

Research Paper

# Health promoting and climate proof green and blue spaces in Flanders (Belgium)

## Developing a manual for spatial planning, design and management

Peter VERVOORT, Government of Flanders, Department of Environment & Spatial Development, Belgium

Koen SCHOETERS, Government of Flanders, Health & Care Agency, Belgium

Jens AERTS, Buur part of Sweco, Belgium

Koen COUDERÉ, Kenter, Belgium

Cecil KONIJNENDIJK, Nature Based Solutions Institute, Sweden

### Abstract

*The positive impact of green space on health is increasingly better and more accurately supported by scientific evidence. This knowledge and recognition reflects a broad consensus and a growing collaboration between experts from the various sectors of health, spatial planning and nature conservation. Citizens are also noticing the need for pleasant green and blue spaces in their living environment. However the presence of green space also poses health risks, for instance related with vector-borne diseases or allergies. Moreover in the context of climate change, nearby green space is simultaneously a way to mitigate negative impacts (e.g. by shading, enhancing water infiltration, flood control) as a potentially more severe source of hazards (e.g. emergence of tropical vector-borne diseases). Therefore there is a need to develop more green and blue spaces in the urban fabric as part of health prevention, while anticipating changing environmental conditions.*

*In order to achieve these health promoting and climate proof green and blue spaces in Flanders (Northern Belgium) our research resulted in a practical manual for urban planning, design and management. First a typology of green and blue spaces was drawn up. Then an extensive literature review of the health impacts of the defined types, components and characteristics of green spaces was carried out. This resulted in a profound knowledge base. The gained insights were translated into a practical manual containing ambitions, interventions and guidelines for spatial policy, design and management targeting spatial, health and nature professionals. The manual contains an overview of the main research insights and presents an analytical framework connecting green and blue spaces with cognitive, mental, physical and social health promotion. Furthermore both general guidelines and concrete examples for strategic interventions are presented. The guidelines proposed in the manual were tested in a municipality in the fringe of Antwerp (Belgium), in close cooperation with local stakeholders, local government administration and politicians, which resulted in improvements better tailored to professionals putting the knowledge into practice.*

### Keywords

*Health, Green and blue space, Climate change adaptation, guidelines*

## 1. Introduction

The positive impact of green and blue spaces on health is becoming increasingly better and more accurately substantiated in scientific research. This knowledge and recognition testify to a broad consensus and growing cooperation between experts from the various sectors of health, spatial planning and nature conservation. Citizens also experience the need for pleasant green and blue spaces in their living environment, as places to rest, play sports, meet friends... The corona pandemic emphasised this need: for a long time, nonessential travel was discouraged or even prohibited and social contacts had to take place outdoors. People were therefore dependent on the outdoor areas of their immediate surroundings, such as neighbourhood parks and nearby nature reserves. In densely populated areas, where most residents do not have private gardens and where the number of high-quality green and blue spaces is limited, the supply was sometimes insufficient for the demand, causing people to spend a disproportionate amount of time indoors and in isolation, with all the negative health and social consequences this entails. Besides the corona crisis, climate change will also lead to a health crisis if we are not careful with our space. Health problems and deaths due to increasing numbers, intensities and lengths of heat waves can only be avoided if we are able to cool our cities and provide the living environment with cool green spaces. The increasing risk of flooding after intense rainfall can also cause severe material, physical and emotional damage. The water infiltrating and buffering capacity of green and blue spaces are crucial to prevent this. In the present context, it is very important to invest in high-quality green and blue spaces, and this will be even more the case in the future, especially in more urbanised regions.

Flanders (Northern part of Belgium) being such a region, has relatively few large nature reserves and forests due spatial fragmentation since approximately one-third of the area is occupied by land take and characterised by urban sprawl (Vermeiren et al., 2018). Moreover a large share (around 15,4%) of the total area of soil in Flanders is sealed (Statistics Flanders, 2022). Therefore several regional policy documents in Flanders (Vlaamse Regering, 2019b, Vlaamse Regering, 2019a, Vlaamse Regering, 2018) envision a transformation of the territory to a more resilient and green environment to cope with climate change impacts and to ensure healthy living conditions.

