International Journal of Innovative Technology and Exploring Engineering (IJITEE)
ISSN: 2278-3075 (Online), Volume-5 Issue-3, August 2015

Urban Regeneration

Desislava Angelova, Pavlina Vodenova

Abstract— The last years in all spheres of public life is spoken about recycling, redesign and about all connected with resources preservation. In same spheres this practice has occurred considerably, and in others, it is still to come. The aim of this paper is to find out if there exist good practices in the field of urban design, and in what direction are they. In the construction of equipment and buildings from a different nature are exhausted many materials and means which in many rare cases it is purposeful to be wholly destroyed. The question is: what could be done to improve their exploitation period?

Index Terms— redesign, regeneration, urban design

I. INTRODUCTION

The current pace and direction, the contemporary society has chosen to take in its development lead to higher requirements of our living environment. Following the trend, especially in Europe, the construction industry and the urban development practics changed multiple times in the last 50-60 years. It appears that in many ways our living environment does not respond to the dynamically changing lifestyle we all have. During different historical periods society has enforced various requirements of the living environment: creating specific conditions for social or cultural activities, creating new trade conditions, industry development, information focus etc. Despite the fact that many unsettled areas existed in the past, they have become more and more rare in recent times. In the same time, we observe many abandoned buildings and spaces, which do not meet any of the contemporary requirements and needs the society has. The lifestyle of the modern individual has changed dramatically and these premises appear uncomfortable, dysfunctional, less energy enificient etc. All of this raises the question- What do we do to them? The easiest step is to demolish them but would this be the most effective solution? Of course not. It is irresponsible to destroy something that has taken up so much resources and human energy taking into account the current world economic crisis. The last years in all spheres of public life is spoken about recycling, redesign and about all connected with resources preservation. This tendency is also part of the urban organization system which means that more and more we will meet the need to give a chance for a second life to already existing buildings rather than construct new ones. To improve the quality of urban renovation projects we need to promote a more holistic and integral approach which apart from technical solutions takes into account architectural, social and historical aspects. We need to be aware of the social responsibility in relation to urban projects, as the urban environment plays an important role for creating a well-functioning society.

Manuscript published on 30 August 2015.
*****Correspondence Author(s)
Desislava Angelova, PhD, Department of Interior and Furniture Design, University of Forestry, Sofia, Bulgaria.
Pavlina Vodenova, Department of Interior and Furniture Design, University of Forestry, Sofia, Bulgaria.

The connection between people's lifestyle and the spaces they inhabit, as one of the major issues of the living environment, appears to have two-way characteristics: the architectural surroundings affect the individual's lifestyle and the functional and spacial organization of the material world is under its continuous influence [1]. As it's well-known, the questions concerning the organisation of the material environment have many sides and it is extremely difficult for one to achieve the necessary balance between the different aspects of the processes of inhabitance, especially if we take into account the living constantly changing nature of reality. The bigger role, the bigger diversity of the living processes, the introduction of the various technical systems, the necessity of diverse information that in many cases is related to the optimal organization of the urban life, the increasing cultural-aesthetic requirements- all of this is leading to the growing number and the multiplicity of city objects range. Many problems about the optimization of their content, the artistic synthesis of design, architecture, landscaping and monument and decorative artwork in the contemporary urban environment have started to appear. Without having these problems solved, this environment would not be able to function properly, it would not hold the necessary qualities to be responsive to the various requirements the modern urban dweller has. [2]. It is hard to pin down the needs and the requirements of the inhabitants. This is why the development of the surrounding environment should be based on the multidisciplinary approach, having different specialists of different fields that would benefit the urban regeneration with their knowledge and work. This approach should be able to integrate functional, social and environmental demands to a satisfactory extent in order to guarantee a holistic view on urban development. The aim is to think about urban regeneration conducted from an approach that takes into consideration not only the architectural and urban planning aspects but also social factors, and the new demands on habitat and sustainability in the urban areas. This will guarantee a broad view on the issues related to renovation and rehabilitation. When we strive to improve the surrounding environment and its spaces we should try to think not only for their major function, but also for the energy regulation, environmental legislation, social and cultural impact. The aim of this paper is to find out if there exist good practices in the field of urban design, and in what direction are they.

