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# The Health and Social Benefits of Nature and Biodiversity Protection

## Executive Summary

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# The Health and Social Benefits of Nature and Biodiversity Protection

## Key Messages

### The Problem

1. **European society faces a range of health and social issues that merit urgent attention.** The EU health sector represents 15% of public expenditure and health care costs are expected to increase. At the same time, there is considerable pressure on public spending budgets.
  - **Air pollution:** Particulate matter, ozone, and nitrogen dioxide create risks of cardiovascular, cerebrovascular and respiratory disease. Poor air quality is responsible for early mortality - more than 400,000 deaths in the EU-28 in 2012 - and recent progress on air quality in cities has been limited.
  - **Heat stress** causes exhaustion, heat stroke and mortality. Europe's 2003 heat wave caused 70,000 additional deaths. The urban heat island effect, the temperature increase (by up to 12°C) experienced by urban areas, coupled with projected climate change will exacerbate the risks of heat stress.
  - **Low physical activity levels** is one of the biggest health risks in Europe, with high levels of obesity and related diseases (e.g. Type-2 diabetes), undermining wellbeing and health, and putting enormous strain on health care systems. In terms of all-cause mortality, inactivity has been called the "new smoking".
  - **Noise pollution** is considered the second-worst environmental cause of ill health after air pollution. Symptoms include annoyance, sleep disturbance, stress, hypertension and cardiovascular diseases (e.g. coronary heart disease and stroke), as well as impaired cognitive development of children. 20% of the EU population is exposed to levels exceeding 65 dB.
  - **Mental disorders** alone account for about 20% of the burden of disease in the European Union (EU). Depression is responsible for about 15% of all days lived with disability.
  - **Urban demography:** 70% of Europe's population live in towns or cities. Inequality in wealth and access to services, as well as unemployment, threaten Europe with pervasive social exclusion.

### Nature can help in responding to these challenges.

2. **There is robust scientific and practice-based evidence that nature can contribute to addressing the health and social challenges that EU citizens are facing** – from access to Natura 2000 sites and other protected areas, to investments in wider green infrastructure.
3. **While nature cannot be a remedy to all challenges of society** (e.g. air pollution control will primarily need to address the sources of pollution), **there exist untapped opportunities to realise health and social benefits that often come with co-benefits for biodiversity and nature protection.**
4. **Protected areas and other nature parks are already being recognised as "preventative health care centres" and "health hubs", with increasing numbers of health related activities taking place in these areas.**
5. **Nature-based solutions can offer affordable, sustainable, and reproducible benefits across a range of areas affecting public health and social well-being.**
6. **Practical examples of the direct and indirect public health benefits from Natura 2000 sites, other protected areas and wider green infrastructure can be found across every EU Member State and at scales ranging from the micro/local level to EU wide.**

- **Reducing exposure to pollutants:** Green infrastructure contributes directly and indirectly to reducing personal exposure to air pollutants. In 2008, the Stuttgart Region developed KlimaAtlas to map air pollution, wind and climate, which informed a green infrastructure strategy and new planning legislation. Commitment led to an increase in green space to 60% and a greening of 300,000 m<sup>2</sup> of rooftops.
- **Mitigating noise stress:** Vegetation can impede noise propagation by absorbing or diffracting noise. A former industrial zone in a southern suburb of Paris was converted into a 23 hectares park that acts as a buffer between a highway and a residential area, reducing the noise level in the park to 20dB lower than at the highway, with inhabitants at the east of the park exposed to noise levels below 55dB.
- **Reducing stress and maintaining everyday well-being (preventative):** Regular exposure to nature has a positive effect on mood, concentration, self-discipline and physiological stress. Evidence shows that people living in a greener environment experienced fewer health problems and scored their health more positively compared to people living in less green areas. There is also some evidence that being in natural environments lowers blood pressure, pulse, and reduces cortisol level.
- **Mitigating heat stress:** Nature can help to reduce the risks associated with heat stress by providing cooling, by shade and evapotranspiration. Recognition of these benefits has led to riverside restoration in Lyon in France, where asphalt was replaced with 5 km of riverside pathway and green space.
- **Providing spaces for effective treatment and rehabilitation (therapeutic):** Forests and parks are used for therapeutic interventions, providing active and passive benefits for patients. NHS Forest, a national project in the UK, created green spaces near healthcare sites to support rehabilitation and recuperation. The Alnarp Rehabilitation Garden in Sweden demonstrated the benefits of nature-based rehabilitation (NBR) on different users groups - individuals recovering from stress-related mental disorders, stroke and war neuroses (e.g. with refugees) – and is being rolled out in other sites.
- **Supporting children’s development:** Nature areas can contribute to children’s development – notably to their concentration, motor skills, self-esteem, and emotion regulation. Nature-based learning and nature-play-initiatives exist across Europe. In the Social Forest, Barcelona, the Collserola forest is being used to reintegrate and educate children otherwise marginalised and at risk of future unemployment.
- **Promoting recreation and sustainable mobility:** Exercising and being physically active in green areas provides not only physical health benefits but also positive effects on mental health. Furthermore, as people want to spend more time exercising in green areas, proximity to green areas increases the frequency and duration of physical activities. “Moved by Nature” in Finland was launched to promote collaboration between nature and health sectors to allow vulnerable groups to benefit from access to physical activity in natural spaces, delivering tangible results in physical condition and self-esteem.
- **Supporting social cohesion:** Having access to and using green public spaces and wider green infrastructure can contribute to increased social cohesion and reduced social tension, particularly for minority groups (e.g. ethnic, religious) and the socially excluded (e.g. immigrants, economically deprived). Urban green space was used to enhance social cohesion in Almada, Portugal. When designing and maintaining urban parks, attention was given to stimulating social integration of different ethnic and cultural groups in green spaces. The Green Routes without Obstacles initiatives in Lithuania, Latvia and Belorussia increased the availability of nature-based tourism for disabled people in three protected areas.
- **Volunteering and local participation** in nature can increase social support and reduce social isolation, and the natural environment can provide opportunities for learning and enhance people’s personal development and self-esteem, promoting social interactions and connections. Volunteers in the Coastwatch initiative in Ireland cleaned up marine litter from Blue Flag beaches to preserve the quality of green and blue infrastructure.
- **Contributing to employment:** Managing and improving natural spaces also provides multiple direct opportunities for employment. The Belgian Province of Limburg, which was threatened with post-industrial decline following coal pit closures, set up the Hoge Kempen National Park that has created an equivalent of 400 full-time jobs and direct economic benefits of circa €20 million.

7. **There remain important gaps in knowledge of the health-social-nature links and there is a need for information to support both research and actions.** For example, more needs to be known about the causal relationship between green infrastructure and air pollution in "real world" situations, and **more site specific monitoring, mapping, modelling, analysis and research is needed.**
8. **Common sense is also needed in relation to what constitutes sufficient proof of the health and social benefits of greater contact with nature:** the real world is not the same as a medical laboratory and it is not possible to control all compounding factors.
9. **Engaging with nature is not a panacea and indeed there are sometimes risks** such as allergic reactions to plants or exposure to tick-borne diseases. **In the majority of cases, these risks can be managed and controlled effectively, but they need to be taken into account.**

#### **Policy, stakeholder roles and a road map to build on the benefits**

10. **Currently, prevention expenditure represents only 2% to 3% of health care in Europe. There is a need to increase the role of prevention** and build on the health-social benefits of nature to support wellbeing and social inclusion, thereby avoiding health impacts and excessive societal and budgetary costs.
11. **While recognizing that responsibility for public health policy rests with the Member States and Regions, stakeholder initiatives, both public and private, are taking place at different levels across the EU.** Much of this activity is still small scale and experimental, but there is increasing evidence that this is being scaled up as successful practice and increasing scientific evidence continues to drive change.
12. At the EU level, critically important policy instruments include the EU's **Birds and Habitats directives** that underpin the **Natura 2000 network** of over 27,000 protected areas, **the Green Infrastructure strategy** the **Biodiversity Strategy to 2020, including the 15% restoration target, the Cohesion policy, and the Research & Innovation policy.**
13. **Protected areas with national parks as their flagships can be health care centres in their own right, and park authorities across Europe increasingly integrate health and social benefits into nature policies and actions.** An increasing number of collaborations are taking place with health and social sector organisations. There remains significant potential for scaling-up across Europe.
14. **A range of cities across Europe – from Barcelona to Berlin and Bristol, from Vienna to Victoria Gasteiz - are driving the integration of nature into wider environmental, health and social policies – investing in parks, tree-lined streets, green roofs, green corridors and access to Natura 2000 sites to support the health and wellbeing of their citizens.** Cities that do this successfully are some of the most attractive places to live and work in the world and are consequently very successful in attracting business investment.
15. **The way forward in realising the health and social benefits of nature will rely on advocates/champions promoting change and cooperation both with and between different stakeholder communities.** This builds on:
  - **At the EU level – promoting effective implementation of EU biodiversity policy and integrating health-social-nature synergies** across the different policy domains and financial mechanisms in order **to improve policy coherence and EU added value.** The implementation of the **Water Framework Directive** and **Marine Strategy Framework Directive, the Paris Agreement on Climate Change** and the **Sustainable Development Goals (SDGs)** will each provide wider frameworks for progress given the links between their objectives and nature-based solutions that can also offer health and social benefits. In addition, the integration of health-social-nature synergies in EU

funds, including in the European Fund for Strategic Investments (EFSI) that drives the Investment Plan for Europe, can increase the added value of the EU budget.

- **At the national level** – promoting a **robust policy and institutional framework** that recognises and promotes the positive links between public health and nature and supports the uptake of nature-based health and social benefits at a broader scale. Such a framework needs to be expanded across different sectors and it needs to ensure effective integration of different themes (e.g. heat stress, recreation, mental health, depression and respiratory disease) and policy areas (e.g. environment, health, education, spatial planning and transport).
- **At the level of cities and regions** – promoting **strategies, plans and investments** that take into account the health, social and wider benefits of nature, to meet the interests of their citizens.
- **At the level of individual protected areas** – managers can take **initiatives and cooperative actions** - to promote the potential of nature parks as health hubs.
- **At the level of individual private businesses** – there are **many opportunities for entrepreneurial vanguard initiatives** based on the nature/health link.
- **At the level of the individual** – **grass-roots activities and advocacy** to build **flourishing communities** as well as **citizen science inputs** to improve understanding of the nature and scale of health and social benefits of different actions with nature.

