Article Title: Nature-Based Solutions for city redevelopment and tourism.

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Abstract

Nature-Based Solutions (NBS) are being used in city areas to improve environmental conditions and increase tourism. This research examines the drivers behind, and impacts of, the application of NBS in city redevelopment projects for tourism. Nature based solutions is a term that refers to the use of flora and fauna ecosystems as an approach to resolve problems faced by society. Urban redevelopment projects are incorporating NBS to address climate change as well as local environmental issues such as disaster resilience whilst simultaneously delivering social and economic benefits. The research is highly original as it examines a new topic in tourism studies, the role of NBS in relation to city tourism. The research methodology uses a combined empirical and desk-based analysis in five case-study cites. NBS, as part of urban development projects, is now a strategic aim of many cities globally to re-brand, re-vision and re-orientate themselves to be more hospitable, liveable and attractive to tourists and visitors. The research reveals that NBS can deliver benefits to human wellbeing, tourism, economic vitality as well as more sustainable models of urban development.

Keywords: Nature-Based Solutions (NBS); tourism, city development, green infrastructure.

Introduction

Nature based solutions (NBS) refers to a range of interventions and practices, utilizing natural ecosystems, to address socio-environmental challenges. NBS involve changes to the physical environment and results in an environment that is 'more natural' than previously, with an accompanying alteration in the management system of that natural asset. NBS are being proposed as a means of addressing problems posed by issues such as: climate change, rapid urbanization, mass migration and emerging human health issues (Blewitt, 2014; Frantzeskaki et al, 2017; Cook et al, 2016; Nordhaus, 2014; European Environment Agency (EEA), 2017). Whilst NBS is mostly used to address environmental challenges, it also delivers social and economic benefits, particularly improvements to health and wellbeing.

The research examines the application of NBS in city and urban areas. The world is rapidly urbanizing, fifty years ago two-thirds of the world's population inhabited rural areas, in fifty years hence two-thirds of the global population will live in cities and urban areas (United Nations, 2014). Specific definitions of 'cities' vary from country to country, but all share similar traits: human settlements with high population densities and high levels of built environment infrastructure (Harvey, 1993; Healey, 1988; Lefebvre, 1991; Lefebvre, 1996; Castells, 1977; Castells, 1989). The broad aim of the research is to identify how urban NBS might address the sustainability and environmental challenges of the hospitality and tourism sector.

Tourism is transforming societies, economies and urban areas; new cities are being constructed whilst existing cities are radically altering. Cities and urban areas compete globally for tourists as part of their economic development strategy (Bauman, 2013, Judd, 2003). There are over one billion tourist journeys annually (United Nations World Tourism

Organization (UNWTO), 2018). The majority of world's population is now suffering from ill-health caused by unhealthy lifestyles (Ackland et al, 2003; Lay, 2015). Many determinants of ill-health and poor wellbeing are related to tourism behaviors and practices (Hobson & Dietrich, 1995; Hunter-Jones, 2005); furthermore tourism is partly responsible for the *"globalization of unhealthy lifestyles"* (Bloom et al, 2011). As tourism increases globally this generates pressure on urban areas to develop and change. The tourist industry is often interconnected with unsustainable development and unhealthy lifestyles (Inskeep, 1991; Liu, 2003; Parris, 2003). Nature-Based Solutions (NBS) is part of a wider strategy to make tourism and urban development more sustainable for the planet and human health. Sustainable development is defined as: "*development which meets the needs of the present without compromising the ability of future generations to meet their own needs*" and has three facets: social, economic, and environmental (Brundtlandt, 1987). These three facets are also addressed through the implementation of NBS projects. NBS is used to simultaneously improve human wellbeing *and* deliver sustainable development. Tourism is both the beneficiary of this, and one of the drivers towards greater adoption of NBS globally.

