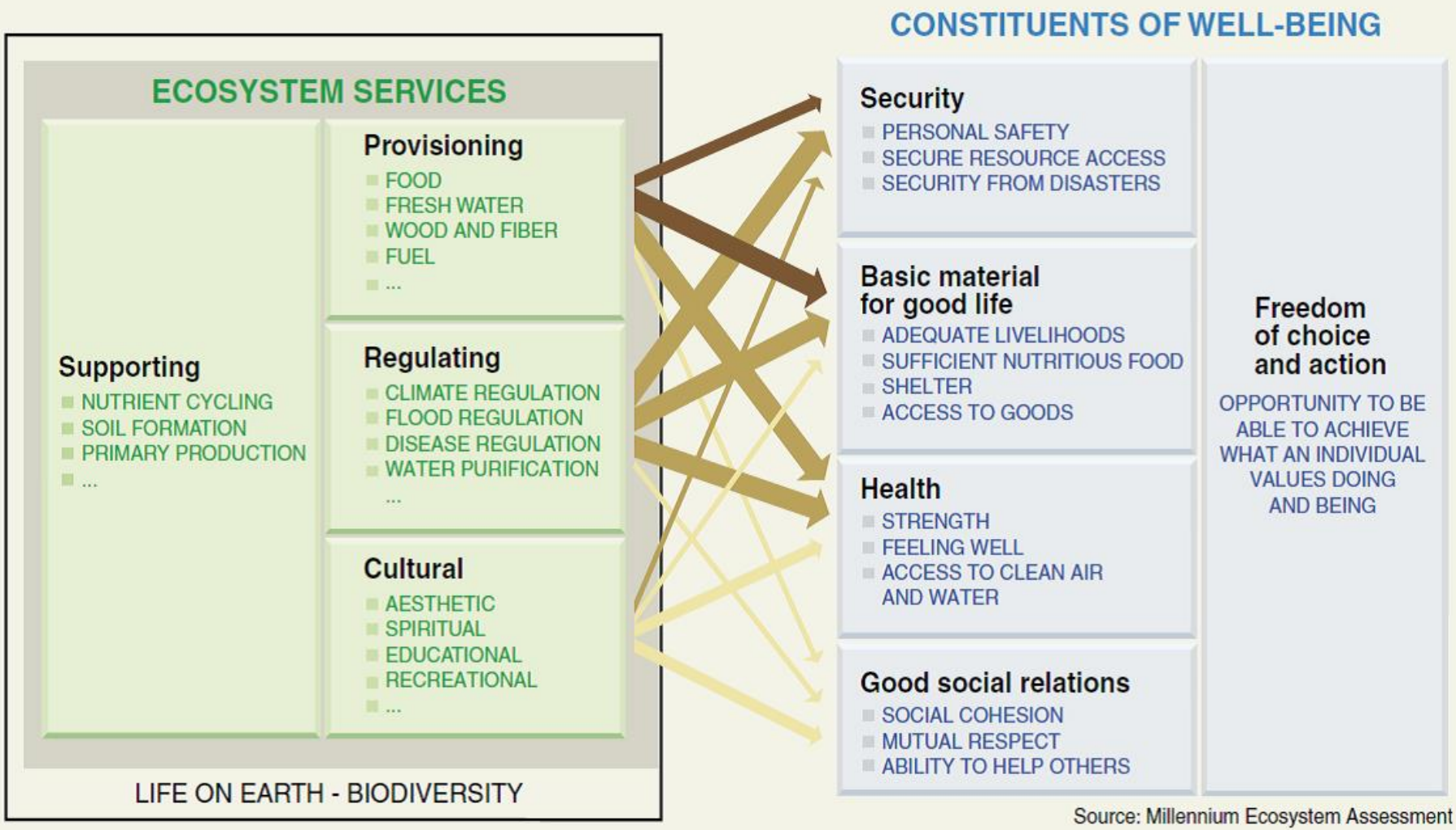
Promoting ecosystem and human health in urban landscapes

Prof. Dr. Aletta Bonn
Dr. Melissa Marselle

Helmholtz Centre for Environmental Research
German Centre for Integrative Biodiversity Research (iDiv)



