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In the name of Allah , Most Gracious , Most Compassionate, Thanks be to the Lord of the worlds , prayers and peace be upon the lover and the chosen , Abualqasim Muhammad , and upon his brave immaculate progeny .

Edition Word

Chief among the targets the International Al-`Ameed Centre for Research and Studies gives eye teeth for are to produce and develop knowledge in urging the scientific research and studies with high quality and scientific distinguished methodology in the orbit of natural and engineering sciences .

Being issued , Al-Bahr journal with its 21 and 22 issues broaches a number of highly valued articles in different fields of specialization ; sustainable energy , biochemistry, physics and architecture .

It is hoped that such articles meet the requirements of the scientific quality and stimulate the specialized reader into plough a pathway to other articles exploiting the published articles in these two issues.

The journal stresses its desire to invite all the researchers in the various fields of the journal to send their article to promote science and knowledge , which is the target of both the journal staff and the International Al-`Ameed Centre for Research and Studies .

Last but not least, we wish that the content of these issues lays the hand of all , readership and researchers, on great meritorious benefits . Nothing left but our thanks to the Lord of the worlds and prayers and peace be upon Muhammad , the prophet of mercy , and his immaculate beneficent progeny .

Consultation and Editaril

Study and Analysis the Impact of Solar Energy Source on Stability of Electrical Power Grid.

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الخلاصة

ان زيادة الطلب العالمي على توليد الطاقة الكهربائية الرخيصة والنظيفة من مصادر الطاقة المتجددة ادى الى زيادة عدد هذه المصادر مما ادى الى زيادة تاثيرها على اداء واستقرارية انظمة توزيع الطاقة الكهربائية عند ربطها بمنظومة التغذية الرئيسية. الهدف من هذا العمل هو دراسة وتحليل تاثير مصدر الطاقة الشمسية عند ربطها مع منظومة الشبكة الكهربائية على استقرارية جهد وطاقة المنظومة الرئيسية. تم اجراء الاختبارعن طريق دراسة مجموعة من العوامل الفنية التي يمكن من خلالها تحديد تأثير مصدر الطاقة الشمسية على شبكة الطاقة الكهربائية عن طريق حساب مقدار الفقد في الطاقة النشطة والمتفاعلة، وتغيرات الجهد في الشبكة الكهربائية عند ربط مصدر الطاقة الشمسية بالشبكة الرئيسية. يمكن استخدام النتائج الحاصلة كقاعدة بيانات لتقدير مدى التأثير الحاصل في هذه الحالة. تم تنفيذ نموذج المحاكاة باستخدام برنامج MATLAB وتم مقارنة النتائج مع بيانات الشبكة الكهربائية القياسية . (9-bus IEEE)

Vol. 11, No. 21 and 22, P. (13-22), Jun., 2020

Abstract

The increase of global demand for cheap and clean power from renewable energy sources has increased the number of these sources, increasing their impact on the performance and stability of electrical distribution systems when integrated to the main line feeder. In this work, number of technical factors related to electrical production quality have been examined in order to evaluate the impact of solar energy source on electrical power grid. The tests were carried out by measuring the losses of active and reactive power and the voltage changes in the electrical grid due to connecting the solar source to the main grid. The results obtained can be used as a database to estimate the impact of solar power supply on the stability of the grid. The simulation model was conducted by using the MATLAB Simulink and the results were compared with the standard (9-IEEE) bus grid..

1. Introduction

Increasing the CO2 emissions and limiting fossil fuel reserves have pushed renewable energy sources into the forefront. The European Union has set a very ambitious target, by (2050), in terms of reducing CO2 emissions below (80%) of the level that was represented in 1990 [1].

Renewable energy sources are becoming more and more represented in electricity generation and replace sources that are responsible for CO2 emissions. In this way they contribute to the decarburization of future power systems [2].

Penetration of renewable energy, especially wind, is on the rise. Total production capacity from renewable energy sources was over 2240 GW in 2016. A steady decline in the price of technology for renewable sources can lead to their even greater presence [3] In addition to the ecological factor that was the main motivation for investing in renewable energy sources. The integration of such sources has brought many benefits to the main grid. One of the advantages is that the consumption requirements can be provided at the local level, which reduces the need for transmission of electricity to large distance [4].

The direct consequence of decentralized production from the renewable energy is the reduction of strain on the lines and the losses of active and reactive energy in the system. This reduces the probability of overloading the lines and increases the safety of the main grid. At the same time, the transmission system operator is responsible for the losses of energy in his network, so that the reduction of losses has an economic benefit [5].

An analysis of the impact of the integration of renewable energy sources into the electric power system becomes the subject of research by a large number of researchers. The authors in deal with the problem of finding the optimal location and capacity of distributed energy sources. The objective function can be different; the most common is minimization of losses or better voltage conditions [6].

Power calculations represent a very useful tool that gives information about the state of the power system. The results of calculation give us variable values of amplitude and phase angle of the voltage on the bus under certain load and production. In the calculations of power, the input and output variables of the system are considered as random variables and in this way it is possible to obtain different possible states of the main grid [7].

However, with the development of efficient tools and modern computers, MCS method was often used in probabilistic power calculations. This method represents an iterative process where in each iteration random values for each of the stochastic variable systems (consumption and output from the renewable energy source) are selected based on the distribution density function [8].

Then, the optimum power is calculated for each set of input random variables. The result of each calculation of optimal power is

recorded and the process is repeated until the state for interrupting the algorithm is met [9].

2. Mathematical calculations:

To determine the impact of solar energy source, some technical parameters have studied and analyzed in two stets, the initial state of the system without integrating the solar sources and the second state involving solar energy sources. In this paper, three technical aspects are considered: power losses, voltage deviation and load capacity. The emphasis on the influence of solar power plants connected to the network in load nodes, solar irradiation is intermittent and stochastic. In order to reliably assess the impact of solar power source on the main power system, it is necessary to establish an appropriate model for estimating production from photovoltaic panels.

2.1. Solar irradiation intensity parameter f(r): p

In a certain period, solar irradiation can be approximated by a Beta distribution whose probability intensity function has the following form [10]:

$$f(r) = \frac{\Gamma(\alpha+\beta)}{\Gamma(\alpha)\Gamma(\beta)}\left(\frac{r}{r_m}\right)^{\alpha-1}\left(1-\frac{r}{r_m}\right)^{\beta-1} \quad \text{..... (1)}$$

Where r & rm represent the instantaneous and maximum solar irradiation at some time interval,

α & β are the parameters of the Beta distribution, and Γ is the Gama function. Parameters of the Beta distribution of solar radiation can be obtained from the mean value of solar irradiation μ and variance σ for some time [10]:

$$\alpha = \mu\left[\frac{\mu(1-\mu)}{\sigma^2}-1\right] \quad \text{..... (2)}$$

$$\beta = (1-\mu)\left[\frac{\mu(1-\mu)}{\sigma^2}-1\right] \quad \text{..... (3)}$$

The Beta distribution parameters are obtained by the measurement of irradiation at some intervals, the mean value of **(α = 3.034, β = 2.299)** and the maximum solar irradiation **(r_m = 1.029 kW / m2)**. When the known Beta function for solar irradiation, the output power of a solarpower plant can be obtained.

2.2.Loss parameters of active and reactive power (lPa & lP):

Technical parameters of active and reactive power losses lPa & lPr compute the total losses of active and reactive power in RES (renewable energy sources) scenarios and base scenarios without RES. Their mathematical formulation is given by the formulas (4) and (5) [10]:

$$LPa = 1 - \frac{\mathrm{Re[Sy]}}{\mathrm{Re[Soy]}} \quad \text{..... (4)}$$

$$LPr = -\frac{\mathrm{Ie[Sy]}}{\mathrm{Ie[Soy]}} \quad \text{..... (5)}$$

Where:

Sγ: refers to the total loss of active power in case of solar energy presence.

S 0γ: refers to the total loss of active power without solar energy soursee.

When the values of this parameters are (0 < LPa, LPr < 1), there are a positive effect, with a higher loss in solar panel penetration, while negative values indicate an increase in power losses.

2.3. Voltage deviation index in the grid (Vd):

Maintaining the voltage in an acceptable range ensures the reliable power transfer. The maximum permitted voltage deviations are precisely defined by the Grid Code. The most common is that the deviation is (± 5% or ± 10%) of the nominal voltage acceptable. Some loads are particularly sensitive to voltage values beyond the limits set. This parameter is important for some cases, such as in case of asynchronous motors in which the starting torque is proportional to the voltage square, so that low voltages make it difficult to start this type of engine and high voltages accelerate the aging of the insulation and can damage electronic devices

The technical voltage parameter (Vd) refers to the maximum deviation of the voltage between the busbars. A uniform profile voltage is usually desirable in the operation of the system. Therefore, positive values of voltage parameter indicate a uniform voltage profile, while negative values mean a wider voltage deviation. In mathematical terms, the index is expressed by the following equations [10]:

Vd=(Vomax-Vomin)-(Vmax-Vmin) …. (6)

Where:

Vmax and Vmin: Maximum and minimum voltage value in the system with solar source,

$$LL = \max\left(\frac{SL_m^0}{SR_m}\right)_{m=1}^{NL} - \max\left(\frac{SL_m}{SR_m}\right)_{m=1}^{NL} \quad \text{.....} \quad (7)$$

V0max & and V0min: Maximum and minimum voltage in the system without solar source.

2.4.Load level index (LL):

This Parameter refers to the load level of the transmission lines in the systems. It can affect the reduction of investment costs related to the installation of new transmission lines that are necessary due to the increase in system load. In mathematical terms, the index can be expressed as [10]:

where:

SL^0_m & Slm: the load of feeder for the system with solar system.

SR_m: is the limit load of feeder. While NL is the number of feeders in the system.

This index serves as a means of determining whether solar source integration raises or reduces the load level of the most overloaded transmission lines. So, reducing or increasing the load of lines directly affects the ability of the system to accept an increase in consumption in the future. This index indirectly points to the necessary investments in a new transmission capacitance.

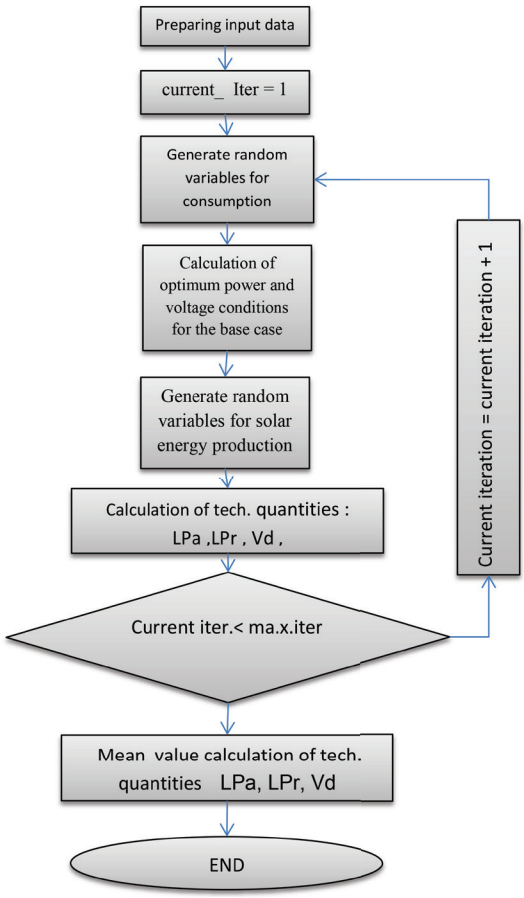

Fig.(1): The proposed algorithm.

3.Implementation of testing algorithm.

The proposed algorithm for calculating the technical parameters based on power and voltage calculations with and without integrating the solar source has been conducted in some steps in MATLAB Simulink as shown in the flowchart in Fig. (1).

Table (1) indicate the objective of each step.

The proposed algorithm was tested on a standard (IEEE 9-system) for calculating the power as shown in Fig. (2). In particular, the system consists of three conventional generators that supply three consumer areas. Installed capacity is (820) MW, while the average load is (315) MW. In addition, it is assumed that there is a solar power source in the load nodes whose total power in MATLAB Simulink installed capacity is (100) MW. The optimal distribution of power was performed according to the criterion of the minimum total production costs of the generator, whereby the curve of production cost of a generating unit representing a square function.

Table (1) : Steps of proposed algorithm for calculating the technical parameters.

Step No.	Task	Objective
1.	Preparation input data	Upper and lower limits of active and reactive power levels, Production cost coefficients, amplitudes of voltage nodes and apparent power transmitted through feeders & finally the consumption of active and reactive power in knots.
2.	Set the current iteration counter =1	Start the iteration counting.
3.	Generate random variables for consumption	The loads are modeled over the normal distribution of N (μ, σ2) with parameters μ = 1 and σ = 0.07 in relative units.
4.	calculation of optimum power and voltage for base case	To find the distribution of active generating powers on generating nodes at which the minimum objective function is achieved, while meeting the physical and technical limitations of the network.
5.	Generate random variables for solar energy production	The objective function that needs to be minimized is the sum of the cost of production of all manageable sources in the electricity system. The state of generating random variables is obtained to produce high precision in the system. Production was determined by taking values α = 3.034 and β = 2.299.
6.	Calculation of optimal energy and voltage levels.	Budget for optimal flows of energy and voltage levels if the energy is produced from a solar source.
7.	Calculation of technical quantities: LPa, LPr, Vd	Calculation of technical quantities, taking into account the basic situation and the case of solar source integrating.
8.	Check the criteria for the exiting algorithm	If the current repeat number is smaller than the maximum limit, steps 3 through 8 will be repeated with one addition. When the current frequency exceeds or equals the maximum, it will continue to step 9.
9.	Mean value calculation of tech. quantities : LPa, LPr, Vd	Calculation of the mean value of the technical quantifiers based on the results of individual iterations.
10.	End	Display results and end of the algorithm.

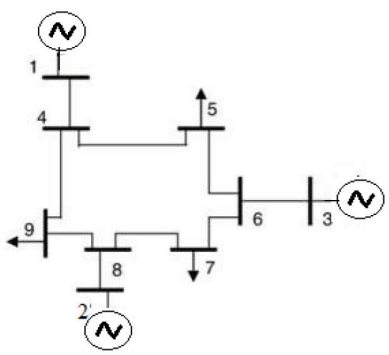

Fig.(2) : IEEE 9-Bus testing system[11].

4.Results and discussion

1-Technical lPa and lPr (active and reactive power losses) measurements show that by introducing dispersed solar power source near the load center results in some decrease in the loss of active and reactive power due to reduced transmission of power lines capacity.

2-Decentralized production can results in reducing the energy losses. The effect of the integration of solar source into the main grid depends on existence the source of the load (shunt capacitors, reactors). For this reason, the values of the current overload technical indicators are not as smooth as the ILp and ILq indicators due to the specific topology ofp the test system. Namely, the facts that there are three sources that can provide reactive support in the system directly affect the integration of solar power sources on voltage level. In addition, the line breakdown also decreased because solar power plants located on consumer busses partially locally supply consumption. In Figs. (3), (4) and (5) are given the graphics of these measurement, while in Table (2) are given the basic characteristics.

It should be seen that the Beta distribution is modeled by the production of solar power plant only when there is solar irradiation. For this reason, this analysis covers only the

Table (2): Statistical analysis of the technical indicators.

Parameter	LPa [w]	LPr [w]	Vd [v]
Max.value	0.376	0.270	0.17
Min.value	0.001	0.003	0.01
Average valu	0.13	0.135	0.065

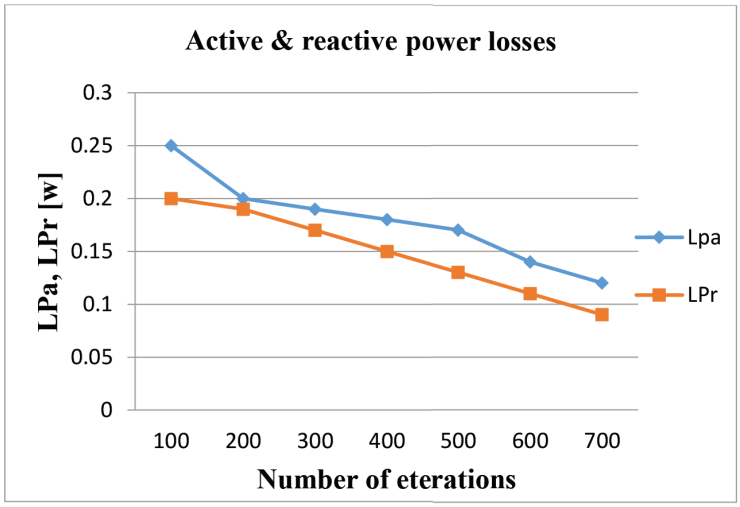

Fig (3). Active and reactive power loss indication.

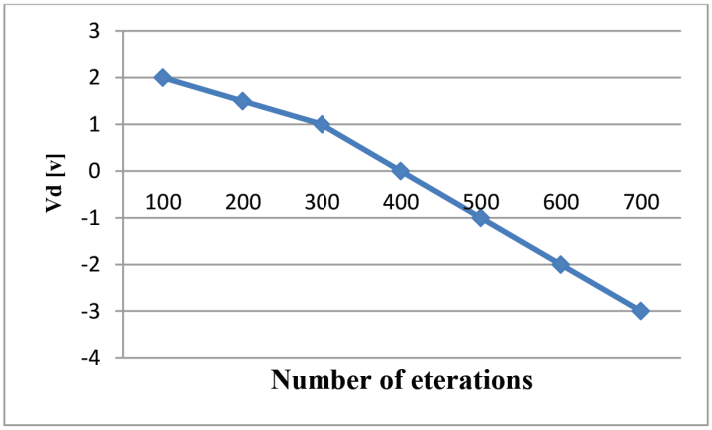

Fig.(4) Voltage profile indicator.

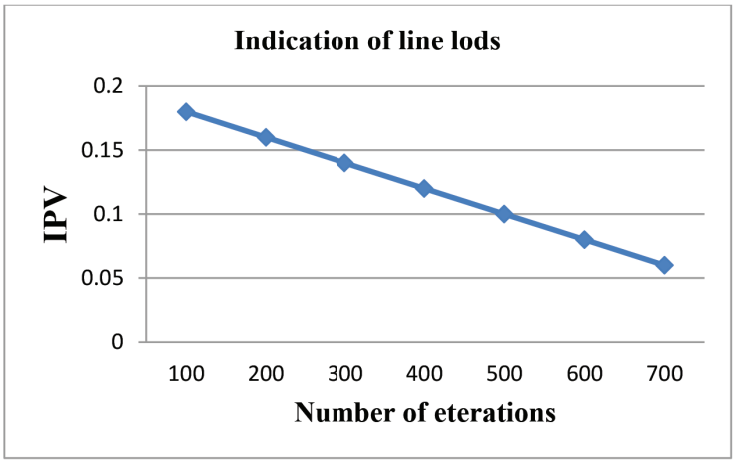

Fig.(5). Indicator of the line loads.

period of the day when there is a sun. During the night, when there is no production from solar power plants, the state of the power grid is identical to a condition without integration of the solar energy source.

