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Connecting Cairo to the Nile: Renewing life and heritage on the river

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Connecting Cairo to the Nile:
Renewing Life and Heritage on the River

George Mathias Kondolf, Louise Mozingo, Rachael Marzion, Krishnachandran Balakrishnan, Amir Gohar, Khalid El Adli, Abbas El Zafarany, Linda Jewell, Sami Sabri Shaker, Ahmed Shalaby, Noha Abbassy, Tami Church, Richard Crockett, Nada Abd El Aziz, Fekria El Bialy, Aly Abd El Gawad, Momen El Husseiny, Mohamed El Kharbotly, Heba Ezzat, Salsabil Fahmy, Ahmed Farouk, Erene Kamal, Michal Kapitulnik, Mirette Khorshed, Madonna Maher, Malak Maher, Nada Nafeh, Adrienne Smith, Bahaa Stephanos, Mohamed Tarek, and Rob Tidmore

September 2011

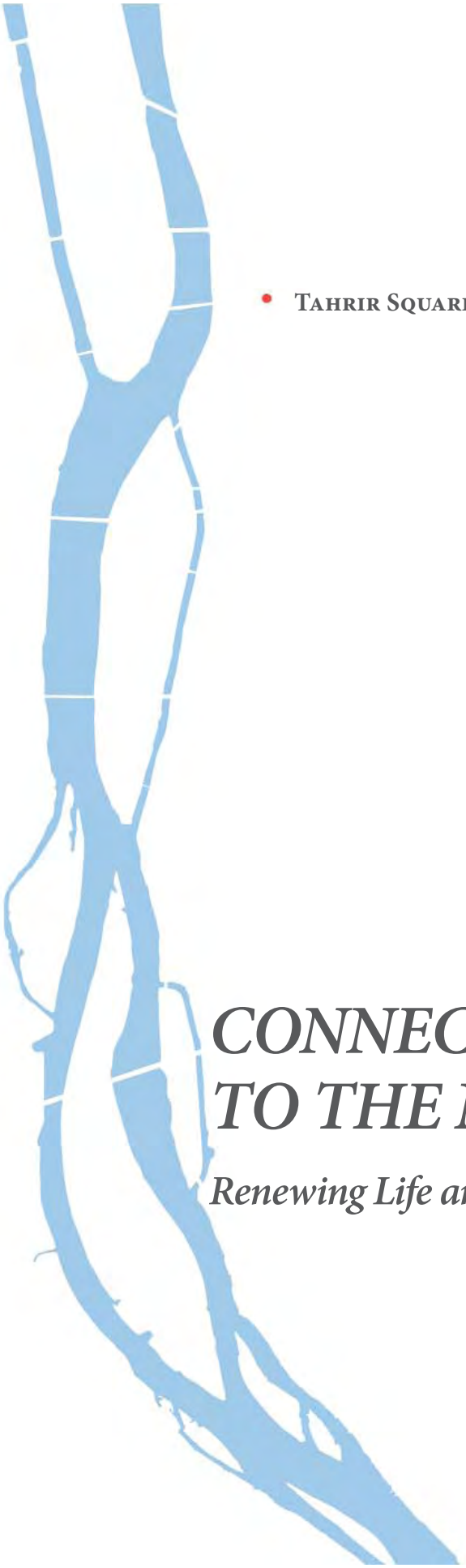
UNIVERSITY OF CALIFORNIA

ربط القاهرة بالنيل

إعادة الحياة والتراث على النهر

CONNECTING CAIRO TO THE NILE

Renewing Life and Heritage on the River



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View of the Nile waterfront along Zamalek Island near the 6th of October Bridge (sketch by Krishnachandran Balakrishnan)

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CONNECTING CAIRO TO THE NILE

Renewing Life and Heritage on the River

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Foreword

The following report is the result of a remarkable partnership between Cairo University, The American University in Cairo, and the University of California, Berkeley. When we conceived of the studio in 2010, our intent was to craft a collaborative learning experience for our universities' students and to catalyze a new understanding of the Nile as a public resource for the people of Cairo. Needless to say, the events immediately following the close of the on-site workshop provided an additional impetus to realize the potential of the river as a vital urban space in the future of Cairo. We hope that this report, in the face of the many challenges that lie ahead for Cairo and the nation, will inform and even catalyze a focused interest in the Nile as a collective place for the citizens of Cairo, who have shown the world, in the most vivid way possible, the centrality of public space to civic engagement and cooperation.

