



Cairo University
Faculty of Engineering
Department of Architecture

Shaping Neighbourhood

As an Appraisal Approach Concerning Sustainability of Urban New Communities in Egypt

Prepared By

Sherif El Sayed El Said M. Donia

A thesis submitted in partial fulfillment of the requirements of
The Doctor of Philosophy Degree in Architecture

Faculty of Engineering
Cairo University
2014



Cairo University
Faculty of Engineering
Department of Architecture

Shaping Neighbourhood

As an Appraisal Approach Concerning Sustainability of Urban New Communities in Egypt

Prepared By

Sherif El Sayed El Said M. Donia

A thesis submitted in partial fulfillment of the requirements of
The Doctor of Philosophy Degree in Architecture

Under the Supervision of

Prof. Dr. Hesham Sameh Hussein

Professor of Architecture
Faculty of Engineering
Cairo University

Ass. Prof. Dr. Mohamed Reda Abdallah

Ass. Professor of Architecture
Faculty of Engineering
Cairo University

Shaping Neighbourhood

As an Appraisal Approach Concerning Sustainability of Urban New Communities in Egypt

Prepared By

Sherif El Sayed El Said M. Donia

A thesis submitted in partial fulfillment of the requirements of
The Doctor of Philosophy Degree in Architecture

Under the Supervision of

1. Prof. Dr. Hesham Sameh Hussein Sameh

Professor of Architecture
Faculty of Engineering
Cairo University

2. Ass. Prof. Dr. Mohamed Reda Abdallah

Ass. Professor of Architecture
Faculty of Engineering
Cairo University

3. Prof. Dr. Emad Aly El Din El Sherbiny

Professor of Architecture
Faculty of Engineering
Cairo University

4. Prof. Dr. Mohamed Shoukr Nada

Professor of Architecture
Faculty of Engineering
El Fayoum University

Acknowledgement

For the sake of **Allah**,
To my heart; **Prophet Mohammad** (Peace and blessings upon him)
To the soul of my **Dear Mother** - who is always in my heart
To my tender **Father**
To my beloved **Wife** and **Son**
To all of my **Brother** and **Sisters**
To all my **Teachers** and also to thesis **Examiners**

The Researcher

TABLE OF CONTENTS

Cntents	i
List of Figures	x
List of Tables	xix
Abstrac	xxi
Research Broblem	xxi
Research Objectives	xixx
Research Structure	xxii

Part (1): Literatures reviews

1. SUSTAINABILITY	3
1.1. Definitions of Sustainability	3
1.2. Sustainable Goals	5
1.2.1. Environmental Sustainability	5
1.2.2. Social Sustainability	6
1.2.3. Economical Sustainability	6
1.3. Sustainable Development in Egypt	7
1.4. The Concept of Sustainable Design	9
1.5. Sustainable Design Guidelines	10
<hr/>	
2. REINVENTING NEIGHBOURHOODS	13
2.1. Making places that are healthy, safe and sustainable	13
2.2. Neighbourhood planning	13
2.3. The Neighbourhood as Habitat (The Ecosystem Approach)	15
2.3.1. Ecological niche and symbiosis	15
2.3.2. The Neighbourhood ecosystem model	16
2.3.3. Neighbourhood design principles	18
2.3.4. Defining Neighbourhoods	21
2.3.5. Neighbourhood Form	25
2.3.6. Township, Ownship, Neighbourhood and Home-Patch	28
2.3.7. Neighbourhood Planning Procees – (Master plan as implementation)	31
2.3.8. Development Proposal	33
2.3.9. Submitting an application	35