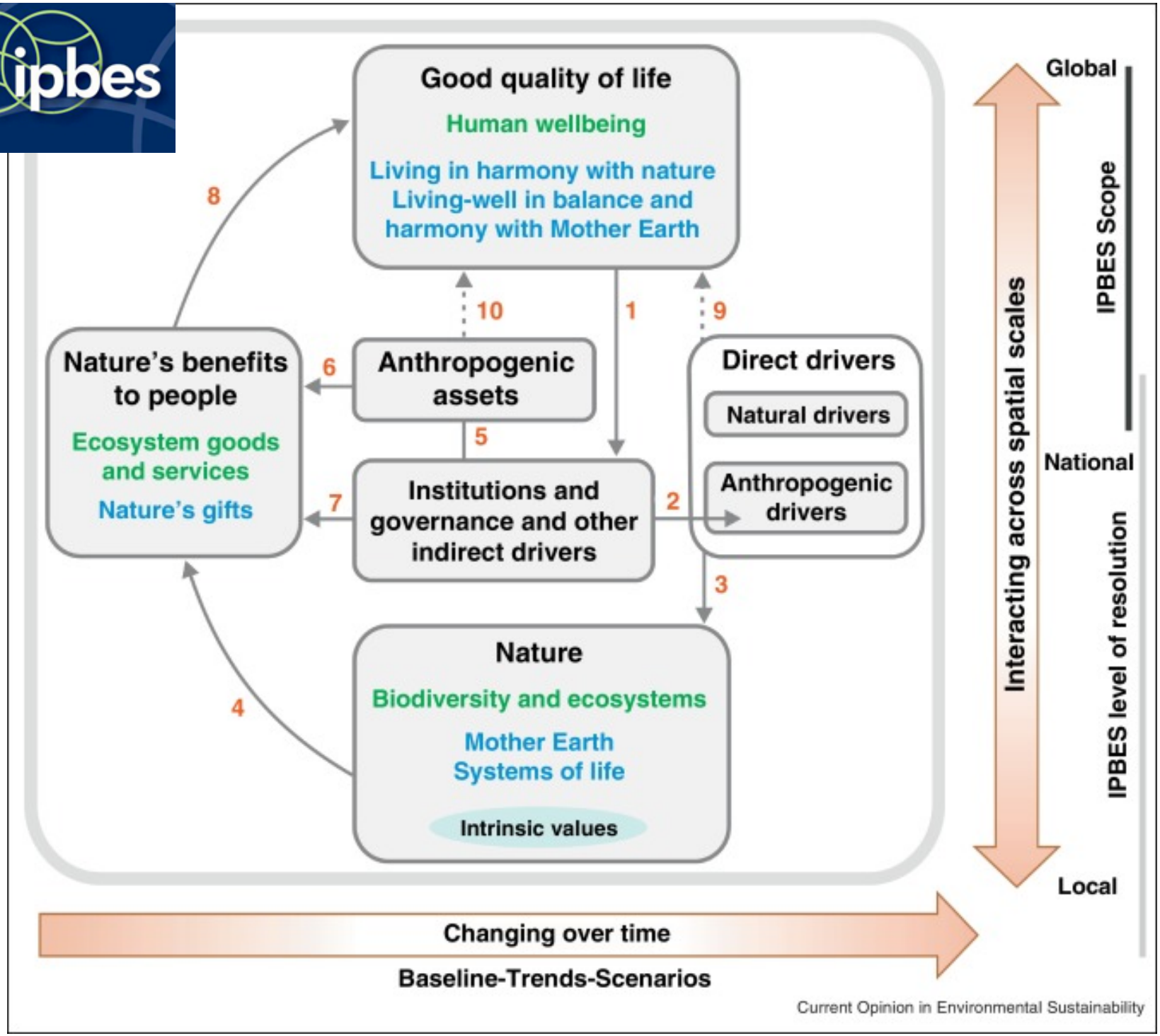
Source: Millennium Ecosystem Assessment

ARROW'S **COLOR**
Potential for mediation by socioeconomic factors

- Low
- Medium
- High

ARROW'S **WIDTH**
Intensity of linkages between ecosystem services and human well-being

- Weak
- Medium
- Strong


Good quality of life
Human wellbeing
Living in harmony with nature
Living-well in balance and harmony with Mother Earth
Nature's benefits to people
Ecosystem goods and services
Nature's gifts
Anthropogenic assets
Direct drivers
Natural drivers
Anthropogenic drivers
Institutions and governance and other indirect drivers
Nature
Biodiversity and ecosystems
Mother Earth
Systems of life
Intrinsic values
1
2
3
4
5
6
7
8
9
10
Global
National
Local
IPBES Scope
IPBES level of resolution
Interacting across spatial scales
Changing over time
Baseline-Trends-Scenarios
Current Opinion in Environmental Sustainability

