# Incorporate Resilience Principles Into Architectural Education Programs

**Associ. Prof. Dr. Ahmed Yehia Esmail**
**Associate Professor, Faculty of Fine Arts , Helwan University**
**E-mail: ahmed-yehia@f-arts.helwan.edu.eg**

## Abstract :

Resilience is one of the most important challenges facing contemporary architecture and must demonstrate that it is capable of accommodating its requirements, so it is necessary to develop architecture that is familiar with the principles of Resilience and can apply these principles with modern technologies in producing a Resilient and sustainable architecture. However, the reality does not reflect the community's awareness of the importance of Resilience and the ability of different systems to adapt to different variables and to cope with different challenges. Moreover, many architectural programs in universities do not have enough knowledge of Resilience.

The importance of the research is highlighting the role of architectural education in the rehabilitation of architects with skills that enable them to apply the principles of resilience in their buildings, whether in university or in practice . The research will study the extent to which the concepts of resilience are incorporated into the architectural education programs in Egypt, highlighting the different methods that are appropriate, and will analyze the program of the architecture department of the Faculty of Fine Arts as a case study, to assess the knowledge students receive about the concepts of resilience, as well as to review research into many local and international educational endeavors in the form of workshops on the importance of opportunities offered by "resource recycling" strategies as resilience and sustainable design tools.

The research also concluded a series of results, the most important of which is that architectural education programs should create a community environmental culture by increasing students' awareness of the principles of resilience and emphasizing the idea of recycling materials. With recommendations on bodies linked to the development of the architectural education system in Egypt to achieve a resilience and sustainable society that provides comfort to its users.

## Keyword :

Architectural Education , Resilience , Adaptability , Resource Recycling , Education Development.

## Introduction :

In the light of the crises of natural resources and energy shortages that most countries are currently experiencing, the challenge that architectural education must meet are clearly shown to us, and how to address these problems by activating the principles of resilience and the most important of these is the reuse and recycling of materials and reformulate and include them in the framework of the architectural education programs.

Over the past few decades, developing economies have also experienced significant increases in population numbers, an unprecedented rise in environmental disasters from floods and landslides to cyclones and tsunamis, severe climate changes, and global and local coronas.

DOI: 10.21608/mjaf.2020.44467.1876

All this gives us sufficient precedents to consider the concept of " Resilience " as an important and necessary architectural response. Both at the level of teaching architectural design programs and at the level of the practice of architecture in the form of resilience architectural products that increase the ability of their societies to withstand and adapt to such crises, variables and disasters. [1]

It is therefore necessary to integrate and operationalize the principles and concepts of resilience and adaptability in the appropriate courses, by incorporating them into the curriculum content of the architectural theories and courses that include building technology. In addition, the new project will be designed to provide the necessary training to the students in the field of education, as well as to provide them with the necessary training.

**Research problem:**

The architectural education is a highly interlinked area of society and its issues, and it has a great responsibility to graduate architects who are aware of environmental issues, and because many Egyptian cities suffer from many architectural problems, among the most prominent are the excessive and indiscriminate exploitation of natural resources and environmental pollution as well as problems of climate change.

This shows the urgent need for architects to be able to deal with these problems and to participate in finding suitable solutions for them. The reality, however, reflects the contrary by a gap between graduates of educational institutions in the field of architecture and their ability to participate in the sustainable and resilience development of their societies. Hence the need to move toward an advanced stage of managing and developing architectural education programs and to adopt the principle of conservation of natural resources, recycling and utilization of waste, in order to enhance societies' capacity for resilience ecological adaptation.

**Research methodology:**

The research methodology consists of the analytical approach by extrapolation of the most important principles and issues of resilience that must be incorporated and activated within the framework of the architectural education programs, where the study examined the various ways to integrate them with the architectural programs and stages. The program of the Architecture Department of the College of Fine Arts, as a case study, was also analyzed and examined to see how the concepts of resilience were incorporated.

In addition to reviewing and analyzing the research for a range of experiments locally and internationally, including the concept of resilience in the framework of architectural education programs, identifying the goals, the course and outcomes of those experiments, and identifying the positive aspects of them, with recommendations for all those involved in architectural education in Egyptian universities.

