

# using science to create a better place

## The Health Benefits of Environmental Improvements

Science Report – SC030106

The Environment Agency is the leading public body protecting and improving the environment in England and Wales.

It's our job to make sure that air, land and water are looked after by everyone in today's society, so that tomorrow's generations inherit a cleaner, healthier world.

Our work includes tackling flooding and pollution incidents, reducing industry's impacts on the environment, cleaning up rivers, coastal waters and contaminated land, and improving wildlife habitats.

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# Science at the Environment Agency

Science underpins the work of the Environment Agency. It provides an up-to-date understanding of the world about us and helps us to develop monitoring tools and techniques to manage our environment as efficiently and effectively as possible.

The work of the Environment Agency's Science Group is a key ingredient in the partnership between research, policy and operations that enables the Environment Agency to protect and restore our environment.

The science programme focuses on five main areas of activity:

- **Setting the agenda**, by identifying where strategic science can inform our evidence-based policies, advisory and regulatory roles;
- **Funding science**, by supporting programmes, projects and people in response to long-term strategic needs, medium-term policy priorities and shorter-term operational requirements;
- **Managing science**, by ensuring that our programmes and projects are fit for purpose and executed according to international scientific standards;
- **Carrying out science**, by undertaking research – either by contracting it out to research organisations and consultancies or by doing it ourselves;
- **Delivering information, advice, tools and techniques**, by making appropriate products available to our policy and operations staff.

Steve Killeen

**Head of Science**

# Executive summary

The Environment Agency has a clearly defined role in public health. First, we protect people's health according to our statutory duties. We regulate air emissions from industrial sites and license waste handling, treatment and disposal. We also work with local authorities to identify and clean up contaminated land, and manage water resources, for instance by regulating discharges to water, water abstractions and by managing flood risk.

But we do not focus solely on health protection. We also enhance people's quality of life by providing high quality environments for them to enjoy and be active in. We manage rivers, lakes and waterways for navigation and leisure boating. We improve fisheries, promote angling, and manage coastal bathing water quality, and we promote access to the countryside and recreation in or near water.

Regular physical activity and contact with nature reduce the risk of serious illness, and improve quality of life and mental well-being. Physical activity within a natural environment ("green exercise") may bring additional benefits. This research aims to develop an understanding of our broader role in contributing to people's health and well-being, and to investigate the positive health and other social and economic impacts of our activities.

We commissioned three case studies – one urban and two rural – from the Centre for Environment and Society at the University of Essex to examine the physical and mental health benefits of environmental improvements carried out by the Environment Agency and our partners. All three sites provide opportunities for outdoor recreation and relaxation in natural spaces that include water.

The studies were carried out at Sutcliffe Park in Greenwich, the Montgomery Canal in Welshpool and the Easington coastal path. A questionnaire and a map that allowed more in-depth participation were used to collect data. Participants were asked about smoking and physical activity habits, health and self-esteem, how they used the sites before and after the improvements, and what they thought was special about the sites.

Most of the survey participants were already meeting target levels of physical activity. However, each site demonstrated that small-scale environmental improvements bring significant health benefits to local communities. After the improvements:

- more people visited more often, stayed longer and were more likely to visit to exercise and for health;
- analysis showed that visitors' self esteem increased the longer they had spent exercising in the natural environment;
- local green spaces are an important health resource for surrounding communities.

The most impressive results were found at Sutcliffe Park in Greenwich, where improvements led to a 73 per cent increase in the number of park visits and an increase in the number of people coming to exercise from 40 per cent to 68 per cent.

Rising levels of obesity and physical inactivity and associated illness, together with increasing levels of mental illness, are a major public health concern in the UK. These case studies have shown the importance of creating and maintaining high quality, local natural environments. Enhancements to local environments can dramatically change the way these spaces are used and can be a major factor in encouraging physical activity.

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# 1 Background

The Environment Agency has a clearly defined role in public health. We first have a statutory duty to protect people's health. We regulate air emissions from industrial sites, and license waste handling, treatment and disposal. We also work with local authorities to identify and clean up contaminated land, regulate discharges to water and water abstractions, and manage water resources and flood risk.

We also work to improve people's quality of life, alongside our regulatory activities to protect public health by providing high quality environments for them to enjoy through sport and leisure activities. We promote access to the countryside and recreation in or near water, for example by managing the quality of coastal bathing waters, improving fisheries, promoting angling, and manage waterways for navigation, leisure boating and waterside activities.

This research project aims to develop an understanding of the Environment Agency's broader role in contributing to people's health and well-being. It investigates the positive health benefits that stem from our work and explores other social and economic impacts of our activities.

## 1.1 Policy Context

### 1.1.1 Environment Agency context

The fundamental aims of the Environment Agency are to contribute to sustainable development and improve the quality of life for people in the UK; our statutory guidance, vision, and corporate strategy highlight our broader role in these areas. But it can be difficult to appreciate and measure the contributions we make to quality of life, or understand how our everyday activities improve people's health. Most research on environment and health issues relates to health protection from environmental hazards; little research looks at the ways in which our environments can improve health and well-being.

This project explores the positive health aspects of our activities, and the social and economic benefits they can bring.

### 1.1.2 External interest

Another motivation for this study is that the health benefits of a good environment are increasingly the focus of research and work organisations similar to the Environment Agency and this is an area of increasing political interest.

There have already been a number of UK and European policy initiatives highlighting the importance of environment and health issues. These include:

- a European Commission strategy on Environment and Health;
- a WHO initiative on Children's Environment and Health (CEHAPE);
- a UK public health white paper (published in 2004);

- the Game Plan report by Cabinet Office's Strategy Unit, proposing that 70 per cent of the population should do 30 minutes physical activity five days a week by 2020;
- the Wanless report, commissioned by the Treasury, emphasising the responsibility of the individual for their own health, and the systems needed to support them.

Other government bodies, agencies and NGOs, for example the Forestry Commission, English Nature (now Natural England), and the Countryside Commission for Wales, have also conducted research in to the broader health benefits of the environment.

## 1.2 Literature review

The Environment Agency commissioned literature reviews as part of the research from the Centre for Environment and Society at the University of Essex. These reviews describe the health challenges facing the UK, the potential health benefits of nature and green space, and the emerging concept of 'green exercise', summarised below (Peacock et al 2005; Peacock et al 2006).