NBS: environment, society and economy

Defining NBS

Despite the relative nascence of NBS as a discipline, there is already a proliferation of definitions (Nesshöver et al, 2017). A widely-used definition, developed by the European Commission (2015; p2), states that: *'Nature-Based Solutions harness the power and sophistication of nature to turn environmental, social and economic challenges into innovation opportunities'.* This definition succinctly summarises the two key aspects of NBS; firstly the use of nature, or natural systems, as the *mechanism* through which change is delivered; and secondly, the *outcomes* of NBS projects that address not just environmental issues but also economic and social challenges. What is frequently raised in the literature on NBS is the difficulty of the 'wicked problems' faced (Buchanan, 1992; Callon et al, 2011; Latour, 2005) and how solutions need to simultaneously produce co-benefits to environmental, economic and social realms (Bennett et al, 2015; Calfapietra et al, 2015; Carrus et al, 2015; Wang et al, 2015). The characteristics of many of the issues facing society: climate change, food security, human ill-health, large-scale urbanization, mass migration are complex issues and impact on a range of sectors. NBS is deemed to have the capacity, flexibility and contingency to address these challenges holistically.

NBS and the environment

NBS emerged from ecological management systems and was primarily aimed at resolving environmental issues; particularly protection against flooding, drought or erosion. An example is NBS 'sponge-city' projects; whereby tracts of nature act as a 'sponge' to absorb rainfall and help reduce the threat of flooding **(**Dong & Han 2011; Liang & Langong, 2018; Li et al, 2017; Van Rooijen et al, 2005; Argent et al, 2008; Xia et al, 2017). NBS are used at the local scale to provide: *"air filtration, regulation of microclimate, noise reduction, surface water drainage… nutrient retention, and pollination and seed dispersal"* (Elmquist et al, 2004; p308). Environmental dangers posed by 'natural' disasters are heightened in light of climate change; the use of NBS is thus part of a wider strategy for ameliorating the potential effects of climate change. In this light, NBS are claimed to enable greater protection against natural disasters, particularly to mitigate against future risks and to improve disaster resiliency (Persson et al, 2016).

NBS and wellbeing

NBS can also be used to improve human health and wellbeing particularly in light of evolving disease scenarios and climate change impacts in urban areas. The presence of, and human interaction with, nature leads to improvements in human health and wellbeing (Kellert & Wilson 1995; Wilson, 2017; Ulrich, 1993). NBS are seen as particularly beneficial to mental and physical health and wellbeing (van den Berg et al, 2015; van den Bosch, & Sang, 2017; Ulrich, 1999; Lee & Maheswaran, 2011; Lovell et al, 2014; Lachowycz & Jones, 2011; Elmquist et al, 2004; Kaczynski & Henderson, 2007). The addition of greenery may help ameliorate the more harmful effects of noise pollution (Dzhambov & Dimitrova, 2014) which is often indirectly related to health issues such as hypertension, (WHO, 2011; Pirrera et al, 2010). Excessive heat, exacerbated in urban areas due to the heat island effect, has contributed to additional deaths, increased health risk factors and threat of diseases (Basagana et al, 2011; Bluyssen, 2014, Jehn et al, 2014; Patz et al, 2014). NBS has been successful in reducing heat island effects and reducing air temperature as well as perceptions of heat (Bowler et al, 2010).

NBS and the economy

The positive contributions of NBS by reducing health care cost to a society are significant. NBS is deemed a cost effective mechanism to deliver many infrastructure projects (Ferrario et al, 2014; Narayan et al, 2016; Reid, 2016; Stive et al, 2013; Temmerman et al, 2013). For example, the planting of trees is often cheaper in the short term than hard engineering solutions and the longer term cost of maintenance is often considerably lower (ibid). NBS can further contribute to economic sectors, predominantly through innovation leading to employment generation and the reduction of health and welfare costs (Bendor et al, 2015; Edwards, Sutton-Grier & Coyle, 2013; Adams 2014; Bommarco et al, 2013; Maes & Jacobs 2017; Nesshöver et al, 2017). NBS is also used to improve local economies by attracting tourists.