Actions to enable and facilitate the further development of nature/health synergies at all levels would include **mapping, modelling and assessments of ecosystem condition in relation to health and social needs**, increased **research** into health-social-nature synergies and risks, the **communication** of the evidence of success, and **engagement with communities** to help **facilitate access and use of the natural environment**.

# The Health and Social Benefits of Nature and Biodiversity Protection

## 1 Health and Social Challenges in Europe and the Role of Nature

European society faces a growing range of health and social problems. Respiratory diseases from air pollution, thought by some as yesterday's problem, continue to affect European cities. Heat stress in an increasingly urbanized society is a growing risk, exacerbated by urbanisation and climate change. Noise is now recognised as a major environmental health challenge as well. Obesity and related diseases, such as Type-2 diabetes, are on the rise. With an aging population and a high-stress environment, incidences of various mental health problems from dementia to burnout are also on the rise. There is also a growing recognition that many individuals feel isolated and socially excluded in modern society. There is a need for measures to promote social inclusion and cohesion, and to develop a sense of wellbeing, place, and self-esteem.

There are multiple solutions to the complex problems outlined above. This report presents a summary of the evidence on the challenges, the role that nature can play in addressing these challenges, what different stakeholders are doing and can do to build on the health-social-nature synergies and elements of a road map for a way forward. It builds on both a study carried out in 2015 and early 2016 (literature review and interviews), the range of case examples studied from across the EU, and the discussions from a two day workshop held in Brussels on the 27<sup>th</sup> and 28<sup>th</sup> of January 2016 and hosted by the Committee of the Regions.

This report has been written by the Institute for European Environmental Policy (IEEP) and partners - Collingwood Environmental Planning (CEP), LUKE, Milieu, WWF and ICLEI, building on the study for DG ENV of the European Commission (under contract: ENV.B.3/ETU/2014/0039) and building on insights from the many speakers and participants of the two day workshop.

### Structure of the Executive Summary

The executive summary is structured around nine key health and social benefits themes:

- Improved climatic conditions – mitigating heat stress
- Improved air quality & health benefits
- Noise and human health
- More pleasant, peaceful and less stressful environment
- Healthier lifestyles – nature experience
- Outdoor recreation and physical activity
- Wellbeing – living in an attractive location
- Quality of green public spaces, reduced social tension
- Opportunities for employment & volunteers

It then presents a synthesis of insights on the role of policy, focusing on the Natura 2000 network and Green Infrastructure, governance insights, and elements of the road map for realising the health-social-nature synergies.



## 2 IMPROVED CLIMATIC CONDITIONS – MITIGATING HEAT STRESS

### What is the problem?

Heat stress occurs when extreme temperatures overcome the body's natural cooling system. **Risks include exhaustion, heat stroke and mortality** (Kovats et al., 1999). **Europe's 2003 heat wave caused up to 70,000 deaths** over four months (EEA, 2012a). Heat stress is exacerbated by the urban heat island effect (UHI) (Watkins, Palmer, & Kolokotroni, 2007). In Europe, **UHIs can increase urban temperatures by up to 12°C** compared to non-urban areas (Depietri, Renaud, & Kallis, 2011).

**Climate projections suggest that the risk of heat stress will increase in the future.** Around 75% of Europeans live in urban areas, which will be exposed to rising average and extreme temperatures from climate change (EEA, 2012a). Several assessments conclude that there will be an increase of heat-related mortality across Europe (EEA, 2012b). For example, the ClimateCost project concluded that there would be an additional 127,000 deaths per year across Europe in the 2080s without climate adaptation activities and 40,000 deaths per year with adaptation activities.

**Heat stress can affect economic productivity** (Lancet Commission, 2015). Hubler et al. (2007) assess that heat-induced output losses in Germany could amount to 0.1%–0.5% of GDP or €2.5–10.4 billion per annum by the end of the 21<sup>st</sup> century. **The risks are unequally distributed according to geographic and social factors.** Age, gender and income can determine vulnerability. In France, during the 2003 heatwave, mortality rates doubled in the most deprived cantons (Rey et al., 2009).

### Can nature help? What does the evidence say?

**Nature can help to reduce the risks associated with heat stress by providing cooling through shade and evapotranspiration** (Ennos, 2012). The magnitude of cooling is dependent on the configuration, type, size, health and density of vegetation (Zupancic Westmacott & Bulthuis, 2015). Seasonal and temporal variations may also influence the cooling capacity of vegetation (Renaud & Rebetz, 2009).

**Large parks and protected areas make significant contributions to cooling and provide oases on hot days** (Bowler Buyung-Ali Knight & Pullin, 2010). The cooling effect of parks may extend to the wider surrounding area. A study of three parks in Goteborg, Sweden, showed cooling effects could reach as far as 1 km from the boundary of the largest park considered (156 ha) (Upmanis et al., 1998). Small parks also offer relief on hot days. Air temperatures in the Teofilo de Braga garden (0.24 ha), Lisbon, were up to 6.9°C cooler than the surrounding area (Oliveira et al., 2011).

Tree planting campaigns in European cities are often motivated by their cooling benefits. The city authorities in Berlin aim to plant 10,000 new trees by 2017 (Senatsverwaltung für Stadtentwicklung und Umwelt, 2015). A study in Manchester, UK showed that an **increase of green areas by 10% would keep the maximum temperatures by 2080 at nearly the same level as 1961–1990 baseline conditions** and mitigate an expected temperature rise of 4°C (Gill et al., 2007).

### Does it work in practice? A case example: Berges du Rhône, Lyon, France



**The heatwave in 2003 increased mortality in Lyon by 80%**, above the average for a French city. The Rhône River, which runs through the city, has been at the heart of the solution. **Climate adaptation plans for Lyon aim to increase access to cool and shaded areas.** In 2007, the city reopened access to the banks of the river. The **€42 million redevelopment programme, Berges du Rhône, replaces asphalt with 5km of riverside pathway and green spaces** (Grand Lyon, 2014). In addition, riverside redevelopments aim to provide 25,000 new homes and **14,000 new jobs by 2030.**

### 3 IMPROVED AIR QUALITY & HEALTH BENEFITS

#### What is the problem?

Air pollution has both health and social consequences. Pollutants such as particulate matter, ozone, and nitrogen dioxide affect human health, ecosystems, climate and the built environment. **Air pollution is the largest environmental health risk in Europe.** The EEA (2015a) estimates that poor air quality was responsible for more than **400,000 deaths in the EU-28 in 2012.** From 2011–2013, in excess of 75% of the urban populations in the EU-28 were exposed to harmful levels of PM<sub>2.5</sub>, PM<sub>10</sub>, and O<sub>3</sub>, as defined by the WHO (2015a). Risks are particularly linked to cardiovascular, cerebrovascular and respiratory disease. The health impacts of air quality are particularly acute in urban areas and have considerable economic impacts – increasing mortality and medical expenditure, and reducing productivity. WHO Europe estimates that the **annual economic burden of health impacts from air pollution is in excess of €1 trillion.**

#### Can nature help? What does the evidence say?

Air pollution can be controlled in a number of ways: reducing the emission of pollutants, increasing the dispersion of pollutants, providing sinks for pollutants, and reducing personal exposure by avoiding polluted areas. **Nature can contribute both directly and indirectly to these pathways to control pollutants.** Air pollution also directly influences the health of vegetation and ecosystems (Pugh MacKenzie Whyatt & Hewitt, 2012).

**Green infrastructure has a natural capacity to directly act as a barrier and remove air pollutants from the atmosphere through gaseous absorption or dry deposition.** A number of variables, such as the type of vegetation, its location, and interaction with other variables such as airflows, determine the role of vegetation as a sink for pollutants. Carefully designed **green infrastructure, such as tree lined street canyons and green walls can positively influence pollutant exposure** (Currie & Bass, 2008; Pugh MacKenzie Whyatt & Hewitt, 2012).

**Nature can indirectly reduce air pollution and its impacts.** Firstly, green infrastructure, such as green corridors, can **promote emissions reductions through behavioural change**, for example by facilitating beneficial mobility choices such as cycling (ECF, 2014; EEA, 2015b). Secondly, green infrastructure, particularly parks and protected areas such as Natura 2000; **provide valuable oases where air quality is significantly better than surrounding areas.** Access allows individuals to reduce their personal exposure to pollutants, even though surrounding ambient levels may be poor. Thirdly, the cooling effect of vegetation, through providing shade and evapotranspiration, **can help to generate airflows, which disperse pollutants** and thereby reduce their relative concentrations.

#### KlimaAtlas, Stuttgart Region, Germany



*KlimaAtlas Region Stuttgart*

Historically poor air quality in Stuttgart, due to industry and local geography, gave rise to a **response based on mapping and green infrastructure** (Baden-Württemberg, 2012, 2015). In 2008, the Region of Stuttgart developed **KlimaAtlas to map air pollution, wind and climate, as well as urban morphology.** The software was used to support a **green infrastructure strategy and new**

**planning legislation**, which prompted an **increase in green space to 60%**, the **greening of 300,000 m<sup>2</sup> of rooftops**, and the greening of tram tracks. The city is zoned in order to generate clean airflows from the surrounding countryside. At least 39% of the city is under nature conservation.

## 4 NOISE AND HUMAN HEALTH

### What is the problem?

Exposure to excessive noise is considered the second-worst environmental cause of ill health after air pollution (WHO, 2011). In Europe, road traffic is the number one cause of environmental noise. The WHO estimates that **40% of the population in EU countries is exposed to road traffic noise at levels exceeding 55 dB(A)**. More specifically, 20% of the population in the EU is exposed to levels exceeding 65 dB(A) during the daytime and more than 30% are exposed to levels exceeding 55 dB(A) at night.

Noise can result in both auditory and non-auditory effects. Auditory repercussions mainly include **hearing impairment and tinnitus**. Hearing loss can be caused by a single intense noise event or long-term exposure with sound pressure levels higher than 75–85 dB, which can occur, for example, in industrial settings (Basner et al., 2014). The main non-auditory repercussions consist of **annoyance, sleep disturbance, stress, hypertension and cardiovascular diseases** (e.g. coronary heart disease and stroke), as well as impaired cognitive development of children (Basner et al., 2014; EEA, 2014; Floud et al., 2013). For western European countries, the WHO estimates that **one million healthy life years (HLY) are lost per year due to traffic noise**. More specifically, these include 61,000 HLY lost due to heart disease, 45,000 HLY related to cognitive development, and 903,000 HLY from sleep disturbance (WHO, 2011).