**Search goal:**

Research seeks to consolidate and inculcate the idea of resilience and the ability to adapt in the minds of students in architecture departments by emphasizing their concepts and principles in working to avoid waste and reuse resources. This is by introducing the idea of recycling waste in the field of architectural education through the creation of architectural models that increase visual and mental experience and expand students' understanding, as well as the development

of their communication, display and collaboration skills. The extent to which this reflects on the development of architectural education and its increasing efficiency in Egypt.

The research also aims at identifying the extent to which the principles and issues of resilience are included in the architectural education programs, and revealing the appropriate methods. In order to achieve the main objective of the educational process, it is an architectural production with scientific and applied skills to achieve resilience in its society and to confront the problems it faces, the most important of which is the problem of dealing with the huge amount of waste produced annually worldwide, especially in the Middle East region. The total production of urban waste in the Middle East countries exceeds 150 million tons per year [3], so it was necessary to consider the role of architecture in how to deal with it, and the role of recycling of waste as one of the basic concepts of resilience that should be incorporated and implemented in architectural education programs.

**Resilience and Sustainability :**

"Sustainability" has been one of the most prominent scientific terms in the field of ecology for long periods, until the concept of "adaptation" has been incorporated into the concept of sustainability, where the concept of " Resilience ", and the ability to withstand and resist.

As natural disasters increase and spread worldwide, especially climate disasters, causing a reaction from many international organizations such as the European Union (EU). 20 % of relief funding has been allocated to disaster risk reduction, and two thirds of its humanitarian projects included activities to this end in 2013. In April 2014, the organization hosted the first disaster-resistance forum "to serve as a catalyst for global efforts to support communities in areas facing recurrent disasters or conflicts - to prepare, overcome and recover from pressures and shocks."[4]

Sustainability and Resilience can work together in many areas such as economy, construction, transport systems, and other systems, Resilience is the ability to recover from a disaster that could have been prevented or mitigated by sustainable practices, and sustainable practices contribute to resilience, both aim to achieve a sustainable health society that can withstand disasters and crises.

Resilience can also be seen as the ability of a system to prepare for threats, absorb effects, recover and adapt after persistent stress or disruption, while sustainability implies continuity, with something referred to as sustainable until its resources are never exhausted. These resources are often used again.

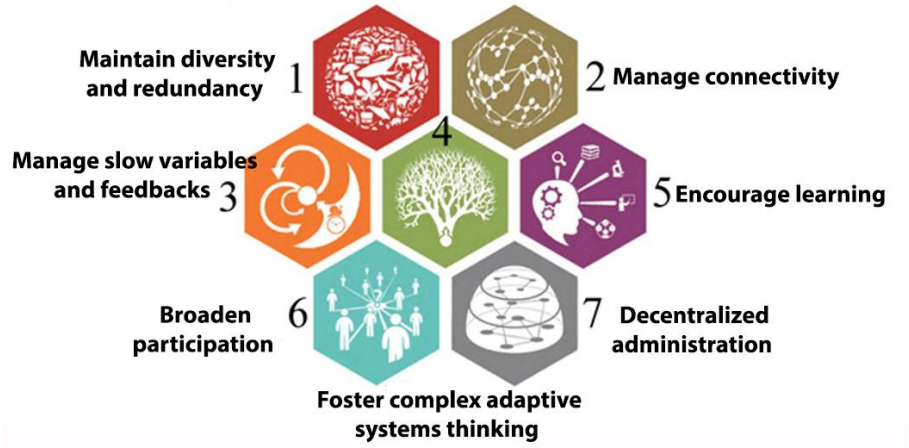
**Resilience and Architectural Design :**

Resilience design is the feature that allows for modification and change in the space functional system of the building, after the completion of its formation, in order to respond, and adapt to the time and location variables to meet the new and expected functional needs and requirements of the building. This building will continue to be used in high quality for as long as possible. This design process may be carried out by the occupants of the building without the assistance of the specialists.