Part (2): Neighbourhood Components

3.	SUSTAINABLE NEIGHBOURHOODS	38
3.1.	Key differences from current policy approach	39
3.2.	Principal aims	40
3.3.	Trends in neighbourhood design approaches	40
3.4.	Proposals	41
3.4.1.	Objectives and requirements	41
3.4.2.	Compliance with sustainable neighbourhood's objectives	41
3.5.	Applications	42
3.5.1.	Local structure plans	42
3.5.2.	Subdivisions	43
3.6.	Application Information Guide	44
3.7.	Community design	47
3.7.1.	The need to design for sustainable communities	47
3.7.2.	Key differences from conventional practice	48
3.7.3.	General principles and background to objectives and requirements	49
3.7.4.	Community Design Objectives	54
3.7.5.	Community Design Requirements	55
3.7.6.	Sustainable Community Checklist	63
4.	SUSTAINABLE NEIGHBOURHOODS CASE STUDIES	65
4.1.	Songdo Green City	65
4.1.1.	Songdo Neighbourhoods	65
4.1.2.	Livable Streets	66
4.1.3.	Public Transportation	67
4.1.4.	Songdo Rental Bikes	68
4.1.5.	Water Use Network	69
4.1.6.	Waste Collection	70
4.1.7.	Energy Network	71
4.1.8.	Songdo High Performance Buildings	72
4.2.	Geos Net-Zero Energy Mixed-Use	73
4.2.1.	Project Data	79
4.2.2.	Geos Land Uses	74
4.2.3.	Geos Energy and water	75

4.2.4.	Optimize Density With Solar Access	76
4.2.5.	Geos Layout for Solar Access	77
4.2.6.	Geos Passive House	78
4.2.7.	Storm Water Management and Civic Life	80
4.2.8.	Geos Parks: Squares	82
4.3.	Cairo Eastown and Westtown	83
4.3.1.	Addressing an Urgent Need	83
4.3.2.	Creating an Authentic Urban Experience Building on the Past While designing the Future	84
4.3.3.	Westown and Eastown Master-plans	84
4.3.4.	Cairo Westown Neighbourhood	88
4.3.5.	Cairo Eastown Neighbourhood	94
<hr/>		
5.	MOVEMENT NETWORK - Element (1)	104
5.1.	Key differences from conventional practice	104
5.2.	Arterial routes classification	106
5.3.	Relationship between Functional Road Hierarchy and Sustainable Neighbourhoods	106
5.3.1.	Primary distributors	106
5.3.2.	Types of integrator arterials	106
5.3.3.	Arterial network spacings	107
5.3.4.	Controlling vehicular access along arterial routes and neighbourhood connectors	107
5.4.	Local streets classification	110
5.4.1.	Neighbourhood connectors	110
5.4.2.	Access streets	111
5.4.3.	Special purpose streets	111
5.4.4.	Laneways	112
5.4.5.	Culs-de-sac	112
5.5.	Network connectivity and Management	112
5.5.1.	Control of vehicle speed in local streets	112
5.5.2.	Intersection controls	113
5.6.	Pedestrian movement network	113
5.6.1.	Pedestrian interest, safety and efficiency	113
5.6.2.	Walkable catchment (ped shed) efficiency	114
5.7.	Safe routes to schools, bus stops and stations	114
5.8.	Cyclist movement network	114

5.9.	Shared paths and dedicated bike paths	114
5.10.	Movement network for users with disabilities	115
5.11.	Public transport	115
5.11.1	Bus routes and stops	115
5.11.2	Enhanced transit facilities including bus and/or light rail transit-ways	116
5.11.3	Railway routes and station locations	116
5.12.	Road safety audits	116
5.13.	Clearance to trees in streets	116
5.14.	Objectives	124
5.15.	Requirements	126
5.16.	Sustainable Movement Network Checklist	137
<hr/>		
6.	COMMUNITY WALKABILITY - Element (2)	139
6.1.	Aspects of walkable communities	139
6.2.	The importance of urban form	141
6.3.	Personal security issues	143
6.4.	Pedestrian Network Components	144
6.4.1.	Traffic-reduction engineering techniques	144
6.4.2.	Traffic calming	145
6.4.3.	Network components outside the roadway	146
6.4.4.	Network components on the roadway	149
6.5.	Assessing the demand for walking	153
6.5.1.	Key issues in assessing demand	153
6.5.2.	Methods of assessing current demand	153
6.6.	Objectives	155
6.7.	Requirements	156
6.8.	Sustainable Walkable Network Checklist	164
<hr/>		
7.	LOT LAYOUT - Element (3)	166
7.1.	Key differences from conventional practice	166
7.2.	General principles and background to objectives and requirements	166
7.2.1.	Lot layouts for housing diversity and density	166
7.2.2.	Lots for special uses and future residential and/or business intensification	167
7.2.3.	Lot layout to front parks and natural areas	167