### Can nature help? What does the evidence say?

The **health benefits of living on the quiet side in urban dwellings** – quiet façades or quiet courtyards – have been studied extensively, as well as **the relationship between noise annoyance and adverse health effects**. Access to a quiet side, including green spaces, can help to reduce annoyance and concentration problems. Having a bedroom located on a quiet side can reduce noise annoyance and noise induced sleep disturbances (Bodin et al., 2015; van Renterghem & Botteldooren, 2012a).

**Vegetation can impede noise propagation by absorbing or diffracting noise**. Trees can function as obstacles placed within sound waves (distance between the source and receiver of sound) to reduce noise. The trunks, branches and foliage of trees can scatter the sound, which reduce the sound level that reaches the receiver (van Renterghem et al., 2015). The presence of green areas also influences noise perception and can have a positive impact on people's mental health. A survey carried out in Sweden concluded that the **presence of green areas reduced long-term noise annoyances and the prevalence of stress-related psychosocial symptoms** (Gidlöf-Gunnarsson & Ohrstrom, 2007).

Looking at the types of green areas and vegetation, studies have shown that tree belts and earth berms can be relatively effective in reducing road traffic if they are well designed (Hosanna, 2013; van Renterghem et al., 2015). For example, trunks and forest floor can reduce noise significantly, which shows the necessity to plant a high density of trees when designing tree belts. **A 15 meter deep tree belt can achieve a reduction up to 6 dB(A) at a distance of 50 m, and a 30 m deep belt up to 10 dB(A)**. Green roofs can reduce the intensity of sound waves over buildings, in particular due to the porous substrate they are made of. Noise reduction is highly influenced by the shape of the roof. **A 10 cm thick vegetated substrate placed on a ridge roof can reduce noise propagation by 7.5 dB(A) over a courtyard**. The same substrate placed on a flat roof reduce traffic noise by around 3 dB(A) (van Renterghem et al., 2015).

### Le Parc des Hautes Bruyères, Villejuif, France

A former industrial zone in Villejuif (a southern suburb of Paris) was converted in a 23 hectares park. The park is a buffer area located between a highway and a residential area – the park is 600 meter large at its largest point. In particular, a large earth berm (60 m large) along the highway acts as a noise barrier. **The noise level in the park is consequently 20dB lower than at the highway - inhabitants at the east of the park are exposed to noise level below 55dB.**



## 5 MORE PLEASANT, PEACEFUL, LESS STRESSFUL ENVIRONMENT

### What is the problem?

In 2010, 75% of Europeans lived in cities and urban areas. This is expected to reach 80% by 2020 (European Commission, 2010). While living in urban areas brings benefits such as job opportunities, limited access to green space in cities can directly affect people's health and quality of life.

More pleasant and peaceful, and less stressful green environments can have a positive effect on people's mental health. Mental disorders are common among Europeans: a systematic review, covering 16 European countries, estimated that **27% of the EU adult population (18–64 years) experienced at least one mental disorder** during the last 12 months (Wittchen & Jacobi, 2005).

### Can nature help? What does the evidence say?

The presence of nature in living and working environments has been shown to be beneficial in a number of contexts. Benefits can be gained when making active use of nature, but also from the physical presence of nature in the near surroundings (direct health benefits). In the latter case, the distance from and amount of green space plays an important role in how large the health benefits are. Potential direct health benefits from nature include faster recovery from mental fatigue, less stress, better quality of life, and lower risk of mortality (Maller et al., 2005).

Several experimental studies (Health Council of the Netherlands, 2004, van den Berg et al., 2007, Roe et al., 2013) have shown that exposure to nature has a **positive effect on mood, concentration, self-discipline and physiological stress. People living in a greener environment experienced fewer health problems and scored their health more positively compared to people living in less green environments** (de Vries et al., 2003). Another study focused on the amount of green space inside a 1-3km radius of one's living environment (Maas et al., 2006), finding a **positive interaction between the amounts of green space in people's living environment and their self-reported general health**.

**Lower mortality rates have also been associated with a reduced distance to green areas in people's living environment** (Maas et al., 2009; Mitchel & Popham, 2008; Takano et al., 2002). The Scottish Government (2014) conducted a study on the relationship between the amount of green space in relatively deprived urban areas and mortality rates. The study showed that **middle-aged men living in deprived urban areas with high amounts of green space have a 16% lower risk of dying** compared to the same age group living in areas with lower amounts of green space.

Finally, having green infrastructures and nature in people's direct living environment has also been linked to a decreased prevalence of allergies. Various studies suggest that **growing up and living in microbe-rich environments can reduce the development of allergies** (Björkstén et al., 2004; Ege et al., 2011; Haahtela et al., 2013; Hanski et al. 2012; Kabesch et al., 2004). Researchers argue that exposure to certain microorganisms such as those present in green environments can positively influence the human immune response (e.g. reduced prevalence of hay fever).

Hence, research indicates that the presence of natural spaces and biodiversity in living environments promotes healthier and happier lives; however, there is still a need for more robust evidence to demonstrate the specific health pathways and associations.

### NHS Forest, United Kingdom

NHS Forest – a national project in the UK – created green spaces near healthcare sites. Patients can see the green landscape from their windows and can go outside to walk through the green area. The project aims to improve the health and wellbeing of staff, patients and communities. Studies have shown that people experience improved rest and relaxation and it is believed to benefit rehabilitation and recuperation. The green spaces are seen as part of the healing process, and NHS Forest has therefore developed a guideline for green space design for health and well-being.





## 6 HEALTHIER LIFESTYLES – NATURE EXPERIENCE

### What is the problem?

Acute and chronic stress and insufficient recovery from stress is an important public health concern. Prolonged stress is linked to several diseases such as infections, cardiovascular, gastroenterological and immunological diseases, diabetes, depression and aggression (Kivimäki et al., 2002; Wellen et al., 2005; Nilsson et al., 2011). **Mental disorders alone account for about 20% of the burden of disease in the European Region, rising to 26% in the countries in the European Union (EU). Depression alone is responsible for about 15% of all days lived with disability.** Nature areas are not currently considered a necessity for healthier lifestyles, particularly in urban areas where competition for land is intense. The public health benefits of forests and other nature areas must be better understood and more effectively communicated (Africa et al. 2014).

### Can nature help? What does the evidence say?

Being in contact with nature can support health and wellbeing in different periods of life. Nature areas can contribute to children's development – notably to their **concentration, motor skills, self-esteem, and emotion regulation**. Children with attention deficits concentrate better after walking in the park (Faber Taylor and Kuo, 2009). Furthermore, outdoor time (versus indoor) is related to increased physical activity, reduced sedentary behaviour, and improved cardiorespiratory fitness of children aged 3–12 (Gray et al., 2015). Nature has **restorative, stress reducing effects** and even a short break from work in a green area can have positive stress reduction effects. People's mood and positive feelings increase after being in urban green areas (well-constructed urban park and city woodland) compared to the city centre (Tyrväinen et al., 2014). Some **evidence** shows that natural environments **lower blood pressure and pulse rate** as well as **reduce cortisol level** (e.g. Park et al., 2010; Li, 2010; Horiuchi et al., 2013). Forests and parks are also used for therapeutic interventions.

### Alnarp Rehabilitation Garden, Sweden

The aim of Alnarp Rehabilitation Garden is to pilot the effectiveness of nature-based rehabilitation (NBR) on different users groups. Three main groups have been studied: individuals recovering from stress-related mental disorders, stroke and war neuroses (e.g. with refugees). Participants having severe stress and/or mild to moderate depression significantly reduce their health care consumption when participating in NBR. One year after rehabilitation, the costs for primary care had dropped by 28% for the intervention group in Alnarp, and in terms of days spent in hospital, they had fallen by 64% (Währborg et al., 2014).

The Skåne region has supported the initiative to start NBR in rural businesses and **it has now expanded to 11 gardens**. This project is financially supported mainly by **Region Skåne** and the **European Social Fund**, and by the **Swedish Social Insurance Agency**, the **Federation of Swedish Farmers** and the **Swedish Public Employment Service**. For this project, €1.3 million per year was reserved for the project with a capacity to treat 250 – 300 patients per year.



## 7 OUTDOOR RECREATION AND PHYSICAL ACTIVITY

### What is the problem?

In Europe, low physical activity levels are one of the biggest health risks. In many European countries, the national recommendation for children and young people is at least 60 minutes of moderate-to vigorous-intensity physical activity each day, in line with the WHO global recommendation (Kahlmeier et al., 2015). Worldwide, 80% of the 13–15-year-olds and 31% of adults are physically inactive and do not reach the minimum recommended levels (Hallal et al., 2012). Globally, physical inactivity causes approximately three million deaths per year (Lim et al., 2012), as well as 6%-10% of the burden of coronary heart disease, Type-2 diabetes, and breast and colon cancers (Lee et al., 2012). As a cause of death, inactivity is considered as a “new smoking” (Lee et al., 2012).

### Can nature help? What does the evidence say?

Evidence shows that green exercise (activity in the presence of nature) leads to positive short- and long-term health outcomes. **Exercising and being physically active in green areas provides not only physical health benefits but also positive effects on mental health.** Physical activity in nature in comparison to other environments is related to higher vitality levels, diminished negative affects, and general mental health (Thompson et al., 2011). **People want to spend more time exercising in green areas,** so proximity to green areas increases the frequency and duration of physical activities. Outdoor walking is associated with higher levels of enjoyment, and because of that people tend to exercise for longer periods when outdoors (Neuvonen et al., 2007; Focht et al., 2009; Gladwell et al., 2013). Nature areas are attractive environments for physical activities across Europe. The majority of people that take part in outdoor recreational activities consider natural environments as more attractive activity settings than built-up areas. Among natural areas, forests are considered one of the more attractive types of nature, although landscape variation is highly appreciated (Tyrväinen et al., 2005).

### Moved by Nature, Kuopio, Finland

Moved by Nature’s aim was to promote collaboration between **nature** and **health sectors** in Finland to allow **vulnerable groups** to benefit from access to **physical activity in natural spaces across Finland.**

The pilot study in Kuopio included men at risk of Type-2 diabetes. The eight meetings in total covered different outdoor activities (e.g. canoeing, hiking, horse riding, ice fishing), lifestyle counselling, and healthy food preparation together in nature.