II. POSSIBLE DIRECTIONS FOR URBAN REGENERATION

There are many world-renowned examples which show that it is possible to start functional integration of already existing morally and physically old buildings and premises in the common urban and spacial organization.

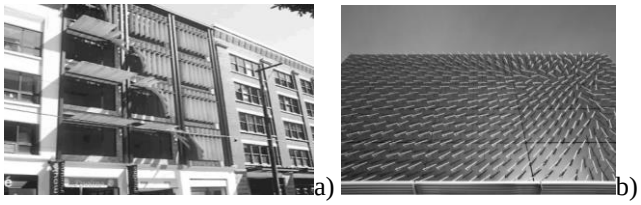
Drawing a conclusion from the current observation it becomes clear that the regeneration and integration could be achieved through the application of three methods: through the improvement of the buildings' facades for achieving better energy efficiency, through the addition of extra functions achivieng better functional efficiency or through the general function change.

A. Through the improvement of the buildings' facades for achieving better energy efficiency

There are many examples of buildings that have had visible changes only on their facades. This is done normally to improve the energy efficiency of the building as well as its aesthetic properties (fig.1). The new vertical garden on the exterior of the Palacio de Congresos has a total area of 1,492 m2, with 1,000 m2 made up of a hydroponic vertical garden system and the remainder made up of climbing plants covering the windows. The garden was installed to improve energy efficiency for the building; the additional insulation from the plants shields it from the sun and protects it from the weather. In fact, the system adds a thermal resistance of 2,644 m2.K/W, which provides a 270 percent increase in efficiency, thus saving money normally spent on climate control. [10]

Fig. 1 Vertical garden, Palacio de Congresos, Vitoria-Gasteiz, Spain, Urbanarbolismo

Very positive results are achieved when show an artistic approach in a combination with the energy efficiency strategy. This is how we completely change the perception of the building. A good example is the *Penumbra Kinetic Shading System* (fig.2, a) - an incredible shading system that rotates in three directions in accordance with sun's position. Tyler Short designed the *Penumbra kinetic shading system* using traditional, static components that make the shading louvers swing out to create a deep shade. The vertical louvers rotate in three directions, both laterally and axially, and can independently pivot to maximize solar protection even when sun the sun is so high that traditional vertical louvers become ineffective. In the case of the Penumbra system, louvers can completely rotate upwards. The system can be computer-operated or manual.[7]. Another example is wind-driven kinetic façade *Windswept* installed on the exterior of the Randall Museum in San Francisco (fig.2, b). *Windswept* is a fascinating interactive facade that moves in response to the wind, revealing the exact direction it's blowing at a specific location [11]. Located on the exterior of the Randall Museum in San Francisco, Charles Sower's wind-driven kinetic installation is part art and part science experiment. His precision instrument showcases the complex interactions between the wind and the building and gives us insight into something that isn't normally invisible. Windswept is one example of how to make the wind visible, or at least its direction.



a) b)

Fig. 2 (a) Penumbra Kinetic Shading System, design: Tyler Short; (b) Windswept wind-driven kinetic façade, Randall Museum, San Francisco. Designed by Charles Sowers

B. Addition of extra functions for achieveing better functional efficiency.

Fig. 3 Cultural Space, Tranebergsbron Bridge, Stockholm, Sweden, Studio Visiondivision

Swedish studio *Visiondivision* devised a clever idea to use a redundant space underneath a concrete bridge in Stockholm (fig.3). In order to entertain and shorten the walking time for pedestrians crossing the beautiful Tranebergsbron Bridge, the designers imaging an exciting new complex called *Under the Bridge* with a promenade, an outdoor cinema and an art gallery - all placed under the empty space beneath the bridge. Under the Bridge is a proposal for a cultural and entertainment complex under the Tranebergsbron Bridge. Linking the city island Kungsholmen and the suburb of Bromma, the bridge was built back in 1934 and at that time had the largest concrete vaults in the world. As well as reducing people's walk from 15 to just 3 minutes, the 'parasitic architecture' project will activate a large unused space and enhance the connection between the suburbs and inner city. The impressive concrete pillars would be the perfect support for a temporary art gallery and the dead spaces in between will be used for small kiosks. There are also exciting plans for the existing concrete stairs, which can double as seating for watching films projected on the pillars [3].

