The built environment and the survival of neighborhood-based social organizations in Amsterdam

Summary

We have looked at the extent to which the built environment, distinguishing between car-related; walking-related infrastructure, and mix land use infrastructure, has an impact on the survival rate of neighborhood-based leisure organizations. As expected by the literature, elements of the built environment that stimulates walking increase the survival rates of these organizations and elements that discourage walking decrease these survival rates. A pedestrian-friendly infrastructure will enhance daily meetings and conversations among neighborhood residents, increasing the formation of neighborhood-based social networks that are known to underpin the vitality of neighborhood-based voluntary organizations that in turn have positive effects on social life in neighborhoods as well. Mixed land use, which according to part of the literature, also enhances daily encounters between local residents also had a positive, albeit less strong, effect on the survival rates of neighborhood-based social organizations. This research shows, among other things, the need for urban planners and local policymakers to make room in their designs for pedestrians, also as a way to allow urban social life, including place-based networks and organizations, to flourish. An infrastructure that encourages the use of cars and long-distance mobility will jeopardize the ability for neighborhood-based social organizations to establish close connections with the people who live in the surrounding area, for which they organize activities and trough which they gain legitimacy and increase their survival chances.

Hypothesis

Neighborhood-based voluntary leisure organizations rely on strong neighborhood social and civic networks that provide them with legitimacy and members needed to survive. The built environment of neighborhoods is known to have an impact on these neighborhood networks. Traditional neighborhoods in which the infrastructure encourages walking by the absence of big roads, intersections, parking lots, and by the presence of sidewalks, urban greens, and parks enhance these networks.

- Hypothesis 1: the presence of car-related (roads or parking lots) infrastructure in the close proximity of the location of voluntary leisure organizations will decrease the probability of their organizational survival.
- Hypothesis 2: the presence of walking-related (parks, urban greens, sidewalks) infrastructure in the close proximity of the location of voluntary leisure organizations will increase the probability of their organizational survival.
- Hypothesis 3a: the presence of mixed land use in the close proximity of the location of voluntary leisure organizations will increase the probability of their organizational survival.
- Hypothesis 3b: the presence of mixed land use in the close proximity of the location of voluntary leisure organizations will decrease the probability of their organizational survival (outsider or stranger hypothesis).

