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Research Article

An Analysis Of The Housing Footprint In Urban Areas As An Indicator Of Sustainable Development (Katameya Heights Resort, New Cairo, Egypt)

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ABSTRACT

As part of the State's efforts to achieve development at the different planning levels and in all sectors, including housing, a series of challenges and obstacles have emerged, namely, increasing the constant human demand for nature, its overexpression, and its biological potential. There is a lack of recent physical development because it does not take into account the pivotal relationship between both activities and human requirements and the types of land cover, but the impact can be traced and studied through the use of them.
Within the framework of global developments that seek to achieve comprehensive sustainability, the research seeks to assess the ecological impact of Egyptian urban agglomerations on the housing sector to achieve sustainability.
The research focuses on tools and methodologies for assessing the environmental footprint in development sectors for ease of implementation in Egyptian urban communities. The research concludes with a set of recommendations and future proposals for appropriate urban development policies to reduce the gap between ecological footprint and biological capacity.

Keywords: Environmental footprint - environmental assessment - housing environmental footprint - transport environmental footprint - biological capacity - ecological footprint- environmental footprint-Sustainability of cities.

1. Introduction

The research examines the sustainability of Egyptian urban agglomerations as a model for developing countries of a hot environmental nature from the perspective of environmental footprint.
To achieve sustainable development by applying to the housing sector, through the study of housing as one of the key sectors of reconstruction and sustainable development.
Environmental assessment and hence environmental footprint are one of the tools for environmental assessment of the sustainability of the housing sector from the perspective of the environmental footprint and a case study of a model.
An urban gathering to identify the pros and cons of urban development in the housing sector from the perspective of the environmental footprint through which development mechanisms are identified.
From the perspective of the environmental footprint through a set of recommendations to improve positivity, maximize utilization, identify negatives, and try to avoid them.
To strive for the sustainability of physical agglomerations in hot developing countries and to try to develop an application model for the environmental footprint of housing in developing countries with economies in transition Hot, desert climate with little rain.
It was selected as a case study because it was one of the first privately owned urban communities to be set up in the fifth cluster, and one of the most impressive golf resorts with a luxurious residential level, many villas, and palaces, with high incomes.

In this case study, the researchers used the EF method for assessing the housing's ecological footprint (EF Housing). This paper is coordinated as follows: following this introduction, Section 2 characterized the research methodology, including the case study area, the calculation procedure, data collection, and analysis. Section 3 displays research findings and discussion. Finally, the conclusions are drawn in Section 4.

2 Definitions of environmental footprint

The term "environmental footprint. utilized to figure out how much waste needs to be absorbed and how much resource usage is required. In terms of resource management, the concept of the environmental footprint is still very prevalent. [1]
That is the only gauge that takes into consideration how much nature we both have and utilize. [2]
It also functions as a resource accounting tool that determines how much Earth regeneration (or "biological capability") is required for a certain activity. [3]
Basically, refers to the amount of land needed to safeguard urban areas and recycle or absorb their waste. [4]

3 RESEARCH METHODOLOGY

3.1 Case study area

New Cairo is a new settlement created, in the nineties, to the east of Cairo by the Egyptian government in the hope of finding a solution to the old city's problems getting out of the city to invade the desert has been always approached as a solution for Cairo's unsolved dilemmas. [5]
The city of New Cairo is the result of the process of including the first assembly in the third and fifth assemblies, which became the new city of Cairo.
It has been targeted by investors and has made investments through the creation of several service housing projects in the city. The main economic base of the city services, as well as an industrial zone with few light industries and no agricultural and tourism activity (except for the JW Mariott Hotel and Katameya Heights for some sports and recreational activities). [6]
Katameya Heights Golf and Tennis Resort became the first commercial venture to combine golf and real estate in Egypt Since January 1997. The golf course, clubhouse, and residential plots of land cover an area of 2270000 square meters and a population of 2751. [7]
Katameya Heights Resort is in a very distinct place in the heart of New Cairo, specifically near the ring road and the Gamal Abdel Nasser axis (see Fig. 1).

Figure 1: Satellite Map of Katameya Heights Resort. (Source: Researchers, 2021 based on Google Maps, 2021.)

Figure 2: layout of Katameya Heights Resort. (Source: Researchers, 2021 based on http://www.katameyaheights.com/.)

3.2 Data Sources and Collection.

To source the required data, the researchers reviewed published technical and governmental reports and papers, web pages, and statistical reports.

To establish how EFA could be measured and what type of data should be collected, journal articles were consulted. The EF Housing method provided valuable insights into decision-making processes and how sustainable urban policies can be proposed.