Fig. 4. "The Cascade" by Edge Design Institute 2007, Central Hong Kong. Photo from *BSA*, taken by Scott Burnham.

Edge Design Institute has converted an ordinary public stairway in Hong Kong into a striking, socially engaging public area called.

Published By:
Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP)

The Cascade Project (fig.4). Located in The Centrium, the asymmetric mesh sculpture offers individual and adjoining seating areas surrounded by Bauhinia trees and assorted plants. In the evening, a strategic lighting system creates an inviting atmosphere that tuns the previously undervalued concrete structure into a secure and sociable environment [9]. More than just pure artistic design, the repurposed staircase aims to change the face of utilitarian commercial areas by providing city officials with the option of "layering" underutilized areas with attractive communal environments. By repurposing a public thoroughfare and empty urban space into a welcoming and socially active area, the unique Cascade project illustrates the potential of public stairs everywhere to be converted into vibrant citizen-centric spaces that meet both the pragmatic and social needs of local communities.

C. General functional change

1. Public buildings


a) b)

Fig. 5. Alternate use for abandoned post office (a) Manhattan Beach Post Office Transformed Into Hip New LA Restaurant (b) Abandoned Post Offices Could Be Revived as Local Supermarkets

Some of the most beautiful structures in the United States are post offices, but with more and more people using email as opposed to snail mail, many of these historic buildings are shuttering down. From the 1950s until the 1970s, the Manhattan Beach Post Office (fig.5, a) doled out mail to the local residents and was often a good place to see your neighbors. Now the location is an even better place to meetup as it houses the M.B. Post Restaurant [12]. With the aim of creating a nostalgic throwback, as well as a place where local residents would want to come and hang out, the firm and restaurant's owners set out to create a space with a uniquely local personality. Additionally, the history of the original post office served as a guiding light throughout the design process, and the help of the Manhattan Beach Historical Society proved especially beneficial in the re-design. New York School of Interior Design MFA graduate Erika Reuter decided to devise an alternate use for these abandoned post office as hyperlocal supermarkets (fig.5, b). Her concept involves retrofitting each closed-down location with fixtures that would allow it to function as a hypermarket and serve the surrounding community in a new way [19].

Fig. 6. BĀKA Lighthouse: (a) SAALS Architects Transform an Old Pump Station Into a Water Tourism Center in Latvia (b) Baka Lighthouse before the renovation.

Latvia's *BĀKA Lighthouse* (fig.6) once served as a drainage pump station near the coast, but now it's an activities center that promotes water tourism. The marshy site had a dilapidated structure, which Latvian-based firm *SAALS* used as a basis to begin the renovation. The architects were inspired by the vast and scenic surroundings when designing the renovated and new structures, which draw people to the area to play tennis or volleyball, boat or meet for events. SAALS preserved historic artifacts and the pump as a visual reminder of the history of the site. Materials were selected to blend in with the environment and reference the industrial and historic nature of the site while also paying tribute to its natural beauty [13].

