GREENING THE GREY

Measuring the Social Value of Integrated Nature-Based Solutions in Singapore

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Abstract

This poster presents the results of a field study from 2015 examining the socio-economic benefits of Nature-Based Solutions (NBS) based on different value dimensions. Using a multidisciplinary approach, value-based social accounting was applied to analyse and compare the added net benefits of upgrading concrete water infrastructure into a naturalised river in Singapore. The ABC-Waters pilot project Bishan Ang-Mo-Kio Park, with high levels of integrated NBS, represents the main case of this study. Two complementary case studies - green corridors with medium and low levels of NBS - were analysed for comparison. Quantitative primary data was obtained by observing the number of park users, division of activity and level of socialization, and by surveying 330 park users across the three parks. The study finds that replacing concrete infrastructure by NBS is financially viable when measured over a lifecycle, and a strong generator of social capital - adding a social dimension to blue-green infrastructure.

Figure 1. Bishan Ang-Mo Kio Park (BAMKP) before and after redevelopment. Photo: Atelier DreiseitI

Introduction

As urban populations continue to grow across the world, cities are faced with rising challenges, ranging from declining social capital, increasing segregation and mental disorders, to risks associated with ambient air pollution, exacerbated heat waves and water scarcity (Huppert 2010, Brashears 2011, Bartolini & Sarracino 2015, IPCC 2018, WHO 2019). While having historically been drivers of climate change and environmental degeneration, cities also bring opportunities for social and technological innovation (Neij et al 2014).

One country that has made safe water supply and climate adaptation a top priority, is Singapore. The limited area and the high population density of the city-state pose several challenges related to water and land scarcity (UN ESCAP 2011). Thanks to technological breakthroughs, Singapore has managed to reduce vulnerability linked to water scarcity and now has four major sources of water supply: local catchment, imported water, NEWater (recycled water) and water from a desalination plant (UN ESCAP 2011, p. 17).

With the launch of the Active, Beautiful and Clean (ABC) Waters Programme in 2006, the government began to use bio-engineering to integrate extensive water bodies with the green environment and the community, thereby creating a holistic, eco-efficient approach that can extend and improve public areas while at the same time-managing and treating the water (PUB 2014, p. 21). This method is a fundamentally new approach that aims to solve multiple urban challenges simultaneously (PUB 2014, p. 4).

Purpose of the study

Using Singapore's ABC-Water pilot project Bishan Ang-Mo Kio Park (BAMKP) as case study, the purpose of this research is to appraise and evaluate the benefits of replacing grey infrastructure by Nature-Based Solutions (NBS). While there are numerous studies suggesting that NBS is advantageous in adapting to climate change, grey infrastructure water solutions still dominate the urban agenda. By adopting a holistic and innovative approach, this paper aims to examine and combine the wide range of benefits and costs related to NBS in a more comprehensive manner. This, in turn, contributes to making the foundation for decision-making more accessible.

Methodology

The ideal setting to evaluate the social impact of the project would, of course, be to compare BAMKP before and after the completion of the NBS. However, since there is very limited available data on the park use from prior to redevelopment, other sites had to be used for comparison. Consequently, two other park areas were used as comparison: the western, green section and the eastern, grey section of Ulu Pandan Park Connector (see Figure 1). Once the cases were selected, the analysis was divided into two phases, a public life study and a park user survey.

Following the methodology on public space use established over the last 30-40 years by the Danish architect and public space specialist Jan Gehl, the research team selected a counting strategy that would not only yield an estimate of total use per year but would also measure the flow of people at different locations and with different means of transportation.

Each spot was surveyed for 10 minutes per hour, during the course of an entire day, from 6 am until 9 pm. The 10 minutes are thus assumed to be representative of the entire hour and multiplied by six in order to reach the total number of park users for the hour. As previous studies of urban life suggest that the flow of people is quite rhythmic and uniform from one day to the next, counting for 10 minutes every hour is likely to provide a rather accurate picture of the daily rhythm.

To obtain quantitative data on the perceptions and attitudes towards the different levels of NBS, 330 park users were surveyed in all three parks. By observing the share of social interaction, mapping the behaviour and by conducting on-site interviews and surveys, any potential differences of how the people in the three parks use, perceive and evaluate the environments from a social point of view is uncovered. Based on a literature review, socio-economic modelling was used to combine the survey data and on-site observations into a cost-benefit analysis comparing the three scenarios in order to evaluate the impact of NBS.