3.3 Ecological Footprint Defined.

It is the amount of land required to provide the population with resources, to measure the area required to absorb their waste, to show the total amount of resources consumed by the population of a region, whether self-production or imported and to determine the extent of the damage caused using those resources on the ground. [9]

The term environmental footprint appeared to describe the impact of human consumption and production. The activities were first developed by planners at the University of British Columbia (Wackernagel & Rees, 1996, p. 9) In this way, they have defined the environmental footprint as a computational tool used to measure the consumption of resources and the requirements for absorbing waste from such consumption. [10]

The relationship between the elements of cities and their reflection on the environmental footprint can be illustrated by biological capacity, since human activities carried out by a human being to meet his or her needs in terms of various uses have an impact on the environment and biological capacity, within a framework of the inner-city interaction, through which communities and cities can be stripped to land areas so that they can be easily handled and evaluated through relationship studies and interactions. [11]

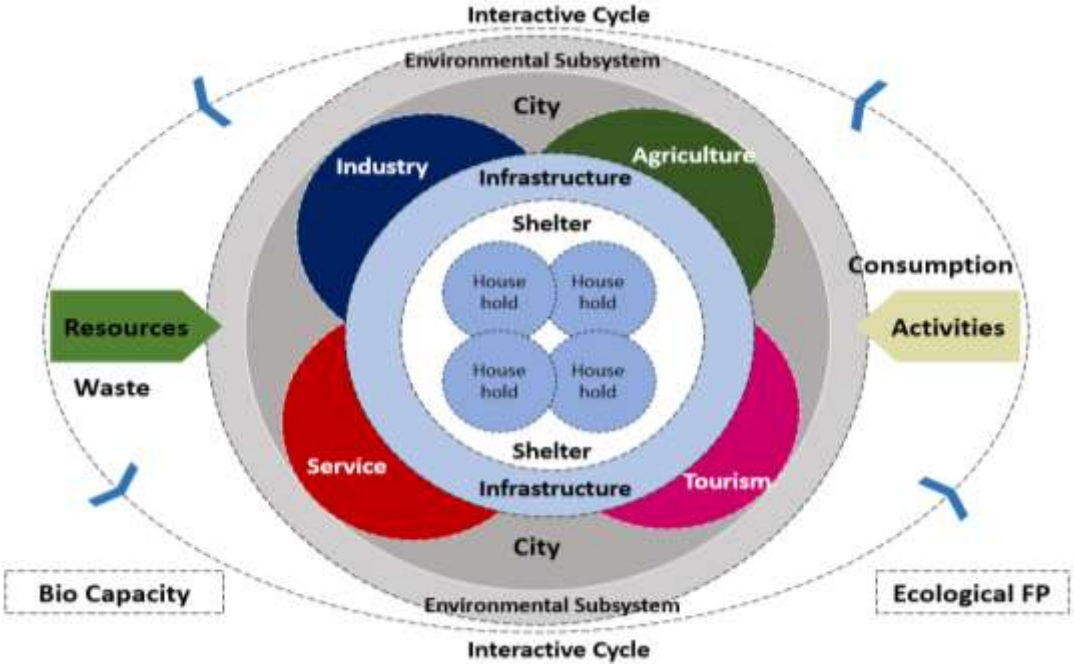


Figure 3: the relation between city sectors and urban footprint which includes housing footprint in the environmental cycle which reflects sustainable development.: (Source: Researchers, 2021.) [11]