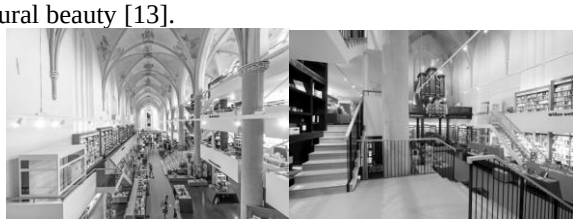


Fig. 7. Gorgeous 15th-Century Church Renovated as a Modern Bookstore in the Netherlands

The 15th century Dominican church was renovated into a modern-day bookstore in the Dutch city of Zwolle (fig.7). Utrecht-based *BK. Architecten* designed a 700-square-meter shopping area on three added floors that can be removed in the future without damaging the existing building. Two architects, Jos Burger and Wouter Keijzer of BK. Architecten, in charge of the renovation of the old church decided to preserve the atmosphere of the existing place with a spatial intervention that preserves its historical value[5].

Fig. 8. Stunning Modern Building Breathes New Life Into Bergen's Historic Fish Market, Norway. Design: *Eder Biesel Arkitekter*

Eder Biesel Arkitekter transformed a local fish market in Bergen, Norway into a beautiful modern space that harks back to the city's heritage (fig.8). Completed in 2012, the renovation carefully balances the site's historic heritage with its contemporary use. The project is titled "History Continued," and it honors these principles by telling the story of the site while creating a symbol of modern architecture in the center of the city[18]. *Eder Biesel Arkitekter*'s fish market gives the historic site a modern twist with an angular, daylight-filled "floating" volume.

Fig. 9. UTAA Carves a Wooden Ribbed Rest Spot from a Former Parking Lot in Seoul

University of Seoul architecture students and design firm *UTAA* have transformed a parking lot into a cool and contemporary public space (fig.9).

Published By:
Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP)

Titled the *Rest Hole*, the ribbed structure has curved wooden panels that form sinuous seating and frame an undulating organically inspired space. Each wooden rib is spaced out to allow light and sound to permeate the structure and fortify the concepts of spaciousness and flexibility. Located on the first floor of a student dormitory, the former parking lot was once a dark and underused space only frequented for smoke breaks and bicycle parking. The university sought to hollow out the parking lot into a modern rest area for students. The resulting organic shape adds a warm contrast to the harsh angles of the surrounding university buildings.

2. Post-Industrial Factory Landscape

Landscape architects frequently work to transform areas that contain industrial and toxic waste or infrastructure no longer in use. These neglected places, while often having a negative impact on the environment and surrounding community, are simultaneously part of our cultural heritage.

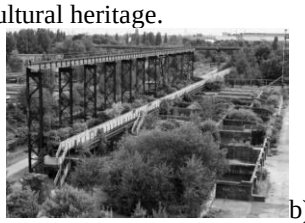

a)

b)

Fig. 10. Post-Industrial Factory Landscape: a) Gas Works Park in Seattle, Washington. Designer: Richard Haag, Photo courtesy of the Cultural Landscape Foundation; (b) Landscape Park Duisburg Nord in Duisburg, Germany. Designer: Latz + Partners

Gas Works Park was converted into a picnic shelter complete with tables and fire grills, while a former exhauster-compressor building was turned into an open-air play barn that houses a maze of brightly painted machinery for children (fig.10,a). This groundbreaking project has been celebrated for its ability to garner local support and shift public perceptions of post-industrial landscapes. It is considered revolutionary for its reclamation of polluted soils using the natural processes of bioremediation. Working on a 570-acre site of a former steel plant, Latz + Partners's goal approached their reuse and reclamation project with optimism(fig.10, b). Rather than looking at the site's disturbed and complex conditions as nuisances that should be erased or camouflaged, they worked carefully to mine them for their creative potential[8]. The transformed site creatively repurposes existing structures, and throws in number of amenities that promote recreation and community, including a deep diving pool, a rock climbing wall, picnicking areas, hiking trails, and multiple performance spaces—all woven together to create tapestry of memorable places. The aim was to change the industrial landscape with minimal intervention, recycling and visually renewing decaying architectural objects into poetic places that pay homage to the site's past.

