Chapter 9
Natural Elements and Physical Activity in Urban Green Space Planning and Design

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Abstract While studies on physical activity behavior are widely available, research on physical activity environments is relatively new, particularly when related to 'natural' environments. In this chapter planning issues and design elements that can influence the use of urban green areas for physical activity are discussed. Availability, features, conditions, safety, aesthetics and climatic comfort are the main characteristics of urban green areas considered in the discussion, particularly in relation to natural elements. In the first part of the chapter the current literature presenting scientific evidence is examined. Once this evidence is discussed examples of best practices and significant planning and design solutions concerning the most relevant attributes of the green spaces are presented.

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K. Nilsson et al. (eds.), *Forests, Trees and Human Health*,
DOI 10.1007/978-90-481-9806-1_9,

9.1 Introduction

The purpose of this chapter is to discuss how the quality and the features of the physical environment, deriving from urban and peri-urban green space planning and design, can influence physical activity. The chapter will first examine the literature presenting scientific evidence relating planning issues (such as availability of green spaces, accessibility and equitability) design features (such as size, layout, facilities, attractiveness, climatic comfort) and maintenance, to the physical activity levels of the users and/or more in general of the population living in the surrounding areas. Once this evidence is discussed examples of best practices and significant planning and design solutions concerning the most relevant attributes of the green spaces will be presented.

The definition of urban green space generally includes a variety of sites, characterized by the presence of vegetated land or water, within or adjacent to urban areas. A common classification of urban green space does not exist although many state or local agencies and governments have adopted their own for planning purposes. They include a variety of sites, such as parks and gardens, playgrounds for children or teenagers, amenity green space, outdoor sports facilities, cemeteries and churchyards, natural and semi-natural urban green space and green corridors.

Although the presence of accessible attractive green space is likely to engage residents in frequent physical activity, the current evidence does not provide a classification based on the characteristics of green space that encourage autonomous use for physical activity. Similarly, it is not possible to classify green space according to the psychological benefits it delivers (CSC Consulting 2005).

Humpel et al. (2002) suggested that "*while the measurement of physical activity behavior is now a well-established field, this is not the case for the measurement of physical activity environments*." The key attribute for classifying green space in relation to health is its functionality for physical activity. A number of studies have examined barriers and opportunities in the use of parks and green areas and their influence in physical activity levels for the population using them (Jackson and Scott 1999). Many of the barriers are related to demographic or social characteristics, such as age, gender, race/ethnicity, socio-economic status (Lee et al. 2001). Others are related to specific physical features of the green areas, and might be easier to be dealt with through planning and design solutions. While there are relatively many studies on factors that inhibit park and open space use, there is a need for more research regarding features that can promote the use of parks and green areas for physical activity (Bedimo-Rung et al. 2005). According to Sallis et al. (1997), physical environments are the least studied type of influence on physical activity and the existing studies are often restricted to specific user groups, limiting generalization. Recently, however, many studies are focusing on the development of comprehensive instrument to measure the physical environmental factors that may influence physical activity in the open spaces (Pikora et al. 2002, 2003; Brownson et al. 2004; Lee et al. 2005; Iamatrakul et al. 2005; Lawrence et al. 2005; Hoehner et al. 2005; Bedimo-Rung et al. 2006; Saelens et al. 2006; Kaczynski et al. 2008).

9.2 Physical Attributes of Green Space

Following the framework proposed by Bedimo-Rung et al. (2005), green space characteristics that can strongly influence their use for physical activity, and therefore should be considered in urban planning and green-space design, can be divided into six categories: *Accessibility, Features, Conditions, Safety, Policies and Aesthetics*. Policies, especially those specifically aimed at promoting and encouraging physical activities are well covered in other chapters of this book and therefore will not be addressed here. To the categories proposed in the framework we have added climate and microclimate, considering how they can influence physical activity in the outdoors (Chan et al. 2006; Merrill et al. 2005; Togo et al. 2005) and how they can be modified through design choices (Brown and Gillespie 1995; Plotcher et al. 2006).

9.2.1 Accessibility

Accessibility is defined as the ability of city dwellers to get to the green spaces. To gain health benefits from physical activity, but also from the green environment, regular exposure to influential factors seems to be needed. Research suggests that regular contact with the natural environment enhances physical health and mental well-being, and good accessibility to green areas helps to achieve this. Grahn and Stigsdotter (2003) identified a significant relationship between the number of visits to an urban open green space and the level of self-reported stress. Accessibility is directly influenced by how recreation areas and facilities are provided and managed. Accessibility is primarily a consequence of the availability of parks/forests within the geographic area (m^2 per capita, ha of open space per 1,000 population, etc.). However, it also relates to the distribution within the city and its neighborhoods, and to how the availability of parks is distributed between different ethnic and economic groups. Do all groups have equal access to parks? And are parks/forests in different areas equally maintained and supported? The distance from the dwellings as well as the transportation system available are also an important factors influencing accessibility for individual users, as is safety of access (safe pedestrian or bicycle routes to the park/forest), and the awareness of the existence of green open spaces.

In a Dutch study (De Vries et al. 2003), the relationship between residents' perceived health-status and the amount of green space in one's living environment was studied. This relationship was consistent after controlling for personal characteristics, such as age and socio-economic status. Furthermore, all socio-demographic groups expressed a similar need for using urban green spaces in a Swedish study (Grahn and Stigsdotter 2003). Humpel et al. (2002) reported that location and convenience, as well as perceptions of safety have a great influence on whether people visit parks and use them for physical activity. Sallis et al. (1998) found that a convenient location of parks was associated with vigorous physical activity. Strong evidence suggests that access to parks and activity programs is related to more activity for children and youth (Sallis et al. 2000).

Troped et al. (2001) found that the closer people lived to bike trails, the more likely they were to use them. However, in a recent study by Kaczynski et al. (2008), distance from home was not found to be a significant predictor of the use of neighborhood parks for physical activity.

Information regarding how far people are willing to travel to use destinations for different types of recreational physical activity behaviors is limited. A study by McCormack et al. (2006) examines the demographic characteristics, neighborhood opportunity and specific-physical activity behaviors associated with distances travelled to destinations used for recreational physical activity. Work by Giles-Corti et al. (2005), examined the association between access to public open space and physical activity using three accessibility models that progressively adjusted for distance to public open spaces, and its attractiveness and size. The study showed that the likelihood of using these spaces increased with increasing levels of access, but the effect was greater in the model that adjusted for distance, attractiveness and size. After adjustment, city dwellers with very good access to large, attractive public open spaces were 50% more likely to achieve high levels of walking. The availability of green spaces for physical activity may be particularly relevant for certain user groups. Several studies have shown that proximity to recreational facilities and parks is one of the most important predictors of physical activity for youth. Cohen et al. (2006) have found that adolescent girls who live near parks, particularly near parks with amenities that encourage walking and contain active features, engage in more non-school physical activity than those living in areas with fewer parks. In this study the presence of parks within a 1 mile radius from home was associated with higher levels of non-school moderate to vigorous physical activity among adolescent girls, and this relationship is also found for proximity, number, and the type of parks, as well as specific park amenities. Roemmich et al. (2006) have found that neighborhoods with greater proportion of park area are associated with greater physical activity amongst young children.

In a study by Grahn and Stigsdotter (2003), proximity to a green environment (distance travelled to a public urban green area, access to a garden) also appeared to be influential, in addition to the duration of the visit. An individual who lived 50 m or less from an urban open green space visited it three to four times weekly, but when the distance was 300 m, the number of visits reduced to an average of 2.7, and if the distance was 1,000 m, visits occurred only once a week. Also in a Finnish study, both a good amount of green areas and easy access (i.e. short distance) to a natural environment increased the number of visits to a green environment by Helsinki residents (Neuvonen et al. 2007), see Fig. 9.1. People who live closer to a park or trail use it more frequently, on average, than people who live farther from these facilities (Hoehner et al. 2005).

