

Evaluation report

App for citizens
Baron Mobility

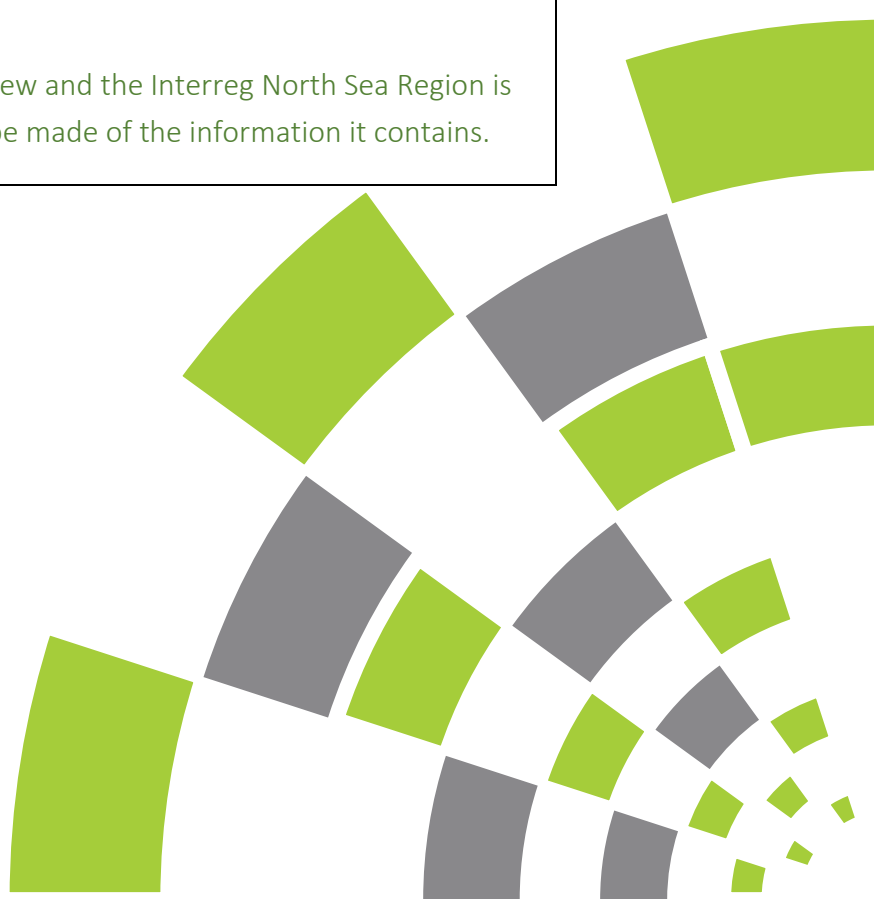
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Short description

An interactive mobile application, the smartphone app Ciclogreen, was used in order to collect data about the cycling behaviour of citizens in the city of Oldenburg and to measure to what extent an app with gamification features could encourage citizens to cycle more often. On the one hand, the app registered bicycle usage and other statistics (e.g. average cycling speed, days the bike is used, etc.), while on the other hand, the app questioned its users through pop-up questions starting when first opening the app, continuing after 3, 6 and 9 months and closing at the end of the pilot. This way, the app provides information about the total bike use of the app-users as well as changes in behaviour due to the use of the app. App users were activated by means of challenges of 1-2 months duration each. During these challenges the users could collect points ("Ciclos") for every kilometre, track their own progress such as the (increasing) kilometres they cycle, check their position in the ranking with other participants and earn discounts and exclusive gifts.

Type of ITS

App for citizens with a gamification aspect, giving rewards when cycling and stimulating competition with others

Timeline

In September 2020, the app for citizens was launched. The app ran for 1 year, until the end of September 2021. Almost each month, the app users were activated by means of a challenge. In total, the pilot included 10 challenges.

Hypothesis

A mobile application with gamification features and rewarding system leads to more (or longer) cycling trips by citizens in the city of Oldenburg.

Data sources

- Number of app users and their registered data such as unique ID of the cyclist, date, time, kilometres, geo locations, frequency of cycling of each cyclist.
- Results of a survey the user completed upon registration in the app
- Survey results from pop-up surveys in December 2020, April 2021, June 2021
- Results of a final survey, at the end of the pilot in September 2021
- Report of meeting with project managers about the evaluation of the pilot (October 2021)

Analysis

Report of the pilot

At the start, in September 2020, the initial number of users of the app was registered as well as the total bike use of the users through pop-up questions when first opening the app. This first survey was held as a baseline measure, in order to be able to track subsequent changes and compare results. Another survey with pop-up questions was launched in December 2020, in April 2021 and June 2021. A final survey was conducted at the end of the pilot, in September 2021.

