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# Novel Solutions or Rebranded Approaches: Evaluating the use of Nature-Based Solutions (NBS) in Europe

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### *Author contribution statement*

FO'S wrote the original draft. IM and SC provided in-depth feedback and the final copy was re-written by FO'S

### *Keywords*

Nature-based solutions, Urban greening, Horizon 2020, Climate change resilience and adaptation, Sustainable urbanism

### *Abstract*

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The Nature-Based Solutions (NBS) concept is the most recent entry to discussions around how 'nature' can be mobilised to render urban areas more resilient to the threat of climate change. The concept has been championed by the European Commission (EC) as a tool that can transform contemporary environmental, social and economic challenges into opportunities for innovation, bolstering Europe's position as a leader in climate change mitigation and adaptation. With its current research and innovation programme - Horizon 2020 - the EC looks to position itself as the global NBS frontrunner, providing funding to cities to act as NBS demonstrator projects across the continent. These are expected to provide a "repository of best-practice examples" (Favre et al., 2017:513) that can be replicated globally.

This paper focuses on three Horizon 2020-funded NBS demonstrator projects: Connecting Nature, URBAN GreenUP and Grow Green, each of which brings together a suite of urban partners from both within and outside the European Union (EU). It examines the internal 'politics' i.e., the aims and internal governance and implementation issues associated with these projects, and analyses how partners perceive the NBS concept. To engage with these aims, interviews were conducted with a diverse set of NBS 'practitioners' working within the three projects. Analysis showed that the projects aim to influence climate-change resilient and sustainable urbanism through the process of retrofitting cities with small-scale green and blue interventions, as well as help the EU secure stronger diplomatic relations with neighbouring non-EU countries and key international trade partners. It also illustrated that for many project partners, NBS is perceived to be a novel concept, because it re-frames pre-existing terms such as Green and Blue Infrastructure (GBI) and Ecosystem Services (ES) in a way that makes principles of urban greening more understandable to lay audiences and more politically palatable for urban governments. However, partners also warn that this framing of NBS has led to a narrow and idealised representation of nature; one that simultaneously undervalues biodiversity and oversells the capacity of natural processes to provide 'solutions' to urban climate vulnerability and broader patterns of unsustainable urbanism.

### *Contribution to the field*

This research looks to fill three gaps within the Nature Based Solutions (NBS) discourse. Firstly, it investigates the politics of Horizon 2020-funded NBS projects i.e. their overarching aims, scope and the issues associated with their governance structure(s). Secondly, it analyses whether actors working within these projects perceive NBS to be a 'novel' urban greening concept. Thirdly, it interrogates the way in which 'nature' is being framed within the NBS concept and discuss what the potential impacts of this are. If the NBS concept is to gain prominence in the field of urban greening and contribute to making cities more climate resilient, an exploration of these questions is crucial.

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32 **Abstract:**

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34 'nature' can be mobilised to render urban areas more resilient to the threat of climate change. The  
35 concept has been championed by the European Commission (EC) as a tool that can transform  
36 contemporary environmental, social and economic challenges into opportunities for innovation,  
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48 projects aim to influence climate-change resilient and sustainable urbanism through the process of  
49 retrofitting cities with small-scale green and blue interventions, as well as help the EU secure  
50 stronger diplomatic relations with neighbouring non-EU countries and key international trade  
51 partners. It also illustrated that for many project partners, NBS is perceived to be a novel concept,  
52 because it re-frames pre-existing terms such as Green and Blue Infrastructure (GBI) and Ecosystem  
53 Services (ES) in a way that makes principles of urban greening more understandable to lay audiences  
54 and more politically palatable for urban governments. However, partners also warn that this framing  
55 of NBS has led to a narrow and idealised representation of nature; one that simultaneously  
56 undervalues biodiversity *and* oversells the capacity of natural processes to provide 'solutions' to  
57 urban climate vulnerability and broader patterns of unsustainable urbanism.

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65 **Introduction:**

66 During the late 19<sup>th</sup> and early 20<sup>th</sup> Centuries, urban planners and designers including Ebenezer  
67 Howard and Frederick Law Olmsted promoted the use of nature as a tool to sanitize the city (Kaika,  
68 2005). Drawing on a 'romanticized' view of nature as pristine and inherently good, they proposed  
69 using green and blue spaces to simultaneously tackle environmental issues such as pollution, as well  
70 as social ills such as high levels of crime. Evolving out of these early examples of "urban  
71 experimentation" (Caprotti & Cowley, 2017:1422), the concept of 'Nature-Based Solutions' (NBS) –  
72 defined as "living solutions underpinned by natural processes and structures that are designed to  
73 address various environmental challenges while simultaneously providing economic, social and  
74 environmental benefits" (Frantzeskaki et al., 2017:67) – has increasingly gained traction in the last  
75 decade within discourse surrounding sustainable and climate resilient futures (Mell and Clement,  
76 2019).

77 Endorsed by organizations such the European Commission (EC, 2015) and the International Union for  
78 Conservation Nature (IUCN, 2014) as a way of making natural ecosystems an "integral part of  
79 sustainable development" (Laforteza et al., 2018:431), NBS aims to "integrate the ecological  
80 dimension alongside traditional planning concerns" (Scott et al, 2016:267). Viewed as a cost-  
81 effective alternative to grey or 'man-made' infrastructures, it is also believed that NBS interventions  
82 such as rain gardens or green walls can more effectively protect urban dwellers, infrastructures and  
83 business interests from climate change hazards when compared to engineered approaches (IEDD,  
84 2018).

85 NBS entered the mainstream scientific literature in the 2000s, originally in the context of providing  
86 solutions to agricultural problems e.g. pest management (Potschin et al., 2014). However, from  
87 approximately 2009 onwards the term became increasingly embedded within literature related to  
88 how nature could be used "to tackle major societal challenges such as climate change" (Eisenberg  
89 and Polcher, 2018:1). Due to the relative newness of the concept and its broad scope, definitions of  
90 NBS have been vague and divergent (Pauleit et al., 2017) which has hindered its conceptual  
91 development and uptake in practice (Cohen-Schacham et al., 2016).

92 Questions have also arisen around whether NBS represents a 'novel' approach to re-naturing urban  
93 areas (EC, 2015). This is because the relationship between NBS and pre-existing concepts, namely  
94 green and blue infrastructure (GBI) and ecosystem services (ESS), is ambiguous (Potschin et al., 2014;  
95 Dorst et al., 2019). Whilst the relationship between these terms has received attention within the  
96 academic literature (cf. Pauleit et al, 2017), it has been theoretical in nature (although this is  
97 changing via the growing number of academic publications associated with EU funded NBS projects).



98 Therefore, there is a clear need to study how the organizations practically involved in the  
99 implementation of NBS perceive the nascent term and the vision of 'nature' it mobilises. Moreover,  
100 unlike other forms of 'urban experimentation' (Frantzeskaki et al., 2017), such as 'smart cities' (see  
101 Viitanen and Kingston, 2014), there has been no analysis of the 'politics', i.e. drivers, interests, risks  
102 and pressures (Karvonen et al., 2014), associated with how NBS projects are governed.

103 In an attempt to explore these research gaps, this paper focuses on three current NBS projects:  
104 *URBAN GreenUP*, *Grow Green* and *Connecting Nature*. Funded by the EU's current research and  
105 innovation programme – Horizon 2020 – these are demonstration projects that aim to increase  
106 climate resilience through the delivery of innovative NBS in cities. The aim of this paper is to  
107 examine the role of these projects in promoting NBS by 1) investigating the politics of Horizon 2020-  
108 funded NBS projects i.e. their overarching aims, scope and the issues associated with their  
109 governance structure(s); 2) to analyse whether actors working within these projects perceive NBS to  
110 be a 'novel' urban greening concept; and 3) interrogating the way in which 'nature' is being framed  
111 within the NBS concept and discuss what the potential impacts of this are.

## 112 **Rise of NBS in the contemporary 'Risk Society'**

113 Modern societies have increasingly become concerned with risk, borne out a preoccupation with the  
114 future and safety (Giddens, 1998). Global problems such as climate change and economic  
115 uncertainty present qualitatively different problems from those societies evolved to confront,  
116 creating the 'cosmopolitan imperative' and requiring them to either cooperate or fail (Beck, 2011).  
117 In an increasingly urbanised world under the myriad threats posed by climate change, cities are sites  
118 of immense importance, as both drivers of change that generate climate risk and the expected  
119 victims of it (Dulal, 2016).

120 Cities currently produce 70% of global waste, consume 60% of global energy, and emit 75% of world-  
121 wide greenhouse gas emissions (Nature, 2018). These extensive urban 'metabolisms' (Swyngedouw,  
122 2006) endanger global health and wellbeing (WHO, 2010), deplete 'stocks' of natural capital both  
123 within and beyond urban ecosystems (Grunewald et al., 2018; EC, 2019), and significantly contribute  
124 to climate change threats that disproportionately impact the lives and businesses of urban-dwellers  
125 (Dulal, 2016; HBR, 2017). It is within this context of urban climate risk-factors that the NBS concept  
126 has gained increased traction, especially within Eurocentric discourses.

