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Radical Urban Development in the Egyptian Desert

Abouelfadl S^{1*}, Ouda K², Atia A³, AL-AMIR N³, Ali M³, Mahmoud S³, Said H³ and Ahmed A³

¹Architectural department- College of Engineering, Assiut University, Asyut, Egypt

²Department of Geology- College of Science, Assiut University, Asyut, Egypt

³Architect, Asyut, Egypt

Abstract

Gardens' City is a new city in newly discovered area in the Egyptian western desert, which is rich to be developed. It lies in new Farafra Oasis. The site has different potential aspects for sustainable development; it has agricultural and industrial economic bases. The city center's area is designed to be about 5% of the city's area. The area of the industrial zone is about 22% of city area. This paper refers to the development of the city with a focus on the central and the industrial zones. The city center has the major managerial and commercial services. The industrial zone includes industrial areas as well as the major industrial education, training and managerial services. Renewable energy will be generated with different methods. This city will be the first step of development series opportunities in Egypt.

Keywords: Gardens' city; New Farafra; City centre; Industrial area; Egyptian desert

Introduction

Egypt has the highest population in the Middle East, with about 85 million inhabitants as 2013 reports referred. Egyptian people are living along the Nile (notably Cairo and Alexandria), in the Delta and near the Suez Canal. Egypt's area is about 1 Million square kilometers, but the inhabited area is only 50 thousands kilometer. Nile Delta's area is about 37 thousands kilometer. It represents 74% of the inhabited area. The ratio of land used in agriculture is 3.74% of Egypt's area [1,2]. Several threats will face Egypt's densely populated coastal strip and Nile Delta by the probable dramatic increase of sea level due to global warming. These threats will badly affect Egypt's economy, agriculture and industry. The rise in sea level could turn millions of Egyptians into environmental refugees by the end of the century, as Nile Delta will turn to a wasted land if the sea level only rises 30 cm, which means that 70,000 agricultural jobs will be ended. Challenges have risen now, so we should be prepared for the expected global warming crisis and its impacts [3-5]. This paper discusses the development of Gardens' City in the Egyptian western desert with focus on its' central and industrial zones as a solution for development needs and to overcome the coming challenges. The methodology which is used, site analysis- to discover strength and weakness points- applying international planning ratios and achieving sustainable city planning.

Newly Explored Areas in Egyptian Western Desert

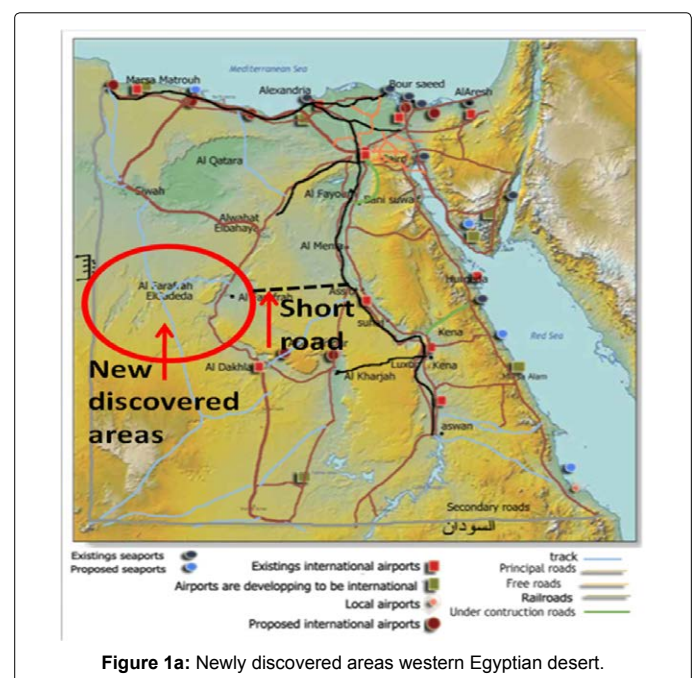
There are different scenarios to help Egypt overcome these challenges. One of them is protecting the Nile Delta lowlands from the sea's incursion by building seawalls along the Delta's entire coastline to hold back the Mediterranean. Another one is to move the affected people to more suitable areas [4].

There is a new discovered area in the Egyptian western desert which can be developed. An Egyptian expedition found about 3.5 million Acres, which are rich to be developed in the Egyptian western desert [6-8]. Figure 1a shows the place of these newly discovered areas, while Figure 1b shows the new discovered oasis and plateaus. This area was always considered as a part of great sand sea.

