)

REFERENCES	
Documentation available on the project	Centre for Public Impact, 2016. Green Waves for Bicycles in Copenhagen [online: https://www.centreforpublicimpact.org/case-study/green-waves-bicycles-copenhagen/ accessed 19/09/2019].

Web link(s)	

ILLUSTRATIONS

Swarco, 2017 [online: https://www.youtube.com/watch?v=IfMp42fS4QU].

GENERAL INFORMATION	
Name of service/system/project	**45. Brighton Cycle Hub**
Supplier of service/system/project	Cyclepods/Lumiguide
Name of operator/organisation	Southern Rail
Service delivery	☐ Public ☒ Private
Main category	☒ Infrastructure-based ☐ Bicycle data ☐ Information provision to cyclists ☐ Interactive ITS for cyclists ☐ Other
Contact for more information	

GEOGRAPHICAL ASPECTS	
Country	United Kingdom
Region/city of implementation	Brighton (UK)

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☒ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☐ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Provision of a 500-cycle space storage facility at Brighton Rail Station, including swipe cards for entry into the facility and signing outside and within providing details on the number of spaces available, as well as directions to these. Targets Southern Rail users at Brighton Station.

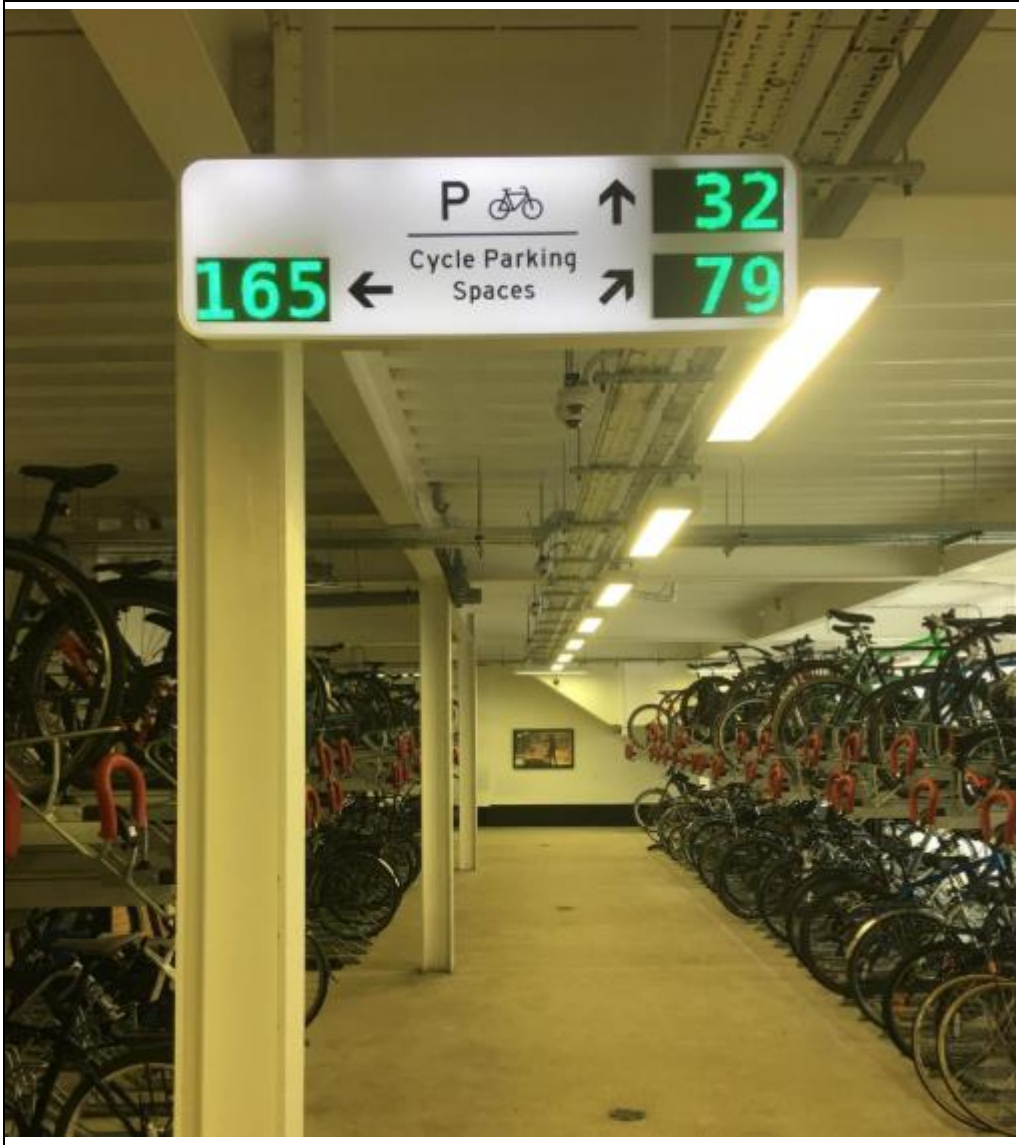
Main technologies used	ITS; Cycle parking sensors; “Swipe” cards for entry into the hub.
How does the system collect/generate data (if any)	Collects data on the usage of cycle parking stands within the hub.
How does the system use data (if any)	Uses data to provide information on the number of parking spaces available outside and within the hub, with directions provided.

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	2015
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	“Swipe” card also acts as a South Rail travel card, increasing convenience; Situated in Brighton, with a relatively high level of cycle usage. Storage is free to use, with alternative methods for generating revenue (rental from additional space within the hub building). A repair facility is located within the hub, as well as a café which facilitates group meetings which increase the usefulness of the hub.
Impacts assessment / results (if available)	N/A
Other important information	

REFERENCES	
Documentation available on the project	Cyclepods, 2019. Brighton Cyclehub [online: https://www.cyclepods.co.uk/case-studies/brighton-cyclehub/ acccessed 18/09/2019].

	Southern Rail, 2019. Cycle Hubs [online: https://www.southernrailway.com/travel-information/on-board/bringing-a-bike/cycle-hubs acccessed 18/09/2019]. EU (European Union), 2019. Clean Transport, Urban Transport – 1.9 Multimodal Integration [online: https://ec.europa.eu/transport/themes/urban/cycling/guidance-cycling-projects-eu/cycling-measure/19-multimodal-integration_en acccessed 18/09/2019]. Lumiguide, 2019. Brighton Bicycle Parking: A European Commission Case Study [online: https://lumi.guide/en/brighton-bicycle-parking-eu-case-study/ acccessed 18/09/2019].
Web link(s)	

ILLUSTRATIONS



Ref: Cyclepods, n.d.