### 1.2.1 Nature, health and lifestyle

Conservation of the natural environment is a rising political priority, partly due to a better understanding and recognition that we gain a wide range of benefits – including health and well-being – from a high quality natural environment. Research has shown that contact with nature and living things makes most people feel good (Kellert and Wilson 1993; Maller et al 2002). The quality of nature in people's environments affects their mental health.

Green spaces are particularly important for health and well-being in urban areas. Over 80 per cent of the UK population live in urban areas and expansion and regeneration will increase this proportion. The lack of natural environments can negatively impact mental and physical well-being (Pretty et al 2004).

#### *Health challenges in the UK*

Stress and poor mental health are becoming more common. Depression and related illness is estimated to become the most pronounced source of ill-health by 2020 (World Health Organisation 2001). Depression, as well as being an illness in its own right, is a known risk factor for conditions such as asthma, arthritis, diabetes, stroke and heart disease (Hippisley-Fox *et al.* 1998; Turner and Kelly 2000; Ostir *et al* 2001). Stress is a serious and increasing problem for individuals living in modern societies; it is a strong predictor of mortality.

Many of the emerging physical and mental health challenges such as obesity and coronary heart disease (CHD) are associated with a sedentary and indoor lifestyle (CDC 1996; DCMS 2002; DoH 2004). Physically active individuals are at lower risk of dying from CHD, type II diabetes, hypertension and colon cancer. They have better mental health, healthier muscles and bones, and greater independence in old age (Paffenbarger *et al* 1994; Scully *et al* 1998; DoH 2004; Pretty *et al* 2004).

Cardiac rehabilitation programmes that encourage physical activity have a key role to play in reducing the risk of a secondary cardiac event. However, current adherence rates for these programmes are remarkably poor due in part to "lycraphobia" (a fear of

participating in physical activities in a gym or other commercial fitness setting). Alternative options such as “green exercise” (exercise outdoors in a green environment) may offer a better way to increase compliance to rehabilitation programmes.

### **1.2.2 The health benefits of nature and green space**

There is growing evidence that regular contact with the natural environment has physical and mental health benefits (Frumkin 2001, 2002, 2003; Health Council of the Netherlands, 2004; Henwood 2001, 2003; Morris 2003; Pretty *et al* 2003; Pretty 2007; Van den Berg *et al* 2007). The “biophilia hypothesis” (Wilson 1984; Kellert and Wilson 1993; White and Heerwagen 1998) suggests that humans have an innate desire or instinct for contact with nature.

The psychological value of open space has been documented (Jackson 1979; Taylor 1979; Altman and Zube 1989; Rubenstein 1997) and studies have shown the value of urban parks in reducing stress and encouraging community cohesion (Rubenstein 1997). Access to a green or natural environment in urban areas enhances the lives of residents, builds social capital and provides an opportunity for exercise (Brill 1989; Ward-Thompson 2002). Studies have shown that the quantity of green space available to residents correlates with longevity and a reduced risk of mental ill-health in Japan, Scandinavia and the Netherlands (Takano *et al* 2002; DeVries *et al* 2003; Grahn and Stigsdotter 2003).

Local natural environments, such as parks and open spaces, street trees, vacant lots, backyard gardens, fields and forests are of great importance (Kaplan *et al* 1998), whilst poor environments are often a source of stress (Frumkin *et al* 2004). Grahn and Stigsdotter (2003) have shown a significant relationship between the number of visits to an urban green space and levels of stress in users. If residents have limited access to green space within their local vicinity they do not compensate for this by visiting public parks or urban forests more frequently, hence the importance of nearby green space.

The design of the built environment can influence whether or not people take part in physical activity such as cycling and walking (Ross 2000; Berrigan and Troiano 2002; Craig *et al* 2002; Handy *et al* 2002; Parks *et al* 2003). A dose-response relationship has been identified by Parks *et al* (2003) between the number of locations to exercise within a neighbourhood and the likelihood of complying with current physical activity recommendations. The health benefits of using canal towpaths were analysed in a towpath monitoring survey (British Waterways 2003) involving 12 English canal sites. Sixty two per cent of users in this study believed that the presence of a canal towpath led to increased levels of physical activity.

There is substantial evidence that viewing nature through windows can have substantial health benefits, for example to reduce the need for pain relief in hospital patients, or to lower the incidence of illness in prison inmates (Moore 1981; Ulrich 1984, 1993; Kaplan 2001; Diette *et al* 2003; Laumann *et al* 2003).

### **1.2.3 Emergence of green exercise**

Regular physical activity has a major positive effect on physical and mental health (Scully *et al*, 1998) and regular contact with nature can enhance mental well-being. Hayashi *et al* (1999) have suggested a synergistic benefit when people engage in physical activities whilst being directly exposed to nature, termed “green exercise” (Pretty *et al*, 2003). Current evidence suggests that contact with nature positively contributes to our overall health status by aiding recovery from pre-existing stresses or

problems, by having an ‘immunising’ effect that protects us from future stresses, and by improving concentration.

Most of the evidence relates to the USA, Scandinavia and Japan; few empirical studies analysing the health benefits of nature and green space have been conducted in the UK (Reynolds 1999, 2002; Countryside Agency 2003; Willis 2004; Pretty et al 2005; Pretty et al 2006; Pretty et al 2007; Mind 2007). Furthermore, few research studies have separated the effects of nature on social capital and collective well-being (Burgess et al 1988; Coley et al 1997; Fredrickson and Anderson 1999; Ulrich 1999; Ward-Thompson 2002).

## 1.3 Research objectives

This research project examines local environmental improvements and assesses whether the health benefits outlined in the literature review do actually occur. The findings of this research will contribute to the available evidence by demonstrating actual benefits to people’s health from contact with improved local environments.

The three following Environment Agency partnership projects were chosen as case studies:

- case study one: Sutcliffe Park, Greenwich;
- case study two: Montgomery Canal, Welshpool;
- case study three: Easington coastal path.

The impacts of environmental enhancements at these sites on users’ levels of physical activity were studied as a proxy measure of health. Some qualitative evidence on mental health and quality of life benefits was also recorded.

The three case studies are summarised below and described in detail in the following chapters.

