

ECO-EFFICIENT RESORT PLANNING AND DESIGN A practical case study of Marina el-Alamien

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Abstract

Egypt is a country that is endowed with one of the world's richest and most spectacular environment suitable for different types of tourism. Despite the diversity and richness of those natural heritage resources, the industrial and economic situation of the country is in turmoil. Such a situation leads the country to intensively rely on developing, and extensively using, its resources to satisfy its economic demands and requirements without much care to the environment. Since the eve of the seventies until now, unsustainable forms of tourism development have been initiated upon the natural and historical dimensions of the country's heritage. Consequently, the country's resources have been inefficiently consumed to a degree that the country has lost a number of its sensitive sites and resources.

The paper deals with one of the natural heritage resources of the country, the coastal areas. Egypt endows more than 2450 km of highly scenic outstanding beaches overlooking the Mediterranean and the Red sea, and has adopted a highly intensive resort tourism industry, both on the national and international tourism markets. The types of resort development that took place have exerted deep negative impacts on the ecological integrity and stability of such highly sensitive coastal areas. The paper provokes the importance to adapt and promote the concept of eco-efficient design for promoting a sustainable form of resort development. Based on theoretical and practical analysis an eco-meter for eco-efficient resort planning and design is innovated. The eco-meter is tested and applied on the case study of Marina al-Alamien Resort, to be used as a guideline for promoting sustainability among existing and future resort designs.

Keywords: Eco-Efficient development, Eco-Efficient resort planning and design framework, Resorts eco-meter, Marina al-Alamien.

المخلص

تعتبر جمهورية مصر العربية من أكثر الدول التي حباها الله بتراث متنوع لا يقدر بمال وهو ما تم استغلاله بطريقة مكثفة خلال القرن الماضي لتوفير الاحتياجات الاقتصادية المطلوبة للدولة نظرا لضعف وعدم فاعلية القطاع الصناعي والإنتاجي

بالدولة. ومن أمثلة هذه المقومات التراثية الطبيعية السواحل والشواطئ المصرية الخلابة والرائعة. ولقد اهتمت الدولة بهذه الشواطئ الساحلية كأحد أهم موارد التنمية السياحية لما يمكن أن تمثله من عائد اقتصادي ومردود ايجابي على الاقتصاد بوجه عام. ولكن نظرا لان هذه التنمية تمت بطريقة غير مستدامة بل ويمكن القول أنها عشوائية، فلقد تم تدمير كثير من المقومات الطبيعية لهذه الشواطئ بصورة لا يمكن تعويضها الأمر الذي يؤثر بالسلب على البيئة الطبيعية لهذه الشواطئ. وهنا يأتي دور البحث في اقتراح منهج التخطيط البيئي الوقائي، كمنهج وقائي يمكن من خلاله رصد المشاكل البيئية الحالية للمنتجعات القائمة والتعامل معها وأيضا يمكن تطبيقه كأجراء وقائي لقياس مدى التوافق البيئي والكفاءة البيئية المتوقعة للتصميمات الحديثة للمنتجعات السياحية. ولقد قام البحث من خلال منهج استقرائي تحليلي تحديد هيكل عام لمؤشرات التخطيط البيئي الوقائي للمنتجعات الساحلية. ولقد تم تطبيق هذا الهيكل على الحالة الدراسية لمنتجع مارينا العالمين السياحي بالساحل الشمالي من خلال منهج تحليلي وتطبيقي. كما خلص البحث لابتكار وسيلة لقياس درجة التوافق البيئي لعمران المنتجعات الساحلية مع البيئة الطبيعية (Eco-Meter). ويمكن استخدام هذه المقياس لتفعيل التخطيط البيئي الوقائي للمنتجعات السياحية القائمة أو التصميمات الخاصة بالمنتجعات المستقبلية، حيث انه يعطي مؤشر كمي عن مدى التوافق ما بين البيئة المشيدة والبيئة الطبيعية للمنتجع السياحي .

1. INTRODUCTION

Egypt is considered one of the countries most vulnerable to the potential impacts of climate change. This will affect all sectors of development including tourism that is very sensitive to temperature increasing and the phenomenon of sea level rise (EEAA, 2010; El-Raey, 1999). Despite all of these upcoming threats, intensive linear touristic patterns are conspicuously developed in the Northern Western Coastal (NWC) region without taking these challenges into contemplation. The NWC region extends for over 400 km in length along the Mediterranean with different patterns of tourism development. The public policy for the development of this region promised to ensure four key principles, environmental protection, the rights of future generations, equity and the efficient use of the resources (GOPP, 2010). Despite that, the NWC region witnessed an *ad hoc* development and urban sprawl that deteriorated the natural environment and caused erosion of the beaches (Attia, 1999). The region undergoes extensive development, unplanned or ill-planned activities that have abandoned the environmental risks such as vulnerability to the impact of sea level rise (EEAA, 2010; Serageldin, 2009), salt water intrusion, the deterioration of coastal areas and the impact of extreme dust storms (El-Raey, 1999). Indeed, the tendency to develop facilities very close to the coast threatens the beaches, marine biodiversity and aquatic species (Shaalan, 2005). Pristine landscapes and exquisite sites are gradually replaced by concrete built environment, with no identity to the local environment and thus nature is gradually wiped out by these unsustainable developments. Pollution, waste generation and land degradation are therefore reasonable consequences of the success of the over intensified development leading to over exploitation of the natural resources (Budeanu, 2005). Accordingly, it is argued that the interaction between humans and the environment is missing at these projects, creating an unsustainable model (Nosair, 1995). Consequently, believing that the natural environment to many beaches are sensitive (Jennings, 2004) the adoption of sustainability principles is compulsory for the NWC region's development. In order to improve the development process of tourism sector at the NWC region, many approaches are recommended. Eco-resort planning and design is highly recommended in this matter.