GENERAL INFORMATION	
Name of service/system/project	**46. BikeCitizen**
Supplier of service/system/project	-
Name of operator/organisation	Bike Citizens Mobile Solutions GmbH
Service delivery	☒ Public ☒ Private
Main category	☐ Infrastructure based ☐ Bicycle data ☐ Information provision to cyclist ☒ Interactive system ☐ Other
Contact for more information	info@bikecitizens.net

GEOGRAPHICAL ASPECTS	
Country	Germany, Austria
Region/city of implementation	Over 450 cities worldwide

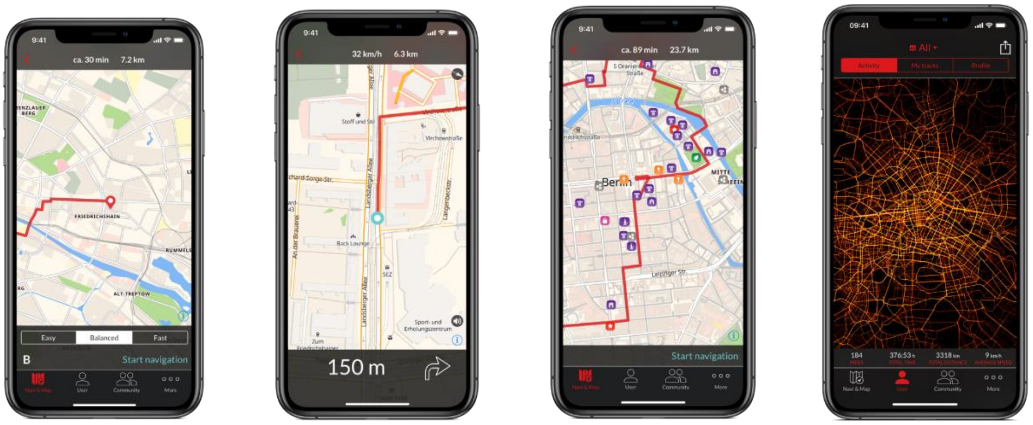
ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☒ Increase cyclist comfort ☐ Facilitate bicycle parking ☒ Facilitate routing ☒ Gamification ☒ Provide feedback to road operator ☒ Nudging ☒ Tracking/tracing/counting ☒ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Discover new cycle routes, record journeys, discover new places, be guided by voice prompts, explore the city via a cycle tour, and add summary of your activities.

Main technologies used	GPS, Cycling route Planner, Cycling route Planner, Reach per bike (#5minsbybike), Route export, POIs (Points of Interest)
How does the system collect/generate data (if any)	Of all survey methods GPS cycling data renders the highest density of information: exact route taken, speed, delays and even choice. Personalised location data is stored on servers. This means that individual journeys are linked to the login details and can then be viewed in a personalised view on a dashboard. The transfer of personalised data between smartphone or computer and servers is always encrypted. In addition, the password in the server database is stored in an encrypted form (using Salt). The database servers are located in Germany or Austria.
How does the system use data (if any)	Bike Citizens Analytics is a GPS data analysis tool designed specifically to analyse bicycle traffic which places bicycle data analyses at the forefront of urban planning.

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	-
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	Bike Citizens Analytics offers a continuously expanding number of features that analyse, visualise and interpret GPS cycling data. Some features are pretty self explanatory, some work invisibly in the background, some may reveal their true power in combination or in correlation with a complementary feature on the other side of the split screen.
Impacts assessment / results (if available)	Total number of journeys: 3 732 925 Total kilometres: 22 021 630 km
Other important information	Other features: intensity, the detail screen, heatmap simulation, speed, relative speed, delay, attractivity, traffic spider, detail routes, destinations, action radius, ping if you care!

REFERENCES	
Documentation available on the project	https://www.bikecitizens.net/
Web link(s)	https://www.bikecitizens.net/

ILLUSTRATIONS



GENERAL INFORMATION	
Name of service/system/project	**47. Komoot**
Supplier of service/system/project	-
Name of operator/organisation	komoot GmbH
Service delivery	☒ Public ☒ Private
Main category	☐ Infrastructure based ☐ Bicycle data ☐ Information provision to cyclist ☒ Interactive system ☐ Other
Contact for more information	help@komoot.de

GEOGRAPHICAL ASPECTS	
Country	Germany, Austria
Region/city of implementation	Worldwide

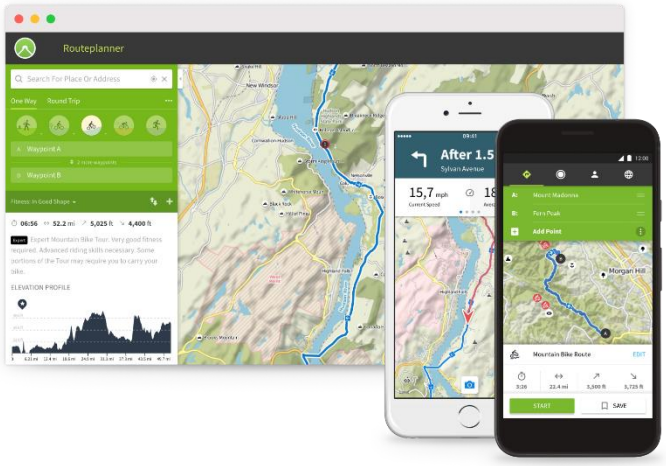
ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☒ Increase of safety ☒ Increase cyclist comfort ☐ Facilitate bicycle parking ☒ Facilitate routing ☒ Gamification ☒ Provide feedback to road operator ☒ Nudging ☒ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Features are: Customizable, Navigation, offline functionality, share adventures, highlight favorite moments, invite others along for the ride.

