

# Promoting measurable indicators for sustainable development of open areas in neighbourhoods-with special reference to Khartoum Town-Sudan

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**Abstract:** The research reported in this paper identified indicators for sustainable planning of open areas in neighbourhoods. The research was performed in the new residential developments in Khartoum Town (El Riyadh (1972), Nasr Extension (1972) and El Mujahedeen 1988), compared to older neighbourhoods (Khartoum (2) (1950), El Diem (1953), and Alamarat (1958)). The research problem is that some of these areas are typically single-use residential areas, with small undeveloped open spaces and poor landscape design. The research is aiming to study the planning of open spaces in these neighbourhoods; collect, analyse and classify the data to find its impact on the development of open spaces. Then set guidelines to achieve well-used open spaces that can best serve the general public. The research was concerned with recognition of good practices that lead to sustainable development of open areas and promoting measurable development indicators such as index of sufficiency, accessibility, safety of the users and social-inclusion dimensions. The analysis focuses on some physical parameters of open spaces e.g. area, fencing, green coverage and types of facilities available (lighting), and some behavioural parameters i.e. type of activities, group of users, developers and managers of open spaces. The results confirmed a lack of a comprehensive development programs and reliable statistics for open spaces that leads to poor variety of outdoor activities. The research found that most of the successful examples of developed open areas of the surveyed neighbourhoods are managed by community groups (public participation).

**Keywords:** sustainable planning, neighbourhoods', open spaces, measurable indicators, out-door activities.

## Introduction

Open space is the publicly owned land that is set aside primarily for recreation, nature conservation, passive outdoor enjoyment and public gatherings. This includes public parks, gardens, reserves, waterways, publicly owned forecourts and squares. Joan Clos (2016) in the foreword of "the city at eye level" said: "*The character of a city is defined by its streets and public spaces. From squares and boulevards to neighbourhood gardens and children playgrounds, public space frames city image*".

Green areas are very important as sustainable drainage system, solar temperature moderator, source of cooling corridors, wind shelter and wildlife habitat (UN Habitat 2015) . Green areas can reduce noise pollution and the visual intrusion from traffic. The risk of flooding is lower where there is plenty of urban vegetation to intercept and absorb storm water. Urban green areas provide a diverse habitat for many common bird and animal species. There is no comprehensive assessment of challenges or factors behind deteriorating condition of urban green spaces in Africa (Mensah 2014), he gave examples of how high rates of urban sprawl and informal settlements destroying green vegetation in Africa e.g. Reduction in green vegetation from 21% to 12.9% in Abuja due to urban sprawl. The proportion of green spaces appears to decrease in relation to the proportion of residential areas and the proportion of forest, which means that urbanization negatively affects the quantity of urban green spaces, whereas the existence of natural green spaces such as a forest may be seen as a substitute for urban green spaces (Baycan and Nijkamp 2007).

A recent critical review research on green space and quality of life conducted by Green Space Scotland (2008) revealed that physical exercise in green spaces is generally positively associated with promoting well-being and recovery from stress. Also, green space plays a

role in providing places for social interaction and there is some evidence that green spaces do actually promote social cohesion amongst and between different groups in different places, such as parks and gardens. Moreover, individuals who have some nearby vegetation or live closer to green space seem to be more effective in managing major life issues, coping with poverty and performing better in cognitive tasks.

At present, society seems to be polarized. At one extreme are older, more affluent, better educated, more environmentally aware people, who are often the most active users of the countryside and green spaces. At the other extreme are younger age groups, ethnic minorities, who are often much less engaged. These groups have very different values and attitudes. But most people need to access and enjoy different types of landscape at different times and for different purposes (Swanwick 2009). The neighborhoods we live in shape our behaviors and influence our health in other important ways hence, the physical, social and service environments of neighborhoods can promote health or put health in jeopardy (The commission to build healthier America 2008).

Access to, use of and engagement in green space in neighbourhoods can contribute to people's levels of satisfaction and sense of community (Jennings et al 2016).

