




AKADÉMIAI KIADÓ

Integration of sustainable street furniture in Tunisian urban public spaces

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ABSTRACT

In order to develop the quality of urban spaces, street furniture seems to be the significant element that defines the city's social attraction points. It stimulates outdoor spaces because of its location, buildings and sidewalk meet. This study explores the issues of design criteria that introduce sustainability into street furniture design in urban public space in Tunisia. This research is based on the role of street furniture and its importance in urban public spaces, and the possibility of supplementing a recycling design. This paper aims to explore the necessary criteria to design sustainable street furniture in order to present its importance in a way that helps to ameliorate the quality of living in urban areas and cities.

KEYWORDS

urban development, sustainable design, recycling design, eco-friendly street furniture, social integration

ORIGINAL RESEARCH PAPER



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1. INTRODUCTION

Because of the lack of implementation of sustainable criteria, the existing street furniture design affects the country's development, especially in urbanized Tunisian areas. In order to preserve liveable environments, a recycling criterion seems to be important to make urban public spaces more attractive and meaningful. For more than a decade, sustainable requirements were introduced as a necessity for the development of designing new products. So many requirements need to be taken into consideration while designing street furniture: public space and activity appropriation, accessibility, safety, comfort, aesthetic, design quality to enhance the urban design image [1]. In the first part, the focus will be on the roles of ecological design and its importance based on the literature review and document analysis of the environmental aspects adoption. The second part of the paper intends to explore the different possibilities in adopting recycling design in Tunisia urban spaces [2]. It is hoped that this study could contribute to creating awareness on the importance of integrating street furniture in public urban spaces towards the enhancing of living quality in the urban areas.

1.1. Laws and legal texts that ensure environmental protection in Tunisia

Ecological design, green design, green architecture, environmentally friendly design are names that lead to a similar meaning of sustainable design. 'Able to be maintained' is the definition of something sustainable. By the book of the philosophy of sustainable design [3]; challenging ecological design, the 'word restorative' was chosen as the much better word to achieve sustainable goals.

The fennec 'Labib' symbol of environmental protection in Tunisia became in the 1990s the mascot that mobilized young and old for the protection of the environment. It was everywhere in the landscape, and its effigy was visible at the entrances of all cities. After the Revolution of 2011, this ecological symbol fell into disuse without any mascot replacing it.



Worse, the environment suffers more and more attacks in general indifference. There are several factors that influenced Tunisia to embrace sustainable development. The major concerns of the agricultural land loss in Tunisia are: Erosion that threatens 76% of the nation's land area, degradation of range and forest lands due to overgrazing and overcutting of timber for fuel [4]. In order to involve the sustainable living idea, Tunisia has implemented laws and legal texts. At a national level, the protection of the environment in Tunisia is ensured by a fairly large legal arsenal which reflects, on the one hand, an awareness of the problems related to the management of natural resources and, on the other, the commitment of the country to the rational and sustainable use of the heritage of future generations.

In Tunisian law, there is no environmental code that contains all the provisions relating to environmental law; however, there are several provisions scattered in several legal texts, which concern totally or partially environmental matters. Institutions supporting sustainable development in Tunisia [5]: Agence Nationale de Protection et de l'Environnement (ANPE), Agence de Protection et d'Aménagement du Littoral (APAL), Agence National du Patrimoine (ANP). The new Tunisian constitution of January 2014 incorporated a set of environmental principles:

1. *Prevention*: It is an impact assessment before the preparation of a plan or the realization of work or activity. This forecast document contains four elements: the potential direct effects of a project on the environment, the indirect effects, the immediate consequences, and the distant consequences. The impact assessment must be of dual interest: theoretical and other practical interest;
2. *Precaution*: This is a precautionary principle; it involves taking the necessary steps to avoid risks. It shall implement risk assessment procedures and adopt provisional measures to prevent damages;
3. *Reparation*: The principle (polluter pays) aims to impute the social cost of pollution to the polluter, thereby triggering a liability mechanism for ecological damage covering the effects of pollution not only on property and people but also on nature itself;
4. *Information and participation*: The best way to deal with environmental issues is to ensure the participation of all concerned citizens.

The new constitution clearly recognized the right to a healthy and balanced environment, a sustainable development goal that governs much of the constitutional provisions, a right to water, and the protection of heritage the fight against pollution and climate protection [6].

