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## REVITALISATION OF DEGRADED AREAS AS EXEMPLIFIED BY THE ARCHITECTURAL DEVELOPMENTS IMPLEMENTED WITHIN THE FRAMEWORK OF THE LEED CERTIFICATION PROGRAMME

### REWITALIZACJA TERENÓW ZDEGRADOWANYCH NA PRZYKŁADZIE INWESTYCJI ARCHITEKTONICZNYCH REALIZOWANYCH W PROGRAMIE CERTYFIKACYJNYM LEED

#### Abstract

Revitalisation of degraded areas fits in perfectly within the strategy of sustainable development in modern construction industry and architectural design. Basic principles of sustainable architectural design make all due allowances for, as well as address at some depth the overall need for respecting natural environment and natural resources. On the basis of the two select architectural developments sited within the ecologically degraded areas, i.e. Foshan Lingnan Tiandi Development estate, China and The Yard Redevelopment in Washington, DC, USA an evaluative study was undertaken, with a view to assessing the specific actions aimed at enhancing the prospective development sites. All three development projects were implemented within the framework of the LEED assessment programme for the sustainably built buildings, devised and developed by USGBC, a US non-profit organisation of global stature.

*Keywords: revitalisation, degraded areas, urban sprawl, sustainable development, LEED certificate*

#### Streszczenie

Rewitalizacja terenów zdegradowanych w znaczący sposób wpisuje się w strategię zrównoważonego rozwoju na polu współczesnego budownictwa i architektury. Podstawowe zasady projektowania zrównoważonego uwzględniają w sposób szczegółowy szeroko pojęte zagadnienia dotyczące ochrony środowiska i zasobów naturalnych. Na podstawie wybranych obiektów architektonicznych zrealizowanych na terenach zdegradowanych ekologicznie: kompleksu Foshan Lingnan Tiandi Development w Chinach oraz projektu urbanistycznego The Yard w Waszyngtonie w USA przeprowadzono analizę działań podjętych w celu poprawy jakości wybranej przestrzeni. Omawiane obiekty były realizowane w programie do oceny budynków zrównoważonych LEED (*The Leadership in Energy and Environmental Design*), opracowanym przez amerykańską organizację USGBC.

*Słowa kluczowe: rewitalizacja, tereny zdegradowane, urban sprawl, zrównoważony rozwój, certyfikat LEED*

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## 1. Introduction

The rapid growth of world population in recent years has had a marked influence on the quantity and quality of developed areas. According to prognoses for up to the year 2050, the percentage of developed areas will increase by two-thirds as compared to the present state. The design and realization of future urban architecture significantly affects our planet, the quality of natural environment and people's lives.

The design of an urban space has a direct effect on the quality of the natural environment and the lives of inhabitants. Examples of badly developed urban spaces can be found across the world, where their uncontrolled development has led to the degradation of many areas. The need for redevelopment of such spaces poses a challenge to the architects, urban planners and inhabitants, to which the principles of sustainable development may provide a solution. There are many global and local programmes promoting the redevelopment of such degraded, brownfield areas [1]. The multi-criteria building assessment system created by USGBC (*US Green Building Council*), an American non-profit organization, is one of them. It features guidelines for the designing and implementation of investments undertaken to improve the quality of urban spaces in accordance with the new regulations for reurbanisation and urban space redevelopment.

One of the major concerns for the degraded urban spaces is their segmentation. Observations show that in the last fifty years, urban areas divided by motorways have become the dominant model of all inhabited areas in the USA as well as Europe and Asia. Mechanical transport is responsible for one-third of greenhouse gas emission, the bulk of which is produced by cars. As a result of fossil fuels burning, there has been a significant increase in air pollution and environmental pollution. Distant urbanized areas seem to be falling short of the sustainable development principle, which naturally puts them in opposition to the wholesome traditional pattern of mixed architectural development whereby all necessary facilities such as shops, schools, cafes or hospitals are situated within walking distance.

Urban architecture scattered over many square kilometers also plays a part in the ground and water supplies pollution, the segmentation of valuable arable land and the precious green areas such as forests or woods. It also puts a marked strain on the urban infrastructure, increasing the costs of its construction and everyday use [3].

The degradation of urban spaces resulting from improper use has led to a change in the approach to future and existing urban architecture. The new designs take into consideration the redevelopment of urban areas as well as the protection of areas not yet developed [6]. The urban planning that places residential areas in the vicinity of working spaces and recreational areas can reduce the amount of mechanized transport and the subsequent greenhouse gas emissions and toxic waste production; it can also reduce the costs of construction and operation of the infrastructure. Concentrated, mixed architecture improves the quality of life and environment and functions better [4, 9]. It provides easy access to all necessary facilities such as banks, parks or schools; it encourages walking, bonding with other people and taking care of one's physical and mental health. A balanced urban environment is a chance to alleviate the results of natural environment exploitation, diminish air and water pollution or cut down on the natural resources consumption as well as protect the priceless green areas [5, 10].