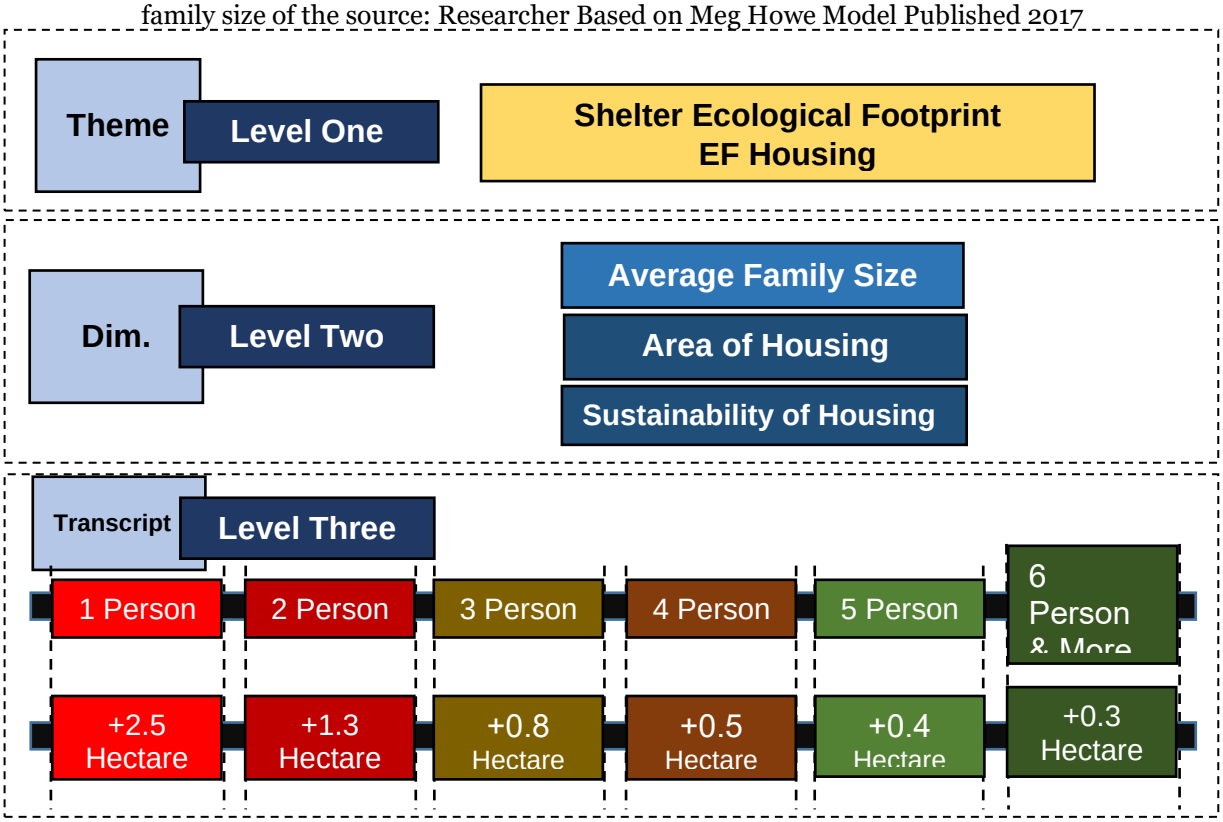
3.4 Sustainable Development.

So, what is an ecological footprint, exactly? The simple answer is that we all need a certain amount of land area to live, and this area can be measured. Anything we eat or throw away needs a place to go.
What we use or discard is created or assimilated around the world. Consequently, the ecological footprint is a clear accounting method for estimating human impacts. [12]
The ecological footprint is not the only accounting approach available. Life Cycle Analysis, Ecological Space, Ecological Rucksack, Environmental Impact Assessments, Factors 4 and 10, MIPS (material strength per service), and a plethora of other resources are available on the market. [13]

3.5 The application of the Ecological Footprint Analysis (EF Housing) model.

The Meg Howe model published in 2017 to calculate components of the ecological footprint of the Katameya Heights area has been applied as a standard for environmental assessment of the application to the housing sector. Research in the framework of global developments that seek to stimulate overall sustainability seeks to assess the environment of Egyptian urban communities from the perspective of the environmental footprint of application to the housing sector to achieve sustainability. [14]
The model is broken down into three levels as the following Figures (4,5,6)

Figure 4: Indicators of the environmental footprint of the housing (EF Housing) associated with the average family size of the source: Researcher Based on Meg Howe Model Published 2017



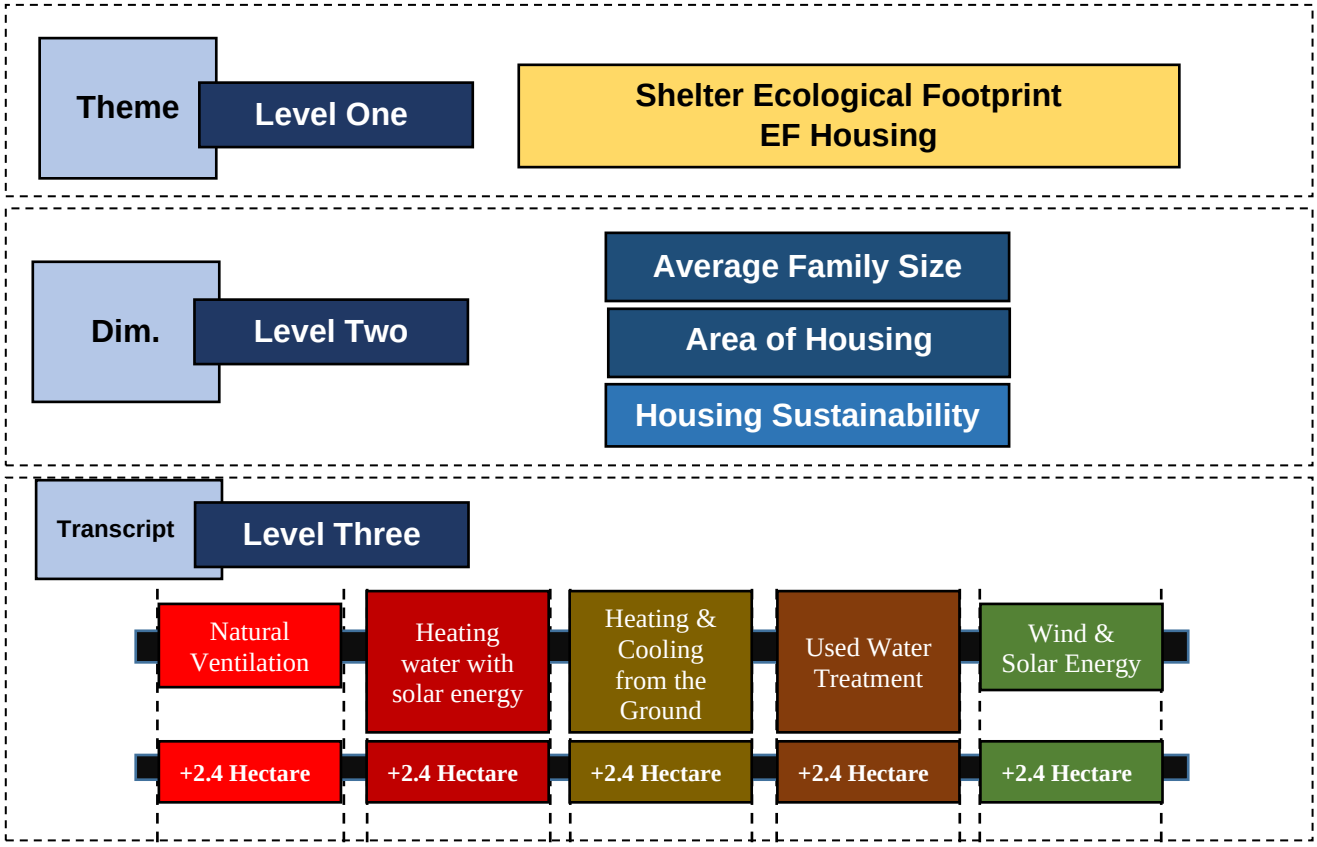


Figure 5: Indicators of the environmental footprint of the housing (EF Housing) associated with the Area of housing of the source: Researcher Based on Meg Howe Model Published 2017

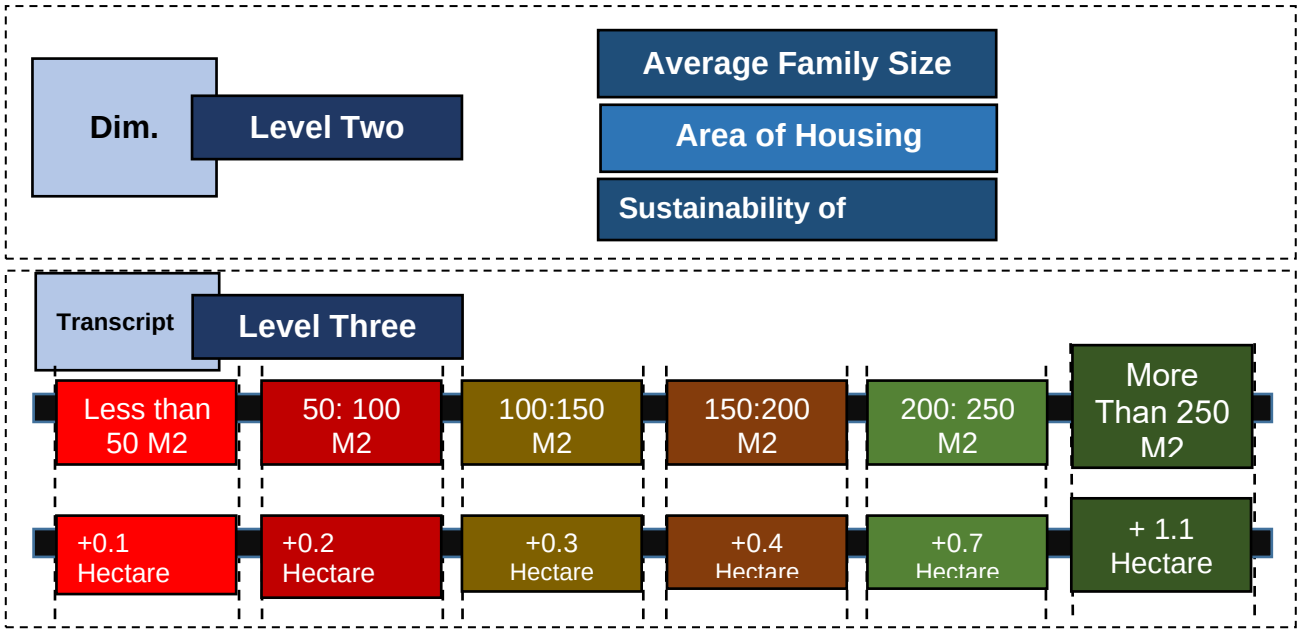


Figure 6: Indicators of the environmental footprint of the housing (EF Housing) associated with the Housing Sustainability of the source: Researcher Based on Meg Howe Model Published 2017

3.6 (EF Housing) model

To clarify the model for measuring the environmental footprint of housing, an indicative table of how a housing (EF Housing) model is calculated is attached, as shown in the table for a model assumed by way of illustration.