New Farafra Oasis

The New Farafra Oasis is a part of the newly explored area. It is the

nearest Oasis to the existing urban areas. New Farafra Oasis- extends northeast between altitudes 27° 03' N and 26° 58' E to altitudes 27° 22' 30 N and 27° 24' E, with a maximum NE length of 52 km and a maximum width of 20 km, attaining a total area of 932 km². The floor base of the



***Corresponding author:** Abouelfadl S, Architectural department, College of Engineering, Assiut University, Asyut, Egypt, Tel: +20 88 2423333; E-mail: sabouelfadl@yahoo.com

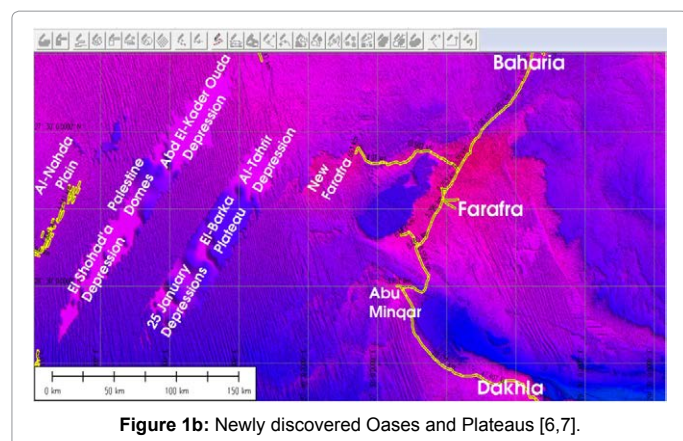
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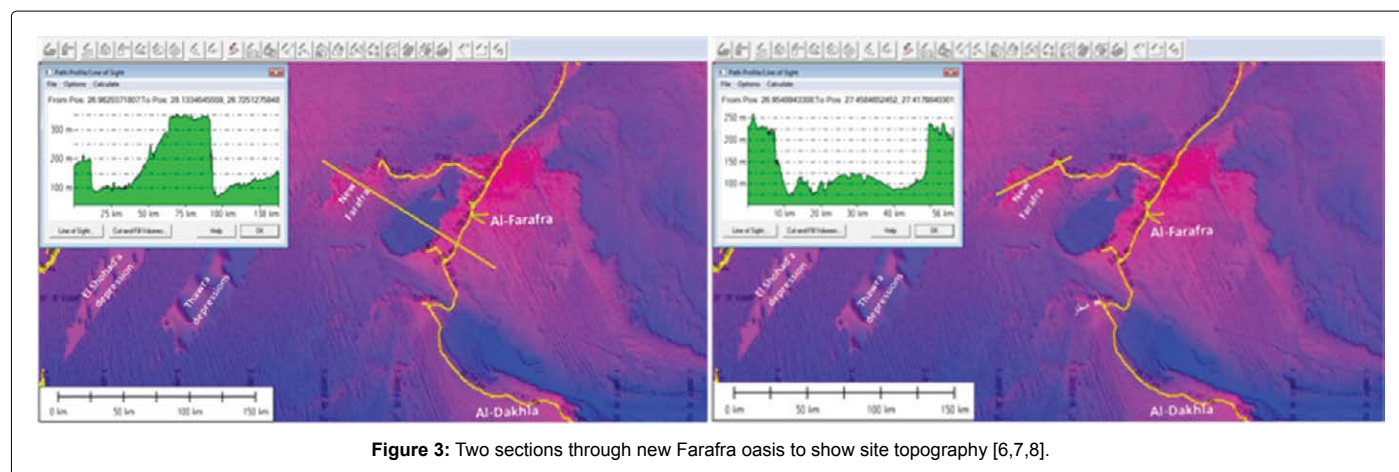
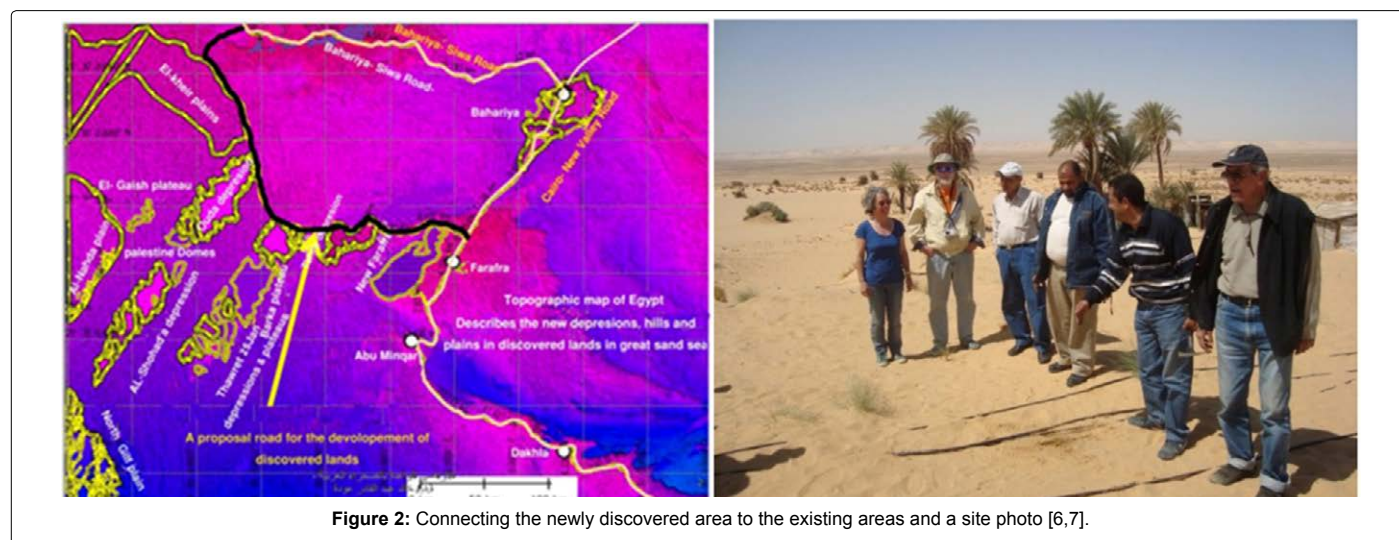
Oasis is situated at a ground elevation varying from 60 m to 115 m and average 94 m above sea level [7,8].