3. Abandoned Transportation Infrastructure

Fig. 11. The High Line in New York City. Designer: James Corner Field Operations, Diller Scofidio + Renfro, and Piet Ouldorf, Photo by *Jill Fehrenbacher* for Inhabitat

The *High Line* (fig.11) is a one mile stretch of abandoned elevated railroad on New York's West Side, which was under threat of demolition. After years of public advocacy, it has been resurrected as a park that's become one of the city's most popular destinations. The park's attractions include naturalized plantings that are inspired by the self-seeded landscape that grew on the disused tracks, unexpected views of the city and the Hudson River, and cultural attractions that are thoughtfully integrated into the architecture and plant life. The project cost substantially less that it would have been to wholly demolish and redevelop the area, and further serves as a precedent for adaptive reuse[20].

Fig. 12. *Halle Freyssinet*, Paris

The historic *Halle Freyssinet* building in the heart of Paris will soon be transformed into a huge business incubator for 1000 Start-Ups (fig.12). Designed by Wilmotte & Associés SA, the project will be the largest incubator in the world and it will utilize shipping containers, flexible design solutions, and daylighting while retaining the original charm of the station. The renovated rail station have capacity for 1,000 start-ups along with facilities to foster and support the companies' growth [15]. 1000 Start-Ups will provide space for co-working areas, a fablab, a large auditorium, meeting rooms, large work spaces, and a bar-restaurant that will be open 24 hours a day. The existing structure will be maintained to preserve the building's industrial heritage.

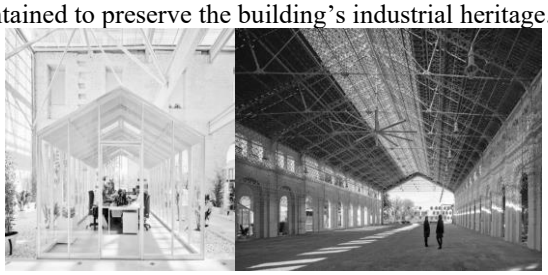


Fig. 13. Train Station Transformed Into Office for Casa Mediterraneo, Alicante, Spain. Design: Manuel Ocana del Valle

In the Mediterranean city of Alicante, Spain an old railway station has been transformed into a vibrant daylit office for Casa Mediterraneo (fig.13). Architect Manuel Ocana del Valle helped the diplomatic institution equip the existing station with the spaces required to effectively sustain the organization's program. Casa Mediterraneo is committed to fostering a common identity for the Mediterranean Villages, and this new headquarters offers a beautiful example of how the organization can reinvigorate old perceptions[4]. The improvements made to the Benalua railway station lie at the intersection of modern design and cultural preservation.

Published By:
Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP)

In an era that is pushing towards all new construction interventions being designed in a sustainable fashion, the new Casa Mediterraneo is a fresh perspective on reusing abandon buildings for new purposes.

4. Abandoned Industrial buildings

Fig. 14. Old Sugar Refinery Transformed into a Sweet Climbing Gym in Montreal

The former Redpath Sugar Refinery in Montreal has found new life as a rock climbing gym and fitness center (fig.14). Located in the Southwest borough on Rue Saint-Patrick, *Allez Up* forms one part of a larger revitalization effort to transform the industrial brownfield site into a vibrant recreational facility. Designed by Smith-Vigeant, the sustainbly-designed gym offers a variety of climbing options along with regular fitness equipment and yoga classes [14].

Fig. 15. Abandoned Warehouse to Be Transformed into Lush Zero-Energy Office Space in Amsterdam

Worldwide sustainability cooperative *Except* has renovated an abandoned shipyard in Amsterdam, transforming it into an energy-neutral office space filled with lush vegetation (fig.15.). The jungle-like space features food producing modules based on hydroponic and aquaponic systems and can be customized to spaces of various sizes. The Crystal Forest concept originates from Except's own search for a new office space in Amsterdam[6].