The environmental footprint of housing per housing unit (EF Housing)
Housing area = 170 square meters
Total number of roles = 1 (ground role)
Average family size = 5 members/families
It was assumed that housing fulfilled the principle of sustainability.

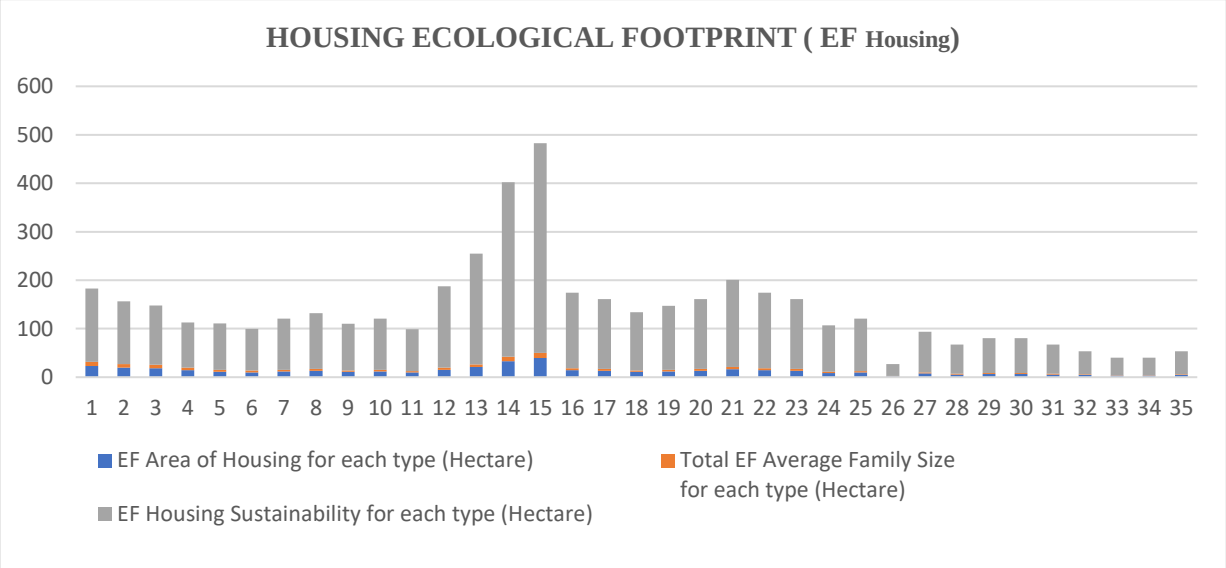
Table 1: To illustrate the model for measuring a home's environmental footprint (EF Housing) (Source: Researchers, 2021. Based on Meg Howe Model Published 2017)

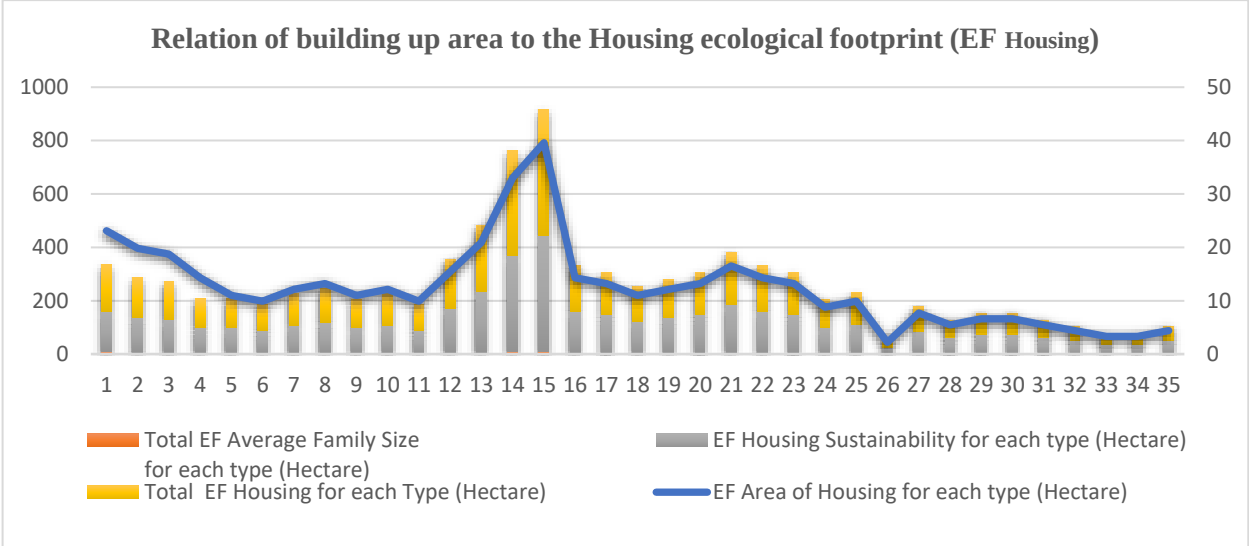
Housing Type A	Area of Housing unit (m2)	Average Family size	Sustainability of Housing	Total Environmental Footprint of the Housing Unit (EF Housing)
Required Data	250	5	Energy Supply, Green House	----------
Environmental Footprint	0.7+	0.4 +	12.0 +	13.1
EF Housing	0.7X1=0.7	0.4X1=0.4	12X1=12	13.1 Hectares