The existing roads from the site to Nile valley are too long (500 km long) so, there are two suggested roads, 1st road which is about 180 km length connects the discovered site to Asyut city as shown in Figure 1a. The 2nd road will connect the discovered site with the existing urban areas around it, Cairo-New valley road from one side and to Baharia-Siwa road from the other side, (Figure 2) [9].



As a development green thinking: This site has a lot of potential aspects (Figures 3 and 4) [9-11]. These aspects are as follows:

- It lies in the Egyptian western desert which represents a high ratio of the Egyptian land that has not been well used yet.
- Flat land is available, which assures easy urbanization and development.
- It is away from sea flooding which may happen due to the global warming, which keeps it safe for the probable future climate migration in Delta and coastal areas in Egypt.
- It lies in Upper Egypt, a part which has been neglected for a long time.
- Water resources are available there; the Nubian sand stone there forms a big storage of water.
- There are natural springheads like Dalah springhead.
- The oasis area is 932 km² (222 thousand acres) which assures great areas of agriculture land.
- Solar and wind energy there are enough to generate clean renewable energy.
- Shale/clay soil is available there which allows agricultural and industrial development.



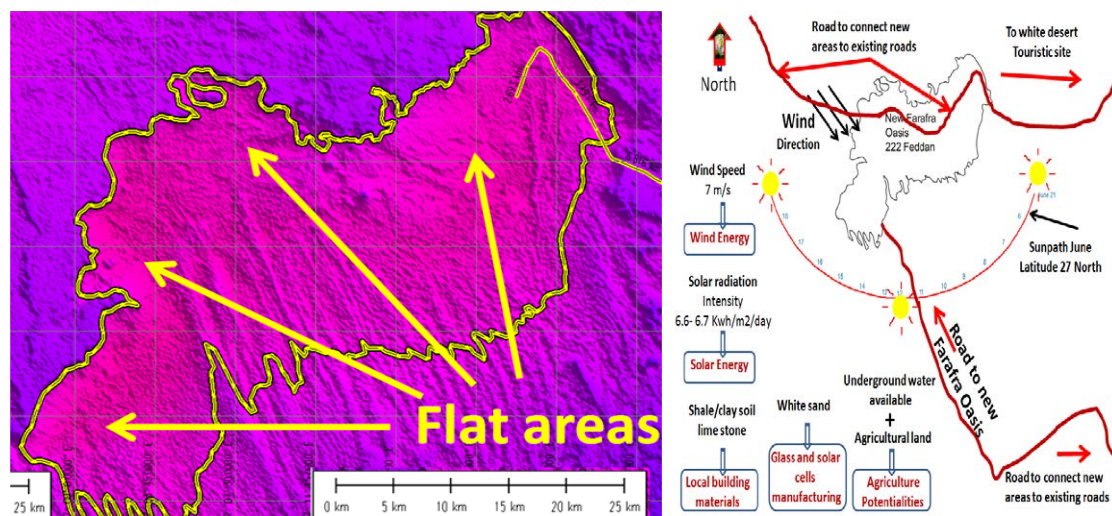


Figure 4: Site potential aspects for new Farafra oasis.