Ecological design (Eco-resort design) should integrate the enhancement of both natural and physical well-being into the notion of a high standard ecological resort

design (Ayala, 1995). The findings drawn from literature are utilised to formulate a prototype that is properly applicable and can deliver an environment-friendly product by minimising the impacts on the environment without affecting guests' satisfaction (Bromberek, 2009). This can provide new generation of resorts where ecological, cultural and social sustainability are highly adopted. The findings emphasise the need to convey a new form of tourism that can "offer flexibility and authentic experiences, reflect greater care and conservation of the environment, and be driven by intelligence and innovation" (Ayala, 1995:355). Ecotourism in this regard may find a solution for the problems of mass tourism development that exist at the NWC region. Despite the accumulation of an extensive literature on ecotourism design and planning (Wood, 2002), this paper gives much attention to the eco-efficiency resort (EER) planning and design that have in-depth interrelations with the principles of ecotourism.

Believing that eco-tourism is the future that would eventually become a compulsory pattern of tourism development in Egypt, this paper offers an approach to develop either the existing or new resorts to be more sustainable, by adopting EER planning and design procedures. The paper adopts the eco-efficient technique as a proactive approach for promoting sustainability among resorts' designs and plans. The paper's methodology is based on profound theoretical studies and practical and field survey analysis. The theoretical studies of the paper concluded a framework of eco-efficient resort indicators. The composed indicators were utilised in an innovated model composing the 'Eco-Resort Planning and Design Meter'. The model was tested and reported on through a field survey and a practical analytical study of Marina alAlamien resort, aiming to test and prove the efficiency of the model.

2. ECO-RESORT PLANNING AND DESIGN

There is a great need for new planning and design approaches that would enable the concept of "eco-resort" to act as a common pattern of tourism development (Bramwell and Lane, 1993). This pattern aims to minimize the impacts on the environment "without compromising guests' comfort and safety" (Bromberek, 2009:21). Closer examination of these approaches discloses that eco-tourism is a good experience for a successful and sustainable development (Pleumarom, 1996). The demand for natural-based tourism is a good example of the kind of preconceptions that are harmless to the natural environment and the prospect to develop eco-resorts (Amrhein, 1993; Ayala 1995). Many recent approaches for ecotourism development and planning widely exist. Among them, and for the purpose of this study, the focus will be on the eco-efficiency design principles as a method for sustainability. Eco-efficiency term was outlined by UN-Habitat (2011) as it is a deliverable of "competitively-priced goods and services that satisfy human needs and bring quality of life, while progressively reducing ecological impacts and resource intensity throughout the life-cycle to a level at least in line with the earth's estimated carrying capacity" (UN-Habitat, 2011:23). The concept of EER is based upon the concept of self-contained developments, which enhance energy efficiency, water conservation, and

recycling of waste (Bromberek, 2009). To be a viable paradigm, EER concept is a strategy of developing a closed sustainable system in which reuse and recycling is a destination for the preservation of natural resources (Birkeland, 2002). According to Ayala (1995), "expanding the affinity of the resort infrastructure to the place experience" is another principle for the EER planning and designs (Ayala, 1995:362).

Thus, designing the resort in a manner that preserves and expresses the site's heritage resources is very significant to the EER values (Lim and McAleer, 2005). The planning philosophy of EER should integrate the outside environment to fit the resort's built environment with the ecological and natural ecosystems (Ayala, 1995). The EER philosophy matches the concepts of "untouched" or "authentic" produced by Pleumarom (1996) for the sake of ecological and natural ecosystems stability (Pleumarom, 1996). The quality of pristine natural environment is a fundamental prerequisite of the resort planning process (Frangialli, 1992). Since the coastal resort industry is located in pristine and environmentally sensitive areas, allocation of nature based zones and touristic based zones are also valuable for the EER planning and design.

3. ECO-EFFICIENT MEASURES

Developing an assessment framework for the EER planning and design should be done through sequential procedures. Two critical stages, working from the general to the specific, are undertaken for this study as the basis for creating this framework: conceptual consolidation and structuring indicators.

3.1 Conceptual consolidation: environmental sustainability themes

This stage aims to clarify the basic concept of eco-efficiency, and in turn identifies the main themes that will be used to evaluate the EER design. Using sustainability as an overall concept in the assessment of resort development is of considerable significance. Of course, sustainable development indicators have been widely discussed since the United Nations Conference on Environment and Development (Earth Summit) in Rio de Janeiro, 1992, issuing agenda 21 as a global approach for promoting sustainable development. Since then, sustainability indicators have been developed and tested and many of these indicators have been produced to measure sustainable development (Warhurst, 2002). This apparent acceptance and unanimity of sustainability is misleading because there is no precise definition (Satterthwaite, 1997). To a group of researchers sustainability has turned out to be no more than a "fuzzy buzzword" (Palmer et al., 1997:87), the need for an applicable tool was identified. The aim of promoting EER planning and design might be seen more applicable utilising eco-efficiency indicators.