## 127 **The EC as *the* NBS frontrunner**

128 Though the NBS concept has gained significant interest from organizations including the IUCN and  
129 the World Bank, it is the EC that has shown the greatest ambition to position itself as the global

130 leader in the innovation and implementation of NBS (Nesshöver et al., 2017). Defining NBS as  
131 interventions that “harness the power and sophistication of nature to turn environmental, social and  
132 economic challenges into innovation opportunities”, the EC (2015:2) believes that the concept can  
133 help to:

- 134 1. Enhance sustainable urbanisation whilst also stimulating economic growth and enhancing  
135 human well-being.
- 136 2. Restore degraded ecosystems and improve their resilience.
- 137 3. Develop climate change adaptation and mitigation.
- 138 4. Improve risk management and resilience.

139 Moreover, NBS is framed as a tool that can stimulate new business opportunities and bolster  
140 Europe’s position as a leader in world markets (EC, 2015). However, the EC also recognises that, at  
141 present, standards and guidelines for NBS design are limited and implementation is still in an  
142 experimental phase (Kabisch et al., 2016). The EC has leveraged the power of funding, through its  
143 current research and innovation programme (Horizon 2020), to deliver extensive urban NBS  
144 demonstrator projects across Europe with the aim of addressing this knowledge gap. Practical  
145 projects such as *Connecting Nature*, *URBAN GreenUP* and *Grow Green* aim to provide a “repository  
146 of best-practice examples” (Faivre et al., 2017:513) by collecting “valuable information on  
147 appropriate designs, implementation techniques and cost benefit analyses for NBS” (ibid:512) that  
148 can guide future sustainability projects and urban policies. But how did NBS become framed as an  
149 instrument for climate adaptation and resiliency?

## 150 **Evolution of NBS into an urban policy term**

151 As the introduction elucidated, the NBS concept was initially envisioned as a ‘nature-based’  
152 approach to agricultural and water management issues (Potschin et al., 2014). In the late 2000s,  
153 however, the World Bank and the IUCN began to mention ‘nature-based solutions’ within a similar  
154 remit to that of ecosystem-based adaptation (EBA); the extent to which biodiversity conservation  
155 can contribute to climate change mitigation and adaptation efforts (Pauleit et al, 2017). Two key  
156 documents emerged at this time: ‘Biodiversity, Climate Change, and Adaptation: Nature-Based  
157 Solutions from the World Bank Portfolio’ (MacKinnon et al., 2008) and ‘No time to lose – make full  
158 use of nature-based solutions in the post-2012 climate change regime’ (IUCN, 2009). Both use the  
159 term NBS, but fail to offer a clear definition if it, or a discussion of how it differs from EBA. Shortly  
160 after the publication of these reports – namely at a European conference held in Brussels in 2014 –  
161 NBS was re-framed as a tool that could simultaneously make EU cities more climate change resilient,  
162 whilst also providing benefits to human health and wellbeing (EC, 2014).

163 Re-modelled as such, NBS has increasingly become deployed as a concept that can aid ‘urban  
164 sustainability transitions’ (Frantzeskaki and Rok, 2018). To test the potential of NBS, the EU, under  
165 the FP7 funding package – the precursor to Horizon 2020 – began to fund urban ‘transition  
166 initiatives’, which are described as “actor collectives led by public, civic, business or partnerships of  
167 those, who put in place new ways of doing, thinking and organizing and transform current systems  
168 of provision with the aim to actively contribute to environmental sustainability” by Frantzeskaki et  
169 al. (2017:66). The ARTS (Accelerating and Rescaling Transitions to Sustainability) project, that ran  
170 from 2013-2016, was one of these initiatives. The consortium consisted of 10 partners from 10  
171 European countries and focused on how sustainability transitions could be accelerated through the  
172 use of NBS interventions such food gardens, urban forests and urban beehives (ARTS, no date;  
173 Frantzeskaki et al., 2017). *Connecting Nature, URBAN GreenUP* and *Grow Green* can therefore be  
174 understood as the next wave of these EU-funded ‘transition initiatives’.

### 175 **NBS projects as urban sustainability ‘experiments’**

176 ARTS aimed to provide a forum for experimentation with context-specific solutions to environmental  
177 issues in ways that that restore, mimic, or extend natural processes (Frantzeskaki et al., 2017).  
178 Though urban experimentation is not a novel phenomenon (Karvonen et al., 2014), cities across the  
179 globe are increasingly being viewed as urban living labs where novel modes of governance can be  
180 tested. Different forms of urban experimentation such as ‘smart cities’ and ‘transition initiatives’ are  
181 envisaged as solution-oriented alternatives to ‘business as usual’ government-led approaches to  
182 sustainability that can steer urban society towards a more liveable, prosperous and sustainable  
183 future (Bulkeley and Castan Broto, 2012; Frantzeskaki et al., 2017). What makes these experiments  
184 attractive is that they are “provisional, risky and dynamic” (Karvonen et al., 2014:104); i.e. they have  
185 a high risk of failing, but also “high rates of return if they are successful” (ibid:105). However, is this  
186 gamble worth it? Such urban experiments are questionable sources of alternative solutions that will  
187 generate transformative change, and may instead reinforce pre-existing practices and dominant  
188 interests, whilst being spatially limited (Evans et al., 2016). An experiment is, after all, predicated  
189 upon one party or group being the ‘experimenter’, and the other being the ‘experimented upon’.  
190 The scale of experimentation also poses questions about their efficacy as a strategy to provide  
191 tangible sustainability outcomes. There is a danger that under the appealing label of ‘innovation’,  
192 small-scale experiments may replace comprehensive planning strategies with one-off interventions  
193 (Karvonen et al., 2014:105)

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196 **Is NBS a 'novel' urban greening concept?**

197 Though the discussion above illustrated how the evolution of NBS can be traced, it remains unclear  
198 how it differs from pre-existing urban greening concepts. This is because typical examples of NBS,  
199 such as sustainable urban drainage systems (SUDs) and green roofs are also commonly referred to as  
200 GBI interventions and ES providers. Nonetheless, multiple authors are beginning to critically unpack  
201 the relationship between these interrelated terms.

202 With its explicit focus on providing innovative 'solutions' to sustainability issues in a predominantly  
203 urban setting, the NBS concept shifts away from the broader concept of ES (Nesshöver et al., 2017;  
204 Pauleit et al., 2017). The line between NBS and GBI, however, is perceived as being more ambiguous.  
205 When compared to GBI, Dorst et al. (2019:4) assert that NBS provides "more focus and immediacy as  
206 a planning approach". Again, this can perhaps be attributed to the former's overt aim to provide  
207 direct 'solutions' to sustainability problems. For Mell and Clement (2019), a subtle difference  
208 between the two approaches is that NBS places 'nature' at the very centre of development debates.  
209 They suggest that the NBS approach "concentrates on the inclusion of 'nature' in its widest sense  
210 and promotes its ecological value as being of equal importance to socio-economic benefits" (ibid:3).

211 Despite these differences, there is a broad consensus that NBS overlaps significantly with these  
212 'foundational' concepts (Sekulova and Anguelovski, 2017). Pauleit et al. (2017) puts forward a view  
213 of NBS as an 'umbrella' term that includes or 'sweeps up' (Dorst et al., 2019) GBI, ES and EBA within  
214 it (See Figure 1). In this model, these concepts are conceptualised as sub-sets or components of NBS  
215 (Mell and Clement, 2019). Laforteza et al. (2018) support this vision of NBS, stressing that the  
216 'umbrella' term model illustrates how NBS cannot be considered an isolated concept because its  
217 own existence is contingent upon these other 'foundational' concepts.

218 **What does NBS 'add' to the urban greening discourse?**

219 With its focus on providing multi-functional, cost-effective benefits, Mell and Clement (2019:3)  
220 argue that utilising the NBS concept can integrate "ecological concerns alongside traditional  
221 planning activities". The concept's holistic nature can allow NBS to overcome the "traditional  
222 structures of city departments" (Sekulova and Anguelovski, 2017:18), namely the 'sectoral language'  
223 that traps knowledge into silos. This in turn can help to mainstream environmental targets into  
224 sectors such as policy, business and practice "that might not traditionally consider or value the  
225 environment" (Nesshöver et al., 2017:1224), and aid urban adaptation "by providing planners,  
226 developers and architects with ecologically sensitive choices that can be used to reverse some of the  
227 cost, maintenance and delivery issues associated with engineered solutions" (Mell and Clement,  
228 2019:4). Observations such as these have led authors to characterise NBS as a 'boundary concept';

229 “a loose concept, which has a strong cohesive power” (Allen, 2009:35). As Dorst et al. (2019:5) put it,  
230 NBS offers “interpretive flexibility with scope for reflection yet provides a solid enough foundation  
231 for different actors previously lacking a common language to work together”.