16 men at risk of Type-2 diabetes were involved in the pilot and reduced their group weight by 60 kg in total (Kaasalainen et al. 2015). The whole Moved by Nature program was funded by **the European Union Social Fund (75%)** and **public and private organisations,** with a total budget of **€348,000.**



## 8 WELLBEING – LIVING IN ATTRACTIVE LOCATION

### What is the problem?

The quality of living and working environments has an impact on **both physical and mental health** and the well-being of citizens. Low-quality living environments do not offer adequate opportunities for reducing high stress levels or locations for physical activity. Alongside urbanization, more people are confronted with the health and well-being risks of grey living environments, including problems with noise and air pollution.

### Can nature help? What does the evidence say?

Biodiverse natural environments promote better health and well-being of urban inhabitants through exposure to pleasant environments and **encouraging outdoor recreation and physical activity** (Lovell et al., 2014). Even short visits to nature increase urban dwellers' positive emotions and the sense of well-being. **Nature should be easily accessible**, so that visits to nature can be incorporated into daily routines. This is particularly important for older people, who tend to report more positive benefits in a natural environment than younger age groups (McMahan & Estes, 2015).

Epidemiological studies have found **long-term beneficial health effects** of green environments on **reduced morbidity and increased longevity** (Maas et al., 2009, Takano et al., 2002). The cross-sectional studies on the topic have found a positive relationship between well-being and the amount of neighbourhood greenery (e.g. van Herzele & de Vries, 2012, Ward Thompson & Aspinall, 2011).

Moreover, living in areas with green spaces is associated with **significantly less income-related health inequality**, weakening the connection between deprivation and health by as much as 40% (Mitchell and Popham, 2008, Mitchell et al., 2015).

Green areas improve the quality of residential and working environments, which is reflected in **property values** (Kellert, 2005, Tyrväinen et al., 2005). For example, a study from the Netherlands reports that the distance to green environment has a price effect as long as the areas are within walking distances from home, which means between 400 meters and 600 meters (Luttik, 2000).

The results reflect the fact that green structures offer valuable aesthetic and recreational services to households. From the residents' perspective, the relevant issue is not only the accessibility to nature, but also the **environmental quality and diversity of nature experiences** offered by the everyday living environment (Tyrväinen et al., 2007; Faehnle et al., 2011).

### Chrudim, Czech Republic

Chrudim has been part of the WHO Healthy Cities Project now for more than a decade. It has implemented a wide range of activities and changes, including **investments in green infrastructure**, to promote sustainable living in a healthy city. Chrudim has run a programme of greening to deliver health benefits to its citizens and visitors. Notable activities include investing in **arborists to care for city trees**, developing **new public parks**, **greening housing estates**, and providing residents with new **opportunities for outdoor recreation**. Around 1000 people participate in **voluntary projects** organised by the city each year. Furthermore, Chrudim has a number of ongoing campaigns to promote healthy lifestyles and the links with biodiversity.



Chrudim continues to promote healthy living, for example with its **“Health Plan 2015–2018”**, which aims to address several issues such as active ageing, non-infectious diseases, and reducing alcohol-, drug- and tobacco-related harm. The Health Plan is based on data and statistics on the current health status of the citizens of Chrudim. This is supported by a number of health/biodiversity promoting campaigns ongoing, such as the “Days of Health”, the “Day of the Earth” and the “Bio-market”.

## 9 QUALITY OF GREEN PUBLIC SPACES, REDUCED SOCIAL TENSION

### What is the problem?

Currently 70% of Europe's population live within urban settlements, and urban development is Europe's fastest-growing category of land-use change (EEA, 2015c). Increasing size and density of urban populations in Europe can lead to limited access to quality green space for some citizens. **“Access” to a green space is generally defined as having a public green space within 300 metres or a 5-minute walk.** Unequal access to quality green space is a factor in social exclusion and social tension, where particular social groups pursue their own values and preferences without consideration or inclusion of others. However, **accessibility depends on multiple factors**, such as gender, age, relative income, and education, and consequently, **social aspects as well as physical proximity determine the accessibility of green space to individuals** (Booth et al., 2010, Kabisch et al., 2015, Wang et al., 2015).

### Can nature help? What does the evidence say?

**Having access to and using shared, green public spaces and wider green infrastructure can contribute to increased social cohesion and reduced social tension**, particularly for minority groups (e.g. ethnic, religious) and the socially excluded (e.g. immigrants, economically deprived) (Keniger et al., 2013).

Green spaces, including community gardens, allotments and forests are an **important factor in community identity**, and can **strengthen people's attachment to their communities**. Research indicates that green infrastructure and accessible green space are important factors for individuals and communities to establish a 'sense of place' and 'ownership' of their local landscape (Maas et al., 2008, English Nature, 2003), and a study in Slovenia identified the importance of urban forests in supporting community identity (Hladnik & Pirnat, 2011).

Green spaces, parks and playgrounds provide places for formal and informal social interaction, which can strengthen communities and **help people from minority groups or different cultural backgrounds to become more integrated** and to identify with their community (see e.g. Seeland et al., 2009). Research suggests that seeing one's neighbour at the local park can help to **build familiarity and a sense of commonality, as well as setting the groundwork for future engagement**, and encouraging neighbourhood interaction (Bennet et al., 2012). These interactions, in turn, can lead to increased social cohesion and inclusion: green infrastructure in the form of green public spaces, especially in urban areas, can act as 'green hubs' for communities (Hartig et al., 2014, New Economics Foundation, 2012, Ockenden, 2007, Ecominds, 2013, Swanwick et al., 2003).

The evidence indicates that **the quality and design of green spaces, particularly in urban settings, plays an important role in people's perceptions of access and safety**, and thus influences the extent to which greenspaces may enhance community cohesion and result in social benefits (Arnberger et al., 2012). Visitor density, spatial layout and well maintained 'infrastructure' (e.g. signage, benches, play equipment) in green spaces all enhance potential benefits including social interaction, with factors such as the availability of seating and 'shady areas' influencing the extent of social interaction (Bennet et al., 2012).

### Urban green space to enhance social cohesion, Almada, Portugal

The city of Almada in Portugal acknowledged that effective management of urban green spaces requires the participation of local citizen groups, e.g. to help maintain public green spaces such as urban parks and gardens. In designing these spaces and their maintenance, **attention was given to stimulating social integration of different ethnic and cultural groups** in green spaces e.g. by providing a varied infrastructure for different recreational activities such as biking, jogging, or practicing yoga or Tai-chi.

A network of community allotment gardens has also been established, in part to promote local production and small-scale commerce, as well as social cohesion by fostering social relationships.





## 10 OPPORTUNITIES FOR EMPLOYMENT & VOLUNTEERS

### What is the problem?

Europe's population is becoming increasingly urban, and at the same time diverse. Such changes have and continue to take place against a backdrop of economic austerity policies in many EU countries (ECB, 2008). These trends present challenges for Europe, **often combined with high unemployment, particularly in urban areas. There is a need for new means of individual and community engagement, and access to the opportunities that engaging with the natural environment can provide.**

### Can nature help? What does the evidence say?

**Engagement** in the natural environment, such as urban green spaces, woodlands or protected areas, **can take various forms, including volunteering, training and employment, communal actions such as community gardens and allotments, and organised eco-therapeutic activities** such as group walks (Mind, 2013).

Volunteering in the natural environment can lead to **social and community benefits, enabling people to strengthen existing social relationships and develop new ones, build a sense of community, and learn new skills.** A recent study of volunteering in the natural environment in the UK found that volunteers reported personal benefits (e.g. improved knowledge), but also social benefits. Among those were e.g. a 'sense of belonging in my community'; 'trust in other people in the community'; 'meeting new people in the community'; and 'fostering a sense of pride and care in the area' (Environment Agency and Forest Research, 2015). The evidence suggests that **volunteering increases social support and reduces social isolation** (Reynolds, 2000), and that **the natural environment provides opportunities for learning which can enhance people's personal development and self-esteem**, promoting social interactions and connections (Bendt et al., 2013, Natural England, 2013).

**Managing and improving natural spaces provide multiple direct opportunities for employment.** Natura 2000 supported 8 million FTE jobs directly, and 4 million indirectly from 2006 to 2008 (BIO intelligence, 2011). The network's full implementation is expected to generate 122,000 additional FTE jobs (ICF et al., 2012). **In addition, further indirect opportunities may be provided from recreation and tourist services.** Such opportunities may arise from activities including the maintenance and enhancement of urban, peri-urban, and rural parks, planting new tree-lined roads or developing green-roofs (Forestry Commission, 2013, Edwards et al., 2009). From 2006 to 2007 in **Scotland**, 7,500 volunteers carried out forest-related work, and 17,900 FTE jobs in tourism and recreation are attributable to woodland (Edwards et al 2009). Initiatives to manage and attain community benefits can make use of traditional knowledge (e.g. forest management) and new approaches, skills and tools (e.g. architects, spatial planners, GIS mapping).

The increased recognition and use of the ecosystem services concept has increased interest in social and economic benefits. One study estimated **the total annual revenue linked to visitor spending in national parks and key recreation areas in Finland (a total of 45 areas) to be €87 million per year, generating €10 return for every €1 of public investment** (Huhtala et al., 2010). As regards restoration, in Germany, the Emscher River System Renewal directly created or secured 1,400 jobs per year, and 3,700 in total with the indirect effects (RWI, 2013).

### Hoge Kempen National Park, Belgium

The closure of the last coalmines in the province of Limburg left 40,000 unemployed and vast brownfield areas threatened with post-industrial decline, including large wetland lakes left from extraction areas. In 2006, following efforts by the local environmental NGO Regional Landschap Kempen en Maasland (RLKM), the area became Belgium's first national park, covering a number of Natura 2000 sites.