Tourism, city marketing and attractiveness

City marketing

As tourism is an important source of revenue, cities and urban areas now make themselves attractive to visitors (Judd & Fainstein, 1999). *'Cities all over the world have entered into a vigorous international competition for tourists'* (Judd, 2003; p3). Cities need to market themselves in order to attract inward investment, particularly through increasing levels of tourism and hospitality (Ashworth & Voogd, 1990). City marketing is the process of relating the demands of prospective visitors with the social, economic and environmental design of the city (Paddison, 1993; Kavaratzis, 2004; Moilanen, & Rainisto, 2009). NBS is one of the more recent mechanisms through which cities are being re-visioned and branded to become more hospitable and more liveable (Gulsrud, et al 2013; Southworth, 2003; Onnom et al, 2018; Ismail et al, 2018). Initiatives such as 'Green Capital' status (Gulsrud et al, 2017; Ratas & Mäeltsemees, 2013), knowledge cities (Yigitcanlar et al 2008; Ergazakis & Metaxiotis 2010), resilient cities (Godschalk, 2003; Folke et al, 2010; Leichenko, 2011); smart cities (Viitanen & Kingston, 2014; Caragliu et al, 2011; Allwinkle & Cruikshank 2011), sustainable food cities (Cities, 2017), digital cities (Besselaar et al, 2000) and ecological cities (White, 2002; Lehmann, 2010; Chang & Shepherd, 2013) are some of the mechanisms through which cities are re-visioning themselves to be more hospitable and attractive to visitors. This city re-visioning is directed to various modes of tourism activity (Andersson, 2016; Tardivo et al, 2014; Gonzalez, 2011). Tourism is an important driver for urban development and regeneration strategies.

City livability and attractiveness

Cities are now ranked globally on a livability index. This signifies both how important wellbeing is perceived as a driver of tourism and visitor attractiveness but also how cities operate on a global scale. Cities are fighting for inward investment against cities from all over the world (Ashworth & Voogd, 1990; Judd & Fainstein, 1999). The human population is more mobile than ever, along with the billion tourists there are also highly kinetic individuals who re-locate to more attractive locations. Furthermore there are many corporations who need to attract highly trained and educated staff who are looking for an attractive location to live, particularly those that offer a better work-life balance. Cities can no longer pursue policies of economic growth at any costs and remain competitive. Instead cities must balance other environmental, social and quality of life issues (Rice, 2019). For example, Beijing pursued decades of policies focusing on economic growth without due consideration of social or environmental policies. High levels of air pollution, leading to poor human health, made Beijing less attractive to visitors and the city was forced to change its policies (Zhang et al, 2015; Xu et al, 2004). NBS formed part of Beijing's strategy to improve air quality; simultaneously NBS was also used as a re-branding tool to market Beijing as a healthier, more livable city (Deng et al, 2017). Cities and urban areas using NBS as part of their attractiveness is a proxy for a healthier work-life balance. Tourism, city development and NBS are all interconnected. The next section examines the inter-relationship through a typological classification of: NBS, tourism and urban development.

Typologies of Nature, Tourism and Cities

Typology of Nature Based Systems

As nature is the central component of NBS, it is necessary to define what is meant by '*nature'* in this context. One of the central debates in defining nature concerns the '*human/nature'* relationship (Spaargaren & Mol, 1992). The *human/nature* question pertains to the degree to which humans are, or should be, independent of nature; some consider humans to be separate from nature whilst others see humans as an indivisible and integral part of nature (Kahn, 1999; Kant, 1999; Baudrillard, 1994; Ehrlich & Ehrlich 2000; Katz, 2009; Vogel, 2003; Elliot, 2008; Swart et al, 2001).

At one end of a spectrum, nature is defined as '*wilderness'*, a form of totally pure pristine nature. This is also understood as '*prehuman*' nature, that is, an ecosystem as it would have existed before humans evolved. In this conception of nature, natural ecosystems will function without any need for human intervention, human interaction in this type of nature is as a visitor or outsider. Cities following this NBS perspective are often 're-wilding', i.e. bringing in wild animals and flora into urban areas (Jepson, 2016; Prior & Brady, 2016). At the other end of the spectrum is '*quasi-nature'*; these are forms of nature that experience high levels of human intervention (Whatmore, 2002; Serres, 2007; Rice, 2014, Latour, 2012). This might be in the form of productive landscapes that require high degrees of maintenance and harvesting. Equally, it might describe highly 'artificial' forms of nature such as vertical gardens or living walls, where flora and fauna have been forced into configurations that do not exist 'naturally' and often require considerable levels of pesticides, fertilizers, hydroponics, manipulation and maintenance to survive. In between the two extremes: wilderness and quasi-natural is a spectrum of degrees of human intervention.