Eco-efficiency indicators are widely adopted in the assessment of urban development. For the purpose of this study, a clear understanding and selection of a set of appropriate indicators is considerable. Basically, the EER planning and design

principles emerged from the principles of Environmental Sustainable Design (ESD) (Bromberek, 2009). Applying the concept of ESD to urban areas aims to create more values for citizens and to reduce the use of resources and the production of waste and pollution (Coaffee, 2008). Three principles for the EER planning and design have been raised by scholars; maximize quality of life, maximize competitiveness and maximize environmental sustainability (UN-Habitat, 2011). Due to the high environmental sensitivity of the coastal regions of the NWC region, the third principle is of much interest to this study.

Research on sustainable resort suggest that environmental sustainability requires a commitment to reducing gas emissions and pollutions by controlling negative tourist behaviours (Scheyvens, 2011). From this perspective, the sustainable resort planning should be based on reducing the consumption of resources, reducing the impact on nature and increasing product or service values. These are matched with the concept of 'eco-techniques' proposed by Ceballos-Lascurain (1993). Solar energy, water sensitive planning (France, 2002), recycling of waste (Trainer, 2002), bio-climatic design, local materials and procedures (Nancy and Todd, 2002) are the environmentally friendly techniques that express the concept of 'eco-techniques' (Ayala, 1995). This concept is not only considered with the new environmental techniques but also in using traditional cultural and material resources (Inskip, 1987). Designing the resort should be done in a way that presents the sites' cultural and heritage resources, that gives the resorts' a strong sense of place and reduces the potential impacts on the environment (Lim and McAleer, 2005).

The insights emanating from the above discussion resulted in the main themes expressing the EER planning and design. The impact of resort development on the environment can be traced through: energy consumption rates and renewable energy, water supply and wastes, construction technology (materials used in buildings and infrastructure) and human impacts through activities (Lim and McAleer, 2005). Land, water, energy and materials are therefore the four leading themes that are used extensively in literature and can be used in building the EER framework, Figure (1).

Figure (1) Key dimensions on the ecoefficiency assessment



3.2 Structuring indicators

The second stage is to develop the assessment framework where the process moves on from the conceptual discussion to provide the structure within which the indicators will be collated. The procedure of creating these indicators was based on theoretical

analysis of the academic literature about EER planning and design. Using the four emerged themes, a review of the possible negative implications on the environment and thus the associated key recommendations and strategies may be a guide to identify the significant indicators.

Materials and wastes:

Another related theme to the energy efficiency is the use of local materials. Resorts are usually highly materialistic they require huge amounts of building materials. This unsustainable use of materials leads to the accumulation of wastes that have dramatic implications of the natural environment. As highlighted by many scholars, the use of earth natural material has been constantly used in the past as it has many environmental advantages (Nancy and Todd, 2002), such as the creation of a comfortable atmosphere; having cool air in summer and warm air in winter. Two indicators are employed for this study; the percentage of natural earth material used and the levels of material consumption.

Land:

Human activities negatively impact resort lands by affecting biodiversity, conservation purposes and sometimes the visual values (Wong, 2006; Bromberek, 2009). Therefore, as given in table (2), three dimensions are suggested to test the EER in regard of land: biodiversity, geographically balanced development and sustainable land use. The concept in structuring these dimensions and their indicators is based on 'shore-land buffer' suggested by Clar (2002). It is defined as "a naturally vegetated upland area adjacent to a surface water... often means uncut or undisturbed forest, minimally disturbed or managed forest, and abandoned pasture or fields reverting to forest" (Clar, 2002: 361). Landscape design for the EER should incorporate the sensitive 'untouched' areas, protecting biological diversity, minimize the ecological changes that may affect water quality, visual concerns and encourage the development of natural green landscape and vegetation areas (Ayala, 1995).

Water:

Since water is a key ingredient for a liveable and sustainable city, EER indicators should also enhance the efficient use of water by utilising the right quality of water for the right purpose (France, 2002). For the EER planning and design, use of potable water for outdoor landscape plants should be minimized and performed in a conservative manner (Birkeland, 2002), Table (1). The water-use efficiency should also include the recycling of wastewater. Reduction of the consumed water, redistributing water, and preventing wastage are key recommendations for the EER planning and design (UNEP, 2012; Bromberek, 2009). Water sensitive design practices either in building or in the outdoor spaces are the foremost indicators used for measuring water efficiency.

Energy:

Resorts usually acquire huge amounts of energy and produce waste and pollution. The high demand for energy is often due to the use of energy intensive technologies to provide high comforts and conveniences such as the extensive use of airconditioning (Bromberek, 2009). The use of methods that minimize the energy consumption and

introduce efficiency planning principles are key objectives for the EER in terms of energy efficiency (UNEP 2012; Nancy and Todd, 2002), Table (1). Environmentally friendly practices are therefore strongly recommended for the EER through the passive design with efficient use of renewable energy and new practices for the reduction of consumption (Missaoui et al., 2012).

Table (1) Possible impacts and key recommendations for EER planning and design

MATERIALS & WASTES	LAND	WATER	ENERGY
NEGATIVE IMPLICATIONS OF TOURISM			
<ul style="list-style-type: none"> ▪ Potential effects of use of fuels and (maintenance). ▪ Buildings materials and their ability to provide the comfort zone leading to efficient energy consumption patterns. 	<ul style="list-style-type: none"> ▪ Land uses impacts on conservation purposes within and beyond its site. ▪ Impact of the resort and its operations on biodiversity. ▪ Use of natural surroundings of the impact of the resort and its operations on visual landscape resort. 	<ul style="list-style-type: none"> ▪ High consumption of water. ▪ Negative implications on the source of water: impact of storm water, including drainage techniques, wastewater and effluent on resort site. 	<ul style="list-style-type: none"> ▪ High extensive of energy consumption: excessive use of traditional types of energy leading to unfair competition with the local communities. ▪ Gas emissions and air pollution resulted from the uncontrolled use of energy.
KEY RECOMMENDATIONS			
<ul style="list-style-type: none"> ▪ Select materials, construction and demolition technologies to limit the amount of waste, emissions, pollution and site contamination at all stages of construction. ▪ Select materials in small modular sizes that do not require heavy machinery to handle. ▪ Select technologies, either vernacular or prefabricated, with low water requirements. ▪ Select reusable and recyclable materials with low energy content. ▪ Select materials that are durable and require minimum maintenance. 	<ul style="list-style-type: none"> ▪ Concentrate and channel tourist movements through the site. ▪ Create physical barriers to prevent uncontrollable penetration of the area. ▪ Develop zones corresponding with environmental responses to various types and extent of impacts. ▪ Contain impacts at their source with visual, acoustic and other pollution buffers. 	<ul style="list-style-type: none"> ▪ Carefully select services that require minimum use of water: waterless solutions when available. ▪ Implement water sensitive urban design in roads, drainage and streetscape works. ▪ Use of potable water for outdoor landscape plants should be minimized and performed in a conservative manner. ▪ Reducing of the consumed water, redistributing water, and preventing wastage. ▪ Only water for direct consumption should be subject to purification and treatment. 	<ul style="list-style-type: none"> ▪ Careful selection of units that minimize the consumption of energy. ▪ Use local context as the main criterion of energy source selection. ▪ Generate an efficient power generation system. ▪ Investigate planning/design implications of selecting a particular source of energy.

Source: Grauthoff et. al., 2012; Missaoui et al., 2012; Bromberek, 2009; UN-Habitat, 2009; Birkeland, 2002; Clar, 2002; France, 2002; Todd and Todd, 1994

Accordingly, as provided in Table (2), the selected indicators for this study cover two main areas; measuring the existence practices to reduce the energy consumption and the installation of renewable energy techniques.

Table (2) EER planning and design indicators

THEME	DIMENSIONS	OBJECTIVES	CODE	INDICATORS
LAND	Biodiversity	Reducing the impact on nature	EN1-1	Terrestrial area protected
	Geographically balanced development		EN1-2	Areas deteriorated by changing its natural morphological aspects
	Sustainable land use	Minimize site disturbance in design & construction	EN1-3	Changes in the shoreline
			EN1-4	Artificial surfaces
			EN1-6	Land affected by desertification
			EN1-7	Green areas and open spaces
			EN1-8	Area of pollution
	WATER	Water sensitive planning & design	Increase water use efficiency and access	EN2-1
EN2-2				Existence of water efficiency landscape techniques
MATERIALS & WASTES	Building & landscape materials	Good efficiency materials use	EN3-1	Using of recycled and reclaimed materials
			EN3-2	Using of earth wall materials
	Wastewater and waste generation	Enhancing the recycling process and product durability and closing the loop of material production and consumption	EN3-3	Existence of recycling station to occupants dedicated to the separation, collection, and storage of materials
			EN3-4	Existence of drop-off point to all occupants for potentially hazardous wastes
			EN3-5	Existence of litter receptacles on residential streets, with recycle containers adjacent to other receptacles
ENERGY	Consumption and production patterns	Reducing the consumption of resources by minimizing the use of energy	EN4-1	Existence of energy consumption techniques in streets
			EN4-2	On-site renewable energy sources
			EN4-3	Existence of energy consumption techniques in streets

Source: UNEP, 2012, UN-Habitat, 2011; Alshuwaikhat and Nkwenti, 2002; Birkeland, 2002; Burroughs, 2002; Nancy and Todd, 2002

4. APPLYING EER INDICATORS ON A LOCAL CASE (MARINA –AL ALAMEIN RESORT)

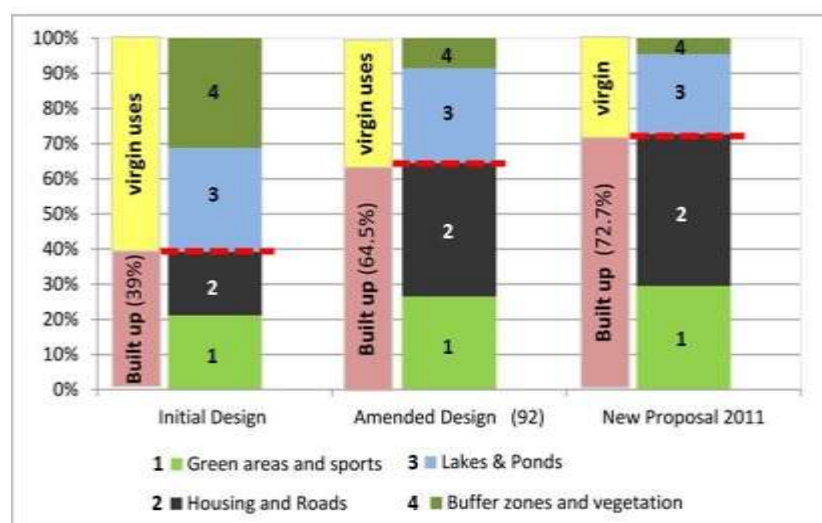
In mid 1980s, the Egyptian government decided to change the pattern of resort development of the NWC region, represented in 'Marakia' resort (51th km CairoAlexandria Desert Road), by inviting new tourism types. The government encouraged the development of unique local architectural styles and the implementation of economic activities that would attract residents to compete with tourism projects in the Mediterranean countries (GOPP, 2010). The tourist location is

unique in having good accessibility; it includes attractive beaches and large natural lakes connected to the Mediterranean. It is located between 94th and 106th km Cairo-Alexandria Desert Road bounded by the Mediterranean coastline in the north, and extends to about 1 km to the south of the international coastal road. This site has different natural and aesthetic values. Despite that, many changes occurred in either the planning or constructing of these activities without respecting the natural values (Ibrahim, 1998). An analysis of a selected case study may be helpful here in evaluating the tourism development pattern by using the EER framework produced in the earlier section.