We are deeply indebted to our Cairo-based partners in this endeavor. The American University in Cairo generously provided facilities, transportation, access to student housing, and the venue for the final presentation, all with the gracious facilitation of Associate Chair of the Department of Construction and Architectural Engineering, Dr. Ahmed Sherif. Dr. Khalid El Adli, Professor of Urban Planning at Cairo University kindly arranged for meeting facilities, expert briefings, and transportation, and other support. Once in Cairo, Dr. Abbas El Zafarany and Dr. Aboulfetouh S. Shalaby, Professors of Urban Planning at Cairo University provided many insights for our field studies, lively discussions about Cairo's urban planning issues, and incisive critique during the design charette phase of our work. The indefatigable Dr. Sami Sabri Shaker, Professor of Architecture and Urban Design at both The American University in Cairo and Cairo University shared his profound knowledge of the urban history of Cairo, guided students and the American faculty in the field with genial generosity of time and intellect, and took special care in assisting students in their preparation of the final presentation.

This project would not have been possible without the on-the-ground leadership of Amir Gohar, Cairo-based urban planner and visiting scholar at the Institute of Urban and Regional Development at UC Berkeley. His optimism, spirited participation, and persistence in seeing this project come to fruition was inspiring to us all and enabled us to strike what we hope is a good balance between current realities and aspirational visions in our projections for the Nile. We significantly benefited from the support of this work by the General Organization for Physical Planning (GOPP), the National Organization for Urban Harmony (NOUH), the Aga Khan Foundation for Culture, Kais Menoufy, and Professor Mahmoud Sitohy of Zagazig University. Professor Nezar AlSayyad (UC Berkeley) provided valuable advice in planning the project. Funds to support travel and production of the report were provided by UC Berkeley's Department of Landscape Architecture and Environmental Planning, the department's Beatrix Jones Farrand Fund, and the Center for Middle Eastern Studies.

All participants benefited enormously from the opportunity to work collaboratively across disciplines, institutions, and cultures to develop a vision for Cairo and the Nile. That this coincided with what can only be called a historic moment we hope will add to the possible import of this work. We have been honored by this prospect and we look forward with enthusiasm to future collaborations.

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August, 2011

Summary

As urban waterfronts around the world de-industrialize, cities are increasingly capitalizing on these opportunities to provide open space and alternative commuting routes along riverbanks, bringing residents and visitors back to the waterfronts. Cairo has remarkable opportunities to reconnect its people with the river that was historically its heart.

With a population of over eleven million, Cairo is one of the densest cities in the world. The urban population is underserved by parks and other public open space. The need for open space – and the compelling attraction of the wide river – is put in sharp focus by a common sight on Cairo's traffic-snarled bridges: families set up chairs and picnic on the sidewalks, overlooking the river and enjoying the open space, seemingly oblivious to the honking traffic that crawls besides them. Most of the river banks are fenced off from public access, but those that are open to the public are heavily used by Cairenes of all ages and all walks of life. The potential for human use of the river banks as open-space is enormous.

In an intensive workshop involving 23 students and seven faculty from Cairo University (CU), The American University in Cairo (AUC), and the University of California, Berkeley (UCB), interdisciplinary teams systematically inventoried existing conditions along a 12-km reach of the Nile from Maadi to Tahrir Square, recording river-bank relations, building heights and conditions, circulation, and land-use.

Based on this field work the student teams identified specific opportunities and challenges for interventions along the Nile. The low, wide flood plains along much of the Nile bank have great potential to be reconfigured into accessible and active public spaces. It was also identified as a feasible route for a continuous pedestrian/bicycle trail. Air quality measurements along the river bank showed that particulate matter levels along the flood plain were on average 30% lower than street level measurements.

The presence of historic landmarks and tourist attractions along the Nile provides significant opportunities for urban revitalization and economic development. The excellent views of the Nile and the Pyramids of Giza available at many waterfront locations provide a unique opportunity that interventions along the waterfront can capitalize on. While some stretches of the Corniche have wide sidewalks that can be redesigned to function better as public spaces, the Nile bank provides ample opportunities for ecological restoration at many places. The presence of vacant lots along the Corniche provides opportunities for strategic developments and also for better open space connectivity with the rest of the city. The visible public interest in the limited ferry routes along the river illustrates the potential the Nile holds to function as a significant public transportation corridor if the city is able to expand the existing ferry system.