SUSTAINABLE DEVELOPMENT GOALS

EKLIPSE

Knowledge & Learning Mechanism
on Biodiversity & Ecosystem Services

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

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**

Network of Heads of European Nature Conservation Agencies (ENCA)
Recommendations for Biodiversity and Health

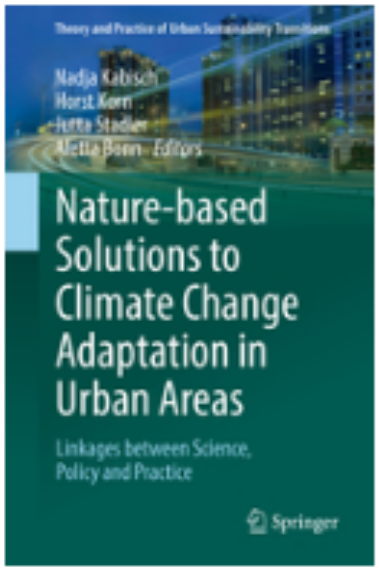
3. <u>Highlight the co-benefits of</u> nature-based solutions for climate change adaptation to policy-makers and regional planning authorities.

- 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

Theory and Practice of Urban Sustainability Transitions



Open Access

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

Network of Heads of European Nature Conservation Agencies (ENCA)
Recommendations for Biodiversity and Health

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

Contents lists available at ScienceDirect

Preventive Medicine Reports

journal homepage: http://ees.elsevier.com/pmedr

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'