Introducing more green and blue spaces has undisputable health benefits in the short, but also in the long term. However, at the same time, introducing green and blue space in residential and living environment may also impose health risks like increased seasonal inconveniences such as a higher concentration of pollen or airborne hairs of oak processionary caterpillars. This could very well lead to less pleasant green spaces that, in some cases, will even be avoided by people. Moreover a changed climate (long periods of drought, heat, intense rainfall, etc.) could also cause future health risks or hazards related to the presence of water or green space in residential areas. Therefore as part of environmental health prevention in Flanders, the necessary attention to water quality and vector-borne pathogens, as distinct health aspects of climate policy, is being stressed (Vlaamse Regering, 2019c).

Currently, governments are accelerating their investments in more green and blue space in the living environment. Although these efforts are all made to ensure healthy living conditions in the future in the light of climate change, aforementioned aspects underline they could also be a source of unwanted side-effects. To ensure durable investments in health promoting and climate proof green and blue space the Government of Flanders (the *department of Environment and Spatial Development* together with the *Health and Care Agency*) commissioned a research project. The project aimed to develop a manual containing scientific supported practical guidelines for spatial planning, design and management in order

to realise health gains and reduce health risks by deploying high-quality green and blue spaces in and near living environments.

The research was carried out by *Buur part of Sweco, Kenter* and *Nature Based Solutions Institute* in close cooperation with governmental researchers and policy officers and resulted in a scientific background report (Aerts et al., 2022a) and a practical manual (Aerts et al., 2022b)

## 2. From research and conceptualisation to a practical manual

The research project combines knowledge, insights and expertise from several scientific and professional disciplines. In addition to the health dimension, green and blue were also approached from the perspective of climate adaptation, as climate change also entails health risks, and green and blue environments have an important role to play in mitigating the impacts of climate change. However, a smaller framework centered around health was deliberately delineated within the study and practice of ecosystems. Because of the focus of the study on the relationship of green and blue to human health, green and blue spaces are viewed with a distinctly anthropocentric view.

The research project started with a thorough study of the definition of green spaces and the link between these types (and characteristics and components of the types) and their impact on health. This resulted in an extensive literature study of the linkage between different types and characteristics of green space and their health impact. Furthermore also the health impact of climate change on health effects within these green space types were assessed.

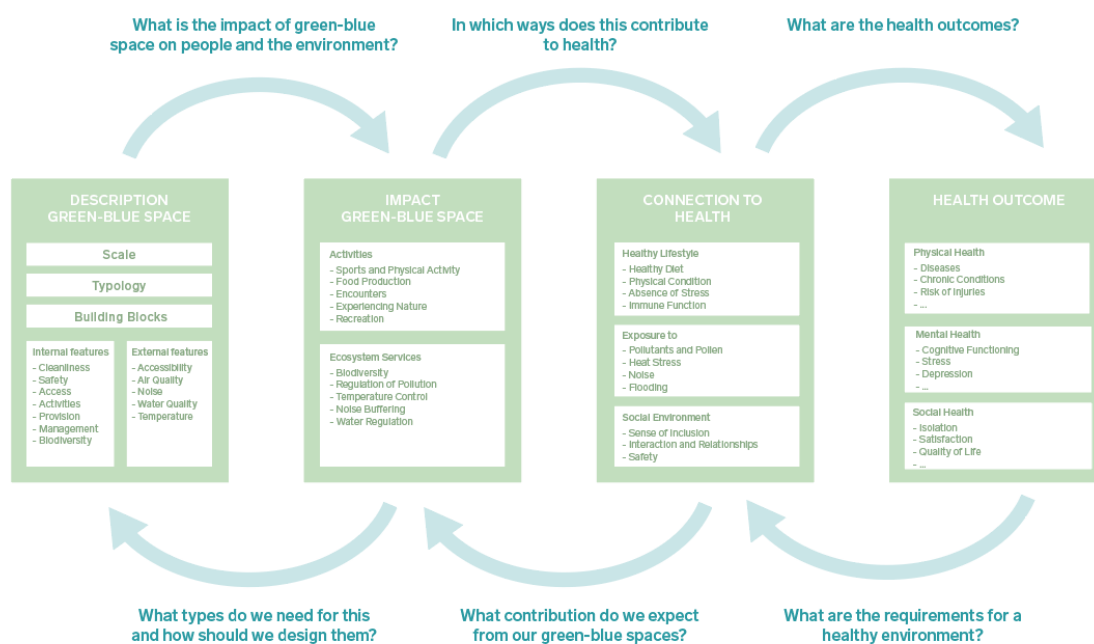
The insights from scientific research were then supplemented with experiences from practice. A sounding panel consisting of experts from four cities and municipalities (Roeselare, Vilvoorde, Lommel and Borsbeek), their respective local health advisors and other experts in the field of spatial planning, landscaping, health prevention, nature and forestry was brought together and questioned to ensure that the research results and insights gained would lead to a single practical manual tailored to needs of health, planning and nature professionals.