There are also significant challenges related to existence of incongruent public and private land-uses along the Nile Corniche. Appropriate institutional and regulatory frameworks would be required to ensure that proposals for public space restructuring are implemented and maintained well. Urban waste management is a significant concern in Cairo and the Nile waterfront is no exception.

Building on the identified opportunities and challenges, workshop participants developed a strategic plan for a longitudinally continuous trail network along the Nile with lateral connectivity to important nodes in Cairo. They also developed detailed plans for the revitalization of two key zones (Athur El Nabi and Old Cairo).

The workshop ended just one week before the streets of Cairo became the venue for historic political demonstrations that eventually resulted in major political changes. While there have been many past efforts to rehabilitate the city and 'plan' the future growth of Cairo, including the 'Cairo 2050 Vision Plan' (a multi-year planning effort initiated by the Egyptian government and undertaken by international consultants), none of these prior efforts have highlighted the potential to develop the Nilotic riverfront. In the wake of the January events, 'Cairo 2050' quickly became uncertain and outdated. However, the collaborative research and planning process undertaken here could serve as a model for future planning efforts that are more in-touch with local conditions and reflective of real needs of everyday Cairenes. The political changes of January 2011 highlighted public desires, expectations, and demands for major economic changes and improvements in living conditions. Thus, the concept of reconnecting Cairo's urban population with the Nile is unusually timely. Bringing the people to the river banks could significantly improve daily life for millions, and could contribute to democratization of society and strengthening of the social fabric.

CHAPTER 1

Introduction and Background

"Egypt is the gift of the Nile" - Herodotus

Cairo, Egypt, sits on the River Nile about 160 kilometers (km) south of the Mediterranean Sea, just upstream of the point where the river widens into the Delta. Blessed with a Mediterranean climate, the Nile, a rich culture and history, and a vibrant urban life, Cairo has tremendous potential to contribute new solutions to urban problems such as population growth, urbanization, traffic, and water and air pollution.

Much literature about the Nile River and Cairo exists, ranging from scholarly articles and statistical studies on water and air pollution, to Naguib Mahfouz's Nobel Prize winning novels set in narrow pathways of the old city. Descriptions of Cairo are vivid and telling:

> "a city struggling with uncontrolled growth, inadequate infrastructure, deteriorating household conditions and ever-expanding informal settlements " (AlSayyad 2011, 260);
>
> "modern Cairo, sprawling across miles and miles of former agricultural and desert land and made up of densely laid out buff-coloured buildings with few green spaces between them" (Rabbat 2004, 43);
>
> "the diversity of its neighborhoods, old quarters and new Western-style areas, high-rise buildings around the Nile, satellite dishes, foreign fast-food chains, … and life that never stops – all of these phenomena blend together to give Cairo its magic and recreate the feeling that this city is 'the Mother of the World'" (Ghannam 2002, 25).

NILE CORNICHE: The word "corniche" typically refers to a coastal or cliff-side road. Cairo's "Corniche Al-Nil" refers to the wide boulevard running alongside the Nile with between three and five lanes of traffic in each direction. We surveyed a 12-km stretch of the Nile and busy Corniche, which functions as the primary north-south artery for the city's automobiles, minibuses, taxis, and other public transit vehicles.

The Opportunity

The definition of megacity varies, but by all definitions, Cairo is one of the world's largest with a 2010 population of eleven million people and a 2025 projected population of 13.5 million people (Table 1). Most authors and planning organizations place current estimates as high as eighteen million when considering outlying areas, the potential for undercounting informal housing residents, and varying definitions of the Greater Cairo Metropolitan Region (GCMR) (Fahmi and Sutton 2008, Golia 2004, GOPP 2011). "As centers of thought, power, and resources, mega-cities like the GCMR often provide the greatest hope" for improvements in urban living conditions (El Araby 2002, 399).