### 1.3.1 Research approach

This research examined the physical and mental health benefits of environmental improvements carried out by the Environment Agency and its partners at three sites in the UK. These sites provide opportunities for outdoor recreation, such as walking, jogging or cycling, which are relatively inexpensive inclusive activities. The sites also allow visitors to relax and help to reduce their stress level, thereby providing a range of physical and mental health benefits for local residents and visitors.

Bird (2004) analysed the economic value of the health benefits of outdoor recreation in a recent report for the RSPB. This study showed the extensive costs of physical inactivity to the economy and predicted that a new 8-20 hectare urban park could potentially procure economic benefits of between £1.6 and £8.7 million. These figures are derived from the enhanced activity rates, which are based on 20 per cent of the local population using the facility. Similarly, a new 3km footpath would add economic benefits ranging from £0.1 to £1.0 million, based on usage by 16 per cent of local residents (Peacock *et al* 2005).

# 2 Sutcliffe Park and Welshpool

## 2.1 Methodology

The Centre for Environment and Society (CES) at the University of Essex developed a common methodology to be used for the case studies at Sutcliffe Park and Welshpool (Peacock et al 2005). The methodology had two parts, a questionnaire and a participatory approach, which are summarised below.

### 2.1.1 Composite questionnaire

CES designed a composite questionnaire to maintain consistency and allow comparisons between the field data collected at the two case study sites. Questions related to basic data, physical health and mental well-being, and provided an opportunity to collect qualitative narratives. Some components of the questionnaire used standardised tools, and some questions were designed specifically for this research.

The basic data collected by CES researchers included information on gender, age, smoking habits, weekly levels of physical activity and the participant's own perceived current state of health. They also asked participants about their height and weight so we could calculate their Body Mass Index (BMI), a useful indicator of risk for a number of common diseases. Government recommendations state that adults achieve a general health benefit with 30 minutes of moderate physical activity on five days of the week (DoH 2004). By measuring participants' weekly physical activity, the questionnaire identified whether the study population met these recommendations. We measured the participants' current health-state using a question adapted from the EuroQol EQ-5D questionnaire (the EQ VAS), a standardised measure of health outcome. The question gives a self-reported overall health-related quality of life score, which can then be compared to UK normative data.

Self-esteem was measured using the Rosenberg Self-Esteem Scale (RSE) (Rosenberg, 1989), a widely used standardised tool within the field of health psychology and used in numerous studies analysing the relationship between self-esteem and exercise (Cusumano and Robinson 1992; Mactavish and Searle 1992; Desharnais et al 1993; Brown et al 1995; Palmer 1995). Participants were also asked how long they had been exercising at the site prior to their participation in the research.

CES also asked participants site-specific questions to compare their usage of the site before and after the environmental improvements, to establish changes in usage, time spent at the site, number of visits and reasons for visits. All these factors could be directly attributable to the enhancements.

Finally participants were asked whether they felt differently since the improvements and if so, how. An additional open question asked participants what they thought was special about the site.

### 2.1.2 Map model

CES prepared a separate map model of each site in advance as a visual tool and to engage people with the research. The models helped initiate conversation and

revealed the geographic knowledge of the participants. Participants were asked to locate their area of residence on the map using a pin, which allowed us to identify the geographical spread of users. The researchers also gave participants coloured flags on which they could write comment about what was special about the site, any problems, and opportunities for improvement. The flags could be stuck into the map and allowed users to express anonymous opinions in a visual and informal manner.

### **2.1.3 Population sampling**

Researchers positioned themselves at a central point to access as many people as possible who used the park or canal towpath. The combination of research tools ensured that a large population sample was accessed. The questionnaire was not suitable for children or those with learning disabilities and prior informed consent was also required for those under 18 years of age if not accompanied by a parent or guardian. The map model allowed children and those with limited time to take part.

## **2.2 Background information**

### **2.2.1 Sutcliffe Park, River Quaggy, Thames Region**

Sutcliffe Park is an area of urban green space, through which the River Quaggy has run along a concrete culvert since the 1930s. Plans to re-naturalise the river for flood risk management created the opportunity to improve the amenity value of the park. Before work started, the park was a flat area of open green space lacking biodiversity. The mown grassland was used primarily for sporting activities. The work, completed in June 2004, transformed the park. It created a naturalised river, which flows through the park at surface level. The design allows a controlled flood to occur, covering the lower lying sections of the park, where the river feeds into the lake.

The restored park provides a greater variety of habitats for local wildlife, including wetland environments such as reed beds and a shallow lake. The park is now rich in biodiversity, and has traditional benches, bridges, boardwalks and a circular seating area, acting as an informal meeting place. The abundance of flora and fauna allows visitors an opportunity to learn about environmental matters.

Users of Sutcliffe Park are predominantly dog walkers and joggers; it is also used by family groups and as a thoroughfare to bus stops. There has been strong community involvement in the project. The local action group “The Friends of the Quaggy” was an important factor in the development of the scheme. Since the work, a “Friends of Sutcliffe Park” group has emerged.

### **2.2.2 Montgomery Canal towpath: part of the Welshpool Dragonfly Trail project, Powys, Wales**

Enhancements have been made to a section of the Montgomery Canal towpath in Welshpool as part of a wider rural regeneration project. The stretch of towpath passes through the centre of Welshpool, providing a focal point that connects the recreation area, museum and town centre. It is primarily used by dog walkers and as a local pedestrian transport corridor to residential, industrial, leisure and educational premises. Refurbishments on a 200m stretch of towpath included improved paving of the lock area and better access via new steps to the railway bridge/aqueduct. Safety issues

were addressed and towpath road barriers were installed. Old tramlines were restored and an interpretation board was erected.

A circular trail on the theme of dragonflies has been introduced to link the improved canal towpath area to the town. This walk encourages visitors to explore the town and its heritage whilst engaging with wildlife. Artwork from a local artist's work with local children has been installed. The art project educated the children about the canal, its role in their lives and the abundance of rare dragonfly species inhabiting the waterside.

Many groups regularly use the canal, including members of the "Friends of the Montgomery Canal" and Age Concern walking groups.

## 2.3 Results from the two case studies

Researchers from the Centre for Environment and Society (CES) at the University of Essex carried out field work at the two sites. The results of the questionnaires and map modelling are summarised below (Peacock et al 2005).