5.Conclusion

Increasing the different gases emissions and climate change gave the renewable energy sources some advantage over conventional electrical sources. However, renewable energy sources integration into existing power systems is a very complex task mostly due to their stochastic and intermittent nature. The aim of this analysis is to investigate the impact of renewable energy source on the transmission network system in order to avoid unwanted situations that could potentially harm the system. The conclusions of this paper rely heavily on the concept of probabilistic flows of forces. This method involves the stochastic behavior of consumption and production from the renewable energy source in the system. The influence of solar power plants on power losses, deviation of voltage and load of lines was observed. The conclusion of the paper is that the integration of renewable energy source generates reductions in active and reactive power losses, as well as reduces the load on the lines. This conclusion is justified because the integration of solar power plants that locally

power consumption leads to the unloading of the lines and thus to the reduction of losses in the network. Another conclusion of this study is that the renewable energy source can have a different impact on the voltage conditions in the network. This is a direct consequence that network grids are dominantly dependent on reactive support near load centers

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Generate Clean Energy in The Holy Shrines in Karbala (Energy Generated by Human Steps)

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الخلاصة

ان عملية توليد طاقة كهربائية نظيفة تحتاج الى عدة عوامل منها المواد التي تنتج الطاقة والتقنية المستخدمة في انتاج الطاقة وكذلك البيئة التي ممكن انتاج الطاقة النظيفة فيها. وهذا ما تم ايجاده في حركة الزوار للعتبات المقدسة في كربلاء حيث وجد البحث امكانية توليد طاقة كهربائية كافية لتغذية الانارة الخارجية بواقع (38) عمود انارة خارجية فقط من حركة الزوار ولمدة (10) ساعات باليوم وهذا مما يساعد شبكة الكهرباء الوطنية.

الكلمات المفتاحية

جول، خطوات، الكهرباء، المراقد المقدسة، الزوار.

Abstract

The process of generating clean electricity requires several factors, including materials that produce energy and technology used in the production of energy as well as the environment in which it is possible to produce clean energy. This is what was found in the movement of visitors to the holy shrines in Karbala, where the research found the possibility of generating sufficient electrical energy to feed the external lights by (38) external lighting column only from the traffic of visitors and for a period of (10) hours of the day, which helps the national electricity network.

Keywords

Joules, footsteps, electricity, holy shrines, visitors.

1. Introduction

Clean energy has become one of the most important issues in the life of societies. There are many ways of generating clean energy depending on the Environment and spatial conditions, some of which may be through the movement of air or the sun or the movement of people and others.

The holy shrines in Iraq have a large number of visitors and employees, and therefore the movement generated from them can be exploited to generate clean electrical energy that contributes to the preservation of the environment.

2. Objective of the research

The research aims is obtaining general indicators of the amount of clean electrical energy that can be generated from visitor steps to the two holy shrines in Karbala.

3. Renewable energy

Renewable energy can be defined as energy generated from relatively unlimited sources of vanishing, such as wind, water, sun and others, also does not depend on the combustion of conventional fuel [1] and add to it the electrical energy generated by human movement, a relatively modern energy which is transformed movement of human foot cover on the ground to generate a clean electrical energy that can be used in street lighting or advertising signs or other applications.

4. Generation of electricity from human movement

As a result of the ongoing search for new sources of clean energy, science has reached the possibility of generating electricity from human movement on special tiles of floor. "The steps of man are not just a movement from one point to another, but these steps can generate electricity." [2] "The world is wasting energy every day that can be exploited in a good way." [3] A number of companies have produced special tiles of floor - which varies their shape and specifications according to the manufacturer - generate electricity by storing energy from human traffic within batteries and then reproducing them to generate continuous electricity depending on the number of steps that generate this energy. Fig (1(.

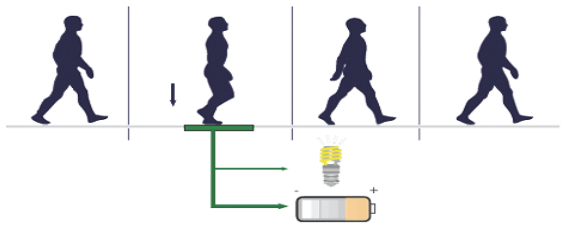

Fig (1): generate electricity by human steps [4]

A (Piezoelectric) is a technique that can generate electricity by pressure, such as the pressure exerted on the feet during walking, and generates an electric current that can be used to charge batteries, and this is an old technique that has long been used in lighters. Electricity can be generated by the pressure of certain materials such as quartz Generates voltage difference resulting in a simple

electric current and the result of changing the size, when pressed on the material converge some of the electrical charges, generating on both ends of an electric effort [5].

For the purposes of research, we will study the product of a company to determine the amount of electrical energy that can be produced as a result of visitors' traffic in Karbala. And this product will be with piezoelectric technique (Pavegen, UK) – (V3) technology. These tiles are resistants to water, dust and chemicals. They also carry a weight of up to (700) kg per piece for (0.1) square meters and a (25) year warranty. For heat, special specifications can be requested by country of manufacture [6]. Where each footstep generates approximately (3-5) joules of energy [7] therefore we can have considered that the average is (4) joules per step, Fig (2).

As for cost of tiles there is a large different between companies depending on the cost of employs, material, taxes, place of project and so many other elements that effect of the final cost of the project, because of that this research will be limited on the object of power (amount of clean electrical energy generated) only without considering the cost issue.

Fig (2): The shape of (V3) technology piece which have three generators and the manner of its arrangement [8]

5. Space of human movement

The principle of the work of the tile is the pressure caused by foot step, and we will assume -for research purposes- that the path moves by one person and regularly in case of more than one person or a smaller step, this means increasing the number of steps and thus increasing the energy generated by these steps. Therefore, our calculations will be based on the minimum expected steps, not the maximum.

Fig. (3) shows the difference between the distance between the footsteps of the adult man according to the nature of movement, where we note that the distance between the feet during the walk varies from (625 - 875) mm. and therefore can be considered that the average of distance between the footsteps is ((625 + 875) / 2 = 750 mm.). This figure also shows the width of the human body, which is (625) mm. Since there is no detailed statistics of the number of visitors showing whether the visitor is a man, woman or a child and so on, therefore adult measurements will be adopted for purposes of calculations within the search.

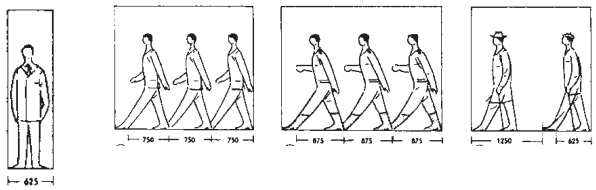

Fig (3): Measuring the distances of the traffic patterns and the standard of the human body [8]

Based on the measurements above we can draw up a diagram that shows the following:

A- Floor with dimensions (7250 x 650) mm. which is (7.25 0.65) m. and the approximate area (4.7) m^2 can provide ten footsteps for an adult and as in Fig (4).

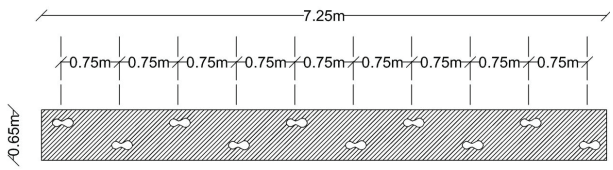

Fig (4): Plan showing the dimensions of the floor needed for ten steps
Source: Researcher

B- Floor with dimensions (3.63 × 0.65) m. and the approximate area (2.3) m2 can provide five footsteps as in Fig (5).

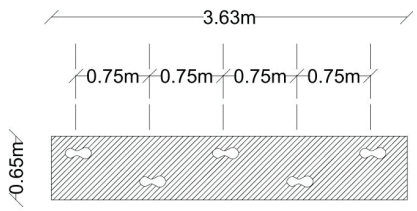

Fig (5): Plan showing the dimensions of the floor needed for five steps
Source: Researcher

6. Street lighting

The street lights are different according to the street function and the height of the light column and the type of light used in it ranging from 40 watts to 300 watts in highways and so on [9] For the purpose of the research, we will use light with (100) watt LED Fig (5).

7. Case study

7.1. Site

The objective of the research is to find the amount of energy that can be generated through the movement of visitors and employees to the two holy shrines of imam (Hussain and Abbas) in Karbala.

Since most visitors visit both shrines during the visitation, the number of visitors to the holey shrine of imam Abbas will be calculated only and then the same number will be considered for the holey shrine of imam Hussain. Because there are a small number of visitors visiting the Imam Hussain holy shrine without the Imam Abbas holy shrine. The probability of underwriting knowing that the number of visitors is variable and not fixed but the goal is to obtain general indicators. Figs. (6) & (7)

Fig (6): the holy shrine of imam Abbas [12]

Fig (7): the holy shrine of Imam Hussain [11]

7.2. Survey

It is known that the number of visitors to the holy shrines throughout Iraq in general and in Karbala in particular is variable and unstable, sometimes reaching millions of visitors (such as visiting the days of Ashura and visiting the half of Shaaban), while the number of visitors in other days reaches tens of thousands. Therefore, in order to obtain the general average number of daily visitors, the number of visitors and employees entering the holy shrine of imam Abbas in the first week for eight months was taken in a series that included the summer, autumn and winter months also a part of the summer holidays for students and colleges, the purpose is to get a general average for the number of daily arrivals (pedestrian) of the holy shrine of imam Abbas as in Table (1).

Table (1): Number of entrants to the holey shrine of imam Abbas [13]

Date	No. of visitors	Date	No. of visitors
1-7-2018	22919	1-11-2018	313625
2-7-2018	24962	2-11-2018	264049
3-7-2018	25155	3-11-2018	185574
4-7-2018	25527	4-11-2018	112710
5-7-2018	63750	5-11-2018	60518
6-7-2018	47473	6-11-2018	110436
7-7-2018	38947	7-11-2018	125595
Date	No. of visitors	Date	No. of visitors
1-8-2018	53219	1-12-2018	78518
2-8-2018	116930	2-12-2018	44437
3-8-2018	99160	3-12-2018	50269
4-8-2018	79708	4-12-2018	50752
5-8-2018	55393	5-12-2018	48420
6-8-2018	57336	6-12-2018	114827
7-8-2018	55906	7-12-2018	124632
Date	No. of visitors	Date	No. of visitors
1-9-2018	80079	1-1-2019	117645
2-9-2018	59825	2-1-2019	34203
3-9-2018	62073	3-1-2019	68113
4-9-2018	62756	4-1-2019	79746
5-9-2018	65925	5-1-2019	85790
6-9-2018	122136	6-1-2019	50983
7-9-2018	108008	7-1-2019	25373
No. of visitors	Date	No. of visitors	Date
1-10-2018	60850	1-2-2019	84933
2-10-2018	66800	2-2-2019	90912
3-10-2018	62861	3-2-2019	66794
4-10-2018	135455	4-2-2019	72394
5-10-2018	152656	5-2-2019	77959
6-10-2018	123206	6-2-2019	85709
7-10-2018	54814	7-2-2019	122052
The average is (84478) person / day			

7.3. Distribution of tiles that generate power

To ensure that the steps of all visitors and employees are included in the generation of clean electricity we will distribute tiles of floor that generate power of electricity at the gates (entrances) to the holy shrine we will.

Therefore, the ten-step floors can be placed in the front of the gates, while the five-step floors will be placed at the other side of gates, which means that the tiles of floors will be in both sides of every gate in the holy shrine. Fig (8) & (9).

Fig (8): Imam Hussain Gate in holy shrine of Imam Abbas [17]

Fig (9): Al-karama Gate in holy shrine of Imam Hussain [16]

The area of tiles can be calculated after installing the width of entries in the two holy shrines approximately –that the widths of gates are different according to field visit to the researcher - considered is (3) meters, thus the provision of (4) tapes path with five footsteps or the path of ten footsteps the Width will be:

- (0.65 × 4 = 2.6) m.

This means the width of two paths will be (2.6) m. and therefore the spaces are as follows:

• The 10-footsteps path area is: (7.25 x 2.6 = 18.85) m2.

• The 5-footsteps path area is: (3.63 x 2.6 = 9.44) m2.

• The total area of the tiles in one gate (entrance) is (18.85 + 9.44 = 28.29) m2

The number of gates (entrances) to the holy shrine of Imam Hussain are (7) gates [14] and in the holy shrine of imam Abbas are (10) gates [15]. So that the total area of tiles of floors in the two holy shrines is:

• (17 × 28.29 = 481) m2

7.4. Calculate generated energy

We can now calculate the approximate electric power generated by the movement of human who inter to the holy shrine of imam Abbas (visitors and staff) as this outline procedure:

• 84478 (person per day inter to the shrine as shown in Table (1)) × 2 (person per day leave the shrine) × 15 (for the ten and five footsteps floors) × 4 (Joules per step energy generated × 2 (for the holy shrines) = 20274720 joules/second

This main we can generate in one day about (20) million joules/ second.

As in cost of tiles there is a large different between companies also the type of battery there is a large different between companies depending on the cost of employs, material, taxes and so many other elements that effect of the final cost of battery, but –in general- if we know that the process of energy storage and reprocessing will cost us a loss depending on the type of battery and the method of conversion used, ranging from (5%) and up to (70%) in some cases or more, we can adopted a general rate which is (30%) of the amount of energy lost [18] then we can calculate the amount of electrical energy - the approximate - obtained as follows:

• The energy that can be stored and reproduced - after the deletion of lost energy - represents the proportion of (70%) of the total energy and thus equal to:

(20000000 × 0.7 = 14) million joules/ second in one day (24) hours

• We have (14) million Jules from the first day to run the system, so if we do storage for period of (10) days and not for one day will be our total:

(10) days × (14) million joules = (140) million joules for the first (10) days of operation of the system, where each day will be compensated for the use of a day to store the energy and thus keep the figure almost constant. That is, this storage process takes place only once when the system first starts.

• The amount of electrical energy achieved in the second (joule represent energy for one second) and stored for ten days thus we can convert it to a number of hours of operation as follows:

140000000 ÷ 60 (second) = 2333333 joule / minute

2333333 ÷ 60 (minute) = 38888 joule / hour

• If we know that: (1) watt = (1) joule / sec [19] this means that we have electric power

can occupy (38888) watt / hour and since the street lighting proposed by the (LED) is (100) watts then:

(38888) ÷ (100) watts = 388 streets light worked (one hour/day).

• Since the work hours of night lighting varies according to the seasons of the year and ranges from (8-12) hours therefore it can be adopted a general rate is (10) hours per day: The result is therefore:

(388) watts ÷ (10) hours = (38) street light column works for (10) hours per day at night. Therefore, it is possible to provide clean electricity to supply street light columns which works for (10) hours per day for (38) columns of street light with (19) columns on each side between the two holy shrines in Karbala.

If the distance between one column and another is (10) meters, then this column will cover the two sides at a distance of (190) meters between the two shrines. If we knowing that the distance between the outer fence of the two shrines is about (250) meters, while the distance for the pedestrian walking and sitting between the two holy shrines is about (190) meters [20], this means that street light columns will cover (100%) for the need of external lighting. Fig. (10).

Fig (10): An aerial photo of the two holy shrines in Karbala [21]

8. Conclusions

1. The possibility of providing clean electrical energy from the traffic of visitors and in quantities that allows the work of street lighting and electric billboards at the holy shrines of Karbala.

2. There are a number of occasions where the number of visitors to millions and here can generate a large clean electric power which can be sold to the public electricity network.

3. The amount of clean electricity obtained depends on the amount of storage that can be stored from the first few days of operation.

9. Recommendations

1- The work of additional research concerning the rest of the holy thresholds and how to benefit from the traffic of visitors in the generation of clean electricity.

2- Further research on the use of traffic in the generation of clean electricity in crowded places in Baghdad and Iraq.

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Effect of Dexamethasone on Some Functional Standards of (calcium, phosphorus, sodium, potassium, alkaline phosphatase, and acid phosphatase) in Pregnant Female White Rat.

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الخلاصة

اظهرت النتائج ان تركيز الكالسيوم والفسفور والصوديوم والبوتاسيوم في مصل الدم لمجاميع المعالجة انخفاض لكن لم يصل حد المعنوية ($P<0.05$) عدا الفسفور الذي كان انخفاضا معنويا عن مجموعة السيطرة وقد حصل انخفاض معنوي ($P<0.05$) لكل تراكيز الكترولايت الدم بالنسبة لفترات الحمل المدروسة.

اما بالنسبة لتركيز انزيم الفوسفاتيز القاعدي فقد كان هناك انخفاضا معنويا ($P<0.05$) في مستوى مجاميع المعالجة بالمقارنة مع مجموعة السيطرة ، من ناحية اخرى ان تركيز انزيم الفوسفاتيز الحامضي سجل ارتفاعا معنويا ($P<0.05$) في مجاميع المعالجة ، وقد حصل ارتفاع معنوي ($P<0.05$) لكلا الانزيمين بالنسبة لفترات الحمل المدروسة.

الكلمات المفتاحية

الديكساميثازون، الحمل، الكالسيوم، الفسفور، الصوديوم، البوتاسيوم،انزيم الفوسفاتيز القاعدي، انزيم الفوسفاتيز الحامضي.

Abstract

In the present study the results, The calcium, phosphorous, sodium and potassium levels in the blood of the treated groups were lower than the control group, but did not reach the significantly ($P < 0.05$) except phosphorus, which was lower significant. There was a significant decrease ($p < 0.05$) for all electrolyte concentrations for the studied pregnancy.

For the alkaline phosphatase enzyme level, there was a significant decrease in its level in the treated group ($P < 0.05$) compared with the control group. On the other hand, the level of acid phosphatase enzyme was higher in the treated group ($P < 0.05$). There was a significant increase ($p < 0.05$) for both enzymes for the studied pregnancy.

Keyword:

dexamethasone, pregnant, calcium, phosphorous, sodium, potassium , alkaline phosphatase, acid phosphatase.

1. Introduction

There are many commonly-used drugs that cause undesirable side effects or side toxicity [1]. Drug toxicity can develop at normal therapeutic doses of a drug or as a result of an acute overdose. Drug toxicities in humans manifest themselves as functional, biochemical, and/or structural changes [2].

Dexamethasone is a long acting glucocorticoids . Due to its anti-inflammatory activity it is widely used in medicine [3]. Dexamethasone is an effective anti-inflammatory drug and is an important drug in the treatment of lymphoma and leukemia using it in a combination with other chemotherapy drugs. Dexamethasone (DEX) is a potent synthetic GC agonist, (25–30) times more potent than the natural glucocorticoids [4] It is also used to treat cancer as a supportive drug and for purposes such as reducing the growth of brain tissue hypertrophy during radiation therapy,This drug, like other drugs, has been shown to have side effects when used in varying doses, varying in severity depending on the dose and duration of treatment [5].

Pregnancy is one of the critical periods in which the pregnant mother experiences external influences, and these effects are more common in the period called embryonic period [6]. There was an interest in giving glucocorticosteroids to improve pregnancy rates in women undergoing embryo transfer [7],or women who have a history of repeated miscarriage, It has been shown that the use of glucocorticosteroids has a role in improving the environment within the uterus. [8]. Sugarcorn can have a range of positive effects that are expected to encourage the formation of early pregnancy such as suppression of natural killer cells Uterine uNK stimulates the secretion of hCG as well as promoting the proliferation of trophoblasts and invasion of the uterus [9].

2. Materials and Methods

2.1.

Eighty four (3-4 month old) adult female rats were used as experimental animals . They were maintained under controlled temperature (24-26 °C)and (12:12) hours light:dark cycle daily during the period of the experiment.Males were placed overnight in cages containing two virgin female for breeding. Those females found to have sperm in the vaginal smear were considered to be in day 1 of pregnancy.

The pregnant femal rats were divided into two groups:Control and treated grups. The control group was included (28) rats ,were given daily I\P injection of physiological saline solution . At 7 (7 rats),10 (7 rats),15 (7 rats) and 20 (7 rats) days of pregnancy ,blood sample were taken from the preganant rats at these allocated days.

The second group was treatment group . It was divided into three subgroups,which were injected I\P with dexamethasone.The first subgroup (28) rats were given (0.2 mg / 0.25 kg) body weight of dexamethasone.

while the second subgroup (2)8 rats were injected I\P a concentration of (0.4 mg / 0.25 kg) body weight from the same drug. Blood samples from pregnant female rats were collected on day 7 (7 rats for each subgroup), day 10(7 rats for each subgroup), day 15(7 rats for each subgroup) and day 20(7 rats for each subgroup).

Blood serum collected from the control and treated groups was subjected for biochemical analysis to measure the following parameters , viz: calcium, phosphorus, sodium, potassium, alkaline phosphatase, and acid phosphatase.

2.2.

Statistical analysis: The variance analysis of a (3 × 4 × 7) replicates experiment was performed according to the complete random design to study the effect of dexamethasone in female pregnant rats in the biochemical parameters and to test the significance of the differences between the averages using the revised Least Significance Differences (LSD) [10].

3. Results and discussion

The results of the study showed in Table (1) that the concentration of calcium in the female serum of pregnant rats from the dexamethasone treated group was lower than the control group , but did not reach the moral level (P <0.05). On the other hand, there were no significant differences between the rats of the treated group (P <0.05).

It was found that there was a significant effect (P <0.05) for pregnancy in the concentration of calcium in the serum of pregnant rats where the decrease was significant (P <0.05) between the seventh and the tenth, seventh and fifteenth, twenty-seventh, tenth, fifteenth, and the fifteenth and twentieth of pregnancy.

Table (1): Effect of Dexamethasone treatment on calcium concentration (mmol / l) in pregnant female serum.

Groups / Duration	Control group	Dexamethasone treatment 0.2 mg / 0.25 kg	Dexamethasone therapy 0.4 mg / 0.25 kg	Average duration
After 7 days of pregnancy	0.94 ±0.025	0.90 ± 0.039	0.88 ±0.022	a 0.91 ± 0.011
After 10 days of pregnancy	0.90 ± 0.021	0.85 ± 0.025	0.89 ± 0.031	b 0.87 ±0.010
After 15 days of pregnancy	0.83 ±0.039	0.81 ±0.020	0.83 ±0.022	c 0.82 ±0.004
After 20 days of pregnancy	0.78 ±0.027	0.77 ±0.021	0.75 ±0.028	d 0.76 ±0.006
Average totals	0.86 ±0.026	0.83 ±0.021	0.83 ±0.022	

Rate ± standard error n = 7

The small letters in the vertical direction indicate significant differences (P <0.05).

The results of the study, as shown in Table (2), showed that the concentration of phosphorus in the female serum of pregnant rats from the group of treatment with dexamethasone in the doses (0.2 and 0.4 mg / 0.25 kg) body weight was significantly lower than that in the control group (P <0.05) The comparison of dexamethasone treated groups also decreased but did not reach the moral limit (P <0.05).

There was also a significant effect (P <0.05) for pregnancy in the concentration of phosphorus in the female serum of pregnant rats, with significant decreases (P <0.05) between the seventh and tenth days, the seventh and fifteenth, the twenty-seventh of pregnancy, the tenth and fifteenth and the tenth Twenty of pregnancy, and fifteen and twenty of pregnancy.

Table (2): Effect of Dexamethasone treatment on the concentration of phosphorus (mmol / l) in the female serum of pregnant rats.

Groups / Duration	Control group	Dexamethasone treatment 0.2 mg / 0.25 kg	Dexamethasone therapy 0.4 mg / 0.25 kg	Average duration
After 7 days of pregnancy	6.81 ±0.31	6.83 ±0.16	6.58 ±0.49	a 6.74 ±0.05
After 10 days of pregnancy	6.49 ±0.24	6.05 ±0.27	5.97 ±0.29	b 6.17 ±0.11
After 15 days of pregnancy	6.08 ±0.29	5.46 ±0.17	5.06 ±0.36	c 5.54 ±0.19
After 20 days of pregnancy	5.56 ±0.24	4.84 ±0.43	4.67 ±0.33	d 5.03 ±0.18
Average totals	6.24 ±0.20 A	5.80 ±0.32 AB	5.57 ±0.33 B	

Rate ± standard error n = 7
The small letters in the vertical direction indicate significant differences (P <0.05).

The results of the study showed that, as shown in Table 3, the concentration of sodium in the female serum of pregnant rats from the group of dexamethasone treatment in the doses 0.2 and 0.4 mg / 0.25 kg body weight was lower than in the control group but did not reach the moral level <0.05). When comparing the doses of dexamethasone, it also decreased, but did not reach the moral level (P <0.05).

There was also a significant effect (P <0.05) for pregnancy in sodium concentration in the female serum of pregnant rats as the decrease was significant (P <0.05) between the seventh and the tenth day, the seventh and the fifteenth, the twenty-seventh of pregnancy, the tenth and fifteenth, Twenty of pregnancy, and fifteen and twenty of pregnancy.

Table (3): Effect of Dexamethasone on the concentration of sodium (mmol / l) in the female serum of pregnant rats.

Groups / Duration	Control group	Dexamethasone treatment 0.2 mg / 0.25 kg	Dexamethasone therapy 0.4 mg / 0.25 kg	Average duration
After 7 days of pregnancy	145.8 ±3.07	140.0 ±1.64	140.6 ±1.90	a 142.1 ±1.21
After 10 days of pregnancy	140.3 ±2.55	136.5 ±1.04	137.1 ±2.76	b 138.0 ±0.76
After 15 days of pregnancy	134.7 ±2.16	134.6 ±1.38	132.1 ±0.93	c 133.8 ±0.56
After 20 days of pregnancy	128.5 ±2.09	131.4 ±1.81	126.9 ±3.78	d 128.9 ±0.86
Average totals	137.3 ±2.80	135.7 ±1.36	134.2 ±2.26	

Rate ± standard error n = 7
The small letters in the vertical direction indicate significant differences (P <0.05).

The results of the study showed that, as shown in Table 4, the concentration of potassium in the female serum of pregnant rats from the group of dexamethasone therapy in the doses 0.2 and 0.4 mg / 0.25 kg body weight was lower than in the control group but did not reach the moral level. (P <0.05). However, when comparing the doses of dexamethasone, it also decreased, but did not reach the moral level (P <0.05).

There was also a significant effect (P <0.05) for the duration of pregnancy in the potassium concentration in the female serum of pregnant rats as the decrease was significant (P <0.05) between the seventh and the tenth day, the seventh and the fifteenth, the twenty-seventh of pregnancy, the tenth and fifteenth and the tenth Twenty-five pregnancies, twenty-five pregnancies did not reach the morbidity reduction (P <0.05).

Table (4): Effect of Dexamethasone Treatment on Potassium Concentration (mmol / l) in Females of Pregnant Rats.

Groups / Duration	Control group	Dexamethasone treatment 0.2 mg / 0.25 kg	Dexamethasone therapy 0.4 mg / 0.25 kg	Average duration
After 7 days of pregnancy	5.97 ±0.41	5.89 ±0.69	5.65 ±0.27	a 5.84 ±0.06
After 10 days of pregnancy	5.57 ±0.27	4.93 ±0.18	4.96 ±0.18	b 5.15 ±0.13
After 15 days of pregnancy	4.66 ±0.28	4.65 ±0.38	4.32 ±0.38	cd 4.54 ±0.07
After 20 days of pregnancy	4.22 ±0.19	4.33 ±0.33	4.00 ±0.28	d4.18 ±0.06
Average totals	5.11 ±0.30	4.95 ±0.25	4.73 ±0.27	

Rate ± standard error n = 7
The small letters in the vertical direction indicate significant differences (P <0.05).

This study agreed with the study of Al-Khayat et al.[11] who pointed out that the effect of glucocorticosteroids caused a significant decrease in the values of levels of calcium, potassium and phosphorus. There was also an agreement with the study of Kenyon et al. [12] who mentioned a decrease in calcium, sodium and potassium levels due to dexamethasone use. Glucocorticosteroids plays an important role in the water and salt balance within the body and may affect the permeability of capillaries and redistribution of fluids between and outside the cells, affecting saline balance and plasma volume.

The direct effects of glucocorticosteroids include the inhibition of absorption of calcium from the intestines, decreased calcium retention by urinary tubules and increased urinary calcium secretion. [13], hypercalcemia is due to increased calcium resorption of bones and decreased calcium retention by the kidney, which occurs despite high levels of thyroid hormone In serum [14].

The increased cortisone taken by patients leads to phosphorus secretion in the urine [15]. Hyperphosphaturia was observed as a result of patients taking glucocorticosteroids due to hyperparathyroidism. The other culprit that is produced from sugars is the interaction between sodium and hydrogen ion, which causes a decrease in the absorption of sodium based on phosphorus absorbed in nearby tubules Proximal tubule [14] Prolonged treatment with glucocorticosteroids is also caused by a lack of serum potassium concentration due to the effect of renal tubular infarction [16].

And the glycoproteins also have an effect on the levels of sodium, but not significantly, through its effect on the kidneys where the retention of sodium and at the same time increase the secretion of potassium [17], and the major kidney complications of the use of glucocorticosteroids is the presence of gravel kidney as a result of increased levels of calcium with urine and uric acid, Dexamethasone-induced reductions in bone mineral mass, reduced vitamin D, decreased intestinal calcium absorption, and increased amount of lost urinary calcium [16].

Pregnancy is a normal physiological process that constitutes a natural effort in addition to pregnant females. The body must be prepared to function in order to accommodate this additional stress. The changes that accompany pregnancy are designed to reconcile the needs of the mother and the fetus to achieve a successful birth. Which occur in the components of blood and pregnancy in the labyrinths of complex hormonal controlled processes that are involved in the organization of all physiological events in the body, the pregnancy puts great pressure on the balance of calcium in mothers, which works to occur Large variables in the mineral content of bones [18]. Where it was observed that pregnancy is associated with increased secretion of corticosteroids, especially Estrogen Estrogen, which maintains the bone from the decay and high concentration of the hormone calcitonin,

which restricts the movement of calcium from the bones and things that get is doubled the level of vitamin D effective (1.25) dihydroxy vitamin D since the first chapter of pregnancy Which stimulates absorption of calcium and phosphate from the intestines [19], by stimulating the production of so-called calcium-binding protein in epithelial cells of the intestines (leading to storage in the skeleton of the mother and benefiting from the growth of the fetus in the last months of pregnancy), these changes To meet the loss of calcium obtained during pregnancy, which corresponds to the rapid formation of fetal bones, especially in the third trimester of pregnancy [20], for the growth and construction of the skeleton of the fetus, leading to a decrease serum calcium concentration and increase this decrease with the progress of pregnancy due to low level [21], as a result of the expansion of blood plasma volume and the increase of glomerular filtration rate (GFR), which results in an increase in the release of calcium in the urine [22], the supply of calcium and its movement from the formation of the fallopian tissue, The point increases the rate of Is transferred from the mother to the fetus significantly increased and is often derived through the calcium obtained from food during pregnancy as well as absorption by the intestine with the help of vitamin D and other factors and doubles absorption of the intestine of calcium during the early periods of pregnancy [23], Before the fetus in Third trimester The mother stores calcium in the bones early in pregnancy and is used by the fetus in the later stages of pregnancy.

In this study, the concentration of calcium in the female serum of pregnant rats tended to decrease throughout pregnancy and was consistent with the study of [24] (where calcium concentration begins to decrease during pregnancy). [25] Calcium required for fetal bone formation can be obtained by increasing resorption Mother 's bones during pregnancy [26]. As a result of some studies, the calcium balance is affected by the amount of maternal intake of food as well as the availability of vitamin D and thyroid hormone PTH, which plays a large role in the balance of calcium in pregnancy and childbirth.

The results of this study showed that it was consistent with a study of Saudi women who decreased the concentration of inorganic phosphorus during pregnancy [27]. The reason for this decline in pregnant women may be due to its use in the process of building the skeleton of the fetus. The other reason is through the depletion of phosphorus from Before the mothers to save calcium and its return to the body through the effect of thyroid hormone, which works to affect directly on the renal tubules, especially close cohort, resulting in a decrease in the ability of these plants to re-absorb the phosphorus and allow the disposal of urine by contrast g The birth of the possibility of distal tubule coiled re-absorption of calcium [28]. Changes in blood potassium in normal pregnancy may be due to an increase in levels of the hormone

Aldosterone and other mineral corticosteroids (Mineralocorticoids) [29]. Potassium deficiency is due to inadequate potassium retention through metabolism.

The results of the study showed that, as shown in Table (5), the treatment of pregnant women with dexamethasone with (0.2 mg / 0.25 kg) body weight resulted in a significant decrease (P <0.05) in serum ALP concentration in serum compared with control group The decrease in the concentration of alkaline phosphatase (ALP) in serum for pregnant female rats treated with dexamethasone at (0.4 mg / 0.25 kg) body weight did not reach the moral level (P <0.05) compared with the control group. When comparing the doses of dexamethasone, P <0.05).

There was also a significant effect (P <0.05) for pregnancy in the concentration of alkaline phosphatase (ALP) in the female serum of pregnant rats, with a significant increase (P <0.05) between the seventh and tenth days, the seventh and fifteenth, the twenty-seventh, Ten, and the tenth and twentieth of the pregnancy, and the fifteenth and twentieth of the pregnancy. It was also shown that there was an effect of the interaction between dexamethasone therapy and gestational age, where the increase in the concentration of the enzyme as the pregnancy progresses.

Table (5): Effect of Dexamethasone therapy on the concentration of ALP (IU / L) in the female serum of pregnant rats.

Groups / Duration	Control group	Dexamethasone treatment 0.2 mg / 0.25 kg	Dexamethasone therapy 0.4 mg / 0.25 kg	Average duration
After 7 days of pregnancy	a 135.9 ± 8.96 A	a 137.7 ± 2.74 A	a 142.0 ±3.19 A	a 138.5 ±1.18
After 10 days of pregnancy	a 155.6 ±9.57 A	a 143.7 ±4.08 A	ab 162.1 ±3.17 A	b 153.8 ±3.53
After 15 days of pregnancy	b 191.4 ± 16.95 A	ab 160.3 ±3.79 B	b 176.1 ±2.29 AB	c 175.9 ±5.87
After 20 days of pregnancy	c 217.6 ±11.93 A	b 176.9 ±3.31 B	b 180.6 ±2.71 CB	d 191.7 ±8.50
Average totals	175.1 ±13.78 A	154.6 ±6.66 B	165.2 ±6.56 A	

Rate ± standard error n = 7
The small letters in the vertical direction indicate significant differences (P <0.05).
The large letters in the horizontal direction indicate significant differences (P <0.05).

The results of the study showed that, as shown in Table (6), the treatment of pregnant women with dexamethasone with (0.2 mg / 0.25 kg) body weight resulted in a significant increase (P <0.05) in the serum ACP concentration compared with control group The increase in serum ACP concentration in pregnant females treated with dexamethasone with (0.4 mg / 0.25 kg) body weight was also significant (P <0.05) compared with the control group. When comparing the doses of dexamethasone, To a significant extent (P <.05).

There was also a significant effect (P <0.05) for pregnancy in the concentration of acid-phosphatase (ACP) in the female serum of pregnant rats, with a significant increase (P <0.05) between the seventh and tenth days, seventh and fifteenth, twenty-seventh, Ten, and the tenth and twentieth of the pregnancy, and the fifteenth and twentieth of the pregnancy.

Table (6): Effect of Dexamethasone treatment on the concentration of acid phosphatase (ACP) (IU / L) in the female serum of pregnant rats.

Groups / Duration	Control group	Dexamethasone treatment 0.2 mg / 0.25 kg	Dexamethasone therapy 0.4 mg / 0.25 kg	Average duration
After 7 days of pregnancy	138 ±9.77	157 ±7.33	160 ±8.01	a 152 ±4.50
After 10 days of pregnancy	156 ±6.99	198 ±6.41	196 ±10.75	b 183 ±8.95
After 15 days of pregnancy	194 ±11.59	213 ±13.89	225 ±6.40	c 211 ±5.90
After 20 days of pregnancy	226 ±14.45	247 ±14.02	260 ±6.10	d 245 ±6.48
Average totals	178 ±14.86 A	204 ±14.09 B	211 ±16.06 B	

Rate ± standard error n = 7
The small letters in the vertical direction indicate significant differences (P <0.05).
The large letters in the horizontal direction indicate significant differences (P <0.05).

The study showed that the use of dexamethasone led to a reduction in the concentration of the ALP enzyme and agreed with the study of both [30]. The basal phosphatase enzyme is produced from osteoblast osteoblasts during bone formation and in the absence of liver dysfunction, and its serum level is reflected in the mineralization rates. The decrease in the efficacy of the ALP, which results from treatment with glucocorticosteroids, suggested bone resorption. There may be a decrease in the mineralization process, as well as glucocorticosteroids reduce the number and function of osteocytes [31] .For short periods, they promote the function of different bone cells, but if the period increases and becomes long, it inhibits the manufacturing or functional processes of bone cells [14]. The reduction in the alkaline phosphatase enzyme (ALP) may be due to the effect of cortisone on bone-forming osteo-cells, as well as the effect of zinc and magnesium levels, which are important for the activity and efficacy of the enzyme.

Prolonged exposure to glucocorticosteroids is thought to cause osteoporosis through several mechanisms, which include direct effect on the intestinal mucosa, where calcium absorption is reduced and hyperparathyroidism [32] is produced.

The acid phosphatase which is usaly found in bones, spleen, prostate, red blood cells, platelets, large plaques, and bone marrow cells. It can be used as an indicator of the effectiveness of bone marrow cells. Bull et al. [33] have

suggested that the glucocorticosteroids have an active role in activating cells, concentration and efficacy of the enzyme when using dexamethasone.

Alkaline Phosphatase and Acid Phosphatase are found in many tissues of the human body, including Placenta. Enzymes are associated with the process of carbohydrate metabolism and Phospholipids, and are essential in the active transport of some metabolic mediocre metabolites cross the placenta.

Luk et al. [34] observed an increased concentration of acid phosphatase enzyme and basal phosphatase enzyme during pregnancy in rats. The alkaline phosphatase enzyme (ALP) found in the placenta in the second stage (which includes the month 4-6 of pregnancy) and the third (which includes the 7-9 month of pregnancy) is excreted through the cell membranes of the placenta, Syncytiotrophoblasts. This enzyme has an important role in cell division For the effective transfer of phosphate and the transfer of IgG from mother to fetus, helps to absorb nutrients, this is important for the growth and development of the fetus. This enzyme is more effective in the placenta during the second and third periods of pregnancy. In pregnant women, the decrease in the effectiveness of this enzyme in the serum can be associated with delayed fetal growth in the uterus, early membrane rupture, and premature birth.

The effectiveness of the ALP enzyme increases by (2-3) times its effectiveness during the prenatal period,compared to its normal effect in the non-pregnant women's plasma (35). This is due to the enzyme build-up and release to the bloodstream by the placenta because the placenta contains high concentrations of this enzyme (36).

The study also indicated that pregnancy significantly affected ($P < 0.05$) on the concentration of ALP in serum. The study agreed with AL-Safi study [37] and the study of Marbut etal [38]. who showed an increase in the effectiveness of the basal phosphatase enzyme during pregnancy as a result of its secretion from the placenta.

In addition, some studies have indicated that the higher the effectiveness of the enzyme is by increasing the production of isoenzymes of the enzyme, which comes in the latter stages of pregnancy, in addition to the presence of an increase in the symmetry of enzymes that come from the bones and other members such as liver and kidney Alonso, In free radicals during pregnancy because of the oxidative stress experienced by the body of the pregnant woman. These free radicals attack the cell membranes and cause them damage resulting in the filtration of a section of the cell substances and enzymes in the circulatory system, and thus increase These enzymes high during pregnancy [39]. In addition to the presence of analogues of these two enzymes in the circulatory system of the pregnant mother, additional quantities of these two enzymes are constructed and released by the placenta with a higher concentration, thus increasing their effectiveness in the serum [40].

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Resonance Tunneling Current Density of Quantum Well in a-Si/Si1-xGex Super-lattice

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الخلاصة

ان الغاية من هذا العمل هو تقديم دراسة نظرية حول كثافة تيار تنفيق الالكترونات عبر منظومة من الشبيكة الفائقة لشبه موصل. والمنظومة التي تم أخذها بنظر الاعتبار هي (a–Si /Si1–xGex) وضمن مدى الطاقة E> ارتفاع حاجز الجهد (V_0) ومن هكذا نظام تم تعيين اعتماد كثافة تيار تنفيق الالكترونات على عدد الحواجز (N) والكسر المولي (x). لقد أظهرت نتائج هذا العمل بأنها ليس فقط تضئ المفهوم الفيزيائي لفكرة التنفيق الرنيني في تركيب الحاجز الكهربائي بل أنها تعدت ذلك الى كيفية تصميم النبائط الكمية الإلكترونية والمستندة على تراكيب التنفيق المتعدد الحواجز.