TABLE 1. POPULATION OF CAIRO COMPARED TO OTHER LARGE CITIES

Rank	Urban agglomeration	Year 1950	Urban agglomeration	Year 2010	Urban agglomeration	Year 2025
1	New York	12.34	Tokyo	36.67	Tokyo	37.09
2	Tokyo	11.27	Delhi	22.16	Delhi	28.57
3	London	8.36	São Paulo	20.26	Mumbai	25.81
4	Paris	6.52	Mumbai	20.04	São Paulo	21.65
5	Moscow	5.36	Mexico City	19.46	Dhaka	20.94
6	Buenos Aires	5.10	New York	19.43	Mexico City	20.71
7	Chicago	5.00	Shanghai	16.58	New York	20.64
8	Kolkata	4.51	Kolkata	15.55	Kolkata	20.11
9	Shanghai	4.30	Dhaka	14.65	Shanghai	20.02
10	Osaka-Kobe	4.15	Karachi	13.12	Karachi	18.73
11	Los Angeles	4.05	Buenos Aires	13.07	Lagos	15.81
12	Berlin	3.34	Los Angeles	12.76	Kinshasa	15.04
13	Philadelphia	3.13	Beijing	12.39	Beijing	15.02
14	Rio de Janeiro	2.95	Rio de Janeiro	11.95	Manila	14.92
15	St. Petersburg	2.90	Manila	11.63	Buenos Aires	13.71
16	Mexico City	2.88	Osaka-Kobe	11.34	Los Angeles	13.68
17	Mumbai	2.86	**Cairo**	**11.00**	**Cairo**	**13.53**
18	Detroit	2.77	Lagos	10.58	Rio de Janeiro	12.65
19	Boston	2.55	Moscow	10.55	Istanbul	12.11
20	**Cairo**	**2.49**	Istanbul	10.52	Osaka-Kobe	11.37
21	Tianjin	2.47	Paris	10.49	Shenzhen	11.15
22	Manchester	2.42	Seoul	9.77	Chongqing	11.07
23	São Paulo	2.33	Chongqing	9.40	Guangzhou	10.96
24	Birmingham	2.23	Jakarta	9.21	Paris	10.88
25	Shenyang	2.15	Chicago	9.20	Jakarta	10.85
26	Rome	1.88	Shenzhen	9.01	Moscow	10.66
27	Milan	1.88	Lima	8.94	Bogotá	10.54
28	San Francisco	1.86	Guangzhou	8.88	Lima	10.53
29	Barcelona	1.81	Kinshasa	8.75	Lahore	10.31
30	Glasgow	1.76	London	8.63	Chicago	9.94

The 30 most populated urban agglomerations in 1950, 2010, and projected to 2025. Population amounts shown in millions. Urban agglomeration "refers to the population contained within the contours of a contiguous territory inhabited at urban density levels without regard to administrative boundaries. It usually incorporates the population in a city or town plus that in the suburban areas lying outside of but being adjacent to the city boundaries" (United Nations 2010).

MEGACITIES: Researchers generally use a population threshold to determine whether a large city can be considered a "megacity." This threshold can vary from as low as four million inhabitants to as high as ten million inhabitants. However, the exact value of this threshold is often insignificant as megacities of varying population sizes suffer from similar problems, including air pollution, housing and water supply, and unmanageable population growth (Sorenson and Okata 2011).

Though extremely difficult to bring about such improvements, measures and policies implemented in megacities can serve as models for revitalizing urban development in smaller cities or other megacities. This idea becomes particularly important when considering that over half of the world's current population is urban and by 2050, 70% of the world's population is projected to live in cities. Improving livability, reducing ecological impacts, and increasing social equity will rely to a large extent on improving conditions and addressing problems associated with megacities and other urban environments (Sorenson and Okata 2011).

FIGURE 1. Munich, Germany
Visitors relax along the Isar River near the city center.

Urban Waterfronts

As is the case with other great cities, Cairo is located on a major river: The Nile has been recognized as the source of life for Egypt since its civilization began. Historically, the Nile Corniche played a central role in transportation along the river corridor. The Corniche in its current form serves as the primary north-south artery for Cairo's congested traffic, as well as the site of aging industrial facilities, commercial businesses, residences, aging or inadequate pedestrian promenades, informal housing settlements, and ferry stops. Yet public access to the riverfront is generally lacking.

FIGURE 2. Coimbra, Portugal
Cafes and restaurants line the urban waterfront along the Mondego River in Coimbra.