The guidelines, principles and interventions proposed in the manual were tested in Borsbeek, a municipality in the fringe of Antwerp (Belgium), in close cooperation with local stakeholders, local government administration and politicians, which resulted in improvements better tailored to professionals putting the knowledge it into practice.

## 3. Linking green and blue space typology to health effects

The aim of the study was to provide scientific support for the health effects of green and blue space, from a distinct spatial perspective leading to practical guidelines. The research was conceived as an iterative process (Figure 1) starting with defining a green and blue space typology spatial experts can relate to, investigating how exposure to these types can impact human health (now and in a context of climate change) and clarifying which health outcomes could be the result. Based on this analytical process the reverse reflection can be made: defining the desired health outcomes, identifying environmental conditions to achieve this, setting objectives and expectations for the contribution of green and blue spaces to meet these conditions, determine what kind of types should be planned and designed.

ANALYTICAL PROCESS



VISION-BUILDING PROCESS

Figure 1. Green space and health in an analytical and visionary process – adapted from Aerts et al. (2022a)

In literature diverse green and blue space typologies are developed, all approaching the topic from different angles. Some stress the link with ecosystem services (Belmiziti et al., 2018), others focus on differences in surface area (Schipperijn et al., 2013), functionality and users (Bell et al., 2007, Paduro and Lausted Veie, 2013) or highlight informal green space typologies (e.g. Rupprecht and Byrne (2014)). Our research typology is based on likely the most comprehensive - and most useful - typology of both green and blue areas and elements which has been established within the European GREEN SURGE project (Branquinho et al. (2015); see also [www.greensurge.eu](http://www.greensurge.eu)). Green areas are defined as all vegetation in the city. The typology emphasises the link with ecosystem services, including health. This approach is also proposed in a policy brief by the World Health Organisation (WHO Regional office for Europe, 2017), which visualises the relationships between green space characteristics, through green space impacts and via specific pathways to health and wellbeing. In addition to the types of green space, properties such as availability and accessibility aesthetic qualities, facilities and management are of great importance for the delivery of health effects. The 'pathways' from green space to health run further via the individual (lifestyle, mental status, fitness etc.), the physical environment (air quality, noise, noise, quality of neighbourhood, etc.) and the social environment (safety, social cohesion and participation). Health can be further subdivided into physical and mental health, social well-being and 'health inequity'.

However, in order to fully describe the health effects of a green space, assigning a typology is not enough, Certain characteristics that determine the quality of a space are partly independent of its typology. Examples include accessibility, air quality and aesthetics. Other properties, such as the provision of sufficient space for ecological processes, biodiversity and ecological management are vital to the provision of ecosystem services in the long term. Research into the health effects of green and blue spaces will also require different levels of scale. Sometimes the starting point will be the type of green space (e.g. the importance of urban parks and forests for recreation and therefore physical and mental health) while in

other cases there will be more emphasis on green or blue elements within these types (e.g. trees that provide cooling and flowering plants that inspire us). Therefore the analytical framework was complimented with a notion of scale: situating green spaces in a larger spatial configuration, green and blue structures, typologies within these structures and small-scale components like specific plants, trees, or presence of animals, small blue components (e.g. ponds, fountains, brooks), grey components (e.g. pathways, sport infrastructure, built heritage).