The findings presented here show that the distance to green areas is an important factor in explaining visitation to close-to-home recreation areas. The results from Scandinavia (Jensen and Skov-Petersen 2002; Grahn and Stigsdotter 2003; Nielsen and Hansen 2006; Neuvonen et al. 2007), show that the shorter the distance to open green space, the more often people use them. All these results are in line with findings which have shown that, on the other hand, physical inactivity is related to poor conditions for walking or cycling in residential areas (Lenthe et al. 2004). Also the

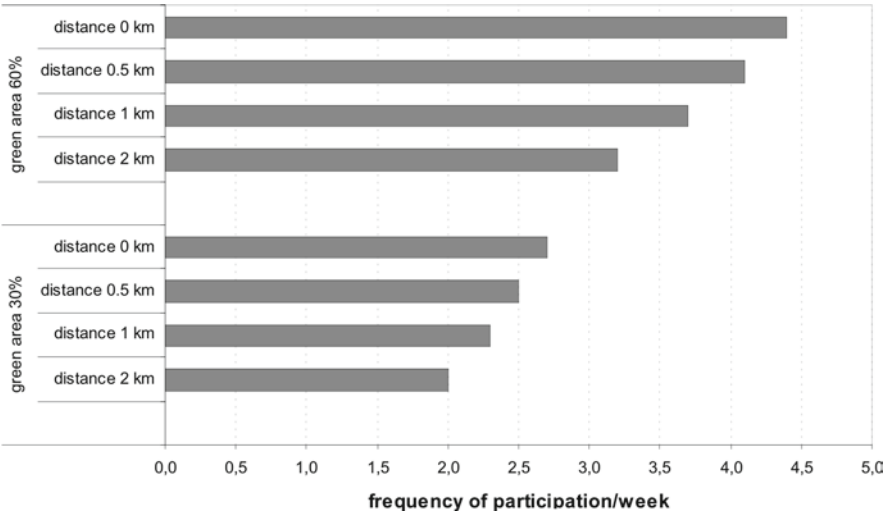

Fig. 9.1 Estimated frequency of participation in close-to-home outdoor recreation per week in two different recreation opportunity situations, with 30% respectively 60% of the total neighborhood area consisting of green space (Neuvonen et al. 2007)

amount of green areas in the residential areas as well as the landscape attractiveness affect the frequency of visits to green areas (Neuvonen et al. 2007; Giles-Corti et al. 2005; Roemmich et al. 2006). Recent data suggest that people who live near attractive, public open spaces may be almost twice more likely to walk at moderately active levels than were those who do not have access to public open spaces (Carnegie et al. 2002).

Different population groups are not equal in terms of ability to travel or to move to recreational areas. The distances adults travel to a recreational facility depends on the demographic characteristics, destination type, physical activity behavior undertaken at that destination, and number of neighborhood opportunities (McCormack et al. 2006). The selection of parks for a recreational visit is correlated to travel distance, travel time and travel cost (Iamatrakul et al. 2005). Accessibility is also related to the means of transportation available to reach the open space. In terms of available time during weekdays or weekend-days, most people have somewhat restricted possibilities to engage in recreation outside their own residential area during weekdays. Close-to-home recreation opportunities are, therefore, essential for fulfilling daily recreation needs. Proximity and a safe and attractive gateway to recreation areas have been found to be important quality factors in one's living environment. In one study, a short distance to recreation areas was important for 95% of the residents of a Swedish town (Lindhagen 1996). In another study, the frequency of visits and greater distance to recreation areas also had a negative relation (Roovers et al. 2002). According to the Swedish study, residents expressed that the maximum distance to a recreation area should not exceed 1 km (Hörnsten and Fredman 2000). According to the recommendations given by the Nordic Council of

Ministries, the maximum walking distance to recreation areas for daily use should be 250–300 m, but areas provided for weekend and vacation use may be located further away (Nordisk Ministerråd 1996).

Awareness of park existence has been found to be strongly related to distance, length of residence, and park age, which indicates the role of time and space in diffusing information about urban parks to residents of a community (Stynes et al. 1985). There is also evidence that the physical environment itself may be of limited importance to achieving the overall recommended levels of physical activity as such; in a prospective study of the building of a multi-use trail, for instance, Evenson et al. (2005) did not demonstrate an increase in physical activity among adults living near the trail. Nevertheless, in many other cases, accessible recreational facilities determined the use of those facilities, and thus good access is necessary to create a supportive environment (Giles-Corti and Donovan 2002).

Individual motivation is crucial as well. In Gobster's (2005) study of trail users, health-motivated trail users visited the trail more often and were more likely to walk or run on it than those people using the trail for pleasure or for other reasons. Proximity of the trail did not appear to be a differentiating factor between health or pleasure oriented users. The most frequent trail users were twice as likely to be health oriented than less frequent users. This implies that both good access and personal motivation is needed to achieve the level of physical activity required to obtain health benefits.

The health impacts of close-to-home outdoor recreation are remarkable. This leads to the conclusion that access to recreational areas in residential areas should be as easy and safe as possible. Recreational areas that are close to home are particularly important for children and families with small children, and also for elderly people in big cities (Maas et al. 2005). Developing a habit of going on daily outings to close-to-home green areas and engaging in physically active leisure activities in childhood is a good start for a physically active lifestyle later in life. When planning urban green areas and recreational services, much more attention should be paid to the outdoor recreational needs of families that include small children and their opportunities to experience nature. The needs of elderly people and those without access to a private car should also be known and considered more in order to provide attractive and inviting close-to-home recreation opportunities (Lehmuspuisto 2004). There is evidence that elderly women in all population groups face the most constraints and obstacles when it comes to participating in outdoor recreation (Neuvonen et al. 2004; Sievänen et al. 2005).

Green areas should be available to everyone, but those with some kind of disability often find themselves excluded from them (Lundell 2005). Physical barriers are key factors in this exclusion, since they create obstacles that don't allow full access and mobility to and within these sites, such as steps, slopes, surfaces, or inadequate dimensions of paths (Crosby 2003). Easily accessible and high quality recreation opportunities, which equally serve all population groups and inhabitants of different locations in the urban environment, are indicators of

good living conditions and a healthy environment, as well as of quality of life as a whole.

9.2.2 Facilities

Green space facilities represent a variety of elements, structures and programs that can make green space suitable and attractive for different active uses. People are attracted to green space where they feel they may engage in specific activities and obtain certain benefits. Therefore the presence or absence of a variety of features can determine a park's ability to promote physically active leisure behavior. Facilities that support active use of the green spaces will be considered rather than facilities specifically designed for organized sport activities (sport fields, swimming pools, etc.). Access to facilities and opportunity for activities are described as factors that may be associated with physical activity among adults (Humpel et al. 2002), and the presence of facilities in the neighborhood can also be significant for youth's levels of activity (Cohen et al. 2006; Mota et al. 2005). Baker et al. (2008, p. 258) concluded that parks should offer "equipments and low levels of physical disorder" in order to increase their use for physical activity. A study conducted by Tinsley et al. (2002) revealed that the presence of facilities in the park such as cycling and foot paths, parking and toilets was important for a high percentage of those interviewed. In the literature, however, there is limited amount of information as to which facilities and park features encourage activity (Baker et al. 2008).

The presence or absence of specific features plays an important role in how green can be used for physical activities, but 'thoughtful design' can include multiple users: sports people, walkers and passive users (Giles-Corti 2006). According to Kaczynski et al. (2008), park facilities are more important than park amenities and trails and have the strongest relationship with park use for physical activity. In a recent Canadian study (Potwarka and Kaczynski 2008), children that had a park with a playground within 1 km were found to be almost five times more likely to have a normal weight rather than being overweight, compared to those children without playgrounds in nearby parks. In this study there were no significant relationships between the proximity-based park variables and normal weight among the children in the sample.

Green spaces do not provide the same level of activity for their users, and parks can be considered as 'active' if they provide sports facilities such as tennis courts or playground equipment. More 'passive' parks are characterized by the presence of lawn areas, trees, water features, lakes, picnic areas, and/or walking trails (Mertes and Hall 1996).

Since walking is one of the most common type of physical activity among adults (Godbey et al. 2005), the design of good path and trail networks in green space and good links between home and the outdoor spaces are essential in order to encourage physical activity. Foot and/or cycling paths can take advantage of the existing landform, creating paths with different gradients which can be used to promote different

levels of physical activity (Sport England 2005). Appropriate lighting, surfacing and a careful design should be considered in order to plan aesthetical and safe foot and cycling networks (Sport England 2005). Based on their study on trails characteristics and urban greenways Lindsey et al. (2008) concluded that trails were used more often when they offered wide paths, open views, a diversity in land use, and when they where greener than the surrounding environment. In the same study a negative correlation between use and unpaved paths was found.