Number of users of the app and registered data

185 citizens of Oldenburg registered themselves for the first challenge (16.09.2020 – 15.11.2020). The number of registrations increased a lot when the second challenge (16.11.2020 – 31.12.2020) was launched. From the third challenge onwards (starting 01.01.2021), the number of registrations remained stable. In particular, from challenge 3 onwards the number of registrations increased only slowly ranging from 1 to 4 new registrations each month. The number of registrations slowly increased again when the seventh challenge (01.06.2021) and eight challenge (01.07.2021) were launched, possibly due to the influence of the weather conditions and less strict COVID-19 measures during summer. The 10 challenges ended up in a total number of 422 registered users in the Oldenburg Bicycle Challenge. However, we can conclude that up to 80% (335/420) of the users already registered before the end of the 2nd challenge (31.12.2020).

	Number of registrations (*cumulative)	Total usage in km/challenge	Active users/challenge	Average km travelled/user
Challenge 1 (16.09.2020 – 15.11.2020)	185	19.845	86	230
Challenge 2 (16.11.2020 – 31.12.2020)	335 (+150)	26.094	118 (+32)	221
Challenge 3 (01.01.2021 – 14.02.2021)	335 (+0)	18.360	69 (-49)	266
Challenge 4 (16.02.2021 – 14.03.2021)	339 (+4)	13.036	61 (-8)	214
Challenge 5 (15.03.2021 – 18.04.2021)	341 (+2)	14.869	53 (-8)	281
Challenge 6 (19.04.2021 – 31.05.2021)	344 (+3)	18.632	54 (+1)	345
Challenge 7 (01.06.2021 – 30.06.2021)	398 (+54)	14.665	64 (+10)	207
Challenge 8 (01.07.2021 – 31.07.2021)	417 (+19)	15.676	62 (-2)	253
Challenge 9 (01.08.2021 – 31.08.2021)	418 (+1)	14.987	48 (-14)	312
Challenge 10 (01.09.2021 – 30.09.2021)	422 (+4)	12.693	50 (+2)	254

Furthermore, an important note here is that there seems to be a large difference between the number of registrations and the active users of the app. Active users are defined as users who actually open the app and track at least one route during one challenge. We see for example 335 registered users in the second challenge and 118 active users during that challenge. While in the following months, we see the number of active users decreasing. In the final challenge for example, 422 cyclists are registered, while only 50 of them are active users. The numbers indicate that it is rather difficult to keep the registered people motivated to use the app over a longer period of time.

The 10 challenges ended up in a total number of 168.850 km which is equal to 42.155 CO2 savings. The total usage in km in each challenge varied, depending on the number of active users. At the end of the first month, the participants of the first challenge cycled 19.845km. As the number of registrations and number of active users increased a lot during the second challenge, a higher bicycle usage in kilometres was noted in the second challenge: the users cycled at total number of 26.094 km. If we look at the decreasing number of active users between challenge 3 and 10, the usage in km/challenge showed the same trend. This is quite obvious.

In addition, on average, active participants travelled a total of 258 km per challenge day with the lowest number of km per challenge day during challenge 1 (230 km/day) and the highest number during challenge 9 (312 km/day). As the total number of km may be illustrative for the cycling use of the active users, it is interesting to see that also in challenges 3 to 10, characterized by a lower number of active users, the average km per challenge day remained quite stable. This finding may suggest that the active users actually cycled more km/day.

If we look at the total number of trips and the number of trips per day, about 18.051 trips were detected by the app in the Oldenburg area between mid of September 2020 and the end of September 2021.