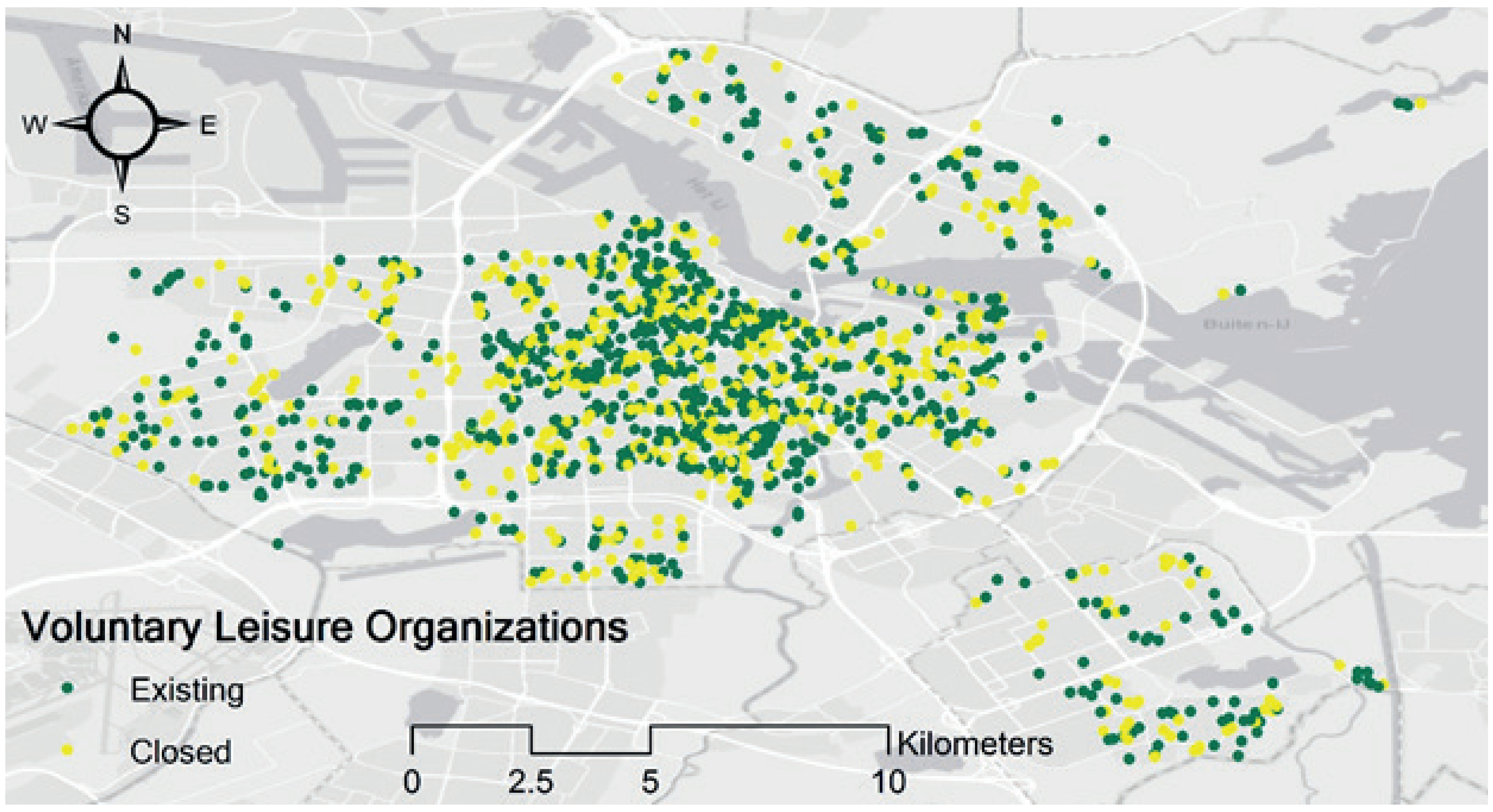

Fig 1. The spatial distribution of included voluntary leisure organizations in Amsterdam in 2012 and 2017 (N = 1575).