As many urban waterfronts around the world de-industrialize, cities are increasingly capitalizing on these opportunities to provide open space and alternative commuting routes along riverbanks, bringing residents and visitors back to waterfronts (Breen 1994, Breen and Rigby 1996, Gabr 2004, Souers and Otto 2005). These revitalized waterfronts provide recreational opportunities and green space for residents of dense, crowded cities (Figures 1-4). Literature on redeveloped waterfronts indicates that negative social consequences can arise when public access is limited to a vital public resource (Gabr 2004). Experience in North America and Europe demonstrates that waterfront trails and riverside parks, once completed, are used and greatly appreciated by urban residents (Souers and Otto 2005).

FIGURE 3. London, England
The Thames River, declared "biologically dead" in the 1950's, now supports an aquatic ecosystem and attracts numerous visitors to the waterfront for socializing, recreation, and art or cultural exhibitions.

As other major cities redevelop their riverfronts, Cairo has remarkable opportunities to reconnect its people with the river that was historically its heart. Many private projects have arisen along the Nile in recent years and contribute to the inability of city dwellers to freely access the riverbanks. The heavy public use of the existing, remaining, accessible short reaches of bank demonstrates the tremendous potential for a riverside trail. Reconnecting Cairo with the Nile could provide much needed open-space and parkland for urban residents and visitors, and provide healthful bicycle and pedestrian transportation alternatives connecting the city center with outlying neighborhoods.

FIGURE 4. Bangkok, Thailand
Water taxis on the Chao Phraya River provide city residents with an alternative to driving in Bangkok.

The Workshop

In this workshop, held in Cairo in January 2011, 23 students from Cairo University (CU), The American University in Cairo (AUC), and the University of California, Berkeley (UCB) (Figure 5) worked together in interdisciplinary teams to develop long-term plans and designs for the future to create increased access to the Nile waterfront, pedestrian pathways, attractive public spaces, and environmental improvements. Prior to the workshop, students compiled a comprehensive summary of existing research related to the Nile, environmental planning, urban growth problems in Cairo, and previous plans to rehabilitate the city.

FIGURE 5. Workshop student participants
Student participants on the campus of The American University in Cairo.

In addition, they researched several topics related to revitalizing Cairo's urban waterfront:

- Baseline geographic data for the Greater Cairo Metropolitan Region (GCMR)
- History and hydrology of the Nile River
- Precedent case studies of neighborhood revitalization plans
- Precedent case studies of riverfront access plans
- Cairo 2050 planning process
- Historical urban and city plans for Cairo

At the beginning of the workshop, students toured Old Cairo, the Corniche, and previously rehabilitated or revitalized sites around the city, such as Al-Azhar Park (Figures 6-7). They also attended an orientation at Cairo University, which included presentations by faculty and representatives from:

FIGURE 6. Group tour of Al-Azhar Park
Cairo university faculty lead workshop participants on a tour of Al-Azhar Park and Old Cairo's Al-Darb Al-Ahmar district.

- Cairo University Urban Design Department, Faculty of Urban & Regional Planning,
- The American University in Cairo, Construction and Architectural Engineering Department,
- National Organization for Urban Harmony (NOUH), an organization affiliated with the Ministry of Culture and tasked with improving urban space in Cairo,
- Aga Khan Foundation, which has focused on specific development problems, and
- General Organization of Physical Planning (GOPP), Egypt's primary governmental regional and urban planning organization.

The orientation provided an introduction to the Nile River, an overview of selected previous restoration projects, and a review of existing governmental long-term plans for the city. Following the orientation, Berkeley and Cairo students and faculty worked collaboratively to complete a synoptic one-day field inventory of conditions along the Nile banks in central Cairo, measured levels of atmospheric particulate matter along the existing heavily used Corniche, shared field work assessments with each other, and worked together for several days to develop a strategic plan for a longitudinally continuous trail network, including detailed plans for two key zones.