The resort is internally classified into seven stages, and is considered a modern and new pattern of tourism development in the NWC region. Most noticeably, the planning and development of Marina resort witnessed dramatic changes in its design (NUCA 2012). The project's first phase, Marina 1 and 2, was planned to be implemented as an experimental stage (Attia, 1999). The initial design accommodated several activities and uses to enjoy the prevailing natural environment. Holiday homes, motels and hotels, yacht marina, fishpond, cabanas and camping areas are common components of the experimental centres (NUCA, 1987). Due to the sensitivity and different natural values of the site, the initial design assigned only 39.2% of the total area for urban activities i.e. hotels, touristic housing, services, roads and parking areas. Bearing in mind the carrying capacity of this site, the rest of the area was left for the natural uses such as lakes, fishponds, buffer areas and vegetation open areas (Attia, 1999).

Yet, as drawn from the analysis given in Figure (2), the amended design and the actual situation have negatively affected the natural environment in comparison to that of the initial design. In its former plan, it was suggested that the built environment occupied not more than 18% of the total area (NUCA, 1987). The Ministry of Housing; however, insisted on intensifying the holiday homes and increasing the built-up area by converting the buffer zones and vegetation areas into houses and activities (Hanna, 1998).

Figure (2) Ratio of built up areas and the natural uses between the initial, amended and actual design of Marina al-Alamein



Source: NUCA, 2013; NUCA, 1987

Figure (2) shows the result of increasing the built-up area to be more than 64.5% of the total resort area. Filling up the lakes and ponds to create new urban oasis is another reason for the decreasing of the natural virgin sites (NUCA, 2012). The development existed in the site has a dramatic change in the morphological pattern of the natural islands separated in the west. Thus, in 2013, the areas assigned for lakes, ponds and natural vegetation decreased to half of the initial proposed areas; only 27.3%. From another angle, the level of urban greenery has also witnessed a slight decrease between the initial design, 53% of the urban areas, and the actual situation; only 39%. Therefore, these urban intensification practices have devastating implications on the natural environment.

The increase shift in the urban development of this resort represents an increase of houses, activities, swimming areas and beaches. The implemented projects therefore included several changes from the virgin natural environment. It is helpful to provide another examination in this context. Tracing the shoreline changes between the outset development (1992) and the existing development (2013) revealed how much the natural environment has been completely affected. Several areas have been changed due to the filling and cutting purposes to provide more spaces for development, particularly at the lake islands and the northern spine between Marina lakes and the Mediterranean, Figure (3). The construction and operation of individual Marinas is usually accompanied by destruction of marine life, sedimentation and changes in shorelines, oil spills and increased pressure on the marine life due to increased human activities (Shaan, 2005). Generally, setback lines of these islands are highly sensitive areas that require cautious urban intervention by developing environmental activities with low density. Yet, the expansion of tourism development created breakwaters to protect the swimming areas and beaches from water currents, and strong waves (Nosair, 1995). The construction of breakwaters has indeed caused many ecological problems such as the instability of the shoreline, the degradation of the Northern Coast and severe beach erosion that affected the sensitivity of these unique locations; especially due to the inexistence of proper maintenance (Ibrahim, 1998).

Figure (3) Filling and cutting sites at Marina 5



Source: Authors based on NUCA, 2012; NUCA, 1987

The quality of air and water may be another marker for measuring the efficiency of resort development. Due to the artificial morphological changes by privatization development, the water flow and stream inside the lake have been distorted. According to the analysis given from Figure (4), private villas and activities have been constructed on the water stream that closed the inlet between the lake and the Mediterranean. Villa owners in the western part of the resort complain of the poor water quality as the lake became contaminated due to a weak linkage with the fresh water (Youssef, 1997). This affects the colour and odour of water at these areas. Overall, due to the dramatic change in the natural environment in Marina 7 and due to the increase of activities and houses to the extent that exceeded the natural carrying capacity, the quality of natural environment has deteriorated (Attia,1999).

Figure (4) Polluted water lakes at Marina 7



Source: satellite images 2003 & 2013

The privatization of the sensitive shoreline and zones is surely an important measurement for the EER appraisal. For sensitivity purposes, it is common having at least about 50-100 meter in-depth as a buffer or protected zone (Shalan, 2005). The original plan was based on leaving a buffer zone along the shoreline to protect it and decrease the implications of the built-up area on the natural environment (NUCA, 1987). Despite that, the majority of private owners converted the front beach into private gardens with exclusive green spaces, Figure (5). Quarrying practices that involve the cutting of the ridges destroys natural vegetation and create an environment that contrasts with the less disturbed areas around it. From another angle, building constructions are now obscuring the view to the Mediterranean and destroying aesthetic values and the visual experience of travellers along the coast (Ayad, 2004).