### 2.3.1 Aggregate results

#### *Basic data*

A total of 92 participants completed the composite questionnaires and engaged in the map model exercise. A total of 53 questionnaires were completed at Sutcliffe Park and the remaining 39 were filled out during the visit to Montgomery Canal Towpath.

Reasonably equal proportions of male and female participants were involved in both case studies. The majority of users at Sutcliffe Park were predominantly aged 31-50 years, and at Montgomery Canal the majority were 51-65 years. Overall Montgomery Canal attracted more users over the age of 66 and Sutcliffe Park attracted more users aged between 11-18 years. Over two-thirds (68%) of all the participants at both sites engaged in more than the 2.5 hours of recommended weekly physical activity, and 41 per cent participated in more than five hours a week. Physical activity patterns were very similar in both case studies.

#### *Self esteem*

Self-esteem values were measured on a possible range of 10-40, where the lowest value corresponds to the highest self-esteem. The aggregate value reported was 19, ranging from a minimum score of 10 to a maximum score of 29. Our statistical analysis compared scores according to how long people had been participating in physical activity before completing the questionnaire. An independent t-test showed a significant difference between people who had been active for more than 11 minutes compared to those who had not, with an average self-esteem score of 17.6 compared to 20.3<sup>1</sup>. Individuals who had been participating in physical activity for longer reported improved

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<sup>1</sup>The t-test revealed a significant difference ( $p = 0.012$ ;  $t = 2.593$ ) with an average self-esteem score of  $20.30 \pm 0.711$  (< 11 minutes) compared to  $17.59 \pm 0.768$  (> 11 minutes). A Spearman's Rho correlation (-0.418) also shows a significant difference ( $p < 0.000$ ) between the two exercise groups.

self-esteem. One explanation for this could be that participating in outdoor recreation in a green environment increases self-esteem.

We compared how often participants visited the sites before and after environmental improvements, together with the average duration of each visit. During a four week month a total of 55 people visited both sites 959 times. Following the improvements, a total of 73 people visited the sites 1283 times during the same period. On average, participants spent 30.26 minutes at the site on each visit prior to the improvements. Following the environmental enhancements, this time increased to 39.73 minutes, implying a total increase of 11.64 hours spent at the sites per person per month.

The time spent participating in outdoor recreation within these environments has significantly increased; consequently individuals are deriving further positive health benefits.

### **2.3.2 Results: Sutcliffe Park**

#### *Composite questionnaire findings*

A total of 53 participants (49.1% male and 50.9% female) completed the composite questionnaire and the map model exercise at Sutcliffe Park. The average Body Mass Index (BMI) was 24, implying that overall the sample was within the accepted BMI normal health range. We asked participants to rate their current perceived health state on a scale of 0 to 100 (worst imaginable health state = 0). The average value was 76, slightly below the recognised norm value for the UK.

Participants had spent on average 28 minutes exercising within the park before stopping to complete the questionnaire. The average self esteem score was 18 and an independent t-test showed a significant difference ( $p = 0.026$ ;  $t = 2.326$ ) between those individuals who had exercised for more than 11 minutes ( $16.79 \pm 0.759$ ) to those who had exercised for less ( $19.58 \pm 0.928$ ).<sup>2</sup>

Table 2.1 shows the primary reasons that participants gave for visiting Sutcliffe Park, before and after the environmental improvements. There is a marked increase in visits for all the reasons cited following improvements. Twenty-eight per cent of participants in the research had never visited the park prior to the work. A series of non-parametric sign tests revealed that the difference in visits “for exercise”, “health”, “scenery” and “wildlife” were exceptionally significant ( $p < 0.001$ ). More participants visited the park primarily for these four reasons once the improvements had been completed. Although positive changes were noted for each of the other reasons listed, these differences were not all statistically significant.

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<sup>2</sup> This significant finding was supported by the Spearman’s Rho correlation technique ( $-0.392$ ;  $p = 0.007$ ).

**Table 2.1 Primary reasons for participants' visits to Sutcliffe Park before and after improvements**

Primary reason for visit	Before improvements (%)	After improvements (%)
For exercise	40	68
Walking the dog	42	51
On the way to somewhere	13	17
Meet family/ friends	9	21
Health (walking/ fresh air)	25	66
Scenery	9	62
Wildlife	2	47
Other	11	15
Not visited prior to improvements	28	-

Source: Peacock et al (2005)

Notes: Percentages total more than 100 as some participants had more than one primary reason for their visit.

Table 2.2 shows how often participants visited Sutcliffe Park before and after the environmental improvements took place. The percentage of people visiting twice a day, everyday, twice a week, once a week, once a fortnight and once a month increased following the enhancements and those who only visited the park occasionally reduced in number. A non-parametric sign test revealed that there was a significant difference between the number of visits prior to the improvements and the number reported after the enhancements ( $p < 0.000$ ;  $Z = -4.419$ ).

**Table 2.2 Frequency of visits to Sutcliffe Park before and after improvements**

Frequency of visits	Before improvements (%)	After improvements (%)
At least twice a day	4	9
Every day	11	15
Twice a week	15	19
Once a week	11	25
Once a fortnight	6	8
Once a month	2	6
Occasionally	23	19
Never visited it before improvements	28	—

Source: Peacock et al (2005)

Table 2.3 shows the average length of time (minutes) spent in the park during one visit. The percentage of participants spending less than 30 minutes in the park per visit reduced and those spending more than 30 minutes significantly increased. It undoubtedly shows that a higher proportion of people spent longer in the park each visit following its restoration.

**Table 2.3 Duration of visits to Sutcliffe Park before and after improvements**

Duration of visits	Before improvements (%)	After improvements (%)
5-10 mins	9	2
11-20 mins	6	4
21-30 mins	32	23
> 30 mins	15	28
> 60 mins	9	43
Never	28	-

Source: Peacock et al (2005)

### *Summary of changes*

The average number of visits per person per month increased from 14 to 15 following improvements, but the number of visitors and therefore the total visits increased by 65 per cent and 73 per cent respectively. The total time spent in the park per person per month increased by 214 minutes (i.e. 3.6 hours), an increase of approximately 44 per cent. The environmental improvements have attracted new visitors and increased the time people stay in the green space, resulting in more positive health benefits being experienced by a greater number of people.