Main technologies used	Connect with Smart Watches, E-Bikes, GPS Devices & other gear
How does the system collect/generate data (if any)	Komoot collect the data in servers
How does the system use data (if any)	GPX Export and Import functionality

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	From 2010
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	
Impacts assessment / results (if available)	Offline maps are currently available in the following countries: Germany, Austria, Switzerland, United Kingdom, Ireland, France, Luxembourg, Belgium, Netherlands, Denmark, Italy, Spain, Portugal, Poland, Czech Republic, Slovenia, Croatia, Malta, Turkey, Greece, Cyprus, Hungary, Bulgaria, Slovakia, Romania, Iceland, Norway, Sweden, Finland, Latvia, Lithuania, Estonia, Bosnia and Herzegovina, Albania, Serbia, Montenegro, Macedonia, Moldova, Belarus, Ukraine, United States, Hawaii, Canada, Haiti, Tahiti, Mexico, Cuba, Bahamas, Jamaica, Puerto Rico, Dominican Republic, Central America, South America, Georgia, Jordan, Israel, Iran, Yemen, Oman, Qatar, Bahrain, Kuwait, Saudi Arabia, United Arab Emirates, India, Nepal, Myanmar, Sri Lanka, Japan, South Korea, Taiwan, Vietnam, Laos, Thailand, Cambodia, Malaysia, Philippines, Australia, New Zealand, Mainland Africa, Cabo Verde, Madagascar, Mauritius
Other important information	Become a Pioneer. Once you get the most upvotes in your region, you'll become the Pioneer— and you'll get the golden badge to prove it.

	What makes a great Pioneer - “Sharing the best spots as highlights for the world to see, writing the most insightful tips, providing the most beautiful photos, voting on others’ tips and photos”

REFERENCES	
Documentation available on the project	https://support.komoot.com/hc/en-us
Web link(s)	https://www.komoot.com

ILLUSTRATIONS


GENERAL INFORMATION	
Name of service/system/project	**48. Strava**
Supplier of service/system/project	strava
Name of operator/organisation	Strava
Service delivery	☒ Public ☒ Private
Main category	☐ Infrastructure based ☐ Bicycle data ☐ Information provision to cyclist ☐ Interactive system ☐ Other
Contact for more information	

GEOGRAPHICAL ASPECTS	
Country	United States
Region/city of implementation	San Francisco, California (US)

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☒ Gamification ☐ Provide feedback to road operator ☒ Nudging ☒ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g.	Track & analyse all activity, share & connect, explore & compete, measure performance, social network concept.

geographical dimension, numbers, target group, costs etc.	
Main technologies used	GPS
How does the system collect/generate data (if any)	In July 2015, Strava switched to MapBox maps and imagery, based on OpenStreetMap data. Strava allows users to report issues with the maps, which are linked to the OpenStreetMap editor so that users can contribute improvements to the map
How does the system use data (if any)	Via OSM

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	Since 2009
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	Strava is a social fitness network, that is primarily used to track cycling and running exercises, using GPS data although alternative types are available. Strava offers a free service with no advertising in its mobile application, and a monthly subscription plan called Strava Summit (formerly Strava Premium).
Impacts assessment / results (if available)	-
Other important information	Strava Metro, a program marketed towards city planners, uses cycling data from Strava users in supported cities and regions, allowing ad-free use of the software there for everyone. There are two eras of endurance sport history: before segments, and after segments. Created by the millions of Strava athletes, segments mark popular stretches of road or trail (like your favorite local climb) and create a leaderboard of times set by every Strava athlete who has been there before.

REFERENCES	
Documentation available on the project	https://support.strava.com/hc/en-us/categories/202558427
Web link(s)	https://www.strava.com/about

ILLUSTRATIONS


GENERAL INFORMATION	
Name of service/system/project	**49. Locus map**
Supplier of service/system/project	
Name of operator/organisation	Locus Map is developed by an independent software company Asamm Software.
Service delivery	☒ Public ☒ Private
Main category	☐ Infrastructure based ☐ Bicycle data ☐ Information provision to cyclist ☒ Interactive system ☐ Other
Contact for more information	https://www.locusmap.eu/contact/

GEOGRAPHICAL ASPECTS	
Country	Prague, Czech Republic
Region/city of implementation	English, German, French, Italian, Spanish, Russian, Chinese, and other 23 languages

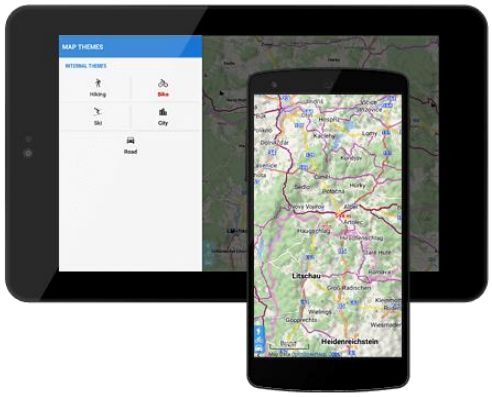
ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☒ Increase cyclist comfort ☐ Facilitate bicycle parking ☒ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☒ Nudging ☒ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Locus Map has been developed in cooperation with its users who communicate with the app's developers via dedicated forum or general GPS or navigation discussions. The main source of users' contributions is the helpdesk with voting

	system - users themselves vote for changes and improvements in the app
Main technologies used	Selection of Maps and GPS Location, GPS Navigation for your Biking and Hiking, Offline Maps, Geocaching, Track Recording, Own Points and Tracks, Live tracking
How does the system collect/generate data (if any)	-
How does the system use data (if any)	-

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	Since 2009
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	Dashboards Location Selector GPS/Compass Altitude Manager Bluetooth Manager ANT+ Manager Backup Manager NFC Manager QR Code Generator
Impacts assessment / results (if available)	-
Other important information	https://en.wikipedia.org/wiki/Locus_Map

REFERENCES	
Documentation available on the project	https://www.locusmap.eu/contact/
Web link(s)	https://www.locusmap.eu

ILLUSTRATIONS



GENERAL INFORMATION	
Name of service/system/project	**50. Bikemap**
Supplier of service/system/project	-
Name of operator/organisation	Bikemap GmbH
Service delivery	☒ Public ☒ Private
Main category	☐ Infrastructure based ☐ Bicycle data ☐ Information provision to cyclist ☒ Interactive system ☐ Other
Contact for more information	office@bikemap.net

GEOGRAPHICAL ASPECTS	
Country	Austria
Region/city of implementation	Worldwide

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☒ Facilitate routing ☐ Gamification ☒ Provide feedback to road operator ☐ Nudging ☒ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Mapping for bicycles Features: Bicycle routes worldwide, can be created by user, can be used online and offline, real-time information, big bicycle community.

Main technologies used	Mobile app using GPS and other technologies.
How does the system collect/generate data (if any)	The app uses data to load the map and the route.
How does the system use data (if any)	Bikemap uses a combination of cellular, Wi-Fi, Bluetooth, and GPS signals to determine the location.