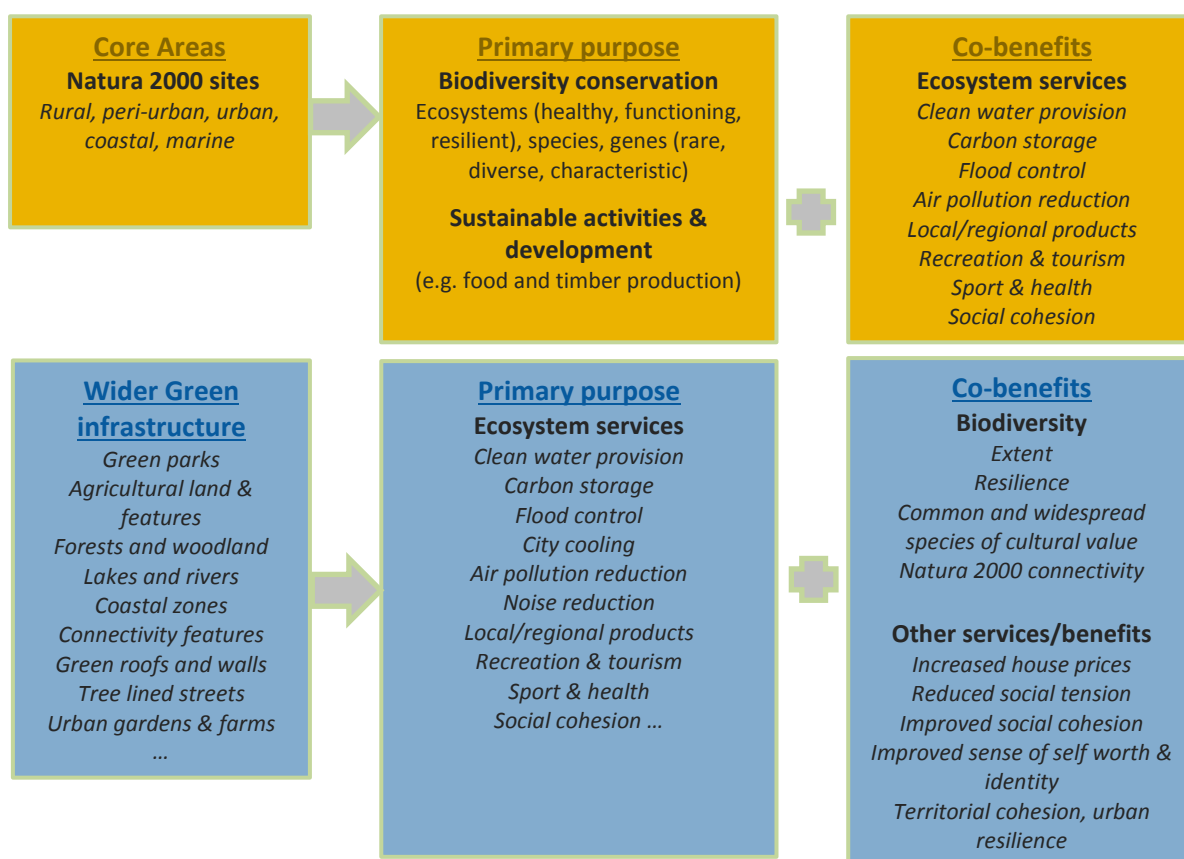
Investments in conservation were based on socio-economic arguments: the equivalent of **400 full-time jobs** (direct and indirect) and **direct economic benefits of around €20 million** (Schops, 2011). A total **€128 million has been invested** in the park, compared to an **annual indirect revenue creation of €191 million.**



## 11 PROTECTED AREAS, GREEN SPACES – SOLUTIONS FOR HEALTH & SOCIAL NEEDS

The Birds Directive and the Habitats Directive form the main legal framework for the protection of nature and biodiversity in the EU. Together they establish the EU-wide Natura 2000 network of protected areas. Currently the network comprises of 27,393 sites<sup>1</sup>, covering 18.1% of the EU territory (around 788,500 km<sup>2</sup>) and includes a growing number of marine protected areas (MPAs) of over 3,000 sites covering over 318,000 km<sup>2</sup>. The Natura 2000 network is designed to protect habitats and species of European importance. However, while its primary purpose is biodiversity conservation and sustainable development of activities, the network also provides a range of ecosystem services as co-benefits of biodiversity protection. A range of these benefits is related to health and social wellbeing (see Figure 1). As such, the network is a core element of wider EU green infrastructure and forms the backbone of European living natural capital.

The EU Biodiversity Strategy (Target II) is committed to the better protection for ecosystems, and more use of green infrastructure (including a 15% restoration target by 2020). Green infrastructure is a strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services. It incorporates green spaces (or blue if aquatic ecosystems are concerned) and other physical features in terrestrial (including coastal) and marine areas. On land, green infrastructure is established both in rural and urban settings. While biodiversity conservation plays an integral part in green infrastructure, the focus is on the provision of multiple ecosystem services, including a range of benefits to health and social wellbeing.



**Figure 1: Aims of Natura 2000 network and wider green infrastructure and relation to health and social benefits**

Source: own representation

<sup>1</sup> End of 2014. See [http://ec.europa.eu/environment/nature/natura2000/data/index\\_en.htm](http://ec.europa.eu/environment/nature/natura2000/data/index_en.htm) for data and maps and [http://ec.europa.eu/environment/nature/info/pubs/docs/nat2000newsl/nat39\\_en.pdf](http://ec.europa.eu/environment/nature/info/pubs/docs/nat2000newsl/nat39_en.pdf)

## Can protected areas and green infrastructure help?

There is a clear and undisputable link between green areas and health and social benefits. Green areas known to deliver such benefits range from small-scale urban infrastructure (green roofs and walls, tree belts, green noise barriers etc.) to wider natural and semi-natural areas (urban green areas and parks, nature conservation areas in the vicinity of cities, wider forest areas etc.). Consequently, the development of an EU green infrastructure network – comprising of a wide variety of different green elements - can play an important role in maintaining and enhancing the health and social benefits provided by nature. Furthermore, a strategically planned network of green areas at the EU level can help to bring added value, for example, by catalysing political and financial support, sharing knowledge and good practice, supporting transnational initiatives, and ensuring an equitable sharing of such benefits.

In terms of protected areas and the Natura 2000 network, there is a clear synergetic relationship between Natura 2000 sites and health and wellbeing benefits, particularly when it comes to the management of green areas to deliver health and social benefits. In general, the current evidence indicates that, while protected area status is not an absolute precondition for an area to deliver health and social benefits, Natura 2000 sites and other protected areas, especially the ones located within or close to urban areas, are a very useful mechanism for maintaining and promoting such benefits. This is in particular due to the physical infrastructure (network of trails, campsites etc.) and governance frameworks in place that helps to facilitate the delivery of benefits.

The existing evidence, including the examples provided in earlier chapters, highlights the importance of physical infrastructure in lowering the barrier to access and enjoy nature, encouraging healthier lifestyle and supporting the delivery of physical, mental and wider societal benefits. Establishing and maintaining such infrastructure is a common characteristic of Natura 2000 sites and other protected areas, enabling easy access to stakeholders. Furthermore, Natura 2000 sites and other protected areas are recognised locations with known ecological values and related information. This makes such areas commonly desirable destination for educational and other social purposes, linking to cognitive and social cohesion benefits. Similarly, building on their status and information base, Natura 2000 sites and other protected areas may help focus community activity and volunteering by connecting with the idea of place and a sense of community identity. Protected areas also often have established mechanisms for stakeholder engagement and attracting funding, which is something of crucial importance. Existing case studies show that protected areas managers, including managers of individual Natura 2000 sites, play a proactive role in initiating projects that promote health and social benefits of nature.

For example, the Walkability Project in Pembrokeshire, UK, (see Table 1) aims to improve the health and well-being of local people by encouraging and supporting them to use walking routes in the Pembrokeshire Coast National Park. The project is co-hosted by the national park authorities and the local health board. The cooperation of these two organisations - and the prominent role of the national park managers - is considered as one of the key success factors for the initiative, as generally leisure activities led by the leisure services tend to focus primarily on indoor exercise. Similarly, a pioneering Nordic hiking trails initiative of in the Białowieża National Park, Poland (see table below) has been developed thanks to a collaborative effort by multiple stakeholders involved in the national park management, as well as finance from EU and national sources supporting the national park. The key aim of this initiative is to promote health through outdoor physical activity while increasing environmental awareness.

## What are interesting case examples across Europe?

The workshop presented 20 case examples across Europe in which protected areas and wider green infrastructure yield benefits to human health and/or social cohesion, often in addition to benefits to biodiversity or wider ecological benefits (see Table 1)<sup>2</sup>. These case examples illustrate the diversity of approaches. For example, with respect to stakeholders involved, funding sources or scale of initiatives (e.g. local citizen and municipal initiatives and national approaches). In some cases, financing instruments of the European Union have been involved; in other cases, the initiatives are relying on local and

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<sup>2</sup> See Annex of the main report for details. Furthermore, over a hundred cases are presented in the main report; see ten Brink et al., 2016.

voluntary actions of citizens and civil society. In many cases, Natura 2000 sites are an integral part of the initiative, both in rural settings, as well as in urban and peri-urban areas.

**Table 1: Case examples of health and social benefits provided by Natura 2000 sites and wider green infrastructure across Europe**

Country	Case	Description	Natura 2000/GI
Belgium	Hoge Kempen National Park	Hoge Kempen National Park is Belgium's only national park. It contributes to the social cohesion and regeneration of a former coal-mining region that was at risk of economic decline.	Natura 2000
Bulgaria	Zmeeva Dupka Eco-Trail	The construction of an eco-trail in the Natura 2000 site Zmeeva Dupka cave has helped different social groups to discover nature and develop a healthier lifestyle while deterring illegal and exploitative nature use.	Natura 2000
Czech Republic	Chrudim, Zdravé mesto (Healthy City)	In 2001, the city of Chrudim joined the WHO Healthy Cities Project. Since then, the city has implemented a "Plan of Municipal Greenery Maintenance" and has invested in new areas of green infrastructure.	Green infrastructure
Denmark	Copenhagen, Increasing Well-being through Climate Change Adaptation	The City of Copenhagen is implementing ambitious climate change adaptation plans using green and blue approaches to improve the quality of life for its citizens. Copenhagen's waterways are now safe for public bathing and new green spaces provide new opportunities for recreation, tourism and biodiversity.	Green infrastructure
Germany	Stuttgart, StadtKlima and Nature Conservation for Clean Air	In Germany, the City of Stuttgart has implemented GIS mapping, zoning legislation, and investment in green infrastructure to facilitate air exchange and control air pollution in the city, in addition to controlling emissions at their source. Since 2004, the city has recorded significant reductions in PM <sub>10</sub> and NO <sub>2</sub> measurements.	Natura 2000
Ireland	Slí na Sláinte – Path to Health	The Irish Heart Foundation set up the Slí na Sláinte project in 1996 that aims to promote regular walking among the population as it has numerous health benefits, including cardiovascular, pulmonary and articular benefits. Local authorities and local communities are encouraged to work together and start a health path in their area.	Natura 2000
Spain	Barcelona Green Infrastructure and Biodiversity Plan 2020	The "Barcelona green infrastructure and biodiversity plan 2020" launched in early 2013 and sets the environmental goals that the Municipality intends to achieve by 2020 in order to become a city where natural and urban spaces interact and enhance one another.	Natura 2000
France	Villejuif, Le Parc des Hautes Bruyères	South of Paris, the Council of Val de Marne converted a brownfield site into 23 hectares of public park with the purpose of reducing noise from a motorway, as well as providing a valuable community resource. The park houses a number of public allotments, spaces for recreation, education and biodiversity.	Green infrastructure
Croatia	Zagreb, Medvednica Nature Park	Nature Park Medvednica is a protected area on the border of the city of Zagreb and offers residents and an increasing number of tourists a chance to escape the urban environment and enjoy nature through activities such as winter sports, walking and hiking, as well as educational programs.	Natura 2000
Italy	Slow Food	The Slow Food Presidia project aims to sustain traditional agricultural products and processing methods at risk of extinction, and to protect unique regions and ecosystems. Presidia are important for biodiversity; they contribute to local/regional culture and identity.	Natura 2000
Latvia	Rāzna National Park, Green Routes without Obstacles	The aim of "Green Routes without Obstacles" is to increase the availability of nature-based tourism for disabled people at three protected areas in Latvia, Lithuania and Belarus. At the Rāzna National Park in Latvia, efforts have been made to provide equal opportunities and access to this protected area.	Natura 2000