In order to connect the green and blue space structures, types and components to health outcomes a thorough literature review was carried out. For the literature review, various research databases were used, in particular Google Scholar, Scopus and PubMed. By using search terms that combined certain structures, types, elements or characteristics with health aspects, relevant scientific publications were collected. Where possible available, preference was given to (systematic) literature reviews and meta-analyses, as these types of publications often give the best and most reliable image of the current state of research. The aim was to connect green and blue spaces with potential health gains in four dimensions: physical, mental, cognitive and social.

This literature study indicates that more and more is known about the (possible) health benefits of various green and blue structures, types and elements, but that also that there are still many gaps in the research. It is also important to look carefully to the various characteristics of green and blue, as a park, for instance, does not meet its full health potential when there are problems with safety or accessibility. Furthermore any health inequalities and risks related to possible 'disservices' (also in terms of health) must also be taken into account.

The study resulted in an extensive matrix connecting scientific evidence on health and specific health indicators to green and blue space structures, types and elements. Some of the components stand out because of their importance to our health. Examples include the importance of visible green space and easily accessible green and blue space in the immediate vicinity of our homes. In terms of green elements, trees (and also shrubs) are important. Various types of parks and woodland also score high on several health dimensions, literature also indicated the importance of gardens and playgrounds. (Aerts et al., 2022a)

The research did indicate several potential negative side effects, such as the fact that green and blue spaces potentially form a habitat or breeding location for ticks or mosquitos (being vectors for diseases), the presence of allergenic pollen, or the occurrence of toxic cyanobacteria blooms in water bodies. However most of them can be easily prevented, mitigated or are manageable through design (e.g. choice of trees according to their allergenicity), management (e.g. mowing strategically, improving water quality) or education (e.g. being aware of possible presence of ticks and knowing how to prevent an actual infection with Lyme-disease). However the study also highlighted positive side effects including mitigating climate change impacts (like heat, drought and flooding), compensating carbon emissions that cause climate change through carbon capture, and positive impacts on air quality. (Aerts et al., 2022a)

Green and blue structures, types and elements will almost always play a multifunctional role. The research shows there could be more emphasis on health benefits, although we should be aware that other goals, like enhancing biodiversity or preserving space for wildlife are also important and are not always compatible with human presence or use of space. Furthermore enhancing all four health dimensions (physical, mental, cognitive and social) at the same moment will not be possible in any location. Forest visitors who are looking for silence, nature experience and restoration are often less served by (groups of) joggers and mountain bikers. (Aerts et al., 2022a)

#### 4. Guidelines for green space ambitions, conditions and interventions

The extensive literature study provides scientific support for the health effects of green and blue space, from a distinct spatial perspective. However a research report is not suited to be used in daily practice, as an aid to realising a healthy living environment with more space for green and blue. In cooperation with stakeholders from four cities and municipalities, their respective local health advisors and other experts in the field of spatial planning, landscaping, health prevention, nature and forestry the research team drafted a practical manual tailored to needs of health, planning and nature professionals.

The manual starts with an introduction of a conceptual framework, based on the research report, defining typologies of green and blue spaces and connecting them with potential physical, mental, cognitive and social health benefits. Drawing from these benefits a number ambitions are formulated: providing space for exercise, sports and recreation; for repose, restoration and contemplation; ensuring green and blue visibility and experience; enhancing contact with nature, stimulating education in natural settings, enhancing environmental quality, providing space for gardening and local food production; and encouraging social interaction and spontaneous encounters in green spaces. (Figure 2)