The position of features in the space needs to be logical, for example locating the seating points near a playground or drinking points near sports fields (Bedimo-Rung et al. 2005). The presence of playground equipment seems to attract a higher density of children, and for this reason playgrounds should include a variety of equipment in order to favor different types of physical activity such as climbing, running, swinging, etc. (Farley et al. 2008). Green space facilities should also, as much as possible, be free of physical barriers to enable their use by all population groups and inhabitants. Physical barriers are usually well-known and today there is a great awareness for this issue, although 'basic mistakes' still occur (Stoneham 2003). Guidelines for designing accessible outdoor spaces can be found in e.g., Bell (1991, 1997), Bell et al. (2006) and Price and Stoneham (2001). Open space layout and the availability of facilities can also have an effect on intra-activity conflicts. Few studies have examined the effect of intra-activity conflicts on urban park use for physical activity (Schneider 2000). Conflicts do not seem to detract from park experiences (Schneider 2000), but perceptions of conflict appear to vary by activity group. For example, Moore et al. (1998) found that a greater proportion of walkers and runners than skaters and bikers reported that their enjoyment was negatively affected by skaters and bikers than vice versa.

9.2.3 Conditions

Conditions are strictly related to the maintenance and to the proper or improper use of green space. The quality of the maintenance has an influence on aesthetics and on perceived and actual safety. Poorly maintained parks can be considered unsafe both due to the presence of broken, and thus dangerous, play equipment or hazardous trees and due to the fact that poor maintenance sends the message that breakdown is accepted civil behavior, inviting vandalism, and leading to unsafety. If the green space available is of poor quality people do not feel confident to use the area for recreational purposes. As a consequence increased vandalism or other means of damage and misuse occur. Ellaway et al. (2005) report in their study that higher levels of greenery and lower levels of graffiti and litter in residential environments are associated with being physically active and not being overweight or obese; efforts to promote activity and reduce weight should take environmental facilitators and constraints into account. There is a whole range of causes for damage and misuse, which strongly influences the use of parks and other urban green space for physical activity and recreation. The presence of litter and debris, as well as lack of apparent maintenance might be important detractors from

using a physical activity resource for physical activity; especially since people who walk more frequently typically rate their environment more positively (Carnegie et al. 2002). In fact, a high proportion of incivilities might suggest lack of attention to an area, and might even encourage less desirable behavior, clearly not promoting favorable conditions for recreational physical activity (Brownson et al. 2001; Lee et al. 2005). The most common negative aspects as described by the Woodland Trust (2002) are vandalism (opportunistic or premeditated); litter and fly-tipping; antisocial behavior of certain groups; uncontrolled dogs and dog fouling; dumping of cars, motorbikes, refrigerators, etc.; and the use of unauthorized vehicles.

It is important to analyze the given damages and misuse in order to find adequate solutions that can mitigate the situation. Communication, education and working with authorities, and neighborhood engagement, are seen as general principles to deal with misuse issues. The more people are involved in maintaining green areas, the more they get a sense of ownership, and the more likely misuse and damage decrease. Thus public involvement is crucial for maintaining positive conditions of urban green areas (e.g., Van Herzele et al. 2005).

Maintenance can also have a direct influence on the opportunities for physical activity. Poorly maintained entrances, signs, paths, or thick vegetation can become physical obstacles or hazards for joggers, bicycles, and people just strolling through the parks. Guidelines recommend developing check-lists and stepping stones for the planning as well as the maintenance and further development of urban green spaces as spaces people tend to go to every day for recreational and sports reasons. Footpath and biking routes have to be checked frequently, damage has to be removed as soon as possible to avoid further damage (Bundesamt für Naturschutz 2008). If, for example, a certain part of a much frequented hiking path is in a bad condition, people will create new paths crossing meadows or woods which might have negative effects on the wildlife or raise conflicts with private owners. Urban dwellers tend to prefer green structures that are well kept and tidy. It is therefore crucial to develop effective maintenance routines, which includes regular control visits of the green areas. It is important to integrate the maintenance aspects into the planning process in order to calculate the financial and human resources needed to maintain green spaces. It is reported that the maintenance costs of green spaces are much higher in urban areas than in rural areas. For example, the Emscher Landscape Park is a regional park and its management involves a multitude of cities and counties (Dettmar and Rohler 2007). Maintenance aspects are closely linked with safety aspects as described in the next paragraph. Research and conclusions drawn from visitor studies have pointed out that people avoid green spaces that are neglected.

9.2.4 Safety

Both real and perceived safety can be a strong factor in favoring or inhibiting the use of green spaces, and consequently their use for physical activity. Safety can be related to the surrounding environment (crime rate in the neighborhood) but very

often it originates from the park layout and features (openness, type of vegetation, lighting, entrances). Features that promote a variety of uses of the green areas, keeping the spaces alive throughout the day and evening, are important both for perceived and actual safety. Perceived safety is often analyzed by looking at how safe people feel their green spaces and neighborhoods are considering crime. A few studies found an association between neighborhood safety and physical activity levels (Hastert et al. 2005; Weir et al., 2006). The Center for Disease Control and Prevention (1999) found a significant association between perceived safety from crime and physical activity participation. In addition, Kirtland et al. (2003) found that people who were the least active were more concerned with safety issues.

Perceived safety in urban green spaces has been found to be related to park features and layout (Schroeder and Anderson 1984; Herzog and Chernick 2000). The authors of these studies found that some features that are perceived as enhancing the scenic quality, such as forest vegetation, were at the same time negatively influencing perceived safety. They discussed the management implications of their findings and conclude that the perception of both safety and aesthetics depends on specific manageable features of recreation sites, including vegetation and manmade features. Although perceived security and attractiveness may sometimes be difficult to achieve simultaneously, this is not necessarily always the case. According to the authors a compromise between perceived safety and scenic quality might be achieved by, for instance, reducing shrubs and raising tree canopies to improve visibility at ground level, while preserving a feeling of naturalness.

Perceived safety in urban parks is significant for promoting physical activity in specific urban settings (Hastert et al. 2005). According to the authors, having access to a safe park is particularly important for teens that live in neighborhoods in which people are afraid to go out at night. Among teens living in neighborhoods perceived as unsafe, 16.3% of those with no access to a park that is safe during the day get no physical activity, compared with 9% of those who have access to a park that is safe during the day. Suminski et al. (2005) reported that neighborhood safety is an important determinant of walking. Parents' concern for safety has also been found to be negatively correlated to children physical activity in poor neighborhoods (Weir et al. 2006). Some qualitative studies indicate that criminal activity such as the sale and use of drugs deters use of parks by children and adults (Gobster 2002; Outley and Floyd 2002). Use of urban parks can also be affected by having to traverse 'gang territory' (West 1993). We could only find one study that has used an objective measure of safety, by looking at the reported incidents of serious crime in the neighborhood, and found an association with physical activity (Gordon-Larsen et al. 2000).

9.2.5 Aesthetics

According to Giles-Corti (2006, p. 3) a "*Well designed public open space is an important component of the recreational mix providing opportunities for physical activity, social interaction and potentially a restorative environment providing*

some relief from the rush of life in the 21st century." However, the design of a space is a complex process since many variables are used in order to create a well-designed, appealing and balanced space that is aesthetically pleasing. Hoehner et al. (2003) propose that recreational activities are positively related with objective measures of attractive features. This category includes all the elements and features that can enhance the attractiveness and appeal of a park or a forest and especially those that stimulate the desire of being physically active. These elements are strictly related to design choices that can influence the perception of the environment through the different senses. Overall scenery, visual appeal of features, vegetation type, density, colors, scents and sounds.

