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The opportunities and challenges of adopting electric and hybrid vehicles in tourism road transportation in Egypt

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ABSTRACT

This paper aims to investigate the opportunities and challenges of using electric and hybrid vehicles in the tourism transportation sector in Egypt. To achieve this aim, a closed-ended questionnaire was directed to 100 travel agencies in Luxor and Aswan (class A and C) to investigate their opinions concerning positive and negative aspects of actual road tourism transportation means compared to those expected by applying the new hybrid road transportation technology in the Egyptian tourism sector. The study concluded that most travel agencies in Luxor and Aswan are aware and willing to positively participate in implementing the Egyptian vision of sustainable green road transportation by using electric and hybrid vehicles instead of gasoline-based vehicles. Having legislative and economic incentives could influence them to participate more positively.

1. Introduction

Tourism contributes to climate change and is responsible for approximately 5% of global CO_2 emissions of which 75% of the transportation sector is accountable. While air travel is estimated to cause 54-75% of transportation emissions, cars, and rail account for around 13%. (UNWTO, 2014). As the tourism industry continues to develop, many organizations are aware of these negative impacts and are transitioning to sustainable business practices that consider economic, social, and environmental impacts in decision making and planning.

Emerging trends in travel and transportation preferences among all drivers offer policymakers and clean transportation advocates a timely and compelling opportunity to introduce new technologies to the tourism marketplace. One of these trends is the hybrid vehicle technology, which can address consumers', destinations and tourism stakeholders' emerging appetite for innovation, lower cost, and enthusiastic embrace of low-emission transportation. (Ruder et al., 2015).

Hybrid and electric vehicles are an opportunity for the tourism industry to cater to a new market segment. Whether rented travelling in a personal electric vehicle (EV), travellers can visit destinations and attractions while producing zero tailpipe emissions which can maximize the economic, social, and environmental advantages of using hybrid vehicles in tourism Road transportation.

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This paper aims to investigate the advantages and challenges of using this new technology in the tourism transportation sector in Egypt, as well as its' role in maximizing different tourism partners' benefits and reducing the negative effects of tourism in the Egyptian destination.

This study aims to identify travel agencies' awareness and readiness to participate in implementing the Egyptian vision of sustainable road transportation which hinders replacing fuel-based vehicles with new electric and hybrid ones, by answering the following questions:

- What are electric and hybrid vehicles' advantages and disadvantages?
- Do the qualifications and capabilities of electric and hybrid vehicles suit the operational requirements of travel agencies?
- What are travel agencies' requirements to use hybrid and electric vehicles?
- What are the obstacles facing the appliance of this technology in tourist road transportation?
- Does the Egyptian government offer incentives to influence travel agencies to use electric and hybrid vehicles?
- What are the opportunities and challenges of wide-spreading hybrid and electric vehicle use in touristic transportation in Egypt?

Drawing from the previous perspectives, the following hypothesis can be given: The challenges facing the implementation of Egypt's 2030 vision for sustainable road transportation affects negatively travel agencies' readiness degree to participate in the transformation to use electric and hybrid vehicles.