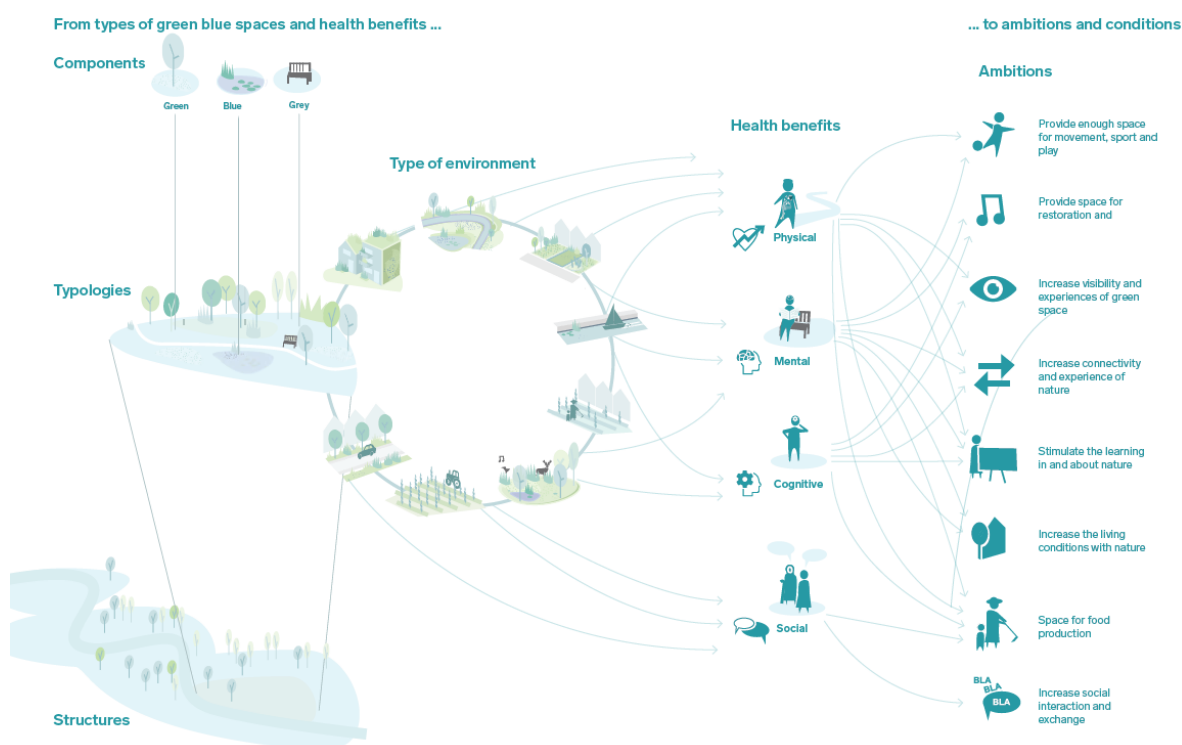


Figure 2: conceptual framework connecting green and blue space typologies to health benefits and guidelines for policy ambitions and conditions – adapted from Aerts et al. (2022b)

These ambitions are complemented with essential conditions: green and blue spaces should be accessible and available; resilient and future-proof; limit hazards and nuisance; and accommodate multifunctionality. Furthermore the manual presents a non-exhaustive overview of (eleven) inspiring strategic interventions, based on realised examples of green and blue developments that lead to health benefits. Doing so the manual provides the necessary conceptual and practical ingredients enabling spatial planners or local authorities to achieve health benefits through development or enhancement of green and blue spaces.

Of course presenting these ingredients do not directly entail successful realisations. Developing green and blue spaces and creating healthy and resilient living environments means a diverse set of actors need to join forces - including local authorities, designers, property owners, but also health professionals and civil

society. Interventions take place in existent environments with a specific spatial context, other policy objectives, a specific dynamics of actors and particular health risks or possible gains. Every specific situation contains large or small opportunities for green and blue interventions. Sustainable improvement requires a cyclical approach, with often small changes or insights in the short term, to grow into impactful projects embedded in an ambitious climate-robust policy on spatial planning and health promotion.

To ensure a consistent sequence of actions leading to successful projects the manual therefore clusters the guidelines according to different phases in spatial planning processes: (1) develop an inspiring interdisciplinary cooperation; (2) measure, monitor and evaluate spatial explicit health aspects; (2) develop spatial concepts, plans and instruments enabling a healthy green space policy; (3) formulate concrete actions for implementation (e.g. providing qualitative green space as a condition to obtain a building permit) and (5) facilitate greenspace management incorporating health impacts.