Typology of tourism

The key definitional characteristic of types of nature in NBS correlates to the extent of human intervention within a natural system. This definition also correlates with an important typology of tourism traits. Cohen (1972) developed a typology of tourist roles. Tourists can be classified into four types ranging from: institutionalised to non-institutionalised, based on

individual's degree of preference for agency and freedom to explore. At one extreme, tourists are *'non-institutionalized'*; meaning that these tourists enjoy wilder space, wilderness or environments free from commodification (Curtin, 2010; McCabe & Stokoe, 2004; Fan et al, 2017). These environments can be categorized as free from, or experiencing low levels of, human intervention. At the other end of the spectrum are '*institutionalized*' tourists who enjoy environments with increased levels of human intervention that have been modified, adapted or maintained to cater for high numbers of tourist visitors (Boissevain, 1996; Judd & Fainstein, 1999).

Typology of urban development: 'Paradigm city'

Despite the proliferation of cities that use NBS globally, there is a relatively limited number of different types of urban NBS in use. Urban development strategies follow paradigmatic models. Paradigm cities are instances of successful innovative urban design and development that is subsequently *'copied'* by many more cities globally (Franklin, 2006). The most well-known example is the '*Bilbao effect'* whereby the city of Bilbao redeveloped a former industrial site alongside the river (Plaza, 2000). The ensuing regeneration project transformed the city, which was economically struggling, into a thriving urban area with millions of additional tourists annually (ibid).The reason cities follow a paradigmatic model is partly because of the cost of urban development, usually measured in the hundreds of millions or billions of dollars/euros. Furthermore the timeframe for urban development is often decades, i.e. you only get one chance in a generation. Given the phenomenal costs of urban development, there is very little appetite for experimentation in urban development, instead risk averse strategies are usually adopted (Scheer, 2017). Therefore when a city develops a successful approach to development, it becomes the 'paradigmatic' blueprint for many other cities to copy. Consequently approaches to urban development currently adopt *"an extremely narrow urban-policy repertoire*" with most cities globally duplicating the approaches from a handful of other successful models (Gonzalez, 2011; p1412). The consequence of the paradigmatic city is that there are relatively few instances of genuine innovation and myriad more replications of that paradigm (Coenen & Truffer, 2012). The most recent paradigmatic cities have incorporated NBS to address environmental issues and to encourage tourism.

Interdisciplinary research methodology

It is appropriate and timely to examine the relationship between city NBS and tourism. Whilst environmental sustainability is an established aspect of tourism development, policy and practice however there is little or no research focusing on the role of urban NBS in relation to tourism. The research is premised on the 'ecological modernist' epistemological framework (Mol and Spaargaren, 2000) which argues that sustainable development practices lead to benefits, principally to the environment but also to society, health and the economy. This theory is pertinent to better understanding how NBS might relate to tourism practices. However given that this necessarily involves multiple academic disciplines it is not a straightforward procedure. *Nature Based Solutions* includes perspectives from ecology, biology and environmental science; *tourism* covers social science and economics; and *urban development* encompasses humanities, financing, marketing and built environment science. The research requires an interdisciplinary approach spanning three different disciplines, each with their own terms, methods and research approaches (Kristeva, 1997; Aboelela et al, 2007; Hadorn et al, 2008). In order to address the research problem in a rigorous and systematic manner, an empirical case-study methodology has been conducted. The methodology sets out how the design of the research strategy addresses these issues; further articulation of the methods and standardised techniques are set out in more detail in the following subsections.

The research project was broken down into three distinct phases; a literature review, typology study and empirical case study analysis.