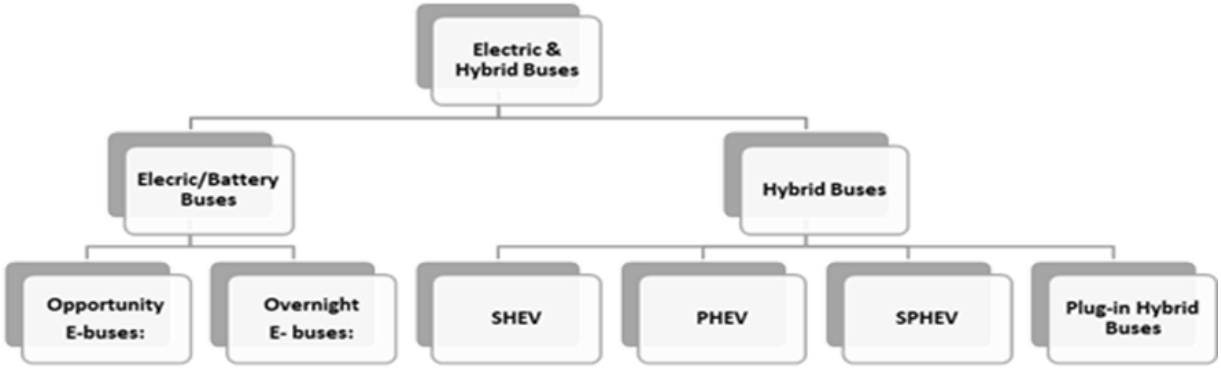
2. Literature review

2.1. Hybrid Vehicles concept and modes

A hybrid vehicle uses two or more distinct types of power, the basic principle with hybrid vehicles is that the different motors work better at different speeds; the electric motor is more efficient at producing torque, or turning power, and the combustion engine is better for maintaining high speed (better than a typical electric motor). Switching from one to the other at the proper time while speeding up yields a win-win in terms of energy efficiency, as such that translates into greater fuel efficiency (wikipidia, 2021). A hybrid electric vehicle (HEV) is a type of hybrid vehicle that combines a conventional internal combustion engine (ICE) system with an electric propulsion system (hybrid vehicle drivetrain). The presence of the electric powertrain is intended to achieve either better fuel economy than a conventional vehicle or better performance. There is a variety of HEV types and the degree to which each function as an electric vehicle (EV) also varies. The most common form of HEV is the hybrid electric car, although hybrid electric trucks following categories (pickups and tractors) and buses (Wikipidia, 2021), which are classified into different categories as shown in figure1.

Figure 1

Electric & Hybrid Vehicles Classification



2.1.1 Electric buses (Battery Buses)

A bus that is driven by a purely electric motor powered by batteries charged with electricity. The vehicle has no other power source other than the battery. Two types are available:

- Opportunity e-buses aim to minimize the weight of the battery by recharging en route at passenger stopping points. They have medium battery capacity (typically 40-60 kWh) and need regular charging from the grid at intermediate stops.
- Overnight e-buses carry the weight of the battery required to drive the entire route without recharging. They have a large battery capacity (typically >200kWh) and recharge the battery from the grid only at the depot (CIVITAS, 2013).

Table 1

Features of electric buses

	Opportunity – charging buses:	**Overnight – charging buses:**
Performance	– Short free range of <100 km. – Limited route flexibility – Recharging needed multiple times a day – Short recharging time: 5-10 min – Energy consumption 2012 (based on prototypes):1.8kWh/km – Energy consumption 2030: 1.58 kWh/km	– Medium free-range: 100 - 200 km. – Higher route flexibility – Recharging at the end of each day – Very long recharging times: more than 3 hours – Energy consumption 2012 (based on prototypes):1.91kWh/km – Energy consumption 2030: 1.68 kWh/km
	Both for the opportunity and overnight-charging buses – Charging time depends on the power of the charging station and battery technology. – In-service life is estimated to be 12-15 years, depending on duty cycle, ambient conditions, and charge rate.	
Infrastructure	– Require charging points within the bus depots and along the routes at bus stops. – Infrastructure cost is +/-10000 euro/per bus/per station.	
Cost	Indication purchase price: +/- 400.000 euros per bus	Indication purchase price: +/-350-500.000 euros per bus
Advantages	– Promising in terms of projected costs. – No tailpipe emissions – Low maintenance costs in comparison to diesel and fuel buses (Noel and McCormack: 2014) – Lower noise level than standard diesel buses	– No tailpipe emissions – High route flexibility – Low maintenance costs in comparison to diesel and fuel buses. (Noel and McCormack: 2014) – Lower noise level than standard diesel buses
Disadvantages	– The high purchase price, TCO, and investment in infrastructure	– The high purchase price, TCO, and investment in infrastructure

Source: CIVITAZ, 2013**.**

2.1.2. Hybrid Buses

Hybrid buses are classified into the following segments according to their drivetrain configuration: parallel Hybrid Electric Vehicle (PHEV), series Hybrid Electric Vehicle (SHEV), and series-parallel HEV.

- A PHEV can use both propulsion systems either simultaneously, or separately using ICE propulsion for acceleration and high speeds, and electric propulsion at steady cruising speeds.
- In a SHEV, the ICE generates energy, which is converted to electricity, which is applied to propel the vehicle and charge the battery.
- A series-parallel HEV has a powertrain designed in such a way that it can act as a SHEV and/or a PHEV at multiple driving modes.