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	April 2007
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	App can be used in offline mode
Impacts assessment / results (if available)	-
Other important information	-

REFERENCES	
Documentation available on the project	https://www.bikemap.net/
Web link(s)	https://www.bikemap.net/

ILLUSTRATIONS


GENERAL INFORMATION	
Name of service/system/project	**51. Radfahren - Fahrrad Tracker**
Supplier of service/system/project	-
Name of operator/organisation	-
Service delivery	☒ Public ☒ Private
Main category	☐ Infrastructure based ☐ Bicycle data ☐ Information provision to cyclist ☒ Interactive system ☐ Other
Contact for more information	support@zeopoxa.com

GEOGRAPHICAL ASPECTS	
Country	Germany
Region/city of implementation	Worldwide

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☒ Tracking/tracing/counting ☐ Rewarding cyclists ☒ Other: Bicycle fitness app
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Number of installations: 1.000.000+ Bicycle fitness app. Features: workout plans, challenges, routing, blog, statistics and goal tracking and shop.

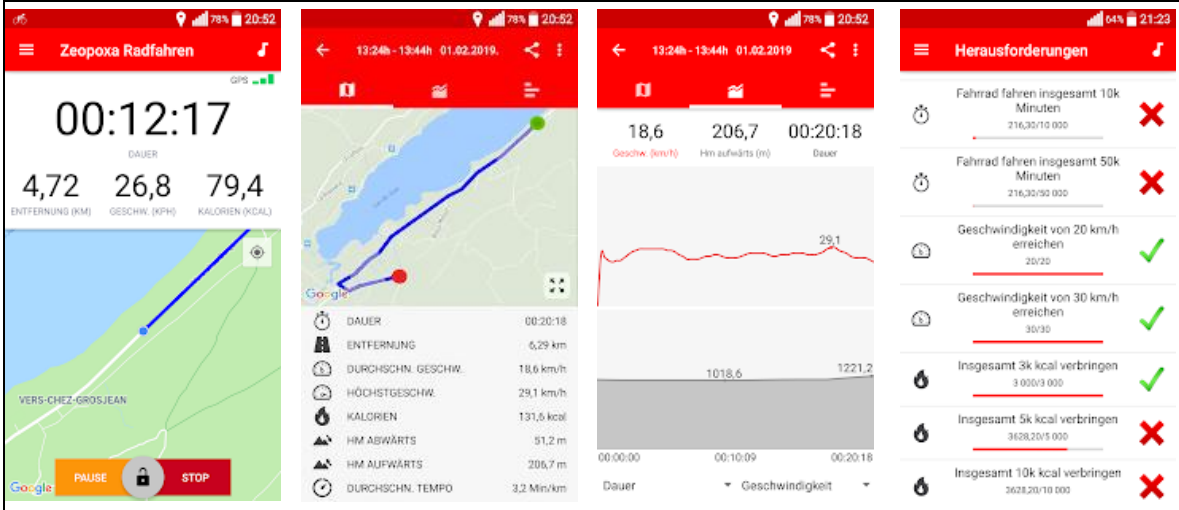
Main technologies used	GPS
How does the system collect/generate data (if any)	In the servers
How does the system use data (if any)	-

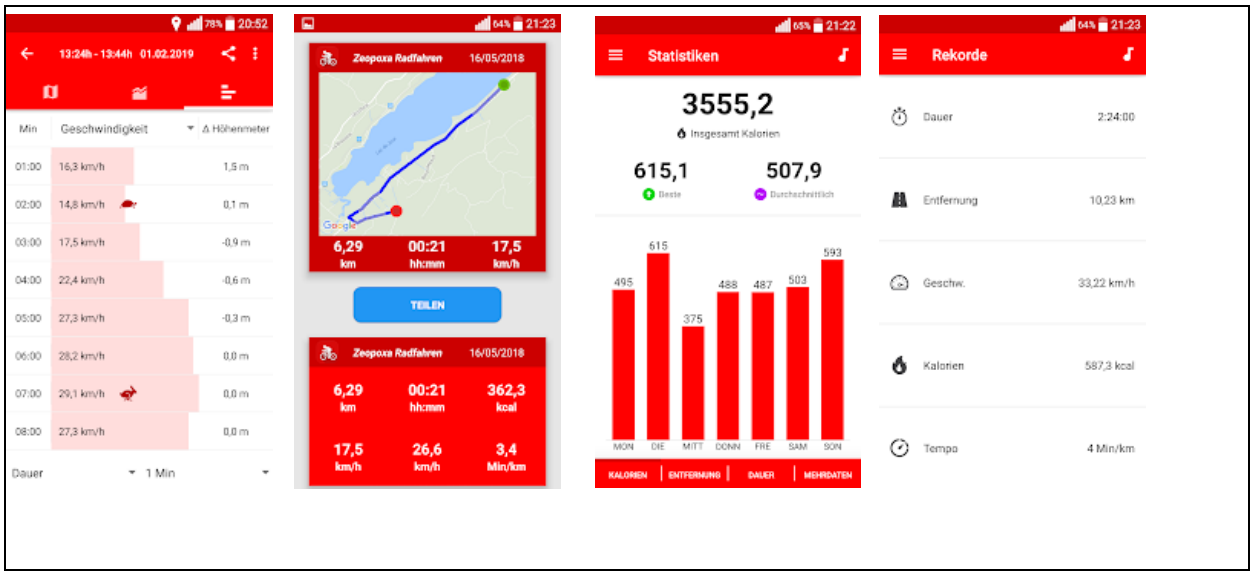
IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	APP FUNCTIONS & BENEFITS: * Plan your training times in real time with GPS & Monitor practice progress * Calculate distance, duration, speed and calories burned for your activity - with high accuracy and in real time. * Get a complete report of your driving after you finish with the following information: duration, distance, calories burned, average speed, maximum speed, average speed, percentage of time you cycle, normal or fast bike and Map with the route on which you cycle * Extended charts for distance, time and calories burned, in 3 different intervals (week, month and year) * Cycling - The Bike Tracker app allows you to set goals that are right for you (number of calories burned, distance traveled or cycling during the day) and get notified when they reach them * No need for a wristband or other hardware, no logging in to a web page, just download it for free and start pursuing your exercise right away. Cycling - The Bicycle Tracker app works completely on your phone

	* Complete the challenges the app offers and stay motivated to do more cycling * Get audio updates about your calorie count, pace, speed, distance, and time as you do exercises
Impacts assessment / results (if available)	-
Other important information	-

REFERENCES	
Documentation available on the project	https://play.google.com/store/apps/details?id=com.zeopoxa.fitness.cycling.bike&hl=de
Web link(s)	https://play.google.com/store/apps/details?id=com.zeopoxa.fitness.cycling.bike&hl=de