The first phase involved a desk-based literature review of academic literature, grey literature, practice-based journals and precedent studies. The second phase of the research was to systematically analyze urban NBS in relation to tourism. In order to progress understanding of this field, a comprehensive classification was required. A typology is a system for classification of types within a general discipline and is an appropriate methodological approach to structuring the field of NBS, urban development and tourism (Allmendinger, 2009). Typologies are widely used in the fields of tourism (Keng & Cheng, 2004; Phillip et al, 2010; Prentice, 2004), urban development (Lang, 2005; Lee & Jacoby, 2011; Jabareen, 2006) and NBS (Eggermont et al, 2015; Rutt & Gulsrud, 2016; Lafortezza et al, 2018). The typology developed here is along the dimension of 'ideal' types which are generalized forms to act as referents against which to compare individual cases (Weber, 2009). The selection of projects for a typology is not meant to be exhaustive nor comprehensive; however, it does result in an exhaustive categorization of 'types' (Bailey, 1994; Smith, 2002). The use of typologies revealed the commonalities shared between these disparate interdisciplinary fields. The third phase of the research adopted an empirical case-study research strategy. Case-studies are used for the investigation of contemporary phenomenon in a real life context (Yin, 2009). Case studies are effective at enabling a range of data capture methods and combining qualitative and quantitative data (Payne & Payne, 2004). Flyvbjerg (2001: p79) proposes that case studies should be "*selected on the basis of expectations about their information content... using information-orientated selection".* Accordingly five case studies have been selected as they represent the full range of NBS project characteristics. The choice of projects was based on a review of literature and the most widespread dissemination of exemplar NBS as "*paradigmatic"* case studies (Flyvbjerg 2006: p234). The presence of innovative nature-based solutions in paradigmatic cities was employed as the independent variable to ascertain the effect on the tourism typology as dependent variable. The case-studies are selected to meet a number of key criteria in order to address the key variables of the research aim which is understand the relationship between tourism and NBS in urban areas. Accordingly the selection process for case-study cities needs to address three criteria: namely that each context must be paradigmatic, have implemented an NBS scheme and be a location of significant tourism. Each of the case-studies chosen are a globally-recognized paradigmatic city in terms of innovative NBS design strategies (Metzger and Olsson, 2013; Yuen, 1996; Teriman, Yigitcanlar and Severine, 2009; Beatley, 2016; Cho, 2010). The cities have implemented NBS, i.e. these have been designed, built and are currently operating in each context, along the spectrum of wilderness and quasi-natural. Furthermore in order for the research to have a more global relevance, provide a broad basis for comparison and future research applicability, the chosen cities are chosen are from a variety of different countries (spanning three continents and both hemispheres) and cover a variety of levels of economic development with varying cultures and climates. The choice was partly governed by the availability of data and limited to five urban NBS schemes for brevity. For each city a mixed-method approach combining observations and thematic textual analysis from digital archives has been used to triangulate the data-gathering (Mason, 2002; Flick, 2009). The research used geotagged photographic data in order to ascertain the 'hotspot' location and content of visitor behaviours, including the location of 'selfies', to derive the focus and attention of tourist practices (Hu et al., 2015). Global social media platforms globally such as Instagram and Flicker enable Geographical information metadata to be added to photographs to allow geolocation to be performed; from this data a hotspot of photographs in a location can be

determined and their content analysed. Inclusion of this data is included in the findings where significant. Documentary evidence and city archival information were used to ascertain the location and extent of NBS in case study locations.

Findings

Case Study City 1: NBS in Stockholm, Sweden

Stockholm is considered one of the most sustainable cities in the world. Sweden has a long history of sustainable development and uses NBS for a variety of social, environmental and economic purposes in urban areas. The largest-scale NBS in Stockholm is a '*green wedges'* strategy, which aims to improve and increase amounts of large continuous areas of forest, woodland and green space. The green wedges is a 'wilderness' type NBS that contributes to a range of environmental issues such as: reducing air pollution, regulating the microclimate, retaining surface water runoff and retaining soil. The large scale green wedges is a form of '*sponge-city'*, this version in Stockholm has been much emulated by cities threatened with flooding worldwide. The wedges form part of a much wider biosphere capable of maintaining a very rich diversity of flora and fauna, which provides species diversity that can contribute to smaller pocket parks and discontinuous green spaces. 'Quasi-natural' NBS types are implemented within Stockholm for urban food production with the aim to source some food locally whilst increasing awareness of sustainable food production as well as a mechanism for enabling human-nature interactions, and encourage community interaction (Bonow & Normark 2018). One of the best-known NBS projects in Stockholm is a major urban redevelopment scheme named Hammarby Sjöstad. There are numerous examples of NBS within this development, including planting to reduce flooding risk, improve shading, reduce wind strengths to improve micro-climates as well as a variety of natural space to improve human health, particularly community-focused spaces to improve social wellbeing (Frantzeskaki et al., 2017). Being a world leader in NBS design, Hammarby Sjöstad is one of the most visited NBS developments, with frequent visits by world and city leaders as well as academics, engineers and private industry learning from this innovative design approach (Julien et al, 2014; Holt, 2014). The design of this urban NBS development also incorporates purpose-built facilities for visiting scholars, experts and industrialists with buildings and spaces dedicated for this purpose. Stockholm uses its exemplary and pioneering paradigmatic city NBS developments as a marketing mechanism for tourism focused on education, advocacy, sustainability and NBS-tourism itself.