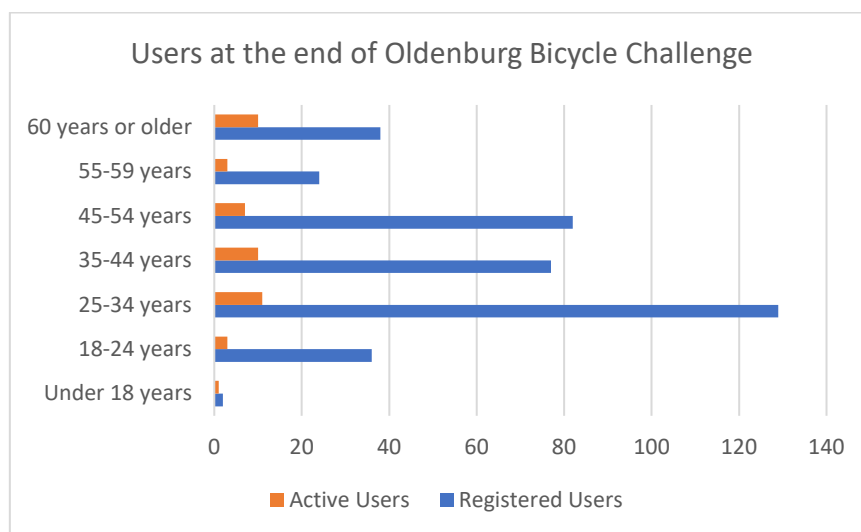
Month	Trips	Trips/day
Sep 2020	75	9.38
Oct 2020	1.589	51.26
Nov 2020	1.923	64.1
Dec 2020	1.671	53.87
Jan 2021	1.519	49
Feb 2021	1.103	39.39
March 2021	1.504	48.52
April 2021	1.386	46.17
May 2021	1.168	37.68
June 2021	1.596	53.17
July 2021	1.704	54.97
Aug 2021	1.497	48.29
Sep 2021	1.319	43.67
Total (Sep 20 – Sep 21)	18.051	48.39

Furthermore, on average, around 50 trips per day were recorded. An important note here is that the numbers below are covering one month and not one challenge which makes it difficult to draw conclusions. For instance, the very low number in September 2020 can be explained by the fact that the first challenge was launched at the 16th of September. Likewise, the peak in November - December 2020 can be explained by the sharp increase in the number of registrations and active users in challenge 2 (16.11.2020 – 31.12.2020). Nevertheless, it can give us some indications of the cycling use in the Oldenburg Bicycle Challenge. It is clear that the number of trips each month as well as the number of trips each day seem to be quite stable over the period of 1 year, despite the lowering number of active users. This also suggests that the active users actually cycled more.

GPX data¹

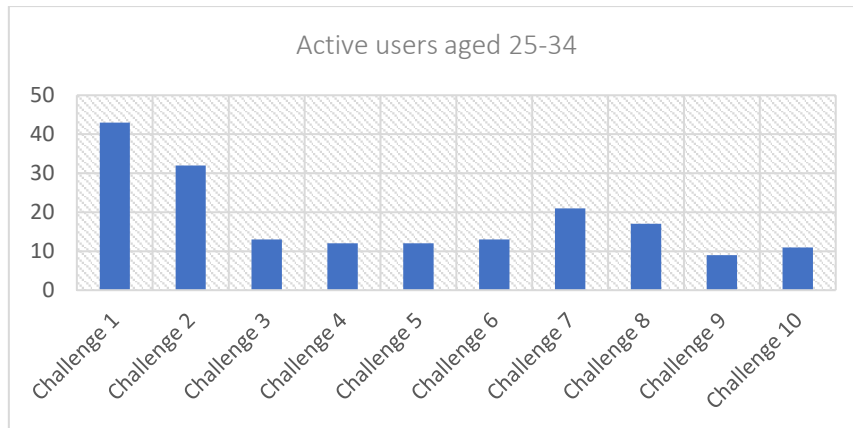
Via the GPS in the app, data was collected about the locations, driven kilometres, speed, etc. of the app users. Also information on the weather conditions was integrated. The main conclusions from GPX data are the following:

- Overall, the majority of users who registered for the Oldenburg Bicycle Challenge were between 25 and 34 years old (33,2%). However, interestingly, if we look at the age of the participants who can be defined as active users at the end of the challenge, we observed that only 8% of registered users in the age category of 25-34 were still active users while still 26% of the registered participants who are 60 years or older can be described as active.



In addition, these data also show that the young (25-34y) registered people mainly lost their motivation to participate in the challenges as active users from Challenge 3 (01.01.2021 – 14.02.2021) onwards. In these numbers, new registered users per challenge cannot be ruled out.

¹ Some descriptions can only be based on the first six challenges over the period from 16.09.2020 to 31.05.2021



Based on the data of the first 6 challenges over the period from 16.09.2020 to 31.05.2021, we can conclude that participants predominantly cycle for commuting, including shorter distances than for leisure and with clear peaks during rush hour in the morning and the evening on a weekday. Except for precipitation, weather conditions (temperature, wind) did not have an influence on the cycling behaviour of the participants. Both the average trip length and the average trip duration seem to decrease in rainy weather.