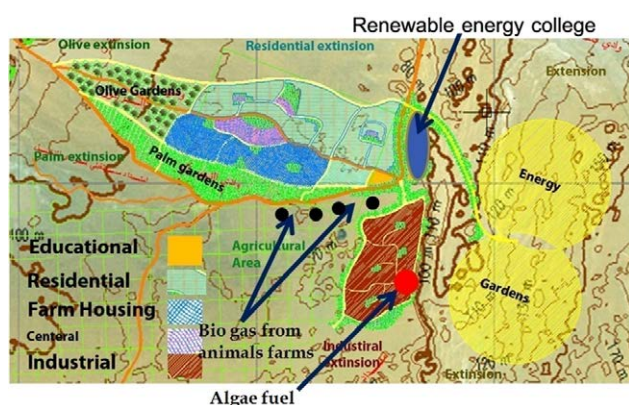


Figure 5: Primary master plan of Gardens' City [9].

- Shale/clay soil and lime stone are available, which facilitates local constructional material.
- The white desert, in the western desert, lies near the site, which allows geological tourism.
- White sand, which is suitable for glass and solar cell manufacturing, is found near the site.

Gardens' City

Gardens' City is a new city, which is planned to be implemented in new Farafra Oasis [9,10]. The site of Gardens' city has been chosen to be located in the eastern northern part of the new Farafra Oasis. The plan benefits from some rough roads are already found in the site, one of these roads has been chosen to be a major axe of the city, and another one will work as a high way. The Egyptian desert, including the area around new Farafra Oasis, is famous for its good palm and olive, which is considered as an economical base for the oasis. A big palm garden is planned southern to the city, with an area enough for about 123 thousands palm trees. Another garden for olive is planned to the west of the city with an area enough for about 78 thousands olive trees. Agricultural area, about 15 thousand acres, will be planted with wheat rotated with other crops (southern to the city). As the city

site has elevations mostly between 70-90 m above sea level, housing areas have been allocated between 70-80 m above the sea level. The industrial zone lies in the southern east of the city. The energy production area will be 100 m above sea level, which lies eastern to the city with an extendable area up to 9000 acres. A primary master plan shows different zones in Gardens' city and future extension areas for different zones is in Figure 5. The city master plan, which has been also developed, adopts neighborhood community system with services inside each community. Local materials, like plants rest, will be used firstly to feed 750 thousands animals head in specific animal barns area, lies southern to the city, then the remains in addition to the animal residue will be used in producing biogas and fertilizers. Algae will be planted on a sanitary lake in the industrial area to produce biofuel. New Farafra Oasis will be developed in parallel with Gardens' City in the four developing flat spots (Figure 4). Gardens' City is planned for about 117 thousand inhabitants. Each developing spot in the oasis will have 250 thousand inhabitants, so the target will be a million inhabitants, so in the whole oasis [9].

Gardens' City will be sustainable in energy, agriculture, land use, rest and residue etc. It will have four different kinds of renewable energy and a yearly net profits about 63-90 Million Egyptian pound (LE). The whole new Farafra oasis will have around a million palm trees, 633 thousands olive tree and 60 thousand acres of wheat. The yearly net profits are estimated to be 394- 535 Million LE [10].

Gardens' City Center

The city centre is 137 acres, which forms about 5% of city area without including the industrial area, which has its own central area. The city centre includes central managerial and commercial areas lies in 397 land pieces. These land pieces are divided into, 203 land pieces of about 400 m² area for commercial use and 194 land pieces of about 900 m² area for managerial use. The city centre has two places for car parking, they wide for about 1100 cars. In addition to, a big central park of about 10.3 acres, (Figure 6). shows land use, roads, and the big central city garden of the city central area.