### *Map model findings*

The following tables show examples of participants' comments about Sutcliffe Park. Table 2.4 gives an overview of what participants considered special about Sutcliffe Park.

**Table 2.4 Participants comments on what they considered special about Sutcliffe Park**

	Examples of comments
Wildlife	Grey herons Bird life The naturalisation of the Quaggy meaning greater wildlife and overall better environment
Water	River resurfaced and full of life – human and wildlife The general landscape and water, rivers etc Water and bridges
Landscape	Nice to watch a boring open space develop into somewhere interesting to walk Improvement in the park by changing scenery landscaping The good view and looks better
Exercise and recreation	Good for walking the dog, good for exercise  Nice open spaces for recreation
Emotional Impact	Walk the dog every day, money well spent, has dramatically improved You have a chance to get in touch with nature
General	It feels as if I'm in a very nice place where I could relax and unwind after a hard days work in the prison Been turned into a functional park, with vast areas to do a multitude of activities for all ages

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### **Examples of comments**

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Allows Kidbrooke Estate something to use, look after and be proud

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Source: Peacock et al (2005)

The three key elements of Sutcliffe Park considered to be extremely special were the wildlife, the water and the landscape and views. Over 35 participants commented on these three features acknowledging how pleasing the naturalised river, bridges, wildlife and views were. Many people commented on how the park's improvements provided an ideal opportunity for exercise and recreation. Three individuals also remarked on the emotional impact and how the park aided their relaxation.

Table 2.5 gives examples of the key problems participants identified and their recommendations for further improvements. The most common problem reported was the presence of excess litter.

**Table 2.5 Examples of problems and opportunities for further improvement identified at Sutcliffe Park**

<b>Problem</b>	<b>Examples of comments</b>	<b>Opportunity for improvement</b>	<b>Examples of comments</b>
Litter	Keeping water clear of rubbish Too much litter and not enough bins	Litter control	More regular collection of litter There could be some dustbins in more centralised locations
Fencing	Fencing around the stream, dangerous for small children Fences get broken sometimes	Fencing	Higher fencing around the stream to make it safe Strong fence around the pond
Vandalism	No deterrent for vandalism	Park warden	Park keeper who is installed to watch the park
Lack of facilities	No toilets	Toilets	Particularly for children
Access	No play area or swings for children	Children's play area	Children's area for see-saws, swings, climbing frames etc
	Cycle, pram and wheelchair access impossible through meadow side gate and some others Doesn't open gates early enough to allow cut through for station Park closes too early on Sundays and in the summer If you come to the park at night there are no lights	Café/picnic area Football pitches	A café could be a good thing Add a picnic area Where possible football and play areas should be restored and maintained Introduce more football pitches
Terrain	There's lots of mud and paths are very muddy Quite exposed and windy at times Lack of vegetation	Vegetation	Add some colour – bulbs, flowering shrubs etc Would be nice to have more greenery to encourage wildlife Replacement of damaged trees
General	Under-use – they need to encourage more people to use it, facilities, notice board, organised events etc The occasional "odd" looking person in the park	Organised Events / Education	Need more marketing of potential forthcoming fairs, sports, social events for all ages Organised events to benefit park and awareness of wildlife and looking after what has been created School visits for nature interpretations or nature tours examining specimens in the water

Source: Peacock et al (2005a)

### *Qualitative narrative from the composite questionnaire*

Examples of some of the comments made by participants about what they feel is special about Sutcliffe Park are given below (Peacock et al 2005):

- “It is a transformation. Now the potential to become a special place, a green oasis in a busy urban area.”
- “It is a far more pleasant place to be. There is a feeling of it being safer, whether this is so or not I don’t know, but because it is more pleasant it gives that feeling. It is interesting and can be enjoyed by young and old.”
- “I enjoy feeding the ducks and the swans. I now spend 2 hours here in the morning and 2 hours in the afternoon, every day.”
- “It’s much more attractive. I like observing the various visiting birds, frequently see kingfisher and herons amongst others.”
- “We need green spaces for exercise and recreation. Now the river is re-naturalised it is a much more pleasant experience. I love the lake too.”
- “The children enjoy seeing the birds and walking across the bridges and the stepping posts.”
- “Its biodiversity value, especially as it’s in an urban setting.”
- “Attempt to combine practical use (control Quaggy) with environmental use / wildlife.”
- “River running through, attracting wildlife, people and serenity.”
- “It is in a unique environment.”

Participants were also asked if they felt differently now the River Quaggy runs through Sutcliffe Park. Eighty-three per cent of participants said they did, giving comments such as (Peacock et al 2005):

- “More tranquil.”
- “Feel transported away from troubles. Feel more relaxed, absorbed by the park and what is going on in it.”
- “It gives you time to shut out other things – It’s an oasis and a little piece of heaven.”
- “I feel closer to nature which gives me a greater feeling of well-being.”
- “Feels you are somewhere else other than inner London.”
- “It feels as if I am in the countryside.”
- “Feels much more peaceful.”

### 2.3.3 Results: Montgomery Canal towpath, Welshpool

#### *Composite questionnaire findings*

A total of 39 participants (41% male and 59% female) completed the composite questionnaire and map model at Montgomery Canal. The average Body Mass Index (BMI) was 24, implying that overall; the sample was within the accepted BMI normal health range. We asked participants to rate their current perceived health state on a scale of 0 to 100 (worst imaginable health state = 0). The average value was 77, slightly below the recognised norm value for the UK.

Participants had spent on average 14 minutes exercising along the canal towpath before stopping to complete the questionnaire. The average self-esteem score reported was 20, and there were no significant differences between individuals exercising for more or less than 11 minutes.

Table 2.6 shows the primary reasons given by participants for using the canal towpath before and after the improvement programme. It shows that, following the improvements, a higher percentage of participants used the canal towpath for all of the reasons cited apart from “walking the dog” and “meeting friends or family”, which both remained the same. Although the differences were not statistically significant, it is important to recognise that improvements to a short section of only 200 m of canal towpath positively encouraged participants to visit it more for exercise, health, its scenery and wildlife.