Fig. 16. Abandoned Pearl Brewery Adapted into a Vibrant Mixed-Use Project, San Antonio

The *Pearl Brewery* (fig.16) was transformed into a vibrant mixed-use office, retail and entertainment district. Located along the famed San Antonio River, the Pearl Brewery/Full Goods Warehouse is at once a tribute to the history of the brewery and a modern and sustainable project. Local firm *Lake|Flato Architects* handled the master plan for the Pearl Brewery redevelopment project as well as the redesign of the main brewery building into the Full Goods Warehouse, which includes a PV system, rainwater collection, impressive use of reclaimed materials, and drought-tolerant landscaping [16]. The Pearl Brewery/Full Goods Warehouse was on of the Top Ten Green Projects of 2013 by AIA/COTE.

Fig. 17. La Cosa: Historic Madrid Sawmill Transformed into Thriving Arts Center, Madrid

Langarita-Navarro Arquitectos transformed a 1920s Belgian sawmill into the ambitious new Medialab-Prado Center in Madrid by renovating the existing structure with modular spaces inserted throughout the campus (fig.17). This modern adaptive reuse project uses the industrial LA Serreria Belga building's concrete walls as an exoskeleton for a flexible structure inside that can grow with the needs of Medialab-Prado. Lit at night with colored LEDs, the renovation is a research laboratory and exhibition space that focuses on art and digital culture [21].

Fig. 18. Abandoned Grain Silo Converted into Arenc Silo Opera House, Marseille

When Marseille decided it was high time for a new opera house, they took stock of their existing infrastructure and made the choice to renovate a building instead of erecting a brand new one. The resulting Arenc Silo is an adaptive reuse of a large historical grain silo into an opera house was designed by C + T Architectes (fig.18). The space opened in September of 2011 and began its new life as a member of the arts community, leaving behind traces of its past industrial existence [17]. The industrial structure still retains much of its original character and the large theatre space was carved out of a hollow area in the center.

III. CONCLUSION

There is no doubt that the common urban material environment could create realistic enough or insufficiently realistic opportunities for meeting the material and spiritual human needs, could influence the mind, the character and the psyche of the contemporary dweller. As phsycologists say, the material environment is the designer of the human behavior and its limits. The ever growinhg needs of the society shape bigger requirements to the living environment and its quality and quanity characteristics affect the mass and the structure of the needs themselves. According to the observations it is right to stimulate the following possible directions for regenerating and integrating the ineffective urban areas:

Published By:
Blue Eyes Intelligence Engineering
and Sciences Publication (BEIESP)

- Energy efficiency improvement of existing buildings, add more program, more surface; improve the building skin; incorporate any bio-material; collect rainwater; apply renewable energy systems;
- Development and treatment of the functional purpose and image of the existing environment through creating more conditions for social contacts, connecting the building with the public space, the new public facilities etc. All of these improvements will secure the city's function as a social organism.
- Providing areas for urban or rural open-air recreation
- Creating conditions for improving the sports culture and activity of the inhabitants.

Regardless of the urban development intervention rate we will always have to take in account the following conditions:

- To use a holistic approach regarding the impact or limits of all the aspects related to a process of dwelling.
- To provide professionals with new ways how to organize different functions in a city.
- To preserve the architectural identity.
- To design in accordance with contemporary needs.
- To solve a real social problem solved

The main rule remains intact. The human being is a measurement of the environment change. The integrity of the human activity in all of its shapes is considered to be the base of the integrity of the living environment itself.

ACKNOWLEDGMENT

This document was supported by the grant No BG051PO001-3.3.06-0056, financed by the Human Resources Development Operational Programme (2007 – 2013) and co-financed jointly by the European Social Fund of the European Union and the Bulgarian Ministry of Education and Science.