Luxemburg	Eicherfeld, Terra, Community Supported Agriculture	Started in 2014, TERRA (Transition and Education for a Resilient and Regenerative Agriculture) is Luxembourg's first Community Supported Agriculture initiative. This locally based, grass roots, and community-orientated model for the production of food provides opportunities for employment, volunteering, and participatory learning.	Green infrastructure
Hungary	Lake Hévíz, Hungary's Unique Thermal and Medicinal Lake	Lake Hévíz is a peat bottom thermal lake located in West Hungary within the Lake Hévíz Nature Protection Area. Its healing effects, which are primarily linked to its sulphur content and sulphur bacteria living in the water, are used for the treatment of rheumatic and locomotor diseases.	Natura 2000
Austria	Vienna, Neighbourhood gardens	Caritas Austria has initiated 3 neighbourhood gardens where residents of their care homes work together with volunteers. The residents are elderly people that need care, disabled people and underage refugees separated from their parents. Gardening brings these people closer together and the garden provides a common ground that enables new social interactions and learning from each other.	Green infrastructure
Poland	Hajnówka, The Land of the Bison and Primeval Forest Nordic Walking Park	In 2011, a network of Nordic walking trails opened in Hajnówka county in Eastern Poland. The trails spread across the Białowieża Forest, a UNESCO World Heritage site fully covered by Natura 2000 protected areas. It is a pioneering initiative aiming at engaging the local rural community, promoting health through outdoor physical activity, and increasing environmental awareness.	Natura 2000
Portugal	Cascais, Quinta do Pisão - Sintra-Cascais Natural Park	Quinta do Pisão is part of the Sintra-Cascais Natural Park, which belongs to the Natura 2000 network. The Quinta do Pisão is the redevelopment of abandoned agricultural land into a working farm and large public park offering walking and cycling paths, as well as a range of events based around sustainable tourism.	Natura 2000
Slovenia	Secovlje Salina Nature Park and Lepa Vida Spa	The Natura 2000 area Salina Nature Park generates 90 local jobs in the tourism and health sectors while maintaining biodiversity values of the area. A public private concession programme has supported the improved conservation status of this habitat for migratory birds as well as providing public access for 50,000 visitors per year.	Natura 2000
Finland	Kuopio, Moved by Nature Programme	Moved by Nature's primary aim was to promote the collaboration between nature and health sectors to allow vulnerable groups to benefit from access to physical activity in green spaces. Case studies and pilots were carried out in a number of areas, working with different population groups.	Natura 2000
Sweden	Alnarp, Rehabilitation Garden	The Alnarp Rehabilitation Garden was established as a research and development project involving nature-based rehabilitation (NBR), with a special focus on the role of nature in improving the mental health of patients. Based on the preliminary evaluation results, NBR is being integrated as a form of treatment in local health care provisions.	Green infrastructure
United Kingdom	Pembrokeshire Walkability and Exercise Referral in National Park	The Walkability Project started in 2011 and is a partnership between Pembrokeshire Coast National Park, the Welsh Government and the Hywel Dda Local Health Board. The project has encouraged and supported local individuals with higher health risks to walk in and around the National Park.	Natura 2000

## 12 GOVERNANCE INSIGHTS

### Who are the stakeholders already involved in initiatives related to health and social benefits from biodiversity and nature protection?

A wide range of initiatives and projects exist across the EU that bring together stakeholders from the health, social and environment sectors. These range from very small local projects (e.g. Walkability project in Pembrokeshire; Zero-emission hotel in Vienna), to city initiatives (e.g. KlimaAtlas in Stuttgart; Barcelona), regions (e.g. Emscher Region regeneration in Germany), national initiatives (e.g. Moved by Nature in Finland), cross-border projects (Latvia, Lithuania, Belarus trans-frontier cooperation programme) and EU wide initiatives (e.g. potential Trans-European Network on Green Infrastructure).

The majority of current **cross-sectoral collaborations** involve or are led by NGOs and/or directly by protected area managers (mainly operating at local levels). Academic and research institutions, the private sector and local voluntary associations play important roles as well in many projects. The involvement of local citizens or residents as a specific stakeholder group is often key, particularly where an initiative addresses urban planning or the restructuring of neighbourhoods or districts.

The **level of engagement** of stakeholders group differs per sector. To date, the environmental sector has been most active, underlining the need to focus on bringing in health sector actors.

Various formal **governance** structures and approaches have been developed and implemented within European countries to bring together stakeholders from nature, health or social sectors. Particularly local governments and authorities play an important role in facilitating cross-sectoral work, as most projects and initiatives focus on specific local sites, including urban green areas, Natura 2000 sites, other protected areas, and unprotected rural areas. Examples of the formal governance structures include cross-ministerial or municipal working groups, fora or platforms or thematic/topic committees.

### What are the success factors and tools that enable progress?

Success factors defined by stakeholders that facilitate cross-sectoral collaborations and initiatives are defining clear and common objectives, empowerment and building trust, agreeing on a common language, persistence and ensuring continuity, and ensuring long term funding opportunities. Furthermore, evidence-based arguments are powerful tools for bringing in new stakeholder groups, particularly politicians and authorities. In some contexts, scientific evidence e.g. in the form of peer reviewed epidemiological studies or clinical trials can help to engage the health community.

Having the support of a governmental body often stimulates action, either through the implementation of a policy or strategy (e.g. health strategies that integrate nature, green infrastructure strategies that recognise air pollution or heat island mitigation benefits), the availability of funding schemes for health/social/nature initiatives or a political champion that plays an important role in awareness raising and putting nature-based solutions on the policy agenda.

### What are challenges that need to be addressed?

While initiatives exist that address the health and social benefits of nature and biodiversity, awareness raising efforts are required to ensure the further involvement of more stakeholders – particularly from the health sector. The challenge here is to have a stronger role of prevention in the portfolio of activities of medical and public health experts. Effective dissemination of information and evidence among people working at the grass-roots level as well as policy makers, to ensure that those elements that seem to be facilitating success and the fulfilment of goals are shared. By capturing this knowledge, other countries, regions and municipalities can implement similar initiatives, and smaller projects can be rolled out on a wider scale. Furthermore, mapping of green infrastructure and its proximity to population centres can help provide a basis to explore actual and likely health and social benefits (see ongoing MAES initiative of the EU and Member States).

Moreover, greater support from each governance level would further facilitate work at the health-social-nature-nexus. Increased funding opportunities (e.g. EU funding via LIFE and regional funds) and formal structures/institutional arrangements can provide the necessary frameworks and support that allow stakeholders to collaborate effectively.

## 13 FUTURE POTENTIAL AND ROAD MAP: RECOMMENDATIONS FOR ACTION

### The potential for benefits of Natura 2000 and the development of EU green infrastructure for public health and social benefits

An increasing number of formal and informal initiatives make use of Natura 2000 sites for activities aim to promote health and social benefits. Evidence is growing that protected areas can play important roles as “health hubs” and “preventive health care centres”. Furthermore, the experience – such as lessons learned in the Walkability project and the Healthy Trails initiative in Pembrokeshire, the UK - has underlined that small local initiatives can not only be repeated but also copied and applied in a wider set of regions. Many of the 27,393 terrestrial and marine protected areas in the EU can be seen as potential preventive health care centres and arenas for social integration. To realise this will require investment in the site (e.g. infrastructure, quality), awareness raising, training (e.g. for guides and volunteers) and communication of the benefits beyond simple word of mouth.

For green infrastructure in and around cities, a range of studies have explored how increased green coverage can help address the heat island effect, mitigate noise and improve air quality – whether by urban parks, tree-lined streets or green roofs. As an example, in 2014 the coverage of green roofs in Germany and Austria was 86 million m<sup>2</sup> and 4.5 million m<sup>2</sup>, respectively, and was growing at around 10% per year (11% in Austria, 9% in Germany) with a yearly market of €280 million per year in the two countries combined (ENZI, 2015<sup>3</sup>). Average green space coverage (i.e. combining parks, tree-lined streets and green roofs) was around 18.6% in Europe in 2007 (Fuller et al., 2009<sup>4</sup>), ranging from a couple of percent in the most urban cities to near 50% coverage in the greenest cities – with a per capita green space provision ranging from around 10m<sup>2</sup> per capital to over 200 m<sup>2</sup>. Despite of the recent increase, there remains a high untapped potential for green roofs, tree-lined streets and wider urban greening, which in turn can support the delivery of improved health and social benefits. Bringing this about requires:

- **Mapping and assessment/valuation** - e.g. to identify needs to improve access to green spaces for communications, and cost-effective areas for GI;
- **Awareness raising** – e.g. of the multiple benefits of GI and hence reason to support the plans and investments;
- **Integration in policies, strategies and plans** - e.g. nature and biodiversity considerations into noise mitigation plans, health and climate adaptation strategies and plans, health and social aspects of green infrastructure strategies and plans;
- **Cooperation and collaboration across stakeholders** – e.g. engage multi-stakeholders into a common project to help implement plans and objectives;
- **Skills training/capacity building** - e.g. for green roof and landscape architects, urban farmers;
- **Additional funding** - e.g. municipal funding, potentially supported by Cohesion funding.

Recommendations for action are presented in more detail below in the form of a road map.