**Table 2.6 Primary reasons for participants’ visits to Montgomery Canal before and after improvements**

Primary reason for visit	Before improvements (%)	After improvements (%)
For exercise	61	63
Walking the dog	26	26
On the way to somewhere	45	50
Meet family/ friends	13	13
Health (walking/ fresh air)	53	58
Scenery	63	68
Wildlife	47	53
Other	8	13

Source: Peacock et al (2005)

Notes: Percentages total more than 100 as some participants had more than one primary reason for their visit.

Table 2.7 shows how often participants used the towpath before and after its improvement. The percentage of people using the towpath at least twice a day and once a week increased following the work. Those who only used the canal towpath occasionally actually reduced in number. Nevertheless, the majority of participants continued to use the canal towpath in a similar manner following the improvements, although the sample included a lot of dog walkers, who obviously needed to walk their dog routinely regardless of the circumstances.

**Table 2.7 Frequency of visits to Montgomery Canal before and after improvements**

Frequency of visits	Before improvements (%)	After improvements (%)
At least twice a day	5	8
Every day	37	37
Twice a week	24	21
Once a week	3	5
Once a fortnight	3	3
Once a month	5	5
Occasionally	24	21

Source: Peacock et al (2005)

Table 2.8 displays the average length of time (minutes) spent along the canal side during one visit. A higher proportion of people spent longer on the towpath during visits following its restoration. The overall time spent along the canal side before and after the improvements was significantly different ( $p = 0.001$ ).

**Table 2.8 Duration of visits to Montgomery Canal before and after improvements**

Duration of visits	Before improvements (%)	After improvements (%)
5-10 mins	31.6	18.4
11-20 mins	23.7	31.6
21-30 mins	18.4	18.4
> 30 mins	15.8	15.8
> 60 mins	10.5	15.8

Source: Peacock et al (2005)

### *Summary of changes*

The average number of visits per person per month increased from 20 to 21 following the improvements. Although the number of visitors hasn't increased, the number of visits has increased by 9 per cent. The environmental improvement scheme has encouraged existing visitors to visit more frequently, thereby providing them with enhanced health benefits. The total time along the canal side per person per month has also increased by 100.95 minutes (i.e. 1.7 hours). This figure represents an increase of approximately 19 per cent, which is admirable given that only a short section of the canal was enhanced.

### *Map model findings*

The following tables show examples of participants' comments about the Montgomery Canal.

Table 2.9 gives an overview of what participants said they thought was special about this stretch of canal towpath.

**Table 2.9 Participants comments on what they considered special about Montgomery Canal**

	<b>Examples of comments</b>
Wildlife	Wildlife, nature, water, peace, exercise, conservation I enjoy the swans and feeding the ducks Good for wildlife, particularly outside town Seeing local flora and riverside fauna
Relaxation	Nice to go for a walk with my young children away from the traffic Thinking time, a little apart from town noises Quiet, relaxing, no sound of traffic Gives me time to think
Enjoyable walk	A lovely long walk, all in all I'm very pleased  We're lucky to have it – you can walk for miles this way and that way, it's brilliant
General	An asset for the town but still undervalued and perhaps underdeveloped A heck of a lot has been done – the new wharf, lots of people use it, we're really pleased with it

Source: Peacock et al (2005)

The particular aspect of the canal towpath that participants considered extremely special was its wildlife and flora. Over 48 per cent of participants commented on this characteristic of the canal side, mentioning their enjoyment of feeding the ducks, the array of wildlife and watching the local flora and riverside fauna.

Table 2.10 gives examples of the key problems participants identified with the canal towpath and their recommendations for further improvements. The most common problem reported was the presence of dog mess.

**Table 2.10 Examples of problems and opportunities for further improvement identified for the Montgomery Canal towpath**

<b>Problem</b>	<b>Examples of comments</b>	<b>Opportunity for improvement</b>	<b>Examples of comments</b>
Dog mess	Still dog mess along sections of the towpath, although improved section has got better	More dog bins	More dog dirt bins would be welcomed
Mud on pathways	Very muddy paths which can be dangerous  After resurfacing, leaves were left and it got muddy again	Pathway enhancements	More maintenance of paths – if it was all like this section there would be no problem at all Footpath improvements and cleaning
Flora and fauna	Weeds clogging up the water  Japanese knotweed encroaching Poor maintenance of hedges Rats appearing because people keep leaving too much food to feed the birds	Maintain flora	Improve maintenance of hedges  Better control of the weeds  Rebuild some of the canal banks  Keep hedges cut back, especially in the summer
Litter	Lots of litter – may harm wildlife  Something should be done about the litter and cans A bit of rubbish under the second bridge	Removal of litter  Education and information	Regular litter collection  If they could get a board with a brief history of the canal  Wildlife or history information
Maintenance	Benches smashed which older people used to enjoy sitting on Improve appearance around the Safeway store as it is beginning to look very scruffy Did the lock up and have now let it go	Improved facilities	The new steps up to the bridge need a handrail for elderly people  Coffee shop to walk to and lighting needed in the winter  More seats and repair the benches
General	Loss of boats – I used to enjoy watching the boats coming up Worried about the Smithfield development Licence fee for canal boats – it is only a remainder water but yet we only get a 25% reduction in cost and only have 16 miles of water we can use for our money	Recreation	Bring back the pleasure boats!  Needs more activity, events publicised  Need some leisure craft to be introduced, how about opportunities to use the canal – e.g. for canoeing

Source: Peacock et al (2005)

## *Qualitative Narrative from the Composite Questionnaire*

Some examples of the comments made by participants about what they feel is special about the Montgomery Canal towpath are given below:

- “The upkeep of the canal is essential, we are very fortunate to have the canal in Welshpool and I feel the dragonfly trail will benefit local people and tourism.”
- “Fresh air, its peaceful, can let the dog and the baby off the lead!”
- “Quiet, unusual – no other canal close, wildlife.”
- “The trail would be great – my daughter loves art and nature.”
- “The educational aspects will help all to think about our environment and the importance of wildlife and our interaction with other species.”
- “I enjoy walking along it because it’s flatter, enjoy the wildlife, away from the traffic, I walk for health reasons and it’s a pleasant walk.”
- “Nice to be close to nature and so forth.”

Participants were asked if they felt differently following improvements. Sixty per cent said they did, and examples of their comments are given below:

- “Nice and peaceful.”
- “A pleasure to live by.”
- “Relaxing and peaceful with lots of nature.”
- “It’s improved.”
- “Much better pathways, canal cleaner.”
- “It’s quiet, no people around.”

