Promoting ecosystem and human health in urban landscapes

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ECOSYSTEM SERVICES

Supporting
- NUTRIENT CYCLING
- SOIL FORMATION
- PRIMARY PRODUCTION
-...

Provisioning
- FOOD
- FRESH WATER
- WOOD AND FIBER
- FUEL
-...

Regulating
- CLIMATE REGULATION
- FLOOD REGULATION
- DISEASE REGULATION
- WATER PURIFICATION
-...

Cultural
- AESTHETIC
- SPIRITUAL
- EDUCATIONAL
- RECREATIONAL
-...

LIFE ON EARTH - BIODIVERSITY

CONSTITUENTS OF WELL-BEING

Security
- PERSONAL SAFETY
- SECURE RESOURCE ACCESS
- SECURITY FROM DISASTERS

Basic material for good life
- ADEQUATE LIVELIHOODS
- SUFFICIENT NUTRITIOUS FOOD
- SHELTER
- ACCESS TO GOODS

Freedom of choice and action
- OPPORTUNITY TO BE ABLE TO ACHIEVE WHAT AN INDIVIDUAL VALUES DOING AND BEING

Health
- STRENGTH
- FEELING WELL
- ACCESS TO CLEAN AIR AND WATER

Good social relations
- SOCIAL COHESION
- MUTUAL RESPECT
- ABILITY TO HELP OTHERS

Source: Millennium Ecosystem Assessment
What types and components of urban and peri-urban blue / green spaces have a significant impact on human mental health and mental well-being?
European BfN/ENCA conference

Biodiversity and Health in the Face of Climate Change – Challenges, Opportunities and Evidence Gaps
27 - 29 JUNE 2017, BONN / GERMANY
European BfN/ENCA conference

Biodiversity and Health in the Face of Climate Change

27. - 29. June 2017 in Bonn/Germany

ENCA Recommendations

1. **Increase the evidence base** of the contributions of biodiversity for human health and wellbeing.

2. **Increase awareness** of the human health and wellbeing effects of natural environments and biodiversity.

3. **Highlight the co-benefits** of nature-based solutions for climate change adaptation to policy-makers and regional planning authorities.

4. **Foster application of nature-based solutions for climate change adaptation** from society and policy

5. **Effectively design and manage green spaces** to ensure people have contact with nature and biodiversity
3. **Highlight the co-benefits of nature-based solutions for climate change adaptation to policy-makers and regional planning authorities.**

- Highlighting *the interlinkages of climate change, human health and biodiversity* by emphasizing that there are *direct effects* (e.g. heat stress) as well as *indirect effects* (e.g. spread of vector-borne diseases and allergenic plants) negative impacts of climate change on health and biodiversity, but also promoting the *potential health effects* of nature based solutions to climate change adaptation.

- Focusing on human health and wellbeing as a *central benefit* of nature-based solutions for climate change adaption (instead of a co-benefit).
Nature-based solutions
Nature-based Solutions to Climate Change Adaptation in Urban Areas

Linkages between Science, Policy and Practice

Editors: Kabisch, N., Korn, H., Stadler, J., Bonn, A. (Eds.)

Provides specific recommendations to assist city planners
2. **Increase awareness of the human health and wellbeing effects of natural environments and biodiversity.**
   - Emphasizing the contribution of biodiversity in tackling our main health problems; demonstrating the facts and synergies regarding the benefits and risks to health.
   - Developing guidance for health professionals on how to use natural environments for health promotion as a complement to other already established measures.

5. **Effectively design and manage green spaces to ensure people have contact with nature and biodiversity**
   - Managing small urban green spaces to increase the aspects of biodiversity that can be beneficial to human health and wellbeing. *It is important for people to have contact with natural environments in their daily life* (e.g. on their ways to school or work, around the home).
Urban Gardens
Urban Gardening and Health

Review Article

Gardening is beneficial for health: A meta-analysis

Masashi Soga a,*, Kevin J. Gaston b, Yuichi Yamaura c

• Meta-analysis of 22 studies examining the effect of gardening on physical and mental health

• Gardens include private, allotment and community gardens and horticultural therapy

• Studies from US /Europe/ East-Asia
‘A regular dose of gardening improves public health’
5. Effectively design and manage green spaces to ensure people have contact with nature and biodiversity

• Utilising social and physical interventions to facilitate use, and improve the quality of, green spaces. Access to green space does not necessarily result in its use.

• Focussing interventions on increasing both the biodiversity of the green space, and the amount of time people spend in that green space. Both have been shown to achieve positive health and wellbeing benefits.