The Industrial Zone

Gardens' City area is 3250 acres including the industrial zone. The

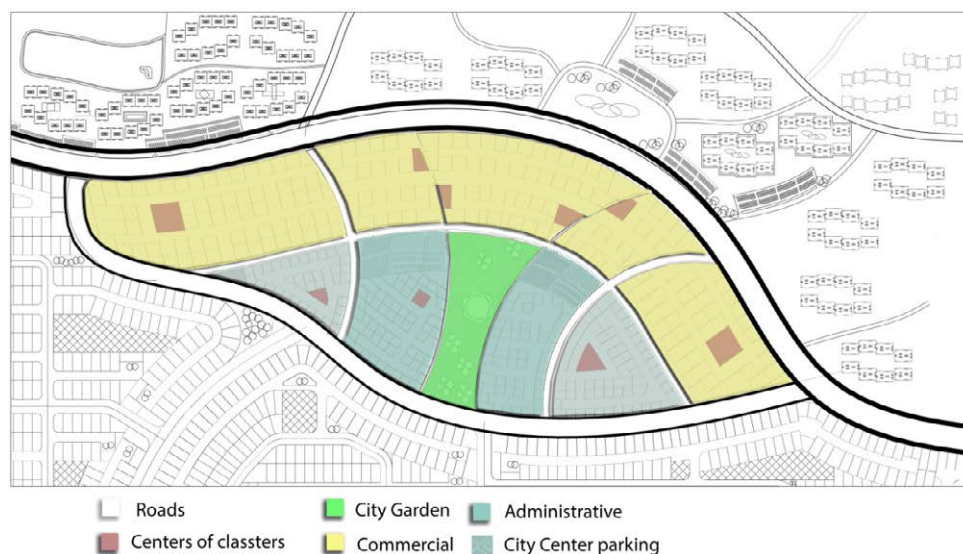


Figure 6: City centre.

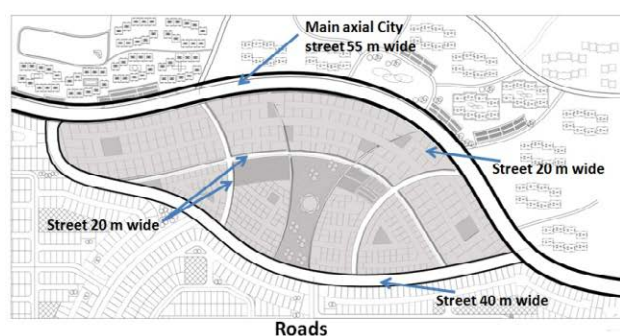


Figure 7: City centre land use, roads, sub centers and the city garden.

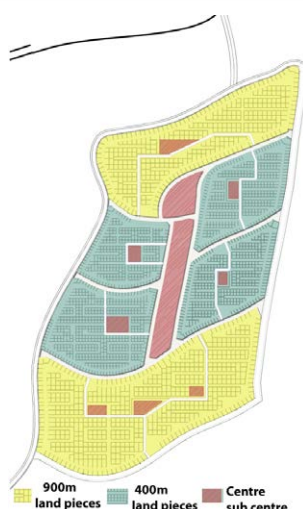


Figure 8: The industrial zone.

area of the industrial zone is 720 acres (22% of city area). It consists of 2401 land pieces. 1494 piece of about 400 m² each (262.3 acres), and 907

piece of about 900 m² each (334 acres). Total area of land pieces=596.7 acres. The area of streets is about 296 acres (41% of the industrial area). Each piece of land has a direct access on a street of at least 20 m wide. An industrial project might take any number of land pieces according to planning requirements of factory. The main streets and the central area of the industrial area are designed to be 123.3 acres (17% of the industrial area). The industrial area centre is 38 acres (5.3% of industrial zone), (Figure 8). Tables 1-3 show services ratios and areas in industrial zone, Figure 9 shows the industrial zone's land use, roads and centre and sub centers. Services have been distributed in the central and sub central areas in the industrial zone. Figure 10 shows Gardens' City, its central and industrial zones and the neighborhood system used.

Feasibility Study for Gardens' City

Gardens' City will be the first step in a series of development opportunities in Egypt. It will be sustainable in energy, agriculture, land use, rest and residue etc. It will have four different kinds of renewable energy. The estimated yearly net profit for the city would be 63-90 Million Egyptian pound (LE) and 394-535 Million LE yearly net profit for the whole new Farafra oasis from olive, palm and wheat only. Tables 4 and 5 shows that plants rest will be able to supply animal farms with the required animals' food [10].

| Land use | Land use ratios% | | |
|-----------------------|------------------|---------|---------|
| | Minimum | maximum | Average |
| Industrial Land use | 60 | 70 | 65 |
| Services | 3 | 7 | 5 |
| Roads and car parking | 18 | 32 | 25 |
| Green and open areas | 3 | 7 | 5 |

Table 1: Land use ratios in industrial city [12,13].