7.2.4.	Lot layout to front major streets	167
7.2.5.	Lot layout and garage locations	167
7.2.6.	Lot Layouts to facilitate noise protection	168
7.2.7.	Detailed area plans	168
7.3.	Requirements	169
7.4.	Sustainable Lots Checklist	178
<hr/>		
8.	ACTIVITY CENTERS AND EMPLOYMENT - Element (4)	180
8.1.	Key changes from conventional practice	181
8.2.	General principles and background to objectives and requirements	182
8.2.1.	Why mixed-use main street centres instead of enclosed retail complexes?	182
8.2.2.	Typical town centre main street retail locations relative to arterials	183
8.2.3.	Typical Street and block layouts for main street retail and related anchor stores	184
8.2.4.	Hybrid centre layouts incorporating some enclosed mall retail in a main street centre	185
8.2.5.	Larger neighbourhood centres	185
8.2.6.	One-way arterial couplets in centres	186
8.2.7.	Street types and parking in activity centres	186
8.2.8.	Key location and design parameters for neighbourhood and local centres	188
8.2.9.	Schools and neighbourhood centres	190
8.2.10.	Integrating large-format stores or carbased big box uses into a walkable urban activity centre	190
8.2.11.	Providing denser housing in activity centres	191
8.2.12.	Home-based business	191
8.2.13.	Public transport and overall density in activity centres	191
8.3.	Requirements	194
8.4.	Sustainable Activity Center Checklist	198
<hr/>		
9.	PUBLIC PARKLAND - Element (5)	200
9.1.	Key changes from conventional practice ...	200
9.2.	General principles and background to objectives and requirements	201
9.2.1.	A wider range of parks and other open space	201
9.2.2.	Visual surveillance of parks – promoting safety	201
9.2.3.	Key challenges in relation to parkland provision	201
9.3.	Requirements	202
9.4.	Sustainable Public Parkland Checklist	209

10. SCHOOLS - Element (6)	211
10.1. Key changes from conventional practice ...	211
10.1.1 Primary schools	211
10.1.2 Secondary schools	212
10.2. General principles and background to objectives and requirements	212
10.2.1 Provision of school sites	212
10.2.2 Location	212
10.2.3 Demand for school sites (1)	213
10.3. Requirements	214
10.4. Sustainable School Checklist	217
<hr/>	
11. UTILITIES - Element (7)	219
11.1. General principles and background to objectives and requirements	219
11.1.1 Utility services	219
11.1.2 Reductions in street widths	219
11.1.3 Reticulated sewerage	219
11.1.4 Underground power	219
11.1.5 Waste water re-uses	219
11.1.6 Provision of street trees and street lighting	220
11.1.7 Services in rear laneways	220
11.2. Requirements	221
11.3. Sustainable Utilities Checklist	225
<hr/>	
12. SUSTAINABLE HOMES - Element (8)	227
12.1. Building Elements	227
12.1.1 Site and landscape	227
12.1.2 Site and landscape Objectives & Requirements	228
12.2. Dwelling access	233
12.2.1 Dwelling access Objectives & Requirements	233
12.3. General dwelling design	238
12.3.1 General dwelling design Objectives & Requirements	238
12.4. Building material and finishes	243
12.4.1 Building material and finishes Objectives & Requirements	243
12.5. Plumbing and drainage	248

12.5.1	Building material and finishes Objectives & Requirements	248
12.6.	Electric, Lighting and Gas	249
12.6.1	Electric, Lighting and Gas Objectives & Requirements	249
12.7.	Sustainable Home Checklist	252