REFERENCES

1. Н.Д. Пенева, *Архитектура и начин на живот,* Техника, София, 1984, 5-9.
2. Т.В. Булев, *Дизайн на градска среда*, Техника, София, 1990, 6-43
3. A. L. Alperovich, *Envisions Parasitic Cultural Space 'Under the Bridge' in Stockholm.* Available: http://www.inhabitat.com
4. A. Goodwin, *Spanish Train Station Transformed Into Gorgeous Daylit Office for Casa Mediterraneo.* Available: http://www.inhabitat.com
5. L. Grozdanic, *Gorgeous 15th-Century Church Renovated as a Modern Bookstore in The Netherlands.* Available: http://www.inhabitat.com
6. L. Grozdanic, *Abandoned Warehouse to Be Transformed into Lush Zero-Energy Office Space in Amsterdam.* Available: http://www.inhabitat.com
7. L. Grozdanic, *Mesmerizing Penumbra Kinetic Shading System Brings Dull Facades to Life.* Available: http://www.inhabitat.com
8. P. Hartford, *Landscape Design Projects That Turn Damaged and Neglected Spaces Into Healthy, Beautiful Environments* Available: http://www.inhabitat.com
9. N. Jewell, *The Cascade Project Transforms Disused Staircase into Inspiring Urban Space for Hong Kong Residents.* Available: http://www.inhabitat.com
10. B. Meinhold, *Urbanarbolismo's Magnificent 1500 m2 Vertical Garden Covers the Palacio de Congresos in Spain* Available: http://www.inhabitat.com
11. B. Meinhold, *Windswept is a Fascinating Kinetic Façade That Reveals the Direction of the Wind.* Available: http://www.inhabitat.com
12. B. Meinhold, *Manhattan Beach Post Office Transformed Into Hip New LA Restaurant.* Available: http://www.inhabitat.com
13. B. Meinhold, *BĀKA Lighthouse: SAALS Architects Transform an Old Pump Station Into a Water Tourism Center in Latvia* Available: http://www.inhabitat.com
14. B. Meinhold, *Old Sugar Refinery Transformed into a Sweet Climbing Gym in Montreal*. Available: http://www.inhabitat.com
15. B. Meinhold, *Renovated Paris Rail Station Will House 1000 Start-Ups!* Available: http://www.inhabitat.com
16. B. Meinhold, *Abandoned Pearl Brewery Adapted into a Vibrant Mixed-Use Project in San Antonio.* Available: http://www.inhabitat.com
17. B. Meinhold, *Abandoned Grain Silo Converted into Arenc Silo Opera House in Marseille.* Available: http://www.inhabitat.com
18. H. Morgan, *Stunning Modern Building Breathes New Life Into Bergen's Historic Fish Market.* Available: http://www.inhabitat.com
19. T Laylin, Unique "Marche" Concept Reimagines Abandoned Post Offices as Local Supermarkets
20. S. Cameron, *New York's High Line Park to Double in Size by Next Spring!* Available: http://www.inhabitat.com
21. L. Zimmer, *Historic Madrid Sawmill Transformed into Thriving Arts Center with Glowing LED Facade* Available: http://www.inhabitat.com
22. (Journal Online Sources style) K. Author. (year, month). Title. *Journal* [Type of medium]. Volume(issue), paging if given. Available: http://www.(URL)
23. R. J. Vidmar. (1992, August). On the use of atmospheric plasmas as electromagnetic reflectors. *IEEE Trans. Plasma Sci.* [Online]. *21(3).* pp.876—880. Available:
24. http://www.halcyon.com/pub/journals/21ps03-vidmar

AUTHOR PROFILE

Desislava Angelova, Eng., PhD, Senior Assistant Professor at the University of Forestry, Sofia (2002-2011); Chief Assistant Professor at the University of Forestry (from 2011 till today), guest lecturer at VSU "Lyuben Karavelov", Sofia (2009-2010) and at the New Bulgarian University, Sofia (2011-2012). Doctor thesis: „ A Research on Design Methods for Structural Construction of Sitting Furniture in Residential Buildings", University of Forestry. Textbook: Interior Architecture (2015). Research work in fields of: Interior and Furniture Design; Styles in Interior and Furniture; Design Methods; Engineering Design Education.

PavlinaVodenova, Dipl.Eng.Mgr., assistant Professor at the University of Forestry,Sofia (2009-present);guest lecturer at New Bulgarian University, Sofia (2008-2015). Research work in fields of: Interior and Furniture Design; Interior and Furniture for Children; Residential design; Engineering Design Education.

Published By:
Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP)