Towards Green Infrastructure

"A Digital Approach to improve Resilient and Adaptation Factors to Climate Change in Existing Cities"

Research Proposal submitted by

Nihal Alaa' ElDeen Muhamed Rafeek Kamel

Teaching Assistant in Arch. Dep. Faculty of Engineering- Fayoum University

Requirements for obtaining PHD in Architecture Engineering

Supervisor committee

Prof.Dr. Ehab Mahmoud Bayoumi Okba main supervisor

Professor of environmental design and planning-

Faculty of Engineering – Fayoum University .....

Prof.Dr. Mohga Emam Embaby Hassan Supervisor

Professor of Architecture and urban design –

Faculty of Engineering – Fayoum Univesity .....

Faculty of Engineering

Fayoum University

2025

Towards Green Infrastructure

"A Digital Approach to improve Resilient and Adaptation Factors to Climate Change in Existing Cities"

Research Proposal submitted by

Nihal Alaa' ElDeen Muhamed Rafeek Kamel

Teaching Assistant in Arch. Dep. Faculty of Engineering- Fayoum University

Requirements for obtaining PHD in Architecture Engineering

This thesis for PHD degree has been approved by:

Prof.Dr. Ehab Mahmoud Bayoumi Okba main supervisor
Professor of environmental design and planning-
Faculty of Engineering – Fayoum University .....

Prof.Dr. Mohga Emam Embaby Hassan Supervisor
Professor of Architecture and urban design –
Faculty of Engineering – Fayoum Univesity .....

Prof.Dr. Gihan Elsayed AbdelDayem
Professor of Urban Planning -
Faculty of Engineering – Helwan University .....

Prof.Dr. Shaimaa Ahmed Magdy Amin
Professor of Urban Planning -
Faculty of Engineering – Fayoum University .....

Faculty of Engineering
Fayoum University

2025

ABSTRACT

This research adopts a **comprehensive scientific methodology**, commencing with problem identification, objective setting, data collection, and analysis, culminating in findings and recommendations. The study comprises an introduction outlining the topic's significance, objectives, and chosen methodology, followed by **three main sections**: theoretical, analytical, and applied, in addition to the conclusion and recommendations.

The **theoretical section**, presented in Chapters 1 and 2, explores fundamental definitions and concepts, including:

1. The concept of resilience and its components
2. Steps for achieving resilience
3. Green infrastructure (GI) and its various types
4. Methods for implementing GI
5. Applications of Natural based solutions
6. Outcomes of the theoretical study

The **analytical section**, discussed in Chapter 3, examines the application of GI in existing cities through an analysis of similar global experiences. This leads to the findings of the analytical study and the analytical framework subsequently utilized in the applied study.

The **applied study**, covered in Chapters 4 and 5, delves into the theoretical background of various digital approaches and their methodologies in Chapter 4. Chapter 5 then applies these theories and analyses to existing Egyptian cities. This involves a case study comparing the current situation with a simulated model of the study cities after incorporating various interventions (specifically, the cities of Kerdasa in Giza and Al-Qusiya in Assiut were studied).

Finally, the research concludes by formulating a relationship between different types of infrastructure interventions and the

percentage improvement in environmental variables to achieve elements of urban resilience in the face of climate change impacts. The study also presents several findings and recommendations aimed at achieving resilience in Egyptian cities.