In 2015, the president of the special delegation of Sidi Bou Saïd city announced that the city would soon establish two innovative projects regarding environmental preservation. The realization of these projects will make Sidi Bou Saïd a 'Pilot city' [7]. Indeed, the first project will consist in stopping the circulation of cars, in order to provide residents and visitors with electric buses to move around the streets. However, car parks will be at the entrance of Sidi Bou Saïd to accommodate the other vehicles. The second project

concerns renewable energy that will be used for public lighting in the city of Sidi Bou Saïd.

1.2. Profile of the village

Sidi Bou Saïd, in its global morphology, presents itself as an open-air pedestrian space with a total area of 217 ha. Facing east, it welcomes the first light of day. It is wide open to the urban landscape on one side and a natural landscape on the other. Sidi Bou Saïd is a famous tourist attraction in Tunisia. Its positioning next to the Mediterranean Sea gives the city a cool atmosphere. As it is presented in Fig. 1, the walls and staircases of the age-old buildings are of marble white, while the doors, window frames, shutters, and Moucharabieh are of blue color.

Baron, Rodolphe d'Erlanger, who was a French painter and a musicologist, introduced the blue and white theme. This outside living space was chosen because it is frequented by an infinity of users, including a social, cultural, commercial, artistic diversity. It is a small city with a population of around 6,000. Sidi Bou Saïd is an important touristic pole; it is one of the sites the most visited in the Mediterranean Sea and welcomes up to 100,000 visitors during the weekends of the summer months.

1.3. Existing street furniture conditions and reasons behind

Urban street furniture is considered as a microelement of the city construction and an important part of its ecological



Fig. 1. Incompatibility of street furniture with the surroundings in terms of design, appearance and implementation (Photo: Author)



Fig. 2. The different sort of furniture is no maintained and do not merge with the surrounding environment
(Photo: Author)

aspect that cannot be ignored. Creating an outdoor environmental space became primordial for the city's comfort [8]. Based on the literature review, while the public space is being famous and frequented by an infinity of users, street furniture should be gradually recognized. The municipal government in Tunisia has been working on the overall large-scale urban planning while small-scale planning is not taken into consideration, and urban street furniture has been ignored. The disordered situation of the street furniture leads to a series of problems related to the lack of ecological design aspects and to environmental consciousness. Based on the social orientations and development design innovation, energy conservation, and economic enhancing, eco-design improves promotion of sustainable city construction and a space harmonization with street furniture [9, pp. 219–231]. This paper explores the possibilities of analyzing the actual situation of street furniture just like mentioned in Figs 1 and 2, first in its relation with the space and second in its incompatibility with the surrounding environment.

2. DESIGN METHODOLOGIES

In the field of urban design, the most popular method of designing environmentally friendly street furniture comprises the 3Rs method (reuse, reduce, recycle) into the design process. The main objective of the 3Rs method is to minimize pollution, lower costs and minimize the consumption of resources. It was announced that to design green street furniture, there are three different ways that should be taken into consideration; using recyclable and durable materials, using natural resources, and minimizing resources of maintenance [10]. One of the objectives of the municipal government of Sidi Bou Saïd is to place significance on environmentally urban planning, which is more livable. Meanwhile, a space analysis should be done concerning the geographic environment and climate and the local construction materials. The elements that define these objectives are as follows.

2.1. The reuse and reduce method: climate analysis and proposed design idea

Sidi Bou Saïd is at an altitude of 77 m. The climate is warm and temperate. In Sidi Bou Saïd rain falls mainly in winter with relatively little rain in summer. Sidi Bou Saïd's average annual temperature is 17.7 °C. It is represented in Fig. 3 that the rainfall average is 443 mm per year. It varies from the driest to the wettest of the months by 65 mm.

Between lowest and highest temperature of the year, the difference is 16.0 °C as it is represented in Fig. 4. In August, the average temperature is 26.3 °C. August is the warmest month of the year. In January, the average temperature is 10.3 °C.

In terms of energy use, street furniture design can enforce the use of solar energy by converting it into electric energy during the night for lighting, which ensures maintenance reduction and renewable energy possibilities. A combination of a solar streetlight and sports equipment is suggested as well. The concept invites people to train, not only to take care of their physical condition but also to provide energy to the society around them.