Aesthetic principals have been studied by researchers in different fields of knowledge, from philosophy and psychology to architecture and planning. When related to the environment the aesthetic attributes refer to the perceived design elements of an environment that make it attractive and appealing, and they are very much associated with the notion of perception and aesthetic quality of the landscape. According to Gobster and Westphal (2004), people's response to the environment is often 'aesthetic in nature' and as noted by Nasar (1988) the aesthetic qualities of the environment may influence the experience, the behavior and the responses towards the surrounding environment. Humpel et al. (2002) pointed out the 'aesthetic attributes' of the environment as one of the factors that influences the use of outdoor spaces for physical activity. Titze et al. (2007) found a positive relation between the perception of an attractive environment and cycling, particularly for those who cycle on an irregular basis. Increased levels of walking for exercising are positively correlated with the perception of an aesthetically pleasing neighborhood (Ball et al. 2001). When neighborhoods present good aesthetic qualities, adolescents are more likely to have higher levels of physical activity (Mota et al. 2005). The presence of hills and enjoyable scenery in the neighborhood has been associated positively with the practice of physical activities among women belonging to different racial-ethnic minorities in the US (King et al. 2000). Wilcox et al. (2000) in their study regarding levels of physical activity among women living in rural areas implied that the absence of enjoyable scenery could act as a constraint for exercise, suggesting that green spaces may be important to increase the levels of activity. Wright et al. (1996) found that the presence of street trees, along with green borders, may be considered as attributes that create attractive environments, and may contribute to increased exercise. Pikora et al. (2003) suggested that walking in the neighborhood is also influenced by the presence of diverse views.

Although the presence of high aesthetic quality can motivate people to use and be active in parks (Bedimo-Rung et al. 2005), research regarding green space attributes, particularly park characteristics that might influence the levels of physical activity is sparse (Baker et al. 2008; Bedimo-Rung et al. 2005). The presence of water, trees and woody vegetation in parks seem to have a positive impact on a park's high scenic quality (Schroeder and Anderson 1984). Examples of paths bordered by trees and shrubs allowing wide views and water features (Giles-Corti et al. 2005) are described as elements preferred by individuals, which can promote active use of public open space, and seasonal variation of trees' color, especially in autumn, can also contribute to the

enjoyment of outdoor physical activities (Krenichyn 2006). The design of endowing green spaces with high aesthetic qualities is also deeply linked to the layout, materials, textures and colors of the different features chosen for a particular space. For instance, multicolored markings on playground structures have been shown to increase physical activity in children (Stratton and Mullan 2005; Ridgers et al. 2007).

9.2.6 Climate and Microclimate

The planning and design of urban and peri-urban green spaces can influence microclimatic condition and climatic comfort (Brown and Gillespie 1995; Plotcher et al. 2006). Climate and microclimate can be important factors in promoting physical activity in the open spaces. Many studies relate physical activity levels in the population with meteorological and climatic conditions. Physical activity has been found to be correlated to ambient and apparent temperature, relative humidity, wind speed, rainfall and day length (Chan et al. 2006; Merrill et al. 2005; Togo et al. 2005). Other studies have looked at thermal comfort in open spaces (Nikolopoulou and Lykoudis 2006; Oliveira and Andrade 2007; Stathopoulos et al. 2004; Thorsson et al. 2004). The findings confirm a strong relationship between microclimate and comfort conditions, with air temperature and solar radiation being important determinants of comfort. The perception of air temperature is difficult to separate from the perception of the thermal environment and it is modified by other parameters, particularly wind. The perception of solar radiation is related to the intensity of fluxes from various directions (i.e. falling upon both vertical and horizontal surfaces), weighted by the coefficients of incidence upon the human body. Wind was found to be the most intensely perceived variable, usually negatively. Wind perception depends largely on the extreme values of wind speed and wind variability (Nikolopoulou and Lykoudis 2006). The strong relationship between microclimatic and comfort conditions suggest that careful design can allow for the use of open spaces, even at relative harsh microclimatic conditions balancing exposure and protection to the different climatic elements, depending on the geographical region, season and user preferences. However, this can only be feasible if great care is taken to include microclimatic concerns at the design phase. Solar radiation and wind can be influenced by the design of planting and other features in green open spaces to create more favorable conditions for physical activity (Brown and Gillespie 1995)

9.3 Designing Parks for Physical Activity: Examples Throughout Europe

In Europe many interesting projects have been implemented at different scales, regional, metropolitan and local, specifically to offer opportunities for physical activity in a natural environment. In other cases newly designed public open spaces

have included design solutions and programs to encourage active use. In this section a limited but diverse selection of such projects his presented. The projects were selected to cover different scales, different geographic and climatic regions, and different typology, ranging from designed urban parks to regional trail systems. The Emscher Landscape Park in Germany is an example of a regional scale project, serving a very large population and involving many municipalities and agencies. The Helsinki Recreational Trail System and the Padua Green U are different, yet related, examples of urban scale projects, specifically aimed to promote outdoor physical activity. The two examples from Lisbon (Portugal) describe different approaches in promoting physical activity with green open space design: in a well established peri urban forest such as the Alameda Keil do Amaral and in a recently developed waterfront urban park (Parque Tejo e Trancão). An example of open space design for specific user groups is provided by the Maunula trail in Helsinki.

9.3.1 Regional Project: The Emscher Landscape Park

9.3.1.1 Emscher Park Cycle Track and Industrial Heritage Bike Trail in the Ruhr Area

The Ruhr Area is the largest economic area in Europe and was once the industrial heart of Germany depending mainly on coal mining, steel industries and chemical industry. Its name stems from the river Ruhr, which marks the southern boundaries of the area. The Ruhr Area of today is a landscape full of contrasts: a still visible industrial past and a new infrastructure are intertwined and visible side by side. For decades the rhythm of life was dictated by machinery, noise and shift work. Lifestyles and attitudes grew out of coal dust and working-class housing estates. But then the blast furnaces and collieries started to be closed down but nevertheless even today blast furnaces, gas meters and pithead towers continue to give the Ruhr Area its own unique features. They are important witnesses to 150 years of industrial history in the region, and also to the process of structural transformation which has been taking place here for several decades. The now silent factory sites – many of which are under an industrial heritage conservation scheme – are not sites of nostalgia and regret. They have long been transformed into lively industrial venues and attractive centers for cultural and tourist events. And only when people looked back on the now silent plants did they see the peculiar beauty inherent in the gigantic and ornamented industrial buildings. The Ruhr Area is roughly 13% of the surface of North Rhine-Westfalia. From east to west it measures 116 km, from north to south 67 km. More than 5.3 million people live in the area, the population density being 1,203 inhabitants per square kilometer.

In 1989 the government of North Rhine-Westfalia started the International Building Exhibition to prepare a strategy for the economic, ecological and social development of the Emscher Region. In former times the ‘Emscher’ was a small river, which became the open sewage canal for the whole Ruhr Area during the last

100 years of mining. Within the framework of IBA the Emscher Landscape Park (ELP) is a consequence and the central component of an integrated development strategy for the former industrial region. It is the most ambitious landscape project in Europe in the last decades.

The Emscher Landscape Park is designed as a leisure park for more than two million people living in the main zone of the river Emscher and for the above mentioned 5.3 million people living in the greater Ruhr area. The Emscher Landscape Park represents the largest and most developed regional urban park in Europe with its 45,754 ha and almost 180 realized and approx. 250 planned projects. Within the ELP 20 cities, two counties, 20 municipalities, the regional government as well as the state of North Rhine-Westfalia, the Emscher Waste Water Association (EG) and the Ruhr Regional Association (RVR) are cooperating. The Ruhr Regional Association – RVR is the main actor to develop and manage the ELP. Its responsibilities and duties are described in a special law. The main duties are: coordination and planning; public relations; building and realizing projects; maintenance and care; and financial management.

From the beginning one of the main major projects has been to establish a regional Cycle track system, which covers on one hand the whole Ruhr Area. This Cycle track is called 'Rundkurs Ruhrgebiet' which extends over more than 700 km. Within this greater cycle track the Emscher Park Radweg (cycle track) has been created, planned and designed as an important infrastructure to explore the park but also to be used as a day-by-day transportation system for work and leisure. The cycle track consists of a 230 km circular course running through the Emscher Landscape Park connecting anchor points of industrial heritage sites 70 km are newly built using old industrial railway tracks. The tracks have a width of 3.5 m.

9.3.1.2 Project Elements that Contribute to the Promotion of Physical Activity

Access and safety issues: Together both cycle tracks cover a vast amount of the different facets of industrial heritage along the rivers Emscher, Lippe, Rhine and Ruhr. Parts of the cycle route are created on former railway tracks. In order to create an attractive and safe circular track system it was inevitable to cross main routes, rivers or canals in the area. Therefore new bridges for cyclists as well as pedestrians were constructed. These bridges represent outstanding examples of technology and beauty, designed by well-known architects like Polonyi, Schlaich and Frei Otto (see Photo 9.1 for an example). Further access is possible through smaller local cycle routes which connect with the main cycle tracks.