The concept of adaptation and resilience within the field of architecture also carries the idea of resilience; It is a social, cultural, economic and environmental concept. Resilience design is the one that responds to social, cultural, economic, environmental, technical, pressures and

constraints, and it is the design that retains the ability to "adapt" to the various pressures, constraints and possibilities of a built environment, without compromising its expected performance, not social, economic, environmental or technological. [14]

**Principles of Resilience:**




**(Figure1) General Principle of Resilience. Source: Reinette Biggs , Maja Schlüter and Michael L. Schoon Principles for Building Resilience( Sustaining Ecosystem Services in Social–Ecological Systems)- Cambridge University Press; 1 edition (May 7, 2015).**

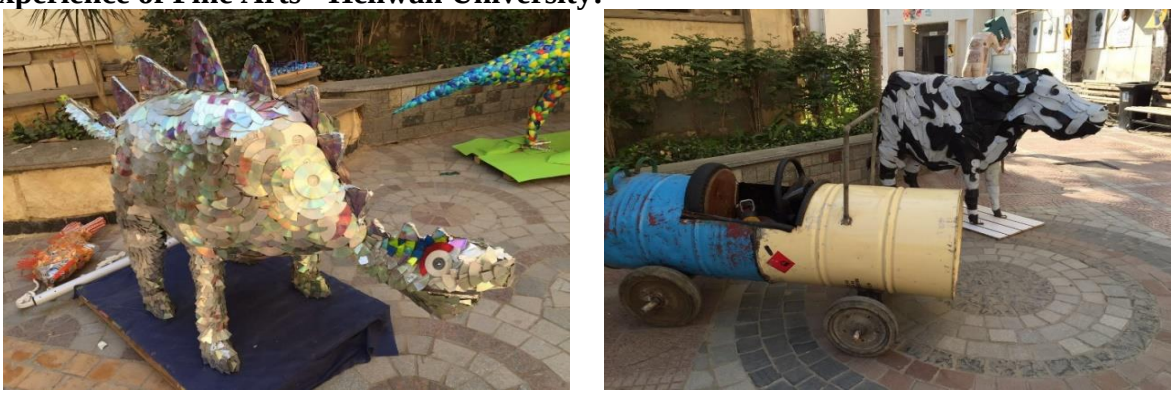
**Resilience and Architectural Education:**

The concept of reuse of different materials and residues, which is one of the most fundamental principles of resilience and adaptability, is combined with the principles and concepts of flexibility, and can be done in the form of workshops and field experiences in which students share members pf the teaching staff in the framework of educational programs in which some structural or architectural theories are applied through the application of those theories using recycling of some paper residues such as cardboard boxes, cardboard, and two-plate boards from finished projects and working on the manufacture of manifolds, construction systems or coverages and other activities in an interactive framework that links the theoretical and practical aspects of application.

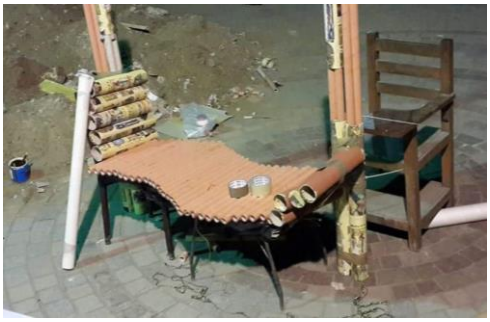
**Experiences of activating and integrating the principles of Resilience within the framework of architectural education programs at local and international universities:**

**Local experiences:**

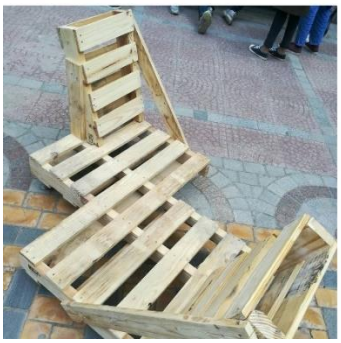
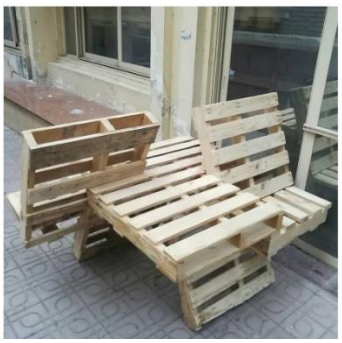
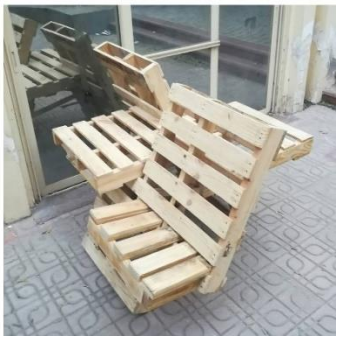
**Experience of Fine Arts - Hellwan University:**



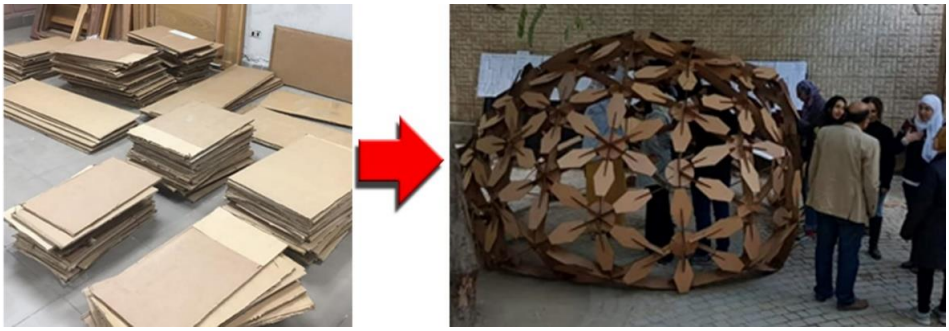
**(Figure2)Examples of waste recycling in the form of 3D works of art. Source: Researcher**

**(Figure3) Models of furniture manufacturing workshop from paper backgrounds of the learning process. Source :Ahmed Y. Esmail -Yasser M. Elsayed , Reusing And Recycling Of Waste Paper In The Configuration And Architectural Education , Proceedings of EDULEARN15 ( 7th International Conference on Education and New Learning Technologies) (July 6th - 8th, 2015) Barcelona ( Spain )**

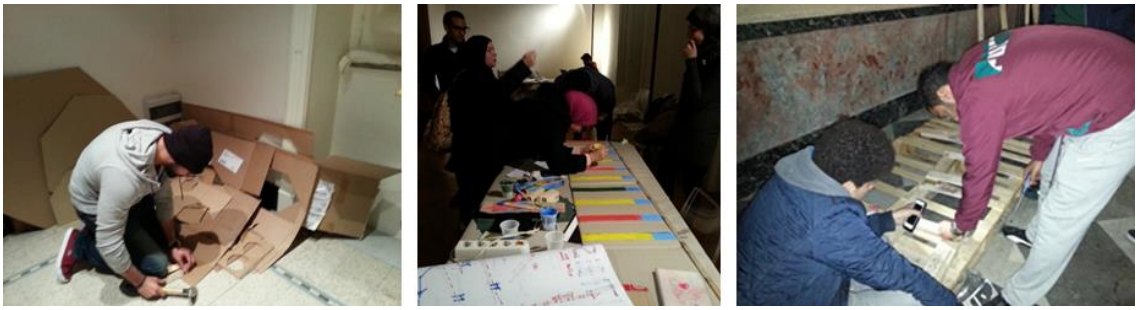
**(Figures4) Sample furniture made from the wooden balates at the college courtyard during the workshop. Source:http://refunc.nl/wp-content/uploads/REFUNC_CAIRO_HELWAN_UNI_2218_S.jpg**