232 As a ‘boundary concept’, the NBS approach may also be a more accessible measure for actors less  
233 familiar with ecological thinking or working with nature in general (Dorst, 2019). Unlike GBI which  
234 stresses the importance of connectivity between natural areas, the NBS approach “more readily  
235 includes ‘detached’ measures” (ibid:5) such as the implementation of singular interventions. This  
236 approach may be more attractive and suitable for companies or small citizen-led organizations who  
237 want to implement a single green roof or green wall. It may also make NBS a more adaptive  
238 approach to urban greening in comparison to GBI and EBA. This is because cities are defined by  
239 “fragmented land ownership” (ibid), which makes “connecting green space more difficult to  
240 achieve”. However, the isolated implementation of small-scale NBS interventions also runs the risk  
241 of failing to provide any tangible ecosystem service benefits (Savard et al., 2000; Dorst et al., 2019).

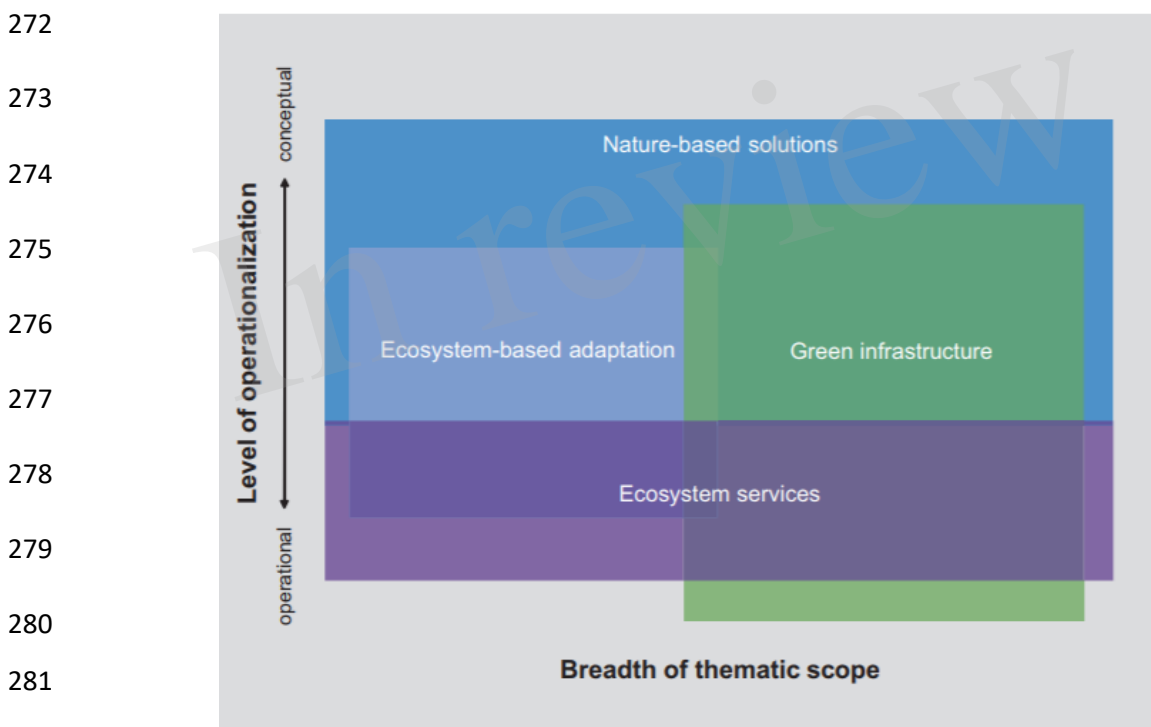
#### 242 **(Re)presentations of ‘nature’ within NBS**

243 Nature is a normative and highly contested term, with little consensus on meaning, reference state,  
244 or application (c.f. Castree, 2014). Due to its breadth and ambiguity, nature is commonly conceived  
245 as a ubiquitous ‘other’ that is unable to represent itself. Rendered “mute” (ibid:54), he suggests that  
246 ‘nature’ is therefore “free to be represented in all manner of different ways in a variety of arenas,  
247 media and genres” by different ‘epistemic communities’ i.e. coalitions of professionals from  
248 different disciplines and backgrounds that possess a united set of beliefs (Haas, 1992:3). Crucially,  
249 representations mobilised by these communities don’t reflect reality, but take on specific meaning(s)  
250 and value(s) within them (Shapiro, 1988). Analyses such as these have led authors like Conesa-Sevilla  
251 (2018, p. 3) to label the term ‘nature’ an empty or floating signifier; a word that, despite being  
252 indispensable, possesses “elusive, ever-shifting and multi-value signification”. With this in mind, how  
253 has this signifier been mobilised within NBS discourse?

254 Despite its relative youth as a concept, multiple academics have registered their concerns over how  
255 ‘nature’ is represented within NBS. Much of this stems around how the NBS term serves to present a  
256 simplified framing of nature, a by-product of representing it as a singular entity, as opposed to an  
257 amalgam of entities and enmeshed processes (Conesa-Sevilla, 2018). What, for example, is the  
258 ‘nature’ in NBS? Does it refer to only biotic life-forms e.g. plants and trees, or does it also include  
259 abiotic nature; non-living parts of the environment, e.g. sunlight and water, that have a significant  
260 influence on biotic factors? This type of analysis is currently missing within the NBS literature.

261 Engaging in “pluralistic reflection about alternative framings and conceptualisations” (Nesshöver et  
262 al., 2017:1220) of nature is sorely needed within the NBS literature to advance the concept.

263 The over-simplification observed thus far risks ‘romanticizing’ nature and over-selling what it can do  
264 (Sekulova and Anguelovski, 2017). Green interventions such as increasing tree cover are limited in  
265 their power, e.g. they can ameliorate air pollution to a limited extent (Baró et al., 2014). At a certain  
266 threshold, ‘nature-based’ strategies are not the optimal approach (Sekulova and Anguelovski, 2017).  
267 A more directed way of dealing with high levels of air pollution would be to effect change through a  
268 non-‘nature-based’ intervention, e.g. banning vehicles within certain parts of a city, thus focussing  
269 on the root(s) of the problem. Therefore, is it problematic to suggest nature as an abstract entity  
270 possesses the capacity to solve urban ills. For Nesshöver et al. (2017:1220), “there may not even be  
271 an agreement about the problems to be solved, let alone the type of solutions needed”.



283 Figure 1. Illustration of the relationship between NBS, GI, EBA and ES and each of their conceptual  
284 ‘scopes’ (Pauleit et al., 2017:41).

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290 **Material and Methods:**

291 **Research approach:**

292 This paper employed a qualitative research programme. With the aim of providing an exploratory  
293 case study of how NBS has been mobilised, twelve semi-structured interviews were conducted with  
294 partners engaged within the *Connecting Nature*, *URBAN GreenUP* and *Grow Green* projects. These  
295 projects were selected because they are amongst the first to specifically test the NBS concept in a  
296 practical, 'on-the-ground' sense. Research at this stage of the concept's development was deemed  
297 crucial because, even in these early stages, 66% of Paris Agreement signatories now include NBS<sup>1</sup>  
298 within their Intended Nationally Determined Contributions (INDCs) to climate change action (IEDD,  
299 2018). Thus, if the concept, and the projects that mobilise it, are not unpacked there is a risk that  
300 future research may be uncritically rolled-out without an evidenced understanding of what the NBS  
301 concept truly offers the discourse around unsustainable urbanism and urban climate change  
302 resiliency.

303 Each project is composed of a mixture of organizations from different, predominantly EU countries.  
304 The members of these epistemic communities can be divided into four broad groups: *city partners*,  
305 *academic partners*, *civil society partners* (predominantly from the environmental sectors in partner  
306 countries) and *small-medium sized enterprises (SMEs)/business partners*. Unlike the other, more  
307 bounded partner groups, city partners within these NBS projects are split into two tiers:

- 308 • **Tier 1:** 'Fronrunner' city partners, which act as the demonstration sites where NBS  
309 intervention design and implementation will be trialled first.
- 310 • **Tier 2:** 'Follower' city partners, who will utilise the lessons learnt from the 'Fronrunner'  
311 cities to design their own NBS interventions. Tier 2 cities are predominantly in EU countries,  
312 but there also are several non-EU cities involved, .e. Colombia, Bosnia-Herzegovina and  
313 Vietnam.

314 Table 1 outlines a full list of the 'fronrunner' and 'follower' cities in each project, as well as the  
315 other types of partners and the EU-funding each project received.

316 The approach taken in support of this research was to shortlist at least one partner from each  
317 institutional background in each project for interview. This aimed to provide a broad and variegated  
318 analysis of how different stakeholders perceive their projects and the NBS concept itself. In practice,  
319 this proved difficult, as many shortlisted partners, especially business partners, were either  
320 unavailable or unwilling to participate. Ultimately, interviews were secured with five partners in

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<sup>1</sup> In this context, they are often called 'natural climate solutions' rather than NBS.