A Plug-in Hybrid Electric Vehicle (PHEV) is a type of HEV that can be plugged in and recharged using electricity from the grid. PHEVs are fully hybrid. They can run in the electric-only mode as well as the ICE-only mode over long driving distances. The major difference between a normal HEV and PHEVs is that PHEVs have very big

battery packs. The biggest benefit that PHEVs provide is that they can be fuel-independent for shorter daily transport and also for long-distance trips by switching to the ICE mode. PHEVs can be of any hybrid configuration (International Energy Agency, 2012).

Table 2

Features of hybrid Buses

Hybrid Busses	Advantages	Disadvantages
Series Hybrid Electric Vehicles (S-HEVs)	The transmission system design is simple – Narrow RPM range for ICE (simple ICE design) – Energy efficiency is high in stop-and-go traffic	– Total weight and costs of the vehicle are high – Energy efficiency is low in long-distance drives
Parallel Hybrid Electric Vehicles (P-HEVs)	– Battery and engine are smaller in size, and, therefore, less expensive than s-HEVs – Energy efficiency is high in long-distance drive	– System design is complicated due to two power transmission paths – Broad RPM range for ICE (expensive ICE design) – Energy efficiency is low in stop-and-go traffic
Series-Parallel Hybrid Electric Vehicles	– Smaller, lighter, and efficient ICE design – Maximum flexibility to switch between electric and ICE power	– Very complicated design – Multiple conversions lead to a lower efficiency at particular driving modes – More expensive than s-HEVs
Plug-in Hybrid Electric Vehicles	– The Small engine size requirement – More reliable than BEVs in terms of range anxiety	– A big battery pack is required – Needs charging infrastructure – More expensive than normal HEVs
Low pipe tail emissions in comparison with diesel and CNG Buses		

2.2 Advantages of using Hybrid and electric buses in tourism road transportation

Tourism relies on travelling, thus the use of transport is obvious, as it is considered one of the main leading forces behind global warming, which should be channelled towards sustainable resource management (Grizane and Kaldava, 2018).

Tourism uses road transport intensively as a means of transporting travellers and passengers whether between markets and destinations or between local destinations in one country, as well as implementing different operational tourist services such as transfers, sightseeing and car rental services (Cooper, 2008; International Road Transport Union, 2014).

Buses are becoming a good alternative in comparison with aeroplanes. It will never replace air transportation on long distances in the ratio of price and time spent on the road and it should not. The main aim was always to make the best transportation on distances to 1000 km. This scale includes in-city transportation as well, usually, called public transportation, which provides 55% of all passengers and the rest 45% provides by tram, metro, and other modes. In Turkey, 95% of passengers use road carriers of which half belong to coaches and buses. In the US, the figure is 751 million passengers per year. Buses and coaches transport 25,000 people per hour in Guangzhou, China. In France, this number is even more amazing. Every year more than 1, 1 billion people use buses. It shows why buses and coaches are strongly connected to the tourism industry (Buss and coach travel, 2014).

Transports that use electrical energy or combined sources as hybrid vehicles greatly help to significantly reduce the pollutant emissions caused by transport equipped with only an IC engine (using petrol, diesel, gas, or renewable fuels); but do not eliminate emissions, as battery-electric buses do (Varga et al, 2020). So, they can improve environmental stewardship, reduce dependence on petroleum, and improve transportation sustainability through noise and emissions reduction (Miller, 2014a).

The wide use of hybrid and electric vehicles in the tourism industry increases tourism spending due to lower fuel and maintenance costs due to reduced stress and maintenance on mechanical components. In addition, the electric drive has fewer parts, therefore requiring less maintenance than a traditional transmission. Moreover, operational costs for hybrids are 15 per cent lower than conventional diesel buses. (National renewable energy laboratory, 2006).

Hybrid and electric vehicles also connect communities, leverage new technology, and decrease dependency on fossil fuels resulting in zero tailpipe emissions, which present a real opportunity to use renewable energy sources like solar power, and decreased noise pollution (Miller, 2014a).

EV charging facilities builds brand awareness for tourist businesses, as they can be incorporated into corporate responsibility reports and press releases. Also, they educate visitors about emissions reduction and provide charging infrastructure for visitors driving electric and hybrid vehicles. (Miller, 2014b).