Case Study City 2: NBS in Singapore

Singapore, due to its small size, is simultaneously both a city and a country, and can be categorized as a single urban area, with natural spaces integrated within it. Singapore has a long tradition of looking favorably towards nature as a mechanism to achieve a more livable urban environment. As a relatively new country, only gaining sovereign independence in 1965, the fledgling country implemented a '*Garden City'* strategy in 1967, which included a range of approaches for increasing the levels of nature in the city, including: planting trees, forest conservation, recreational parks and '*green lungs'* (Corlett, 1992; Yuen, 1996). This approach towards greening the city eventually morphed into their '*City in a Garden'* strategy, which pushed for even higher levels of greenery to be implemented including many different NBS schemes.

The largest NBS project in Singapore is a *wilderness* type involving the protection of the remaining pristine forests as ecological conservation areas. In these highly natural spaces there are few, if any human interventions as part of the management of the ecosystems. The

primary function of this natural space is for preservation of nature and biodiversity. This NBS also provides multiple environmental benefits for Singapore as an urban area. The NBS wilderness areas provide resilience to flooding through the absorptive capacity of the forests and ameliorates the urban cooling effect (Lehmann, 2019). There are also social benefits of the NBS, mostly in terms of improved health and wellbeing through contact with these natural spaces (Lafortezza et al., 2009).

Singapore also has quasi-natural type NBS developments; at the other end of the spectrum in terms of levels of human management. A well-known example is the '*Singapore Supertree Gardens'* which are large, 50 metre high towers of flora; they have been designed into highly dramatic sculptural forms. These towers are not the most efficient forms for housing the flora, indeed, they are perhaps one of the least practical, and most expensive designs for storing and maintaining these plants. The logic of the NBS designs is principally concerned with creating a natural spectacle to attract tourists. This type of NBS is one of the most visited attractions in Singapore. The Supertrees provide many of the benefits of NBS: urban cooling, access to nature and species preservation (Beatley, 2017). This quasi-natural type of NBS is conceived with high levels of human interaction; both for the maintenance of the ecosystem itself and for high levels of human visitors to the experience the '*natural*' event (Hudson, 2014). Singapore has been very effective at marketing all their NBS projects, from the earliest 'garden city' attempts through to the latest success of the 'Supertree' project. These NBS present Singapore as an environmentally friendly city and one that is also highly livable in terms of social wellbeing and economic vibrancy (Tham, 2019).