5. ECO-METER PRACTICAL APPLICATION

The paper utilizes the indicators of table 2 in an innovated sustainable resort development tool named as eco-meter. The idea of the eco-meter tool is to act as a pro-active and reactive tool that bears the ability to sensitively measure the degree of compatibility between the built environment of the resort and its natural context. The model measures the degree of eco-efficiency statistically on equal basis, for the four main categories of the proposed EER indicators. The score of each indicator was

calculated using the Z-score technique which was then summed to calculate the final score for each category.

Figure (5) Deterioration in the use of island shoreline



Source: satellite images 2003 & 2013


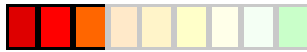
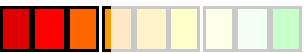
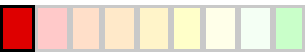

Table (3) summarizes the overall assessment of Marina resort. Since there are different types of indicators used to measure each theme, there is a need to transfer all of them into one value which can be easily understood. In a prior work, Coombes and Wong (1994) suggested the use of Z-scores that scale all component variance scores to one score. To do this, each theme was transformed into a 'Zscore'. The 'Z-score' standardizes the values of all indicators, putting them on the same scale of reference and allowing them to be directly compared and analysed (Webbera and Clinton, 1999). Therefore, each theme will be presented in a score describing its level of efficiency through which an overall judgement can be drawn. The exact value for each indicator was determined based on project design analyses and a site visit during summer 2013. In this context, the study employs an Eco-Meter ranging from ($Z = +1$), high efficiency, to ($Z = -1$), low efficiency.


Closer examinations of the results reveal that there are dramatic changes in the coastal shoreline and the natural morphological aspects, which negatively impacted the water quality and the area's sensitivity. Very few areas are left for preservation and protection purposes in order to increase the ecological and natural aspects. Most of the shore-land buffers are extensively used for private purposes and hence many land and water areas are recorded polluted. Despite the accumulation of resort development on the shoreline and sensitive areas, there is no obvious land affected by desertification because large areas of greenery have been developed. Accordingly, the total assessment of the resort efficiency in terms of land discloses the inefficiency situation ($Z = -0.18$).

From another side, the assessment of water and wastes have negative contribution in the overall resort efficiency ($Z = -0.5$ & 0.4 respectively). At Marina resort, there is grey water irrigation at some locations but the exclusive green lands existing in many locations decrease the efficiency of using water in the outdoor (Kuppinger & College 2004). The study also indicates that there is no efficient waste collection system. No recycling or reuse station has existed; however, some garbage bins are located at some sites for collecting all types of wastes without separation. In terms of energy, there is no obvious energy efficiency practices being

employed in this resort; either for reducing the consumption of energy or for creating new units of renewable supply (energy Z score=-0.8).

Table (3) Sustainability appraisal of Marina resort using the EER framework

Theme	INDICATORS	ASSESSMENT
LAND	EN1-1: Terrestrial area protected (% of the sensitive areas)	 -0.18
	EN1-2: Areas deteriorated by changing its natural morphological aspects (% of the total area)	
	EN1-3: Changes in the shoreline (% of the total length of shoreline)	
	EN1-4: Artificial surfaces (ratio of artificial to natural surfaces)	
	EN1-5: Land affected by desertification (% of areas affected by desertification)	
	EN1-6: Green areas and open spaces (% out of the total built-up area)	
	EN1-7: Area of pollution (% of polluted land or water areas)	
WATER	EN2-1: Existence of water efficiency techniques in building (% of buildings having any type of efficiency techniques)	 -0.3
	EN2-2: Existence of water efficiency landscape techniques (% of spaces having efficient irrigation system)	
MATERIALS & WASTES	EN3-1: Using of recycled and reclaimed materials	 -0.4
	EN3-2: Using of earth wall materials (% of units built by domestic materials)	
	EN3-3: Existence of recycling or reuse station to all project occupants dedicated to the separation, collection, and storage of materials	
	EN3-4: Existence of drop-off point to all occupants for potentially hazardous wastes	
	EN3-5: Existence of litter receptacles on mixed use and non-residential streets, with recycle containers adjacent to other receptacles	
ENERGY	EN4-1: Existence of energy consumption techniques in streets	 -0.8
	EN4-2: On-site renewable energy sources	
	EN4-3: Minimum Building Energy Efficiency (% of building using electrical saving power)	
OVERALL ASSESSMENT (Average Z score=-0.48)		 -0.48



Low efficiency -1 -0.75 -0.50 -0.25 0 +0.25 +0.50 +0.75 +1 High efficiency

Eco Meter (Z Score)

Accordingly, the overall assessment of the resort using these indicators reveals that the design and operation were not sustainable. The level of efficiency of this resort was recorded as highly negative (overall Z score=-0.48) which reveals the inefficiency status. Therefore, many actions should be taken into consideration in developing the existing resort in-order to minimize the negative environmental impacts and minimize

further impact of the new developments. Lakes should have a direct access to the fresh water (Mediterranean). Creek water should be reopened to permit the water flow to access the western lakes. The new extension project currently prepared by the Ministry of Housing should avoid any modification either in the shoreline or the morphological nature of the existing lakes. All artificial surfaces built on the shoreline should be removed and preserved for protection purposes with specific urban regulations. The new extension should be also directed to encourage the design and construction of energy efficient buildings that reduce air, water, and land pollution and adverse environmental impacts from energy production and consumption.