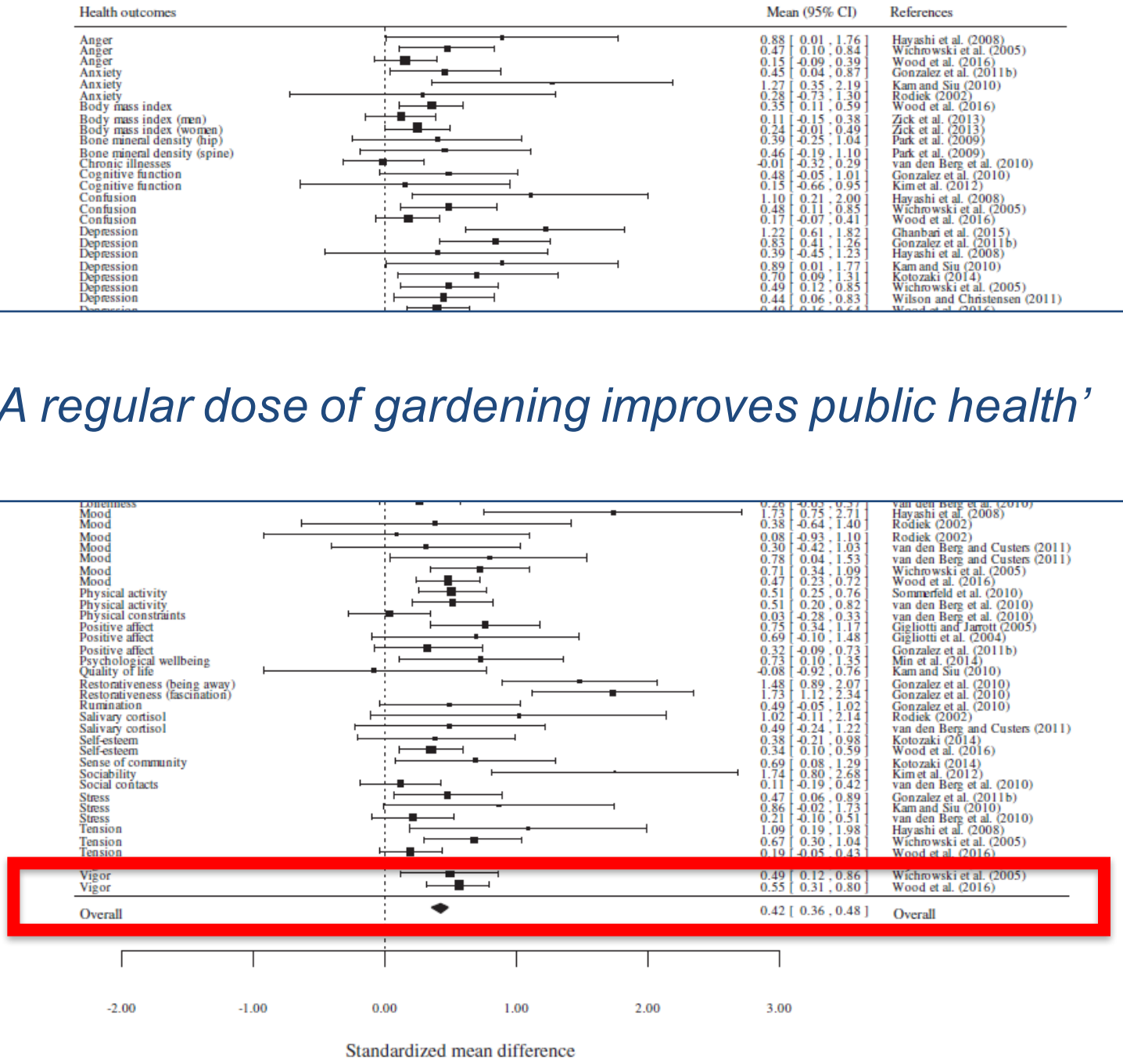


Fig. 2. Standardized mean differences in the health outcomes between the control and treatment groups for 76 comparisons. Positive values indicate improved health outcomes. Dotted and solid lines indicate the effect size of 0 and 95% CI, respectively. Positive affect means the extent to which one is experiencing positive mood states, such as joy, cheerfulness, and enthusiasm.

Network of Heads of European Nature Conservation Agencies (ENCA)
Recommendations for Biodiversity and Health

5. <u>Effectively design and manage</u> 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.

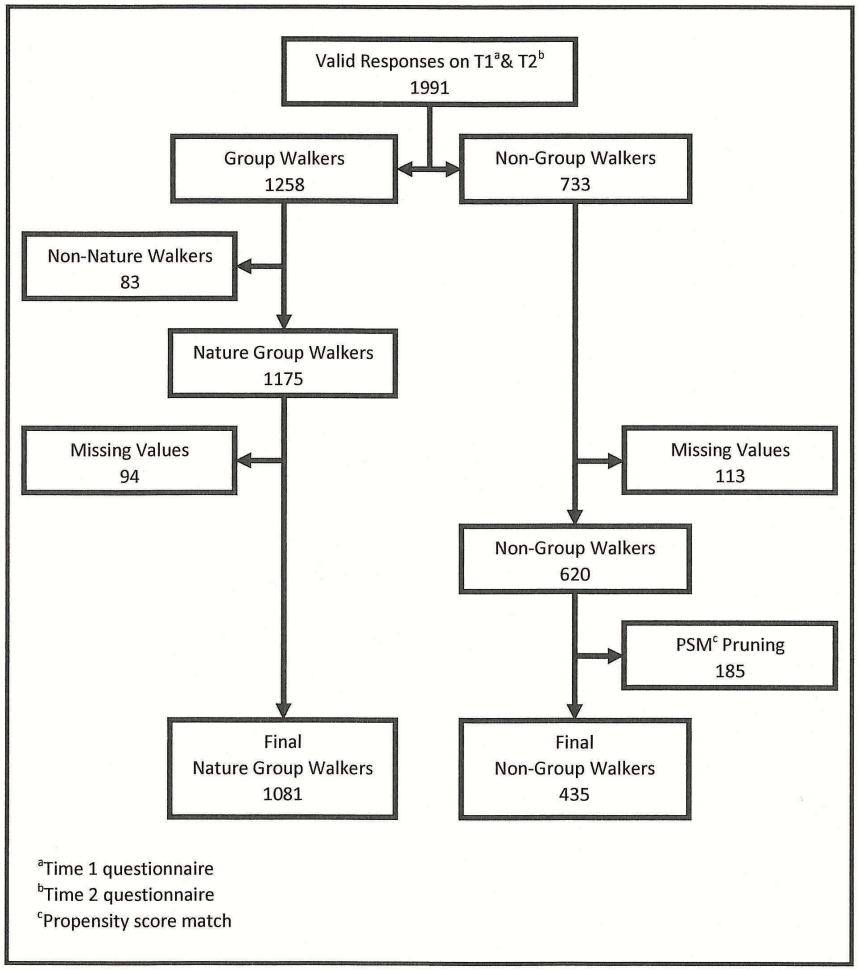
Health walks in nature

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,[1,2] Katherine N. Irvine,[2,3] and Sara L. Warber[4]



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[a] Nature Group Walkers and Non-Group Walkers