- Male users were slightly overrepresented with a share of 56.1%. (*note: Information on the age of a user and a user ID could only be obtained up to the third challenge, after which the recording was discontinued*)
- Users between the ages of 46 and 55 make by far the longest trips, averaging 13.54 km
- Male users recorded longer trips of 9.91 km on average, while the average trip length of female users was 7.73 km. As a result, male users accounted for 63.26% of the total km travelled.
- Users predominantly drive during the day. Significant peaks with over 1000 trips can be seen in the early morning (7h) and early evening at rush hour (15-16h).
- Users predominantly drive for commuting. Weekends have only about half the number of trips per day as a weekday, and the fewest trips occur on Sundays. Trips on Sundays or on Public Holidays are much longer than during the week.
- 40% were identified as leisure trip, which represented 62% of the total miles travelled
- Temperature and wind did not have any impact on the average trip length. This is different when considering precipitation. Both the average trip length and the average trip duration decrease in rainy weather. App users travelled 1.08 km shorter distances in rainy weather than in clear weather. Trip duration, which is strongly correlated with trip length, also decreases by 3:43 min from an average of 33:17 min to 29:34 min
- Slow rides are predominantly observed in the city, especially in the city center. The further out of the city the trips took place, the faster the potential cycling. However, the city center is not considered an exclusion criterion for fast cycling, since medium-fast and fast trips also often took place there.

Survey results

The **first survey**, launched when citizens registered for Oldenburg Bicycle Challenge and opened the app for the first time, was a baseline measure. In total, **405 users** completed the first survey.

- Most of the app users (79,5%) are citizens who regularly use their bikes which means they cycle daily or more than once a week for commuting while 82,5% uses the bike regularly for shopping or leisure activities. Only a small number can be seen as an infrequent cyclist reporting that they cycle rarely or never for commuting (11,1%) and for shopping or leisure activities (3,2%). We can conclude that the app users already cycled quite often when first registering in the app.
- About half of the participants indicated to cycle 20 up to 60 kilometres on average per week.
- If we look at the type of bicycle used, results showed us that half of the participants (49%) mainly used a city bike and over 19% reported to use an e-bike for personal use.

The subsequent surveys show us how the number of app users and total bicycle use changed over time compared to the data from the first survey. A total number of **36 users** answered the **second survey** through pop-up-questions in December 2020. Due to the low number of participants (possibly due to the winter season and strict COVID-19 measures), it is important to be careful in drawing conclusions from the follow-up surveys.

- It was clear that 19,4 % reported to use the bike more often since using the app.
- Also, the participants reported to cycle around 64 kilometres on average per week.
- Zooming in on the changes in behaviour due to the mobile application, 47,2 % felt actually motivated by being able to see their own statistics in the app such as distance, CO2 savings and calorie consumption. Winning prizes or earning discount codes at local merchants by recording kilometres (27,8%) or just being able to contribute to a research project (8,3%) seemed to motivate participants to a lesser extent.

The results of the **third survey** in April 2021 shows us that only **17 participants** answered the pop-up questions. Again, we need to be careful in drawing conclusions here given the very low response rate.

- When looking at the survey results, we found that 16,7% of the participants in the survey reported to use the bike more often since using the app.
- On average, these participants reported to cycle around 107 kilometres per week which was a clear increase in comparison to the previous surveys.
- Around 50 % felt actually more motivated to cycle in comparison to April 2020. Being able to see their own statistics in the app such as distance, CO2 savings and calorie consumption was still the most important motivation to use the app (50%), now followed by being able to compete with others (16,7%). Only 11,1% were motivated by the app because of the challenges including winning prizes or earning discounts.

In June 2021, the **fourth survey** was conducted in which **28 app users** participated.

- Results showed us that 27,6% of the participants were using the bike more often since using the app. This finding illustrates a small increase in reported cycling use (19,4% in survey 1).