6. CONCLUSION

This paper suggests a broad-scale appraisal to test environmental sustainability of existing resorts by using the eco-efficiency indicators. The eco-resort notion redefines the resort concept through the view of: materials and waste recycling, water, energy efficiency and sustainable land. EER planning and design is translated into a number of themes and indicators measuring the eco-efficiency of existing development that can be also used as principles for the new resort development. The paper created the eco-meter tool as a pro-active and reactive sustainability tool that bears the ability to sensitively measure the degree of compatibility between the built environment of the resort and its natural context. This tool was practically applied on the case study of Marina.

The findings that emerged from the evaluation of Marina al-Alamein reveal the inefficiency of the resort's development. The EER planning and design are almost abandoned in the development of Marina resort which increase the environmental risks and problems experienced in the region. An international or western urban style, dissociated from climatic and social-economic contexts, has been developed for this resort. While green urbanism emphasizes environmental excellence and sensitivity in their design, developing massive green products is not realistic in an arid and a developing country like Egypt, especially when lacking adequate water recycling systems.

The adopted strategies should encourage eco-techniques like energy and water efficiency, high indoor air quality, use of local materials and sustainable recycled practices; these are all missing in the development of Marina resort. Most of the evidence demonstrates the increase of environmental degradation in the area that requires urgent intervention to subdue. New design regulations should be adopted in order to recover the quality of the built surroundings by which the environmental risks may be minimized.

Furthermore, the EER planning and design should be highly engaged in developing resort expansions or for new resort development. To enhance the sustainability of sensitive lands, a buffer zone should be defined and regulatory restricted to prevent the marine ecosystem from the negative implications of the built environment. Since

water in the region is a limited resource and the outdoor irrigation usage increased, responsible water usage should be encouraged. This can be done through minimizing the greening of desert lands as well as by using the grey and recycled water for irrigation.

Moreover, the planning process should develop and implement a waste management plan that, at a minimum, identifies the materials that will be stored onsite, diverted for disposal or transferred away. Since the energy has a big share in the inefficiency of NWC region tourism development, many specific recommendation should be taken into consideration to improve the energy efficiency. Earth wall construction provides an opportunity for creating a model which could be applied in NWC region, with a significant potential for reducing energy consumption. Finally, construction of energy-efficient buildings include careful selection of units that minimize the consumption of energy, the use the local context as the main criterion of energy source selection and generate an efficient power generation system; these significant actions should be highly recommended for developers and decision makers.

References

- Abou-Hadid, A. (2006) Assessment of Impacts, Adaptation, and Vulnerability to Climate Change in North Africa: Food Production and Water Resources, Project No. AF 90, Washington, District of Columbia: Assessments of Impacts and Adaptations to Climate Change (AIACC)
- Alshuwaikhat, H. M., and Nkwenti, I. (2002) Developing Sustainable Cities in Arid Regions. *Cities* 19(2), 85–94.
- Amrhein, H. (1993) Respect for the environment as a basic condition for the tourist business in the future: A tour operator's review. International Symposium on Tourism, Ecology and Municipalities, September. Mazatlan, Mexico.
- Attia, A. (1999) Planning for Sustainable Tourism Development: An Investigation into Implementing Tourism Policy In the North West Coast Region of Egypt, Unpublished PhD thesis, University of London. UK.
- Ayad, Y. (2004) Remote sensing and GIS in modelling visual landscape change: a case study of the northwestern arid coast of Egypt, *Landscape and Urban Planning* 73, 307–325.
- Ayala , H. (1995) Ecoresort: a 'green' master plan for the international resort industry, *International Journal Hospitality Management* 14 (3/4), 351-374.
- Birkeland, J. (2002) *Design for sustainability: a sourcebook of integrated eco-logical solutions*, Earthscan, London.
- Bramwell, B. and Lane, B. (1993) Interpretation and sustainable tourism: The potential and pitfalls. *Journal of Sustainable Tourism* 1, 71-80.
- Bromberek, Z. (2009) *Eco-resorts: planning and design for the tropics*, Architectural Press, Oxford
- Budeanu, A. (2005) Impacts and responsibilities for sustainable tourism: a tour operator's perspective, *Journal of Cleaner Production* 13, 89-97.