الكلمات المفتاحية

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Abstract

The purpose of this work is to report a theoretical study for resonance tunneling current density (J) of electrons tunneling through semiconductor super-lattice system. The system that we have considered is (a-Si/Si1-xGex) hetero-junction super-lattice within the energy range of E< the potential barrier height (V_0). From such system, we determined the (J) dependency on number of barriers (N) and the mole fraction (x). The results shown in this work not only shed new light on the physics of resonant tunneling in electric barrier structure but are also helpful in designing quantum devices based on multi-barrier tunneling structures.

Keywords:

Nano-science, Super-lattice, Resonance tunneling current density.

1. Introduction

The multi-barrier potential profile needed for resonant tunneling may be realized using semiconductor by variation of doping in the same semiconductor material, but the most successful approach is to use heterojunction consisting of different types of semiconductor materials [1]. A good combination of hetero-junction devices is two materials of similar lattice constant, but different in energy gap (E_g) [2]. The basic example of an artificial low-dimensional structure is an epitaxial grown QW, which is formed by two hetero-junctions or three layers of materials such that the middle layer which has a lowest (E_c) for an electron well or the highest (E_v) for a hole well, It is well known that a (QW) structure has a finite number of bound states (ground state plus exited states) for electrons and holes. In quantum physics, properties are dominated by the wave-nature of electrons (or holes), related to the quantum mechanical wave function (eigen function) which has a specific energy (eigenvalue) associated with it. Recently, extensive research works have been carried out on hetero-junctions between amorphous silicon (a-Si), and crystalline semiconductors, because of their use in many semiconductor devices, such as metal-amorphous silicon FETs, solar cells. However, the physics of amorphous-crystalline hetero-junctions is not clearly, understood yet [3]. On the other hand, very little work has been done on the (a-Si/Si1-xGex) hetero-junction, although (a-Si) exhibits a series of important properties (e.g. wide optical band gap, mechanical strength) and (SiGe) is the most well-known semiconductor material, so that the (a-Si/Si1-xGex) hetero-junction could be very useful in many semiconductor devices [4]. In (1969), research on quantum structures was initiated with a proposed of an "engineered" semiconductor super-lattice (SL) by Esaki and Tsu [5]. The (SL) consider an alternating thin layers of two or more materials with different equilibrium lattice constants [6], coherent layers on nanometer thickness scale may be deposited by molecular-beam epitaxial or metal-organic vapor deposition, so thus building up a super periodic structure on layer scale [7]. When electrons are confined within a semiconductor thin film with a thickness of the order of the de Broglie wavelength, the wave nature of the electrons becomes important [8].

In classical mechanics, carriers are completely confined by the potential wells, only those carriers with excess energy higher than the barriers can escape. But in quantum mechanics point of view, a particle can tunnel through a potential barrier of height higher than that of the incident particle. The necessary conditions for tunneling are: (1) Occupied energy states exist on the side from the electron tunnels. (2) Unoccupied energy states exist at the same energy level on the side to which the electron can tunnel. (3) The tunneling potential barrier height is low and the barrier width is small enough that there is a finite tunneling probability,

and (4) the momentum is conserved in the tunneling process [2]. Tunneling through a double barrier was first solved in the Wentzel-Kramers-Brillouin (WKB) approximation by David Bohm in (1951)[9].

In this paper, we have considered the tunneling current density of ground state level (J_0) in the (MBS) as a comprehensive manner by using the energy of incident particles is less than (V_0) with applied bias voltage (V_bias). In addition, we have examined the dependence of resonant tunneling current density on various factors like the number of barriers (N) and the mole fraction (x) of the system.

2.Theory

It will be better, if we consider a model to understand the tunneling of electron through multi barrier semiconductor hetero-junction. In such model, we have a super-lattice structure contains alternately semiconductor hetero-junction of (a-Si/Si1-xGex) for (x=0.2 to 0.8). These two materials have similar band structure, but different energy gap, where the (Si1-xGex) has the small gap to form the well, and (a-Si) has the large energy gap to form the barrier. In this structure, the barriers thickness (b), thickness of well (a) and the super-lattice period (c) are related with each other (c=a+b). If these systems consist of (N) barriers then one will find (N-1) wells as shown in Fig. (1):

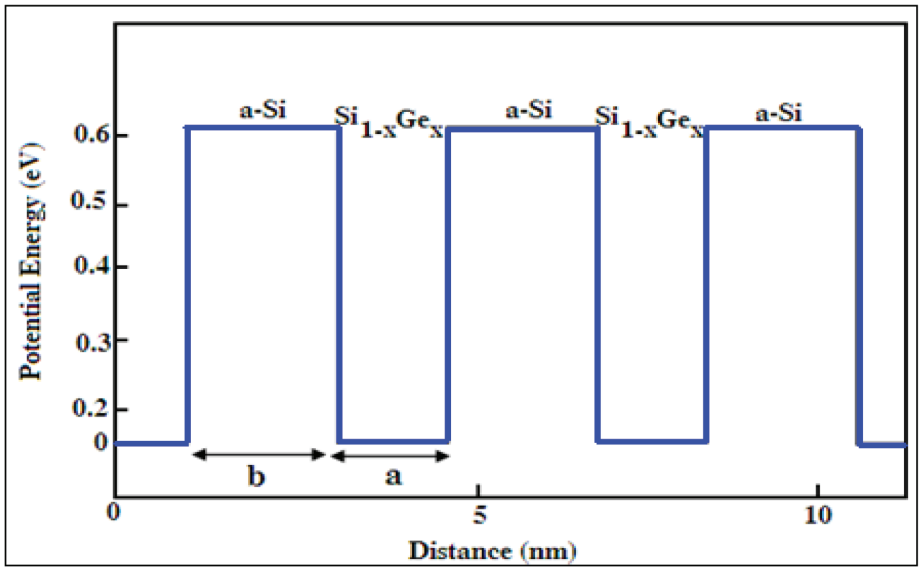

Fig. (1): Scheme of the periodic potential of (a-Si/$Si_{1-x}Ge_x$) super-lattice.

Suppose an electron of energy (E) and mass (m*) is incident from the left of an arbitrary shaped, one-dimensional, continuous potential V(x), in order to calculate the probability of transmission through the double barriers structure in the presence of an applied field, dividing the barrier into steps of infinitesimal width [10], as shown in Fig. (2).

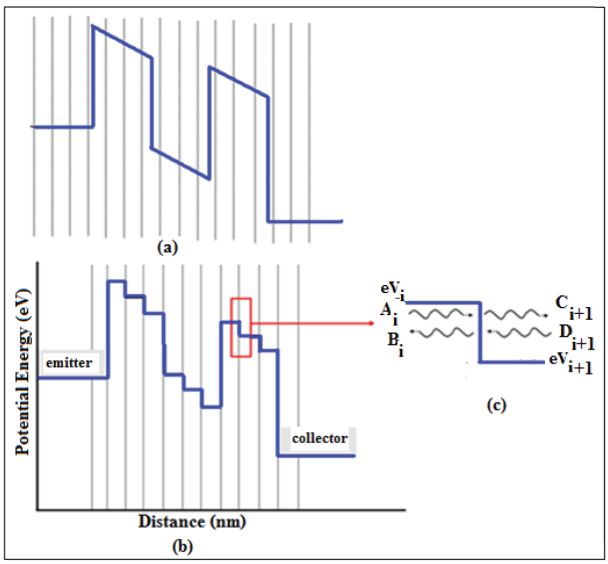

Fig. (2):- (a) Divide the active region into N slices, (b) The potential though the (RTD) conduction band is quantized into small steps for the transmission matrix calculation, (c) In region (i) the potential energy is (eV_i), and in region (i+1) the potential energy is (eV_{i+1})[11].

To solve the transmission probability, the Propagation-Matrix Method (PMM) is used, this method has among its advantages computational simplicity and good accuracy. The transmission probability $T(E_l)$ is given by [12]:

$$T(E_l) = \frac{m^*_i}{m^*_{i+1}} \frac{k_{i+1}}{k_i} \frac{|C|^2}{|A|^2} \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (1)$$

Where m*i and m*(i+1) are the effective electron masses in the regions (i) and (i+1), respectively, k_i and k_(i+1) are the electron wave numbers in the regions (i) and (i+1), respectively, C and A are the transmission coefficients for an electron entering the left barrier into the collector.

If electrons (n) in the system with area (A), the current density (J) in the system:

$$J = \frac{I}{A} = ne\bar{V} \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (2)$$

$$\bar{V} = \frac{1}{\hbar} \cdot \frac{dE_l}{dk_l} \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3)$$

$$n = \int_0^\infty D(E).k_B T.\frac{\partial P(E)}{\partial E} dE \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (4)$$

$$\frac{\partial P(E)}{\partial E} = -P(E)\frac{\left(1 - P(\acute{E})\right)}{k_B T} \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (5)$$

$$n = \int_0^\infty D(E).P(E).(1 - P(\acute{E}))\, dE \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (6)$$

$$J = \frac{ek_B T}{2\pi^2\hbar} . \int_0^\infty P(E).(1 - P(\acute{E}))\, dE \frac{dE_l}{dk_l} \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (7)$$

The net current (J) is due to the electrons going from the left-hand side with energy (E=E_l+(ħ^2 k_t^2)/(2 m^*)) and from the right-hand side with energy ($E' = E + eE\bar{l} = E + eV$), where E^- is the electric field and l is the distance between the contacts on the two sides, (J) is obtained by Esaki formula[13]:

$$J = \frac{em^* k_B T}{2\pi^2\hbar^3}\left(1 - e^{\frac{-eV}{k_B T}}\right)\int_0^\infty T(E_l) . e^{\frac{(E_F - E_l)}{k_B T}} dE_l \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (8)$$

3 .Results and Discussion:

Fig. (3) Shows the J-V characteristics of (a-Si/Si1-xGex) super-lattice with (x=0.5,a=b=1.2nm,N=7). The net tunneling current, at zero applied voltage, is zero, as shown in Fig. (3) region (a), when a bias voltage is applied (V_bias=0.1 V) to the structure, a small current flow. The current increases strongly as

(Jp=4.558*10^(-3) A/nm^2) at peak voltage(V_p=0.9 V), see region (b), when the energy of the incident electron coincides with energy one of confined states. Further increase of the bias voltage detunes the resonance and current decreases sharply as

(Jv=5.654*10^(-4) A/nm^2) at valley voltage (Vv=1.2 V), see region (c) Fig. (3), and creates the negative differential resistance (NDR). Still with further increase of the voltage (Vbias=1.3 V), the excess current starts to dominant, as region (d) of Fig. (3).

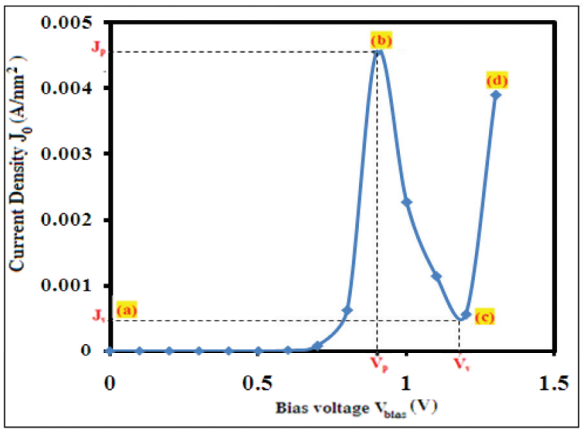

Fig. (3): J-V characteristics of (a-Si/$Si_{1-x}Ge_x$) super-lattice with (x = 0.5, a = b = 1.2nm, N = 7).

Fig. (4) corresponds to the electrical characteristics which are shown in Fig. (3). The Fermi-level is constant across the junction and no filled states exist (electrons) on either side of the junction, while below the Fermi-level there are no empty states available on either side of the junction, as shown in Fig. (4a). Therefore, the net tunneling current at zero applied voltage is zero. Physically, the current maxima occur at certain voltages such that the resonant energies (E_o state) approach the Fermi energy of the electrons at the left of the barrier [14], see Fig. (4b). The decrease in current with the increase in applied voltage results from the fact that this band of common energies decreases, see Fig. (4c). The decreasing current after the peak gives rise to the negative differential resistance (NDR) [15, 16]. Still with further increase of the voltage, the excess current start to dominant, see Fig. (4d), whenever the resonant energies (E_1 state) approach the Fermi energy of the electrons at the left of the barrier.

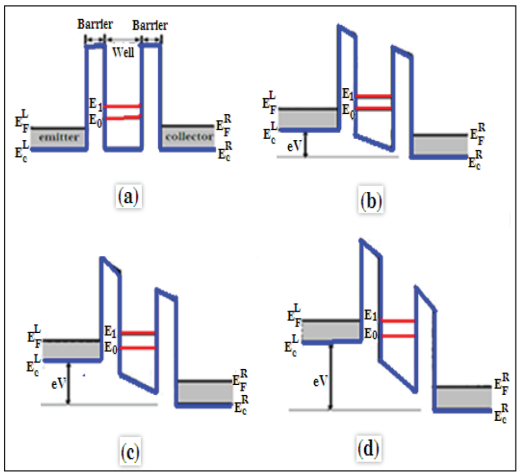

Fig. (4): Energy band diagram of (a-Si/$Si_{1-x}Ge_x$) super-lattice with(x = 0.5 , a = b = 1.2nm, N = 3) under various biases, (a) near zero bias, (b) Resonant tunneling through (E_0state) at V_{bias} = 0.9V, (c) (E_0state) below (E_F) at V_{bias} = 1.2V, (d) Resonant tunneling through (E_1state) at V_{bias} = 1.3V .

Fig. (4) corresponds to the electrical characteristics which are shown in Fig. (3). The Fermi-level is constant across the junction and no filled states exist (electrons) on either side of the junction, while below the Fermi-level there are no empty states available on either side of the junction, as shown in Fig. (4a). Therefore, the net tunneling current at zero applied voltage is zero. Physically, the current maxima occur at certain voltages such that the resonant energies (E_o state) approach the Fermi energy of the electrons at the left of the barrier [14], see Fig. (4b). The decrease in current with the increase in applied voltage results from the fact that this band of common energies decreases, see Fig. (4c). The decreasing current after the peak gives rise to the negative differential resistance (NDR) [15, 16]. Still with further increase of the voltage, the excess current start to dominant, see Fig. (4d), whenever the resonant energies (E_1 state) approach the Fermi energy of the electrons at the left of the barrier.

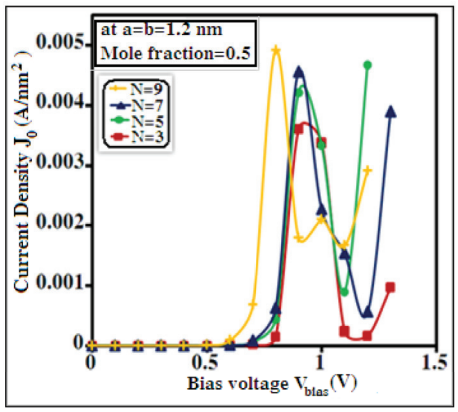

Fig. (5): The current density (J_o) versus bias voltage (V_{bias}) by varying number of barriers.

Table (1): the values of (J_o) for system (a-Si/Si1-xGex) with (x=0.5 ,a=b=1.2nm) and varying bias voltage from (0.1,0.5,0.9)V,N=3,5,7,9.

	$J_0(A/nm^2)$			
a-Si/$Si_{1-x}Ge_x$Superlattice (x = 0.5, a = b = 1.2nm)	N = 3	N = 5	N = 7	N = 9
At V_{bias} = 0.1 V	$1.98*10^{-10}$	$3.26*10^{-10}$	$4.78*10^{-10}$	$5.35*10^{-10}$
At V_{bias} = 0.5 V	$4.61*10^{-7}$	$1.31*10^{-6}$	$1.56*10^{-6}$	$1.75*10^{-6}$
At V_{bias} = 0.9 V	$3.61*10^{-3}$	$4.22*10^{-3}$	$4.56*10^{-3}$	$4.92*10^{-3}$

Also shown that (J_o), at (V_bias=V_o=0.9 V), represents the peak current density (J_p).

Fig. (6) shows the resonant tunneling current density for ground state level (J_o) versus bias voltage (V_bias) for (a-Si/Si1-xGex) super-lattice structure with (N=3,a=b=1.2nm) and different in mole fraction of the composite about (x=0.2,0.4,0.5 and 0.6). It is clear that when the mole fraction of the composite increases the resonant

tunneling current density (Jo) will decrease, this behavior comes in agreement with the results in experiment by S. Mukherjee et al [18], and the values of (Jp) for each (x) will be determined as the corresponding value of bias voltage (Vbias) that is equal to the barrier high (Vo).The explanation of this behavior is expected when increasing the mole fraction of (Ge) it will cause an increase in the barrier height (Vo) due to poor tunneling through the barriers, because the necessary conditions for tunneling occur when potential barrier height is low and the energy gap of quantum wells. See Table (2).

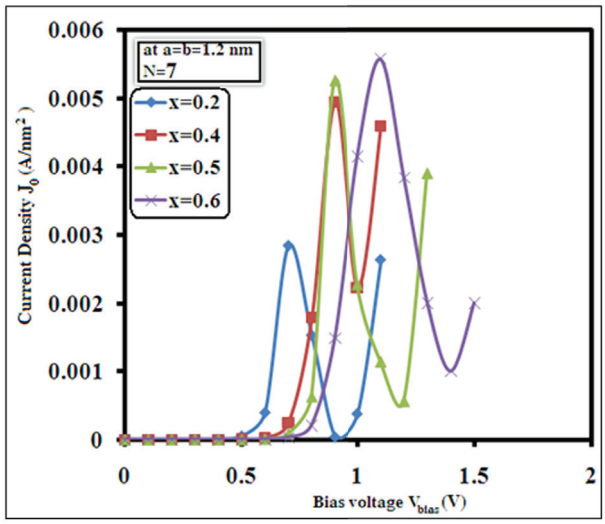

Fig. (6): The current density (J_o) versus bias voltage (V_bias) by varying the mole fraction of the composite.

Table (2): the values of the resonant tunneling current density (J_o) for system (a-Si/Si1-xGex) with (N=7 ,a=b=1.2nm) and varying bias voltage from (0.1,0.5,0.9)V,x=0.2,0.4,0.5,0.6.

	$J_0(A/nm^2)$			
a-Si/Si$_{1-x}$Ge$_x$Superlattice (N = 3, a = b = 1.2nm)	x = 0.2	x = 0.4	x = 0.5	x = 0.6
At V_{bias} = 0.1 V	$1.89*10^{-8}$	$1.54*10^{-9}$	$4.78*10^{-10}$	$1.70*10^{-10}$
At V_{bias} = 0.5 V	$5.53*10^{-5}$	$4.75*10^{-6}$	$1.55*10^{-6}$	$5.38*10^{-7}$
At V_{bias} = 0.9 V	$5.04*10^{-3}$	$4.97*10^{-3}$	$4.55*10^{-3}$	$1.49*10^{-3}$

Also the transmission coefficient (T(El)) will be decrease so (Jo) will decrease as Eq. (8).

Table (3) is put to illustrate how (Jp) values had taken when (Vbias=Vo) for each concentration.