- If we look at the usage of bikes in km cycled, the survey participants reported to cycle around 92 km per week which was more than reported in survey 1 and 2 (respectively, 60 and 64 km per week) but a little bit less than in survey 3 (107 km).
An important note here is that the number of survey participants is far lower than in the first survey. Drawing conclusions is always difficult with this sample but the finding may also indicate that the remaining survey respondents – who can be defined as the active ones – are users who actually travelled more km since the start of the challenge (see also: Number of users of the app and registered data).
- Around 35,4% felt actually more motivated to cycle in comparison to June 2020. This finding shows a small decrease in motivation to cycle (47,5% in survey 2 and 50% in survey 3). Being able to see their own statistics in the app such as distance, CO2 savings and calorie consumption was still the most important motivation to use the app (55,2%). It was clear that the users were still less motivated by the challenges: only 6,9% reported this as a motivation to bicycle more often.

At the end of the pilot, in September 2021, a **final survey** was launched among the registered app users. The main difficulty here was to reach out to the registered users who were not actively using the app anymore. Several recruitment strategies were used, such as contact via email and push messages in the app as well as giving rewards when completing the survey. The final survey was closed on 29.10.2021 and resulted in a participation of **51 app users**. Among the survey participants, we found that 43% can be defined as regular participants in the Oldenburg Bicycle Challenge taking part in at least 7 out of the 10 challenges. Four out of 51 participants took part in all the challenges. Although drawing conclusions is always difficult with this small sample, the large proportion of so-called ‘experienced’ challenge participants may provide us with interesting insights about the impact of the app on the cycling behaviour and motivations.

- Results showed us that 21% of the 51 participants in the final survey indicated to cycle more often. In addition, due to a new question that was added to the final survey, we observed that 17% of the participants reported to cycle longer distances.
- If we zoom in on the actual cycling behaviour, we noticed interesting changes in the cycling frequency for commuting and for shopping or leisure activities. Clearly more participants indicated to cycle for commuting almost daily (from 59% up to 66%) and fewer participants reported to commute by bike rarely or never (from 11% down to 5,7%). Likewise, when looking at cycling for shopping or leisure activities, fewer participants reported to use their bike rarely or never (from 3,2% down to 0%) while there was an increase in the number of participants who use their bike for these reasons at least once a week (from 5,2% up to 9,4%).
- The average numbers of kilometres cycled clearly increased during the challenge. On average, 22% of the participants indicated to cycle 60 up to 80 kilometres per week while even 31% reported to cycle between 100 and 200 kilometres. Compared to the first survey, at the start, the largest part of the participants (51%) indicated to cycle between 20 and 60 kilometres.
- Around 36% of these survey participants reported a higher motivation to cycle since the start of the challenge. According to the survey participants, the app was not often used to network (only 5,7% indicated to actually use the app to network) but seeing own statistics in the app such as distance, CO2 savings and calorie consumption motivated to cycle the most (43,4%). Their

motivation to cycle more also seems to be influenced by being able to record their routes via the app: 49% indicated to record at least 80% of the routes they cycled. Similar to the previous surveys, it was clear that the users were to a lesser extent motivated by the challenges: 26% reported this as a motivation to bicycle more often.

Open questions in the surveys made it possible to measure how attractive the application has been for cyclists. Due to several technical issues (translation errors, app crashes, difficult structure,...), some participants defined the app as not user-friendly. However, some suggestions for improvement were formulated too: some participants plead for more challenges, even without prizes, or more vouchers from the same store. However, overall, the app has been evaluated positively in the closing survey apart from some technical problems. Around 96,2% would recommend the app to others.

Finally, the final survey also asked how the participants found out about the Oldenburg Bicycle Challenge. Here, social media (41,5%) and newspaper articles (28,3%) seem to be the most successful recruitment strategies.

Impact

The Oldenburg Bicycle Challenge pursued a gamification approach and measured its impact through pre and post counting of the total bike use of the app-users and 5 short surveys (at the start, after 3 months, after 6 months, after 9 months and at the end) in order to evaluate changes in cycling behaviour due to the use of the app.

If we look at the overall objectives of the pilot, we may assume that the Oldenburg Citizens Challenge resulted in a higher usage of bikes. Overall, about 20% of the participants reported that they were using the bike more often since using the app. This also corresponds with a reported increase of actual cycling: we found an immediate increase of 7% of participants who commute by bike (almost) daily as well as an immediate increase of 4% of participants who use the bike for shopping or leisure activities at least once a week. Likewise, the data – both registered data as well as survey results – clearly showed an increase in the number of kms, and thus longer distances, travelled among the active participants in the challenge. While this may be an indication of the impact of the Oldenburg Citizens Challenge on the particular target group of existing cyclists, we also observed that the number of participants who reported to cycle rarely or never decreased with 3% (shopping/leisure) to 5% (commuting) which may be an indication of the uptake of cycling by a target group of new cyclists.