## 2. The objective of this paper

The objective of this paper is to prove that rigorous compliance with programme framework in the designing and implementation of redevelopment projects for degraded urban areas using the tool like e.g. LEED Certification Programme has a positive influence on the environment and life quality.

## 3. LEED certification programme and its role in architectural and urban planning

The LEED (Leadership in Environmental and Energy Design) Certificate is a multi-criterion building assessment system that rates the compliance of buildings with the sustained development principles. It was created by an American non-profit organization, US Green Building Council (USGBC) with the purpose of rating the most environment-friendly buildings based on high ecological standards. Since 1998, investments worldwide have been carried out based on the requirements of the LEED certificate. It is also applicable in the already existing developments: housing, offices, hotels or hospitals. USGBC endorses projects that are guided by the sustainable development principles in their implementation. New constructions in the urbanized areas with good access to public transport and to basic services are likely to rate higher than buildings located haphazardly and thus contributing to the urban sprawl phenomenon.

As to the redevelopment of degraded urban areas, the LEED-ND (LEED Neighborhood Development) Certificate is of particular importance. It comprises architectural design assessment as well as infrastructure, neighborhood, natural environment and local and regional contexts that all contribute to the urban area project [6].

The LEED-ND Certificate comprises four credit categories: Smart Locations & Linkages, Neighborhood Pattern & Design, Green Infrastructure & buildings and Innovation in Design.

*The Smart Locations & Linkages* credits are awarded for the project's location and its compatibility with the existing urban space. The focus is on aspects of location such as the availability of public transport, access to basic services, distance from residential areas, protection of surface water and brownfields redevelopment.

*The Neighborhood Pattern & Design* credits concern the reduction of parking spaces in the streets, the creation of pedestrian-friendly spaces such as the streets and the easy access to public spaces as well as recreational and green areas.

*Credits in the Green Infrastructure & Buildings* category apply to buildings situated in urbanized areas. At least one building in the project area is required to be LEED-certified. The credits are awarded based on water economy, rainwater collection for the watering of green areas, the use of already existing buildings, urban heat island reduction and light pollution.

*The Innovation & Design* category is an opportunity for additional credits for outstanding achievements and the inclusion of LEED-AP in the project team.

The role of programmes like LEED-ND is setting an example of good practice and norms necessary in the designs of new urban developments and the redevelopments of already existing ones [7]. They enable a responsible and deliberate redevelopment process.

The LEED system emphasizes the importance of local aspects resulting cultural, geographical and legal differences which furnishes the possibility of objective comparison with similar implementations worldwide. Based on the already implemented LEED-ND-compliant redevelopments, a significant improvement in the quality of urban spaces has been noted.

#### 4. Examples of urban brownfields redevelopments designed and implemented in compliance with LEED-ND certificate

According to the USGBC data of September 2013, there are 101 sites worldwide that have received a positive opinion and have subsequently been LEED-ND-certified. Of these, 83 are located in the United States, 12 are in China and 6 in Canada. Further 57 sites have been entered into the assessment programme in recent years (see Table 1).

Table 1

##### Projects submitted to the LEED-ND and those who received a certificate in numbers

No.	Country	Projects awarded LEED-ND	Projects registered in the LEED-ND
1	USA	83	51
2	China	12	0
3	Canada	6	5
4	S. Korea	0	1
5	Poland	0	0
	SUM	101	57

(The table on the basis of statistics derived from the USGBC: <http://www.gbci.org/GBCICertifiedProjectList.aspx>)

Interesting examples of a LEED-ND programme brownfield redevelopment can be found in Foshan Lingnan Tiandi Development in China and The Yard Washington Redevelopment in the USA.