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<sup>3</sup> [http://www.greenweek2015.eu/material/presentations/day1/2.2\\_05\\_enzi.pdf](http://www.greenweek2015.eu/material/presentations/day1/2.2_05_enzi.pdf)

<sup>4</sup> <http://rsbl.royalsocietypublishing.org/content/5/3/352>

## Road Map: Recommendations for Action

### Better implementation

**The full implementation of existing biodiversity policies and conservation measures will help to lead to significant health and social benefits.** The designation, management, funding and choice of investments (e.g. infrastructure for access to Natura 2000 sites; which brownfield sites to restore) can each improve public health and social wellbeing. There remain significant investment requirements for protected areas to attain good ecological status. Equally, for a range of marine areas, there is still a need for increased designation of the sites themselves as well as improved management and enforcement.

**The implementation of a range of other policies will help achieve the health-social-nature synergies,** including the **Water Framework Directive and the Marine Strategy Framework Directive.** Similarly, meeting objectives such as the EU's 7<sup>th</sup> Environmental Action Plan, the **Paris Agreement on climate change** and the **Sustainable Development Goals (SDGs)** will provide wider frameworks for progress given the links between their objectives and nature-based solutions that can also offer health and social benefits.

### Policy integration and policy coherence

There is a need for a **systematic integration of the health-social-nature links into policies, programmes and finance.** This will require health and social issues to be reflected in nature policy, and nature issues into health and social policies (i.e. two-way policy integration), as well as all three issues being integrated into wider socio-economic policies given the links to jobs and growth. This type of "proofing for coherence" will be useful both for ensuring synergies are taken on board (as this helps with the added value of policies) and avoiding unacceptable trade-offs that can undermine effectiveness and increase the cost of meeting objectives. This applies at EU, country, and regional and, in some cases, city levels.

For policies, **windows of opportunity** include policy reviews, impact assessment for reforms and REFITs. In terms of funding, there is a large window of opportunity every 5 years at the EU level when the EU Budget (the Multiannual Financial Framework) priorities are agreed. There are also regular ongoing funding opportunities, as there are some existing opportunities in CP. Different windows of opportunity will naturally occur across Member States, regions and cities. For example, in Germany, the Federal building code includes requirements for green parking and green roofs. Similarly, court judgements in Stuttgart have shown that following assessment, undeveloped hills that facilitate city air exchange are more important than building individual houses.

A range of **EU policies and programmes** can support progress. Climate change adaptation policy can support nature's role in cities and **RTD can develop the evidence base**, while **Cohesion Policy** and associated use of CP and ESF can help fund projects. There is also potential for the Natural Capital Finance Facility (NCF) of the European Investment Bank (EIB) to integrate health-social-nature issues into the objectives and selection criteria for eligible investments. Similarly, there is potential to support relevant investments via The European Fund for Strategic Investments (EFSI) and the associated Investment Plan for Europe. A potential Trans-European Network Green Infrastructure (TEN-G) offers a particularly interesting EU-wide initiative. Health policies as such are under the jurisdiction of Member States, so input from DG Health and Food Safety will therefore be more supporting than pro-active in the coming years.

**Strategies and plans** can help facilitate actions (e.g. health strategies and plans for green infrastructure, climate change adaptation, and noise). Some of these are at national level, others at city level (e.g. the urban heat islands strategy in Vienna, and the Biodiversity and Green Infrastructure strategy and noise action plan in Barcelona), and others at EU level (e.g. the Green Infrastructure strategy).

### Improving governance

**Multi-stakeholder engagement and partnerships are critical** for improving the governance of health-social-nature synergies. World Health Organisation (WHO) engagement with the Convention on Biological Diversity (CBD) and United Nations Framework Convention on Climate Change (UNFCCC) processes and actors is a success story at global level. At EU level, it requires cross-DG collaboration, for example between DG Regional and Urban Policy, DG Climate Action, DG Environment and DG Research &



Innovation, on nature for climate adaptation in cities. At national level, examples such as the Finnish “Moved by Nature” initiative, success is often facilitated by cross-sectoral collaboration. Private-public partnerships, as shown in Slovenia with the Saline nature park and a mobile phone company, can also be a possible alternative.

### Investing in social-human capital: understanding, skills and jobs

Realising the benefits requires **investment in people**. This can be in the form of **staffing** e.g. having a meteorologist in Stuttgart city, or having a public access officer and permanent specialist walking officer post in a national park. In other cases, it is about **bringing in the right skills from the outside** – for example horticulture experts are brought in by some cities to choose the right plants for tree lined streets and urban parks to ensure not just suitability for the ecosystem and condition, but also for the wider benefits (e.g. shading potential). The assessment of socio-benefits, that can be helpful to communicate to stakeholders, can also require **partnerships** between parks and universities. **Training is equally important** e.g. training of volunteers in protected areas, and training of young people as e.g. in the 16–25 age bracket in the Social Forest initiative in Barcelona, Spain. This can take place at all governance levels, and the European Social Fund (ESF) is one source of potential funding.

### Strengthening the knowledge base

**The knowledge base needs to be developed further, which merits both EU and national funding.** Areas include physical and mental health benefits, cognitive development benefits to children, and social cohesion benefits of working with nature. Recent work includes the DG RTD Phenotype and Blue-Health projects<sup>5</sup>. In addition, there is a need for increased scientific research into the benefits from restoration and investment activities, as well as from halting biodiversity degradation itself to better understand the links between resilient biodiversity and the capacity to ward off threats, such as invasive alien species.

**Priorities will differ across countries and regions given the different environmental conditions, health and social challenges, and demographics.** For example, the role of nature mitigating air pollution is a problem across most EU cities and the role in minimising the heat island effect exacerbated by climate change will relate to some countries more than to others. EU funding can usefully be focused on both, but national funding for knowledge development will clearly need to vary depending on differential needs. As the European population is aging and the level of dementia is increasing, EU research could usefully focus here as well. Furthermore, obesity is a major health problem of this generation and a strain on public finances due to associated health impacts (e.g. Type-2 diabetes), the role of nature in encouraging exercise merits attention.

Health-based research tends to have a hierarchy of analysis types that are seen as of increasing robustness from (a) case study analysis, to (b) cross-sectional studies; (c) case control studies (with time series causal chain analysis); (d) retrospective and prospective cohorts; to (e) non-randomised, and randomised, control trials (NRCT; RCT). For health-social-nature, the first four are each important, while the last is neither realistic nor necessary as the assessment tools apply more to clinical test conditions than to real world cases where it is impossible to control for all conditions.

**Case examples** are already important sources of insight that can capture the mix of biophysical issues (the scale, nature and location of green infrastructure), the links to the population affected (i.e. living in or making use of nature), the governance mechanisms leading to the decisions and investment (i.e. political science analysis) and the effectiveness of the measures (i.e. causal chain impacts. such as epidemiological studies). The latter would, however, require more than simply case examples.

The knowledge base needs to be integrated into **decision frameworks** and a **wider science-policy interface (SPI)** – from **city investment decisions** as noted above, to **integration into EU policy assessments** (e.g. impact assessment and REFITs, integration into **proofing tools and ex ante and ex post assessment** of EU funds) to ensure that EU policies, programmes, their implementation and their reform take on board lessons from practice and insights from science.

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<sup>5</sup> <http://www.phenotype.eu/> and <http://www.ecehh.org/research-projects/blue-health/>

## Tools for implementation: measurement, mapping and evaluation

**More tools** can help in the identification of suitable areas for investment and management and support communication, for example, **ecosystem mapping tools, indicators, monetary and multi-criteria evaluation**. The MAES initiative, an EU initiative with in-depth engagement from a number of Member States, is helping to provide a foundation of knowledge and data that should prove valuable to authorities across the EU. EU RTD projects such as OPERAs and OpenNESS are also providing a range of helpful tools<sup>6</sup>. At a local level, tools such as heat and pollution mapping proving useful tools. The *KlimaAtlas*, for example leads to a practical categorisation in seven build/no build land use options to facilitate decisions by urban planners and developers in the Stuttgart Region. Mapping and modelling, when combined with demographic statistics and/or building stock information, can help identify cost-effective options for investment in green infrastructure that helps address health and social objectives.

In addition, **the assessment of the benefits** can prove valuable not only for the identification of where the greatest benefits may accrue from investments, but can also be used for **public communication** - e.g. to highlight the importance of action, as was the case in the Emscher region regeneration. Assessment of the regional revenue streams created by visitor spending is carried out in Finland on an ongoing basis with view to highlight the local economic development, jobs and growth contributions of national parks.

## Communication and awareness

**Improved communication** helps, but often helps most if done by the right people, namely those who are perceived as being independent. **It is therefore important to identify what analysis should be carried out, who undertakes the analysis and to whom it is communicated**. In the Emscher Region case, the benefits of regeneration were analysed independently by researchers to ensure that decision-takers and the wider public took the outputs seriously.

In case of national parks and other protected areas, visitor surveys (and web-based surveys) can be helpful to identify the social, psychological and physical benefits as well as the economic value. If these are carried out and published in peer-reviewed journals, they can contribute to the literature on the health-social-nature benefits, helping to develop the evidence base. Coast watch activities that monitor beaches, the level of marine litter and the effect of volunteer schemes, can also be helpful to communicate the scale of the problem and the possible solutions, while encourage individuals to change their behaviour and become further engaged.

## Financing change

**Financing ensures the progress and the sustainability of initiatives**. At the EU-level, sources of funds include the Cohesion/Structural Funds (European Science Foundation etc.), LIFE (Financial Instrument for the Environment) funding, H2020 and the European Neighbourhood Policy (ENP) funding for transboundary cooperation, the Natural Capital Financing Facility (NCFF) of the European Investment Bank (EIB), and the European Fund for Strategic Investments (EFSI) that drives the Investment Plan for Europe. The most frequent funding for initiatives promoting health and social benefits originates from the national, regional, and city level, with some contributions from private sources. Often initiatives blend a range of funding sources. For example, *KlimaAtlas* in Stuttgart received city funding and EU-wide research funding. The city also supported investments by private individuals for green roofs. In Finland, *Moved by Nature* was 75 % funded by the European Science Foundation (ESF) and complemented by private and public organisations funds. While Wales is a recipient of significant contributions of EU funds, the Pembrokeshire Walkability case received money from the National park itself and the Welsh government. Private sector companies can also be involved, as in the case in Slovenia where a mobile phone company invests in the Saltpans, similar to how private companies have invested in green roofs in cities across the EU.

