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4 **Towards an integrated understanding of greenspace in the built environment**

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57

58 **Towards an integrated understanding of green space in the built environment**

59

60

Abstract

61 In recent years social, economic and environmental considerations have led to a
62 re-evaluation of the factors that contribute to sustainable urban environments.

63 Increasingly, urban green space is seen as an integral part of cities providing a
64 range of services to both the people and wildlife living in urban areas. With this
65 recognition and resulting from the simultaneous provision of different services

66 there is a real need to identify a research framework in which to develop

67 multidisciplinary and interdisciplinary research on urban green space. In order
68 to address these needs an iterative process based on the Delphi technique was

69 developed which comprised email-mediated discussions and a two day

70 symposium involving experts from various disciplines. The two outputs of this

71 iterative process were (i) an integrated framework for multidisciplinary and

72 interdisciplinary research, and (ii) a catalogue of key research questions in urban
73 green space research. The integrated framework presented here includes

74 relevant research areas (i.e. ecosystem services, drivers of change, pressures on

75 urban green space, human processes and goals of provision of urban green

76 space) and emergent research themes in urban green space studies (i.e.

77 physicality, experience, valuation, management and governance). Collectively

78 these two outputs have the potential to establish an international research

79 agenda for urban green space, which can contribute to the better understanding

80 of people's relationship with cities.

81

82 **Key words:** Delphi technique, multidisciplinary studies, interdisciplinary studies,
83 research agenda, urban ecology, urban green space.

84

85 **Introduction**

86

87 A number of significant factors which are converging and forcing a re-examination of
88 the way cities are planned, designed and lived in. The *Global Environment Outlook*
89 (UNEP, 2007) identified five drivers for human development: demographics;
90 economic processes (consumption, production, markets and trade); scientific and
91 technological innovation; distribution pattern processes (inter- and intra-generational);
92 and cultural, social, political and institutional processes (including human behaviours
93 and the production and service sectors). These drivers, and others that may emerge,
94 will have substantial consequences for urban development, and hence green space
95 within urban areas, yet there is great uncertainty about the ways in which urban areas
96 will be affected. What is lacking is a framework for multidisciplinary research that
97 would form an evidence base to support these changes and actions.

98

99 The terms green space and open space are often used interchangeably (Swanwick et
100 al., 2003). In order to address the confusion that may occur they defined the key terms
101 more clearly. Swanwick et al. (2003, pp97-98) suggested that urban areas are made
102 up of the built environment and the external environment between buildings. The
103 external environment, in their model, is composed of two distinct spaces: “grey
104 space” and “green space”. Grey space is land that consists of predominantly sealed,
105 impermeable, ‘hard’ surfaces such as concrete or tarmac. Green space land, whether
106 publicly or privately owned, that consists of predominantly unsealed, permeable,

107 'soft' surfaces such as soil, grass, shrubs, trees and water. In this paper the authors
108 follow this definition of green space whilst at the same time recognising that the
109 juxtaposition of green and grey spaces is essential in towns and cities.

110

111 Across Europe development trajectories of towns and cities vary (Kasanko et al.,
112 2006). Where the populations are falling (so-called 'shrinking cities'; Mace et al.,
113 2007) there are opportunities exist to redesign the built and external environments in
114 order to improve liveability and sustainability. Where populations are growing and
115 cities are expanding spatially (urban sprawl), or confined by physical or policy
116 boundaries (e.g. green belts), there is a decrease in per capita space and often a need
117 to address issues of urban green space loss.

118

119 Whilst an understanding of the multiple functions of urban green spaces is reasonably
120 well developed it is not well integrated into the planning, design and management
121 process (Yli-Pelkonen and Niemelä, 2005; Sandström et al., 2006). Furthermore,
122 reliable and robust approaches to the valuation of urban green space that effectively
123 support decision making are often absent (Tyrväinen, 2001; Neilan, 2008). Therefore,
124 it is desirable to develop evidence on which to base decisions, to identify the key
125 issues requiring research, and to present these in a way that is accessible to academics,
126 practitioners and decision makers.