ILLUSTRATIONS




13:24h - 13:44h 01.02.2019
Min
Geschwindigkeit
Δ Höhenmeter
Dauer
1 Min
Zeopoxa Radfahren
16/05/2018
6,29
km
00:21
hh:mm
17,5
km/h
TEILEN
362,3
kcal
26,6
km/h
3,4
Min/km
Statistiken
3555,2
Insgesamt Kalorien
615,1
507,9
MON
DIE
MITT
DONN
FRE
SAM
SON
KALORIEN
ENTFERNUNG
DAUER
MEHRDATEN
Rekorde
Dauer
2:24:00
Entfernung
10,23 km
Geschw.
33,22 km/h
Kalorien
587,3 kcal
Tempo
4 Min/km

GENERAL INFORMATION	
Name of service/system/project	**52. mapmyride**
Supplier of service/system/project	-
Name of operator/organisation	
Service delivery	☒ Public ☒ Private
Main category	☐ Infrastructure based ☐ Bicycle data ☐ Information provision to cyclist ☒ Interactive system ☐ Other
Contact for more information	

GEOGRAPHICAL ASPECTS	
Country	Germany
Region/city of implementation	Wordlwide

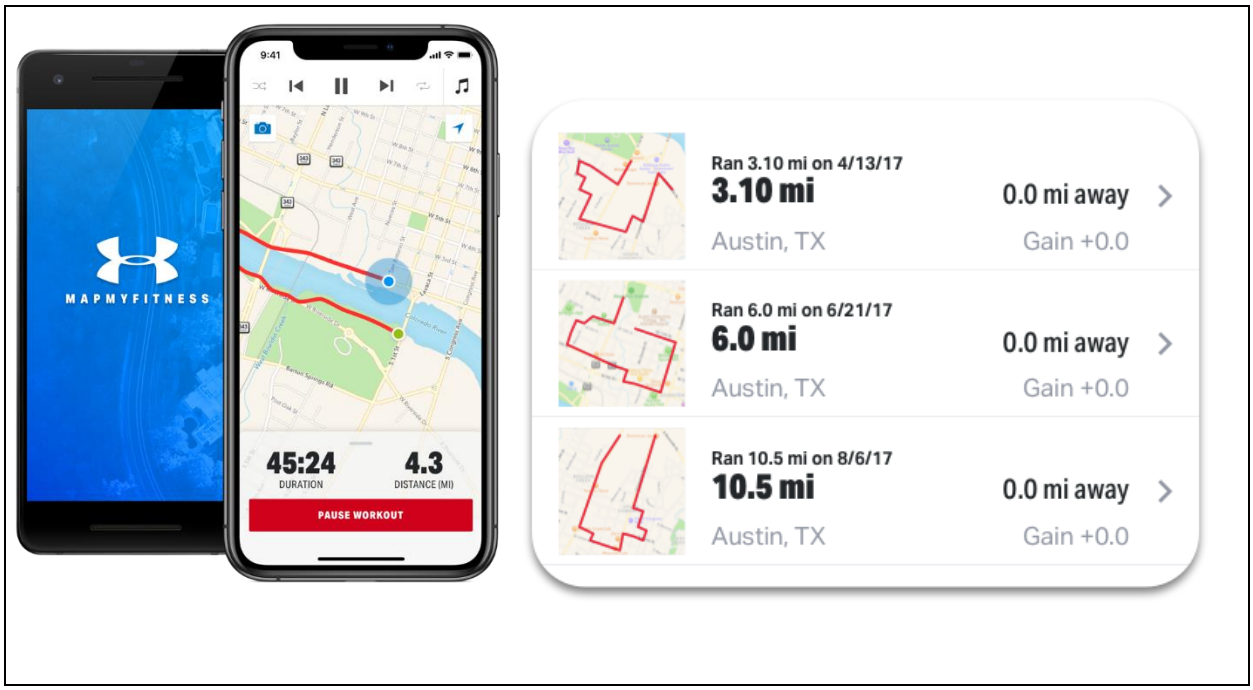
ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☒ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☒ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Map My Ride is focused more on activity tracking, route generation, and route discovery. The social aspects are not as prominent nor the focus of the application. It offers comparable (and sometimes better) analysis tools for *paying members* as well as superior course creation tools.

Main technologies used	GPS, GPX, Boolteeth, WiFi
How does the system collect/generate data (if any)	servers
How does the system use data (if any)	

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	Since April 2007
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	MMR is generally a better experience if you tend to ride solo or with other people who do not use Strava. It is more focused on comparing your efforts to yourself rather than competing with other people.
Impacts assessment / results (if available)	-
Other important information	-

REFERENCES	
Documentation available on the project	https://www.mapmyfitness.com
Web link(s)	https://www.mapmyfitness.com

ILLUSTRATIONS


MAPMYFITNESS
9:41
45:24
DURATION
4.3
DISTANCE (MI)
PAUSE WORKOUT
Ran 3.10 mi on 4/13/17
3.10 mi
Austin, TX
0.0 mi away
Gain +0.0
Ran 6.0 mi on 6/21/17
6.0 mi
Austin, TX
0.0 mi away
Gain +0.0
Ran 10.5 mi on 8/6/17
10.5 mi
Austin, TX
0.0 mi away
Gain +0.0

GENERAL INFORMATION	
Name of service/system/project	**53. Poliscan LIDAR-based traffic surveillance**
Supplier of service/system/project	Vitronic
Name of operator/organisation	
Service delivery	☐ Public ☒ Private
Main category	☒ Infrastructure based ☐ Bicycle data ☐ Information provision to cyclist ☐ Interactive system ☐ Other
Contact for more information	