OUTCOMES[b]	NATURE GROUP WALKERS $n = 1081$ [MEAN (SD)]	NON-GROUP WALKERS $n = 435$ [MEAN (SD)]	t TEST[c]
Depression[e]	6.53 (5.70)	9.78 (7.96)	$t(1514) = 8.47^{***}$
Perceived stress[f]	11.27 (6.15)	13.54 (7.02)	$t(715.75) = 5.89^{***}$
Negative affect[e,f]	14.38 (4.76)	16.26 (6.08)	$t(710.41) = 6.05^{***}$
Positive affect[f]	34.80 (6.90)	31.87 (8.33)	$t(685.52) = 6.50^{***}$
Mental well-being[f]	53.04 (7.27)	50.55 (8.87)	$t(680.92) = 5.18^{***}$
Social support	22.94 (6.44)	22.82 (6.47)	$t(1514) = .328$

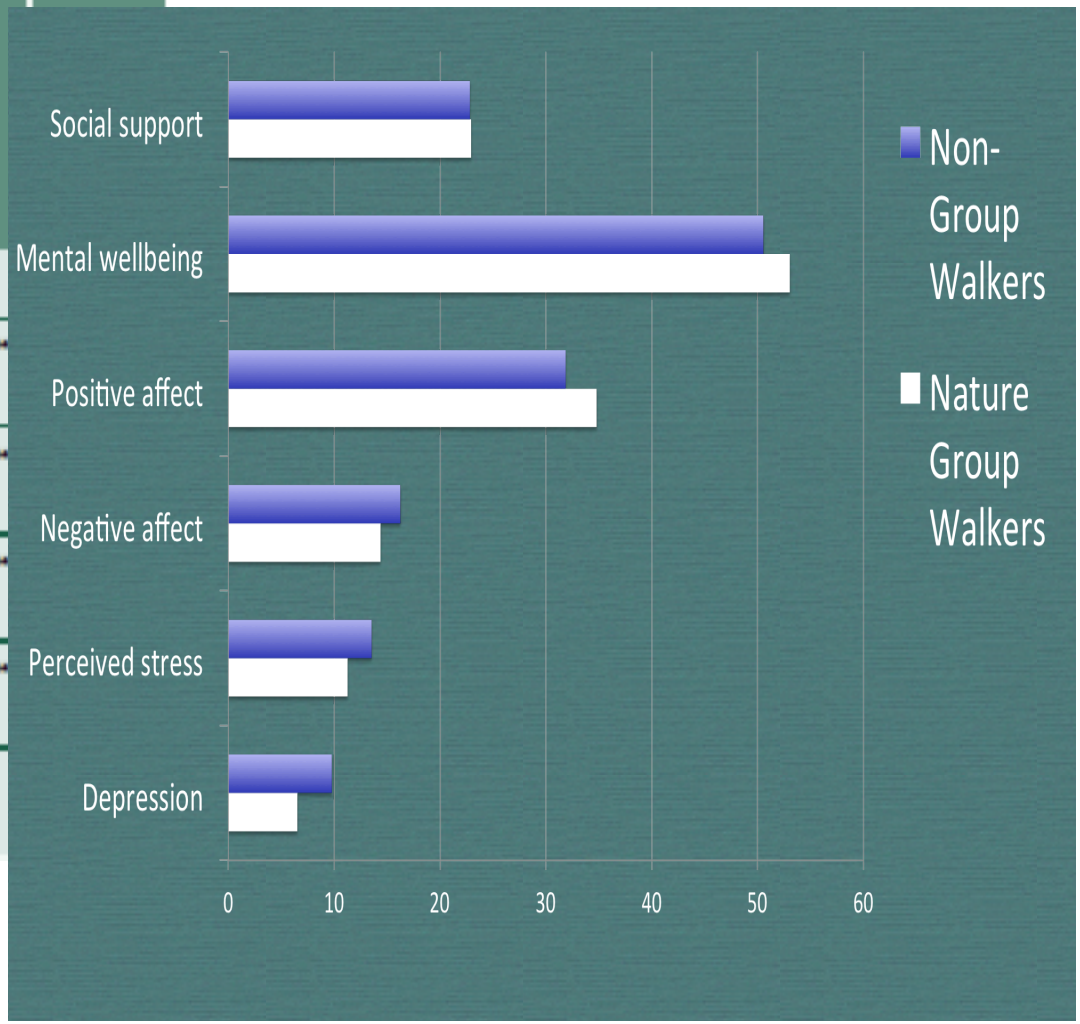


Table 3. Standard Regression Analyses of Matched[a] Sample of Nature Group Walkers and Non-Group Walkers for Time 2 Depression, Perceived Stress, Negative Affect, Positive Affect, Mental Well-Being, and Social Support Adjusted for Health Screening Conditions, Recent Stressful Life Events, Frequency and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