There are also other positive social uses of open space such as bring people together, build stronger communities and contribute to a healthier society. One of the proposed targets of the United Nations (2016) Goal 11 of the SDG, is *"by 2030, provide universal access to safe, inclusive and accessible, green and public spaces, particularly for women and children, older persons and persons with disabilities"* beneath this target, are specific metrics, called **indicators**, by which progress of the target can be measured and tracked. Measuring public space is not easy, there has been a debate at the Stockholm conference —on what to measure and how to measure it (You 2015). The indicator **now under consideration by the U. N. Statistical Commission** is a quantitative one that would specify the area of public space in proportion to a city's total space. However, there are some parameters that can be considered such as: the safety of women, the elderly and children be ensured in public spaces and the social-inclusion dimension. From 1980–2000, total recorded crime rates in the world increased by about 30% and it is estimated that about 15% of those crimes have a public space design and management component (The Habitat global report on human settlements 2007).

### **Selected Case Studies**

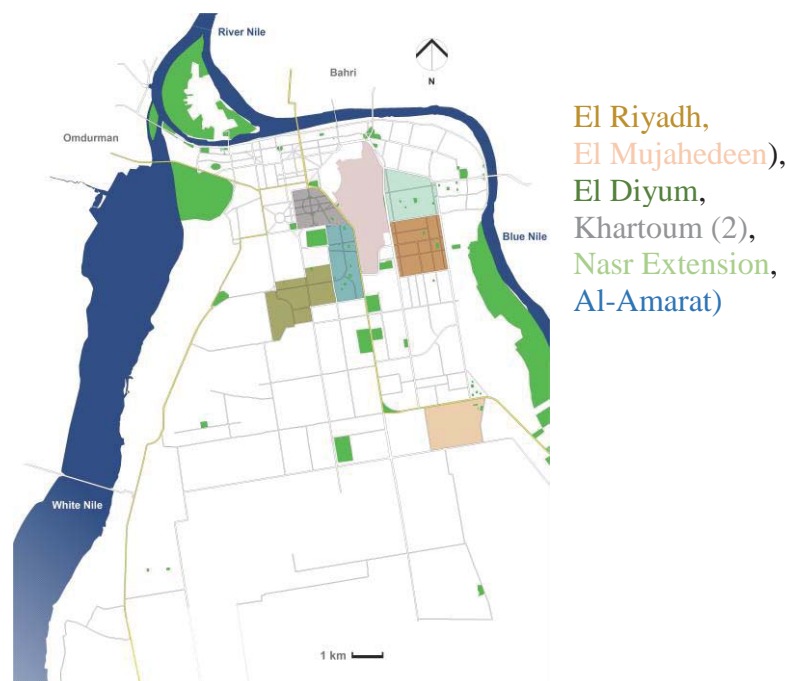
**Khartoum town**, together with the two cities, Omdurman and Khartoum North, constitute the National Capital of the republic of Sudan. It forms a huge triangle. Its population has grown to over 5 million people. The climate is mainly hot desert climate, with an average temperature of 38 C in summer (it may exceed 45°C especially in May), and 24 C in winter, and the total rainfall in autumn is 167 mm. The relative humidity may sometime be low as 20 percent. The unpleasantness of heat during the summer is worsening by the occurrence of dust-storms. Protection from hot dry winds and dust storms is the main target for planners and designers in this climate. open spaces in Khartoum state have been classified into four main classes based on parameters of number of population served and zone of service see table ( 1) below.

Table (1) Classification of open spaces in Khartoum (source: Alhuseen 2015).

| Open space          | No. of population | Service zone (m <sup>2</sup> ) |
|---------------------|-------------------|--------------------------------|
| Neighbourhood court | 500-5000          | 300-500                        |
| Residential garden  | 10,000-20,000     | 2,000-5,000                    |
| Communal garden     | 20,000-50,000     | 2,000-5,000                    |
| City park           | 100,000-150,000   | Bigger than that               |

Sudan is classified by the United Nations as one of the Least Developed Countries; low levels of economic development reflected in neglecting public spaces so that most of neighbourhood's open areas are undeveloped for a long time. Lack of development of neighbourhoods' open spaces and thus non-use for these areas make it mostly converted to another purpose like dumpsite or places to gather homeless. Lately, the government began to takes these spaces, and sold them as residential land. Thus, some neighbourhoods in Khartoum town lose totally or partially their open spaces. For this reason, the residents began to develop their neighbourhoods' open spaces to prevent government authorities from violating it, and to improve the quality of their neighbourhoods.

The research was performed in six neighbourhoods in Khartoum Town- First class residential areas: Khartoum (2) and El Mujahedeen, second class residential areas: El Riyadh and Al-Amarat and third class residential areas: El Diyum and Nasr Extension. Location of these neighbourhoods is shown in fig (1) below.