321 *Connecting Nature* (two city and three academic partners), two in *URBAN GreenUP* (one city and one  
322 civil-society partner) and five in *Grow Green* (two city, two civil-society and one business partner).  
323 Table 2 presents the partners interviewed. To ensure participant confidentiality and allow for  
324 differentiated analysis between types of partners, each interviewee has been ascribed a specialised  
325 code. The code pertains to the 'type' of partner they are; 'city partners' are coded as CP, 'academic  
326 partners' as AP, 'civil society partners' as CSP, and 'business partners' as BP.

### 327 **Interview design and data analysis**

328 As NBS is a relatively new concept that, akin to GBI, resists clear and concise definition, the interview  
329 process was structured to allow interviewees space to discuss how they perceive and value the  
330 concept. Semi-structured interviews were selected, as they provide flexibility and allow the topics  
331 that emerge 'organically' to transition from discussion to in-depth exploration (Drever, 1995;  
332 Brinkmann, 2013). Interview questions were kept predominantly open-ended to encourage  
333 respondents to examine their own working practices and opinion on NBS. Despite coming from  
334 different practical and epistemological backgrounds, all partners were asked a set of core key  
335 questions to facilitate discussion. The aim of this was to build a consistent foundation from which  
336 both convergent and divergent themes could be detected and analysed. However, each individual  
337 interview contained further 'probes' that aimed to symbiotically clarify interviewee responses and  
338 facilitate a more conversational style of interview. Of the 12 interviews, 6 were conducted face-to-  
339 face and the other 6 were conducted via Skype.

340 Interviews were transcribed and analysed via an 'open coding' system. Each transcript coded to  
341 allow for a deep and broad immersion into qualitative datasets. Through this coding process, themes  
342 and "analytical categories" (Schmidt, 2004:255) emerged from each individual interview which were  
343 cross-analysed with each other. The aim of this was to find uniting nodes of analysis, as well as  
344 meaningful disparities between the data sets collected.

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Project	Frontrunner cities	Follower Cities	Academic Partners	Civil Society Partners	Business Partners	Funding
<b>Connecting Nature</b>	Glasgow (UK) Genk (Belgium) Poznan (Poland) La Coruña (Spain)	Bologna (Italy) Burgas (Bulgaria) Ionnina (Greece) Malaga (Spain) Nicosia (Cyprus) Sarajevo (Bosnia & Herzegovina) Pavlos Melas (Romania)	Trinity College Dublin (ROI) Erasmus University Rotterdam (Dutch Research Institute for Transitions) (Netherlands) Humboldt University of Berlin (Germany) Adam Mickiewicz University of Poznan (Poland) University of East London(UK) University of A Coruña (Spain) West University of Timisoara (Romania) University College Dublin (ROI) Centre for Ecological-Noosphere Studies (Armenia) GIS and RS Consulting Center Geographic (Georgia)	Local Governments for Sustainability (ICLEI) (EU) Horizon NUA (ROI) Osmos (EU) Urban Planning Institute of the Republic of Slovenia OPPLA (EU) Greenspace Scotland (UK) Climate Alliance (EU)	BioAzul (Spain) Helix Pflanzen (Germany)	€12 million

<b>URBAN GreenUP</b>	Liverpool (UK)	Mantova (Italy)	The University of Liverpool (UK)	The Mersey Forest (UK)	CARTIF (Spain)	€14 million
	Valladolid (Spain)	Ludwigsburg (Germany)	Università Bocconi (Italy)	Fondazione iCons (Italy)	Singular Green (Spain)	
	Izmir (Turkey)	Medellin (Colombia)	Ege Universitesi (Turkey)	The Centre for New Water Technologies (CENTA) (Spain)	ACCIONA (Spain)	
		Chengdu (China)	Izmir Yuksek (Turkey)	Chengdu High-Tech Investment (CDHT) (China)	Demir Enerji (Turkey)	
		Binh-Quy Nhon (Vietnam)	RMIT University (Vietnam/Australia)	Leitat (Spain)	GMV (Spain)	
					Sociedade Protugeusa de Inovacao (SPI) (Portugal)	
					Bitnet (Turkey)	

<b>Grow Green</b>	Manchester (UK)	Modena (Italy)	University of Manchester (UK)	International Union for Conservation of Nature (IUCN)	Bipolaire Arquitectos (Spain)	€11 million
	València, (Spain)	Brest (France)	University of Cambridge (UK)	Greater Manchester Combined Authority (UK)	Paisaje Transversal (Spain)	
	Wrocław (Poland)	Zadar (Croatia)	Wrocław University of Environmental and Life Sciences (Poland)	Leitat (Spain)	Trinomics (EU)	
	Wuhan (China)		Polytechnic University of València (Spain)	Tecnalia (Spain)	The Guinness Partnership (UK)	
				Wrocław Agglomeration Development Agency (Poland)		
				Manchester Climate Chance Agency (UK)		

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363 **Table 2: Interviewee profiles and codes**

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365 **Connecting Nature:**

Organization	Type	Code
Glasgow City Council	City Partner	CP1
Glasgow City Council	City Partner	CP2
Humboldt University of Berlin	Academic Partner	AP1
Trinity College Dublin	Academic Partner	AP2
DRIFT – Erasmus University Rotterdam	Academic Partner	AP3

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368 **URBAN GreenUP:**

Organization	Type	Code
Liverpool City Council	City Partner	CP3
The Mersey Forest	Civil Society Partner	CSP1

Organization	Type	Code
Manchester City Council	City Partner	CP4
Manchester City Council	City Partner	CP5
Local Governments for Sustainability (ICLEI)	Civil Society Partner	CSP2
IUCN	Civil Society Partner	CSP3
Trinomics	Business Partner	BP1

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382 **Results**

383 **Overarching aims of NBS projects**

384 **1. Retrofitting cities with NBS**

385 As stated above, *Connecting Nature*, *URBAN GreenUP* and *Grow Green* can be understood as  
386 'transition initiatives'. In AP3's words, they are "concrete steps we can take now to realize that  
387 [sustainable] transition". The overarching aim of all three projects is to use NBS interventions to  
388 render cities more resilient to the impacts of climate change, illustrated by CP3, who stated that "the  
389 project [URBAN GreenUP] is about testing solutions that will tackle the future predicted impacts of  
390 climate change... [e.g.] impacts to air quality, air pollution, water quality, water volume, surface  
391 water flooding".

392 But through what 'pathway' do these partners envision using NBS to catalyse this sustainable  
393 transition? The most common answer was through urban retrofit; a term that "implies providing  
394 something with a component or feature not fitted during manufacture or adding something that it  
395 did not have when first constructed" (Eames et al., 2014:2). AP2 expressed that, from the outset of  
396 *Connecting Nature*, the project was expected to answer the following questions: "how do we  
397 innovate with our cities? How do we retrofit them?" Similarly, CP3 stated that *URBAN GreenUP* "is  
398 about testing nature-based solutions in urban city areas... a lot of that is about retrofitting green or  
399 blue infrastructures because cities obviously are well established; we don't have large areas of space  
400 to put [in] big grand schemes". Due to the issue of limited urban space, projects have predominantly  
401 taken a small-scale approach to NBS interventions. *The URBAN GreenUP* project in Liverpool, for  
402 example, takes "a very localised approach" (CP3), focusing on creating "small demonstrator"  
403 interventions such as floating gardens, green walls and green roofs in designated zones across the  
404 city.

405 However, despite taking a small-scale approach to biogenic infrastructural retrofit, NBS projects do  
406 not bypass issues associated with fragmented urban land ownership. As CP3 of the *URBAN GreenUP*  
407 project states, "I might say 'I'd love a green wall here, it'd be brilliant' but if I can't get landowner  
408 permission, I can't deliver it as an output... I may have to compromise on location where I can get  
409 landowner permission to deliver the green wall" (CP3). Moreover, even when an intervention is  
410 implemented, risks pertaining to upkeep remain: "there's also a trust issue with the person whose  
411 property you're placing this wall on, in that that they are going to commit to it financially in the  
412 longer term" (CP3).

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415 **2. Enhancing EU climate change leadership**

416 The EU's ambition to be a global leader in the innovation and implementation of NBS came through  
417 clearly in interviews. CSP2 of *Grow Green* expressed that *"the European Commission would like to*  
418 *see itself... as a global leader in the nature-based solutions market. So global leadership is something*  
419 *that essentially all projects need to answer to"*. This was echoed by AP3 of *Connecting Nature*, who  
420 stated that *"the EU wants to brand itself as the front runner in nature-based solutions... That's really*  
421 *the goal of the European Union with these projects; to really become the nature-based solutions*  
422 *'brand' as such"*.