PREDICTORS		DEPRESSION[c,d]	PERCEIVED STRESS[d]	NEGATIVE AFFECT[c,d]	POSITIVE AFFECT[d]	MENTAL WELL-BEING[d]	SOCIAL SUPPORT[e]
Constant	*B*=	1.03	15.39	1.209	28.24	46.74	2.77
	SE B=	.03	0.56	.011	0.63	0.68	.103
	p=	*<.001*	*<.001*	*<.001*	*<.001*	*<.001*	*<.001*
Health screening conditions[f]	β=	0.03	0.02	0.02	−0.04	−0.02	.08
	p=	*0.21*	*0.53*	*0.51*	*0.12*	*0.53*	*.002*
Recent stressful life events[g]	β=	0.17	0.21	0.19	−0.07	−0.05	.06
	p=	*<.001*	*<.001*	*<.001*	*0.01*	*0.04*	*.02*
Frequency other nature walks[g]	β=	−0.10	−0.11	−0.08	0.06	0.11	−.10
	p=	*<.001*	*<.001*	*.003*	*0.02*	*<.001*	*.001*
Duration other nature walks[g]	β=	−0.05	−0.05	−0.01	0.07	0.04	.03
	p=	*.06*	*.09*	*.74*	*0.01*	*0.10*	*.35*
Recent physical activity[h]	β=	−0.10	−0.07	−0.06	0.20	0.13	−.01
	p=	*0.001*	*0.02*	*0.03*	*<.001*	*<.001*	*.74*
Group walk participation[i]	β=	−0.19	−0.15	−0.16	0.14	0.12	−.01
	p=	*<.001*	*<.001*	*<.001*	*<.001*	*<.001*	*.62*
Adjusted R^2		.104	.095	.073	.102	.066	.018

Network of Heads of European Nature Conservation Agencies (ENCA)
Recommendations for Biodiversity and Health

1. **<u>Increase the evidence base</u> 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

Contents lists available at ScienceDirect

Landscape and Urban Planning

journal homepage: www.elsevier.com/locate/landurbplan

Research note

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

Mark S. Taylor [a,*], Benedict W. Wheeler [a,b,c], Mathew P. White [b], Theodoros Economou [a,b,c], Nicholas J. Osborne [b]

Contents lists available at ScienceDirect

Landscape and Urban Planning

journal homepage: www.elsevier.com/locate/landurbplan

Research note

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

Mark S. Taylor[a,*], Benedict W. Wheeler[a,b,c], Mathew P. White[b], Theodoros Economou[a,b,c], Nicholas J. Osborne[b]

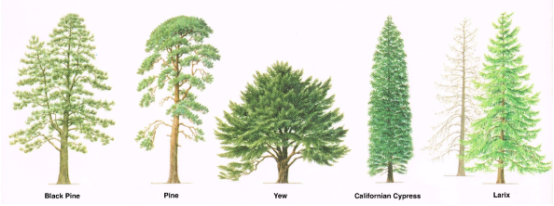
`Street trees may be a positive urban asset to decrease the risk of negative mental health outcomes.`

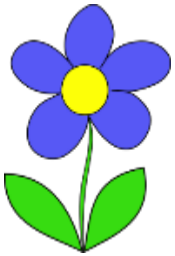
Fig. 1. Scatter plot of street tree density and rate of antidepressant prescriptions.

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

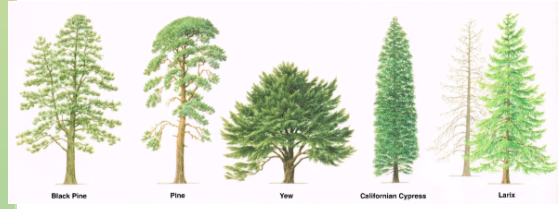
- 34 greenspaces UK
  - –Objective species richness
  - –Perceived species richness
  - –Participants' wellbeing





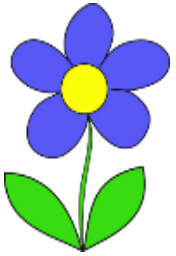
Biodiversity and the Feel-Good Factor: Understanding Associations between Self-Reported Human Well-being and Species Richness