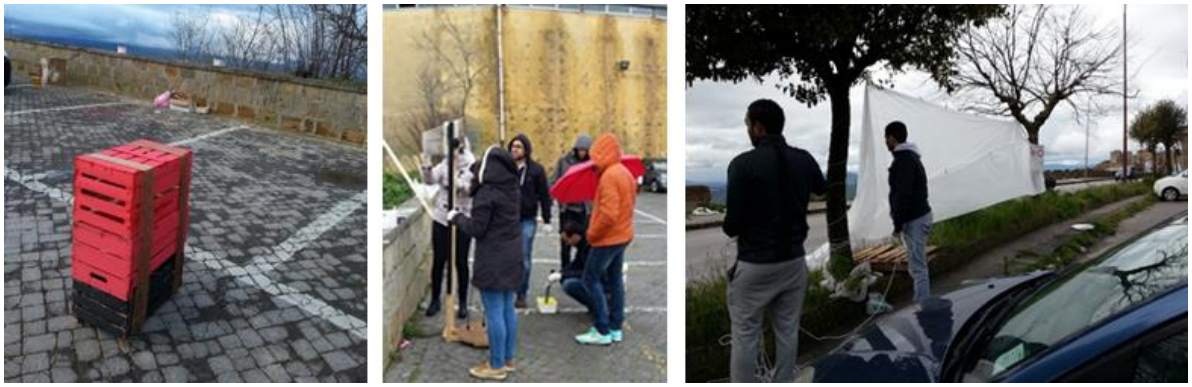
**(Figures5) The idea of the workshop is to re-exploit the materials in a development of different construction systems. Source: Workgroup Imaging**

## International Experiences:

### International Winter School Workshop in Italy (March 2016):



**(Figures6) Student activities participating in workshops. Source: [26].**



**(Figures7) Student activities and products in external sites. Source: [26].**

## Results:

- The principle of reuse not only stands the idea of using old waste or materials as resources, but also helps to build new generations that incorporate Resilience as a way of life, not as a trend or a temporary method, and incorporating the principle and idea of reuse of materials into architectural education programs can add many values. Among them, how the reuse of materials can help create many urban and architectural interventions with few resources and a rapid impact, while reducing waste has a positive impact on society and the environment. In addition, students' educational communities are involved in the reuse of materials as a sustainable and resilience and indispensable way.
- The design and planning decisions were among the most interactive materials with the issues of Resilience and its principles of inclusion and application capabilities, followed by the decisions of architecture theories, environmental studies, and energy. The field of application was available through workshops conducted as reviewed in the body of the research and students benefited greatly by converting some neglected materials into models and solids that played a significant role in the practical, concrete and meaningful delivery of information to the student In developing the learning process.
- The concept of Resilience is still unclear and unpalpable in many theoretical materials and materials related to building cost, indicating a lack of study of techniques and concepts of Resilience in those materials that need to be developed and modernized to include modern issues in the construction world Design .
- International experience has shown how the use and rotation of raw materials can serve different communities and contribute to solving some of their problems.

## Recommendations:

The study recommends that some of the issues arising from these general principles of Resilience be incorporated into the programs of the University's architectural departments through the methods discussed in the study, and that the study also raise some of the issues arising from these general principles of Resilience within the framework of different courses, design projects and planning.

## References:

[1] Yashodha Perera, Milinda Pathiraja , Resilient Environments Vs. Resilient Architects: Creativity, Practice and Education , University of Moratuwa Katubedda, Sri Lanka, JULY 11, 2018 , ecretariat@ace-conference.org

[٢] Folke, C.؛ Carpenter, S.؛ Walker, B.؛ Scheffer, M.؛ Elmqvist, T.؛ Gunderson, L.؛ Holling, C.S. (2004). "Regime Shifts, Resilience, and Biodiversity in Ecosystem Management". Annual Review of Ecology, Evolution, and Systematics. 35: 557–581. doi:10.1146/annurev.ecolsys.35.021103.105711.

[٣] Salman Zafar | March 24, 2015 - 7:19 pm | Middle East, Recycling, Waste Management http://www.ecomena.org

[٤] John Spacey , Sustainability vs Resilience, May 29, 2016 https://simplicable.com/new/sustainability-vs-resilience

[٥] Katharine Logan , Continuing Education: Resilience Rating Systems, October 1, 2018, https://www.architecturalrecord.com/articles/13660-continuing-education-resilience-rating-systems

[٦] Oxford English Dictionary Online, 2011.