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<sup>6</sup> <http://www.operas-project.eu/> and <http://www.openness-project.eu/> which will provide tools also via the OPPLA portal <http://oppla.eu/what-oppla>

## Windows of opportunity – use them and create them.

Progress with health-social-nature synergies can be incremental (e.g. gradual replication of projects that work) or more of a step change (e.g. with either qualitative changes such as through a new policy or plan or large quantitative changes such as via a new funding line or prioritisation). The latter generally occur when specific “windows of opportunity” used – whether planned (e.g. budget debate) or unplanned (e.g. environmental crisis).

**Windows of opportunity in EU, national and local decision-making are key moments to make steps forward, for example,** on financing rules such as EU Cohesion Policy regulations, regulation reviews, public consultation on strategies and plans, mid-term evaluations and local and national budget declarations. In addition, there are regular windows of opportunity through private investment or procurement decisions, e.g. health and social services and cities. At the global level, windows of opportunity include the Conference of Parties (COPs) linked to the Conventions (e.g. CBD, UNFCCC) and the Sustainable Development Goals. There can also be windows of opportunity as part of the follow-up to events such as heatwaves or air pollution peaks.

It is also possible to develop new windows of opportunity – e.g. passing new laws on green roofs, launching and publishing research, or simply making use of marketing opportunities for business (e.g. urban offsetting and green roofs; zero emissions hotels as in Vienna). There can also be other measures such as fiscal reform – for example, German wastewater fees provide incentives for green roofs – as well as institutional consultation and engagement processes. The latter can include formal processes such as Greening the European Semester, less formal EU-Member State fora, as well as direct engagement of the EU institutions with regions, cities and grass roots initiatives, in cases even building alliances with partners across governance levels – e.g. with the Covenant of Mayors/Climate Adapt, via the Committee of the Regions.

## Tackling risks

The way forward is not just about focusing on the benefits and synergies nature can provide to people’s health and social wellbeing, but **also about understanding and addressing the possible risks hindering the uptake of these benefits**. These include for example **social risks** (e.g. delinquents in parks) – which can be addressed by maintaining quality and keeping the park well lit; **health risks** (e.g. tick-borne diseases in certain high risk areas; allergic reactions to certain plants) – which can be addressed through risk management processes (awareness, response facilities); and **environmental risks** (e.g. degradation of nature and green areas due to inappropriate or over-use of areas) – which can be addressed by mapping, zoning, information provision and training.

## Champions and collaborations to make it happen

**Champions drive forward change and it is important to identify who these can and need to be and bring them on board.** They could be **public representatives** with climate change strategies (i.e. EU or vanguard countries and cities), regions with regeneration ambitions, local citizen groups, doctors and hospitals, as well as Members of Parliament. In Stuttgart, the Lord Mayor helped drive the KlimaAtlas project and subsequent investment in greening the city. In Sweden, the Alnarp case included a wide range of champions from the region, including academia, medical practitioners, politicians and the farming community. This helped to create joint ownership of both the problem and the solution.

## How can the transferability of good practice be catalysed?

There is **major scope for building on the good practice** in some sites, cities and regions in other parts of Europe. A large change can be built on small local initiatives.

**The role of cities** is particularly important as a multiplier and existing networks, coalitions, events (e.g. resilient cities) and prizes (e.g. Green City and Greenleaf) can be critically important. The integration of the health-social-nature links into the range of strategies and plans can in themselves be examples of good practice to others, and important drivers for rolling out good practice in their own jurisdiction. The Committee of the Regions use of network of regions have the potential to multiply change in others. Within cities, more **engagement with communities** is needed to help **facilitate access to and use of the**

**natural environment.** Practice has shown that making the infrastructure available is not enough; proactive investment in social capital is needed to encourage actual use.

**Managers of protected areas** are already trying to build on the lessons from sites across a range of countries to the wider network of 27,393 Natura 2000 sites, supported by green, social and health NGOs.

**Citizens** are also grass-roots drivers of change. By investing in green roofs, initiatives that replace pavements with plant creepers and green walls, community identity can be supported. These and other similar initiatives can also engage with communities to help them make use of nature, or engage directly in nature, for example volunteering to support beach clean ups or keeping public parks tidy, which can further support their use.

**Business** can also recognise the benefits of action and roll out initiatives to take advantage of these benefits, whether for savings or for marketing purposes, and also integrate and report on those benefits via their business models, accounting systems and annual reports.

**Countries** remain arguably the most important actors in driving health-social-nature synergies given their responsibility for health – by enabling measures such as policies, strategies, plans and funding for research and investment that can build on lessons from other practice and in turn create more cases to emulate. For example, the national biodiversity strategies and action plans (NBSAPs) can usefully reflect health and social issues, and national climate, health and sustainable development strategies can integrate nature's roles.

**The EU** remains a critically important driver for transferring good practice and catalysing change – whether through the leverage it has in its funding i.e. getting maximum EU added-value and policy coherence by using the EU sectoral policies as means to implement EU biodiversity goals (e.g. Birds and Habitats directives, restoration targets and green infrastructure strategy; Water Framework Directive) and supporting information, awareness and knowledge (e.g. MAES process and H2020 funding). In some cases, the EU has a legal basis for policy action. In others, funding or softer mechanisms are used, such as the European Semester process whereby country practices are compared against agreed objectives and recommendations are made for what more can usefully be done in light of lessons learnt across the Union.

Global initiatives can also encourage the transfer of good practice – whether initiatives by the Secretariat of the CBD and the WHO exploring cases of health and social benefits of nature, to commitments, target setting and reporting requirements that catalyse initiative (e.g. strategic plan for biodiversity targets, CBD declarations, UNFCCC recognition of the roles of nature in meeting climate objectives which in turn support health and social objectives).

**There is no “best solution” or “most important actor” for transferring practice**, but rather a need for action at each of the governance levels by each of the stakeholders, often in close collaboration, to ensure that good practice inspires more initiatives so that the health-social-nature synergies can come to fruition (see Table 2). This process can be supported by a commitment to doing, communicating and integrating analysis on the health and social benefits of nature into decision making at all levels –i.e. improving the science-policy interface. This will require engagement and cooperation by stakeholders within and across all governance levels.

**Table 2: Health & Social Benefits of Nature Roadmap: role of stakeholders, policies and measures: Examples**

	<b>Knowledge – understanding the problem and solutions</b>	<b>Awareness and integration of knowledge</b>	<b>Policy, objectives, strategies and plans</b>	<b>Instruments, measures, legislation</b>	<b>Financing and investment</b>
<b>Global</b>	WHO & impacts; CBD and solutions	WHO with UNFCCC, UNCBD, UNCSG; SDG and nature links	CBD (Aichi targets); UNFCCC (e.g. 1.5 °C Paris); SDGs	Conventions, Protocols	Climate adaptation funds; GEF
<b>EU</b>	MAES – mapping RTD (H2020 calls) Policy studies (DGs Clima; Env; Regio; Mare; Empl, Sante) SPI networks	Guidelines for Nat. Cap. solutions (e.g. e.g. Cohesion Policy, CP); Use of proofing tools (e.g. for biodiversity, health and social benefits across policies and programmes)	Biodiversity & GI strategies; CP rules recognise climate adaptation, health & social benefits of nature; Climate strategies integrate nature; Heath & Environment strategy; Europe 2020 Strat. (employment, R&D)	Birds & Habitats Directives; Water & Marine Stewardship Framework Directives implementation; European Semester recommendations	CP funding; LIFE (ensure health link); ENPI; TEN-GI (ensure health link); NCFF & EIB; EFSI & the Investment Plan for Europe; Development cooperation
<b>National</b>	National research (e.g. epidemiological studies, links to effectiveness of measures); monitoring and mapping; biophysical ecosystem capital accounting; practical case study development	Assessing the value of pre-emptive health care (e.g. of avoided air pollution or exercise); Assess the range of health and social services from nature	Integration of nature in regional development, climate adaptation, health, and noise strategies and plans, as well as in Partnership Agreements linked to EU CP & associated national & regional operational programmes (OPs)	Designation of institutional responsibilities; Inter-ministerial coordination; Building codes (e.g. min. green space requirements, green roof legislation)	Environmental funds grants, loans, green public procurement & improve incentives
<b>Regions &amp; Cities</b>	Climate/heat, air pollution and noise monitoring and mapping; Tree and population mapping; Carry out “access to nature” and vulnerability assessments	Independent valuation of benefits to support action; Awareness raising; Heat emergency plans	Integration of nature (e.g. synergies with biodiversity conservation objectives) in urban development / regeneration, climate adaptation, health, noise and green infrastructure strategies; Integration of health and social benefits into GI strategies	Pilot projects (for scaling up); Zoning (e.g. for land use types); Law (e.g. enabling pavements to be dug up by local residents to plant creepers/green walls)	Investing in parks, tree lined streets, green roofs, with dedicated biodiversity objectives where appropriate; Finance activities to get citizens out to nature
<b>Private Sector</b>	Assessment of noise, pollution and cooling benefits of green roofs and walls and multiple benefits of landscape architecture and planning	Integrate into management systems; Accounting and reporting; Communicate effectiveness of solutions	Opportunities for citizens to buy into reforestation / greening schemes; into green roofs	Support to pilot projects from e.g. health insurance and care providers; partnerships	Building: Investment in green roofs and green walls
<b>Protected area managers</b>	Assess the potential for the parks to be useful and used for health and social benefits; Identify health & social stakeholders to collaborate with	Communicate benefits across the network, to local stakeholders and wider health & social stakeholder networks	Where appropriate (i.e. synergetic with the delivery of set conservation objectives), integrate nature and social benefits into management plans and use of investments (e.g. to improve access and information)	Recruitment e.g. permanent health wardens; Programmes for training volunteers	Targeted own investment when available; targeted support from external sources (e.g. national and EU funds) and blending funding from different instruments as suitable
<b>Civil Society &amp; Citizens</b>	Identify vulnerable groups & needs of groups to make use of nature (i.e. access to use)	Communicate risks and opportunities for action/initiatives	Collaborate e.g. with local, regional authorities in contributing to strategies and plans	Tree ownership programmes; bonds	Own investment in green roofs, urban farming, planting pavements
<b>Research</b>	Provide robust research: on heat island reduction through nature; also for air pollution, noise, mobility and social justice benefits from access to nature	Expert groups supporting evidence-based policymaking	Research strategy on health-social-nature synergies; Research into nature’s roles in the transition to an green economy	Funding grants; field experiments; networks for expertise; education and training	Research and training grants (e.g. EU Horizon 2020); finance collaborative research centres



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