Features: While underway bike tourism service stations are available for information, maps and other written documents, luggage transport, break-down assistance as well as the lending of off-road bikes. If visitors do not want or have the opportunity to take their own bikes it is possible to hire them at the service stations. Stations are inter-connected and rented bikes can be returned at other stations.

Photo 9.1 Bridge 'Erzbahnschwinge' in Emscher Park Radweg cycle track (Photo: Harald Spiering, RVR) (*See Color Plates*)

The 'RevierRad' is a high-quality bike service ideal for individual bikers but also for groups. It is possible to book a large contingent of bikes. The following are available for hire: city and trekking bikes for adults, children's bikes, trailer bikes, tandems, recumbent tricycles, rickshaws and electric bikes. People with moving disabilities do also have the possibility to hire bikes. The cycle route is improving year by year with growing facilities like bed and breakfast for overnight stay, toilets, restaurants and bars open for bikers. There is a huge amount of maps and other items of publicity. In 2007 a completely revised and updated guide for cyclist has been edited, containing a comprehensive series of maps (scale 1:50,000 as well as enlarged maps of 1:20,000 for inner city areas). The richly illustrated text sections describe the history of the industrial locations along the trail.

Conditions, Maintenance and Cooperation: To maintain this huge cycle track is a big challenge. The RVR as holding organization responsible for the whole route divided the 700 km of Ruhr area cycle track into 17 smaller parts. For every part people interested in biking and living in the region could apply as local stewards. Out of a greater number 17 persons were chosen who are responsible for 'their' part of the track. They regularly visit their parts of the track and control maintenance issues like quality of the track itself, the signs, signposts and bridges. Every 3 month during the season they report to RVR about the conditions of the track concerning sign posts, maintenance and other items. There are regular meetings of

all cycle track stewards where issues like the enhancement of the tracks and quality management issues are discussed. It is known that the regular users as well as visitors find the sign system of the cycle tracks very attractive and respond mainly positive. One of the major issues within the responsibility of every local municipality is the waste management. There is also a multitude of institutions responsible for the technical maintenance of the cycle tracks. One of the outstanding responsibilities of the Regional Ruhr associations is to coordinate this multitude of local and regional actors together with involving the civil society actors.

Future Perspectives: The Emscher Park cycle track will be developed in the next years continuously as artery of the network of Industrial Heritage Trail by bike. To achieve this goal further railway tracks will be purchased and developed by the RVR. Furthermore sections leading through the different cities and maintained by the local municipalities will be modified and maintained. Another important goal is to intensify the quality management system. In 2010 the Ruhr Area is the European Capital of Culture. The Ruhr Metropolis lies in the midst of the most populated area of Europe. Twenty five million Europeans can reach the region by rail or car in 2–3 h. The Capital of culture therefore is seen as a unique chance to establish the area as an attractive tourist destination. In this context of Ruhr 2010 a section of the Emscher Park Cycle Track is put particularly into scene as a cultural cycle track 2010.

9.3.2 Municipal Projects

9.3.2.1 Helsinki, Finland[1]

The Recreational Trail System for Bicycling and Cross-Country Skiing

Helsinki is the capital of Finland with 560,000 inhabitants, and a land area of 185 km^2. The Helsinki Metropolitan area has about one million people, three neighboring municipalities included. Nearly all (97% of 15–74 years old) of Helsinki's inhabitants participate in outdoor and/or physical exercise activities. The average number of close-to-home recreational visits among Helsinki residents is 160 during 1 year. Walking for fitness or pleasure is the most popular type of outdoor activity. Other popular activities are cycling, dog walking, jogging and outdoor activities with children. Physical or fitness activities represented about 90% of all close-to-home outdoor activities: walking, skiing, bicycling (Neuvonen et al. 2007). In Helsinki, 55% of all inhabitants exercise enough for health status based on the standard of three times a week with intensity of sweating and getting out of breath to some extent (Kansallinen liikuntatutkimus 2005–2006, 2006).

The average distance from a residence to a park is 600 m in Helsinki. There are about 1,050 ha of managed parks (parks consist 6% of land area) and more than 4,500 ha of urban forest in Helsinki (25% of land area; 37% of green area of total

[1]Acknowledgements to Mr. Antero Naskila, City of Helsinki, for his contribution

land area) (Helsingin kaupungin tietokeskus 2003). The recreational trail system consists of 450 km multiple use routes and about 730 km of bicycling routes (see Photos 9.2 and 9.3). In addition, for walking and running there is more than 50 km of fitness trails. In winter, majority of the trails are kept clean of snow for walking.

The Bicycle Route Network

In Helsinki Metropolitan Region, all bicycle trails and other recreational paths suitable for bicycling provide about 2,600 km of trails or street side bicycle tracks; and from those about 1,200 km are in the City of Helsinki. Helsinki has a special plan for a 'city level' main recreational route network. This 'core' trail system is almost 500 km long, and about 85% of the planned core network is completed. Almost all the links of this network are provided for both pedestrians and cyclists. The paths are located in and between recreational areas and also make connections to housing areas. About three-quarters of the network are in a recreational environment, but commuters also use it. Now, a similar network plan is completed for the whole Helsinki metropolitan area. Seaside routes are of great value for recreation and there are altogether 90 km of seaside or riverside bicycle paths in Helsinki.

There are three designated landscape routes, which are marked on a bicycle map, and 27 special 'neighborhood district bicycling routes', some of which are themed and have special signage. These routes are 12–27 km long, and run past historical, architectural and other cultural attractions as well as nature attractions. One can get the A4 brochures of these routes from the libraries and from the Internet.

Photo 9.2 Hiking trail in Helsinki – in forested areas, the same trail network is used for several activities including walking, hiking, running and bicycling (Photo: Metla/Erkki Oksanen) (*See Color Plates*)

Photo 9.3 The majority of hiking trails are located in urban forest areas in Helsinki, Finland (Photo: Metla/Erkki Oksanen) (*See Color Plates*)

Project Elements that Contribute to the Promotion of Physical Activity

Access: The core bicycle trail network is located in recreational areas within green corridors, meaning in the urban forest or in other green spaces. They are well connected to housing areas.

Safety: The majority of crossings with major streets or roads are facilitated with bridges or road tunnels.

Conditions: The majority of the bicycle trail network is facilitated with lightning in the dark season. In winter time, some parts are managed for bicycle use; some parts are converted into skiing tracks (see below).

Features related to green space: About three-quarters of the core network are in a recreational environment (in green space).

The Cross-Country Skiing Trail Network

In the winter time, the City of Helsinki maintains a trail network for cross-country skiing. When the snow conditions allow, about 200 km of ski trails are prepared. It is possible to follow the ski trail network for 11 km from a downtown entrance point, to the northern end of the Helsinki Central Park (Photo 9.4). In addition, many other recreational areas have a groomed ski trail network. When ice-conditions allow, also ski trails are groomed along the coastline on the ice. Early in the season,

Photo 9.4 Skiing trail in Helsinki – Ski tracks are groomed on part of the trail network when the snow conditions allow (Photo: Metla/Erkki Oksanen) (*See Color Plates*)

and in winters with poor snow cover, Helsinki provides a shorter ski track, which is maintained with an ice shavings coming from ice-hockey (ice skating) halls. This 'artificial' ski trail is a service for the most enthusiastic skiers. Also, one commercial ski hall provides skiing opportunities based on artificial snow.

Project elements that contribute to the promotion of physical activity

Access: The ski trail network is relatively close to residents, free of charge

Safety: The majority of ski trails are in recreational areas; crossings with major streets or roads are facilitated with bridges or under road tunnels in most cases, and with lightning in the dark hours of the ski season.

Conditions: Regularly groomed during the season.

Features/facilities: Outdoor Recreation Centers have rooms for changing clothes, showers and saunas.

Promoting the Trail Network in Helsinki

A Helsinki Metropolitan Cycling and Outdoor Map is published every third year in the Helsinki metropolitan area. The first map was published in Helsinki in 1975. The 2008 edition was printed in 525,000 copies. The scale for bicycling map is 1:35,000 and for other outdoor activities 1:40,000. The map is distributed free of charge at sports centers, libraries, at the tourist office, and in some other places. It is targeted primarily at all city residents, but also at tourists. Helsinki also provides brochures of the above mentioned 'neighborhood district bicycling routes'. Outdoor maps are also available in the Internet and there is a special journey planner for bicycling and other trail activities in the Helsinki Metropolitan Area, where you can

choose your route for instance according to the type of pavement and by interest points. The outdoor recreation and bicycling map shows all parks, recreational areas and green corridors. Trails are marked with different marking: multiple use trails for walking and bicycling, riding trail and skiing trails. On the back side of the map, different types of services are located and described. Also attractions of cultural and natural interests are included.