**Fig (1) Location plan of the selected neighborhoods**  
(source: Khartoum Structure Plan 2012)

The research has two methodological phases: (1) a comparison between neighbourhoods by criteria (geospatial data) describing their physical characteristics and (2) a behaviour observation (user-perception surveys). The research has followed qualitative and quantitative methods which included: analysis of documents, photo documentation, observation, and statistical data.

## Discussion

**Planning Pattern:** Neighbourhood open space can take several sizes, shapes, and purposes relative to the class of the residential area. Residential areas have three distinctive classes; first, second and third. the open spaces have hierarchy according to hierarchy of housing cluster, they range from semi-communal open spaces within plots of houses up to communal open spaces which serves larger group of houses. The hierarchy (semi-communal and communal) does not exist in all neighbourhoods. Old neighbourhoods have hierarchy of open space e.g. Al-Diyum neighbourhood, each plot of houses should have direct access to the semi-communal open space (see fig (2)). While new neighbourhoods have non-hierarchical open spaces e.g. Al-Mujahdeen Neighbourhood (fig (3)).



Figure (2) hierarchy of open spaces in Al-Diyum Neighbourhood (source: Google Map 2016)



Figure (3) non-hierarchical open spaces in Al-Mujahdeen Neighbourhood (source: Google Map 2016)

The total No. of open spaces in the selected neighbourhoods is 187 with total area of 558,699 m<sup>2</sup> while the total No. of the developed open spaces is 35 with total area of 154,050m<sup>2</sup> which represent only 27,6 % of the total area as shown in Table (2).

Table (2) Open spaces in the selected neighbourhoods (source: the researcher)

| Neighbourhood      | Residential class | Area (m <sup>2</sup> ) | Inhabitants (person) | No. of open spaces + area (m <sup>2</sup> ) | index of sufficiency | developed open spaces + Area (m <sup>2</sup> ) | developed open spaces % |
|--------------------|-------------------|------------------------|----------------------|---|----------------------|--|-------------------------|
| 1. Khartoum (2)    | First             | 1,457,870              | 4,871                | 13<br>41,850                                | 8.9                  | 6<br>27,490                                    | 65.7                    |
| 2. Al-Mujahdeen    | First             | 900,000                | 5552                 | 12<br>18,800                                | 3.9                  | 4<br>6400                                      | 34.0                    |
| 3. Al-Riyadh       | First+ second     | 2,774,538              | 12,797               | 31<br>107,000                               | 8.7                  | 3<br>15,800                                    | 14.8                    |
| 4. Al-Amarat       | second            | 2,050,160              | 8,184                | 31<br>38,120                                | 4.7                  | 8<br>21960                                     | 57.6                    |
| 5. Al-Diyum        | third             | 2,562,896              | 29,616               | 65<br>226,609                               | 7.7                  | 8<br>48400                                     | 21.4                    |
| 6. Naser Extension | third             | 2,214,515              | 22205                | 35<br>126,320                               | 5.7                  | 6<br>34000                                     | 27.0                    |

The percentage of developed open spaces is higher in first and second class residential neighbourhoods e. g. Khartoum (2) (65%) and Al-Amarat (57.6%) than third class residential neighbourhoods Naser Extension (27 %) and Al-Diyum (21,4%) as shown in figure (4). In these neighbourhoods' inhabitants are affluent and can afford spending some money to develop their open spaces.