GEOGRAPHICAL ASPECTS	
Country	Germany
Region/city of implementation	Germany

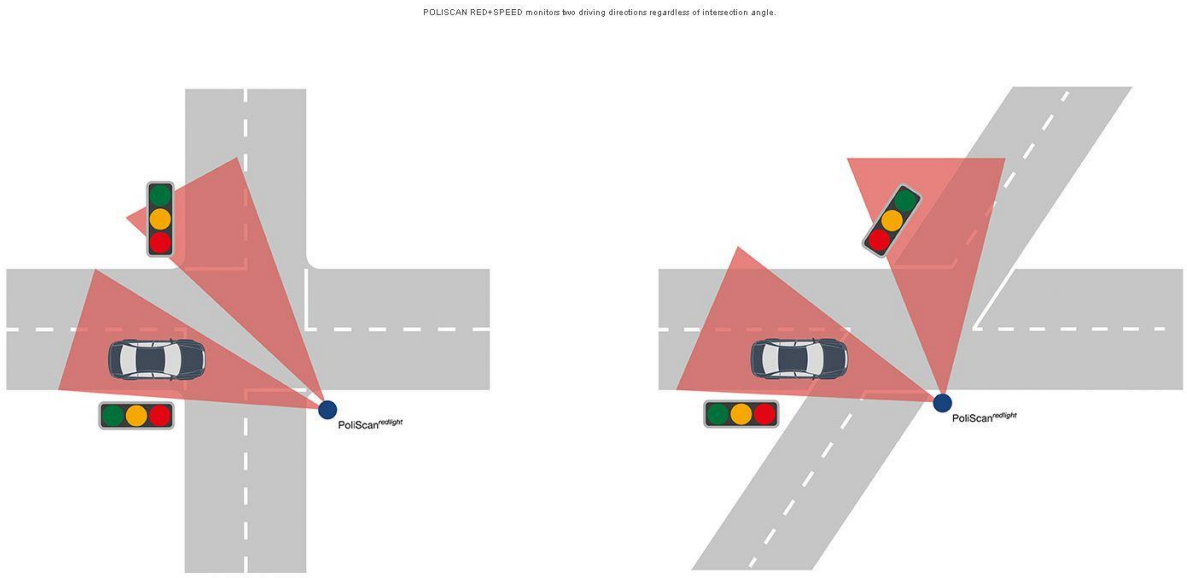
ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☒ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☐ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Laser-based red light enforcement. It does not require loops or additional piezo sensors near stop lines. Based on rotatable individual segments, it allows monitoring of two travel directions from a single location.

Main technologies used	Lidar
How does the system collect/generate data (if any)	Based on rotatable individual segments, it allows monitoring of two travel directions from a single location.
How does the system use data (if any)	

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	
Phase	☐ Planned ☐ Pilot ☐ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	
Impacts assessment / results (if available)	
Other important information	

REFERENCES	
Documentation available on the project	
Web link(s)	https://www.vitronic.com/traffic-technology/applications/traffic-enforcement/red-light-enforcement.html

ILLUSTRATIONS



GENERAL INFORMATION	
Name of service/system/project	**Eco-DISPLAY Classic, Compact en Classic+**
Supplier of service/system/project	Ecocounter
Name of operator/organisation	
Service delivery	☐ Public ☒ Private
Main category	☒ Infrastructure based ☒ Bicycle data ☒ Information provision to cyclist ☐ Interactive system ☐ Other
Contact for more information	

GEOGRAPHICAL ASPECTS	
Country	Canada - France
Region/city of implementation	Chicago (US), Auckland (NZ), Mexico (MX), Avesta (SE), Belo-Horizonte (BR), Izmir (TR), Prague (CZ)

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☒ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Real time bike counter (three versions). Two versions highlight safety with a flashing icon triggered whenever a cyclist is in a nearby bike lane, alerting drivers of their presence.

Main technologies used	
How does the system collect/generate data (if any)	Either ZELT loops or a MULTI counting system installed adjacent to the display unit
How does the system use data (if any)	

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	
Impacts assessment / results (if available)	
Other important information	

REFERENCES	
Documentation available on the project	
Web link(s)	https://www.eco-compteur.com/en/home/

ILLUSTRATIONS

GENERAL INFORMATION	
Name of service/system/project	**55. SolarPath**
Supplier of service/system/project	
Name of operator/organisation	
Service delivery	☐ Public ☒ Private
Main category	☒ Infrastructure based ☐ Bicycle data ☐ Information provision to cyclist ☐ Interactive system ☐ Other
Contact for more information	

GEOGRAPHICAL ASPECTS	
Country	Netherlands
Region/city of implementation	Ede (NL)

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☒ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☐ Tracking/tracing/counting ☐ Rewarding cyclists ☒ Other: Collecting energy_____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Prefab concrete Easypath bike path elements are equipped with a top layer with solar collectors. The energy will be used for surrounding buildings, housing, public spaces and street lighting.

Main technologies used	Solar collectors
How does the system collect/generate data (if any)	/
How does the system use data (if any)	/

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	2017
Phase	☐ Planned ☒ Pilot ☐ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	
Impacts assessment / results (if available)	
Other important information	

REFERENCES	
Documentation available on the project	
Web link(s)	https://easypath.nl/solarpath-fietspadelementen-zonne-energie

ILLUSTRATIONS

GENERAL INFORMATION	
Name of service/system/project	**56. Thermopath**
Supplier of service/system/project	Easypath
Name of operator/organisation	
Service delivery	☐ Public ☒ Private
Main category	☒ Infrastructure based ☐ Bicycle data ☐ Information provision to cyclist ☐ Interactive system ☐ Other
Contact for more information	

GEOGRAPHICAL ASPECTS	
Country	Netherlands
Region/city of implementation	Ede (NL)

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☒ Increase of safety ☒ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☐ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Used in Ede on one of theri most busy bikepaths (2.500 – 3.500 cylcist a day) to ensure that in winterconditions the roads are icefree. During the manufacturing process of the concrete cycle path elements special heating pipes are added. The heating pipes keep the bicycle lanes ice-free and snow-free.

Main technologies used	During the manufacturing process of the concrete cycle path elements special heating pipes are added. The heating pipes keep the bicycle lanes ice-free and snow-free.
How does the system collect/generate data (if any)	/
How does the system use data (if any)	/

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	2016
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	
Impacts assessment / results (if available)	
Other important information	

REFERENCES	
Documentation available on the project	
Web link(s)	https://easypath.nl/thermopath-zonnefietspad

ILLUSTRATIONS

GENERAL INFORMATION	
Name of service/system/project	**57. Green Wave**
Supplier of service/system/project	Lane Light
Name of operator/organisation	
Service delivery	☐ Public ☒ Private
Main category	☒ Infrastructure based ☐ Bicycle data ☐ Information provision to cyclist ☐ Interactive system ☐ Other
Contact for more information	

GEOGRAPHICAL ASPECTS	
Country	Denmark
Region/city of implementation	Copenhagen (DK)