9.3.2.2 Lisbon, Portugal

Alameda Keil do Amaral (Keil do Amaral Promenade), Parque Florestal de Monsanto

Alameda Keil do Amaral is part of Parque Florestal de Monsanto and was designed by Keil do Amaral, in 1946. Parque Florestal de Monsanto, located on the hill of the same name, is deemed the city's 'green lung', due to its natural elements, size and scale, which is approximately 900 ha. As a consequence of this urban forest's large extension, the planner created several smaller pocket green areas within the forest which are connected by roads. During the 1980s, this area was seen as an unsuitable area for use, due to a lack of control, as well as poor maintenance. From the 1990s on, the Municipality of Lisbon has again been investing in the Parque Florestal de Monsanto and in order to promote its active use and recreation in the smaller green areas, several action were taken to renew the design and environment: preparing circuits, improving road surfaces, spreading the recreational options and providing users with greater security.

Located in the southern part of Parque Florestal de Monsanto, with extraordinary views of the River Tagus, Alameda Keil do Amaral (Photo 9.5) consists of a 1,300 m long promenade surrounded by green areas, which include barbecue areas, an amphitheatre, viewpoints, sports fields and parking facilities. In 2003 this promenade was permanently closed to traffic, resulting in one of the most important places for physical activity, such as walking, jogging and cycling, mainly during the weekends. A study conducted in 2004 (Soares et al. 2005; Almeida 2006) revealed that Parque Florestal de Monsanto was one of the public green spaces most frequently visited and used by Lisbon residents at weekends.

Project's Elements that Encourage and Promote Physical Activity

Three important components make Alameda Keil do Amaral an attractive area to visitors: the trees, the trails and the views. The trees, and all other vegetation present in the park, are of an exceptional size and shape and have a pleasing appearance, making them the most valuable component in these environments. They create an extraordinary visual frame and natural scenery for the trails and other recreational areas. The trees and vegetation, not only provide high aesthetic value, but also fulfill an important role in terms of bioclimatic comfort. The seasons are marked by the

Photo 9.5 Alameda Keil do Amaral, Monsanto (Photo: Ana Luisa Soares) (*See Color Plates*)

vegetation's different color schemes and the area offers mystery and pleasant views. Throughout the area, while strolling on the curved paths and enjoying the resting areas between the dense areas of vegetation, it is possible to experience moments of mystery, contrasted with the extraordinary open views over the river.

Access: The area can be easily accessed by public or private transport and while not located in Lisbon's city centre, it is served by a good road network and can be used by the urban population of Lisbon and the surrounding cities. Due to its natural topography, there are different levels of circulation and some of the paths have a high gradient which may exclude users with mobility restrictions. Nevertheless there are alternative roads that guarantee access for people with disabilities, children and elderly people. This green space's main promenade is paved with asphalt and has a small gradient allowing activities such as roller skating, cycling, walking and running. The secondary level of paths is paved with loose materials such as gravel and soil, offering the possibility to engage in more radical activities, for example mountain biking.

Features: For the older population there is a special trail, 'the Life Trail', composed by ten bases, each equipped with different physical activity equipment. There is also a natural amphitheatre, designed with grass and stone, which offers the possibility for passive recreation and resting from physical activity. This area is one of the few parks in Lisbon where it is possible to hold a barbecue, which turns it into a very attractive area for Lisbon residents, including minorities (immigrants), as it combines gathering for physical and social activities. The park is fully equipped with facilities such as benches, bins, picnic tables and parking facilities.

Maintenance and conditions: This space requires low levels of maintenance, mainly due to its natural characteristics. Most of the vegetation (trees, shrubs, herbs and grass) is natural, well adapted to the soil and the climatic conditions. In terms of materials used, most are rustic (wood, stone, gravel, soil, etc.). Regular maintenance such as garbage collection and maintenance of the barbecue areas is provided by the local authority, which keeps them in extraordinarily good condition.

Safety: The park is located in the vast urban forest, outside the city centre, and it is surrounded by dense areas of vegetation, mainly Pine (*Pinus pinea*). Due to the dense vegetation and the curved paths, that do not always provide clear and open views, the sense of safety can be affected. However, over recent years, the Municipality of Lisbon has invested in the park's security, using police patrols to undertake the surveillance, either on horseback or by car. Consequently, safety has been re-established and the use of the park has increased.

9.3.2.3 Padua, Italy

The Green U Project – Riparian Green Spaces as the Foundation of the Urban Green System

In many countries in southern Europe the spatial organization of cities, deriving from ancient settlements and often from walled medieval cities, allows for very little room for parks and other green spaces. Most Italian cities are far from satisfying the minimum standard requirement of green public space per inhabitant, and furthermore the quality and accessibility of the existing green spaces for physical activity is questionable (ISTAT 2005). Italian cities are tackling the problem of lack of urban green spaces in different ways, depending on the specific urban and suburban structure (Sanesi 2002). The City of Padua has developed a green network of existing and new parks and green corridors that seems particularly fit to provide opportunities for physical activity. Creating spaces and motivations to get people of different ages and social status to exercise has indeed been one of the major objectives of the project.

The City of Padua has a population of 210,301 people of which approximately 20,000 immigrants mainly from North Africa and eastern European countries. It also has a large student population of about 70,000 students. The public open space system covers an area of about 250 ha m, approximately 11 m^2 per inhabitant. The public green network of the City of Padua includes the historical green spaces of the city centre, mainly located next to the 15 century walls, the semi-natural riparian areas of the river network that characterizes the city, and of the many new neighborhood parks included in the suburban areas of new development. The primary role of the riparian corridors in the development of a green system in Padua has been recognized since the 1980s and early 90s when a preliminary plan was developed by Roberto Gambino, from the University of Turin. In the plan two main corridors were identified along the major rivers, Brenta and Bacchiglione, and these corridors represent the most natural section of the green system. The two main corridors are connected through three secondary corridors along the inner channels that cross the city and

adjacent to the city walls. The main existing parks and green spaces are connected with the corridors and the new park development takes place in areas that have direct access to the corridors.

Based on this preliminary scheme, the Green U system was developed since 2004. The project started with the creation of a walking and cycling trail on the river levees (See Photos 9.6 and 9.7). A surface of crushed granite was put in place, a lighting system was established, and a bike and pedestrian bridge was constructed in an area of possible conflict with heavy road traffic. An agreement was reached with the Water Authority to plant trees on the levees and in the riparian areas, without endangering the hydrological stability of the river system, in order to provide a shady, more natural and pleasant environment for the user. New planting has taken place since 2005. To create further opportunities for exercise some gym trails have been developed with the advice of specialists in physical training and fitness. To attract people to the linear park some facilities have been developed. Two artificial beaches, for sunbathing, were built along the rivers and given in concession to private enterprises, also to provide better surveillance. The direct connection of the green corridors to free sport fields (soccer, basketball) and to playgrounds in the neighborhood parks creates further active recreation opportunities.

The Green U system, which will in the future be connected with a larger green space system surrounding the entire city, includes today a 14 km continuous walking

Photo 9.6 Padua Green U – existing riparian vegetation helps creating 'natural' views from the trails, in close proximity to a densely populated city (Photo: Paolo Semenzato) (*See Color Plates*)

Photo 9.7 Padova Green U – joggers on river levee; new planting and night lighting has been provided along the path (Photo: Paolo Semenzato) (*See Color Plates*)

and cycling trail, and takes approximately 60 min to complete by bike and 3 h on foot. The connection with the city's bike route system, with appropriately located parking lots and with public transportation, makes the system accessible at many locations and allows a choice of short or long walks and rides.