| Services | Per unit | |
|--------------------|---|--|
| Medium Industries | 15-25 craftsman/Acres | 14400 labour/720 Acres Divided to sex sector |
| Commercial | 0.35 m ² /person in sector | 5040 m ² for the sector |
| | 0.56 m ² / person in neighbourhood | 1008 m ² for a neighbourhood |
| Religious | 1.05/person in the sector | 15120 m ² for the industrial sector |
| | 1.4 m ² /person in neighbourhood | 2520 m ² for the neighbourhood |
| | 1.2 m ² For a cell in the neighbourhood | 600 m ² for a cell |
| Recreational | For the sector | 30 Acres |
| | For the neighbourhood | 5 Acres |
| | For a cell | 1 Acres |
| Educational | A Kinder garden for 2000-3000 person with a service scope 400 m (an area of 0.15- 0.25 Acres) for 75-100 child. | 5-8 kinder garden for the industrial zone (0.75-2.0 Acres) - 375-800 child |
| | Secondary school | 1 high technical school |
| | Craftsmen 0.75-1.5 m ² /person | Craftsmen village 10800-21600 m ² |
| | Vocational training centre | 1 Vocational training canter |
| Health | For the sector a Polyclinic for 20000-50000 person | 1 Polyclinic with an area 0.6 Acres with service scope of 1000 m |
| | For a neighbourhood a health canter for 5000- 10000 person with a service scope 250-300 m (an area 0.1 Acres) | 1 health canter |
| Secondary services | 1 Fire extinguisher Station | 1 Fire extinguisher Station, |
| | 1 police station per 20000- 30000 person | 1 police station |
| | 1 Ambulance station per 30000-40000 person (4-10 ambulance car) | 1 Ambulance station |
| Car parking | 15 place/1000 m ² in mosque 5.5 place/100 commercial mall 100-200 place/1000 m ² recreational | |

Table 2: Industrial area (720 Acres–1 Acres= 4200 m²) [12,13].

| | |
|-----------------------------------|--|
| Services ratio/ industrial region | 5.3% (160750 m ² =38 Acres) |
| services | % From region service area |
| Industrial services | 30-50 (40 average) (60480 m ²) (general industrial management, marketing, Incubator projects, maintenance, ... |
| Social services | 20-40 (average 30) (45360 m ²) |
| General services | 20- 40 (average 30) (45360 m ²) (police station, civil defence, commercial, health, religious |

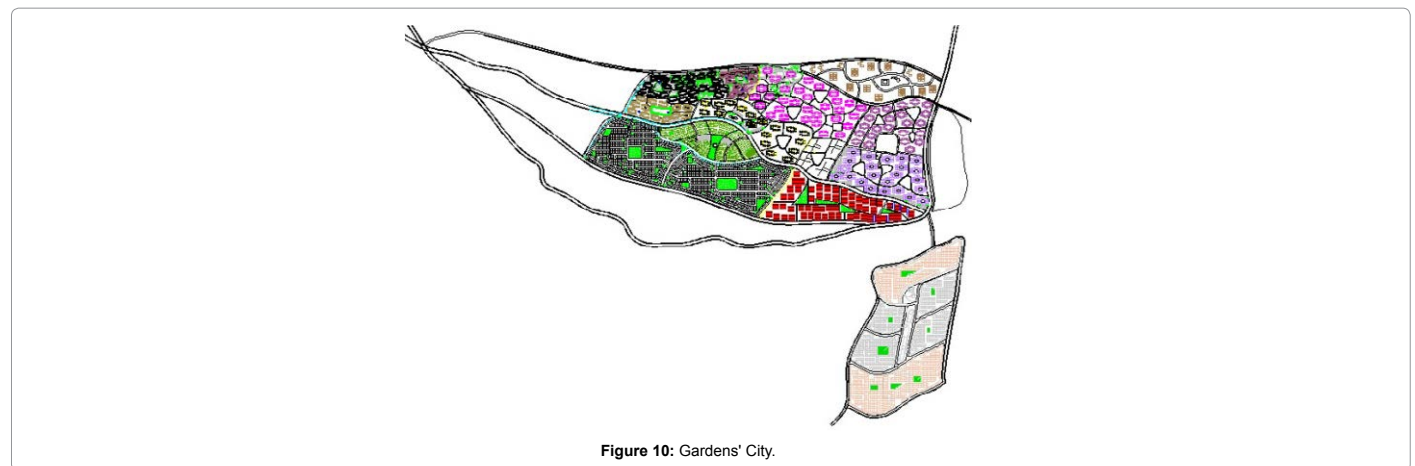
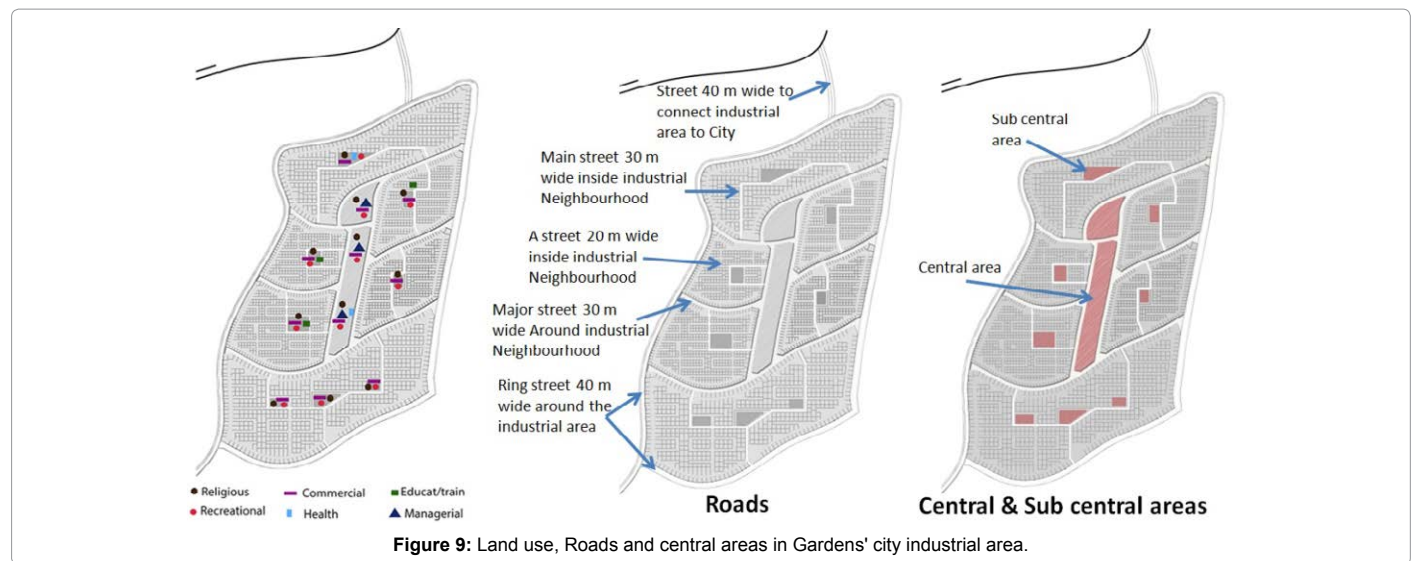
Table 3: Industrial services ration [12,13].