Table (3): the values of (Jp) for system (a-Si/Si1-xGex) with(N=7 ,a=b=1.2nm) at (Vbias=Vo).

a-Si/Si$_{1-x}$Ge$_x$Superlattice (N = 3, a = b = 1.2nm)	(V_{bias} = V_o)V	$J_p(\frac{A}{nm^2})$
x = 0.2	0.709	$2.84*10^{-3}$
x = 0.4	0.841	$4.95*10^{-3}$
x = 0.5	0.901	$5.26*10^{-3}$
x = 0.6	0.957	$5.58*10^{-3}$

4.Conclusions

In this work, a theoretical model for computation of resonant tunneling current density (J_o) has been studied to (a-Si/Si1-xGex) with (x=0.2 to 0.8) super-lattice hetero-junction structure. We have found that when increasing the number of barriers, (J_o) will increase. while (J_o) will be decreased with the increasing of a mole fraction (x). Also, We have found that that the effect of increasing the bias voltage will shift the quantized levels inside the well and the energy levels, which are tunable by some voltage, would exhibit peak current-voltage (I-V) characteristic.

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Evaluation of Total Suspended Particles and Heavy Metals in Air and Soil in Kerbala City

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الخلاصة

تعتبر العناصر الثقيلة من اهم الملوثات الكيميائية التي ركز الاهتمام عليها في السنوات الأخيرة والتي تتواجد في الهواء والتربة والماء بسبب النشاطات الصناعية والطبيعية وذلك لقابليتها التراكمية ولتأثيرها الكبير على صحة الانسان والحيوان. في الدراسة الحالية تم قياس حجم الدقائق العالقة الكلية (TSP) التي تعتبر من اهم ملوثات الهواء لثلاثة مناطق (صناعية، سكنية وزراعية) في مدينة كربلاء المقدسة باستخدام جهاز sniper الماني المنشأ. بينت نتائج الدراسة جود اختلاف معنوي($P\leq0.01$) بين المناطق بينما لا يوجد اختلاف معنوي بين الأشهر. كذلك تم قياس العناصر الثقيله وهي (الرصاص، الزنك والكادميوم) في كل من الهواء والتربة لثلاثة مناطق (الصناعية، السكنية والزراعية) وتم اعتبار المنطقة الزراعية للسيطرة. اوضحت النتائج ارتفاع معنوي ($P\leq0.05$) لعنصر الرصاص في تربة المنطقة الصناعية مقارنة مع المنطقة الزراعية بينما بينت الدراسة ارتفاع معنوي عالي($P\leq0.01$) لعنصر الرصاص في هواء المناطق الصناعية والسكنية مقارنة مع المنطقة الزراعية. كما أظهرت النتائج ارتفاع معنوي عالي($P\leq0.01$) لعنصر الزنك في تربة المنطقة الصناعية والسكنية مقارنة مع المنطقة الزراعية كذلك بينت الدراسة ارتفاع معنوي عالي لعنصر($P\leq0.01$) الزنك في هواء المنطقة الصناعية مقارنة مع المنطقة الزراعية. بينما كان هناك زيادة معنوية عالية في تركيز عنصر الكادميوم($P\leq0.01$) في تربة المنطقة الصناعية مقارنة مع المنطقة الزراعية.

الكلمات المفتاحية

تلوث الهواء، تلوث التربة، عناصر ثقيلة

Vol. 11, No. 21 and 22 P. (59-68), Jun., 2020

Abstract

Heavy metals are dangerous chemical contamination that escape to the air, soil and water from different anthropogenic and/or natural activities in which causes adverse effects on animals, humans and environment because it toxic and accumulation. In the present study measured (TSP) that consider the most important air pollution for three areas (industrial, residential and agriculture areas) found high significant differences among areas ($P \leq 0.01$) but no any significant differences among months. Heavy metals (lead, Zinc, Cadmium) measure in Air and soil for three areas (industrial, residential and agriculture areas) found significant differences ($P \leq 0.05$) for lead element in the soil of industrial area as compared to agriculture areas, while high significant differences ($P \leq 0.01$) for lead element in the air of industrial and residential area as compared to the agriculture areas. The result found high significant differences ($P \leq 0.01$) of Zinc element in the soil of industrial residential area as compared to agriculture areas, and high significant differences ($P \leq 0.01$) in the Air of industrial as compared to agriculture areas. On other hand found high significant differences ($P \leq 0.01$) in Cadmium element in the soil of industrial as compared to agriculture areas, while high significant differences ($P \leq 0.01$) in Cadmium element in the air of residential as compared to agriculture areas.

Key words

Air pollution, Soil pollution, Heavy metals

1.Introduction

In the last years, Iraq environment exposed to different types of pollution results from wars, unregulated industrial, agricultural and commercial activities that increased due to the population expansion, heavy metals are one of this pollution [1]. The term "heavy metals" as commonly held for those metals, which have specific weights more than 5g/cm^3 [2]. The most dangerous of these pollution perhaps go back to the viability of bioaccumulation in tissues and organs of plants and animals, their concentrations can be multiplied in the food chain, then arrive to humans and other organisms in form more toxic and dangerous to life [3]. Generally pollutant can be divided into three types include air, soil and water pollutant [4]. Air pollution is one of the main factors that affects every part of the earth surface and in the health of one-pillion peoples worldwide, so that air pollution called the silent killer because it spreads and is not specific to place [5]. Also soil contamination is one of the important topics for research because it is the final receptor for all kinds of pollutants that reach either from air or from irrigation, water sewage and other toxic sources, in soil the pollution does not spread but remains for very long time [6]. Because of the importance of the subject and for the few previous studies in the field of soil pollution and very few previous studies in the field of air pollution with heavy metals in Iraq and especially in Karbala, therefore this study focuses on the impact of these types of pollution, so the present study is aimed to:

1. Measure total suspended particles (TSP) in air for different areas in Kerbala city.
2. Measure the concentration of some heavy metals that found in Air and soil.

2. Material and methods

2.1. Samples collection

Samples collected in different areas in Kerbala city. The study consisted (108) samples from both soil and air (54 samples for each one) during three months (from January to March) 2014 from three stations (industrial, residential and agriculture areas). The total suspended particles (TSP) samples were collected using sniffer apparatus, at (1.5) m high, and the particles collected on filter paper according to [7], while soil sample taken in depth (5-10)cm.

2.2. Estimation heavy metals concentration in suspended particles and soils

These samples were prepared to analysis according to [8].

2.3. Measuring of concentration of heavy metals

Using atomic absorption spectrophotometer type HGA (800) for measuring heavy metals concentration that extracted from soil and suspended particles after preparing standard calibration for each elements Figs. (1,2 and 3).

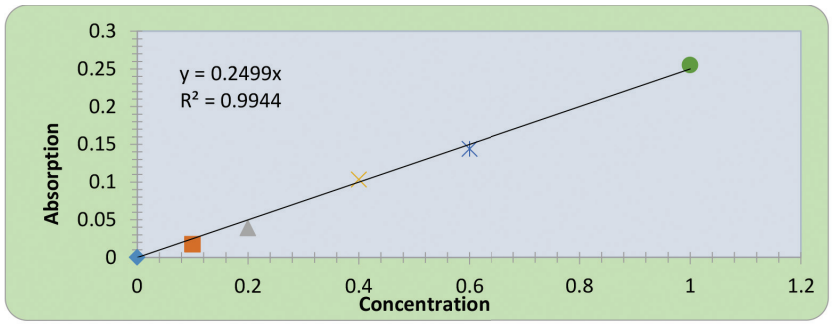

Fig. (1): Standard calibration for lead element

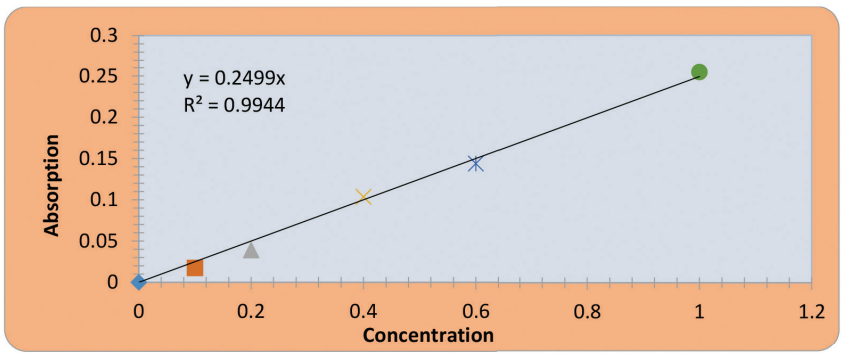

Fig. (2): Standard calibration for Zinc element

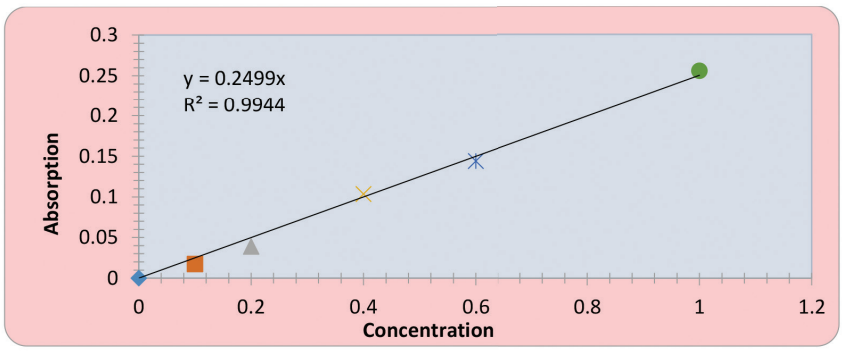

Fig. (3): Standard calibration for Cadmium element

3. Statistical

The software SAS program .USA/version 9 (2004) was used to analyses the data of present work by using complete random design (CRD), then compared the differences between the averages using the test of less significant difference (LSD) [9].

4. Results

4.1. Total suspended particles among different months and areas

Table (1) recorded that no significant differences in the total suspended particles (TSP) among different months, while that there were highly significant differences ($P \leq 0.01$) for (TSP) on both industrial and residential areas as compared with agriculture

area. However, the interaction showed that lowest value in January in agriculture area and a highest value at March in an industrial area.

Table (1): Total suspended particles concentrations in different areas and different months and the interaction between them.

Areas / Months	Industrial Area	Residential Area	Agriculture Area	Mean of TSP in month µg/m³
January	3902 ± 476.77	2921± 562.96	2019.3± 226.85	2947.4±305.19
February	4289± 1168.36	3650± 294.21	2211.9± 387.77	3383.7±448.82
March	4803±1055.73	3630 ± 182.60	2762.5 ± 390.36	3731.8±410.61
Mean of TSP in area µg/m³	4331.4*±522.8	3400.2±222.62	2331.3±201.39	
Iraq limits of (TSP)		350 µg/m³		
International limits of (TSP)		60-90 µg/ m³		

* Significant differences (P≤0.01).

LSD of months= (1025.2); LSD of areas = (1025.2); LSD of interaction = (1775.7).

4.2. Comparison lead concentration in the soil of the different study areas

Fig. (1) illustrated that significant differences (P≤0.05) of lead concentration in the soil in industrial area as compared with the agriculture area, while there was no significant difference in the soil of residential area as compared with agricultural area. Moreover, the results recorded that no significant differences of lead concentration in the soil of industrial areas as compared with residential area.

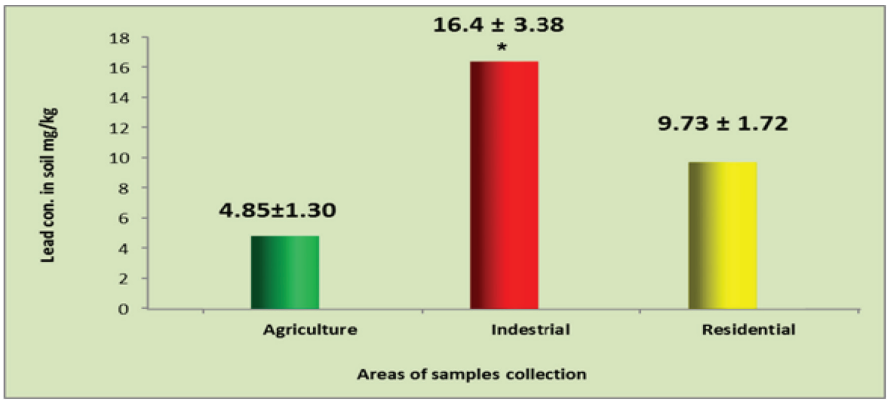

Fig. (1): Comparison of lead concentrations in the soil of different study areas.

* Significant differences (P≤0.05), (LSD=8.2595).

4.3. Comparison lead concentration in the Air of the study areas

Fig. (2) shows a highly significant difference (P≤0.01) of lead concentrations in the air of industrial and residential area as compared to agricultural area. Indeed highly significant differences (P≤0.01) of lead concentration in the air of industrial area as compared to residential area.

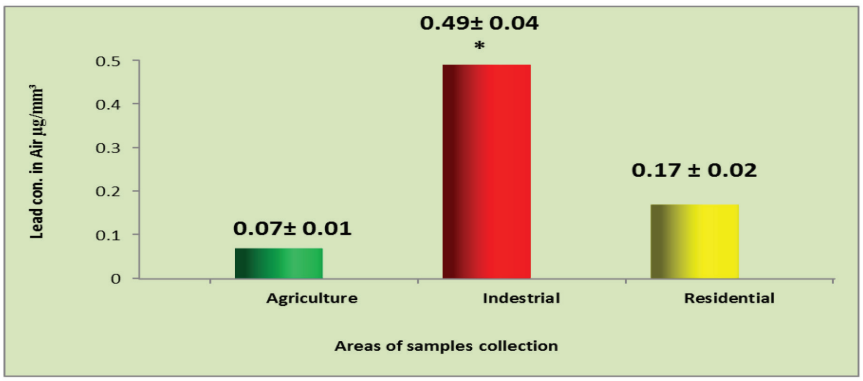

Fig. (2): Comparison of lead concentrations in the air of different study areas.

* Significantly differences (P≤0.01), (LSD= 0.0901).

4.4. Comprise Zinc concentrations in the soil of the study areas

Fig. (3) Shows a highly significant difference (P≤0.01) of Zn concentration in the soil of industrial area as compared to agricultural area, also a highly significant difference (P≤0.01) of Zn concentration in the soil of residential area as compared to agriculture area. However, no significant difference of Zn concentration in the soil of industrial area as compared to residential area.

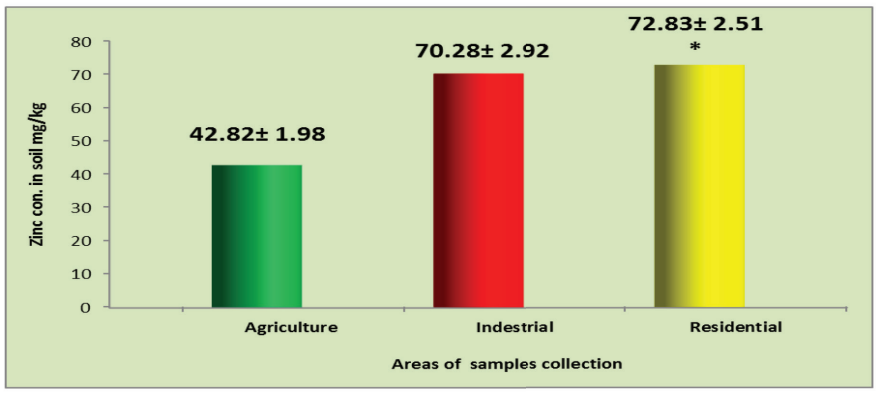

Fig. (3): Comparison of Zinc concentrations in the soil of different study areas.

* Significant difference (P≤0.01), (LSD=7.1123)

4.5. Comprise Zinc concentrations in the Air of the study areas

Fig.(4) shows that there was a highly significant difference (P≤0.01) of Zn concentrations in the air of industrial area as compared with agricultural area, while no any significant difference of Zn concentrations in the air of residential area as compared to agriculture area. However, there was a highly significant difference (P≤0.01) of Zn concentrations in the air of industrial area as compared to the residential areas.

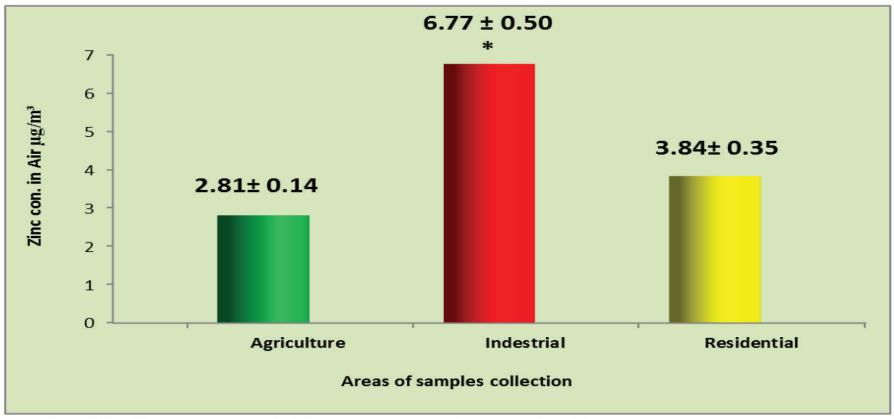

Fig. (4): Comparison of Zinc concentrations in the Air of different study areas

* Significant differences (P≤0.01), (LSD=1.0455).

4.6. Comprise Cadmium concentrations in the soil of the study areas

Fig. (5) Showed a high significant difference (P≤0.01) in Cd concentration in the soil of industrial area as compared to the agriculture area. While no any significant difference in the soil of residential area as compared to the agriculture area. Moreover, a high significant difference (P≤0.01) in Cd concentration in the soil of industrial area as compared to the residential area.

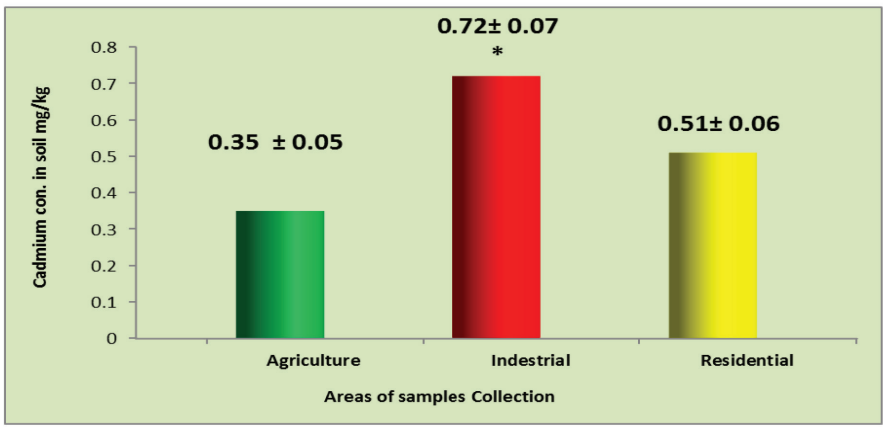

Fig. (5): Comparison of cadmium concentrations in the soil of different study areas.

* Significant differences (P≤0.01), (LSD=0.1911).

4.7. Comprise Cadmium concentrations in the Air of the study areas

Fig. (6) shows no significant difference in Cd concentration in the air of industrial area as compared to the agriculture area, while a highly significant difference (P≤0.01) in Cd concentration in the air of residential area as compared to the agricultural area. Moreover, a high significant difference (P≤0.01) in Cd concentration in the air of industrial area as compared to the residential area.