### **2.3.4 Summary of findings**

The key findings from the two case studies support and add to the emerging “green exercise” evidence base which suggests that time spent exercising within a green environment enhances people’s physical health and mental well-being. The improvements to Sutcliffe Park and the Montgomery Canal towpath have encouraged more people to use them, spend longer in contact with nature and visit more frequently. The longer individuals spend within a green environment, the more their self-esteem improves, which may lead to many further health benefits.

# 3 Easington

This case study was a collaborative project with Durham Heritage Coast. Researchers from the Centre for Environment and Society (CES) at the University of Essex carried out the fieldwork both on and off site.

## 3.1 Methodology

A methodology similar to the one used for Sutcliffe Park and the Montgomery Canal was also applied to the case study site at Easington and was developed by the Centre for Environment and Society (CES) at the University of Essex together with project partners (Peacock et al 2006). Data was collected in the field by researchers from CES using a similar composite questionnaire. Off-site participants were also included in the study to allow comparison with participants who were questioned on the Easington site.

Participants were asked an additional question about their current perceived mood, in addition to their current state of health. Questions were also added about participants' visits to other outdoor recreation sites before and after the improvements along the Easington coastal path to establish whether any changes in visits to the coastal path resulted in differing use of other sites. We asked participants about their method of transport to the site and journey time. A final extra question asked participants to generate ideas about what they thought would encourage more people to use the path.

## 3.2 Background and research aims

Easington is ranked as the 28<sup>th</sup> most deprived local authority area within England. This deprivation affects the health of the local community. Members of the local population are predominantly elderly or are suffering from ill health, partly due to the collapse of the local coal mining industry. Durham County Council is now collaborating with local Primary Care Trusts to promote public health, for example by introducing healthy walking and cycling schemes.

A linear coastal path existed in Easington, but was unsuitable for some users and therefore excluded a proportion of the community. A new circular route that linked the village to the coastal path was designed for all abilities. This route was created through a working partnership between Durham Heritage Coast; Easington District Council; the National Trust; the Environment Agency and Groundwork East Durham. The route provides park benches, and designers worked with schools and a local artist to create pictures and artwork to encourage more people to use the area.

This research aims to evaluate whether the new circular coastal path provides health benefits for its users, in particular members of the local community. The evaluation also involves non-users (members of the community who do not currently use the path) so that potential barriers to its use and possible solutions identified. When policies are today aiming to encourage people who participate little in physical activity to become less sedentary, an understanding of these issues is especially important and will help to highlight possible solutions, which is especially important.

## 3.3 Results

Researchers from the Centre for Environment and Society (CES) at the University of Essex carried out field work on and off site. The results of the questionnaires and map modelling are summarised below (Peacock et al 2006).

### 3.3.1 General findings

A total of 116 participants completed the questionnaires, of which 53 (44.5%) were on-site and 66 (55.5%) were off-site. The on-site participants were accessed on the coastal path, whereas the off-site participants included members of local groups and schools. There was a fairly even mix of male and female participants amongst both the on- and off-site respondents. The age ranges of the respondents varied, but predominantly the on-site participants were aged 51–65 years and the off-site participants were most commonly aged between 11-15 years. Among the on-site users 92.1% were over the age of 31 whereas 72.8% of the off-site users were less than 30 years old.

Physical activity patterns were similar for both samples. The majority of on-site participants (51%) reported that they did more than five hours of physical activity per week. Forty-five per cent of the off-site participants engaged in more than 2.5 hours of weekly physical activity, with 37 per cent involved in more than five hours per week. Overall, 77 per cent of on-site and 82 per cent of off-site participants engaged in more than the recommended 2.5 hours of weekly activity.

Participants were asked to rate their current perceived health state on a scale of 0 to 10 (worst imaginable health state = 0). The average value was 6.7 for on-site and 7.2 for off-site participants. We also asked participants to rate their current mood state on a similar scale from 0 to 10 (worst imaginable mood = 0). The average score for on-site participants was 8.2 and for off-site participants was 7.4. These values imply that the on-site participants were in “better moods” than the off-site participants, perhaps due to their surrounding environment. Interestingly, on-site participants noted better mood states despite having worse perceived health state scores than off-site participants. Significant positive correlations were found between health state scores and mood scores.

### 3.3.2 Frequency and length of visits

Changes in the frequency of visits to the coastal path were less clearly defined than for the previous case studies. The majority of users visited the path once a week prior to improvements (45%); only 31 per cent visited it at least every day. The proportion of daily visits increased to 38 per cent after the improvement programme but the proportion of people visiting the path once a fortnight, monthly or occasionally reduced from 10% to 3%.

For off-site participants, the percentage of people visiting the path at least twice a day, everyday, twice a week and once a week increased by 5, 2, 2 and 2 per cent respectively following the enhancements. Those visiting it less frequently reduced in number (2.3%). Overall there was a significant increase in the number of visits after the enhancements.

A higher proportion of people spent longer on the path for each visit, following its restoration. Overall, for on-site users the number of visits per person per month increased by 13 per cent and the total time spent on the path per person per month increased by 179 minutes (i.e. 3 hours). This figure represents an increase of

approximately 23.5 per cent. For off-site users, the number of visits per person per month increased by 9 per cent; more importantly the number of visitors, and therefore visits, increased by approximately 11.5 per cent and 63.5 per cent respectively.

The improvement scheme at the Easington coast path has therefore attracted new visitors, resulting in more positive health benefits being experienced by more people. The total time spent in the park per person per month has also increased by 69 minutes (1.16 hours), an increase of approximately 16.8 per cent.

### **3.3.3 Reasons for visits**

Changes in the reasons for participants' visits were also more complicated at this site than at the previous case studies. The proportion of on-site participants stating they were visiting the path for health, its scenery and its wildlife increased, although fewer people said they were visiting for exercise or to walk the dog following the improvements. Off site participants showed a slight increase in all reasons for visiting the coastal path; and 5 per cent had not visited the site at all prior to improvements.