[٧] Walker, B.؛ Holling, C. S.؛ Carpenter, S. R.؛ Kinzig, A. (2004). "Resilience, adaptability and transformability in social–ecological systems". Ecology and Society.

[٨] Gunderson, L.H. (2000). "Ecological Resilience — In Theory and Application".Annual Review of Ecology and Systematics.

[٩] REDi Rating System: Resilience-based earthquake engineering design initiative for next-generation buildings. Arup. (2013)

[١٠] Till, J., & Schneider, t. (2005) "Flexible Housing: The Means To The End" Arq. , vol 9, p. 287.

[١١] Reinette Biggs , Maja Schlüter and Michael L. Schoon Principles for Building Resilience( Sustaining Ecosystem Services in Social–Ecological Systems)- Cambridge University Press; 1 edition (May 7, 2015).

[١٢] Prins, M., (1992) "The Management of Building Flexibility in The Design Process: a design Decision Support Model for Optimization of Building Flexibility in Relation to Life Cycle Costs in: Nicholson, M.P., Architectural Management, 1 st Edition, E & FN Spon, London.

[١٣] Friedman, A, (1993) "Decision- Making Process for Choice of Flexible Internal Partition Options in Multi-Unit Housing Using Decision Theory Techniques", in Design and Decision Support Systems in Architecture, Kluwer Academic Publishers, Dordrecht, The Netherlands, pp. 179- 188.

[١٤] R. Minnery, "Resilience to Adaptation," 4 August 2015. [Online].Available: http://www.architectmagazine.com/aia- architect/aiafeature/resilience-to-adaptation_o.

[١٥] AIA Staff, The American Institute of Architects, January 18, 2019. https://www.aia.org/articles/6097684-how-to-integrate-resilience-into-your-prac:56.

[١٦] Al-Khatib, Qassem (2015), A gateway to sustainable environmental security, Ocean to Gulf Publishing and Distribution House - Amman – Jordan.

[١٧] "Types of Recyclables and Recycling Processes", www.nea.gov.sg, Retrieved 19-01-2020. Edited.

[١٨] Salwa Abad El-Rahman Megahed, Fatma Othman Mohamed (2014), EMBED OF SUSTAINABILITY CONCEPTS IN ARCHITECTURAL EDUCATION IN EGYPT ARCHITECTURE DEPARTMENT, ASSIUT UNIVERSITYAS A CASE STUDY, Journal of Engineering Sciences, Assiut University, Faculty of Engineering, Vol. 42, No. 1, pp., January, E-mail address: jes@aun.edu.eg

[١٩] Altomonte, S. (. (2012): "Sustainable Architecture Education", Educate press 2012 , Department of Architecture and Built Environment, United Kingdom , p6-16,

[٢٠] Official website of the College of Fine Arts - http://facultyoffinearts.com

[٢١]NATIONAL ACADEMIC REFERENCE STANDARDS (NARS) FOR ENGINEERING, 2nd Edition
August 2009.

[٢٢] Internal Regulations of the Architecture Department(2016), Faculty of Fine Arts , Helwan University.

[٢٣] Best College Recycling Programs | Recycling on Campus [Internet]. The Best Colleges. 2020 [cited 19 June 2020]. Available from: http://www.thebestcolleges.org/11college-recycling-programs-that-put-all-others-to-shame/

[٢٤] Ahmed Y. Esmail -Yasser M. Elsayed , Reusing And Recycling Of Waste Paper In The Configuration And Architectural Education , Proceedings of EDULEARN15 ( 7th International Conference on Education and New Learning Technologies) (July 6th - 8th, 2015) Barcelona ( Spain ).

[٢٥]Ahmed H. Radwan, A. Morsi , Integration of Reusing Materials as a Tool in Sustainable Design Education, Proceedings of INTED2018 Conference 5th-7th March, , Valencia, Spain.

[٢٦] Enna university, Kore international winter school's report: Spaces for the real life, Enna, 7-13 March 2016.