Part (3): Application Part

13.	SUSTAINABLE NEIGHBOURHOOD DESIGN	256
13.1.	Sustainable Neighborhood Frame Work	256
13.1.1	Sustainable Neighborhood Definition, Target, and Content	256
13.1.2	Connected Neighborhoods	256
13.1.3	Sustainable Neighbourhood Public Transport	256
13.1.4	Sustainable Neighbourhood Design Efficiency	257
13.1.5	Diverse and Convenient Neighborhoods	257
13.1.6	Sustainable Neighborhood Walkable Streets	257
13.1.7	Reduced Parking and Transportation Demand	258
13.1.8	Bicycle-Friendly Design	258
13.1.9	Mixed Uses and Community Spaces	259
13.1.10	Sustainable Neighborhood Green Buildings	259
13.1.11	Reducing Pollution	260
13.1.12	Keeping Things Cool	260
13.1.13	Neighborhood-Wide Energy Efficiency	261
13.1.14	Reuse and Recycling	261
13.2.	Approach to Realize The Neighbourhood Design Objectives	269
13.2.1	Synergy	269
13.2.2	The Integration Process	269
13.2.3	Hierarchy of the System Components Scales and their interrelationships	272
13.2.4	The Logic Behind the Integration Process	274
13.2.5	Applying the approach	276
13.2.6	The Basic Structure of the Proposed Community	277
13.3.	Phases of Designing Sustainable Neighbourhoods	283
14.1.	Sustainable Neighbourhood Model Context	296
14.1.1	Defining the Master Plan Area	296
14.2.	Physical Opportunities and Constraints	297
14.2.1	Opportunities	297
14.2.2	Constraints	298

14.3.	Shaping the Overall Strategy	299
14.3.1	Vision	299
14.3.2	Design Generators	300
14.4.	Master Plan Concepts	309
14.4.1	Important Design Principles	309
14.5.	Landuse Framework, Strategy	310
14.6.	Urban Form And Density	312
14.6.1	Urban Structure	312
14.6.2	Mix of Housing Types and Residential Intensity	312
14.6.3	Building Frontages	314
14.7.	Urban Design Framework	316
14.7.1	Key Streets & Boulevards	316
14.7.2	Activated Edges	316
14.7.3	Pedestrian Linkages	316
14.7.4	Proposed Roads	317
14.7.5	Signalised Crossings	317
14.7.6	Parking	317
14.7.7	Passive Surveillance	317
14.8.	Public Realm and Open Spaces	318
14.8.1	Public Realm and Open Space Strategy Objectives	318
14.8.2	Public Realm	318
14.8.3	Open Spaces	319
14.9.	Neighbourhood Transportation Center	320
14.10.	Neighbourhood Transportation	322
14.10.1	Public Realm Contribution of the Neighbourhood Transportation	322
14.10.2	Principles for Consideration	322
14.10.3	Primary Streetscapes	322
14.10.4	Secondary Streetscapes	326
14.10.5	Tertiary Streetscapes	326

15. SUSTAINABLE NEIGHBOURHOOD INFRASTRUCTURES

15.1.	Sustainable Neighbourhood Water Management	334
15.1.1	Engineering and design issues	334
15.1.2	Green Streets	337
15.1.3	Green Alleys, Driveways and Walkways	338

15.1.4	Green Stormwater Infrastructure Tools	339
15.2.	Sustainable Neighbourhood Energy Management	341
15.2.1	Solar Cells or Photovoltaic (PV) Panels System	341
15.2.2	Solar Thermal Water Collector System	342
15.2.3	Solar Thermal Water Collector System	343
15.3.	Sustainable Neighbourhood Waste Management	345
15.3.1	Waste Hierarchy	345
15.3.2	Waste Management Methodology in the Study Area	345