423 AP2 of the *Connecting Nature* project discussed how the multi-level structure of the project – with  
424 its set of frontrunner EU cities, and several non-EU follower cities – facilitates the expansion of the  
425 EU's influence beyond its external borders. Speaking on how Yerevan (Armenia) and Tbilisi (Georgia)  
426 were included within the project, they state that:

427 *"we've chosen some of the unusual subjects for our project and they [the EU] were very delighted*  
428 *about that... Europe wishes to engage on a more physical level with the agencies and institutions [in*  
429 *Armenia and Georgia] in order to assist in whether they want to become part of the EU or not... they*  
430 *[the EU] wants to start the type of cohesion that we're starting to see sort of falling apart in parts of*  
431 *Europe"* (AP2).

432 As well as engaging emerging nations at the European periphery, the same interviewee discussed  
433 how the *Connecting Nature* project also helps the EU to strengthen its relations with non-European  
434 nations. They state that:

435 *"we [Connecting Nature] found solutions for dealing with problems that the commission can't solve.*  
436 *So, we're helping the EU-Brazil and the EU-China delegation... we've been able to help provide*  
437 *insights into how we deal with them on a city level"* (AP2).

438 **Scope(s) of NBS projects**

439 Though funded from the same source and expected to deliver the outcomes and aims described  
440 above, the way in which *Connecting Nature*, *URBAN GreenUP* and *Grow Green* have approached the  
441 design, scale and scope of their NBS interventions differ. For CP4 of the *Grow Green* project, this is a  
442 product of the EU being *"such a flexible funder"*. Indeed, outside of being *"prescriptive in terms of*  
443 *the call text"*, AP3 states that project partners had *"one hundred percent freedom"* over the  
444 trajectory and design of their respective projects. This ability to design interventions without  
445 restriction from the EU was seen as crucial to the success of the projects by stakeholders. As AP2 put  
446 it, *"the issues we're trying to tackle are local in nature, therefore we need locally adapted solutions"*.

447 **Connecting Nature**

448 Of the three projects, *Connecting Nature* takes the most expansive and dynamic approach to  
449 implementing NBS. In the words of AP3, *Connecting Nature* aims to create “*innovation action*  
450 *projects... across entire cities*” as opposed to focusing solely on “*neighbourhood areas*”. According to  
451 CP2, because the three frontrunner cities have “*very different kind of makeups*”, each is deploying a  
452 “*bespoke*” set of NBS interventions at “*very different scales*”. CP1 expands upon this, stating that  
453 Poznan has ambitions to create a “*green network across [a] quarter of the city*”. This network is to be  
454 composed of natural playgrounds within local kindergartens which look to tackle the lack of green  
455 space available to local schoolchildren. Genk has taken a more micro-approach to urban re-naturing  
456 through NBS. The city aims to “*de-culvert*” (CP1) much of the polluted Stiemer valley, regenerate the  
457 “*vacant, derelict land around it*” and ultimately create a new park that “*would stimulate growth and*  
458 *new development*” in the locality, whilst also mitigating the risk of flooding.

459 Akin to Poznan and Genk, Glasgow is utilising practical NBS interventions, such as a community-run  
460 wildflower nursery. Run in Pollok Park, ‘Flower Power’ looks to “*reverse the decline of meadow and*  
461 *inspect species*” (Glasgow City Council, no date) whilst simultaneously providing social benefits to  
462 local communities. However, running in tandem to this, Glasgow is also developing an “*open space*  
463 *strategy*” (CP1) that looks to provide a methodology or guide for how “*nature-based solutions allow*  
464 *us [Glasgow City Council] to make better asset management decisions*”. Thus, within *Connecting*  
465 *Nature*, the NBS concept is being applied at a local level (Genk and Glasgow), network level (Poznan)  
466 and at a “*strategic level*” (CP1) (Glasgow).

467 **URBAN GreenUP**

468 Unlike *Connecting Nature*, the three frontrunner cities in *URBAN GreenUP* are deploying NBS in  
469 similar ways and scales. They are primarily targeting the implementation of singular NBS  
470 interventions located in multiple sites across the urban landscape, as well as networked green and  
471 blue spaces. However, the extent of these green and blue networks is less than that of Poznan’s  
472 approach in *Connecting Nature*. As mentioned prior, the *URBAN GreenUP* project in Liverpool  
473 focuses on creating small demonstrator interventions such as floating gardens and green walls that  
474 are expected to sequester carbon and mitigate climate change impacts such as the UHI effect. In all  
475 three front-runner cities, these singular interventions are to be used alongside more connected  
476 forms of NBS, such as new green cycle and travel routes, as well as the ‘re-naturing’ of pre-existing  
477 ones (*URBAN GreenUP*, no date). Alongside increasing localised resiliency to climate change, both  
478 these stand-alone and interconnected forms of NBS intervention are expected to “*regenerate areas*



479 *[and] attract other business” (CP3), whilst also helping to tackle “big issues around mental health*  
480 *and wellbeing”.*

#### 481 **Grow Green**

482 In contrast the other projects, Grow Green favours a neighbourhood-level approach to NBS  
483 implementation in each of its demonstrator cities. NBS interventions are being utilised within  
484 historically socio-economically deprived communities. The project team in Manchester are focusing  
485 *“all resource and energy” (CP4) into the neighbourhood of West Gorton. In the words of CP5 “it is an*  
486 *area of regeneration... part of that regeneration is building a whole load of new homes, quality*  
487 *homes, and as part of that regeneration progress, we’ve [Manchester City Council] incorporated this*  
488 *new park which will form the hub of the community between the old and new”.* Incorporated within  
489 this community park are NBS interventions such as *“swales, rain gardens, bio-retention [basin/pond],*  
490 *tree-pits and permeable pavements”* that look to render the neighbourhood resilient to urban  
491 flooding, whilst also improving air and water quality, and enhancing cohesive and active community  
492 lifestyles.

493 This neighbourhood-scale is mirrored in Valencia, where the City Council is focusing on the  
494 Benicalap-Ciutat Fallera district which *“has high levels of immigration and unemployment, as well as*  
495 *an ageing population and deteriorating infrastructure” (Grow Green, no date) and in Wrocław, which*  
496 *is implementing NBS in the Olbin/Plac Grunwaldzki district of the city; “a dense, multi-use*  
497 *neighbourhood that ranges from wealthy to socially deprived” (Grow Green, no date). For Valencia,*  
498 *the focus is on providing interventions that reduce heat stress and increase connectivity between*  
499 *green spaces within the ‘demonstrator’ neighbourhood. Thus, the type of NBS that have been*  
500 *selected are vertical gardens, micro-forest and green corridors (ibid). In Wrocław, the city council is*  
501 *utilising interventions such as pocket parks and green streets to mitigate the city’s risk of flooding*  
502 *(ibid).*

#### 503 **Governance dynamics within NBS projects**

504 Operating beyond national government jurisdiction and composed of stakeholders from city council,  
505 academic and SME backgrounds, NBS projects are contemporary examples of decentralized and  
506 ‘polycentric’ environmental governance i.e. they contain multiple nodes of *“semiautonomous*  
507 *decision making” (Carlisle & Gruby, 2017, p. 2). Polycentricity stands in opposition to monocentric*  
508 *forms of governance, where one entity or actor possesses a monopoly on power or authority over*  
509 *the governing of a ‘common’ resource or issue; in this case urban vulnerability to climate change*  
510 *(Termeer et al., 2010).*

511 Though each NBS project does have a coordinating partner<sup>2</sup> that is expected to “*manage us [the*  
512 *other partners] and set our deadlines*” (CP3), be “*the financial and legal administrators to the*  
513 *project*” (CP5) and operate as “*the first port of call if people have a query in relation to the project*”  
514 (ibid), power is spread horizontally through a system of work-packages (WPs) that guide each  
515 project. Multiple interviewees remarked on how the horizontal governance of these NBS projects  
516 makes them more effective than past EU-funded projects. Referring to a past EU-funded project they  
517 worked on, CSP1 stated that “*the way that this project [URBAN GreenUP] is managed is very, very*  
518 *different.... [it's] very egalitarian*”. The prior project allowed for less autonomy, with an academic  
519 partner acting as the sole hegemon. This top-down approach did not allow the other partners to  
520 contribute their specific skillsets and knowledge(s), which ultimately served to undermine the  
521 project. As CSP1 states, “*when we went into the first partner meeting... they [the lead academic*  
522 *partner] could not have been more dismissive... we were invisible because we weren't in academic*  
523 *papers*”.

524 Whilst the power dynamics amongst partners *within* NBS projects appear egalitarian, multiple  
525 interviewees raised concerns about the dynamic *between* the projects and the communities the  
526 projects look to ‘serve’. Public participation with these communities has undoubtedly been  
527 encouraged within all projects. As CP5 of *Grow Green* stated:

528 “*Part of the process for developing the demonstration sites has been stakeholder engagements...  
529 there's been an awful lot of community consultation with young and old businesses... and there's also  
530 been input from local residents and stakeholders in terms of the final design [of NBS interventions]  
531 that will be built*”.