- Burroughs, s (2002) Low Impact Housing Design and Materials, in Janis Birkeland (ed.) *Design for sustainability: a sourcebook of integrated ecological solutions*, Earthscan, p 193209
- Ceballos-Lascurain, H. (1993) Overview on ecotourism around the world: IUCN's ecotourism program. Proceedings of the 1993 World Congress on Adventure Travel and EcoTourism, pp.219-222. The Adventure Travel Society, Englewood.
- Cities, Vol. 19, No. 2, pp. 85–94, 2002
- Clar, M. (2002) Applications of low-impact development techniques (Maryland) in Robert France (ed.) Handbook of Water Sensitive Planning and Design (Integrative Studies in Water Management & Land Development) Integrative Studies in Water Management & Land Development, CRC Press.
- Coaffee, J. (2008) Risk, resilience, and environmentally sustainable cities. *Energy Policy* 36, 4633–4638
- Coombes, M. and Wong, C. (1994) 'Methodological Steps in the Development of Multivariate Indexes for Urban and Regional Policy Analysis', *Environment and Planning A*, vol. 26, pp. 1297-1316.
- EEAA (2010) Egypt Second National Communication- Under the United Nations Framework Convention on Climate Change (UNFCCC), Egyptian Environmental Affairs Agency.
- EEAA (2010B) Egypt National Environmental, Economic and Development Study (NEEDS) for Climate Change, Egyptian Environmental Affairs Agency.
- El-Raey, M. (1999) Adaptation to the impacts of sea level rise in Egypt, *Adaptation and Mitigation Strategies for Global Change*, 4(3-4), 343-361.
- France, R. (2002), Handbook of Water Sensitive Planning and Design (Integrative Studies in Water Management & Land Development) Integrative Studies in Water Management & Land Development, CRC Press
- Frangialli, F. (1992) Tourism: opportunity for encounter? Threat to local structures? *WTO News* 5, 2-3.
- GOPP (2010) Regional Strategic Development of the Northern West Coast 2022, General Organization for Physical Planning, Ministry of Housing, Egypt.
- Grauthoff et. al (2012) Identification and mobilization of solar potentials via local strategies, *Intelligent Energy Europe*
- Hanna, M., (1998), Marina that was a Paradise, Became Hell, Is There a Way Out?, *Al-Ahram Newspaper*, September 15th.
- Ibrahim, S. (1998) Towards a selection of construction system for the tourist coastal villages, unpublished PhD thesis, Cairo University, Egypt.
- Inskip, E. (1987) Environmental planning for tourism, *Annals of Tourism Research* 14, 118135.
- Jennings, S. (2004) Coastal Tourism and Shoreline Management, *Annals of Tourism Research* 31(4), 899-922.
- Kuppinger, P. & College, M. (2004) 'Exclusive Greenery: New Gated Communities in Cairo', *City & Society*, 16(2), 35–62.
- Lim, C., and McAleer, M. (2005) Ecologically sustainable tourism management, *Environmental Modelling & Software* 20, 1431-1438.

- Missaoui R., Ben Hassine H., Mourtada A. (2012) Energy efficiency indicators in the Southern and Eastern Mediterranean countries, RCREEE.
- Nancy and Todd (2002) Design with less energy, materials and waste, in Janis Birkeland (ed.) *Design for sustainability: a sourcebook of integrated ecological solutions*, Earthscan Publications Ltd.
- Nosair J, (1995) Mutual implications between environmental and touristic project - South Hurghada case, (in Arabic), Unpublished MSc thesis, Cairo University, Egypt.
- NUCA (2012) A proposal for the development of Marina Al-Alamein area (un- published report), New Urban Communities Authority, Ministry of Housing, Utilities and Urban development.
- NUCA (1987) Marina El-Alamein Tourists Center: Programme and Planning Criteria for Phase One, Report Presented to Ministry of Housing, Utilities and Urban development.
- Palmer, J., Cooper, I. and Vorst, R.v.d. (1997) 'Mapping Out Fuzzy Buzzwords- Who Sits Where on Sustainability and Sustainable Development', *Sustainable Development*, 5, 87-93.
- Pleumarom , A. (1996) Eco-tourism: A new "Green Revolution" in the Third World in Koehler, G./ Gore, C./ Reich, U.-P./Zieseemer, T. (eds) (1996), *Questioning Development Essays on the theory, policies and practice of development interventions*, Marburg/Germany: Metropolis.
- Satterthwaite, D. (1997) Sustainable Cities or Cities that Contribute to Sustainable Development?, *Urban Studies*, 34(10), 1667-1691.
- Scheyvens, R. (2011) The challenge of sustainable tourism development in Maldives: Understating the social and political dimension of sustainability. *Asia Pacific Viewpoint* 52(2), 148-164.
- Serageldin, M. (2009) Climate Change in the Local Development Agenda: Promoting Resilience through Enhanced Understanding of Early Threats Climate Change in the Local Development Agenda Fifth Urban Research Symposium 2009.
- Shalan, I (2005) Sustainable tourism development in the Red Sea of Egypt threats and opportunities, *Journal of Cleaner Production* 13, 83–87
- Todd, J. and Todd, J.J. (1994), *From Eco-Cities to Living Machines: Principles of Ecological Design*, North Atlantic Books, Berkeley, CA.
- Trainer, T (2002) The concepts of growth and waste in Janis Birkeland, *Design for sustainability: a sourcebook of integrated eco-logical solutions* (ed) p33-51. Earthscan, London.
- UNDP (2009) Adaptation to Climate Change in the Nile Delta through Integrated Coastal Zone Management, United Nations Development Programme- Government of Egypt.
- UNEP (2012) Sustainable, resource efficient cities – Making it happen! United Nations Environment Programme
- UN-Habitat (2009) Sustainable Urban Energy Planning A handbook for cities and towns in developing countries, ICLEI – Local Governments for Sustainability.
- UN-Habitat (2011) Are we building competitive and liveable cities? Guidelines for developing eco-efficient and socially inclusive infrastructure, Clung Wicha Press Co., Ltd. Thailand.
- Warhurst, A. (2002) Sustainability Indicators and Sustainability Performance Management, International Institute for Environment and Development (IIED) and World Business Council for Sustainable Development (WBCSD), Coventry.

- Webbera., S.A. and Clinton, B.D. (1999) Using Z-scores to Evaluate Accounting Students: A Test of Weinstein's Suggestion, *Journal of Accounting Education*, 17, 407-415.
- Wong, C. (2006) *Indicators for Urban and Regional planning: The interplay of Policy and Methods*, Routledge, London.
- Wood, M. (2002) *Ecotourism principles, practices, policies for sustainability*, United Nations Environments Program (UNEP).
- Youssef R, (1997), Marina: Business and Corruption, *Rose El Youssef Weekly Magazine*, Volume 3608, August 4th , In Arabic.