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☒ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☐ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	GREEN in-road lights "flow" in timing with with your existing vehicle green wave to let cyclists know the pace they need to match to catch the next green light. 20 Km/h was decided as the speed in order to improve the traffic flow of bicycles. The average speed of bicycle users in Copenhagen is about 16 km/h. A wave of 20 km/h encourges some to go a bit faster but it also encourages the faster cyclists

	to slow down in order to benefit from the green lights. The rush hour on the cycle tracks is intense in Copenhagen and speed devils do more harm than good regarding safety and, almost more importantly, perception of safety.
Main technologies used	In-road green led lights
How does the system collect/generate data (if any)	/
How does the system use data (if any)	/

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	2007
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	
Impacts assessment / results (if available)	
Other important information	

REFERENCES	
Documentation available on the project	http://www.copenhagenize.com/2014/08/the-green-waves-of-copenhagen.html
Web link(s)	https://lanelight.com/bike-lanes-3/

ILLUSTRATIONS

GENERAL INFORMATION	
Name of service/system/project	**58. LaneLight in BikeSafe system**
Supplier of service/system/project	Lane light
Name of operator/organisation	
Service delivery	☐ Public ☒ Private
Main category	☒ Infrastructure based ☐ Bicycle data ☐ Information provision to cyclist ☐ Interactive system ☐ Other
Contact for more information	

GEOGRAPHICAL ASPECTS	
Country	Canada, Denmark
Region/city of implementation	Canada, Denmark

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☒ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☐ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	RED in-road warning lights activate in sync with the overhead traffic lights reinforcing the red light phase (and optional amber light phase) to approaching cyclist.

Main technologies used	In-road red led lights
How does the system collect/generate data (if any)	/
How does the system use data (if any)	/

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	
Phase	☐ Planned ☐ Pilot ☐ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	
Impacts assessment / results (if available)	
Other important information	

REFERENCES	
Documentation available on the project	
Web link(s)	https://lanelight.com/bike-lanes-3/

ILLUSTRATIONS


GENERAL INFORMATION	
Name of service/system/project	**59. Cyclemeter**
Supplier of service/system/project	Swarco
Name of operator/organisation	
Service delivery	☐ Public ☒ Private
Main category	☒ Infrastructure based ☒ Bicycle data ☒ Information provision to cyclist ☐ Interactive system ☐ Other
Contact for more information	

GEOGRAPHICAL ASPECTS	
Country	Worldwide
Region/city of implementation	Worldwide

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☒ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	The cyclemeter is installed along cycle paths and can be equipped with multiple displays presenting information such as the number of bicycles per today, per year or any other time range. Additional information like date and time, air temperature or the city's logo can also be shown. In addition to providing this information to cyclists and citizens, the city's

	traffic engineers also get a more detailed picture of the city's bicycle traffic.
Main technologies used	LED technology
How does the system collect/generate data (if any)	Historical data is stored in a central database which provides access to valuable information, 24 hour a day all year around, for the city's traffic planners and future research.
How does the system use data (if any)	

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	
Phase	☐ Planned ☐ Pilot ☐ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	
Impacts assessment / results (if available)	
Other important information	

REFERENCES	
Documentation available on the project	
Web link(s)	https://www.swarco.com/products/cycle-products/cyclemeter

ILLUSTRATIONS

GENERAL INFORMATION	
Name of service/system/project	**60. SolarRoad**
Supplier of service/system/project	Solaroad
Name of operator/organisation	
Service delivery	☐ Public ☒ Private
Main category	☒ Infrastructure based ☐ Bicycle data ☐ Information provision to cyclist ☐ Interactive system ☐ Other
Contact for more information	

GEOGRAPHICAL ASPECTS	
Country	France, Netherlands
Region/city of implementation	Spijkenisse, Haarlemmermeer, Haaksbergen, Blauwestad, Krommenie (NL), Nantes Saint-Naziare Port and Etampes (FR)

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☐ Tracking/tracing/counting ☐ Rewarding cyclists ☒ Other: Collecting energy _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	The SolaRoad Kit consists of four elements, which can be combined to a road section of 12 meters. The SolaRoad Kit delivers approximately 3,500 kWh per year (Dutch climate conditions), which is enough energy to power an average household for one year. SolaRoad is an innovative and

	sustainable energy solution for a business park, a courtyard, a square, a bike path or a footpath. The kit can provide energy for lighting, illuminating a shop window, heating, Wi-Fi access points or a charging point for e-bikes or mobile phones.
Main technologies used	
How does the system collect/generate data (if any)	/
How does the system use data (if any)	/

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	219 - 2019
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	
Impacts assessment / results (if available)	
Other important information	

REFERENCES	
Documentation available on the project	
Web link(s)	https://www.solaroad.nl/

ILLUSTRATIONS

GENERAL INFORMATION	
Name of service/system/project	**61. Ice Alert**
Supplier of service/system/project	Lane light
Name of operator/organisation	
Service delivery	☐ Public ☒ Private
Main category	☒ Infrastructure based ☐ Bicycle data ☐ Information provision to cyclist ☐ Interactive system ☐ Other
Contact for more information	

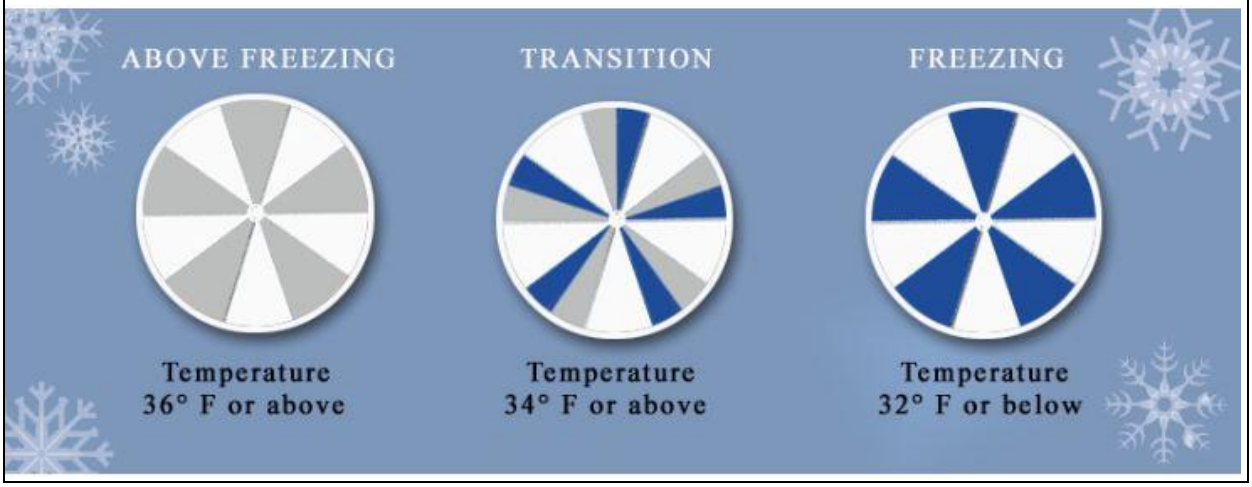
GEOGRAPHICAL ASPECTS	
Country	Canada
Region/city of implementation	Canada

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☒ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☐ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	IceAlert® temperature sensitive reflectors report the temperature by changing color from white (above 36F) graduating to blue at freezing alerting employees, customers and visitors of possible icy conditions and hazardous walking conditions.