However, an immediate increase of 20% in cycling use due to the pilot should not be expected. Although about 35% of the participants in the final survey still felt motivated to cycle more since the start of the challenge, it also became clear that many registered participants did not continue their engagement during the challenges. The number of people that installed the application increased gradually, up to 422, even though the total number of active users during the overall challenge remained low. These numbers indicate that it is rather difficult to keep the registered people motivated to use the app over a longer period of time, which is a contraindication of the uptake of cycling. Of course, an important note here is that there might have been the influence of the COVID-19 restrictions – especially during autumn and winter periods, which may have discouraged people to cycle more often during the challenge and/or to continue their engagement.

When considering the impact of the Challenge on the cycling behaviour and motivations, it is also important to take into account the most effective app functionalities. The pilot revealed which app functionalities motivated the recurrent app users the most to cycle more. Being able to record their routes via the app as well as being able to see their own statistics in the app such as distance, CO2 savings and calorie consumption have the most impact on the motivation to continue using the app, and indirectly to cycle more. Overall, it was clear that the app users were far less motivated by earning discounts and winning prizes, which was of course one of the main features of the Oldenburg Bicycle Challenge.

Experiences project managers

A meeting with the project managers took place in October 2021 after the closure of the Oldenburg Bicycle Challenge (but before the final survey was closed). The project managers of Baron Mobility reacted very positive and satisfied with the pilot. The pilot results not only revealed a lot of information about the cycling behaviour in the city of Oldenburg, but at the same time, the project managers had the feeling that participants in the challenge appreciated the initiative and that the app actually motivated several citizens to cycle more, especially those citizens who were already using their bikes regularly. The gamification features such as being able to win prizes and to see the own statistics were considered important. According to the project managers, the impact of the Challenge on the uptake of the bike by citizens who didn't cycle before is not clear and should be considered in future projects.

The project managers also shared some challenges/problems related to the Oldenburg Bicycle Challenge. First of all, the app faced some technical complications such as problems with route tracking or GPS connection. Also, there were some language issues caused by the fact that Ciclogreen is a Spanish app provider: for instance, some wordings in the app were badly translated or if people reported problems or asked for help, they got only responses in English. Furthermore, there were large difficulties with the installation of the app. Participants needed to register first before installing the app; if this procedure was not followed correctly, people installed the wrong app without the project managers being able to solve the problem. Overall, according to the project managers, both the language issues and the difficulties with the installation of the app may have caused a lot of dropouts and may offer an explanation for the rather low number of active users. Second, the project managers agreed that the particular COVID-19 circumstances restricted the advertisement of the Oldenburg Bicycle Challenge. For instance, live events promoting the Challenge were cancelled. At the same time, given the COVID-19 circumstances, the project managers reported that it was quite hard to find partners who were willing to bring in attractive prizes for the participants. According to the project managers, less attractive or smaller prizes may also help to explain a lowering number of active users. Also, more in general, working from home during the COVID-19 pandemic had an important impact on the extent of commuting.

Third, also related to the rewarding system of the Challenge, the project managers noticed that turning in the points, collected for every kilometre they cycled ("Ciclos"), for vouchers or discounts in different stores was not a common practice among the participants. The COVID-19 pandemic may also have had an impact on this rewarding system.

Overall, the project managers are satisfied with this pilot and its results. They agreed that an app for citizens with a gamification aspect is a useful tool to positively affect cycling behaviour. They recognised the added value of this pilot and will definitely recommend this type of ITS to others.

Conclusions

The main question of this pilot was whether the number of cyclists and kilometres cycled can be increased by means of an interactive mobile application with gamification features. If we look at the overall objectives of the BITS-project², we may conclude that the main goals of this pilot are reached partially. Taking into account the longer distances cycled and the higher frequency of use, the pilot has led to a higher number of km cycled/day among active participants in the Challenge -whether this is for commuting or for shopping or leisure activities-, which equals with an increase up to 20%. The impact of this type of ITS technology has been realised due to the app functionalities such as tracking routes and displaying own statistics. Recurrent challenges, including earnings discounts or winning prizes, seemed to be less effective and maybe even discouraging if we consider the very low number of active users. This can be considered as a contraindication of the uptake of cycling.

² an increase in cycling use with 10% and a reduction of CO2 emission with 9% within target groups due to the implementation of ITS solutions