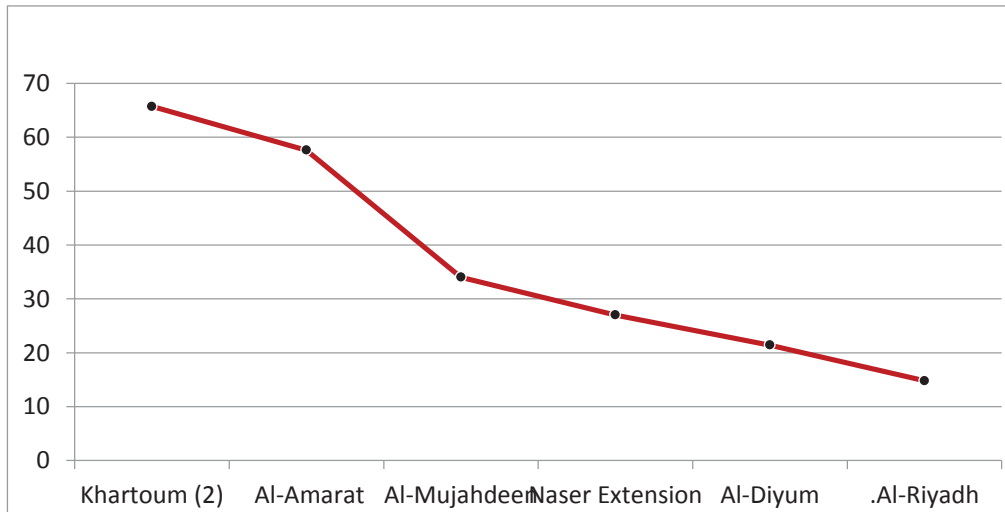


Figure (4) Percentage of the developed open spaces in the selected Neighbourhoods (source: the researcher)

**Functions:** User-perception surveys revealed that developed open spaces within the selected neighbourhoods differ in functions. Each community has variety of activities that can be performed in open spaces. It's clear that the most activities and occasions occurs in outdoor spaces are: children playing, sports, social adults gathering, wedding parties, mourning the dead and eating in Ramadan. Developed open spaces can be categories upon their use to four groups:

1. Outdoor Recreation: Neighbourhood garden that contains recreational facilities, active playgrounds and gardens with sittings e.g. a garden in Al-Amarat (see figure (5)).



Figure (5) Neighborhood garden in Al-Amarat (source: the researcher)

2. Aesthetic Purposes: Green open spaces developed and managed by non-profit organizations aiming to serve the community and improve the aesthetic of the neighbourhood, not containing seating or recreational tools, such as spaces that created by splitting of streets e.g. Badr Park- Khartoum2 (see figure (6)).



Figure (6) Badr Park- Khartoum2 (source: the researcher)

3. Gated open spaces: Green open spaces developed and managed by individuals and in some cases also owned by individuals. Some developers think that, the use of these spaces by the public makes it deteriorate, hence the running cost of development and maintenance is very expensive. So that some developers prevented public to use them and others allow public to access, walking through and taking photos, but there are no places for sitting or playing e.g. Dr.Nabil Rafael Garden (see figure (7))



Figure (7) Dr.Nabil Rafae lGarden (source :the researcher)

4. Community Centres or neighbourhood clubs: Developed open spaces are used as "community centres" which contain recreational facilities according to the needs of the inhabitants, who always participate in its development. These facilities include: - Sports fields, Lounge to watch TV, Commercial activities (restaurant, coffee shop). some of them contain kindergartens and evening classes for school students'. Al-Diyum community centre (see Figure (8)).



Figure (8) Kindergartens in a part of the community centre (source: the researcher)

**Indicators of sustainable development of open areas in neighbourhoods:**

**Index of sufficiency of open spaces:** The index of sufficiency of open spaces is the fraction of the square meters of open space by the number of the neighbourhood inhabitants. The research found that old neighbourhoods e.g. Khartoum (2) (8.9) and Al-Diyum (7.7) have higher index of sufficiency of open spaces than new Neighbourhoods e.g. Naser Extension (5.7) and Al-Mujahdeen (3.9) see table (2) and figure (9) This indicates that planning approaches in 1970s were aware of the importance of providing sufficient open spaces in neighbourhoods.

