

## Executive Summary

With this summary we would like to provide you the most important insights into our research on green spaces and mental well-being.

Firstly, we investigated the existing research regarding green spaces and mental well-being in urban spaces. From here we found that there are increased stressors associated with life in urban spaces, especially due to the highly populated, built and busy environments. Promoting green spaces in cities can counteract the negative effects of urbanization and ultimately benefit not only mental well-being of residents, but also improve (amongst others) biodiversity, climate regulation and light and noise reduction. In general, the background research projects we found support the notion of green spaces influencing people's mental health positively.

We then identified the relevant stakeholders within which include the Municipality of Leiden, companies, commuters, and residents in the area. We carried out an initial survey, interviewing these stakeholders regarding their experiences with green spaces and mental health. They explained that they enjoy having access to green spaces, further stating how green spaces have a positive influence on their mood. Overall, stakeholders voiced that they would welcome any form of new green development, however seeming unsure about what types of green spaces would be best suited for long-term mental health benefits. From this standpoint, we investigated the pre-existing research on the matter. Multiple studies have identified that more insights are needed on what types of green spaces, regarding properties and utilization, improve mental well-being. Furthermore, some studies have pointed out that health benefits of green spaces cannot be assumed to be constant across subgroups leading to underrepresentation of groups such as students. These findings, both from literature and interviews, led us to our research question 'What types of green spaces could be implemented in the city of Leiden that relate to the improvement of mental well-being amongst students?'

We collected the relevant data in through a survey that mainly assesses student's experiences in green spaces in relation to their mental health. We worked with a focus group of students that helped us come up with the questions for our survey. The citizen scientists that were involved in this specifically aided us in categorizing what green spaces are to them, how they view mental well-being, and which further questions could be interesting for us to ask. Most focus group members later also joined us in analyzing the images received in our survey.

## Results

The finished survey had 40 questions with multiple choice, open questions, and an image upload option. Via convenience and snowball sampling we disseminated our survey across a wide student population and received 67 entries in total. The resulting demographics show that a bit more than half of the entries were students in Leiden- the youngest 17, the oldest 28. The most common education level is 'university level'. We found 40 different green space entries through the survey.

Regarding **the connection between green spaces and mental well-being**, we asked for changes in relaxation, with most of the answers pointing towards a positive change. The next question regarding changes in energy levels shows similar results, and so do change in interestedness, excitedness and comfort.

We then went forward in asking about the **green space, specifically how safe it feels, how busy it is, about its accessibility and whether its pleasing to look at**. The results across all five of these

categories are mostly positive, which could be a reason for the positive answer results of the previous questions regarding comfort, relaxation and so forth.

Most green spaces visited by students were open spaces that allowed for recreational activities (walking, picnicking, exercising). People frequently mentioned peacefulness, vegetation and animal presence. Most of the students used green spaces to relax and recharge, though exercising and passing through were also mentioned many times. People stayed in the green space for roughly 1-2 hours. Additionally, 80% of the green spaces visited were within 5km of the person's home. This could mean that access to a green space close by is handy and made use of by people.

The most liked general features were nature and water, including open, peaceful and sociable places. Whilst nature was one of the already most mentioned existing features as well, respondents explained they want a further increase in vegetation. The most noticed and wanted utilities or green types appear to be seating areas, defined walking paths, trashcans, flowers, toilets and weather shelters.

The true results consist of a strong diversity of other elements; however, no trend or common consensus could be discovered for these other elements. This variety indicates that a large portion does come down to personal preferences and interests that make a green space an area worthwhile to visit amongst students. Also noticeable is that most listed features were often listed in combination to each other. Therefore, demonstrating that it is often the combination of various elements that make the spaces worthwhile and not necessarily one or two elements on their own. Variety of setups and facilities is therefore key to achieve widespread mental health benefits amongst students visiting green spaces.

Therefore, when combining all results collected, we come to the general conclusion that, **the types of green spaces often visited by our citizen scientists was equal to the types of green spaces that improve their mental well-being.**

Recommendations for the Municipality

It appears the effect of green spaces on the mental well-being of students are highly affected by 'changes in interest of their own hobbies' and 'overall pleasantness' of the green space as shown in an ordinal PCA. These effectors in turn seem to be related to the setup of- and facilities in green spaces. A more in-depth explanation for the 'change in interest of their own hobbies' is interpreted as the ability to perform your own hobbies in green spaces or to provide the ability to do something completely different and decompress. The most requested changes were therefore more facilities and green spaces. With adding facilities to existing green spaces also being one of the most feasible and realistic goals our recommendations are:

- Adding sufficient seating/benches to existing green spaces
- Adding sufficient trashcans to existing green spaces
- Enhancing the variety of vegetation in existing green spaces
- Adding toilets in existing green spaces
- Creating new green spaces with a large variety of vegetation
- Creating new green spaces that also contain blue space (e.g., pond, fountain, etc.)
- Creating new green spaces with enough facilities such as trashcans, seating, weather shelters and toilets
- Creating new green spaces that feel relatively remote (no urban noise)
- Creating new green spaces with open areas, allowing for socializing and grouping of people

This list of recommendations is based on the input from our citizen scientists (students) as well as literature on other communities. Using these recommendations to enhance existing green spaces and create new green spaces would greatly benefit mental well-being of all communities in Leiden. We therefore strongly recommend the municipality of Leiden to try and implement these recommendations.