Located in the center of Foshan, a city in Guangdong Province in southern China, Foshan Lingnan Tiandi is an example of a redeveloped urban space of mixed functionality that was degraded by years of improper use, the absence of a comprehensive urban development plan and the devastation of the city's historic architecture typical for the cities in the region. The primary project objectives were to restore the historical and cultural heritage of the site as well as the city's individual character while at the same time usher it into the 21<sup>st</sup> century through comprehensive redevelopment. The design and implementation team of the Foshan Lingnan Tiandi project has succeeded in enabling modern lifestyle in the redeveloped site and creating a balanced, modern urban space that blends in with its surroundings and matches the historical and cultural context. In the Foshan Lingnan Tiandi Development project, the site's negative impact on the environment was minimized. The designers focused on the reduction of greenhouse gas and other toxic emissions as well as on water economy and energy conservation. Owing to the site's location in the center of a highly urbanized area, the creation of a mixed functionality development was possible, providing the site's future inhabitants with access to residential areas, offices, shops, industrial areas and entertainment. The project combines not only different functionalities, but also different styles: as a part of the redevelopment plan, the designers have placed

the modern residential, commercial and industrial spaces within the historic architecture. This enabled the preservation of as much as 80% of the traditional Chinese buildings while simultaneously creating an urban area that encourages a new, active and dynamic society. In the project, 50% of the buildings of more than ten different functions have been located within 800 m of one another, which is a distance easily covered on foot. Thanks to the preservation of the existing grid of alleys, streets and squares, the place also encourages outdoor activity. The project's compliance with the sustainable development principle has been pursued further with the introduction of technologies reducing the consumption of non-renewable energy sources. Solar panels for water heating have been installed e.g. in the hotel in the redeveloped area, and photovoltaic panels have been used to power the urban lighting. To reduce energy costs, zone heating systems have been introduced in smaller buildings. A system of rainwater collection has also been designed, which reduced the use of drinking water. As a means of using the space to the utmost, over 50% of roofs and walls have been covered with plants, thus forming horizontal and vertical city gardens. The adherence to the sustainable development principle in the design and implementation process has resulted in the successful redevelopment of a degraded urban area, leading to a Gold-level LEED-ND Certificate awarded to the project in 2010.

Another good example of how the quality of an urban brownfield can be improved is The Yard, a redevelopment design for the wharf area situated by the Anacostia River in the southern part of Washington, DC. In 2009, a project was prepared for 170 ha of land, where 167,000 square meters' worth of offices, 38,000 square meters of commercial and entertainment areas, 2,500 square meters of housing and a surrounding park with waterfront boulevards are to be created. In spite of its opportune location in the center of Washington, The Yard project area has long been neglected and degraded, which resulted from long years of industrial use as a US Navy shipyard and an ammunition production site. The main objective of the project team that includes, among others, the developer, urban planners, architects, engineers and a LEED certification expert, was to convert the former military base into a modern multifunctional developed site that would constitute a valid part of Washington. According to the project, as a new district, The Yard would provide a residential area with a well-developed lattice of roads and sidewalks that would propagate a healthy lifestyle through its urban grid. All the necessary facilities, such as schools, shops or the underground station are to be located in buildings situated in an area that does not exceed 800 m in diameter. In the course of the project works, the designers have decided to redevelop many of the site's typical post-industrial buildings but respected their unique character. Seeing as the city of Washington has so far lacked in recreational waterfront areas, the project team has used the site's location to design a park by the harbor with general-access boulevards. Ground quality improvement has also been an issue in the project, which was resolved by purifying the ground of all oil-related pollution from post-industrial use of the land. The project team has also suggested a plan for the purification of ground water that would protect it from pollution; the plan also features rainwater collection scheme to conserve drinking water, intelligent irrigation and the reuse of greywater. The Yard urban redevelopment has been under construction since 2009 in compliance with LEED-ND, with the project team aspiring to obtain a Gold-level LEED-ND Certificate.

## 5. Summary

The instances of urban redevelopment presented here are a good example of investments compliant with the principle of sustainable development. Based on the material presented, a conclusion has been reached that urbanized areas have a significant influence on the environment, economy, health and development. Owing to organizations like USGBC (*US Green Building Council*) and their sustainable building assessment systems such as *LEED (Leadership in Environmental and Energy Design) Certificate*, a wholesome and controlled redevelopment of degraded urban areas worldwide is possible. An important element of the transformation is a comprehensive consideration of the local aspects resulting cultural, geographical and legal differences of chosen area. The compliance with sustainable architecture and construction principles is an opportunity to slow down, or even altogether stop, the degradation of the spaces we live in [8]. The cooperation of architects and other urban planning specialists with local authorities and prospective users of the spaces is the basis of the movement for the sustainable development of new urban spaces as well as existing ones.

## 6. Conclusions

Based on the analysis of chosen examples, it has been proved that the rigorous adherence to the project requirements compliant with a certification programme such as LEED-ND has resulted in a high quality of the implemented architectural investments, an improved quality and status of a former degraded area, a socio-economic boost, the minimization of the urban sprawl effect, the restoration of natural resources and the improved quality of the ground.

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