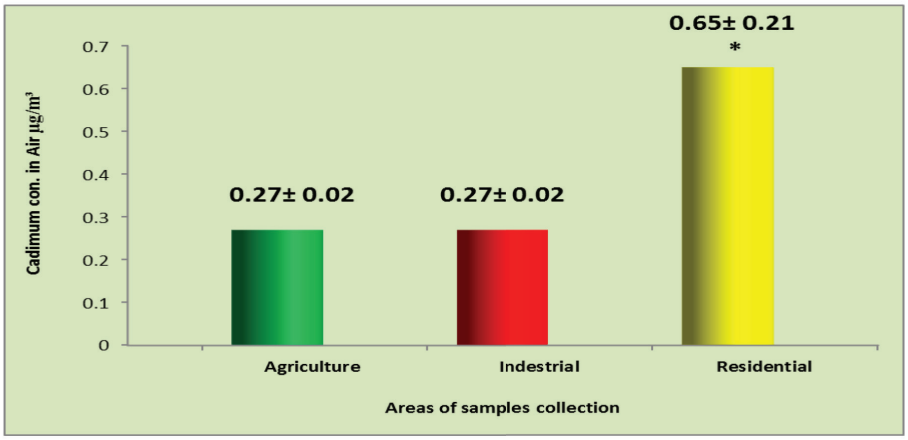

Fig. (6): Comparison of cadmium concentrations in the Air of different study areas.

* Significant differences (P≤0.01), (LSD= 0.3632)

Note: All values are mean ± SE.

5. Discussion

The results of the present study demonstrated a highly significant increase (P≤0.01) in (TSP) as pollutant in the air for all study areas. The reasons behind these result may be attribute to broken ground layers because of the previous wars in Iraq, lack of green spaces; another reason is that the city of Karbala is the first among provinces in terms of religious tourism, in which it receives millions of Iraqi visitors.

The present study in agreement with [10] demonstrated that in Kirkuk province it is found that, a high pollution with TSP in the industrial area (3555.6 µg/m³), while in the residential area (2371.8 µg/m³) and finally in the agriculture area (1666.7 µg/m³), also our result in agreement with [11]. Considerable attention has been given for heavy metal contamination in the environment, the reasons behind air pollution can be attributed to the fact that the development of economic, population increase in growth, rapid urbanization, heavy traffic, vehicle emission and different industrial activity, these findings are also in agreement with [12] who showed that high air polluted with (Cu, Zn, Mn, Co, Cr and Cd) elements in Baghdad city. Many other results showed the

same effect [13, 14, and 15]. In the last (50) years economic and social development occur very rapid which that changes live style lead to accumulation high toxic level of heavy metal in the soil [16].

The result of present study showed significant increase in heavy metals (Pb, Zn, Cd) in the soil of different areas that in agreement with what found by [17,18]. In addition, the present study deal with [19]. As well as present data in agreement with [20] found the concentration of heavy metals (Cd, Cu, and Zn) in the soil of urbanization and industrialization two times greater than the background level contributed to anthropogenic sources also found highly soil pollution by Pb more than others heavy metal related to development especially anthropogenic sources. Rapid industrialization in to development especially anthropogenic sources. This study deal with other study in Romania found pollution soil with five heavy metals (Co, Cr, Cu, Hg, Pb) can attributed to anthropogenic activity such as agriculture, mining, smelting and natural activities, the most important sources of soil pollution are metallurgical and chemical industries [21].

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A Scientific Study on Virus Hepatitis Type C Using the Markov Chain

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Abstract

This paper aims to introduce a study on Markov chain that the Russian scientist presented Markov and how to benefit from it in medical institutions, studying the time series of a number of injuries with hepatitis type C as Markov chain by taking samples from the (Ministry of Health/ Department of Communicable Diseases), in order to build issue according to the Markov's chain and depending on the number of cases that are represented. Hence, the possibility of defining the transition matrix representing it with a tree diagram and study its characteristics in terms of universe whether or not it is primitive, ergodic and reducible.

Key words

Stochastic processes, Random Processes, Markov chain.

1. Introduction

Calculation method for prediction using time series provided by the Russian scientist Markov (1856-1922). Markov came up with a new method. This method includes dependence on the present value to predict chain values in the future not depend on the pervious values or historical values of the studied chain. In this paper we shall try to highlight on some of what come in Markov chain and his equations to show the possibility of benefiting from them and applying them in the medical field. In the financial world and workers are considered Markov chain is difficult while the true concept of this chain gives us the opposite. This chain is considered as simple, easy nature it is able to explain the most complex natural phenomena. The Markov chain is a random sequence of events in which the probability of each event depends directly on the preceding event and does not depend on events of its past.

1.1. Research Objective

The aim of this research is to represent data of the numbers of cases of hepatitis Virus type (C) in Iraq in the form of Markov model. Furthermore, we study and discuss the characteristics resulting from that model.

That is this equation can be written according to the Markov logic as follows:

$$P_{jr} = P_r\{x_{n+1} = k \mid x_n = j\}$$, where:

p_{jr} : Represent the conditional portability of a random process of the value equal to (k) in step (n+1) given its the value of (j) in the step (n) and this clearly means that there is a discontinuous parameter space for the random process that is $[x_n;n=0,1,2...\ ]x_n = j$: means the random process of the value of (j) in the time (n) or step (n).

$x_{n+1} = k$: means the random process of the value (k) in the step (n+1).

In the case of clearly defined Markov chain see the following:

Markov chain means (the value of the phenomenon in the future it depends only on the present value and not on the previous or historical value).

The simplest example is close to the minds of our dear students; if we want to plan for the fourth years' students, a statistic for the coming year then we have to rely on the third stage statistics not on the number of the second stage or the first stage students.

Transitional possibilities can also move one step from state or value in the time of (n) to state or value of (k) in the time of (n+1) assuming these probabilities are stable over time. Transitional possibilities can be represented, which represents from (E_j) to (E_k) in a way that is more appropriate and arrange them in the form of a square matrix. See the following

	0	1	2	3	4	5	.....
0	p_{00}	p_{01}	p_{02}	p_{03}	p_{04}	p_{05}	
1	p_{10}	p_{11}	p_{12}	p_{13}	p_{14}	p_{15}	
2	p_{20}	p_{21}	p_{22}	p_{23}	p_{24}	p_{25}	
3	p_{30}	p_{31}	p_{32}	p_{33}	p_{34}	p_{35}	
4	p_{40}	p_{41}	p_{42}	p_{43}	p_{44}	p_{45}	
5	p_{50}	p_{51}	p_{52}	p_{53}	p_{54}	p_{55}	
. . .							

p_{00}: means the probability of process in state 0 and remain in state 0.

p_{01}: means the probability of process in state 0 and remain in state 1.

p_{04}: means the probability of process in state 0 and remain in state 4.

p_{06}: means the probability of process in state 0 and remain in state 6.

The matrix (p) can be defined as follows:

First: It is possible to name (p) as homogeneous transitions or stochastic matrix because all transitional possibilities are fixed and independent of time, and the possibilities

(p_{jk}) must such that the following conditions:

(1) $\Sigma p_{jk} = 1$, for each $j, k \in E$,

(2) $p_{jk} \geq 0$, for each $j, k \in E$.

Second: The matrix (P) can be defined as a square matrix for all possibilities which defined for all . We can call the matrix (P) as Markov matrix and also by achieving the above conditions.

2. Basic Concepts

2.1. Random Process [1]

The random process is a family of a set of random variables that are inferred by the evidence of m where denoted by .

2.2. Time Series[1]

If the indicative set M in the stochastic process represents the time, then the random set is called the time series and the time series is continuous time if it is -∞<m<∞ and it is denoted by {X(m)}. Also, if it is discrete values , then the time series is called Discrete time series and it is symbolized as or abbreviated as .

2.3. Markov chain [2]

It is a series of random variables with a discrete value which represents the conditional distribution of the value of by achieving the values of random variables ,it depends on the value of only, and in a clear mathematical

expression

2.4. The Primitive Matrix [3]

The transitional probability matrix is said to be primitive matrix if it has self-value equal of self-(1) and the rest of the other values are lower than the absolute value self-values are found by solving the following system; .

2.5. Closed Set [4]

Let be a subset of a state space then is closed if where for all a positive integer values.

2.6. Irreducible Matrix [5]

Let P be any transition matrix, then P is called reducible matrix if it is possible to find a partial closed matrix of this matrix. Conversely, P is called irreducible matrix.

2.7. The State of Connected: [4]

We say and are connected and denoted by , if there exist two integers numbers such that

2.8. Theorem (1): [5]

Markov chain is irreducible if and only if all cases are connected.

2.9. The Ergodic Chain [2]

Markov chain is Ergodic if it is possible to move from every case to every case. The

transfer does not necessarily have to be one-step. In other words, markov chain is Ergodic if it is primitive and irreducible.

3. Applied and Statistical Side

We will work here to find the time series and study the number of cases of hepatitis virus type C in Iraq according to the Markov chain where we were provided with data from the Ministry of Health-Department of Transitional Diseases which represents the monthly rates of the number of people with hepatitis virus type C for both sexes from 2013 to 2016 and for all ages. We will work to find Markov chain formula from the given data in the following way: at the first we know the step and the state of the number of patients in order to formulate a Markov chain and then several assumptions are made to cover the cases and the movement of these cases which include the number of patients to formulate the transition matrix. In this work the state was defined as the number of patients with hepatitis C virus for period of four years the stat was defined as increasing the number of patients from one-time period to another. The following Table (1) explains the age groups from one year to more than (45) years.

Table (1):The age groups

Class	State
0-4	T_1
5-14	T_2
15-45	T_3
More 45	T_4

Through the above assumptions, the number of patients for both sexes and these with hepatitis type C can be classified for several consecution yours to obtain the following Table (2).

Table (2):Number of patients in the age groups

	T_1	T_2	T_3	T_4
2013	33	154	600	410
2014	24	95	166	261
2015	40	115	639	423
2016	32	42	368	246

Where includes all the different cases for the Markov chain for all age groups. Now, we need data describing the movement of patients individually over time to find transition matrix. This data is not available to us and the reason is that patients are not reviewed regularly by health centers. As for what is available from the data, it gives information about the total number of patients of different ages. Here it is taken a period of one year, it is an appropriate time for transition matrix that can be formulated with appropriate assumptions in order to represent patient's movement between

different age groups, they are as follows:

First: Any patient who reaches the state remains in it.

Second: Any patient in gets old, he will be in the higher level of (i.e).

Third: The emergence of a decrease in the number of patients is the result of their transition to the state of which is a state of recovery from illness. By using this data for a period of one years, we can obtain Table (3) which represents the number of patient in cases for (2013-2014). The Table (3) shows the number of patients within cases for (2013-2014).

Table (3): Number of patients for (2013-2014).

Stats	T_1	T_2	T_3	T_4
2013	33	154	600	410
2014	24	95	166	261

Therefore, it is possible to show the estimated movement of patients from one case to another during the period (2013-2014) as shown in a Table (4)

Table (4): The estimated movement of patients for (2013-2014).

2014/2013	T_0	T_1	T_2	T_3	T_4	Rows
T_0	0	33	154	464	0	651
T_1	0	0	0	24	0	24
T_2	0	0	0	95	0	95
T_3	0	0	0	17	149	166
T_4	0	0	0	0	261	261
Columns	0	33	154	600	410	

In the same way the other Tables for (2014-2015) and (2015-2016) are found. By adding the Tables according to the rule of adding matrices, we get the following Table (5) which shows that the estimated movement of patients from 2013 to 2016.

Table (5): The estimated movement of patients for (2013-2016).

T_k / T_{k-1}	T_0	T_1	T_2	T_3	T_4	Sum Rows
T_0	0	73	269	838	0	1180
T_1	40	0	0	56	0	96
T_2	115	0	0	137	0	252
T_3	516	24	95	212	326	1173
T_4	0	0	0	162	768	930
Sum Columns	671	97	364	1405	1094	

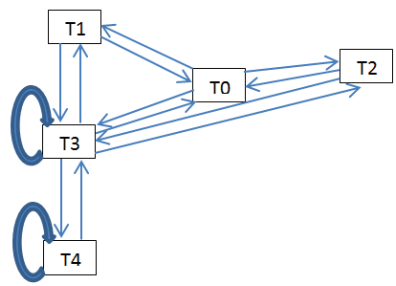
And from the Table (5); we divide the elements of each row into the sum total of rows in which they fallow as a result we will get a random matrix which called probability matrix which reflects to us initial assumptions about the movement of patients where , are ended cases.

The following Table shows the transition matrix for the number of patients infected with hepatitis virus type of C.

Table (6): The transitional matrix of the patients with hepatitis type C

	T_0	T_1	T_2	T_3	T_4
T_0	0	0.069	0.228	0.710	0
T_1	0.417	0	0	0.583	0
T_2	0.456	0	0	0.544	0
T_3	0.44	0.02	0.081	0.181	0.278
T_4	0	0	0	0.174	0.826

transition matrix can be represented by Table which explains the characterizations of the Markov chain represented by probity matrix (P).



Diagraph (1): Transition matrix

4. Ergodic

In this paragraph we will try to show as to whether the Markov chain of patients with hepatitis virus of type (C) is Ergodic or not. We must prove that the transition matrix is primitive and irreducible. Also, from Theorem (1), we find that the transition matrix is irreducible and the reason is because it is connected and accessible from any case to all cases it contains one closed set and to prove that the transition matrix is primitive we have to find the self-values for the matrix P and prove these values are equal to one and the rest of the values are the less than the absolute value. In order to find self-values we follow the next system solution, and by solving the above system we obtain the following self-values:

$\lambda_1 = -0.510$
$\lambda_1 = -0.199$
$\lambda_1 = 0$
$\lambda_1 = 0.715$
$\lambda_1 = 1.001$

From these values, we find the matrix is not primitive and therefore it is not ergodic. Hence the applied method is correct and compatible with this disease is not fixed in increase or decrease in the age group for all governorates of Iraq. This is because of the different in health awareness at the same age group like using tattoos and other habits without knowing its risks and negative effects while these habits are almost non-existent for the most age groups, in other regions either because of health awareness or religious deterrence.

5. Conclusions

Through our study of the time series of the number of cases of hepatitis virus type C in Iraq and data recorded for all Iraqi governorates, it was found that the series is not ergodic and the possibility of infection with this disease is fluctuating between the age groups of several health centers in different regions and for the same one Iraqi province, because the lack of health awareness of the causes of disease transmission to the population of a particular region makes it more vulnerable than others to the spread of this epidemic disease. Also, the genetic factor, which is the transmission of the disease from the affected mother to her child, which appears in the first age group (T1) in the transmission matrix where it is few, and then the number of infected people increases in time periods more than twice when moving to other age groups, see (T2, T3). Also, for some time periods that may reach zero status, which is the result of death or recovery, see (T4). Therefore, external factors are more influential than the genetic factor and these results are reasonable, which indicates the efficiency of the method and model used in this study.

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The Role of Architectural Awards Criteria in Identity and Belonging Concepts Enhancement in Contemporary Architectural Desig

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الخلاصة

برز نشاط عدد من المنظمات العالمية والإقليمية في التأكيد على أهمية التراث المعماري وتوظيفه في التصميم المعماري، خاصةً بعد إنتشار مبادئ العمارة الحديثة والإسلوب العالمي في التصاميم المعاصرة. مما أدى الى حصول وعي بأهمية العودة الى التاريخ والإهتمام بالعمارة التراثية في منتصف القرن العشرين، إذ عملت هذه المنظمات على تشجيع المعماريين للقيام بأعمال الحفاظ، والإحياء، وإعادة التأهيل للأبنية والمواقع التراثية، فضلاً عن توظيف الأبعاد الشكلية والفكرية من التراث في تصاميم جديدة منتمية للمكان والمجتمع. من أبرز هذه المنظمات منظمة المدن العربية، ومؤسسة الأغا خان التي عملت على نشر عدد من المؤلفات المهتمة بالموضوع مع إقامة عدة مؤتمرات وندوات لإيجاد حلول للمشكلات المعاصرة، كما خصصت جوائز مادية لعدد من المشاريع المعمارية المتميزة في التصميم المعماري المعاصر، ولعدد من المعماريين كذلك.

ويمكن تحديد مشكلة البحث بالحاجة المعرفية الى إيضاح معايير التقييم وكيفية منح الجوائز من قبل المنظمات بما يسهم في تعزيز الهوية والإنتماء، ويهدف البحث الى توفير المعرفة عن أبرز المشاريع الفائزة بالجوائز وبيان التطور الزمني لمعايير التقييم منذ تأسيس الجوائز وحتى وقت إعداد البحث، وتحليل ابرز المشاريع الفائزة بالجوائز لإيضاح أهم مافيها من خصائص تصميمية جعلتها منتمية للمكان ومعبرة عن الهوية.

يفترض البحث استفادة المعماريين من معايير الجوائز والتركيز على قيم الهوية والانتماء في التصاميم المعمارية المعاصرة. إذ يتم تطبيق المعايير المستخلصة من الجوائز على المشاريع المحلية المعاصرة لبيان مدى تعبيرها عن الهوية والانتماء. ويستنتج البحث ان لبعض المشاريع الامكانية في تكوين هوية خاصة ومعروفة على المستوى المحلي والعالمي، فيما تستفيد المشاريع الاخرى مما موجود من خصائص محلية لتحقيق الانتماء.

الكلمات المفتاحية

جائزة الأغاخان في العمارة، جائزة منظمة المدن العربية، العمارة الإقليمية، الحلول التصميمية المبتكرة، مبادئ الإستدامة.

Abstract

Multiple of International and Regional organizations have been active in emphasizing the conservation and employment of architectural heritage in contemporary design, especially after the wide spread of modern architecture principles and international style design. These organizations have led to the interest in history and heritage since the mid of twentieth century. By encouraging architects to conserve, revive, and rehabilitate the traditional sites and buildings through number of symbioses and conferences. Besides encouraging the use of architectural heritage (its features and concepts) in new architectural design to show the identity of each place and society. The most famous organizations are Arab Towns Organization (ATO), and Aga Khan Organization which has published many books about this subject, besides establishing awards for unique projects and distinguished designers.

The research problem can be specified as the need to show the evaluation criteria of choosing awards' winners that are given by the mentioned organizations. And it aims to analyse the most significant winning projects in architectural design to explain criteria development of through time since award establishment till nowadays to determine the most appropriate methods of design, which provide identity, belonging, and contemporary concepts in the same time as the best methods for future architectural design.

The awards' criteria are applied to contemporary local projects to demonstrate their expression of identity and belonging concept. The research concludes that some projects have the potential to create a special identity that is known locally and globally, while other projects use local characteristics to achieve belonging.

Key words

Aga Khan award for architecture, Arab Towns Organization Award, Regional Architecture, Innovative Architectural Design, Sustainability Principles.

1. Introduction

After the widespread of modern architectural design that relies on International style principles, especially in the beginnings of the twentieth century. Many international and regional organizations have encouraged architects to participate in the rehabilitation, conservation, and renovation of traditional buildings and sites. Besides Implementing heritage in contemporary architectural designs to emphasis the role identity and belonging concepts.

One of these organizations is Agha Khan development network that is established by Shah Karim al-Husseini, the Ismaili Imam since 1957. He has assigned a financial award of (1) million dollars that is given for creative architectural projects. This award is distributed among Architects, clients, engineers, and craftsmen, as a confirmation of their role in achieving creative projects.

Aga khan award for architecture has begun in 1977, and it has been held every (3) years since then. It is given for the projects that serve Islamic societies or depends on Islamic concepts for inspiration in their design concepts, the project should be constructed in a period of no more than (25) years.

After nominating a number of outstanding projects, the Aga Khan himself leads a steering committee with the help of judgment committee which is changed in every cycle of the award, they select the winning projects. Many of distinguished and famous architects had participated in those committees such as: Hassan Fathi, Kenzo Tange, Mohammed Makiya, Rifat Chadirji, Charles Moore, James Stirling, Robert Venturi, Charles Correa, Abdul wahid alwakil, Rasim Badran, Zaha Hadid, and others [1,2].

This award has encouraged architects to write expandingly to spread the discussed concepts in the lectures and the seminars during selecting the award-winning projects. And Aga Khan foundation have published these works in several books and journals, as (Mimar) journal for example, which is published in Singapore since 1983, and its chief editor is Hassan Aldin Khan who is a member of judgment committee [3].

Another architectural award is given by Arab Towns Organization (ATO), since 1983, and it is held every 3 years too. This organization aims to preserve the identity of Arabic cities, and to achieve sustainable development in design and planning [4].