The manual concludes with a case study in the municipality of Borsbeek (located in the fringe of Antwerp) illustrating how principles and guidelines can put in practice by local government authorities and lead to context specific analysis, determining policy priorities and developing a strategy for spatial interventions.

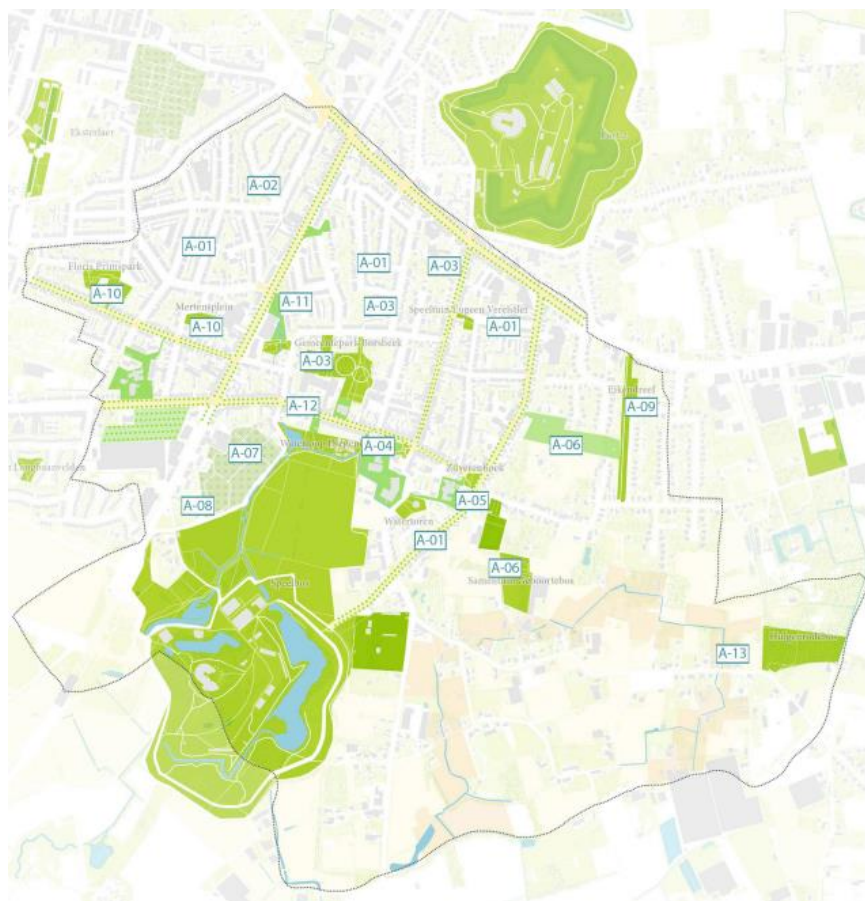


Figure 3: Case-study Borsbeek: overview of desired green and blue spaces with indication of specific locations for action - Aerts et al. (2022b)

In the case study first a quantitative analysis is made of the green space availability and shortages in the municipality. The existing green space quality was evaluated in relation to positive health effects, taking the ambitions and conditions of the manual into account. Also green areas in adjacent municipalities were considered when they were located in the vicinity of dwellings in Borsbeek. Then opportunities for improvements are mapped out, indicating specific locations that could be transformed into green spaces and assessing possible locations for densification through housing projects in the vicinity of existing or

possible future green spaces. Furthermore the existing green spaces are assessed and interventions to enhance positive health effects are listed. Based on the analysis a concept for the desired green structure of the municipality is drawn up, including future additional green areas. In addition an action plan containing concrete interventions, inspired by the examples in the manual was proposed.