Results

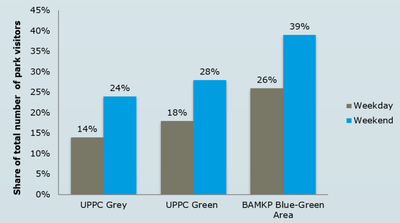
Using a conservative estimate, the cost-benefit analysis shows that the restoration of Bishang Ang-Mo Kio Park, from a concrete canal surrounded by a park, into a blue-green naturalised river, has generated 2,4 times as much value to society. The observational data indicate that the number of visitors who come to enjoy and spend time in BAMKP has doubled from 3 million to 6 million since the redevelopment of the park. Using opportunity Value of Travel Time (VTT), it was possible to estimate the socio-economic value of the visitors to 83 million SGD per year.

Figure 3. Observations of share of park users visiting the green and blue-green part of BAMKP as a group

Looking particularly at social capital defined as social interaction, the data suggest a strong association between NBS defined as blue-green infrastructure and higher levels of socialization. As shown in Figure 3, more people engage in social activities in integrated blue-green canals compared to the parks proximate to concrete canals. On an average weekday, only 16% of the park users in the green section persued social activities with other people compared to 26% in the section of the park located next to the naturalized river. The difference in observed social activity was valid for weekends too, although less apparent.

The same pattern was observed when comparing BAMKP with UPPC Green and UPPC Grey, making an even better setting for comparing blue-green with green and gray. On average, only 24% of the park users in UPPC Grey were pursuing social activities with other people during weekends, which corresponds to 28% in UPPC Green and 39% in the blue-green section of BAMKP (see Figure 3).

Observing the types of activities, the on-site observations confirm the view that more park users in BAMKP tend to perform "slow activities" such as walking, whereas fast activities, such as running, cycling and intense walking are more common in both sections of UPPC.



To the left (**Figure 2**): The three park cases in the same scale. To the right is the main case, Bishan Ang-Mo Kio Park (BAMKP), with fully integrated NBS (Photo: Oliver Tovatt). Above (**Figure 4**): Observations of share of park users visiting the three different parks.

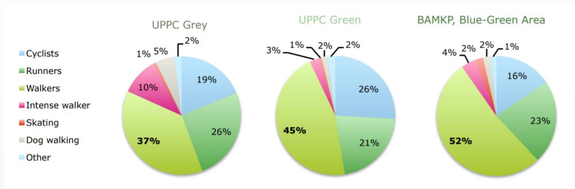


Figure 5. Division of activity.

Looking at the types of activities, the on-site observations confirm the view that more park users in BAMKP tend to perform "slow activities" such as walking, whereas fast activities, such as running, cycling and intense walking are more common in both sections of UPPC. "Fast motion" park users tend to be more goal-oriented, be it in a location inside or outside the park. This tendency is shown in public life studies, where "slow motion" pedestrians instead go on walks for pleasure (Gehl 1968). Speed is also connected to how public life is perceived. People who are in a hurry move quickly out of site, while park users who stay longer are also more noticeable to other park users, thereby making the place seem livelier (Gehl & Svarre 2013, p. 87).

Conclusion

This study has focused on examining the social capital effects of integrating blue and green urban elements in public spaces according to the ABC Waters Programme guidelines. The fieldwork underlying this report has brought some interesting insights regarding the relationship between place and people: adapting a holistic approach to urban infrastructure clearly pays off, and not only in monetary terms.

The empirical findings presented in this poster support the hypothesis that NBS can work as an instrument to re-naturalize urban space, thereby encouraging people to reconnect with each other and with nature. As a structural element, NBS is a focal point for social interaction as it provides inspiring and activating environments.

The ABC Waters Programme and the use of NBS has proven that urban waterways can do a lot more than just transport rainwater. They can become places for recreation, relaxation and community bonding. This study has provided some evidence that the ABC Concept has not only improved the water capability, but also extended the social capacity of the city, making Singapore more resilient and socially robust. The cost-benefit analysis show that the NBS elements pays off and that the monetarized value exceeds the cost of building and maintaining the infrastructure. Building city infrastructure for the future is as much about traditional engineering as social engineering. By integrating NBS in open spaces as opposed to grey construction, the city gets a third, social element as bonus.

Acknowledgements

We would first and foremost like to express our gratitude to Herbert Dreiseitl, at the time professor at the National University of Singapore, and Bettina Dreiseitl-Wanschura, for their great guidance and support throughout the project. We also want to thank Dr. Nirmal Kishnani and Giovanni Cossu at the National University of Singapore for your invaluable assistance with the survey application and for great knowledge exchange. Last but not least we want to send our gratitude to Matthias Wörlen for his much-appreciated input on the qualitative analysis.