2.2. The recycle method: local construction materials

As Sidi Bou Saïd is already known for its blue and white colors, which are the best colors representing as the main colors for ecological design, including green, it makes people feel relaxed psychologically thinking of the natural space. Concerning the materials, the design choice is related to the risks factors control; non-toxic materials, environmentally friendly, local climate consideration.

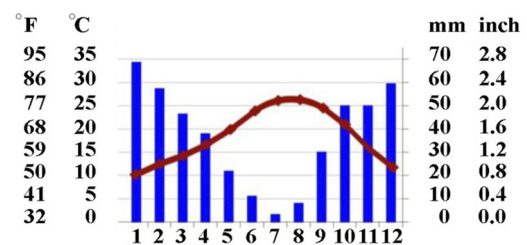


Fig. 3. Ombrothermic diagram of Sidi Bou Saïd
(Source: Authors plot on the basis of Climate-Data. org)

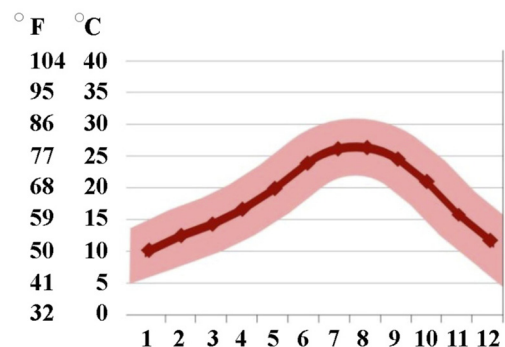
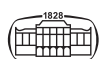


Fig. 4. Temperature curve of Sidi Bou Saïd
(Source: Authors plot on the basis of Climate-Data. org)