Participants were asked if they regularly visited other outdoor recreation areas, prior to the improvements. Among the on-site participants 38.8 per cent stated that they often visited elsewhere; of these people, 88.9 per cent still continued to visit there after the improvements at Easington. A slightly higher proportion (48.2%) of off-site participants visited alternative places; among these people 72.7 per cent said they still visited these sites following the improvements.

### **3.3.4 Participants' comments**

Both the on-site and off-site participants were asked what they felt was special about Easington coastal path. Examples of their comments are given below (Peacock et al 2006):

- "Beautiful scenery and a lovely walk."
- "Good walking, good view, fresh air."
- "Wild feeling of outdoors."
- "Beautiful countryside, openness."
- "The way it changes and to meet friends within a view like that."
- "Fresh air, stunning views."
- "The amazing views and landscape."
- "Peaceful"
- "Sea air, walk for miles."
- "History, scenery, wildness."
- "Beautiful coast line."
- "The walks and the views."
- "The improvements have made the walks more accessible to enjoy the scenery since the pits shut as its beautiful."
- "Seascape, remoteness."

- “Lovely scenery, quiet, great for dogs.”
- “Quiet, somewhere to go.”
- “Local, part of our heritage.”
- “Scenery, atmosphere.”
- “The fact I can get out for fresh air.”
- “I like watching the birds and the peace and quiet.”
- “It gives opportunity to get exercise and fresh air.”
- “It is a reminder of the pit area and a nice place to go for a walk.”

When asked what they thought would encourage more people to use the coastal path, comments included (Peacock et al 2006):

- “Maybe multi-use, i.e. cyclists.”
- “Steps to beach really need seeing to, it’s dangerous. More pavement (tarmac), more seats on beach banks.”
- “Better disabled access, coffee tea bar.”
- “Putting in more hardcore paths would encourage young families and the elderly to use the walks.”
- “A gentler path up from the beach, going down is fine, coming up is hard. More seats and better paths for the pushchairs.”
- “More publicity and amenities.”
- “Better advertising, more seating.”
- “Clean beach, build wall and hide waste.”
- “Somewhere to have a cuppa.”
- “Improve footpath, dog bins/litter bins, better drainage in muddy bits.”
- “Nothing, leave it wild as it is now.”
- “More information about paths, more emphasis on exercise, more seats, bins, bins for dog waste.”
- “Lighting for walking at night, picnic area/benches, more bins to prevent littering.”
- “Better paths, securer car park.”
- “Car park safety, need to ensure car is secure before will leave it here regularly.”
- “If people picked up litter.”
- “If people cleaned up after your dogs.”
- “A warden to try and keep trouble makers/teenagers away.”
- “To be much, much cleaner.”

The key suggestions from the on-site participants included increasing advertising and publicity, improving access for wheelchairs, prams, disabled etc, improving the footpath surface, and introducing more paving and seating areas. In addition, off-site participants discussed the problems of dog mess and litter and the need for the area to be cleaner. Issues of security and safety in the car park also needed to be addressed.

# 4 Conclusions

We commissioned three case studies – one urban and two rural – from the Centre for Environment and Society at the University of Essex to examine the physical and mental health benefits of environmental improvements carried out by the Environment Agency and partners. All three sites provide opportunities for outdoor recreation and relaxation in natural spaces that include water. Our case studies show that small-scale environmental improvements bring significant health benefits to local communities. After the improvements:

- more people visited more often, stayed longer and were more likely to visit to exercise and for health;
- analysis showed that visitors' self esteem increased the longer they had spent exercising in the natural environment;
- the local green spaces became an important health resource for surrounding communities.

Rising levels of obesity and physical inactivity and associated illness, together with increasing levels of mental illness, are a major public health concern in the UK. To tackle these issues it is crucial to encourage lifestyle changes that increase outdoor recreation and physical activity. These case studies have demonstrated that the creation and maintenance of high quality, local natural environments are vitally important in encouraging such activity so people gain the health benefits they offer.

There are several points to note from the case study findings:

- i. The results show that improvements to local outdoor environments can increase the number of visitors, the number of visits made, and the duration of each visit. Even very small-scale enhancements, such as those to a 200 m stretch of towpath of the Montgomery Canal, can have a significant impact. More dramatic improvements, such as those at Sutcliffe Park, have the potential to transform the capacity of local natural environments to provide a resource for health.
- ii. Enhancements to local environments can dramatically change the way these spaces are used and can be a major factor in encouraging physical activity. For example, following improvements at Sutcliffe Park, the number of people primarily using the site for exercise increased from 40 per cent to 68 per cent.
- iii. Although environmental improvements can be dramatic, the participants that took part in these case studies were predominantly meeting physical activity targets and were not overweight/obese, as defined by their Body Mass Index (BMI). This finding suggests although we are successful in increasing activity in people who already engaged in some physical exercise; we need to do more to target groups who currently do very little or no activity. These groups are at greatest health risk and should be the focus of more effort in terms of our engagement.

The case studies demonstrate one way in which we can meet the targets in our corporate strategy associated with 'A better quality of life'. The strategy states our long-term aim as: "Everyone will have the opportunity to enjoy a high-quality environment, now and for future generations. More people will care for, use, appreciate and enjoy their environment."

This research provides evidence that our activities contribute to quality of life.

# 5 Recommendations

These case studies demonstrate the health benefits that local green spaces and water environments can have for communities. The quality of natural environments is crucial in encouraging people to use and enjoy them, shown in all the case studies by an increased use following improvements.

The findings of this research can be applied to the Environment Agency in the following ways:

## *Increasing the evidence of benefits*

- The Environment Agency should develop tools that allow the wider health and social benefits of our environmental improvements to be measured. Although these case studies provide useful information, they represent a very small sample and the evidence base would be significantly stronger if routine evaluation of projects took place.

## *Communicating how we contribute to health*

- This evidence should be used to demonstrate how we contribute to improving health and quality of life. Such communication would help raise awareness internally with staff, and highlight how we contribute to wider government agendas on public health.

## *Targeting our environmental improvements*

- Our environmental improvement schemes should be targeted towards areas of high deprivation and poor health, as this is likely to create the biggest benefit in terms of health.

## *Engaging with the most at-risk members of the public*

- We should make additional efforts to engage sectors of the public that currently undertake little or no outdoor activity. These groups are at the greatest health risk and stand to benefit the most from increasing levels of physical activity.

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