2. Research Methodology

This research depends on the descriptive analytical method, by the following steps:

- Reviewing the literatures that have studied and discussed architectural awards, and extracting indicators.
- Showing the selecting criteria of awards winning projects chronologically, besides analyzing the most prominent projects.
- Extracting the indicators that are related to identity and belonging concepts.
- Applying the indicators on local projects.

3. Literature Review

There are several studies that have discussed awards and competitions of architectural projects, this paper will show some of them in order to extract indicators that helps to achieve paper's aims.

3.1. The study of (Kristian Kreiner, 2010):

The study defines architectural competitions as a social and institutional technique for researching and selecting great architectural designs, in an effective and fair way. Technology means it is a means of serving a particular goal, and this goal is to choose a winning project, and a winning architect. It also refers to the attempt to standardize competition selections in balancing three key themes: Creativity, Legitimacy (Justice), and Efficiency. The study indicates that the latter is linked to the achievement of sustainability, in order to develop the concepts and values associated with society throughout history and its impact on architectural competitions [5].

3.2. The study of (Jonas E Andersson, 2013):

The book contains a number of studies that have shown global interest in architectural competitions and awards, as they are an important subject in architectural research. Many conferences and researches have been held on the subject, and studies have shown that architectural awards aim to find the best design solution for architectural and urban problems, including the emphasis on identity and belonging [6].

3.3. The study of (Kazemian R., Ronn M., 2009):

The research studies competitions in Finland and their criteria for evaluating award-winning projects, by dividing them to: the relationship of the building to the historical context and adjacent buildings, the comprehensiveness of the design solution, including social, economic and environmental sustainability, and the nature of the link between interior spaces, project function, technical solutions and project services, and the possibility of developing the project in the future while preserving the original design concept [7].

3.3. The study of (Lakkala M., Pihlajaniemi M., 2018):

The study presents architectural competitions and awards as a guiding tool for access to knowledge, and focuses on the use of log (wood) as a local building material in design and architectural construction, both at the façade, and in traditional building techniques, as an important factor indicating Finland's identity, especially in award winner projects [8].

From previous literature, it is clear that the criteria of architectural awards have been linked to societies values, and the concept of identity and belonging has become an

important value required to win architectural awards. In addition to the standards of creativity and functional requirements, the standards of compatibility with context, the use of local materials, traditional techniques, and the maintenance of the original design concept throughout project's development. There is also an interest in the concept of social, environmental and economic sustainability, which has emerged as an important criterion for evaluation. As it is shown in Table (1).

Table (1): Awards' criteria that are derived from literatures [authors]

Creativity	Design concept	
Efficiency	Function	
	Services	
Compatibility with context	Urban context	Building Materials
		Building Techniques
	Historical Context	
Sustainability	Environmental	
	Economical	
	Social	

4. Architectural Awards

The research will specify the adopted criteria in selecting winner projects of architectural awards, after analyzing the design concepts of the winning projects. With a focus on the criteria that achieve identity and belonging in design.

4.1. Aga Khan Award for Architecture

The award included fourteen cycles from 1978 to 2019, during which the 14th edition was held, many outstanding architectural projects have won, and the criteria for their selection varied according to the developments associated with the spirit of the age, as well as the trends of achieving identity and belonging in design [9].

4.1.1. The Eighties of Twentieth Century

In the first cycles of the Aga Khan Award, which are held from 1978 to 1989, the Foundation held various seminars in eastern countries such as China, Senegal, Yemen, Malaysia, and others to increase knowledge of Islamic architecture culture, heritage and contemporary concepts, its association with identity and belonging concepts, to illustrate the relationship of technology to Islamic architecture, as well as to emphasize the role of architects in society, where the President's Award was given to Hassan Fathi and Rifat Chadraji. The winning projects were divided into two groups, the first comprises architectural design projects, and the second involves conservation, restoration

and rehabilitation. The research will focus on architectural design projects because the projects of the second group include different methods in dealing with them, although the award is still awarded for conservation and restoration projects till nowadays [10].

One of the winning projects in the first cycle of the award (Pondok Pesantren Pabelan in Indonesia), it was chosen for its contribution to improve the conditions of rural residents with individual social initiatives, and (Mughal Sheraton Hotel in India) which relies on vocabulary that are inspired by local vocabulary and local materials to meet contemporary functional needs. This trend is similar to (Halawa House in Egypt) and (the Agricultural Training Centre in Senegal), with the revival of traditional construction techniques. One of the unique projects is (water towers in Kuwait), which is formally inspired by the arab rose water sprinkler, with the exterior finishing by bright colored steel sheets which are inspired by traditional mosaics, as shown in Fig. (1-5) [11].

Fig. (1): Pondok Pesantren Pabelan, Indonesia, 1965 [11].

Fig. (2): Mughal Sheraton Hotel, India, 1976 [11].

Fig. (3): Halawa House, Egypt, 1975 [11].

Fig. (4): water towers, Kuwait, 1976 [11].

Fig. (5): Agricultural Training Centre, Senegal, 1977 [11].

In the second cycle, the project of (Hajj Terminal in Saudi Arabia) had won because it provided innovative technological solutions inspired by the forms of Arab tents in the desert, while the award was awarded to both of (Great Mosque of Niono in Mali) and (Ramses Wissa Wassef Arts Centre in Egypt) because of the revival of traditional techniques in construction and using local materials (bricks), but (Residence Andalous) project has inspired its design from the traditional vocabulary such as the central courtyard, and water gardens which are presented in a contemporary style. There are some attempts to modernize within the context in both of (Sherefudin's White Mosque) at the architectural level, and in (Hafsia Quarter I) at the urban level, as shown in Fig. (6-11) [12].

Fig. (6): Hajj Terminal, Saudi Arabia, 1981 [12].

Fig. (7): Great Mosque of Niono, Mali, 1973 [12].

Fig. (8): Sherefudin's White Mosque, Bosnia, 1980 [12].

Fig. (9): Ramses Wissa Wassef Arts Centre in Egypt, 1974 [12].

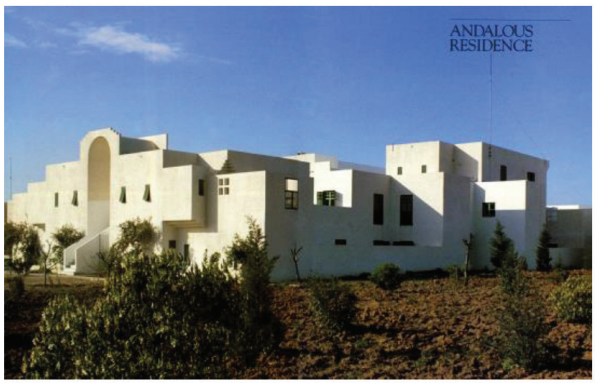

Fig. (10): Residence Andalous, Tunisia, 1981 [12].

Fig. (11): Hafsia Quarter I, Tunisia, 1977[12].

In the third cycle, the Aga Khan award has been directed towards social development projects such as (Shushtar New Town), which is designed with traditional architectural vocabulary to indicate spatial belonging such as gates and arcades. The award was also given to (Saïd Naum Mosque) which presents the vocabulary of local architecture in a modern style, and to (Social Security Complex) project which combines contextualism with modernity in a regional trend, as shown in Fig. (12-14) [13].

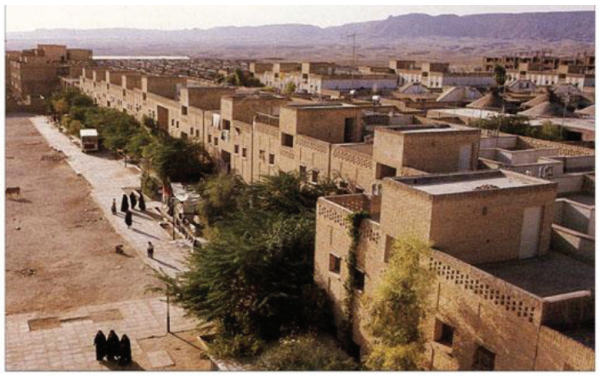

Fig. (12): Shushtar New Town, Iran, 1977 [13].

Fig. (13): Social Security Complex, Turkey, 1970 [13].

Fig. (14): Saïd Naum Mosque, Indonesia, 1977 [13].

The award's interest in housing projects continued in the fourth cycle, as in (Grameen Bank Housing Programme), which achieved the concept of community participation and teamwork in the construction of unified houses that are financed by Grameen Bank. While the award showed the interest in creative works also, as in the blending of traditional architecture vocabulary, and modern techniques in (Institute du Monde Arab), which presents the shape of (mashrabia) with glass sensitive to light panels, as an expression of communication between the past and the present on the one hand, and between Arabs and Europeans on the other, as shown in Fig. (15,16) [14].

Fig. (15): Grameen Bank Housing Programme, Bangladesh, 1984 [14].

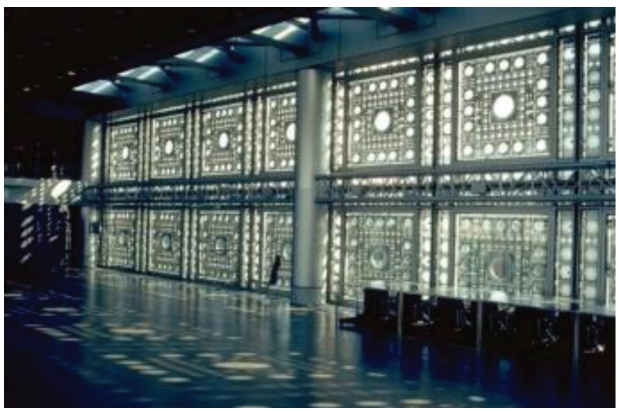

Fig. (16): Institute du Monde Arab, France, 1987 [14].

4.1.2. Nineties of Twentieth Century

In the 1990s, Aga Khan award has been directed towards a deeper understanding of Islamic architecture and the use of its concepts in design, with an interest in housing projects, social development and popular participation. The Steering Committee added a critical dimension to the award, to help in solving the problems of architecture and society in the Muslim world, focusing on taking advantage of the past in contemporary and future dimensions, where creative concepts have been introduced in the presentation of traditions in a contemporary style [15,16].

The winning projects in award's fifth cycle at the urban level were (Cultural Park for Children) and (Kampung Kali Cho-de), that give outstanding examples of human respect and the provision of decent services

through popular participation, with the aim of social development, in a design style that is inspired from traditional vocabulary and local building materials. The award was also awarded to the (Demir Holiday Village), whose houses are built of stone in a developed traditional forms, and for (Stone Building System), which used local stone (basalt) in a construction technique that combines traditional and modern style with the aim of reducing the cost to more than a half, as in Fig. (17-20) [17].

Fig. (17): Cultural Park for Children, Egypt, 1990 [17].

Fig. (18): Kampung Kali Cho-de, Indonesia, 1985 [17].

Fig. (19): Demir Holiday Village, Turkey, 1987 [17].

Fig. (20): Stone Building System, Syria, 1990 [17].

In the sixth cycle, the award was awarded to (Expansion project of Kaedi Regional Hospital), which combined the functional and social aspect with creative oval and curved forms that are built by local brick material. While (Mosque of the Grand National Assembly) project was awarded because of its creative symbolism in employing the cypress tree on the side of the site as a minaret, as well as the design of the graded pyramidic dome. And Local African motifs have occupied a large part of the interior and exterior facades of the (French-Senegalese Association) project to give users special impressions without focusing on certain symbols, as shown in Fig. (21-23) [18].

Fig. (21): Kaedi Regional Hospital, Mauritania, 1992 [18].

Fig. (22): French-Senegalese Association, Senegal, 1994 [18].

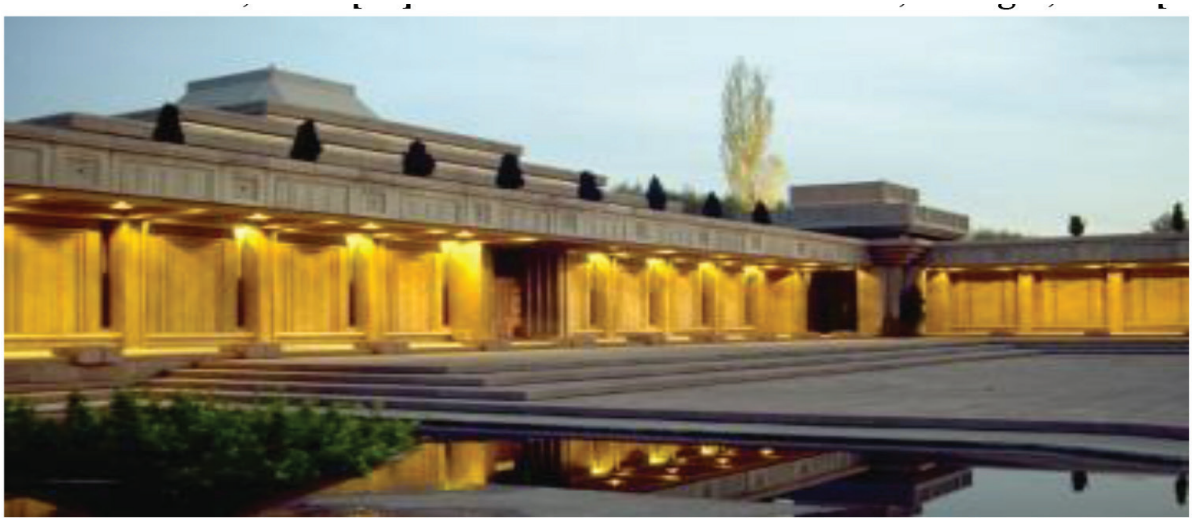

Fig. (23): Mosque of the Grand National Assembly, Turkey, 1989 [18].

The award was also given in the seventh cycle to governmental and administrative buildings such as (Tuwaiq Palace), which includes elements of local architecture in a high-tech style, as the fort is expressed in the form of a twisted wall of stone surrounding an interior oasis, with a number of tents created with modern technology. While (Vidhan Bhavan) project, which represents the Government Council of India, is designed in a simple circular form from the outside and includes details of traditional architecture such as gates, domes and central courtyards, as well as some decoration of local stone, as shown in Fig. (24,25) [19].

Fig. (24): Tuwaiq Palace, Saudi Arabia, 1985 [19].

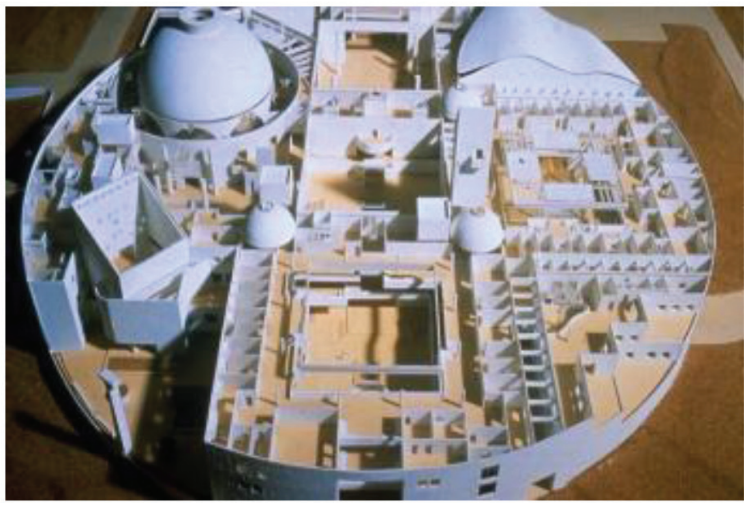

Fig. (25): Vidhan Bhavan, India, 1996 [19].

4.1.3. Twenty first Century

In the 21st century, the award focused on addressing the problems of environment, energy, social development and cultural identity in projects, besides adding the concept of architectural uniqueness and dialogue among civilizations [20, 21, 22, 23].

In the eighth cycle, (Aït Iktel) Village project has won on the social level because it achieves social communication among the villagers, by constructing with local materials (stone) and introducing solar panels technology. The (SOS Children's Village) project has taken care of both the social and environmental aspects, where it works to integrate orphan children with the community through a design that includes green spaces that are integrated with the city, with other various treatments of shading and ventilation, as shown in Fig. (26,27) [24].

Fig. (26): Aït Iktel village, Morocco, 1995 [24].

Fig. (27): SOS Children's Village, Jordan, 1991 [24].

The focus on creative concepts was highlighted in the ninth cycle, and in the projects (Bibliotheca Alexandrina) and (Petronas Office Towers) in particular, where the jury has considered the first project as an important example on the architectural, symbolic and constructional level, as well as being an enhancer of dialogue among civilizations. While the second project has expressed the Malaysian identity in a way that is inspired by Islamic culture and in a contemporary, high-tech style, as shown in Fig. (28, 29) [25].

Fig. (28): Bibliotheca Alexandrina, Egypt, 2002 [25].

Fig. (29): Petronas Office Towers, Malaysia, 1999 [25].

In the 10th cycle, the award was given to (Samir Kassir Square), which represents the entrance to Beirut's central district, it is developed around the Fiscus trees because of their symbolism in bearing at the place and during events that took place at that site. As well as (Moulmein Rise Residential Building) project because of the interest in contemporary technology, that has been combined with traditional techniques in special environmental treatments, as shown in Fig. (30,31) [26].

Fig. (30): Samir Kassir Square, Lebanon, 2004 [26].

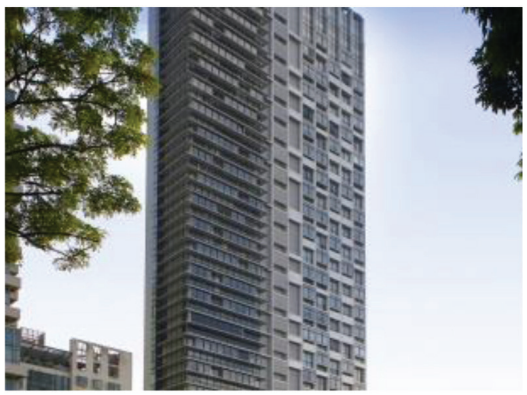

Fig. (31): Moulmein Rise Residential Building, Singapore, 2003 [26].

One of the most distinctive projects in the eleventh cycle is (Ipekyol Textile Factory) which is awarded due to the use of local building materials and traditional vocabulary (central courtyard) as an environmental treatment with the aim of saving energy and achieving communication between employees and nature as well as between the employees themselves. The other project is (Bridge School) which links two parts of a village that is separated by a river with the use of a suspended structure which is distinct from the traditional context. This project helped to achieve social communication, as it has become a social centre after school time, as shown in Fig. (32,33) [27].

Fig. (32): Ipekyol Textile Factory, Turkey, 2006 [27].

Fig. (33): Bridge School, China, 2008 [27].

In the 12th cycle, (Salam Cardiac Surgery Centre) was among the winning projects because it combines modern construction techniques (solar panels) with local building materials (bamboo branches) in roofing, as well as the it uses transport containers for the building of attached residential spaces and cafeteria for workers, as one of the recycling methods. While (Hassan II Bridge) project, which links two historic cities with respect to the context and adjacent heights, also has won, as it confirms the vertical location of the historic Hassan Tower in the city sky line, besides as its role in social development in including markets and recreational spaces, as shown in Fig. (34,35) [28].

Fig. (34): Salam Cardiac Surgery Centre, Sudan, 2010 [28].

Fig. (35): Hassan II Bridge, Morocco, 2010 [28].

In the 13th cycle, (Friendship Centre) project focuses on the inspiration from one of the oldest historical sites in the region, and building a combination of local materials and contemporary techniques to achieve harmony with the environment. On the environmental side, (Issam Fares Institute) and (Tabiat Pedestrian Bridge) are similar, as the two projects reduce the ecological impact on the site in harmony with the context of the first project, and with contemporary technology in the other. While (Superkilen) Park has won because of achieving social cohesion, and a sense of belonging in a multi-identity and multicultural city by putting symbols, monuments and vocabulary indicating each culture, as shown in Fig. (36-39) [29].