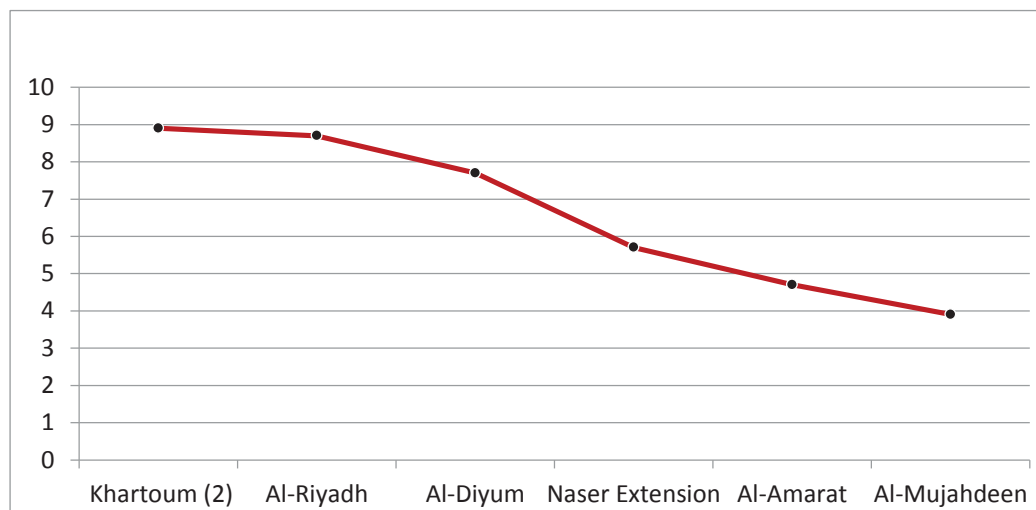


Figure (9) Index of sufficiency of open spaces in the selected neighbourhoods (source: the researcher)

**Social-inclusion dimension:** Unfortunately, most of the developed open spaces are fenced (see table (3)) which indicate a growing tendency of green space being locked behind walls and preventing the public from using them and enhance the social inclusion dimension.

**Accessibility:** the accessibility of developed open spaces is related to the number of these areas and their distribution within neighbourhoods. They are obviously randomly distributed within the neighbourhoods so that some of them have good accessibility ranging

from 122m – 500 m e.g. Khartoum (2), Al-Amarat and Al-Mujahdeen (they are first and second class residential areas) and others have bad accessibility ranging from 565m -1075m e.g. Al-Diyum , Naser Extension and Al-Riyad ( they are-except Al-Riyad- third class residential areas) .

**Safety of women and children:** most of these developed open spaces have lighting (see table (3)) , which to some extent guarantee the safety of women, elderly and children walking by or using these areas.

**Public Participation:** Generally, neighbourhood open spaces in Khartoum town are owned by local government authority, in some cases they are privately owned. The privately owned open spaces are usually developed and managed privately by landowners.

In the selected case-studied most developed open spaces are developed and managed by community groups and individuals at their own expense, sometimes have assistance from the town local authorities (localities) as shown in table (3).

The Factors contribute to sustainable management of neighborhood open spaces are :

- A well organized community group with access to resources and services.
- A local person who acts as a leader who can gain support from several City agencies.
- Clear security for the space, usually in the form of fencing.
- Adaptability of the space to the interests of different age groups of users.

Table (3) indicators of developed open spaces in the selected neighborhoods  
(source: the researcher)

| Neighbourhood | Developed open spaces | Area (m <sup>2</sup> ) | Green cover-age % | fence     | developer       | manager         | lighting  | Accessibility (m) |
|---------------|-----------------------|------------------------|-------------------|-----------|-----------------|-----------------|-----------|-------------------|
| 1. Khartoum 2 | 1.1                   | 6,000                  | 50                | available | Community group | Community group | available | 290               |
|               | 1.2                   | 9,000                  | 60                | -         | Private person  | Private person  | available | 122               |
|               | 1.3                   | 6,000                  | 10                | -         | Community group | Community group | -         | 500               |
|               | 1.4                   | 1200                   | 90                | available | Community group | Community group | available | 200               |
|               | 1.5                   | 1200                   | 70                | available | Community group | Community group | available | 130               |
|               | 1.6                   | 5600                   | 85                | -         | Community group | Community group | available | 134               |
| 2. Al-Amarat  | 2.1.                  | 3,960                  | 80                | available | Private         | Private         | available | 344               |
|               | 2.2                   | 2,500                  | 50                | available | Community group | Community group | available | 198               |
|               | 2.3                   | 2,200                  | 100               | available | Private person  | Private person  | available | 434               |
|               | 2.4                   | 5,200                  | 70                | available | Local authority | Community group | available | 241               |
|               | 2.5                   | 2,200                  | 90                | -         | Community group | Community group | available | 418               |
|               | 2.6                   | 1,800                  | 95                | available | Community group | Community group | available | 425               |