4 RESULTS AND DISCUSSION

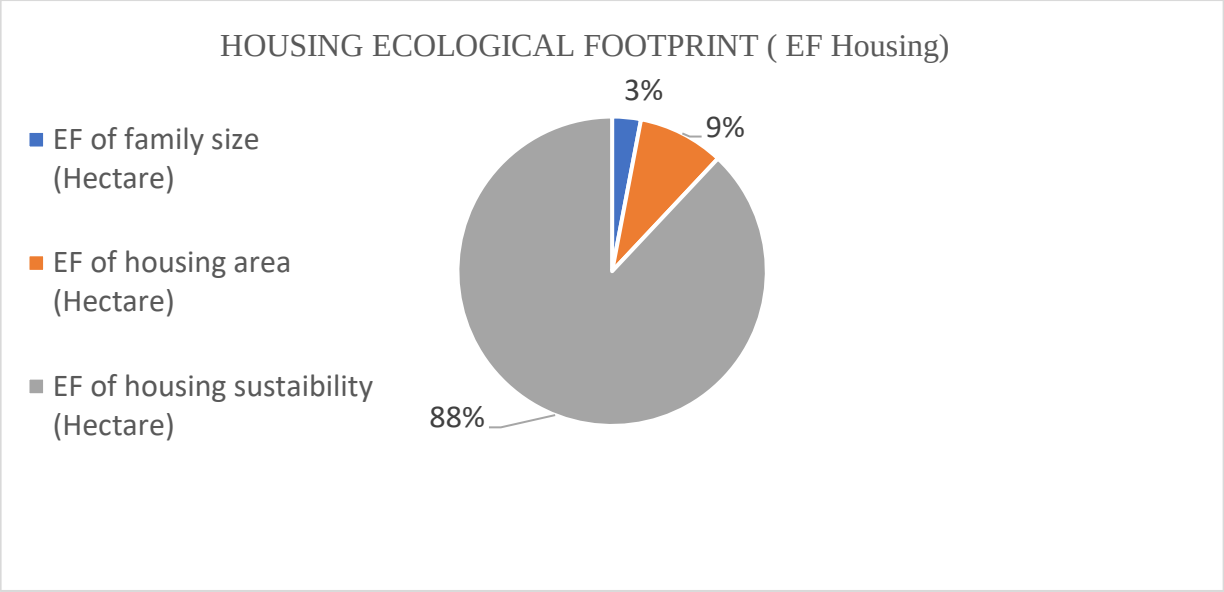
4.1 Environmental footprint (EF Housing) of Katameya Heights Resort

The housing footprint in the study area is estimated by relying on the application of the Housing Sector Environmental Footprint Matrix as explained earlier using the individual indicator measurements. The Housing Environmental Footprint **(EF Housing)** is estimated.
This section deals with research results associated with the housing footprint **(EF Housing)** through indicators that have been addressed to each environmental footprint perspective as an entry point for sustainability.





EF of family size (Hectare)	EF of the housing area (Hectare)	EF of housing sustainability (Hectare)	Area Housing EF (Hectare)
128.8	440	4296	4864.8
3%	9%	88%	100%



Built-up Area (Ha)	EF Housing (Ha)	Ecological Value (Ha)
68	4864.8	-4796.8

Concerning previous graphs showing a deficit in the environmental footprint of the housing 4796.8 hectares are required for the lives of the population in the study area to achieve our sustainable target.
The housing of Ecological footprint in the study area reached its maximum 4864.8 Ha compared with built-up area which reflect a bio-capacity 68 hectare