127

128 This paper reports on the outcomes of a symposium held at the University of Salford,
129 UK during June 2007. This symposium was developed in recognition of three
130 important gaps in urban green space research: the need to encourage interdisciplinary
131 and multidisciplinary approaches, the need to develop joint, multidisciplinary

132 initiatives across Europe, and the need for comparative research. Experts from
133 different disciplines, countries and job roles (e.g. academics, practitioners and
134 decision makers) attended the symposium with the goal to develop, and subsequently
135 agree on, an integrating framework that would bring together different discipline and
136 professional interests in urban green space. Emergent from this process was a
137 catalogue of key research questions for urban green space research and the synthesis
138 of these into an integrating framework to support multidisciplinary and
139 interdisciplinary understanding and communication, decision making, and research
140 efforts. In this paper the authors propose an international research agenda relating to
141 this key component of urban living.

142

143 The paper is primarily informed by research in the European and North American
144 context and by European issues and practices. It is intended that the agenda will
145 influence regional, national and international research funding allocations and inform
146 the discussion of those concerned with identifying the needs and priorities of urban
147 green space.

148

149 **Process**

150

151 The need for a multidisciplinary approach in urban green space research was
152 identified during discussions held amongst the participants at the European Society
153 for Conservation Biology meeting in Eger, Hungary. Subsequently, the overall
154 process was based around a modified Delphi Technique, a widely used technique in
155 consultation exercises where consensus is required (Ndour et al., 1992; Medsker et al.,
156 1995; Curtis, 2004; Okoli and Pawlowski, 2004).

157

158 The modified Delphi Technique was divided into three stages, an initial stage where a
159 group of forty individuals were invited to partake in an email-mediated discussion, a
160 second stage comprising a two day symposium and a final stage involving email-
161 mediated discussions to develop and refine emergent issues from the symposium. The
162 individuals involved in this process comprised representatives of academic
163 institutions, business, voluntary organisations, statutory bodies, and the UK national
164 and local government. These people were all invited because of their established
165 record of interest in, and commitment to academic, managerial or decision making
166 roles relating to the urban environment. Furthermore, the group was drawn from
167 across Europe and it was selected to be representative of different academic
168 disciplines (e.g. psychology, and design, sociology, planning, ecology, and health).

169

170 The email-mediated discussion amongst the group was facilitated by a chair person
171 (Philip James) who ensured that all emails were shared amongst the whole group and
172 periodically produced a compendium of emails covering specific time periods. In this
173 way all contributors were made aware of the ongoing debates and the chronology and
174 provenance of the ideas. These email exchanges began the process of developing a
175 sophisticated picture of the scope and concerns related to the topic. Thereafter
176 participants were invited to submit key research questions developed from the
177 previous email-mediated discussions. In total 215 questions were submitted.

178

179 The second stage was the two day symposium. All forty participants in the email-
180 mediated discussions were invited to the symposium and twenty nine were attended.

181 The symposium was based on facilitated group discussions with participants being

182 split into three multidisciplinary teams, each one having representatives from all the
183 disciplines represented at the symposium. Each team then had one session discussing
184 research areas and emergent research themes, and three sessions refining the research
185 questions. Following the symposium further email-mediated discussion took place to
186 consolidate the emergent, integrated framework and to finalise the catalogue of
187 research questions.

188

189 **Emergent Research Agenda: *Five Research Themes and Thirty-five Research***
190 *Questions*

191

192 The pre-symposium email-discussions enabled the original catalogue of 215 questions
193 to be categorised into five emergent themes: the physicality, the experience, the
194 valuation, the management, and the governance of urban green space. Further
195 refinements during the symposium and post-symposium email-mediated discussions
196 reduced these to 50 questions and finally to 35 questions. This catalogue of questions
197 in conjunction with the integrated framework, which is discussed later in this paper
198 and presented in Fig. 1 form the proposed research agenda for urban green space. The
199 questions are discussed below under the headings of the five emergent themes.