Travel agencies can offer a variety of day and multi-day tours based on sustainable tourism principles by using electric buses that have a range of 200-400 km depending on where it travels. It can also be supplied with renewable energy, making all tours zero emissions (and so no emission compensation is required) (UNWTO, 2018).

Among the choices illustrated above-battery electric buses are the best option for tourist transportation due to low life cycle agency costs and environmental and health impacts from greenhouse and air pollutant emissions. Although there are still some barriers facing using this new technology in tourism transportation including very high bus purchase costs, very poor driving range, major infrastructure upgrades, and low reliability (Traffic21, 2016)

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2.3. Opportunities and Challenges of Adopting electric and hybrid buses in tourism road transportation in Egypt

Sustainable Transport Project for Egypt" (STP), which was launched in 2015 by the Egyptian Environmental Affairs Agency (EEAA) on behalf of the Egyptian Government for Preparing Policy notes for introducing electric vehicles to Egypt. The STP is funded by the Global Environment Facility (GEF) / United Nations Development Program (UNDP) and implemented by the Egyptian Environmental Affairs Agency (EEAA).

The project's overall goal is to reduce the growth of energy consumption and the related greenhouse gas emissions of the transport sector in Egypt, while simultaneously mitigating the local environmental and other problems of increasing vehicular traffic such as deteriorated urban air quality and congestion. This is to be achieved through the execution of many pilot projects that can be replicated in several cities.

EEAA has prepared a plan for reducing the pollution resulting from the transport sector. That plan includes among its activities conducting a feasibility study for using electric buses/minibuses charged by solar cells stations for public transport and tourist buses in city center, residential and touristic areas (like old Cairo and Giza Governorates), also the feasibility of using private cars powered by electricity, and this is to:

- Reduce environmental impacts, such as greenhouse emissions and photochemical smog.
- Reduce health problems caused by smog and other air pollutants.
- Decrease degradation of national monuments (EEAA, 2015).

Egyptian Ministry of Military Production discussed with China's Ankai Automobile Company cooperation in manufacturing electric buses. They also mulled joint production of electric buses for tourism and transportation purposes to support the transport system in Egypt, put an end to traffic congestion and pollution, protect the environment, and reduce fuel consumption. On other hand, the ministry is keen to shore up the local automotive industry which was given a strong impetus after an agreement to manufacture 2,000 electric buses over the course of four years was signed between one of its factories and China's automaker Foton Motor during the Egyptian President visit China in April 2019. (English Ahram, 2019).

In line with the new vision of mobility as advocated by the sustainable city concepts, the Egyptian Ministry of Tourism announces its intention to use electric buses for the transport of visitors to the main tourist sites and archaeological areas of the country. The pyramids of the Giza Plateau in the North-East of Egypt will experience a revolution in the means of transport available to visitors, offering electric cars and buses to take tourists around the pyramids and the archaeological areas of the country. (Ngounou, 2020).

There are several opportunities in Egypt that support the widespread deployment of EVs.

Table (3)