Sustainable Community

Creating a sustainable community is not including the economic side only, but also other aspects of life: social justice, freedom, dignity, respecting rules and duties etc as shown in Figure 11 so, Gardens' City will be sustainable in different aspects as follows:

Land owning

A part of the city strategy is to give youth about 3000 piece land pieces with economical price. Daily consumed crops like tomatoes, potatoes etc. will be planted there. This will help in attracting inhabitants, allow them produce their needs of vegetables and fruits, give them the chance to feel owner of the city, enhance their creativity and drive their



| Gardens City before extension | City production (Ton) | Agricultural rests (Ton/1000 Ton) | City Agricultural rests (Mio Ton) | City Agricultural rests after future extension (Mio Ton) | Oasis Agricultural rests (Mio Ton) |
|-------------------------------|-----------------------|-----------------------------------|-----------------------------------|--|------------------------------------|
| Wheat straw | 42000 | 60000-75000 | 2.520-3.150 | 2.520- 3.150 | 10.520-12.600 |
| Olive Leaves and branches | 2508 | 1000 | 25.080 | 50.16 | 200.64 |
| Olive geft | 2508 | 25000 | 62.700 | 125.4 | 501.6 |

Table 4: Plants rest in Gardens' city [14-16].

| Cows (head) | City needs - concentrated Feed (Thousand Ton/ day) | City need- concentrated Feed (Thousand Ton/ year) | City needs from dry fillers (Thousand Ton/ day) | City needs from dry fillers (Thousand Ton/ year) | Green Feed (Ton/ day) | Green Feed (Mio Ton/ year) |
|-------------|--|---|---|--|-----------------------|----------------------------|
| 375000 | 4.500-5.625 | 1.6-2.0 | 1.870 | 2.3-2.7 | 5625-5625 | 1.3-2.0 |

Table 5: Animal food needed in Gardens' City animals farms [17,18].

efforts forward. Legislation will prevent selling these land pieces before 30 years to prevent investing and price rising by selling them.

Production and work

The produced crops will be collected by companies or organizations to be sold inside and outside the city. Homes will be used as residence, work and investment. From the profit, lands' prices will be paid.