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



Psychological Well-being

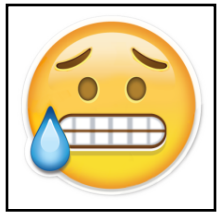
X



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

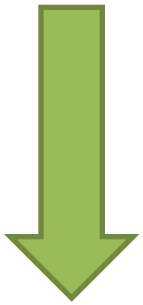
DANIEL T. C. COX, DANIELLE F. SHANAHAN, HANNAH L. HUDSON, KATE E. PLUMMER, GAVIN M. SIRIWARDENA, RICHARD A. FULLER, KAREN ANDERSON, STEVEN HANCOCK, AND KEVIN J. GASTON

- 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

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



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

Dose-response

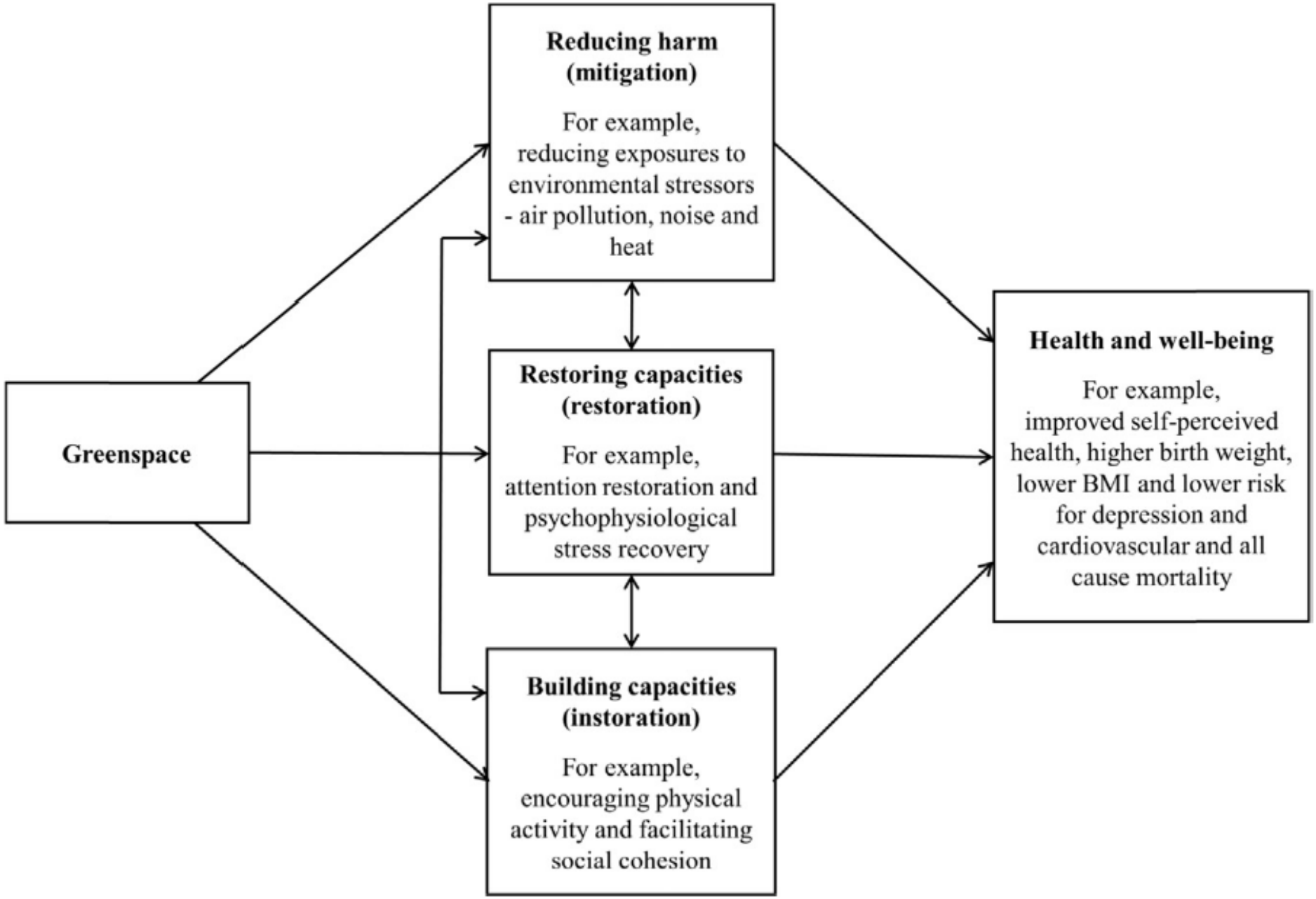
20%

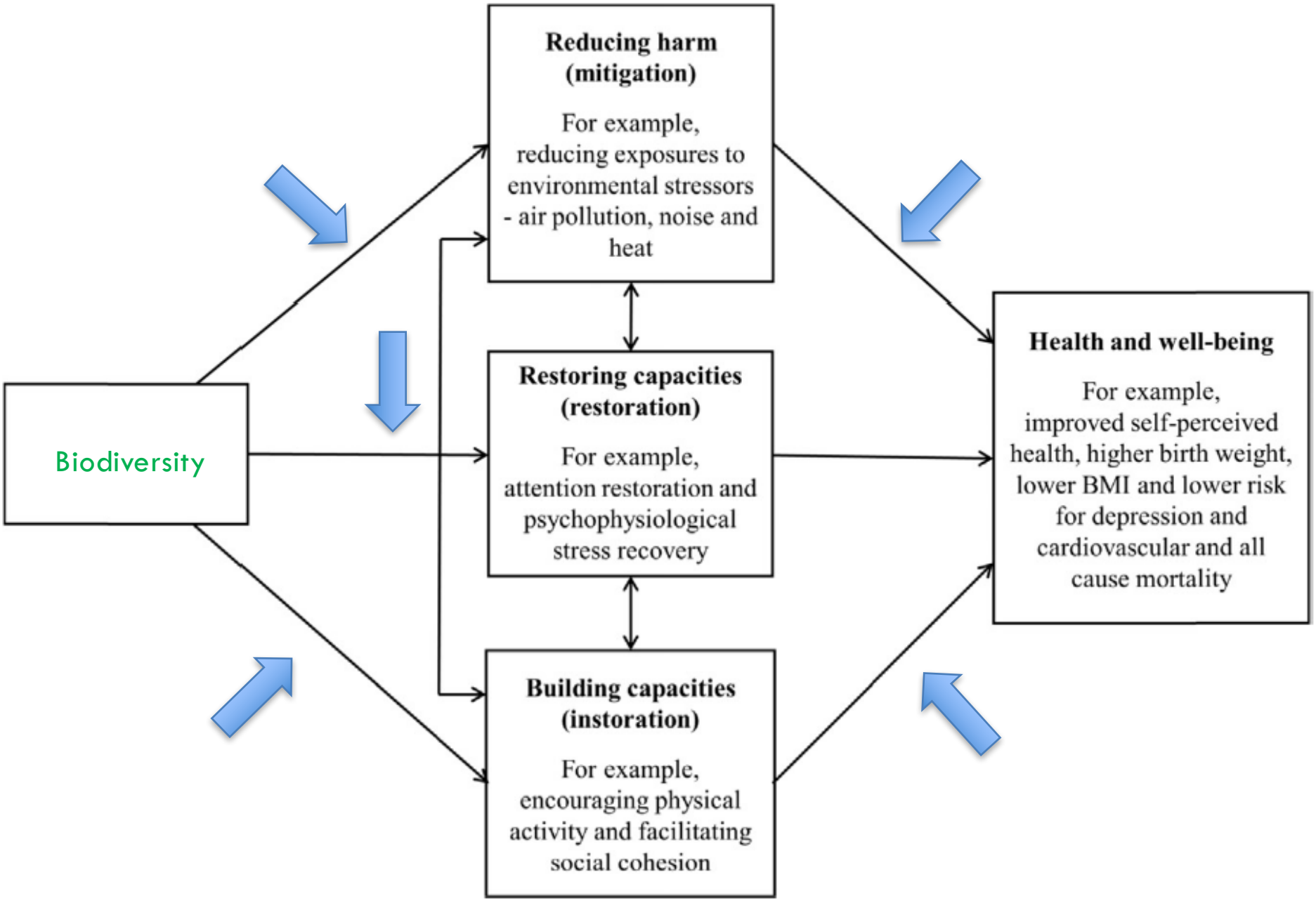
30%

Depression 11%

Stress 17%

Anxiety 25%


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


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

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?**

HELMHOLTZ
ZENTRUM FÜR
UMWELTFORSCHUNG
UFZ

Thank you!

We kindly acknowledge the support
by the German Centre for Integrative
Biodiversity Research (iDiv)
Halle-Jena-Leipzig,
funded by the German Science Foundation
(FZT 118).