The city's 'Parks and Gardens' and 'Sport' departments are promoting many activities to publicize the existence of the park system and to encourage its active use. A pamphlet 'Naturalmente Padova' (Padua naturally) is available on the City's website and provides a description of the system with maps and relevant information for its use. Another leaflet has been published to propose appropriate, self instructed, physical activities and exercises for adult users of the park system In the summer months, organized activities take place in the parks under the city's sponsorship. A special event called 'Gustando il verde' (Tasting the green) has been particularly successful in bringing more people to the parks with their bikes and getting them involved in physical activity. The event takes place three times a year, and is a 20 km

bike ride through the Green U and some of the city parks, with traditional food tasting stations located along the route.

Project Elements that Contribute to the Promotion of Physical Activity

Access: Because of its shape and location, the Green U is easily accessible from most residential areas of the city. The system can be accessed from many of the public parks and connects many of them to one another. The Green U is linked to the urban and regional bike routes system (still under development). Access to the Green U is well served by local public transport, including the newly implemented surface metro-bus line. Access is free.

Safety: The trails are isolated from car traffic and new bridges for cyclists as well as pedestrians have been constructed when necessary to avoid safety issues in the use of existing crossings. Trail and surrounding areas are well lit at night. The design of the new planting allows the preservation of views to the surroundings and avoids the creation of potential concealment areas and hiding places. The presence of organized activities and private concessions improves surveillance, both directly and indirectly by promoting use throughout the day. The presence of many access points also provides many escape routes, generally avoiding the risk of entrapment. The elevated position of the trails (most of them are located on the top of the river levees) allows ample views to the surroundings increasing the perceived safety of the users.

Conditions: The system is characterized by a low maintenance landscape and the maintenance can easily be provided by the City. Areas with higher maintenance requirements are part of private concessions. The relatively intensive use of the trail seems to have reduced problems of vandalism and garbage dumping that was much more frequent before the implementation of the project. A sense of ownership of the users and surrounding residents appears to have been created.

Features/facilities and programs: The combination of the 14 km trail, access to sport fields and playgrounds, the presence of sunbathing beaches that have to be accessed by bike or on foot, all provide attractive opportunities for recreational use of the green system in an active manner. Public and private (non profit) programs tailored to attract specific users groups have been successful in promoting active use of the Green U.

Aesthetics: The Green U partially surrounds the entire city, providing changing views over a diverse urban, suburban and agricultural landscape. The existing vegetation and the new plantings create in many areas a sense of being in a natural environment, enhancing the recreational experience. Some of the linked public parks offer an even greater immersion in a ‘natural’ environment. The new bicycle and pedestrian bridges offer attractive examples of modern architecture and technology, contrasting with the otherwise ‘natural’ aspects of the trails. The new plantings will in the future provide protection from direct radiation and glare, making the walking and biking experience more pleasant in the heat of the summer months.

9.3.3 Local Projects

9.3.3.1 Lisbon/Loures, Portugal

Parque Tejo e Trancão (Tagus and Trancão Urban Park), Parque das Nações

Parque Tejo e Trancão (Photos 9.8–9.10) is an example of a highly successful urban park in Lisbon. This park is one of the green spaces designed during the construction of Parque das Nações, a new urban and environmental development project in a valuable, but inactive industrial area, located on the riverfront. Parque das Nações was designed by PROAP practice (Estudos e Projectos de Arquitectura Paisagista, Lda) in association with Hargreaves Associates. Parque das Nações is located in West Lisbon and is surrounded by the River Trancão and by the River Tagus. Parque das Nações has a total area of 340 ha, of which 110 ha are green space. One of the most attractive natural features in this area is the River Tagus, a vast water surface, which offers a high visual quality along the 5 km of riverfront. Parque das Nações was from the beginning designed to have two uses: to host the Lisbon World Fair 1998 (Expo'98), and act as the driving force for the development of a new city (Castel-Branco 1998, p. 36). This project was part of an attempt at environmental urban renewal, in which planners aimed to create an ideal city with green spaces, residential areas, services and infrastructures contributing to a well-balanced life style for the inhabitants. Based on the initial analysis of the area, and in order to achieve high quality and highly innovative urban planning concepts and designs,

Photo 9.8 Parque do Tejo e Trancão (Photo: Ana Luisa Soares) (*See Color Plates*)

Photo 9.9 Parque do Tejo e Trancão (Photo: Ana Luisa Soares) (*See Color Plates*)

Photo 9.10 Parque do Tejo e Trancão (Photo: Ana Luisa Soares) (*See Color Plates*)

four important recommendations were made to the planners and designers: (1) to create landmarks in the predominantly flat urban space, and to break the barriers, specially the railroad line; (2) to value the river and the riverfront; (3) to improve accessibility and to promote circulation; (4) to recover the environmental quality and to define a strategy for tree planting (Castel-Branco 1998, p. 33).

Initially the Parque Tejo e Trancão project was expected to cover approximately 90 ha of riverside area, however so far only 50 ha have been completed. As part of guidelines and recommendations for the overall planning, and among the ecological principals that riverside ecosystems require, five major objectives were defined for Parque Tejo e Trancão, (Walker and Castel-Branco 1998, p. 48): (1) areas for leisure/informal sports such as bike trails, fishing piers and pedestrian walks designed for multiple uses; (2) areas for competitive sports including tennis courts and other fields sports; (3) areas for passive activities; (4) areas for cultural activities; (5) areas for environmental and artistic education.

The park area was characterized by generally poor environmental quality, dominated by old and dismantled industrial units from the sanitary landfill site and Sewage Treatment Plant, the presence of waste and high levels of pollution in the River Trancão. On the other hand, the proximity to the River Tagus Estuary demonstrates the environmental, ecological and visual potential of this landscape. Eight years after completion, it is possible to verify that the objectives were successfully achieved, as can be seen from the daily flow of people engaging in different types of activities, including physical activities such as: walking and/or running, cycling, skating, a variety of sports, etc.

Project's Elements that Encourage and Promote Physical Activity

This project's design concept was inspired by the idea of bringing the rivers' 'waves' into the flat area, "*evoking the meeting of the wind and the surface of the water*" (Walker and Castel-Branco 1998, p. 52). This was achieved by introducing green slopes/landforms, creating movement and linking the green areas and the surrounding buildings. By using this concept, the design set out to establish a strong visual and aesthetic appeal which was achieved by the spatial structure of the design layout, so as to create unity. This structure emerged from the combination of three complementary systems: the green structures; the network of trails and paths; and the landforms produced by a complex topographic solution. The landforms' structure creates a sense of diversity of spaces and rhythm throughout the park, where users are able to engage with two different views, a panorama across the river and the vast, flat lawns, and an enclosed view between the green slopes.

In order to create an appealing green area, detailed attention was given to the planting scheme, balancing its aesthetic values with the specific ecological nature of the area. The vegetation offers different colors and textures, through the flowers, leaves and fruits which vary along the different seasons, creating a multiplicity of scenarios. Another important role of the vegetation is expressed by the shape of the trees, especially by the umbrella shape of the Pines (*Pinus pinea*). This type of tree works as a sculpture

on its own, punctuating the space, giving the notion of coherence and unity among the green elements. The vegetation scheme along with the topographic solutions provided by the green slopes, balance the most adverse climacteric situations to generate a micro climate. The trees provide shade during the hot summer days, and the landforms protect against the strong, breezy winds.

Access: The park is surrounded by residential and commercial areas (hotels, shopping centers, offices, etc.), providing straightforward and easy access to local residents. The area is also served by a good public transportation network (buses, train station, underground), and there is a wide range of parking spaces. For this reason, this park is also used by non-residents from other parts of the city who travel there to take part in different activities (passive and physically active) especially at weekends. Apart from the roads, there are no physical barriers between the green space and the built environment, allowing good pedestrian circulation. This proximity plus the way the green area and built environment are integrated encourage people to visit a green space on a more regular basis. Also, unlike Lisbon's hilly topography, this area is predominantly flat, being the perfect place for cycling, running and walking for recreational purposes or physical activity. It also caters for different types of users, such as older people, people with disabilities and children, who can interact with the environment and take part in physical activities.

Features/facilities: In terms of features, there are three different levels of circulation, which translate into three types of paths, defined by the use of different materials and dimensions. These paths create diversity in the space by breaking the monotony of the flat environment, allowing a multiplicity of different routes, as well as different visual corridors. There is a promenade along the riverfront which allows the users to choose between a 5 km linear trail along the river or to do smaller circuits between the green space and the residential area. The park is characterized by vast lawns which create informal areas that make the park appealing for different types of physical activities. The users are free to use the space according to their preferences, and the same lawn can used for football, tai-chi, volleyball, etc. The whole area has facilities such as benches, drinking fountains, bins, small cafes, and parking facilities.