532 However, CSP1 suggests that levels of community participation were superficial within *URBAN*  
533 *GreenUP*. They state that:

534 “*It's a tricky thing when you've got European funding because the way the funding works is that  
535 when you put in the bid, you have to know exactly what you're doing [in reference to specific NBS  
536 interventions] and where you're going to do it... So you don't have the luxury of being able to consult  
537 with people to say, 'what is your problem and how can we provide the solution'... [this is] because  
538 you almost have to get the solution up front in order to get the funding*” (CSP1).

539 CSP1 argues that although local communities were consulted, they cannot be considered true ‘co-  
540 designers’ of the planned NBS interventions because the process failed to “*ask people if they have a  
541 problem*” (CSP1) in the first place. Local people perceived the process of engagement as “*almost*

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<sup>2</sup> Trinity College Dublin in Connecting Nature, Cartif in URBAN GreenUP and Manchester City Council in Grow Green.

542 *imperialistic*" (CSP1), and questioned *"what do you mean solution? I haven't got a problem. Why are*  
543 *you giving me a solution? What makes you think you know the answers to our problems?"*

#### 544 **Relationship between NBS and other 'foundational' concepts**

545 Many interviewees expressed the view that the difference between NBS and other 'ecosystem-  
546 based' terms – especially GBI – is ambiguous. This is exemplified by CSP1's statement that *"on the*  
547 *ground, it's quite confusing not just for practitioners, but for people we engage with to try and*  
548 *explain [the difference between NBS and GBI]"* and CP3's view that NBS is *"part of a whole green*  
549 *space and green infrastructure discussion... they're all part of the jigsaw"*. This perceived ambiguity  
550 has led many practitioners to use the concepts synonymously; *"I tend to use them almost*  
551 *interchangeably depending on who I speak to..."* (BP1). Echoing this, CSP3 suggests that creating  
552 concrete distinctions between the terms is unnecessary; *"I think, in practical terms, what matters is*  
553 *that we use the terms that people understand... so that might be green infrastructure for admin*  
554 *planners in the UK for example... it's better to use what people are already using than to teach them*  
555 *a whole concept"*.

556 Does this mean that NBS adds nothing 'novel' to the field of urban greening? For multiple  
557 interviewees, the answer is a resounding no. Whilst the 'meaning' of NBS closely mirrors that of GBI,  
558 the concept's framing is the point of differentiation. Encapsulated by AP3's statement that NBS *"is*  
559 *not so much a scientific term as it is a policy term"*, interviewees expressed the opinion that the NBS  
560 concept makes the ideas and tenets of GBI and ES more palatable for policymakers and urban  
561 governments. Building on the argument of AP2 that *"if you take green infrastructure and ecosystem*  
562 *services and stick them in a blender, you've got nature-based solutions"*, AP1 claims that NBS re-  
563 imagines these terms in a way that makes them *"more handy for urban governments that need to*  
564 *show success"*. Transformed into *"small packages"* that are geared towards providing solutions to  
565 urban ills, GBI and ES are moulded into NBS through a process of what AP1 calls *"project*  
566 *orientation"*.

567 By being rendered more politically 'useful', NBS appears to lose some of the central tenets of GBI  
568 and ES on which it is originally based. This is discussed by BP1, who perceives NBS as lacking the  
569 focus on connectivity and biodiversity that is so central to GBI. They state that, with GBI:

570 *"You need to connect natural areas in order to give biodiversity the chance to flourish and therefore*  
571 *enhance the delivery of ecosystem services, whereas nature-based solutions you can see it as a bit*  
572 *more low scale... whereas the one [NBS] places emphasis on the 'solution' aspects of tackling some*

573 *problem, the other [GBI] is larger scale because you're talking about a network connecting several*  
574 *elements to enhance multiple ecosystem services" (BP1).*

575 Mirroring AP1's concern, CSP2 argues that the NBS concept falls "*a bit short*" because it lacks the  
576 holistic outlook of GBI. On the favouring of singular or stand-alone interventions within NBS  
577 demonstrator projects, they state that: "*one-off solutions; one green roof in a city is of course good,*  
578 *but essentially it's not going to help that much. So essentially you need this sort of network thinking,*  
579 *which I think is really brought across in the term green infrastructure*".

580 Despite these criticisms of the concept, most interviewees stressed that the NBS term is more  
581 accessible for a lay audience in comparison to GBI and ES. BP1 asserts that framing green or blue  
582 interventions as 'nature-based' makes NBS "*more intuitive than something more technical like*  
583 *ecosystem services*", thus rendering it "*quite understandable and simple to the citizens*".  
584 Interviewees also expressed how the NBS term allows practitioners to communicate the principles of  
585 sustainable urbanism more effectively to key actors involved in urban design e.g. architects and  
586 engineers. In the words of CP4; "*getting better at telling the story [of sustainable urbanism] is what*  
587 *NBS helps us to do*". By stressing the co-benefits of NBS interventions, NBS helps practitioners "*make*  
588 *that compelling case without us being like eco-fascists where we're banging the people over the head*  
589 *with it*" (CP4).

590 Mirroring this view, CP1 explains how utilising the NBS term in discussion with other urban actors in  
591 different sectors can galvanise understanding and cooperation. They claim that using NBS "*wakes*  
592 *up*" (ibid) stakeholders who previously would have been alienated by terms like "*green networks,*  
593 *green infrastructure, ecology and biodiversity*". This line of argument is summed up by CSP2 who  
594 states that NBS has the potential to "*integrate many sectors, many themes, many needs and also*  
595 *departments within the planning context of green spaces*". Whilst this silo-busting capacity of NBS is  
596 undoubtedly positive, it appears to come with the cost of neglecting GBI's and ES' focus on  
597 biodiversity. CSP3 argues that:

598 "*One of the risks of the NBS concept is that the place of biodiversity... is somewhat ambiguous... it*  
599 *doesn't really say anywhere in the definitions or criteria that these solutions should also be beneficial*  
600 *to biodiversity. So, there is a risk [that] if you're not careful to see this [NBS] agenda as*  
601 *complimentary to the more traditional biodiversity protection/conservation agenda. There is indeed*  
602 *a risk that biodiversity gets a bit lost in this [NBS discourse]*".

603 This trade-off played out in other interviews, where the economic and social co-benefits of NBS  
604 interventions were stressed at the expense of 'environmental' benefits e.g. increased biodiversity.

605 CP3, for example, stated that the *URBAN GreenUP* project looks to use 'nature' to increase footfall  
606 and local business revenues; *"the café across from the green wall will get a lot more people sitting*  
607 *outside to enjoy their coffee... they might take on more staff, they might move into the building next*  
608 *door and double the size of their floor space"*. For AP1, the anthropocentric instrumentalization of  
609 'nature' within NBS is problematic because it is grounded in *"a simple understanding of how nature*  
610 *works"* (AP1) and reduces 'nature' to a fixed 'solution' provider, practically synonymous with  
611 *"technological 'grey' solutions"* (ibid) such as flood drains. In the words of AP2, *"the nature-based*  
612 *solution approach essentially looks at nature as a technology"*. For AP1, this representation fails to  
613 recognise that *"nature is open and flexible, and all the systems are always in transition"* and that  
614 unlike 'ordered' man-made infrastructures *"nature is not 'fast' in delivering solutions"*.

615 For AP1, this framing serves to romanticize 'nature'. This is seen as a *"dangerous"* (AP1) limitation of  
616 the NBS concept, as the framing serves to 'oversell' the concept's capacity to solve socio-  
617 environmental ills. AP1 argues that *"NBS is not something that is solving or tackling anything. It is*  
618 *just [focusing] on a small part of the big problems"* (AP1). For them, the use of 'solutions' in the NBS  
619 term could give rise to the naïve belief that *"'well if we do A, B and C [in reference to certain NBS*  
620 *interventions] then climate change can be defended from; climate change will not come; it's all safe'.  
621 But this is not at all true"* (AP1). Utilizing the same logic, they also criticize how the concept frames  
622 'nature' as a panacea to socio-economic issues such as health inequalities and urban deprivation,  
623 stressing that *"social deprivation is a structural problem, not a problem that can be solved by*  
624 *nature"*.

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635 **Discussion**

636 **1. Can small-scale retrofit of NBS 'solve' urban sustainability issues?**

637 Interviews illustrated that NBS projects aim to retrofit biogenic infrastructure into urban areas to  
638 render them more climate change resilient. This vision for urban sustainability has gained increased  
639 attention in recent years (Dixon and Eames, 2013; Eames et al., 2013). Within this discourse, the  
640 question that the three NBS projects raise pertains to what scale green space retrofitting should take  
641 place at. Eames et al. (2013:505) state that city-wide urban retrofit can help to “envisage a systemic  
642 transition in the existing built environment; not just to zero carbon, but across the entire ecological  
643 footprint of cities and the regions within which they are embedded”. Retrofit at this scale is seen to  
644 provide more comprehensive and integrated sustainability solutions than local-scale interventions  
645 for two key reasons.