People will find chances in planting palms, olives and other plants. Corporations will have opportunities in planting wheat and other national crops and other materials. Industrial expertise will help developing industry and energy in the oasis. Academics will develop theoretical and practical education for energy and industry. Industry will be initiated on crops and other materials. There will be more

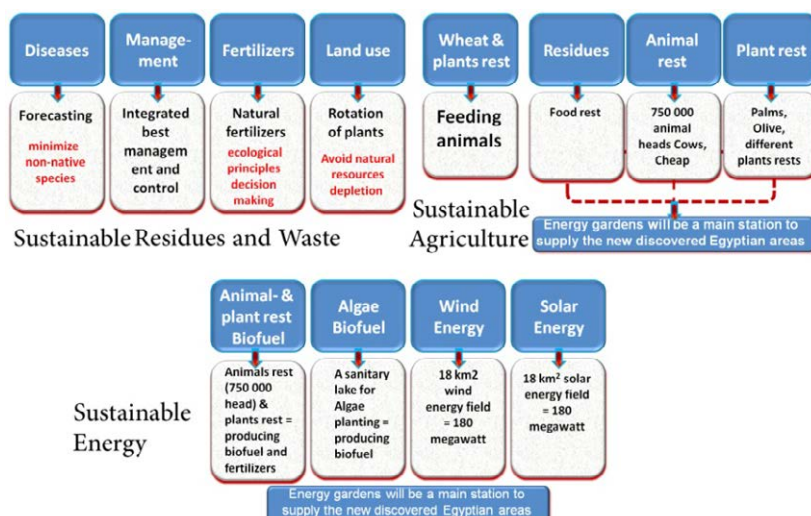


Figure 11: Sustainable in Gardens' city.

than a half million work opportunities for different people (educated, craftsmen, expertise, workers, etc.).

Social reality

The city targets to attract different inhabitants. Both youth and expertise will find opportunities. Farmers and industrial worker will have chances. Investors and job seekers as well as, people who are newly coming back from abroad and those who are in danger due to global warming in Delta and coastal areas in Egypt will find places there. People will share societies and help serving them. All this will allow a stabilized, balanced society and assure dignity and social justice.

Managing a sustainable community:

Decentralization mixed with centralization will be applied to assure a good city reward and Egyptian commercial and economical identity. Crops will be defined through councils from land owner themselves and expertise. Civil societies will solve problems and afford needs and technical help. City citizens will form councils in each city quarter. Expertise will help people to produce best quality products and market them. Prizes will be rewarding for citizens and the city. The city commercial chamber will be responsible for making commercial agreement in Egypt and abroad.

Sustainability aspects: site, water, materials, infrastructure, energy

City site lies on flat land easy to be built. A beautiful touristic site near the oasis gives touristic opportunities. Water is available near ground surface. It will be used wisely. A new sanitary net design will be used to collect used water. Gray water will be reused to grow plants, palms olives, and in industry. Lime stone in the oasis with shale/clay soil form local building materials. Renewable energy will be produced to supply the newly discovered areas in the Egyptian western desert. Biofuel from plants and animals residues and from algae will be also produced [9,10].

Steps on the Road

A conference has been held in September 2012 in the new valley governorate in Egypt announcing the start of new Farafra oasis development. Some investors suggested initiating the city infrastructure.

10 Millions Egyptian pounds have been assigned for experimental wells in the oasis. Another conference has been held at the same governorate on 27th November 2012 looking for financial support. A professor team from Assiut University is ready to develop the project. Professor from agricultural college will define agricultural priorities, best irrigation methods for different crops, local plants in the area to develop their species. Professors from civil engineering roads will design the road from Asyut to new Farafra and other roads. Professors from department of Mining and Metallurgical and civil material professors will study the soil to develop building material from local existing materials. Professors from sanitary specialty will study the city's sanitary system to make use of solid and liquid wastes and plant algae on sanitary water to produce Biofuel. Professor from survey department will develop maps to help plotting the city on land. Professors from mechanical and electrical departments will study making use of wind and solar power. From architecture department the planning team and from College of Science a geological team etc. Investing opportunities will be opened in the new Farafra oasis in different related fields.

Conclusion

Gardens' City is a future city in the new Farafra Oasis in the Egyptian western desert. It represents a sustainable development to afford future growth needs and overcome the probable immigration from Delta and Nile regions due to climate change. Gardens' City is planned for 117 thousand inhabitants in a development spot system with a target of one million inhabitants in oasis. The city centre has 203 land pieces for commercial use, 194 land pieces for managerial use, a big central recreational garden and two big central parking areas. The industrial zone's area is 720 acres. It has 2401 land pieces for industrial use in six industrial neighborhoods with different services. It has a technical school, a craftsmen village and a vocational training centre. Its' central area has the main industrial managerial service. Gardens' City will have different sustainable options and the estimated yearly net profit for it would be 63-90 Million Egyptian pound (LE) and 394-535 Million LE yearly net profit for the whole new Farafra Oasis from olive, palm and wheat only. This city will be the first step that opens great development opportunities in Egypt.

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