• Marketing protected areas as “health hubs” in order to highlight the value they deliver for human health and wellbeing.
Health walks in nature

- National walking program in UK
- Free, guided, group walks
- “One of the largest public health interventions for physical activity in the UK” (Fitches, 2011)
- Walks occur in urban areas, urban parks to national parks (Marselle et al, 2013)
- Similar local health walks occur in USA, Netherlands
Examining Group Walks in Nature and Multiple Aspects of Well-Being: A Large-Scale Study

Melissa R. Marselle, Katherine N. Irvine, and Sara L. Warber

Valid Responses on T1* & T2²
1991

Group Walkers 1258
Non-Group Walkers 733

Non-Nature Walkers 83
Nature Group Walkers 1175
Missing Values 94

Missing Values 113
Non-Group Walkers 620

Final Nature Group Walkers 1081
Final Non-Group Walkers 435

*Time 1 questionnaire
²Time 2 questionnaire
³Propensity score match
Results

Table 2. Comparison of Mean Scores of Time 2 Depression, Perceived Stress, Negative Affect, Positive Affect, Mental Well-Being, and Social Support for Matched Nature Group Walkers and Non-Group Walkers

<table>
<thead>
<tr>
<th>OUTCOMES</th>
<th>NATURE GROUP WALKERS</th>
<th>NON-GROUP WALKERS</th>
<th>t TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n=1081 [MEAN (SD)]</td>
<td>n=435 [MEAN (SD)]</td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td>6.53 (5.70)</td>
<td>9.78 (7.96)</td>
<td>t(1514)=8.47***</td>
</tr>
<tr>
<td>Perceived stress</td>
<td>11.27 (6.15)</td>
<td>13.54 (7.02)</td>
<td>t(715.75)=5.89***</td>
</tr>
<tr>
<td>Negative affect</td>
<td>14.38 (4.76)</td>
<td>16.26 (6.08)</td>
<td>t(710.41)=6.05***</td>
</tr>
<tr>
<td>Positive affect</td>
<td>34.80 (6.90)</td>
<td>31.87 (8.33)</td>
<td>t(685.52)=6.50***</td>
</tr>
<tr>
<td>Mental well-being</td>
<td>53.04 (7.27)</td>
<td>50.55 (8.87)</td>
<td>t(680.92)=5.18***</td>
</tr>
<tr>
<td>Social support</td>
<td>22.94 (6.44)</td>
<td>22.82 (6.47)</td>
<td>t(1514)=.328</td>
</tr>
</tbody>
</table>

Bar charts show the comparison between Non-Group and Nature Group Walkers for various outcomes:

- Social support
- Mental wellbeing
- Positive affect
- Negative affect
- Perceived stress
- Depression
Table 3. Standard Regression Analyses of Matched\textsuperscript{a} Sample of Nature Group Walkers and Non-Group Walkers for Time 2 Depression, Perceived Stress, Negative Affect, Positive Affect, Mental Well-Being, and Social Support Adjusted for Health Screening Conditions, Recent Stressful Life Events, Frequency and Duration of Other Nature Walks, and Recent Physical Activity (\(n=1490\))

<table>
<thead>
<tr>
<th>PREDICTORS</th>
<th>DEPRESSION\textsuperscript{d,e}</th>
<th>PERCEIVED STRESS\textsuperscript{d}</th>
<th>NEGATIVE AFFECT\textsuperscript{c,d}</th>
<th>POSITIVE AFFECT\textsuperscript{d}</th>
<th>MENTAL WELL-BEING\textsuperscript{d}</th>
<th>SOCIAL SUPPORT\textsuperscript{e}</th>
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<tbody>
<tr>
<td>Constant</td>
<td>.103</td>
<td>15.39</td>
<td>1.209</td>
<td>28.24</td>
<td>46.74</td>
<td>2.77</td>
</tr>
<tr>
<td>SE B=</td>
<td>.03</td>
<td>.56</td>
<td>.011</td>
<td>.63</td>
<td>.68</td>
<td>.103</td>
</tr>
<tr>
<td>p=</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Health screening conditions\textsuperscript{g}</td>
<td>(\beta=) .03</td>
<td>.02</td>
<td>.02</td>
<td>-.04</td>
<td>-.02</td>
<td>.08</td>
</tr>
<tr>
<td>p=</td>
<td>.21</td>
<td>.53</td>
<td>.51</td>
<td>.12</td>
<td>.53</td>
<td>.002</td>
</tr>
<tr>
<td>Recent stressful life events\textsuperscript{h}</td>
<td>(\beta=) .17</td>
<td>.21</td>
<td>.19</td>
<td>-.07</td>
<td>-.05</td>
<td>.06</td>
</tr>
<tr>
<td>p=</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>.01</td>
<td>.04</td>
<td>.02</td>
</tr>
<tr>
<td>Frequency other nature walks\textsuperscript{g}</td>
<td>(\beta=) -.10</td>
<td>-.11</td>
<td>-.08</td>
<td>.06</td>
<td>.11</td>
<td>-.10</td>
</tr>
<tr>
<td>p=</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>.02</td>
<td>.04</td>
<td>.001</td>
</tr>
<tr>
<td>Duration other nature walks\textsuperscript{g}</td>
<td>(\beta=) -.05</td>
<td>-.05</td>
<td>-.01</td>
<td>.07</td>
<td>.04</td>
<td>.03</td>
</tr>
<tr>
<td>p=</td>
<td>.06</td>
<td>.09</td>
<td>.74</td>
<td>.01</td>
<td>.10</td>
<td>.35</td>
</tr>
<tr>
<td>Recent physical activity\textsuperscript{h}</td>
<td>(\beta=) -.10</td>
<td>-.07</td>
<td>-.06</td>
<td>.20</td>
<td>.13</td>
<td>-.01</td>
</tr>
<tr>
<td>p=</td>
<td>.001</td>
<td>.02</td>
<td>.03</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>.74</td>
</tr>
<tr>
<td>Group walk participation\textsuperscript{i}</td>
<td>(\beta=) -.19</td>
<td>-.15</td>
<td>-.16</td>
<td>.14</td>
<td>.12</td>
<td>-.01</td>
</tr>
<tr>
<td>p=</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>.62</td>
</tr>
<tr>
<td>Adjusted R\textsuperscript{c}</td>
<td>.104</td>
<td>.098</td>
<td>.073</td>
<td>.102</td>
<td>.068</td>
<td>.018</td>
</tr>
</tbody>
</table>
1. **Increase the evidence base of the contributions of biodiversity for human health and wellbeing.**