|                    |      |        |      |           |                         |                         |           |      |
|--------------------|------|--------|------|-----------|-------------------------|-------------------------|-----------|------|
|                    | 2.7  | 2,900  | 40   | available | Local authority         | Community group         | available | 375  |
|                    | 2.8  | 1,200  | 50   | -         | Local authority         | Community group         | -         | 588  |
| 3. Al-Diyum        | 3.1  | 9,000  | 90   | available | Local authority         | Local authority         | available | 344  |
|                    | 3.2  | 9,600  | 20   | available | Local authority         | Local authority         | available | 565  |
|                    | 3.3  | 1200   | 95   | available | Non-profit organization | Non-profit organization | available | 125  |
|                    | 3.4  | 12,500 | 50   | available | Local authority         | Local authority         | available | 600  |
|                    | 3.5  | 12,500 | 10   | available | Local authority         | Local authority         | available | 850  |
|                    | 3.6  | 1200   | 90   | available | Community group         | Community group         | available | 145  |
|                    | 3.7  | 1200   | 80   | available | Community group         | Community group         | available | 150  |
|                    | 3.8  | 1200   | 30   | available | Community group         | Community group         | -         | 154  |
| 4. Naser Extension | 4.1  | 1,600  | 88.5 | available | Local authority         | Local authority         | available | 245  |
|                    | 4.2  | 1,900  | 98   | available | Local authority         | Community group         | available | 371  |
|                    | 4.3  | 2,800  | 70   | available | Community group         | Community group         | available | 458  |
|                    | 4.4  | 7.700  | 25   | available | Private person          | Private person          | available | 582  |
|                    | 4.5  | 10.000 | 90   | -         | Community group         | Community group         | available | 187  |
|                    | 4.6  | 10,000 | 5    | available | Local authority         | Local authority         | available | 447  |
| 5. Al-Riyad        | 5.1. | 2,400  | 74   | available | Community group         | Community group         | available | 300  |
|                    | 5.2  | 3,000  | 80   | available | Local authority         | Community group         | available | 830  |
|                    | 5.3. | 10,400 | 40   | available | Local authority         | Community group         | available | 1075 |
| 6. Al-Mujahdeen    | 6.1  | 1600   | 90   | -         | private                 | Community group         | available | 385  |
|                    | 6.2  | 1,600  | 40   | -         | Community group         | Community group         | available | 350  |
|                    | 6.3  | 1600   | 80   | available | Community group         | Community group         | -         | 300  |
|                    | 6.4  | 1600   | 60   | -         | Community group         | Community group         | -         | 478  |

### Conclusion

The absence of a comprehensive development programs for open spaces leads to poor outdoor environments in the selected neighbourhoods. Well designed and well managed open spaces can be used for play, recreation, and relaxation they can also encourage neighbourhood's residents to involve in out-door activities which enhance social interaction and sense of community. The provision of open spaces in Neighbourhoods near to where people live can impact significantly on how places are perceived and are valued locally. The results confirmed differences between the physical characteristics of developed open spaces of the selected neighbourhoods.

The research promoted a set of indicators to evaluate sustainable development of open areas in neighbourhoods such as: index of sufficiency of open spaces, social-inclusion dimension, accessibility, safety of women and children and public participation.

The research found that most of the successful examples of developed open space of the surveyed neighbourhoods managed by community groups (public participation). Some landlords follow different approach e.g. development of commercial activities such as cafes within open spaces to meet user needs and to add attraction to the open space and thus the neighbourhood. The revenue used for maintenance and re-developed of the open spaces.

The research confirmed that public participation and control of open spaces in the design and management process both real and symbolic improve the people's satisfaction with community open spaces.

The survey also disclosed a strong influence of a set of socio-economic variables such as education and economic status on development of open spaces by public participation, the comparison between high income - first class neighbourhoods (Khartoum 2, El Mujahdeen) and low income -third class neighbourhoods (El Diem, Nasr Extension) found that urban open space in the first-class neighbourhoods had more services (e.g. tables, toilets) than open spaces in third class neighbourhoods.

It was clear that accessibility of developed open spaces in first and second-class neighbourhoods are better than third class neighbourhoods.

### **Recommendations**

- Prepare a comprehensive development programs for open spaces in all neighbourhoods with specific action programs.
- Involve the community in the design phases of open space to stimulate creative thinking and generate interest and ownership. Engage people in designing and constructing artworks to improve local environments.
- Encourage inhabitants to improve their open spaces because this can impact significantly on how these places are perceived and are valued locally. Give special attention to neighbourhoods where public participation is weak and not effective.
- Invite developers to invest in part of open space by providing cafes or restaurants and use the revenue to develop the rest of the area.
- public authorities have to take the necessary regulatory measures to counteract a growing trend of green space being locked behind the walls of gated communities.

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