646 Firstly, small scale retrofit runs the risk of overreliance on individual building owners to get  
647 interventions ‘in the ground’ (Eames, 2014). The capacity for small-scale retrofit projects to carry out  
648 their plans and provide their deliverables can be precariously predicated upon external forces. For  
649 example, if a previously compliant landowner changes their mind about allowing an intervention to  
650 be built on their property, a project can quite quickly lose momentum. This vulnerability speaks to  
651 CP3’s testimony about how the capacity of the *URBAN GreenUP* team to deliver interventions in  
652 Liverpool has been hamstrung by fragmented land and building ownership within the city. It appears  
653 that the project’s reliance on the permissions of individual land owners has curtailed how innovative  
654 the ‘Research and Innovation’ project can be with regard to the design and location of its NBS  
655 interventions.

656 The second risk associated with local-scale retrofit pertains to their use of micro-level interventions,  
657 which risk having negligible impacts on sustainability outcomes (Eames et al., 2013). What does this  
658 mean for the capacity of NBS projects to effectively bring about tangible sustainability outcomes?  
659 Whilst projects will undoubtedly increase green and blue space across cities, their focus on small  
660 demonstrator interventions means that, alone, they will be unable to transition urban spaces to a  
661 more sustainable future. Should these projects therefore be understood as tokenistic forms of  
662 ‘business as usual’ urban development, as Evans (2011) warns? By framing ‘nature’ as something  
663 that can be mobilised at the local level to solve socio-environmental issues at the city-scale, are  
664 these projects unwittingly off-staging (and perpetuating) the macro capitalistic drivers that continue  
665 to shape patterns of unsustainable, climate-vulnerable urbanism?

666 Predictably, the answers to these questions are not clear. What is crucial to stress, however, is that  
667 these projects are frontrunner experiments; they are devised to “design, test and learn from social  
668 and technical innovation in real time” (Fuenfschilling et al., 2019:219). With their short funding  
669 window, they were never genuinely expected to provide transformative solutions to unsustainable  
670 urbanism. Nonetheless, if the NBS concept is to carve itself out as a novel and effective tool for  
671 urban greening, those mobilising it, e.g. the EU or the World Bank, must attend to this scalar  
672 dilemma. If left unaddressed, NBS risks being superseded in favour of a new term or buzz-word that  
673 carries greater political clout or, at least on paper, appears to better encapsulate the shifting  
674 dynamics of urban unsustainability.

## 675 **2. NBS as the EU’s latest hegemonic ‘environmental’ tool?**

676 Project actors confirmed that the EU has consciously modelled itself as the global NBS frontrunner,  
677 and looks to use the concept to expand its sustainability hegemony both within Europe and beyond.  
678 However, NBS is not the first concept the organization has mobilised to strategically elevate its  
679 position within discourses surrounding environmental stewardship. Since the 1980s (Rayner and  
680 Jordan, 2013), the EU has been widely viewed as an “international agenda setter” (Schreurs and  
681 Tigberghien, 2007:19) within the sphere of climate change governance (Jordan et al., 2010; Rayner  
682 and Jordan, 2016). Actions that contributed to this position include the emergence of the EU’s  
683 emissions trading scheme (ETS) in 2000 (Rayner and Jordan, 2013). Rayner and Jordan (2013:5)  
684 describe how, in the late 1980s, a major ‘frame-shift’ occurred in the EU’s environmental policy. The  
685 institution transitioned away from perceiving ‘the economy’ and ‘the environment’ as two separate  
686 entities and towards a “new ‘sustainability frame’ which integrated the two domains” (ibid).

687 Advocating strong environmental policy therefore became seen by the EU as an economically  
688 beneficial means to simultaneously promote European integration whilst also giving the Union “a  
689 stronger global diplomatic identity” (Rayner and Jordan, 2013). From interview analysis, it became  
690 clear that NBS is the latest tool mobilised by the EU to pursue these same goals. By offering its  
691 ‘environmental’ expertise to countries such as Georgia and Armenia, it can expand its hegemony  
692 within countries at the European periphery that have been either considered for EU membership  
693 (Armenia in 2002) or have expressed a desire for membership in the past (Georgia in 2011).  
694 Operating at the city level, as opposed to the supranational, NBS projects have been utilised by the  
695 EU as ways to troubleshoot and hurdle issues experienced within strategic partnerships with other  
696 global and regional hegemonies, namely China and Brazil. What this illustrates is that NBS is not an  
697 apolitical concept, nor is it favoured just for its merit as an urban greening tool.

698 This latter point poses a troubling question. What is truly catalysing the rollout of the NBS concept?  
699 Is it because the concept adds practical value to discourses surrounding urban greening and  
700 environmental stewardship? Or is it because it consolidates the EU's position as a global leader and  
701 innovator within the remit of environmental, and especially climate change, governance? Regardless  
702 of the answer, it is crucial to recognise that concepts such as NBS are not politically inane concepts  
703 that are brought into existence solely for their practical merit; they are 'signifiers' that embody,  
704 privilege, and elevate a certain type of knowledge and 'expertise' over others.

### 705 **3. Tokenistic public participation within NBS projects?**

706 From the interviews, community engagement within the NBS projects – namely *URBAN GreenUP*  
707 and *Grow Green* – appears somewhat tokenistic. For Momtaz and Gladstone (2008:223) the  
708 objectives of public participation include “sharing information, involving the community at an early  
709 stage of decision making, taking community aspirations into considerations and giving the  
710 community the ability to influence the outcome of decision making”. Thus, on Arnstein's (1969)  
711 'ladder of participation', the level of community participation in both projects would be termed  
712 'placation'. This describes a situation where communities possess a voice within decision-making,  
713 but the power-holders – in this case the partners within the projects – retain the “continued right to  
714 decide” (ibid:217). This speaks to CP5's statement that local input was encouraged at the “*final*  
715 *design*” phase of the project, and begs the question as to what capacity local people had to actually  
716 shape the approach of the projects and intervention design. It also illustrates how, despite their aim  
717 to design local solutions that reflect local problems, techno-managerial epistemologies were  
718 privileged over less quantitatively grounded or standardised 'local' knowledge systems.

719 CSP1's statement that *URBAN GreenUP* failed to actually diagnose local issues before designing  
720 solutions supports this sentiment. Working 'backwards' in this manner risks depoliticising the urban  
721 greening process. Instead of being given, from the outset, a platform to air concerns or suggestions  
722 about the approach of projects, the majority of local dissent was likely off-staged and filtered out  
723 (Kaika, 2017). This speaks to, and expands upon, 1) Nesshöver et al.'s (2017:1220) concern that the  
724 'solutions' element of NBS is problematic because it gives the false impression that the 'problems'  
725 NBS interventions aim to solve are clear and agreed upon, and 2) Evans et al.'s (2016:1) question as  
726 to whether urban experiments truly provide empowering alternatives to how urban issues are  
727 governed, or whether they are, once again, “captured by a familiar cast of dominant interests”.

728 However, does this necessarily mean that NBS project practitioners purposefully delivered shallow  
729 public participation programmes aimed at uncritical consensus-building? As alluded to by CSP1, the  
730 issue seems to be less with the conduct of project partners and more with the way in which NBS



731 projects were rushed to decide upon their intervention designs without being given the necessary  
732 time to consult local people in any meaningful way. This pressure can be understood as an outcome  
733 of the high level of competition between budding NBS projects to attain EU funding (Baroni et al.,  
734 2019). Moreover, it is crucial to recognise that the three projects are first and foremost ‘Research  
735 and Innovation’ projects. Whilst this fact should not excuse the issues of disempowerment discussed  
736 above, it perhaps does help to explain why their public engagement exercises appear shallow.

#### 737 **4. Overselling ‘nature’ whilst undervaluing biodiversity: the paradox of NBS?**

738 The results presented above illustrate how the NBS term renders the concepts of urban greening  
739 more politically palatable for urban governments and more accessible to the general public. Thus,  
740 NBS can be seen as a term that both unpacks and even democratises the tenets of these concepts.  
741 However, this demystification has come at a clear cost. It appears that some of the central facets on  
742 which NBS is built upon – namely the focus on interconnectivity and biodiversity within GBI – have  
743 been watered down. Potentially this is due to an issue that CP4 raises – the fear city councils and  
744 other knowledge holders have about coming across as “*eco-fascists*”, and thus losing their influence  
745 over the general population, as well as businesses. Nonetheless, whilst Mell and Clement’s (2019:3)  
746 assertion that NBS can help contribute to the sectoral ‘silo-busting’ necessary to integrate  
747 “ecological concerns alongside traditional planning activities” appears correct, it is unclear whether  
748 the view of NBS having a more ‘nature-centric’ approach than other concepts holds. Herein lies the  
749 paradox of NBS. Whilst the idea of nature is undoubtedly central to the NBS concept, actual nature,  
750 e.g. biodiversity and ecological resources, appears to be undervalued, especially in comparison to  
751 GBI.