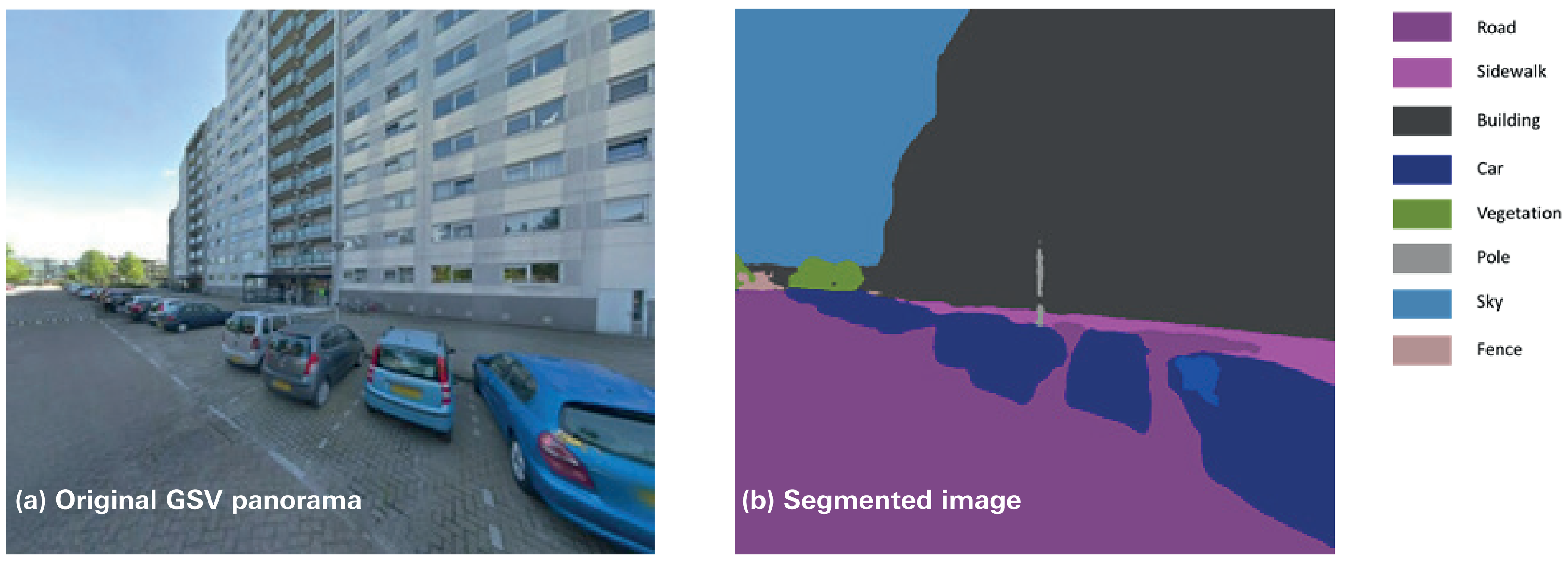

Figure 2. An example of GSV panorama segmentation from Deeplab v3+.

Data and Methods

For our research, we constructed a unique dataset that combines information on the activities of leisure organizations in Amsterdam at two points in time, 2012 and 2017. The database consists of 1,671 voluntary neighborhood-based voluntary leisure organizations, which can be broadly categorized according to their main activities: sports, cultural performance, and hobbies. Examples of sports organizations would be football clubs and billiards associations. Drama clubs and children's circus groups would be found among what we classify as cultural performance organizations. Hobby organizations would include specific interest groups, such as computer labs for seniors and gardening associations.

We used Google Street View (GSV) panoramas to obtain information regarding built environments surrounding voluntary leisure organizations. We applied a deep learning technique, namely Deeplab v3+ algorithm (Chen et al., 2017a), to segment GSV panoramas in this study. Deeplab v3+ achieves excellent performance on PASCAL VOC 2012 with the mean Intersection over Union (mIoU) of 89.0. For each GSV panorama, we utilized Deeplab v3+ to segment the image into 20 classes, which can be categorized into car-related infrastructure (i.e., road, traffic light, traffic sign, car, truck, bus, and train), pedestrian-related infrastructure (i.e., sidewalk, terrain (playgrounds and urban grassland), and person), and other infrastructure (i.e., building, wall, fence, pole, pole group, vegetation (trees and urban forests), sky, rider, motorcycle, and bikes). Then, we calculated the proportion of every class in each image.

We used penalized regression (i.e., elastic net regression, Eq.1) as an alternative to create a linear regression model, which discourage the complexity of a model by penalizing having too many variables in the model (Bruce and Bruce, 2017; James et al., 2013). Penalized regression adds a constraint to an equation to reduce (i.e., shrink) the coefficient values towards zero, which allows the less contributive variables to have a coefficient close to zero or equal zero. It helps solve the overfitting problem which an OLS model often suffers from.

$$L(\lambda_1,\lambda_2,\beta)=\sum_{i=1}^{n}\left(y_i-\sum_{i=1}^{p}x_{ij}\beta_j\right)^2+\lambda_1\sum_{i=1}^{p}|\beta_j|+\lambda_2\sum_{i=1}^{p}\beta_j^{2} \qquad (Eq.1)$$

Where η denotes the number of observations, ρ denotes the number of predictors, λ denotes the level of penalty, β denotes the coefficient. Obviously, when $\lambda_1=\lambda_2=0$, an elastic net regression, becomes an OLS model.

Furthermore, we randomly divided the data into training (70%) and test (30%) sets. For the training set, we train the model using tenfold cross-validation (i.e., splitting the training set into ten randomly sampled folds, where nine folds are used to train the model, and the tenth fold is used to test the accuracy).

Results

- H1 is accepted: the presence of car-related built environment objects decreases the probability of organizational survival, as the abundance of pole (group), road, and car is associated with a higher probability that a voluntary leisure organization is disbanded.
- H2 is accepted: the presence in those walking-related objects in the close proximity of the location of voluntary leisure organizations increases the probability of their organizational survival, as the abundance of people, terrain (urban greenspace, grass), fence, and bikes in the surrounding areas of a voluntary leisure organization corresponds to a higher probability of its survival.
- H3a is accepted (H3b is rejected): that mixed land use in the close proximity of a location of voluntary leisure organization increases the probability of its organizational survival, because if there are many major colors or more visually complexed in the surroundings of voluntary leisure organizations, those organizations are more likely to survive in the future.

References

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