

## **Designing sustainable lighting units in the realm of benefiting from solar energy**

**Assist. Prof. Dr. Alamir Ahmed Shawky**

Assistant Professor, Department of Interior Design and Furniture - Faculty of Applied Arts - Damietta University.

**Assist. Prof. Dr. Gehan Mohamed Fouad**

Assistant Professor, Department of Industrial Design - Faculty of Applied Arts - Beni Suf University.

**Assist. Prof. Dr. Haitham Ibrahim Elhadidy**

Assistant Professor, Department of Industrial Design - Faculty of Applied Arts - Damietta University.

[dr.haithamelhadidy@gmail.com](mailto:dr.haithamelhadidy@gmail.com)

**Assist. Lect. Ahmed Mohamed Nasser**

Assistant Lecturer, Department of Industrial Design, Faculty of Applied Arts, Damietta University.

[ahmednasseressa@gmail.com](mailto:ahmednasseressa@gmail.com)

### **Abstract.**

The world is facing increasing problems resulting from the use of traditional and unclean energies in various industrial products, and these problems represent a challenge that requires human society to take a set of effective policies and measures to overcome those problems, before the planet's resources are depleted in a way that makes the situation out of control.

Hence the need to activate the role of the industrial designer in helping to reduce those problems, by exploiting and employing clean energies in the design of sustainable industrial products, to achieve one of the most important principles and goals of sustainability, which is preserving the environment, through energy conservation, also taking into consideration the rationalization of energy consumption throughout the entire life cycle of the product, as well as resorting to the use of clean alternative energies that have no burden on the environment or society and at the same time have an economic return.

This research focuses on ways to use solar energy in the design of sustainable industrial products (sustainable lighting units), by activating the role of the industrial designer in the various stages of designing a sustainable product that works with solar energy, depending on the research findings of a set of dimensions and determinants. The design must be taken into consideration to integrate solar energy in the design of various industrial products, and knowing the impact of using solar energy in product design on both aesthetic and functional values, in addition to economic aspects of the product.

Accordingly, this research is trying to assist in developing the innovative capabilities and design of the industrial designer in terms of employing solar energy and using it in the design of sustainable industrial products, which contributes to the emergence of more products with innovative and sustainable solutions. It also sheds light on the advantages and methods of utilizing solar energy in the process of designing sustainable industrial products.

### **Keywords.**

Sustainable design, Solar energy, Photovoltaics cells, Modern technology.

## **Research introduction.**

Humanity today is in dire need of finding a number of effective and innovative solutions to many environmental problems that represent a real threat, not only to human existence on Earth, but to all living creatures. This danger is evident in a number of major problems that have a devastating impact, such as the problems of global warming, desertification and others.

It is worth noting that there are many efforts made, which cannot be denied or underestimated, which seek in the direction of preserving and purifying the environment from the pollution caused to it, and perhaps one of the most important fruits of these efforts for us as designers is the emergence of a large number of design trends that take into account aspects environment in the design process such as:

- Environmental design
- Ecological design
- Green design
- Eco-friendly design
- Sustainable design

Most of these design trends focus on the use of clean energies and alternatives to fossil fuels, especially renewable energies, primarily solar energy, as it is a sustainable natural resource. Sustainable design is the most important of these design trends, because it has a great deal of comprehensiveness, as it takes into account not only the environmental dimension in the product design process, but also the social and economic dimensions. The research is based on finding sustainable lighting unit designs in light of the utilization of solar energy.

## **Research problem.**

The use of traditional energies in industrial products, especially the various lighting units, resulted in an increase in environmental, social and economic problems, as well as the failure to activate the role of industrial design sufficiently to benefit from solar energy in designing sustainable lighting units to overcome these problems, with the absence of a clear plan and specific work strategy. Through which this benefit can be achieved.

## **research importance.**

The importance of the research is to help develop the innovative and design capabilities of the industrial designer with regard to employing solar energy in the design of sustainable industrial products, thus contributing to the emergence of more products with innovative and sustainable solutions.

## **search objective.**

The research aims to develop a set of design considerations that can be used in the design of sustainable lighting units powered by solar energy, and to show the development that will occur when using solar energy in the design of products on both the formal, functional and use aspects of the product.

## **Force search.**

By employing solar energy in product design, this helps to find alternatives and innovative design concepts for sustainable lighting units products.

## Research findings and recommendations

### 1- Search results.

The search results were as follows:

The researchers reached a set of considerations, procedures and design determinants in the design of sustainable products in general, and in the scope of research on designing more sustainable lighting units by making use of solar energy in the design process.

☐ Solar energy also affects the design of sustainable lighting units on the various design aspects of the product, such as: (formal, aesthetic, functional, and usability aspects).

### 2- Research recommendations.

It is recommended to search for the following:

☐ The necessity of activating the role of the industrial designer in exploiting and employing solar energy to find an innovative design start for sustainable products.

☐ The need for a national trend to integrate solar energy technologies into the design of various industrial products, in order to maximize the trend towards comprehensive sustainable development.

☐ The necessity of activating the role of universities and various research institutions in increasing dependence on solar energy in various industrial fields in line with the principles of sustainability.

## References:

- 1- Acaroglu, Leyla. 2020. "No Title Quick Guide to Sustainable Design Strategies." 2020. <https://medium.com/disruptive-design/quick-guide-to-sustainable-design-strategies-641765a86fb8>.
- 2- Akadiri, Peter O, Ezekiel A Chinyio, and Paul O Olomolaiye. 2012. "Design of A Sustainable Building: A Conceptual Framework for Implementing Sustainability in the Building Sector." *Buildings*. 2012. <https://doi.org/10.3390/buildings2020126>.
- 3- Apostolou, Georgia, and A Reinders. 2014. "Overview of Design Issues in Product-Integrated Photovoltaics." *Energy Technology* 2 (March). <https://doi.org/10.1002/ente.201300158>.
- 4- Apostolou, Georgia, Martin Verwaal, and A Reinders. 2014. *Estimating the Performance of Product Integrated Photovoltaic (PIPV) Cells under Indoor Conditions for the Support of Design Processes. 2014 IEEE 40th Photovoltaic Specialist Conference, PVSC 2014*. <https://doi.org/10.1109/PVSC.2014.6925027>.
- 5- Askari, Mohammad, Vahid Mirzaei Mahmoud Abadi, and Mohsen Mirhabibi. 2015. "Types of Solar Cells and Application." *American Journal of Optics and Photonics* 3 (August): 2015. <https://doi.org/10.11648/j.ajop.20150305.17>.
- 6- Bhamra, Tracy, and Vicky Lofthouse. 2016. *Design for Sustainability: A Practical Approach*. Routledge.
- 7- Carlson, Riley E. 2018. "How Solar Panels Work | The Science Behind Solar Heating." 2018.
- 8- Crul, M R M. 2006. *Design for Sustainability: A Practical Approach for Developing Economies*. UNEP/Earthprint.

- 9- Elmansy, Rafiq. 2014. "Principles of Sustainable Design." 2014. <https://www.designorate.com/principles-of-sustainable-design/>.
- 10- "Pros and Cons of Solar Energy." n.d. <https://www.greenmatch.co.uk/blog/2014/08/5-advantages-and-5-disadvantages-of-solar-energy>.
- 11- TURNER, SOPHIE. 2012. "What Are Solar Cells?" 2012. <https://www.solarenergybase.com/what-are-solar-cells/>.