SWOT analysis of the widespread deployment of EVs in Egypt

Strength	**Weakness**
– Low grid emission factor with the introduction of nuclear power, Combined Cycle Gas Turbine (CCGT) power plants, and expansion in renewable energy projects. (EL-Dorghamy, 2018) – Customs duty exemption for electric cars, the recognition of EVs in the upcoming new traffic law, age limits on old public transport vehicles to encourage fleet renewal, and the recent landmark agreement for the purchase of E-buses in Alexandria. – The private sector engagement indicated in the initial sales of several electric cars and numerous e-bikes to early adopters, as well as advocacy for improved regulations and recognition, and the recent installation of demonstrational charging stations. (EL-Dorghamy, 2018) – Suitable institutional experience with programs and incentive schemes for vehicle scrapping and replacement. (ELDorghamy, 2018). – The Ministry of Military Production possesses all the essential potential and capabilities to manufacture the main components of electric buses. (English.Ahram.org.eg. 2019). – Agreements signed between Egypt and China concerning manufacturing and delivering E-Busses to Egypt for public and tourist transportation. (English.ahram.org.eg. 2019).	– The delay in developing the enabling policy environment and regulatory framework. – Limited financial resources, as well as other competing priorities in the national development agenda. (EL-Dorghamy, 2018). – Insufficient data for fuels and vehicles, which is a major blind-spot in planning for cleaner vehicles dedicated to informal transport use. – Custom duties for fully electric buses, 40%. (EL-Dorghamy, 2018) – There is no formal process yet for licensing electric vehicles and registering their specifications in the government's databases. Each EV purchased in Egypt is therefore licensed on a case-by-case basis through a written request to the Ministry of Interior (LYNX. 2019). – Insufficient charging infrastructure in Egypt
Opportunities	– **Threats**
– "Sustainable Transport Project for Egypt" (STP), which is launched in 2015 by the Egyptian Environmental Affairs Agency on behalf of the Egyptian Government. (EEAA 2015) – High-density Egyptian cities favor the use of EVs and reduces necessary investment costs in infrastructure and space requirements for gas stations. (EL-Dorghamy, 2018) – Slow and frequent stop and- go driving in Egyptian cities, which is associated with congestion and urban density, increases the relative benefits of EV use compared to conventional vehicles. (EL-Dorghamy, 2018). – The power grid is foreseen to have a lower emission factor over time with the foreseen expansion in new and renewable energy sources, as well as higher efficiency CCGT plants, thus promising an even higher relative reduction of emissions due to EV-use compared to conventional vehicles. – The political will to support solutions for diesel consumption. (EL-Dorghamy, 2018). – Adopting new industry and investment opportunities creating job vacancies and broadening socio-economic development. – The Egyptian Ministry of Tourism intention to use electric buses for the transport of visitors to the main tourist sites and archaeological areas of the country (Ngounou, 2020).	– Uncertainty about technical and financial feasibility. – Absence of necessary legal and regulatory prerequisites. – Market response, impact on employment and on the local industry, etc. (Bloomberg Finance L.P. 2018) – Impact on the power grid (in the case of high-penetration scenarios). – Implications for urban planning and understanding means to cater to apartment dwellers (given the lack of off-street parking in Egypt). – Uncertainty about battery life and performance in hot climates. (EL-Dorghamy, 2018). – High-cost infrastructure for EV charging – High ownership costs of EV

− The wide use of hybrid and electric vehicles in the tourism industry increases tourism spending due to lower fuel and maintenance costs (National renewable energy laboratory, 2006). − EV charging facilities builds brand awareness for tourist businesses	

3. Methodology

The research was conducted using a questionnaire distributed to travel agencies in Luxor and Aswan. The study was conducted from January to March 2021 on travel agencies (categories A and C) in Luxor and Aswan. A 3-point Likert scale was used ranging from (1) disagree, (2) not sure and (3) agree. The method of data collection was a self-completion questionnaire, returned by e-mail or personally collected by the researchers. The collected questionnaires were encrypted and statistically analyzed using SPSS v20.

3.1 Research Measures

The research comprised three phases. The first phase includes measuring travel agencies' opinions concerning electric and hybrid infrastructure readiness in Egypt, as well as their beliefs related to the future benefits of participating in this vision implementation through the replacement of traditional fuel-based vehicles with electric and hybrid vehicles. The second phase measures the challenges and obstacles that may hinder the proper implementation of Egypt's 2030 vision in general, and the travel agencies' participation in particular, the phase was ended by presenting the most effective factors that may represent obstacles to implementation such as the shortage in recharge stations, legislations, maintenance, and manufacturing technology (Bloomberg Finance L.P, 2018; EL-Dorghamy, 2018; LYNX, 2019). Lastly, the third phase measures the readiness degree of Egyptian travel agencies to participate positively in the vision implementation.

3.2 Sample selection

The study was conducted on a purposive sample of travel agencies (categories A&C) that offer tourist road transportation services, located in Luxor and Aswan as the tourist activities in both destinations depend mainly on on-road transportation that causes a high rate of environmental negative impacts on the sensitive tourist sites. Therefore, there is a persistent need to prevent or reduce them as possible.

The study was conducted on a population of 100 travel agencies in Luxor and Aswan (According to the Egyptian travel agents association) (ETAA, 2021) from January to March 2021, having 70 valid and accurate forms.