Part (4): Conclusions and Recommendations
--

16.	CONCLUSIONS AND RECOMMENDATIONS	350
16.1.	Conclusions	350
16.1.	Recommendations	353

FIGERES

Fig.(V-1): Diagram showing different parts of the research and the chapters they contain.	v
Fig.(1-1): Stresses from human settlements on the surrounding natural environment	4
Fig.(1-2): Pillars of sustainable development	8
Fig.(1-3): Traditional development landscape with turf grass, widely placed trees and foundation Shrubs.	16
Fig.(1-4): Landscape modified to conserve water and reestablish indigenous plants.	17
Fig.(2-1): The settlement as an ecosystem.	21
Fig.(2-2): Ecosystem model of a neighbourhood	22
Fig.(2-3): The neighbourhood determinants of health.	22
Fig.(2-4): The influence of physical planning	23
Fig.(2-5): The impact of activities and the built environment on the neighbourhood ecological footprint.	23
Fig.(2-6): Neighbourhood design principles.	24
Fig.(2-7): Characterising Neighbourhoods.	27
Fig.(2-8): Neighbourhoods delineated by planners	31
Fig.(2-9): Closed cell pattern illustrated at Poundbury, Dorset.	32
Fig.(2-10): Harlow: Neighbourhoods clustered around the district shopping centre	33
Fig.(2-11): Linear concentration in Peterborough	33
Fig.(2-12): Nested scales: township, neighbourhood and home-patch	35
Fig.(2-13): It is sometimes difficult to see where neighbourhoods start and stopContext map	40
Fig.(2-14): Local centres and their catchment areas help articulate form	40
Fig.(2-15): Context map	41
Fig.(2-16): Site appraisal map	41
Fig.(2-17): Concept plan - a useful intermediary stage between site appraisal and layout	42
Fig.(2-18): Site layout	42
Fig.(3-1): Example of a local structurer plan.	48
Fig.(3-2): Sustainable neighbourhood Subdivision .	49
Fig.(3-3): Sustainable communities layout exapmle.	53
Fig.(3-4): Sustainable communities layout exapmle.	54
Fig.(3-5): Example of neighbourhood methodes that Balancing urban and environmental life.	55
Fig.(3-6): Neighbourhood activity center example	57
Fig.(3-7): An image of an education complex.The Abu Dhabi Education Council plans to build 24 sustainable schools by 2018.	58

Fig.(3-8): Image of an sustainable education complex layout.	58
Fig.(3-9): Example of an vegetation, habitat and cultural future neighbourhood.	59
Fig.(3-10): Adjacent Site Layout	61
Fig.(3-11): Infill project site based on minimum 75% of perimeter adjacent to previously developed parcels.	62
Fig.(3-12): Infill project site based on min.75% adjacent to previously developed parcels using project boundary and selected bordering parcels.	62
Fig.(3-13): Infill project site based on minimum 75% of land area within 1/2 mile of boundary being previously developed.	63
Fig.(3-14): Infill project site based on minimum140 inter-sections/sq.mi. within 1/2 mile of project boundary.	63
Fig.(3-15): Comparison between conventional and sustainable neighbourhoods design.	63
Fig.(3-16): The neighbourhood unit which is based on a 400- 450 m radius, five minute walk to centre.	63
Fig.(3-17): The neighbourhood unit which is based on a 400- 450 m radius, five minute walk to centre.	64
Fig.(3-18): Example of perimeter blocks with buildings arranged to front streets, and generating private rear yards (or, in centres space for off-street parking) at rear.	64
Fig.(3-19): Diagrams of a primary school located near a neighbourhood edge, or near a centre if proposed as an interim school.	65
Fig.(3-20): Dwellings with a density of 7 units per acre (17 units per hectare) are common in contemporary suburbs.	66
Fig.(3-21): A community with a medium density of 20 to 25 units per acre (50 to 63 units per hectare) can leave open space for residents to enjoy when properly planned.	66
Fig.(3-22): High-density developments from the twentieth century with 31 units per acre (77.5 units per hectare) are likely to be unwelcome by many suburban towns and deemed unfavorable by buyers.	66
Fig.(3-23): Urban structure showing how major open spaces are located to define the edge of neighbourhoods.	68
Fig.(4-1): New Songdo international district on the Incheon, Korea.	71
Fig.(4-2): Songdo Neighbourhoods (DONG) Layout	71
Fig.(4-3): Songdo Neighbourhoods Livable Streets.	72
Fig.(4-4): Public Transportation Network.	73
Fig.(4-5): Rental Bikes Network.	74
Fig.(4-6): Songdo Neighbourhoods Alternative Transportation Systems	74
Fig.(4-7): Songdo Neighbourhoods Tiered Water Use.	75
Fig.(4-8): Songdo Neighbourhoods Wast Collection.	76
Fig.(4-9): Songdo Neighbourhoods Energy Distribution.	77
Fig.(4-10): Up (Day-Light Atrium), Middle (Photovoltaics), Down (External Sunshades)	78
Fig.(4-11): Songdo Neighbourhoods High Performance Buildings.	78
Fig.(4-12): Geos Neighbourhood Land Use.	80
Fig.(4-13): Geos Neighbourhood Energy and Water Layout.	81