Case Study City 3: NBS in Kuala Lumpur, Malaysia

In the centre of Kuala Lumpur is a large urban redevelopment project. The scheme is located in the heart of the city, next to the historic colonial quarter and where the parliament buildings once sat. In the middle of this area is the main river that flows through the city; Kuala Lumpur is named after this part of the river, which translates as '*muddy estuary'*. The river flooded the city several decades earlier and hard engineering interventions were implemented, including rerouting the river to remove bends and concrete channelising structures. Whilst the hard-engineering approach has succeeded in reducing the risk of flooding, it did little to help with other environmental issues. The resultant river area was still a rather unattractive place, with little concern as a place for tourism, or a place for humans generally. The riverside area was generally perceived in a negative light. The river was an aesthetically unprepossessing, smelly, muddy estuary; made even less attractive due to raw sewage, plastic and other debris polluting the river. The riverside environs were generally unpleasant to look at, or smell, with high levels of air and noise pollution from nearby traffic; temperature and humidity levels remain very high throughout the year. Accordingly the city undertook major redevelopment of the riverside area, including NBS, to address some of these issues. The NBS has been marketed as the *'River of Life'* in order to sound more enticing than 'muddy estuary' (Othman & Majid, 2018). The scheme requires high levels of human intervention and maintenance. This quasi-natural NBS project has been careful to consider the social needs of tourists as part of the development of problem-setting (Kozlowski, Ujang and Maulan, 2017), namely: a need for cooling, shading and reduction of visual, acoustic, olfactory pollutants. Additional trees have been planted along the river, upstream and downstream to aid with flooding. The trees have been used to provide shading, cooling and to screen unsightly buildings (Stevens, Kozlowski, and Ujang, 2016). The trees also encourage wild birds, and more birdsong can be heard. More physical space has been allocated next to the river for promenading and relaxing. The area along the riverside has been designed to be more photogenic; NBS is used to address the visual pollution of the river. For example, lining each riverbank there are now additional pools of crystal-blue water

stocked with koi carp, providing tourists with an improved riverside experience. Jets of water along the river's edge produce a fine mist spray, which both creates a cooling effect but also masks the unsightly muddy river. The mists also aid in generating a more '*photogenic'* visual environment. The riverside is now popular with tourists taking '*selfies'* and the redesign was careful to maximize the attractiveness using NBS as part of that strategy. Inspired by the redevelopment of many other paradigm city waterfronts, the design of the riverside is now marketed as both an *attractive* space and as an *attraction* in itself.

Case Study City 4: NBS in Wellington, New Zealand

A major wilderness type NBS project has been developed as part of the wider Wellington urban area in New Zealand. The aim of this NBS project is to create and maintain an area of pristine wilderness (Starbridge, 2009). The intention is to produce a pristine '*prehuman'* nature; that is, an ecosystem as it would have existed before humans evolved (Zealandia, 2018). This is perhaps the most extreme type of the NBS in terms of removing human intervention from a natural system (Norton et al, 2016; Beatley, 2016). Ironically, it took quite a lot of human intervention to create the conditions for this environmental paradise. The area was already a nature preserve, but indigenous species had been decimated by non-indigenous fauna. The area has been fenced off, non-indigenous species removed, and indigenous animals re-introduced into the area (Innes et al., 2012). This wilderness NBS is aimed primarily at species conservation and biodiversity protection. However, there are other benefits from the NBS project. The area contributes to reduce flooding risks and reduce heat island effects. The scheme is located adjacent to a large urban area and the NBS is conceived as a space where humans can visit nature and gain the wellbeing benefits from this interaction (Roberts et al, 2015). The NBS site is marketed as an innovative ecological experiment and as a tourist attraction located within a major New Zealand urban area (Marques et al, 2019). Wellington is regularly short-listed (and has been the winner) as one of the world most livable cities (Blakeley, 2015); NBS projects of this type contribute to the attractiveness and marketability of Wellington and New Zealand for tourism.

Case Study City 5: NBS in Seoul, South Korea

In the centre of Seoul in South Korea, there is a large urban NBS redevelopment project, the '*Cheonggyecheon River Linear Park'*. This example of NBS is innovative because it is an example of the removal of a major hard-engineering project and replacement with a large-scale NBS project. The project serves as an exemplar of the limitations of hard-engineering projects and the benefits of NBS. The river had previously been channelized with concrete flooding defenses and interventions, as well as motor traffic infrastructure in the form of elevated roads and bridges. The hard engineering elements have been removed and replaced with NBS that are a mixture of wilderness and quasi-natural types. The NBS project in Cheonggyecheon addresses flood protection, with planting of marsh areas and wooded sections to reduce the risk of flooding. The NBS also aims to help combat the urban heat island effect and reduce local air pollution. There are explicit aims of social benefits through NBS; there are areas zoned for recreational use within the project, to enable more human-nature interaction to improve wellbeing.