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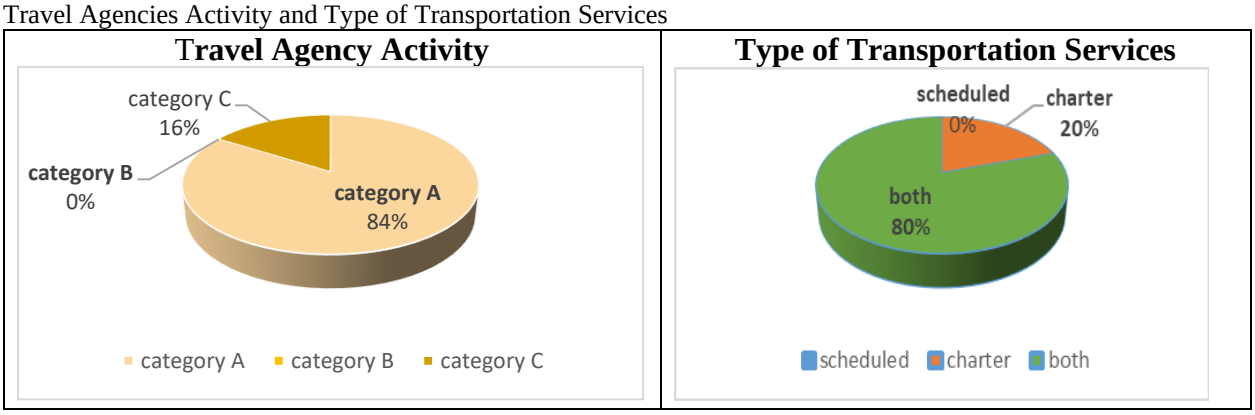
4. Findings

The researchers use both descriptive and inferential statistics to test the research hypothesis and determine the effect of the challenges facing Egypt's sustainable transportation vision 2030 implementation on travel agencies' readiness degree to participate. Mean scores and standard deviations are calculated for all factors in the research. Linear regression and ANOVA analysis at a significance level of 5% are used to find relationships and predict the value of the dependent variable (Readiness of travel agencies to transform to use electric and hybrid vehicles) based on the value of applying the independent variables (the Challenges of implementing Egyptian 2030 vision for sustainable transportation). The collected data were analyzed using the statistical package for social science (SPSS v 20).

4.1 Descriptive analysis of Egypt's vision 2030 acceptance degree

Figure 2

Travel Agencies Activity and Type of Transportation Services



The previous figure shows that the study sample is composed of two categories of travel agencies (category A 84% and category C 16%). As 80% of these agencies operate both charter and scheduled road transportation services, while 20% offer charter road transportation services only

Table 4

Descriptive Statistics

First axis: coincidence of travel agencies objectives and Egypt 2030 vision.	Mean	Std. Deviation	Level of Agree
-Hybrid vehicles usage reduce operational costs.	2.47	0.793	Agree
- Hybrid vehicles support the vision of Egypt 2030.	2.39	0.748	Agree
- Hybrid vehicles enhance the competitive advantages of travel agencies.	2.40	0.769	Agree
-Egypt possesses the infrastructure needed for replacement.	2.29	0.705	Agree
- Hybrid technology is suitable for travel agencies operating requirements.	2.54	0.502	Agree
Total	**2.4171**	**.66441**	**Agree**

Table (4) show that the response for all statements are at the level (Agree), and the total of (M=2.4171) which means that the Egyptian travel agencies' objectives are coincident with Egypt vision 2030 for sustainable road transportation.

4.2 Inferential statistic

Linear regression analysis was conducted to determine whether the independent variable (The Challenges of implementing Egyptian 2030 vision for sustainable transportation) affects the dependent variable (Readiness of travel agencies to transform to use electric and hybrid vehicles) or not and assess the degree of the influence

Table (5)

Dependent and independent variables

Independent variable (phase 2)	**Dependent variable (phase 3)**
The absence of customs exemptions for a hybrid.	The presence of incentives programs offered by the Ministry of Tourism influences travel agencies.
The absence of international technical support companies.	High purchasing costs versus lower operating costs is a good advantage that influences the process of shifting to the use of electric vehicles.
Absence of electric charging stations.	The decision of using this technology is based on the presence of strong tourist demand.
The absence of government incentive programs towards transformation.	My decision will depend on the level of the offered governmental facilities.
The absence of hybrid operating legislation.	Infrastructure and technical support are a prerequisite for the replacement process.
Uncertainty about the efficiency of hybrid operation.	The technical capabilities of electric vehicles still do not match with travel agencies' operating requirements.