752 A source of this paradox relates to the way in which ‘nature’ is valued extrinsically within the NBS  
753 discourse. ‘Nature’ is perceived as ‘good’ or ‘useful’ if/when it brings about positive outcomes,  
754 predominantly within the spheres of the social and economic. To borrow the words of Kaika  
755 (2017:91), ‘nature’ is (re)presented “as if it were something that could be injected into cities in the  
756 form of parks or green roofs” and ultimately help urban governments ‘immunise’ their citizens from  
757 the threats of climate change (Esposito, 2013), whilst stimulating economic growth (EC, 2015). This  
758 instrumentalization of nature speaks to what Kabisch et al. (2016:8) term the “growth obsession” of  
759 cities, which posits that the promise of economic growth is the dominant driver for urban green and  
760 blue space provision. Due to this focus, Sekulova and Anguelovski (2017:6) argue that “finding a  
761 balance between economic growth, social equity and environmental concerns in the  
762 operationalisation of NBS” will almost inevitably result in the ‘environmental’ losing out at the  
763 expense of the other two.

764 As CP1 elucidated, reducing 'nature' to a socio-economic 'solution' provider risks simplification and  
765 romanticization. The trope is by no means indigenous to the NBS discourse, however. Sywngedouw  
766 and Kaika (2014:468) point out that the broader 'sustainability' discourse itself is predicated upon a  
767 "fantastical scripting of a particular 'scientific' nature as singular, ordered and inherently dynamically  
768 balanced". This insight begs the question as to how far we've truly come from Ebenezer Howard's  
769 ideas where, as shown in the introduction, 'nature' was also romanticized and reduced to a tool that  
770 could sanitize socio-economic ills. As AP1 shows, 'nature' is not only still being mobilised as a  
771 solution to social deprivation, but is now held up as a panacea to the fallouts associated with climate  
772 change.

773 Akin to Howard's era, this current form of nature fetishization risks overselling its 'solutionist'  
774 capacity and could feasibly detract or distract attention from more systemic strategies to reduce  
775 pertinent socio-economic and environmental issues. After-all, Howard's prescription of 'nature' was  
776 evidently unable to provide 'solutions' to the prescient crises of his time. As Kaika (2017:98) writes,  
777 whilst 'nature' "can perhaps mediate some of the consequences of global socio-ecological  
778 inequality... [it does] little towards alleviating inequality per se". This speaks to Sekulova &  
779 Anguelovski's (2017) point that whilst nature can help to tackle the symptoms of issues we face, it  
780 cannot address their roots or drivers. Does this mean that AP1's statement that there is distinct  
781 danger in framing NBS as 'solutions' is valid? By championing the concept, are institutions such as  
782 the EU unwittingly sowing a false belief, or even hope, that an amorphous 'nature' can 'save us'  
783 from climate change? The answer appears unclear.

784 What is clear, however, is that both the 'nature' and 'solution' aspects of NBS need to be addressed.  
785 As Nesshöver et al. (2017:1220) have stated, those working within the NBS discourse must engage in  
786 "pluralistic reflection about alternative framings and conceptualisations" of 'nature', instead of  
787 consistently conceptualising it as a unified and fixed solution provider. If this is not addressed, there  
788 is likely to be a reputational backlash for projects that champion urban greening for climate  
789 resiliency. If stakeholders in both private and public sectors, as well as the general public, observe  
790 that a contemporary project has failed to 'solve' the issues it purported to possess the knowledge  
791 and expertise to do so, how will they appraise the next project that aims to do the same? Will the  
792 trust of these stakeholders automatically regenerate? Will businesses want to help finance or  
793 support these new projects if their predecessors failed or performed sub-optimally? Though these  
794 projects must 'sell themselves' to attain funding and recognition, marketing 'nature' as a 'solution'  
795 crosses the threshold of what is possible and, in reality, what is logical.

796

797 **Conclusions:**

798 This paper has investigated three knowledge gaps within the NBS literature. The first gap pertains to  
799 the 'politics' of Horizon 2020-funded NBS projects i.e. their overarching aims and governance  
800 arrangements. Data collected from interviews with NBS practitioners within *Connecting Nature*,  
801 *URBAN GreenUP* and *Grow Green* illustrated that these projects aim to influence climate-resilient  
802 and sustainable urbanism practice through the process of small-scale biogenic infrastructural  
803 retrofit. This approach was problematized on the grounds that retrofit at this scale risks having a  
804 negligible impact on urban sustainability. Enhancing the EU's reputation as a leader within the arena  
805 of climate change governance and strengthening its diplomatic relations with neighbouring non-EU  
806 countries and key international trade partners were shown to be the broader aims of these projects.

807 The results also showed that although the projects aim to be participatory, the extent and depth of  
808 the community consultation conducted around NBS design could be construed as superficial.  
809 Partners within *URBAN GreenUP*, for example, described how local communities were never  
810 consulted on what 'solutions' they desired, or even the 'problems' they wanted solved. This adds  
811 credence to Nesshöver et al.'s (2017) statement that the 'solutions' aspect of NBS gives the false  
812 impression that the 'problems' NBS interventions are ostensibly solving are clear and agreed upon.  
813 However, this research suggests that this exclusionary aspect of the projects is closely related to the  
814 design of the Horizon-2020 funding system, which appears to rush project partners to decide upon  
815 their planned 'solutions' before the specific 'problems' have been identified and unpacked.

816 Although the relationship between NBS and other urban greening concepts such as GBI and ES has  
817 been discussed in the literature, there has been little analysis on how NBS practitioners perceive the  
818 NBS concept. This was the second research gap this paper aimed to address. NBS was perceived by  
819 many interviewees as a 'novel' urban greening concept. This is because it renders pre-existing terms  
820 such as GBI and ES more politically palatable for urban governments and understandable to a lay  
821 audience. This is 'achieved' through a filtering process, which sees central tenets of GBI, namely  
822 green space connectivity and biodiversity becoming side-lined in favour of a more central focus on  
823 the socio-economic benefits of green and blue space provision.

824 This process of simplification renders NBS a 'boundary concept', allowing it to engage stakeholders  
825 who would have been alienated by urban greening terminology in the past. This accessibility is seen  
826 as the greatest strength of the NBS concept and re-affirms Mell and Clement's (2019) view of the  
827 concept possessing the capacity to integrate ecological concerns into the traditional planning agenda  
828 through the process of sectoral 'silo-busting'. However, these 'ecological concerns' overwhelmingly  
829 centre on what impact an amorphous 'nature' can have on socio-economic urban ills. Issues

830 surrounding biodiversity protection and provision were perceived to be missing within the NBS  
831 discourse.

832 This undervaluing of biodiversity coincides with an overselling of a specific representation of  
833 'nature', forming what this paper has termed an 'NBS paradox'. This speaks to the third gap in the  
834 NBS literature that this paper aimed to fill; how is 'nature' imagined within the concept? Multiple  
835 interviewees argued that the 'nature' enshrined within NBS is over-simplified, singularized and  
836 romanticized to the point to which it risks becoming unscientific. Akin to Ebenezer Howard's ideas in  
837 the early 20<sup>th</sup> Century, NBS (re)presents 'nature' as a prophylactic technological 'fix' that can solve  
838 our civilizational problems. This view was problematized by project partners, who argue that whilst  
839 NBS interventions may be able to address the symptoms of unsustainable urbanism e.g. the UHI  
840 effect, when used alone they cannot tackle the systemic metabolisms that have formed and  
841 perpetuate these issues. Moreover, for some interviewees, positing 'nature' as a solution-provider  
842 risks overselling its capacity and gives the false impression that nature can protect us from climate  
843 change threats if it is just mobilised in the 'right' or 'optimal' way.

844 Future research must look at how the NBS concept can re-integrate a focus on biodiversity. A solid  
845 starting point would be for present and future projects to adopt the IUCN's definition of NBS, which  
846 is broader than the EU's definition and crucially stresses the importance of biodiversity: "[NBS are]  
847 actions to protect, sustainably manage, and restore natural or modified ecosystems, that address  
848 societal challenges effectively and adaptively, simultaneously providing human well-being and  
849 biodiversity benefits" (IUCN, no date). Nonetheless, changing the definition of the term alone will  
850 not resolve the paradox of NBS. Until the environmental trade-off that typifies the 'growth  
851 obsession' of cities is addressed, biodiversity benefits of green and blue interventions will likely  
852 always be undervalued. Whilst this point applies to all concepts within the urban greening discourse,  
853 it is particularly pertinent for NBS.

854 With this in mind, though all eyes (and funding-budgets) appear to be focused upon NBS, we must  
855 not cast pre-existing urban greening terms aside and uncritically label them defunct. Though  
856 perhaps not as appealing to urban governments and businesses, or attractive to supranational  
857 entities looking to bolster their standing within global environmental governance spheres, the GBI  
858 concept has consistently championed the connectivity of green space and overtly stressed the  
859 importance of making provision for biodiversity. If NBS is uncritically sold as a replacement to GBI  
860 and ES, what will happen to these two tenets? Questions such as this are for future research on the  
861 mobilisation of NBS to wrestle with.

862

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In review