Fig. (36): Friendship Centre, Bangladesh, 2011 [29].

Fig. (37): Issam Fares Institute, Lebanon, 2014 [29].

Fig. (38): Tabiat Pedestrian Bridge, Iran, 2014 [29].

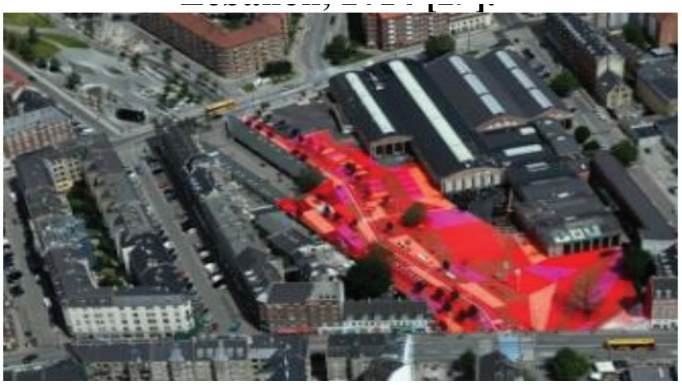

Fig. (39): Superkilen park, Denmark, 2011 [29].

At the 2019 course, the focus is on the principles of sustainability in design, including the winning projects (Arcadia Education Project) and the (Alioune Diop Research Unit), which focus on climatic aspects, the use of local materials and construction techniques that reduce negative environmental impacts, and reducing maintenance costs. So is (Wasit Wetland Centre) project, which aims to provide information on the specificity and uniqueness of its local environment on the Gulf Coast, as well as it is built in harmony with context, and uses recycled materials (wood and plastic). One of the distinctive projects is (Palestinian Museum), as in addition to using local materials in its design, its harmony with the site in planning and its environmental treatments, it carries Gold LEED because it provides crops and water resources. The jury considered it a good expression of the Palestinian heritage, cultural dialogue, and belonging to its land with a symbolism of rejecting the colonialism, as shown in Fig. (40-43) [30].

Fig. (40): Alioune Diop Research Unit, Senegal, 2017 [30].

Fig. (41): Arcadia Education Project, Bangladesh, 2016 [30].

Fig. (42): Wasit Wetland Centre, UAE, 2015 [30].

Fig. (43): Palestinian Museum, Palestine, 2016 [30].

4.2. Arab Towns Organization Award

The Arab Towns Organization award encouraged innovative and renewed design when it is inspired from the Islamic character in Arab cities, besides preserving the aesthetics of the environment, and increasing the use of computer systems. The award is divided into four categories, the first one is interested in Islamic heritage, which includes (architectural design project, architectural conservation project, and the architect). The second category is concerned in environmental health, as it includes (environmental awareness, environmental safety, and environmental advocate). The third category is for the greening and beautification of cities, that includes (urban greening, beautification of cities, and urban beautification expert), the last category of using information technology includes (Application of computer, systems and software, and informatics expert). This award has not been documented as in the Aga khan Award cycles since its beginnings, but its last cycle was in 2017, and the winner project of Architectural Design Award is (Al hazim Commercial Complex) in Qatar, in Fig. (44), where the jury considered its design as a distinctive style that links the huge masses with human scale, as well as borrowing elements and vocabulary from classical architecture, and using modern building materials (marble), which makes it unique in the urban context of the city [31,32].

Fig. (44-a): Front Elevation

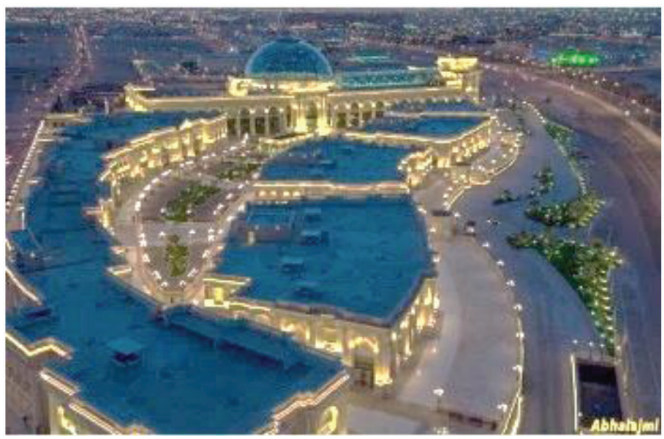

Fig. (44-b): Aerial View

Fig. (44): Al hazim Commercial Complex, Qatar, 2017 [32].

From the mentioned award-winning projects above, a number of Identity and belonging concepts criteria and indicators are derived as shown in Tables (2, 3, 4).

Table (2): Identity and Belonging Indicators in 1980s Awards

	Award's winner Project	Winning Reason	Concluded Criteria	Identity and Belonging Indicators
First Cycle (1978-1980)	Pondok Pesantren Pabelan, Indonesia, 1965	Improving the conditions of residents and individual initiatives	Social aspects	Community participation
	Mughal Sheraton Hotel, India, 1976	Meeting contemporary functional need with traditional vocabulary	Compatibility with context	Traditional vocabulary Traditional Techniques Local materials
	Halawa House, Egypt, 1975	Employing traditional vocabulary with contemporary materials and techniques	Innovative Design	Traditional vocabulary Traditional and modern Techniques Local materials
	water towers, Kuwait, 1976	Employing traditional elements and symbols (Arabic rose water spray, mosaics) with contemporary materials and techniques	Innovative Design	Traditional vocabulary Modern Techniques Innovative Structure
	Agricultural Training Centre, Senegal, 1977	Traditional technical revival (stone construction)	Compatibility with context	Traditional vocabulary Traditional Techniques
Second Cycle (1981-1983)	Hajj Terminal, Saudi Arabia, 1981	Innovative construction solutions inspired by the local environment (tents)	Innovative Design	Merging heritage with Contemporary Innovative Structure
	Great Mosque of Niono, Mali, 1973	Traditional technical revival (brick construction)	Compatibility with context	Traditional Techniques Local materials
	Sherefudin's White Mosque, Bosnia-Herzegovina, 1980	Openness to modernization in design within a traditional context	Innovative Design	Merging modern designs within traditional context
	Ramses Wissa Wassef Arts Centre in Egypt, 1974	The use of local building materials (bricks) in harmony and simplicity based on the effects of natural light	Compatibility with context	Traditional vocabulary Traditional Techniques Artistic Expression
	Residence Andalous, Tunisia, 1981	Employing traditional design principles and elements in a contemporary style	Compatibility with context	Traditional vocabulary Traditional Techniques Local materials
	Hafsia Quarter I, Tunisia, 1977	modernization in design within a traditional context	Innovative Design	Modernization within context
Third Cycle (1984-1986)	Shushtar New Town, Iran, 1977	Employing architectural vocabulary that helps to sense the place belonging (gates, paths)	Compatibility with context	Traditional vocabulary
	Social Security Complex, Turkey, 1970	Simple configurations that reconcile modernity with context (regional architecture)	Innovative Design	Modernization within context
	Saïd Naum Mosque, Indonesia, 1977	modernization in design within a traditional context (traditional vocabulary in modern style)	Innovative Design	Cultural and artistic values in modern style
Fourth Cycle (1987-1989)	Grameen Bank Housing Programme, Bangladesh, 1984	Construction of unified houses, with bank's contribution. It was implemented through teamwork.	Social aspects	Community participation Housing Project
	Institut du Monde Arabe, France, 1987	Expressed the cultural dialogue between French and Arabs, combining the elements of traditional Islamic architecture (mashrabiya and inner courtyard), with modern technology in Europe (light-sensitive glass panels)	Innovative Design	Traditional vocabulary Modern Techniques Dialogue between civilizations

Table (3): Identity and Belonging Indicators in 1990s Awards

	Award's winner Project	Winning Reason	Concluded Criteria	Identity and Belonging Indicators
Fifth Cycle (1990-1992)	Cultural Park for Children, Egypt, 1990	The project worked to revive a neglected area surrounded by archaeological areas with the contribution of community members, besides the employment of traditional elements	Social aspects	Community participation Traditional vocabulary
	Kampung Kali Cho-de, Indonesia, 1985	It is built by strong structures of local materials, with the help of the residents themselves	Social aspects	Community participation Local materials
	Demir Holiday Village, Turkey, 1987	Construction of stone houses in a developed traditional form	Compatibility with context	Local materials Traditional Techniques Artistic Expression
	Stone Building System, Syria, 1990	Using basalt stone from the rural construction site with modern technology and traditional forms (arches)	Innovative Design	Community participation Modern Techniques Local materials
Sixth Cycle (1993-1995)	Kaedi Regional Hospital, Mauritania, 1992	Using creative and distinctive forms (oval domes and curved shapes) that are built by the local material (bricks)	Innovative Design	Innovative Structure Local materials Merging heritage with Contemporary
	French-Senegalese Association, Senegal, 1994	The use of African motifs in a creative language that makes users give their own impressions	Innovative Design	Artistic and cultural Expression
	Mosque of the Grand National Assembly, Turkey, 1989	The use of different symbolism in the building of mosques where the minaret is a Cyprus tree on the side of the site, besides replacing the dome with a pyramid	Innovative Design	Using place's elements as Symbols
Seventh Cycle (1996-1998)	Tuwaiq Palace, Saudi Arabia, 1985	Employing elements of local architecture in a high-tech structure	Innovative Design	Traditional vocabulary Modern Techniques Local materials
	Vidhan Bhavan, India, 1996	Using details of traditional architecture and traditional art in a modern style	Innovative Design	Traditional vocabulary Modern Techniques Local materials Artistic Expression

Table (4): Identity and Belonging Indicators in 21st Century Awards

	Award's winner Project	Winning Reason	Concluded Criteria	Identity and Belonging Indicators
Eighth Cycle (1999-2001)	Aït Iktel village, Morocco, 1995	Social communication among the villagers	Social Aspects	Social development Local materials Traditional and modern Techniques
	SOS Children's Village, Jordan, 1991	Interest in the social and environmental aspects in urban planning	Social and Environmental aspects	Social development Local materials Traditional and modern Techniques
Ninth Cycle (2002-2004)	Bibliotheca Alexandrina, Egypt, 2002	Promoting dialogue among civilizations and intellectual openness	Innovative Design	modern Techniques Dialogue between civilizations Modernization within context Unique Identity
	Petronas Office Towers, Malaysia, 1999	Expresses Malaysian Islamic identity in skyscraper design	Innovative Design	modern Techniques Traditional vocabulary
Tenth Cycle (2005-2007)	Samir Kassir Square, Lebanon, 2004	Developed around two trees in a place full of events	Innovative Design	Using place's elements as Symbols
	Moulmein Rise Residential Building, Singapore, 2003	Environmental design techniques that combine traditional and contemporary treatments	Innovative Design	Traditional and modern Techniques
Eleventh Cycle (2008-2010)	Ipekyol Textile Factory, Turkey, 2006	Using local materials for energy saving, and using traditional vocabulary (central courtyard) to communicate with nature	Innovative Design	Traditional vocabulary modern Techniques Energy saving
	Bridge School, China, 2008	Distinctive structure that links the two sides of a village	Innovative Design	Social development modern Techniques
Twelfth Cycle (2011-2013)	Salam Cardiac Surgery Centre, Sudan, 2010	Recycling local materials with the use of solar panels	Innovative Design	Local materials Recycling modern Techniques
	Hassan II Bridge, Morocco, 2010	Connects two historical cities with respect for their context	Compatibility with context	Enhancing Place's Identity Social development
Thirteenth Cycle (2014-2016)	Friendship Centre, Bangladesh, 2011	The design is inspired from historical architecture and local environmental treatments	Compatibility with context	Traditional vocabulary Local materials Traditional Techniques
	Issam Fares Institute, Lebanon, 2014	The building is floating above an outdoor courtyard to reduce the ecological foot and preserve the environment and visual axes.	Compatibility with context	Respecting Place's context Environmental treatments
	Tabiat Pedestrian Bridge, Iran, 2014	Space frame structure bridge that links two parks	Innovative Design	Social and urban development Respecting Place's context modern Techniques
	Superkilen park, Denmark, 2011	Public urban space helps in merging different cultures of society	Social Aspects	Social development Multiple identities
Fourteenth Cycle	Alioune Diop Research Unit, Senegal, 2017	Inspiration from traditional techniques to decrease maintenance and energy	Environmental Aspects	Traditional Techniques Traditional Vocabulary Energy saving

(2017-2019)	Arcadia Project, Bangladesh, 2016	Construction with local materials and techniques to decrease environmental effects	Environmental Aspects	Local materials Respecting Place's context Traditional Techniques
	Wasit Wetland Centre, UAE, 2015	Providing Information about its unique location on the gulf	Compatibility with context	Local materials Recycling Environmental treatments
	Palestinian Museum, Palestine, 2016	The emphasis on Palestinian heritage and the connection with land	Compatibility with context	Respecting Place's context Environmental treatments Cultural expression
Arab Towns Organization Award	Al hazim Commercial Complex, Qatar, 2017	A distinct, out-of-context style that combines local and international vocabulary	Innovative Design	Local and modern materials Traditional and international Vocabulary Dialogue between civilizations Modernization within context

After combining the criteria in Table (1), with the concluded indicators in Table (2,3,4), the research reaches to the final indicators in Table (5), that are going to be applied to the case studies, to verify the concepts of identity and belonging within their design.

Table (5): Identity and Belonging Indicators that are concluded from awards and Literatures [authors]

Criteria	Indicators	
Creativity	Innovative Design concept	Innovative Structure
		Modernization within context
		Using traditional vocabulary in contemporary style
		Using Artistic and cultural values in contemporary style
		Using local materials in contemporary style
		Combining traditional and modern techniques
		Using place's elements as Symbols
		Dialogue between civilizations
Efficiency	Function	
	Services	
Compatibility with context	Urban context	Local Building Materials
		Traditional Building Techniques
		Traditional Environmental treatments
	Historical Context	Artistic and Cultural values
Sustainability	Environmental	Environmental treatments
	Economical	Energy Saving
		Recycling
	Social	Housing Projects
		Community Participation
		Social development

6. Case study

6.1. Iraqi Central Bank

The project is designed by the Iraqi architect Zaha Hadid in 2011, and the building is under construction until the time of the research. The project is located in Baghdad, in the Al-Jadiriya, overlooking the Tigris River. The building is 172 meters high and it has a built area of 90,000 m2. It consists of a 7-storey high base with a high tower that marks a landmark in the skyline of Baghdad city, with a basement floor at a depth of 15 m.

The building's structure consists of high quality and durable iron and concrete to include a number of spaces such as: coin and alloy cabinets, administrative offices, a conference hall, and a memorial monument of Zaha Hadid.

The design concept is based on site's specificity as it overlooks the Tigris River, which was once a route of commerce, as the project expresses the historical traditions and its relationship to contemporary values, with a prominent axis towards the river, at planning level. Project's facades are characterized by fluidity and movement to express a simulation form of the reflected light on river's waves. This is expressed in the forms of curtain facades that reduce the open glass area, as a sustainable environmental treatment. These flow lines extend to the other parts of project's masses and landscape, as shown in Figure (45) [33-35].

Fig. (45-a): Side Elevation

Fig. (45-b): Aerial view

Fig. (45): Iraqi Central Bank Project, Baghdad [35]

6.2. Library Project in Samawah

The project is located in the centre of Samawah city, within a modern area, of medium-height context. It is designed by the Nudhun Albina'a Company and is still under construction. The design concept is based on the metaphor of Warka city, which was the main source of civilization and the learning of language, writing and numbers. The designer has borrowed symbols from cuneiform writing to express place's identity and its cultural impact which was emanating from the epic of Gilgamish.

The concept is expressed in two, 4-storey height masses of concrete and glass, combined with a traditional central courtyard. The masses' concrete to glass proportions are inspired from the structure of Gilgamish (2/3 human + 1/3 god).

The design concept also based on respecting the local environment, using appropriate climate treatments for facades, inspiring from the deep cultural identity through the formal metaphor of cuneiform letters, and using straight and sharp shapes to express the method of writing with these letters. As well as giving the library a social aspect to be a cultural centre by containing multiple functions, as shown in Fig. (46) [36].

Fig. (46-b): The project under construction

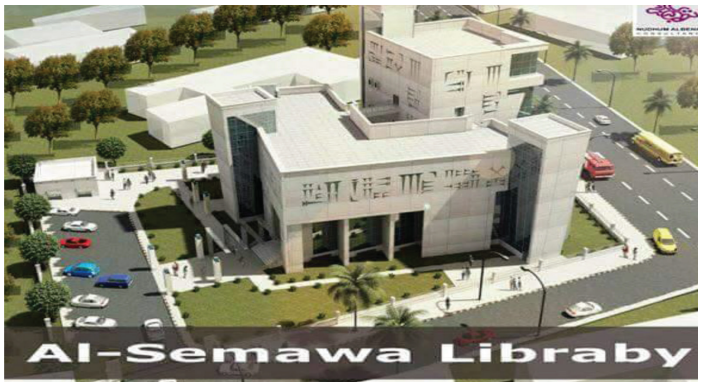

Fig. (46-a): Aerial View

Fig. (46): Library in Samawa City [36]

Table (6): Applying Identity and Belonging Indicators on case study [authors]

Criteria	Indicators		Case Study	
			Central Bank	Library Building
Creativity	Innovative Design concept	Innovative Structure	•	
		Modernization within context	•	•
		Using traditional vocabulary in contemporary style		•
		Using Artistic and cultural values in contemporary style		•
		Using local materials in contemporary style		
		Combining traditional and modern techniques		
		Using place's elements as Symbols	•	•
		Dialogue between civilizations		
Efficiency	Function		It is not assessed because the projects are under construction	
	Services			
Compatibility with context	Urban context	Local Building Materials		
		Traditional Building Techniques		
		Traditional Environmental treatments		
	Historical Context	Artistic and Cultural values		•
Sustainability	Environmental	Environmental treatments	•	•
	Economical	Energy Saving		
		Recycling		
	Social	Housing Projects		
		Community Participation		
		Social development		•

7. Results

•In the Library project, there are more indicators of identity and belonging than in the project of central bank, as shown in Table (6).

•The case studies shared some indicators such as: the modernization within context, Using place's elements as Symbols, and the environmental treatments.

•The Library project was in harmony with its historical context more than the bank, as well as with sustainability indicators. While the bank achieved innovative structure design.

•Neither the bank project nor the library had inspirations from other civilization, implemented traditional techniques, or used local materials.

8. Discussion

•The Central Bank project is characterized by an innovative construction structure more than the library project, due to the use of modern technologies, as well as its distinctive form within the context of city for its form, and height.

•Although both projects are interested in environmental treatments, but those treatments are not inspired from traditional architecture. Despite the resemblance of inspiration from place's elements in both cases, Tigris river in the bank project, and the cuneiform writing in the library project. But the main difference between those inspiration sources, is the cuneiform writing which is a cultural and historical symbol. This indicator has contributed to make the library project in harmony with its historical context, besides being associated with its urban place. In addition, the central courtyard of the library project is considered as a traditional architectural vocabulary.

•Achieving the principles of sustainability in the Central Bank was limited to the environmental aspect, while the library project has achieved sustainability at the environmental and social aspects because it aims to develop community's culture.

9. Conclusions

•The Samawah Library project reflects the local identity and belonging to the context, while the Central Bank project is an expression of its unique identity, especially after its completion. It could become an internationally known landmark.

•Sustainability principles play an important role in the success of contemporary architectural designs.

•Awards criteria have developed from local to international aspects, besides the emphasis on innovative concepts rather than simple or direct metaphors, especially with the development of building materials and construction techniques.

10. Recommendations

•Architects should benefit from architectural awards criteria to give good and creative designs.

•It is possible to nominate local contemporary projects for awards such as Aga Khan or Arab Towns Organization award, because they can achieve more than a criterion to win.

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