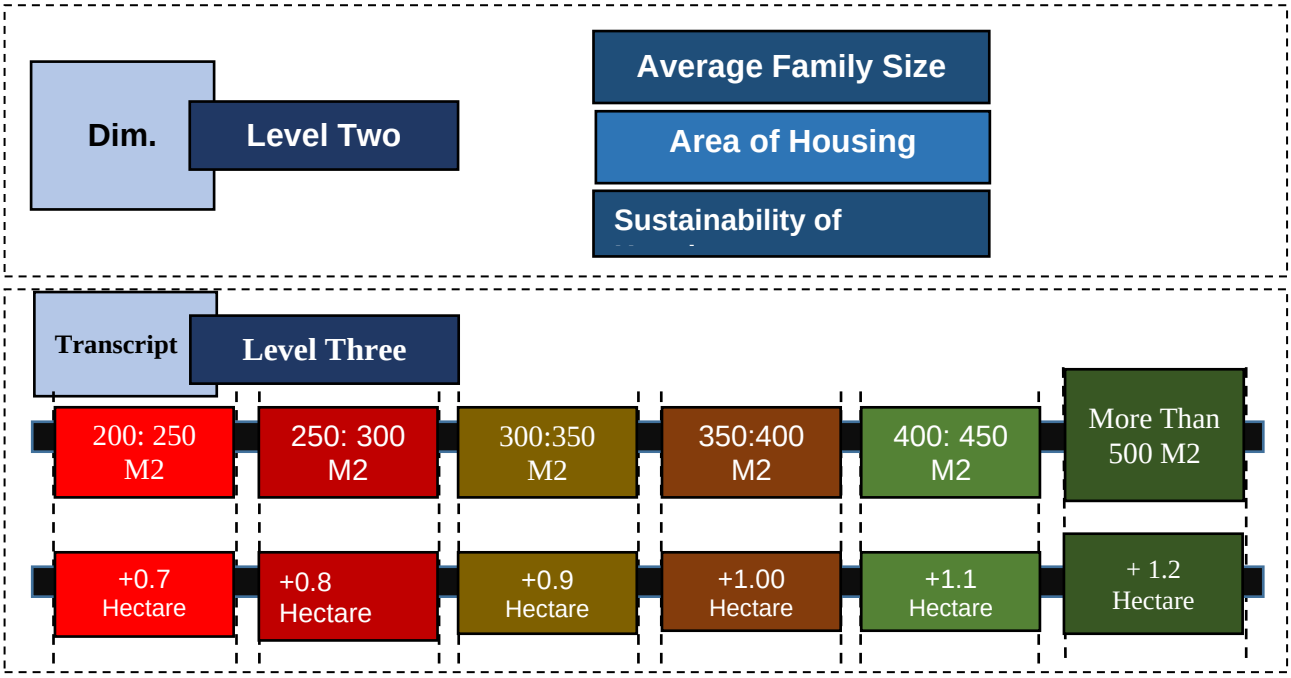
5 CONCLUSIONS

According to the research study, it is recommended to work on a range of future research points:

5.1 The National Footprint Actions (National Footprint Accounts) organizations have sought to make a computational equation for indicators of the environmental footprint of different sectors in urban development and to divide the indicators associated with the environmental footprint into indicators for developing and developed countries to obtain higher accuracy in the results of the sustainability assessment from the perspective of the environmental footprint.

5.2 In addition, research has relied on international standards that do not accurately represent Egyptian and developing countries. Constraints with data and inaccurate data sources for an environmental footprint (EF Housing) assessment were among the obstacles. Given all these factors, the lack of a comprehensive, detailed, and well-organized database for each sector limited the possibility of a more comprehensive analysis.

5.3 Based on the foregoing, which was studied earlier, it was found that the measure of dwelling area had gone from 50 square meters to 250 square meters and had not studied the area above 250 square meters. The researcher suggests that it should be graded and modified as follows:



5.4 By studying the previous measure of the standard for achieving sustainable housing, sustainability technology is unavailable and recovered from abroad.

This is causing considerable strain on the budgets of developing countries. Support must be provided by international organizations to encourage their use and to settle their industry.
For example, the technology for generating electricity from solar cells and batteries for storage must be settled in developing countries, particularly Egypt.
It is one of the brightest countries and attempts to stimulate its use of the population, of medium-living-level areas, to spread it, to stimulate its users in electricity production, and to provide concessional loans for the repayment period.

5.5 Rapid enactment of energy laws and legislation in developing countries, with the assistance and support of international organizations, is necessary to stimulate clean energy production through housing and to stimulate exchange between the state's combined electricity grid and electricity production units within the home, thereby giving incentives to produce electricity from clean domestic energy, thus helping to raise environmental development indicators.

5.6 Parallel development policies offered by developers and urban planners to improve environmental quality urbanization and meet population needs with sustainability as one of the main goals of urban development from the perspective of environmental footprint.

5.7 Design of indicative development schemes from the perspective of the environmental footprint of different city sectors in accordance with the associated foundations and criteria to facilitate the process of physical development aimed at achieving sustainability.

5.8 We need to try to create a measure of the environmental footprint of different sectors in urban development.
Division of indicators associated with the environmental footprint into indicators for developing and developed countries to obtain higher accuracy in the sustainability assessment results from the environmental footprint perspective.