Main technologies used	Temperature Sensitive Reflectors
How does the system collect/generate data (if any)	/
How does the system use data (if any)	/

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	
Phase	☐ Planned ☐ Pilot ☐ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	
Impacts assessment / results (if available)	
Other important information	

REFERENCES	
Documentation available on the project	
Web link(s)	https://lanelight.com/ice-alert/

ILLUSTRATIONS


GENERAL INFORMATION	
Name of service/system/project	**62. M100BR Radar Bicycle Detector**
Supplier of service/system/project	Clearview Intelligence
Name of operator/organisation	
Service delivery	☐ Public ☒ Private
Main category	☒ Infrastructure based ☒ Bicycle data ☐ Information provision to cyclist ☐ Interactive system ☐ Other
Contact for more information	

GEOGRAPHICAL ASPECTS	
Country	UK
Region/city of implementation	Dorset (UK)

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☐ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☒ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	The M100BR Bicycle Radar Detector has been designed to uniquely detect the presence of a bicycle within a defined zone and differentiate it from other forms of traffic. The M100BR works in conjunction with the M100 wireless vehicle detection system.

Main technologies used	Extremely low power, wide-band, fixed-position radar with a Nano power radio
How does the system collect/generate data (if any)	M100BR detectors are capable of detecting and distinguishing large objects from small objects. Detectors have a programmable detection range between 1.2m and 3m. The elevation of a detection zone is approximately 90 degrees and the azimuth is approximately 180 degrees. M100BR detectors can detect bicycles that are stopped at a stop bar and differentiate between a vehicle and a bicycle. The basic method to differentiate bicycles from vehicles is based on measuring the breadth of the vehicles returned RF signal. Bicycles field a relatively small breadth values while vehicles generate both small and large values depending on the location of the vehicle
How does the system use data (if any)	

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	
Impacts assessment / results (if available)	
Other important information	

REFERENCES	
Documentation available on the project	
Web link(s)	https://www.clearview-intelligence.com/products/m100br-radar-bicycle-detector

ILLUSTRATIONS


GENERAL INFORMATION	
Name of service/system/project	**63. Traffic Light Countdown Timer**
Supplier of service/system/project	Shere
Name of operator/organisation	
Service delivery	☒ Public ☐ Private
Main category	☒ Infrastructure based ☐ Bicycle data ☒ Information provision to cyclist ☐ Interactive system ☐ Other
Contact for more information	

GEOGRAPHICAL ASPECTS	
Country	Croatia
Region/city of implementation	Worldwide

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☒ Increase of safety ☒ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☒ Gamification ☐ Provide feedback to road operator ☐ Nudging ☐ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Traffic Light Countdown Timer is a device developed and manufactured in order to increase the safety in traffic by displaying the remaining time of red or green light.

Main technologies used	LED
How does the system collect/generate data (if any)	/
How does the system use data (if any)	/

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	
Impacts assessment / results (if available)	
Other important information	

REFERENCES	
Documentation available on the project	
Web link(s)	https://www.sphere.hr/en/products/traffic-light-countdown-timer/

ILLUSTRATIONS


GENERAL INFORMATION	
Name of service/system/project	**64. Bikescout**
Supplier of service/system/project	Heijmans
Name of operator/organisation	
Service delivery	☒ Public ☐ Private
Main category	☒ Infrastructure based ☐ Bicycle data ☐ Information provision to cyclist ☐ Interactive system ☐ Other
Contact for more information	

GEOGRAPHICAL ASPECTS	
Country	The Netherlands
Region/city of implementation	The Netherlands

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☒ Increase of safety ☐ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☐ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Bike scout improves the safety of cyclists at pedestrian crossings by detecting them in an early stage and by warning motorists on time through LED lighting on the road surface.

Main technologies used	LED
How does the system collect/generate data (if any)	/
How does the system use data (if any)	/

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	
Phase	☐ Planned ☐ Pilot ☒ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	
Impacts assessment / results (if available)	
Other important information	

REFERENCES	
Documentation available on the project	
Web link(s)	https://www.heijmans.nl/nl/bikescout/

ILLUSTRATIONS


GENERAL INFORMATION	
Name of service/system/project	**65. Crosscover**
Supplier of service/system/project	Heijmans
Name of operator/organisation	
Service delivery	☐ Public ☒ Private
Main category	☒ Infrastructure based ☐ Bicycle data ☐ Information provision to cyclist ☐ Interactive system ☐ Other
Contact for more information	

GEOGRAPHICAL ASPECTS	
Country	The Netherlands
Region/city of implementation	The Netherlands

ITS SERVICE DESCRIPTION	
General Objectives	☐ Improve speed ☒ Increase of safety ☒ Increase cyclist comfort ☐ Facilitate bicycle parking ☐ Facilitate routing ☐ Gamification ☐ Provide feedback to road operator ☐ Nudging ☐ Tracking/tracing/counting ☐ Rewarding cyclists ☐ Other: _____
Short narrative description of your best practice including e.g. geographical dimension, numbers, target group, costs etc.	Heijmans has developed a special marker with a fluorescent pigment. This pigment is activated by UV-light in the dark. An intelligent system detects the pedestrian or cyclist and sends the interactive lighting to go on.

Main technologies used	UV-light activated pigment
How does the system collect/generate data (if any)	/
How does the system use data (if any)	/

IMPLEMENTATION ASPECTS	
Year of implementation (+ end date of measure if applicable)	
Phase	☐ Planned ☐ Pilot ☐ Implementation ☐ Stopped
Lessons learnt / factor of success (technical, legal, organisational, financial, geographic, …)	
Impacts assessment / results (if available)	
Other important information	

REFERENCES	
Documentation available on the project	
Web link(s)	https://www.heijmans.nl/nl/expertises/crosscover/

ILLUSTRATIONS