## 5. Conclusion and discussion

Green and blue space contributes to all the different aspects of health: physical, mental, social and cognitive, in a variety of ways. Green not only increases the physical quality of the environment (air quality, temperature, sound environment), it also encourages people to exercise, brings peace to the mind, is a favourite place for social contact... However, there are also a number of conditions for making these health benefits available in the long term and to everyone. These conditions relate to accessibility, safety, the resilience of the ecosystem and the simultaneous provision of other ecosystem services. Healthy green and blue spaces take these conditions into account and try to realise as many pathways to health as possible. This is also the starting point of the guiding framework for healthy green and blue spaces presented in this manual. The manual identifies eleven strategic interventions that can achieve this. Within most administrations in Flanders, green space, spatial planning and health are separate policy areas for which their own policy plans and instruments are drawn up, with their own budgets and own expertise. The manual is therefore built around research, good practice in planning, promotional projects and management measures, in order to draw attention to a good integration between green space and health at all levels and in all possible phases. To realise the principles and model projects, cooperation across policy areas is necessary. This is the only way to achieve the necessary integrated approach to healthy green and blue spaces.

The research project is a good example of the way the practice of 'Health in All Policies' (World Health Organisation, 2013) is slowly being implemented in Flanders. The aim of the 'Health in All Policies'-approach (HiAP) is to systematically take health effects into account in every policy decision, to prevent health risks, to gain health benefits and to diminish health inequalities. A lot of factors outside the health sector influence our health. A quarter of the disease burden worldwide is due to unhealthy environments, and specifically related to urban or built environments (Prüss-Ustün et al., 2017). It is therefore not surprising that the health sector seeks to involve the spatial discipline. In Flanders, too, health is emerging on the spatial policy and research agenda. The strategic vision of the Flanders Spatial Policy Plan (Vlaamse Regering, 2018) identifies health as one of the ten core qualities for spatial development. Both the government coalition agreement (Vlaamse Regering, 2019d) and the policy memorandum on spatial development and environment (Vlaamse Regering, 2019b) highlight health aspects in relation to spatial and environmental policy. The policy document on health and welfare (Vlaamse Regering, 2019c) is perhaps the closest to HiAP, seeing a healthy living environment as an important part of health prevention. There are some examples of HiAP in policy related scientific research in Flanders, in learning initiatives by the spatial planning community and even in some experiments of interdisciplinary cooperation between spatial planning professionals and health counsellors (Vervoort and Vandevenne, 2022). However most of these initiatives are rather temporary or ad hoc.

The interdisciplinary process in this research, starting from a common question from different sectors, answered by a multidisciplinary team by combining very different scientific sources, accompanied by a broad team of local and regional stakeholders provides in our opinion a pragmatic and practical example of health in all policies that guides concrete healthy and climate proof spatial interventions. The proposal for a consistent framework of guidelines highlights the opportunity to combine the area-oriented effect of spatial planning and design with the evidence-based approach of healthcare. The manual is inspirational



and gives a firm support to professionals in the field of health, spatial planning, nature and landscape. It bridges transdisciplinary views or approaches by indicating how the various policy areas can reinforce each other.

Through application in a case study on the territory of a municipality, the guideline framework and the handbook as a whole illustrate the possibilities for guaranteeing the qualities, accessibility, visibility and functionality of green space at different scales.

Therefore the manual is well suited to be used in daily practice, as an aid to realising a healthy living environment with more space for green and blue, for a healthy population and for a healthy planet.