Conditions: The park has a high level of maintenance and the entire environment is extremely appealing. The extensive areas of lawns and the other types of vegetation are all well kept throughout the year. Not only the fact that this project is located along the river, but also the high levels of use, led to a specific choice of vegetation adapted to the soil and climate conditions, and consequently requiring lower levels of maintenance. During the design phase many studies were conducted regarding the selection of plants, lawns and trees for this area, in order to find the best ecological solution. Most of the trees chosen for the project were planted experimentally in order to determine the feasibility and adaptability of the vegetation to the local conditions and constraints (Walker and Castel-Branco 1998, p. 63). In terms of inert materials, specific design details and materials were chosen in order to construct durable project solutions and avoid pavement drainage problems and vandalism. The overall high level of maintenance allows users to explore the environment and to be physically active without worrying about possible obstacles or hazards.

Safety: The safety of this park is perceived as high. The park's layout combines open areas with more enclosed ones. Although the enclosed areas have a dense vegetation scheme linked to the green topographic conceptual design, the perceived safety is given by the wide paths and the strong lightning scheme. The crime rate in the surrounding neighborhood is low, contributing to a high level of objective safety.

9.3.3.2 Helsinki, Finland

Maunula Trail

A special trail is available for elderly and physically disabled people in Helsinki. It is located in a small park next to several social and health service units such as a hospital, a health care centre, a social service centre and two nursing homes for elderly people. There are plenty of elderly and disabled trail users living in the nursing homes. The park where the trail is located is a small forest with natural vegetation. The design and construction of the trail is adapted for people moving with wheel chairs, walkers and other types of supporting equipment, for blind people as well as for people with memory problems. The trail is easy and safe to walk. The trail was opened in 2004.

The main trail is 250 m long, with an additional link of 50 m connecting the main trail to the health care centre. There are several sites for resting and just spending time, where there are opportunities to enjoy the nature. The track is 3 m wide and covered by firm sand/gravel. The whole trail is flat, and there is a rail at the inner rim of the trail. The rail helps, for example, elderly with a memory disorder to keep track back to the starting point. On the other rim of the trail there is a 30 cm wide stone edge, which also helps people to keep on track. The whole trail is well-lit. The resting sites, with benches of different heights and shapes, are situated about 50 m apart. The benches are in bright colors, yellow and orange. Plenty of traditional garden plants, which are suitable for the natural forest environment, were also planted along the trail to bring back memories of former homes and gardens. There is also a feeding place for birds.

This is a unique trail in Finland at the moment, also because it is a result of close cooperation with local residents. One local individual, Salme Kurki, took the initiative, and participated in the planning process throughout the whole project. The trail is also a pilot project for building suitable green environments for disabled people. The project was completed together with City of Helsinki (agencies for construction and social work for elderly and disabled) and the local resident forum. In the planning process, residents and staff in the nursing homes, as well as other elderly people living close by, were interviewed and their local knowledge and needs were considered.

Project Elements that Contribute to the Promotion of Physical Activity

Access: The trail is located in a small recreational area with easy access and short distance from public and private nursing homes and a hospital for elderly and disabled people.

Safety: The trail design has paid special attention to the safety issues such as flat terrain and pavement, and rails along the trail.

Conditions: The trail is facilitated with lightning and benches for resting.

Features related to green space: The trail is located in a small forest park.

9.4 Conclusion and Planning and Design Guidelines

Accessible and aesthetically attractive green spaces are positively correlated with physical activity. There is evidence that people are more likely to engage in frequent physical activity when high quality green space and a well maintained outdoor environments are available close by. The value of green spaces as physical activity resources is correlated to frequent use by a high number of people. Some physical attributes of parks and other green spaces can influence their use for physically active recreation, and attract users. Evidence on the effects of accessibility, attractiveness, the presence of facilities, and real and perceived safety, has been presented in this chapter. Although, with the current evidence base it is not possible to give a complete answer on how the quality of the physical attributes of green space affects use, and how people incorporate green space within the variety of strategies they use to maintain physical and psychological health (CSC Consulting 2005), it is nonetheless possible to suggest some guidelines for the planning and design of urban green spaces.

9.4.1 Planning and Design Guidelines

9.4.1.1 Accessibility

- Parks and other public spaces should be connected to one another as much as possible
- Park locations should take advantage of utility corridors, or multilevel trail corridors were possible
- Link parks, trails, and greenways to local destinations of interest to ensure that walking trips are as convenient, or more expedient, than using a car.
- Park and open spaces should be central to the population they serve and possibly access to parks should be within 500 m or 10 min walking from users dwellings
- Within settlements there should be spaces that can be used by everyone, regardless of age, gender or disability
- Develop neighborhood park and recreation facilities in new subdivisions and in currently underserved residential areas
- Locate neighborhood park and recreation facilities to be easily and safely accessed by most people, especially children

- Utilize smaller sites for youth sport activities (versus large scale, regional facilities to which people must drive)
- Utilize public facilities, such as schools, as multi-purpose facilities, especially for recreation services
- Develop a system of trails that is readily accessible to most people
- The design of green spaces should take the needs of the disabled into account, avoiding physical and sensory barriers

9.4.1.2 Features

- Make park layouts easily understandable from for new users, through easily locatable entrances and exits, appropriate signage, clear connections and destinations of walkways and bicycle routes
- Offer features for passive use such as benches, picnic tables, and barbecues
- Design a good trail and path network with different attributes in order to increase the active use by promoting different activities for different types of users
- Create areas (green or non green) for informal uses and different activities
- If possible, offer a café or restaurant, toilets, and car and bicycle parking facilities
- Provide lighting that helps direct movement between destinations at night

9.4.1.3 Safety

- Consider measures to lessen the impact of vacant, derelict or problematic land uses nearby a park site
- Make sure the edges of a park are open enough to allow views in and out of the park
- If possible, locate at least one activity or facility at the perimeter of the park to create an 'active' edge visible from the street
- Avoid the use of dense vegetation, walls or other feature that can block views or signage along the primary routes
- Avoid use of dense vegetation close to pathways to maintain a feeling of openness and clear visibility and limit potential entrapment areas
- Design pathways to concentrate night movement along well lit routes
- Encourage, through planning and design of facilities and programs, evening and nighttime activities to ensure user surveillance throughout the day
- Locate activity areas to encourage surveillance of access and major routes in the parks
- Design lighting to enhance real and perceived safety through sensible choices relating to visibility of others and visibility by others
- Use lighting to illuminate potential concealment areas and hiding places
- Design a clear hierarchy of car, bike and pedestrian routes within the parks to ensure safety for users. Use vegetation, topography and structures to provide adequate separation

- Employ car speed reduction and traffic calming measures near park entrances, trails and greenways to provide safer access

9.4.1.4 Conditions

- Create active and well used spaces so that undesirable activities or vandalism would be less likely to take place
- Locate park facilities to avoid potentially conflicting uses
- Provide adequate access to park and park features to avoid shortcuts, damage to structure and vegetation, excessive wear of turf grass
- Designate a dog running area in the park big enough to appropriately serve the dog owner population in the area served by the park
- Provide trash cans in convenient locations to encourage use
- When developing new parks, consider maintenance as an element of the open space from the assessment of the preliminary proposals to the final design, to ensure appropriate choices for long term management
- Ensure, through adequate long term planning and funding, that parks, trails, and greenways are constantly maintained and receive the necessary infrastructure improvements
- Design parks, trails, and greenways with multiple users in mind and solicit community participation and feedback to assess community needs and interests, and to create sense of ownership
- Inspect and maintain trees and vegetation with appropriate arboricultural practices to prevent hazard for park users

9.4.1.5 Aesthetics

- Apply conceptual approach to design a balanced, attractive and functional space
- Use combination of different materials, vegetation and path layouts
- Employ attractive planting scheme – combining textures, colors and shapes
- Create an appealing scenery with interesting views
- Create interest during different times of the day and of the year

9.4.1.6 Climate and Microclimate

- Consider local climate and microclimate in the design process
- Provide shade or maintain solar access through use of vegetation to provide comfort conditions for different activities and users
- Use water bodies and vegetation to influence temperature, relative humidity and breezes to provide climatic comfort

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