Table 6

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.960[a]	.921	0.920	0.16824

a. Predictors: (Constant), barriers b. Dependent Variable: Readiness

The previous table provides R-value (R correlation coefficient) = 0 .960 indicating that there is a strong positive relationship between the independent variable (Challenges of implementing Egyptian 2030 vision for sustainable transportation) and the dependent variable (Readiness of travel agencies to transform to use electric and hybrid vehicles). R square value (coefficient of determination) = 0.921 indicates that the independent variable explains 92 % of the variability of the dependent variable

Table 7

ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	22.438	1	22.438	792.720	0.000[b]
	Residual	1.925	68	0.028		
	Total	24.363	69			

a. Dependent Variable: Readiness b. Predictors: (Constant), barriers

F- Ratio in the ANOVA table shows that the independent variable (Challenges of implementing Egyptian 2030 vision for sustainable transportation) statistically significantly (0.000) predict the dependent variable (Readiness of travel agencies to transform to use electric and hybrid vehicles).

Table 8

Coefficients

CoefficientModel		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-1.318	0.139		-9.462	0.000
	Challenges	1.421	0.050	0.960	28.155	0.000

a. Dependent Variable: Readiness

The previous table shows the effect of the Challenges of implementing the Egyptian 2030 vision for sustainable transportation (the Unstandardized Coefficient B for independent variable) = - 1.318. This means that each 1-point increase in challenges results in a decrease in travel agencies' readiness by 1.318 points, meaning that the Egyptian travel agencies' readiness for the transformation to hybrid vehicles is mainly related to obstacles reduction and elimination. However, this assures what is mentioned in the literature review (Traffic21: 2016, Bloomberg Finance L.P. 2018, EL-Dorghamy, 2018, LYNX. 2019) and proves the study hypotheses.

5. Conclusions

The study concluded with the following results that covered the questions mentioned in the research problem:

1- Hybrid and electric vehicles are the best options for tourist transportation due to low life cycle agency costs and environmental and health impacts from greenhouse and air pollutant emissions. According to the literature review (Miller, 2014a), (Miller, 2014b), (National Renewable Energy Laboratory, 2006), (EL-Dorghamy, 2018) and (UNWTO, 2018).

2- There are still some challenges facing using electric and hybrid technology in tourism transportation including very high bus purchase costs, very poor driving range, major infrastructure upgrades, and low reliability. As mentioned in the literature review (Traffic21, 2016), (EL-Dorghamy, 2018), (CIVITAZ, 2013), and the results of the questionnaire directed to Egyptian travel agencies, stated that the readiness of these agencies to convert using electric vehicles depends mainly on the alleviation of these challenges.

3- Despite there are a lot of challenges that may hinder the implementation of Egypt's 2030 vision objectives, Egypt has a high range of opportunities to shift to sustainable road

transportation through minimizing and elevating obstacles and maximizing advantages, as mentioned in the SWOT analyses table in the literature review and the results of the questionnaire directed to the Egyptian travel agencies.

4- Incentives offered by the Egyptian government for different parties are still insufficient to influence them to participate positively, as stated by Egyptian travel agencies through the results of the questionnaire (phase 3).
5- The Egyptian travel agencies' objectives are coincident with Egypt Vision 2030 for sustainable road transportation, as stated by the results of analyzing phase 1 phrases in table 4.
6- The Egyptian travel agencies' readiness for the transformation to hybrid vehicles is mainly related to obstacles reduction and elimination, as assured by the results of regression and ANOVA tests made for phase 2 and phase 3 of the questionnaire.
7- The Egyptian government must provide more investment incentives and opportunities to attract electric and hybrid technology international manufacturers to invest in Egypt to develop the needed infrastructure and requirements of spreading this new technology in the transportation sector in general and tourism transportation.
8- Economic and legislative facilities must be offered to different concerned partners in Egypt involved in implementing Egypt's 2030 vision in general, and tourist sector partners, in particular, to influence them to participate positively.
9- Priority must be given to environmental sensitive tourist sites and destinations in applying sustainable road transportation new technology to reduce negative environmental effects as possible

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