   - Identifying which **aspects of biodiversity** can provide benefits for physical, psychological and social health and wellbeing.

   - **Investigating the ‘dose’ of biodiversity** required for a positive health effect. How much biodiversity is necessary for human health and wellbeing?

   - Examining how biodiversity benefits health and wellbeing. **What are the mechanisms?**
Biodiversity of urban spaces and mental health and wellbeing
Research note

Research note: Urban street tree density and antidepressant prescription rates—A cross-sectional study in London, UK

Mark S. Taylor\textsuperscript{a,*}, Benedict W. Wheeler\textsuperscript{a,b,c}, Mathew P. White\textsuperscript{b}, Theodoros Economou\textsuperscript{a,b,c}, Nicholas J. Osborne\textsuperscript{b}
Street trees may be a positive urban asset to decrease the risk of negative mental health outcomes.

Fig. 1. Scatter plot of street tree density and rate of antidepressant prescriptions.
Biodiversity and the Feel-Good Factor: Understanding Associations between Self-Reported Human Well-being and Species Richness

MARTIN DALLIMER, KATHERINE N. IRVINE, ANDREW M. J. SKINNER, ZOE G. DAVIES, JAMES R. ROUQUETTE, LORRAINE L. MALTBY, PHILIP H. WARREN, PAUL R. ARMSWORTH, AND KEVIN J. GASTON

34 greenspaces UK

– Objective species richness
– Perceived species richness
– Participants’ wellbeing
Biodiversity and the Feel-Good Factor: Understanding Associations between Self-Reported Human Well-being and Species Richness

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Doses of Neighborhood Nature: The Benefits for Mental Health of Living with Nature

Daniel T. C. Cox, Danielle F. Shanahan, Hannah L. Hudson, Kate E. Plummer, Gavin M. Siriwardena, Richard A. Fuller, Karen Anderson, Steven Hancock, and Kevin J. Gaston

- 3 towns, UK
  1. Vegetation cover
  2. Bird abundance (morning)
  3. Bird abundance (afternoon)
  4. Bird species richness (morning)
  5. Bird species richness (afternoon)

- Residents’ depression, anxiety, stress
Doses of Neighborhood Nature: The Benefits for Mental Health of Living with Nature

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Doses of Neighborhood Nature: The Benefits for Mental Health of Living with Nature

Dose-response

20%

Depression 11%

30%

Stress 17%

Anxiety 25%
How does biodiversity influence mental wellbeing?

Markevych, Schoierer, Hartig et al. (2017)

Greenspace

Reducing harm (mitigation)
For example, reducing exposures to environmental stressors - air pollution, noise and heat

Restoring capacities (restoration)
For example, attention restoration and psychophysiological stress recovery

Building capacities (instoration)
For example, encouraging physical activity and facilitating social cohesion

Health and well-being
For example, improved self-perceived health, higher birth weight, lower BMI and lower risk for depression and cardiovascular and all cause mortality
Biodiversity

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Conclusions & Challenges

• Biodiversity can have a significant positive effects on human health. Health as central benefit, not just co-benefit of conservation.

• Physical and social interventions are needed to stimulate these effects by use of green space.

• Investigate the ‘dose – response’ relationship of biodiversity and health.

• Examine mechanisms how biodiversity benefits health and wellbeing.

• Link WHO/CBD collaboration closer with IPBES process – IPBES Assessment on Biodiversity & Health?
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