References

1. L. F. M. P. S. E. J. S. B. a. N. M. Coscieme, "Thermodynamics-based categorization of ecosystems in a socio-ecological context," *Ecological Modelling , Elsevier,* pp. 1-3, 2013 Jun.
2. M. a. B. B. Wackernagel, "Ecological footprint: Managing our biocapacity budget," *New Society Publishers,* p. 3, 2019 Sep 3.
3. C. M. R. R. M. H. P. C. I. M. S. M. A. a. M. G. Filote, "Sustainable application of biosorption and bioaccumulation of persistent pollutants in wastewater treatment: Current practice," *Processes ,* Vols. 9, no. 10, p. p.1696, 2021 Sep.

4. P. R. S. P. S. a. A. S. Verma, "Urban ecology–current state of research and concepts. In Urban ecology," *Elsevier,* pp. 3-16, 2020 Jan 1.
5. R. Mahmoud, Heliopolis: The Metamorphosis of garden city into an urban district, Berlin: EUE Les Editions Universitaires Eurropéennes, 2010, p. 240 .
6. Development NewUrban Communities Utilities and Urban; Minister of Housing, "Strategic outline of a city New Cairo study of the current situation," Ministry of Housing, Cairo, 2012.
7. katameyaheights, "http://www.katameyaheights.com/," katameyaheights, 2 26 2021. [Online]. Available: http://www.katameyaheights.com/. [Accessed 2021].
8. A. S. &. R. E. A. RANA ASHRAF KANDIL, "URBAN ECOLOGICAL FOOTPRINT ANALYSIS AS AN EVALUATION TOOL FOR SUSTAINABILITY," *The Sustainable City,* pp. 271 - 281, 7 October 2019.
9. J. Venetoulis, "Assessing the ecological impact of a university Redlands," *International Journal of Sustainability in Higher Education,* vol. 2, no. , International Journal of Sustainability in Higher Education, Vol. 2 No. 2, pp. 180-197, pp. 180-197, 2001.
10. Mathis Wackernagel and William. E Rees, Our Ecological Footprint: Reducing Human Impact on the Earth., Canada: Gabriola Press New Society, 1996, p. 9.
11. Y. Mostafa, Environmental Assessment of Egyptian Urban Communities Using Ecological Footprint Indicators., Cairo: Cairo University, July 17,2019, p. 34.
12. Nicky Chambers, Craig Simmons, Mathis Wackernagel, Sharing Nature's Interest: Ecological Footprints As an Indicator of Sustainability, London: Earthscan Publications Ltd, January 2000.
13. E. HOLDEN, "Ecological footprints and sustainable urban form," *Housing and the Built Environment,* vol. 19, p. 98, 2004.
14. H. Meg, "Calculating Ecological Footprint Components," 9 June 2017. [Online]. Available: https://small-farm-permaculture-and-sustainable-living.com/ecological_footprint_components/. [Accessed 20 March 2021].
15. J. Venetoulis, "Assessing the ecological impact of a university," *International Journal of Sustainability in Higher Education,* vol. 2 , no. 2, pp. 180 - 197, 2001.
16. D. ,. P. ,. Y. Ramsamooj, "carbonfootprintacp.com," 2021. [Online]. Available: https://carbonfootprintacp.com/.
17. Z. W. Ling Shao, "Exergy based ecological footprint accounting for China," *Ecological Modelling,* vol. 252, pp. 83-96, August 2013.
18. D. D. M. Mathis Wackernagel, "The Ecological Footprint of cities and regions: Comparing resource availability with resource demand," *Environment and Urbanization ,* April 2006.
19. D. S. A. Jessica Blunden, "STATE OF THE CLIMATE IN 2018," *Bulletin of the American Meteorological Society,* vol. 100, p. 30, 9, September 2019.
20. T. F. Y. G. L. D. S. O. L. D. HuijuanDong, "A review on eco-city evaluation methods and highlights for integration," *Ecological Indicators,* vol. Volume 60, pp. 1184-1191, January 2016.
21. J. N. Karna Dahal, "Cities' Greenhouse Gas Accounting Methods: A Study of Helsinki, Stockholm, and Copenhagen," *MDPI,* 3 April 2017.
22. M. W. William Rees, "Urban ecological footprints: Why cities cannot be sustainable—And why they are a key to sustainability," *Environmental Impact Assessment Review,* vol. 16, pp. 223-248, July–November 1996.
23. W. E. Rees, "Ecological footprints and appropriated carrying capacity: What urban economics leaves out," *sagepub,* May 10, 2017.
24. J. Moore, "Ecological Footprints and Lifestyle Archetypes: Exploring Dimensions of Consumption and the Transformation Needed to Achieve Urban Sustainability," *MDPI,* 21 April 2015.
25. F. Nabil, "Atlas environmental footprint in Arab countries," in *Report of the Arab Forum on Environment and Development*, Cairo, 2013.