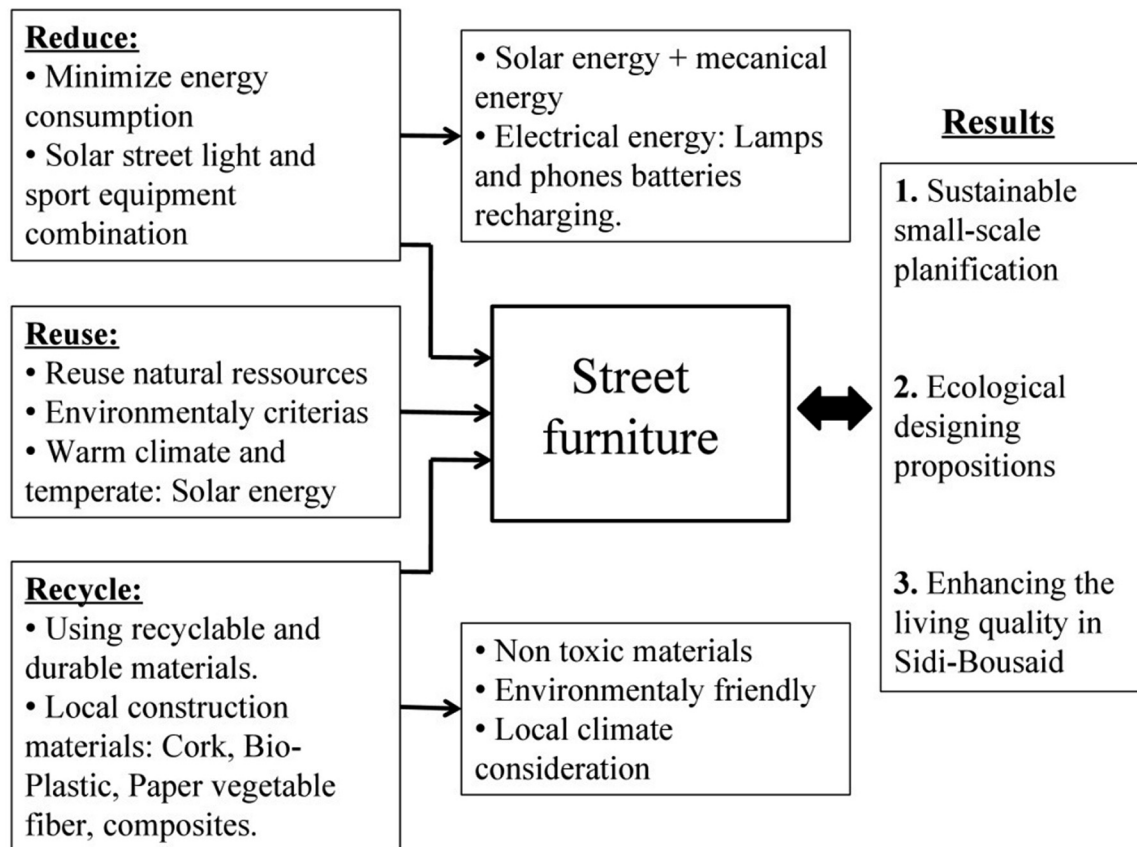


Fig. 5. Structural model relating street furniture with eco-design conception

- *Cork*: Recycling of cork remains recovered in the factory during the manufacture of stoppers. This residual cork conserves its natural properties: Ecological, durable, and insulating;
- *Bio-plastic*: the introduction of agro-sourced or agro-plastic plastic materials from renewable resources, such as corn, wheat, and sugar cane;
- *Paper and vegetable fiber material*: Papermaking based on local materials like palm leaf. Experimenting with paper pulp through new shapes and moldings;
- *Composites*: mixing and creating alternative materials, use of agglomerated cork, natural fibers, and bio-plastic.

This waste is stored and then crushed separately before being mixed. The obtained chips are then heated in a machine to melt them. Large strips of plastic are then extracted to 100% of recycled material. It has great advantages over other materials as well as wood or steel. Composites are particularly suitable for the design of street furniture because it is heavy, solid and robust.

3. PROPOSED RECOMMENDATIONS

In most cosmopolitan cities and developed countries, the urban treatment of the city goes through a survey, a work essentially based on the seizure of the citizen's needs as an

indispensable phase for the elaboration of any strategy. Apart from the urban furniture found in the streets, benches, signs, garbage baskets, etc., the supplies and sports and cultural equipment become indispensable in the renewal and attractiveness of the place, but also in the shaping of a new urban experience by taking into account the health of the inhabitants and thinking about their entertainment.

Here, in the case of Sidi Bou Saïd, many visitors perceive the place as a health trail, a place to take a good walk, practice sports, take a break and stop at some places. It is in this sense that we must read all the possible scenarios of the place.

As being a practice of creation turned towards the future and underpinned by an ameliorative intention. It is about putting itself at the service of improving living conditions and the quality of life. Design is an approach that allows the space users to contribute to the improvement of their living environment by imagining innovative forms of use through its tools for a sustainable project.

In terms of the physical needs and mental health of people, the ecological design method is applied in this stage of research. The proposed design integrates the local materials with modern design aesthetics to adapt to modern life [11, 12]. It carries a profound design conception mixing the historical background of Sidi Bou Saïd with natural resources. During the design conception procedure, it was mandatory to link ecological design with people's needs,

environmental landscape, colors and materials used, and technology in serve. Therefore, an assortment of multiple conception designs should be taken into consideration according to ecological design aspects, flexible positioning, coordination with the space, and the users.

The idea consists of installing futuristic streetlights, which would be powered by photovoltaic panels; it allows consuming renewable energy and kinetic energy. Different from regular streetlights, they also include fitness equipment. When users train with these sports equipment, the resulting mechanical energy is converted into electrical energy through a generator. The electrical energy obtained then recharges the battery of the lamp floor so that it can light the streets of the city at night (Fig. 5).

4. CONCLUSIONS

Perceived as a tourist destination that opens on the Mediterranean, “a city of the world” that welcomes so many visitors each year. Sidi Bou Saïd has enormous potentialities from the point of view of geographical location, climate, architecture, history, etc., which makes it a world heritage for everyone, which deserves to be maintained, highlighted. This article aims to propose urban furniture that meets both the needs of the architectural environment, its climate, but also that of the daily needs of visitors to the space.

The proposed design recommendations based on the stated methodology followed by technical solutions will be suggested to the local municipality after accomplishing with the further study of street furniture. To realize a new ecological spirit into local culture and aesthetics in modern life through this design criteria, Sidi Bou Saïd will be shaped as a landmark of ecological outdoor living space with the conformance of architectural character and urban identity.

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