200

201 *Theme 1: The Physicality of Urban Green Space*

202 The physicality of urban green space covers ecological, microclimate, soil, air and
203 water quality functions (i.e. provisioning and regulating services; Breuste et al., 1998;
204 Marzluff et al., 2001; Berkowitz et al., 2003). Several physical factors differ greatly
205 between urban and rural environments and the location, structure, composition and
206 spatial configuration of urban green spaces will influence their ecological qualities

207 and functions (Pauleit and Duhme, 2000; Whitford et al., 2001; Turner et al., 2005),
208 and thus inform the degree to which urban green space can maintain species diversity
209 and natural processes in cities. These ecological functions may include population
210 dynamics, community interactions and resilience, species migration, or plant
211 pollination.

212

213 The ecosystem services provided by urban green spaces are related to the physical
214 aspects of these spaces (de Groot et al., 2002) and are central to maintaining human
215 health and viable wildlife populations (Tzoulas et al., 2007). Within the context of
216 climate change urban green spaces can play a central role in both climate proofing
217 cities and in reducing the impacts of cities on climate (Gill et al., 2007). While the
218 role of green areas in sequestering carbon is small compared to carbon dioxide
219 emissions produced in cities (Nowak, 1994; McPherson, 1998), urban green spaces
220 may reduce energy consumption and thus also carbon dioxide emissions by reducing
221 the need for air conditioning in the summer and the need for heating in the winter
222 (McPherson, 1994; Jo and McPherson, 2001). Within the theme of *The Physicality of*
223 *Urban Green Space* seven key research questions (1-7) are identified:

- 224 1. What are the ecosystem services provided by urban green spaces and how can
225 these services be quantified?
- 226 2. What benefits does the creation of urban green space provide in areas that
227 have poor environmental conditions or social problems?
- 228 3. What, in relation to urban form, are the required quantity, quality and
229 configuration of urban green spaces to maintain, sustain and enhance
230 ecosystem services and ecological function compatible with other functions?

- 231 4. What are the direct and indirect effects of the climate changes predicted in
232 current scenarios on urban green spaces and how do these changes impact on
233 people's well being (quality of life) in urban areas?
- 234 5. How resilient are current green space designs (including street trees) to climate
235 change and how can resilience be improved?
- 236 6. How can urban green spaces that are robust to harsh urban environments (e.g.
237 lack of water and sunshine) be designed and managed to mitigate the effects of
238 climate change in urban areas and allow cities to adapt to these changes?
- 239 7. How can the provision and management of freshwater quantity and quality be
240 promoted through urban green spaces?

241

242 *Theme 2: The Experience of Urban Green Space*

243 Urban green spaces are important in cities due to the opportunities they provide to
244 people to come in contact with nature and with each other. Contact with nature has
245 psychological benefits by reducing stress (Ulrich, 1984; Ulrich et al., 1991), restoring
246 attention (Kaplan and Kaplan, 1989), reducing criminal and anti-social behaviour
247 (Kuo and Sullivan, 2001) and by positively affecting self-regulation and restorative
248 experiences (Korpela et al., 2001; Hartig et al., 2003; van den Berg et al., 2007;
249 Korpela and Ylén, 2007). In addition to psychological benefits from contact with
250 nature, there are direct physical health benefits (Pretty et al., 2006), such as addressing
251 issues associated with obesity (Department of Health, 2004), increased longevity
252 (Takano et al., 2002) and self reported health (de Vries et al., 2003; Maas et al., 2006).

253 In terms of social well being urban green space contribute encourage social
254 interaction and bring people together, reduces negative social behaviours such as
255 aggression and violence, contributes to a sense of place and plays an important role in

256 fostering social cohesion and identify (Newton, 2007). These psychological, physical
257 and social health effects of urban green spaces make them an important component of
258 public health provision (Henwood, 2003; Newton, 2007).

259

260 However, green spaces that are perceived to be unmanaged may have a negative
261 effect on the wellbeing of people by increasing anxiety caused by crime and fear of
262 crime (Bixler and Floyd, 1997; Kuo et al., 1998; Jorgensen et al., 2007). The
263 occurrence of wild animals, for example large mammals such as fox (*Vulpes vulpes*),
264 badger (*Meles meles*), wild boar (*Sus scrofa*) and bear (*Ursus arctos*), bring with them
265 a need to address the changing relationships between people and these animals. Urban
266 and peri-urban ecological changes can affect the geographical range of diseases such
267 as Lyme disease (Patz and Norris, 2004) and West Nile Virus (Zielinski-Gutierrez and
268 Hayden, 2006). Hence, further research will show whether it is possible to quantify
269 environmental influences and subsequent positive or negative health outcomes from
270 different types and configurations of urban green spaces.

271

272 The aesthetic contributions of urban green spaces to city life are equally important.
273 There is a plethora of theories and studies showing the preference amongst urban
274 dwellers for urban areas with green spaces in them (Wilson, 1993; Appleton, 1996;
275 Stamps, 2004; Staats and Hartig, 2004; Regan and Horn, 2005; Hartig and Staats,
276 2006). The character of urban green spaces has been, and continues to be, important in
277 expressing contemporary values, beliefs and cultural trends in urban societies
278 (Thompson, 2004).

279

280 Closely linked with aesthetic and public health aspects of urban green spaces are the
281 cultural backgrounds of the communities that use them (Ward Thompson, 1996;
282 Tzoulas, 2006). Different cultures have different value systems and relationships with
283 nature. So, the role of urban green spaces in improving local quality, identity and
284 character may be different amongst different cultural groups within the same city and
285 also amongst individuals. Understanding how different cultural and sub-cultural
286 groups in cities use urban green spaces is central in developing appropriate
287 management systems (Johnston and Shimada, 2003). Hence, within the theme of *The*
288 *Experience of Urban Green Space* nine key research questions (8-16) are identified:

- 289 8. How can urban green spaces be designed and managed to help meet national
290 and regional biodiversity targets and provide access to experience nature for
291 the urban population?
- 292 9. What are the personal and social influences that result in greater use of urban
293 green spaces?
- 294 10. What are the dynamic interactions between societal, personality, situational,
295 and temporal factors and individual and group engagement with urban green
296 spaces?
- 297 11. How do the cumulative effects of cognitive, emotional, psychological and
298 physical health benefits from multisensory contact with green spaces influence
299 individual and community health and wellbeing?
- 300 12. What aspects and types of urban green space stimulate positive and negative
301 physical and psychological health effects?
- 302 13. What are the necessary quantities, qualities and configuration of urban green
303 spaces which contribute to their regular use such that different segments of a
304 society with changing socio-demographic characteristics may gain benefits?

305 14. How can actual and perceived levels of crime and anti-social behaviour be
306 managed through manipulation of landscape design in green spaces whilst
307 maintaining ecological, landscape and aesthetic benefits?

308 15. How does green space affect anti-social behaviour and community
309 development generally?

310 16. How can urban green spaces be used for greater benefit in environmental
311 education and in education more generally?

312

313 *Theme 3: The Valuation of Urban Green Space*

314 In her review of English language literature on the link between quality of life and
315 economic competitiveness of city regions Donald (2001) focused on the links between
316 a city region's economic competitiveness and, with regards to environmental quality,
317 concluded there was evidence suggesting a relationship between environmental
318 quality, high technology and the attraction of knowledge workers. As the knowledge
319 society continues to become an ever more dominant feature of the 21st century so does
320 the importance of creating places where people wish to live and work. Luttik (2000),
321 reporting on a study of 3,000 house transactions in the Netherlands, found that a view
322 on a park or water leads to an increase in house prices. The observation, based on the
323 willingness to pay concept, clearly indicates the value attributed to nearby green space
324 by individuals. At a policy level the importance of urban green space to economic
325 development is increasingly recognised (Benedict and McMahon, 2006; Li et al.,
326 2005; Konijnendijk, 2003; Benedict and McMahon, 2002; Sandström, 2002; Ahern,
327 1995). However, at a local authority level this is may not always appear to be the case
328 (Barber, 2007; Britt and Johnston, 2008).

329

330 The contribution made by urban green space to ecosystem services and to
331 psychological, social and health experiences is difficult to value (Tzoulas et al., 2007;
332 de Groot et al., 2002; Takano et al., 2002; Kaplan and Kaplan 1989; Ulrich, 1984) and
333 there is still a need for quantitative economic evaluation of the ecosystem services/
334 benefits and costs (both physical and social) provided by green spaces (McPherson,
335 1998; Tyrväinen, 2001; Lambert, 2007; Neilan, 2008). Traditional valuation concepts
336 (e.g. Cost Benefit Analysis, willingness to pay etc.) may not be able to cope with
337 valuing the functions of urban green spaces that are required to strengthen their role in
338 the decision making process within local communities and new valuation techniques
339 may be required. Hence, within the theme *The Valuation of Urban Green Space* four
340 key research questions (17-20) are identified.

341 17. What global competitive gains are delivered to cities through the provision of
342 high quality green spaces and how can these gains be sustained / increased
343 through green space planning and management?

344 18. How can transdisciplinary considerations be integrated into the development
345 of widely accepted methodologies for quantifying and valuing ecosystem
346 services that are provided by urban green spaces?

347 19. How can the multiple “public good” and “market” benefits of urban green
348 spaces be valued and built into governance and funding decision support
349 tools?

350 20. How can ecosystem services be given an appropriate valuation so that they
351 can be considered more equitably alongside other urban system functions?

352

353 *Theme 4: The Management of Urban Green Space*

354 The management of urban green space including planning, design and resource
355 management requires the collaborative working of many disciplines, at different
356 spatial scales. There is variability in the mechanisms and structures governing green
357 space management and maintenance within the same country but even more so across
358 Europe (Werquin et al., 2005). Overall responsibility for urban green space rarely
359 rests with national ministries, departments or agencies concerned with city planning
360 or the environment (Carmona et al., n.d.); more usually urban green spaces are the
361 remit of municipal or regional authorities (Niemelä, 1999).

362

363 Various schemes have been proposed and implemented to differing degrees across
364 Europe including the urban forest (Konijnendijk, 2000), greenbelt and green heart
365 (Kuhn, 2003), green fingers or wedges (Jim and Chen, 2003), greenways (Walmsley,
366 2006), green infrastructure (Sandström, 2002), ecological frameworks (Kazmierczak
367 and James 2008) and ecological networks (Opdam et al., 2006; Sandström et al.,
368 2006). These and other open space planning models have been recently reviewed by
369 Maruani and Amit-Cohen (2007) who organised the various models into a
370 comparative classification framework. They found that no one model was universally
371 applicable to all functions and needs and that the different models reflect different
372 planning constructs/ concepts of the spatial or functional configuration of urban green
373 spaces. This variability in the mechanisms of governance of green spaces, conceptual
374 spatial models, and concerned agencies creates a difficulty in comparative analysis
375 and importantly in the comprehensive assessment and planning of green spaces at a
376 transnational, national or regional level. Hence, within the theme *The Management of*
377 *Urban Green Space* seven key research questions (21-27) are identified:

- 378 21. What are appropriate indicators and typologies for the comparative
379 assessment, monitoring and prediction of the state and trends of urban green
380 spaces and their ecosystem services across Europe?
- 381 22. What are the mechanisms by which green space can be successfully planned,
382 designed and managed at local, regional and national levels, and how can
383 different levels effectively work together?
- 384 23. How effective is the current theoretical basis of urban and restoration ecology
385 in supporting sustainable urban ecosystem management strategies, and
386 informing urban planning?
- 387 24. How can the resilience and adaptability of urban areas to future economic,
388 housing and environmental demands be enhanced through appropriate design
389 and management of urban green spaces?
- 390 25. How will changing social values and behaviours guide the provision and
391 maintenance of urban green spaces?
- 392 26. How can the views and experience of all local residents inform the planning
393 and design process of urban green spaces?
- 394 27. How can the skills base required for delivering integrated planning, design,
395 management and maintenance of urban green spaces in supporting urban
396 sustainability be improved?

397

398 *Theme 5: The Governance of Urban Green Space*

399 Governance is the process of making decisions that define expectations, grant
400 authority and verify performance. Green space governance and management is
401 commonly a local authority responsibility, often divided amongst different
402 departments and geographical areas (Britt and Johnston, 2008; Carmona et al., n.d.).

403 However, it has been recognised that the way that green space governance and
404 management responsibilities are coordinated is more important than their distribution
405 amongst different departments. Important issues in the coordination of responsibilities
406 of urban green space management and governance may include limitations on existing
407 statutory and non-statutory powers, availability of skills and effective communication
408 amongst departments (Carmona et al., n.d.). Hence, within the theme *The Governance*
409 *of Urban Green Space* eight key research questions (28-35) are identified:

- 410 28. How do differing governance and management systems of urban green space
411 influence the planning for delivery of sustainable ecosystem services and
412 ecological function of urban green spaces?
- 413 29. What are the consequences of changing patterns of urban green space
414 ownership?
- 415 30. What are the social and governance implications of different funding and
416 tenure models for the delivery of high quality urban green space in which the
417 local community is engaged fully?
- 418 31. What are the critical factors that affect the extent to which local communities
419 are empowered to participate in local decision making processes?
- 420 32. How is the power relationship between local authorities, developers and local
421 communities changing as communities are encouraged to become more
422 involved in the decision making process about development and adaptation of
423 their neighbourhood green spaces?
- 424 33. How can financial commitments of developers be reconciled with the time
425 requirements of inclusive public consultation?

426 34. Which models of governance effectively facilitate meaningful participation in
427 decision making in an environment where ownership of land parcels changes
428 over time?

429 35. What is the evidence that urban green spaces have risen up the local political
430 agenda and what difference has it made to green space resources and quality of
431 stewardship?

432

433 *An Integrated Framework for Multidisciplinary and Interdisciplinary Research on*
434 *Urban Green Space*

435

436 The questions identified under the previous five themes were distilled from the Delphi
437 process described previously and, underpinned by the existing urban green space
438 evidence base, has enabled the development of an integrated contextual framework
439 for interdisciplinary and multidisciplinary research (Fig. 1). Such a framework aids
440 interdisciplinary and multidisciplinary understandings, and the communication of the
441 complexity of the issues identified during discussions. This framework, along with the
442 detailed questions catalogued above, forms the basis of an agreed research agenda.

443

444 FIGURE 1 HERE

445

446 Ecosystem services are primarily, but not exclusively, concerned with the
447 environmental functions provided by urban green space (Whitford et al., 2001; de
448 Groot et al., 2002; Tratalos et al., 2007). Such environmental functions may include
449 the provisioning of resources (e.g. food or fuel), the regulating of microclimates, the
450 supporting of bio-geophysical process and cycles (e.g. soil formation); and cultural

451 interpretations (e.g. aesthetic, recreational or educational facilities) (Millennium
452 Ecosystem Assessment, 2005). The broad socio-economic drivers of change focus on
453 demographic, economic or socio-political factors, all of which affect urban green
454 space. In addition to the broader socio-economic and environmental factors, there are
455 specific pressures on urban green space, such as adapting to technological and societal
456 changes, attracting inward investment and retaining employment, as well as
457 promoting nature conservation and health. Social systems and processes integrate
458 wider socio-economic and environmental factors with the management and use of
459 urban green space. They also address issues relating to the integration of professional,
460 academic and voluntary sector practices regarding decision making, participatory and
461 inclusive management of urban green space. The goals of urban green space provision
462 is concerned with improvements in the quality of life in urban areas and the quality of
463 urban green space.

464

465 These broad areas (ecosystem services, drivers of change and, pressures on urban
466 green space) are interrelated and this is indicated by the dotted arrows between them
467 (Fig. 1). So, ecosystem services and the drivers of change for urban green spaces are
468 closely interrelated, and they are expressed as identified pressures on urban green
469 space. These varied pressures on urban green space are further addressed by social
470 systems and processes, which are closely related with the goals of urban green space
471 provision.

472

473 Five research themes: physicality, experience, valuation, and management of, and
474 governance of urban green space, emerged from the Delphi process, and have been
475 presented in this paper. The relationship between the emergent themes and research

476 questions with other parts of the integrating framework is indicated by the solid two
477 way arrows in Figure 1.

478

479 **Discussion**

480

481 An important aspect of the integrated framework developed during this research and
482 presented in Fig. 1 is that changes in the urban environment, as elsewhere, are the
483 result of the complex interactions of natural and spontaneous processes as well as of
484 the planned actions by humans (Wood and Handley, 2001; Antrop, 1998). Thus, an
485 understanding of the detail of, and interactions between, the five broad research areas
486 is important. Furthermore, this integrated framework demonstrates explicitly that the
487 outcomes from different research themes of urban green space are inextricably linked
488 and include physical and social systems and processes. What emerges from this
489 contextual conceptualisation is that an interdisciplinary, multidisciplinary and
490 transdisciplinary understanding of the emergent research themes are required. The
491 proposed research agenda (Fig. 1 and the thirty five questions) facilitates the
492 development of such studies in two ways. First, Fig. 1 identifies broad
493 interrelationships between research areas and thus gives an indication of the potential
494 for collaboration between disciplines. Second, the thirty five questions provide an
495 initial catalogue of identified questions that require further research. This catalogue of
496 questions is not definitive, nor is it prioritised, and the questions may vary in different
497 geographical locations and at different historical times. However, it does provide a
498 common framework for researching current urban green space topics in Europe.

499

500 Our analysis shows that whilst the general functions and benefits of green spaces are
501 reasonably well understood, when looking to the future there is insufficient
502 understanding of:

503 a) How to plan, design and manage green sapce (how large, how to connect, etc.);
504 and

505 b) How green spaces will behave under socio-demographic and environmental
506 change.

507

508 In looking towards an international research agenda the framework (Fig. 1), and the
509 research questions presented here, should be seen as a tool for developing working
510 practices that transcend disciplinary boundaries in order to develop new insights and
511 understanding of urban green spaces: it has been designed to be resilient in order to
512 accommodate changes in knowledge.

513

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527

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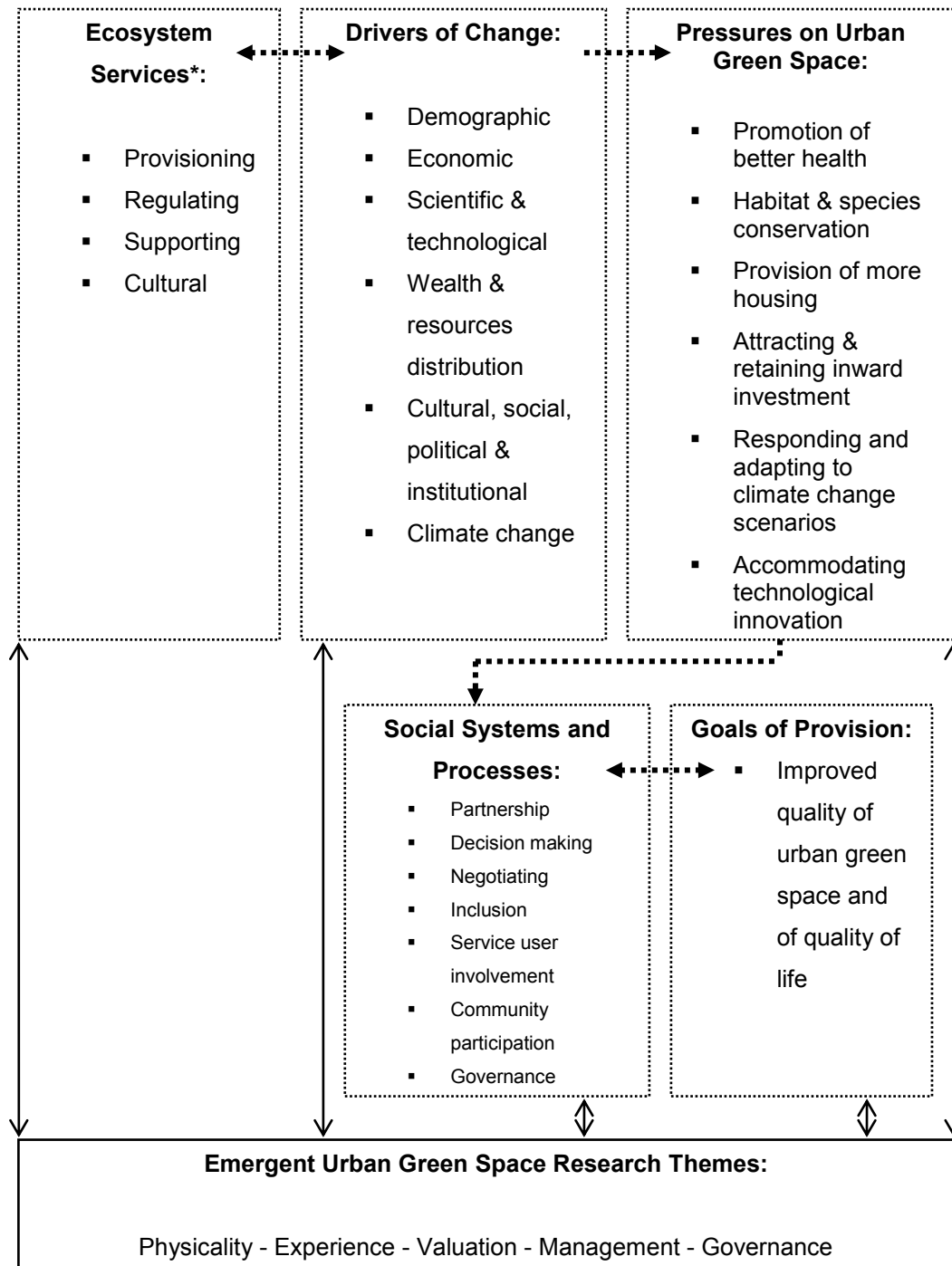
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739

740 **Figure 1: Integrating framework for a research agenda for urban green space**

741 Key: Dashed boxes indicate broad research areas that are changing over time and

742 across geographical areas; Solid box indicates specific research themes that remain

743 constant in time and geographical areas; Dashed two way arrows indicate dynamic

744 relationships between different research areas; Dashed one way arrows indicate
745 integration by the research area at which the arrows are pointing; Solid two way
746 arrows indicate that research themes are drawn from, and are applicable to, the
747 different research areas. (*) Source: Millennium Assessment, (2005).