## 5. References

- AERTS, J., GEUSSENS, K., COUDERÉ, K. & KONIJNENDIJK, C. 2022a. Groenblauwe ruimtes als bouwsteen van veerkrachtige gezonde leefomgevingen. Onderzoeksrapport. In opdracht van het Departement Omgeving en het Agentschap Zorg en Gezondheid.
- AERTS, J., GEUSSENS, K., STEENHUIS, C., COUDERÉ, K., KONIJNENDIJK, C. & VAN DEN BOSCH, M. 2022b. Groenblauwe ruimtes als bouwsteen van gezonde en veerkrachtige leefomgevingen. Handboek voor planning, inrichting en beheer. In: DEPARTEMENT OMGEVING & AGENTSCHAP ZORG EN GEZONDHEID (ed.). Brussel.
- BELL, S., MONTARZINO, A. & TRAVLOU, P. 2007. Mapping research priorities for green and public urban space in the UK. *Urban Forestry and Urban Greening* 6, 103-115.
- BELMIZITI, A., CHERQUI, F. & KAUFMANN, B. 2018. Improving the multi-functionality of urban green spaces: Relations between components of green spaces and urban services. *Sustainable Cities and Society*, 43, 1-10.
- BRANQUINHO, C., CVEJIC, R., ELER, K., GONZALES, P., HAASE, D., HANSEN, R., KABISCH, N., LORANCE RALL, E., NIEMELA, J., PAULEIT, S., PINTAR, M., LAFORTEZZA, R., SANTOS, A., STROHBACH, M., VIERIKKO, K. & ZLEZNIKAR, S. 2015. A typology of urban green spaces, ecosystem services provisioning services and demands. GREEN SURGE deliverable 3.1. Copenhagen: University of Copenhagen.
- PADURO, T. E. & LAUSTED VEIE, K. 2013. Classification and valuation of urban green spaces—A hedonic house price valuation. *Landscape and Urban Planning*, 120, 119-128.
- PRÜSS-USTÜN, A., WOLF, J., CORVALÁN, C., NEVILLE, T., BOS, R. & NEIRA, M. 2017. Diseases due to unhealthy environments: an updated estimate of the global burden of disease attributable to environmental determinants of health. *Journal of Public Health*, 2017 Sep 1; 39(3), 464-475.
- RUPPRECHT, C. D. D. & BYRNE, J. A. 2014. Informal urban greenspace: A typology and trilingual systematic review of its role for urban residents and trends in the literature. *Urban Forestry & Urban Greening*, 13, 597-611.
- SCHIPPERIJN, J., BENTSEN, P., TROELSEN, J., TOFTAGER, M. & STIGSDOTTER, U. 2013. Associations between physical activity and characteristics of urban green space. *Urban Forestry and Urban Greening*, 12, 109-116.
- STATISTICS FLANDERS. 2022. *Land use: soil sealing*. [Online]. Available: <https://www.vlaanderen.be/statistiek-vlaanderen/ruimtegebruik/verharding> [Accessed 30/08/2022 2022].
- VERMEIREN, K., POELMANS, L., ENGELLEN, G., LORIS, I. & PISMAN, A. 2018. What is urban sprawl in Flanders? In: SCHRENK, M., POPOVICH, V., ZEILE, P., ELISEI, P., BEYER, C. & NAVRATIL, G. (eds.) *Real Corp 2018*. Vienna: Real Corp.
- VERVOORT, P. & VANDEVENNE, F. 2022. Komt een man bij de dokter: een novelle over gezonde leefomgevingen In: BOUMA, G., CUSTERS, L., DOOGHE, D. & VANEMPTEN, E., eds. Breek uit de bubbel, bijdragen aan de Plandag, 2022 Brussel. Groningen: Stichting Planologische Discussiedagen/InPlanning.
- VLAAMSE REGERING 2018. Strategische visie van het BRV. Brussel: Vlaamse Regering.
- VLAAMSE REGERING 2019a. Beleidsnota Klimaat 2019-2024. ingediend door Zuhail Demir, Vlaams minister van Justitie en Handhaving, Omgeving, Energie en Toerisme. Brussel.
- VLAAMSE REGERING 2019b. Beleidsnota Omgeving 2019-2024. ingediend door Zuhail Demir, Vlaams minister van Justitie en Handhaving, Omgeving, Energie en Toerisme. Brussel.

VLAAMSE REGERING 2019c. Beleidsnota Welzijn, Volksgezondheid, Gezin en Armoedebestrijding 2019-2024. ingediend door Wouter Beke, Vlaams minister van Welzijn, Volksgezondheid, Gezin en Armoedebestrijding. Brussel.

VLAAMSE REGERING 2019d. Regeerakkoord 2019-2024. Brussel.

WHO REGIONAL OFFICE FOR EUROPE 2017. Urban green spaces: a brief for action.

WORLD HEALTH ORGANISATION. Helsinki Statement on Health in All Policies. . Eight Global Conference on Health Promotion, 10- 14 June 2013, 2013 Helsinki, Finland.