The project was extremely expensive and cost several hundred millions of dollars (in 2005), so there was a need to evidence and justify the financial benefits of the ambitious NBS project. The economic benefit is evident at the small-scale with businesses along the river improving as a result of improved environmental quality; at a city-scale the NBS project has provided a resource for many of the residents and visitors (Nam-choon, 2005). The re-designed riverside now attracts 60,000 visitors a day (Wang, 2014). At the global scale, the project acts as a window onto the entire country for marketing purposes. The NBS project

was conceived, not only to attract tourists to this city, but to South Korea in general. The Cheonggyecheon NBS project positions South Korea as a country that values human wellbeing; it has replaced the image of traffic-choked freeways cutting through a large urban area with an image of a rather romantic quasi-wilderness in the heart of a city (Lee et al., 2014). The NBS project is used as a promotional marketing device to illustrate the transformation of South Korea from a developing country that has leapfrogged into being one of the world's most advanced nations (Lee and Anderson, 2013).

Conclusions

The research is highly original as it examines a new topic in tourism studies, the role of Nature Based Solutions in relation to city tourism. There is little or no existing research into how NBS have been used in relation to tourism strategies or tourism policies. The research critically examines the complexities in the inter-relationships between tourism, marketing, city development and NBS. As the world population becomes more mobile, cities are competing for visitors as a means of attracting inward economic investment. These kinetic populations are seeking cities that deliver environmental sustainability whilst enabling high levels of wealth, health and wellbeing. Cities are using NBS to market themselves as more liveable, sustainable and healthy. NBS is used to address the global environmental challenge of climate change as well as local environmental issues such as flooding or drought. However NBS is a far more wide-reaching intervention; it challenges and transgresses the very relationship between humans and nature. At its best, NBS can successfully harmonise humans and nature to also deliver benefits to human health and wellbeing. NBS can also improve the economic performance of cities, particularly through making cities more hospitable places to live and more attractive to tourists and visitors. 'NBS tourism' is already evident in paradigm cities. The Singapore 'Supertrees' is the most effective type of urban NBS in terms of attracting large numbers of 'institutionalised' tourists. The case studies reveal that the forms of city NBS most focused on attracting large numbers of 'institutionalised' tourists as an 'attraction' require the highest levels of human maintenance and intervention. Furthermore this type of tourism is distorting nature to become less wild, more managed and 'artificial'. NBS in heavily visited tourist locations are being conceived with tourists in mind. As cities cater for tourists and become more *'selfie'* friendly, the design and organization of NBS is being modified accordingly. These urban NBS spaces are designed for people taking selfies in the most photogenic location, whereby nature becomes the frame for the photograph. It is not yet clear the extent to which these types of NBS provide the same positive impacts of human health and wellbeing compared to the wilder types of NBS. The wilder NBS projects tend to be less of an '*attraction'* for tourists. This type of urban development aligns with 'non-institutionalised' tourists. Wilderness type NBS projects serve more of a role in the broader marketing of the city as a location with an improved human-nature relationship. This form of NBS becomes a proxy for cities where quality of life is valued highly. The latest case-study empirical evidence reveals that tourists are leading to changes in the design and application of city NBS. The research is significant as it will act as foundational research for future studies in this area. The implications of the research is that it points towards the need to further understand the extent of demand for NBS-related tourism, including the potential role of city tourism organisation in this context and better understand the motivations of urban tourists. There is evidence of the emergence of 'NBS Tourism' (NBST) which is tourism that is driven by the presence of NBS in city areas. NBS improve the aesthetic and environmental qualities of host cities making them more attractive to visitors; they are also increasingly used as part of sophisticated marketing strategies for these cities. There is a correlation between quasi-nature NBS and the institutionalized tourist typology; similarly there is a correlation between wilderness NBS and

the non-institutionalized tourist typology. A potential financial implication of the research points to additional economic wellbeing for the host city derived from additional tourist activity. At present, this economic benefit is not accounted for in current cost-benefit analyses of NBS projects; but the inclusion of financial benefits from tourist activity would make NBS more economically robust. The research also contributes to future research in the development of NBS for disaster management and resiliency strategies for urban areas, furthermore the research contributes to the theoretical development of the World Health Organisation 'healthy City' agenda through the use of urban NBS. Furthermore the research can unlock further potential for the value of NBS as part of the wider economic wellbeing impacts for the host city.

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