FIGURE 7. **Student introductions at Al-Azhar Park**

TABLE 2. **WORKSHOP SCHEDULE FROM 7TH - 16TH OF JANUARY 2011**

DATE AND DAY	ACTIVITY
7 Friday	Berkeley students arrive in Cairo
8 Saturday	Group tours of Al-Azhar Park, Old Cairo, and the Nile Corniche
9 Sunday	Orientation at CU
10 Monday	Field research
11 Tuesday	Present results of initial data collection
12 Wednesday	Group work on strategic plan development and continued field work
13 Thursday	Group work on strategic plan development and continued field work
14 Friday	Day off
15 Saturday	Presentation preparation
16 Sunday	Presentation of results at AUC

Cairo's Role in Recent Political Changes

The workshop took place in January 2011 (Table 2), and ended just one week before the streets of Cairo became the venue for historic political demonstrations that eventually resulted in the resignation of the country's long-term president and other prominent governmental leaders, dissolution of the country's constitution and parliament, and the potential for free elections. The future of the Cairo 2050 Vision Plan, a long-term planning approach initiated by the government over the past several years and an impetus for our workshop, quickly became uncertain and outdated. The uncertainty generated by these historic events, as well as public desires, expectations, and demands for major economic changes and improvements in living conditions, make the workshop unusually timely–uniquely positioned to inform Egypt's transitional and future planning processes.

The workshop was held in Cairo, Egypt at Cairo University, The American University in Cairo, and in the field, and ended just one week before historic public demonstrations began in Tahrir Square.

WORKSHOP GOALS:

1. PARTICIPATE in an international collaborative studio to exchange interdisciplinary ideas about Cairo planning projects to improve public and environmental infrastructure in the city.

2. DEVELOP a series of collaborative research data and planning proposals onsite and present these proposals to representatives of universities, local communities, and the government.

3. FOLLOWUP by compiling workshop results and expanding upon workshop ideas.

4. PRODUCE a publication summarizing background research, collected data, workshop results, and followup analysis. Make the publication available online to students, government officials, consultants, planners, and other interested members of the public.

Practically speaking, new governmental agencies, academics, international aid programs, and private consultants will likely be summoned for fresh ideas and proposals as the country transitions to a new government–presumably a functioning democracy. Drawing on the synergy of diverse academic disciplines and backgrounds, the interdisciplinary and cross-cultural student teams in this workshop developed a strategic plan and designs to create livable spaces along the river, thinking long-term into the future, and considering visual access, transportation (on land and water), and landscape values. The resulting ideas and workshop publication are uniquely timed and suited to inform the planning process and generate ideas for revitalized public spaces along the Nile, just as a new Egypt emerges.

Cairo's Challenges

As Cairo looks forward to the mid-21st century, the city struggles with many challenges, including heavy traffic, air pollution, and lack of recreational and open space for many residents. As the largest city in Africa and the Middle East, Cairo struggles with pressures from growing urbanization, a high unemployment rate, a large informal housing sector, and ineffective planning entities and strategies. Though the government has taken steps to search for environmentally sustainable systems and policies in recent years, the current infrastructure cannot keep up with Cairo's sources of urban environmental degradation (Duquennois and Newman 2009, El Araby 2002).

FIGURE 8. Al-Darb Al-Ahmar District
Cairo struggles with the impacts of population growth and urbanization on traffic, air pollution, and informal housing settlements.

Several sources of environmental degradation exist. Idling traffic, aging and inefficient cars and minibuses, and industrial emissions contribute to Cairo's poor air quality (El Araby 2002). Advection patterns (e.g., slow winds at certain times of the year), lack of precipitation, and Cairo's tall buildings and narrow streets lead to poor dispersion patterns. All of these factors result in a permanent haze over the city (Figure 8) and particulate matter in urban parts of Cairo reaching three times the levels present in suburban and rural parts (Kanakidou et al., 2010). Studies consistently find that air pollution levels in Cairo endanger human health, and approximately 10% of Cairo's population suffers from respiratory diseases. Poor water quality also persists, as the Nile consistently receives untreated domestic and industrial pollutants, and runoff from the region's dump sites contaminates ground and surface water. Additionally, dense concentrations of informal settlements stand next to factories, garbage dumps, or other noxious activities (El Araby 2002).

In addition to its environmental problems, Cairo has very little space that can truly be considered as accessible to the public (Figure 9). The city has one of the lowest green space per capita statistics in the world and a 1984 study determined that less than one footprint of greenspace exists for each city resident (Nassar 2011). Though some of the population has access to private recreational facilities and some unrestricted open spaces exist (generally in wealthier neighborhoods), some public spaces require a hefty entrance fee. Entrance to the recently developed Al-Azhar Park is costly enough to restrict entrance to only the wealthier Cairenes, or to residents of the adjacent neighborhood (Al-Darb Al-Ahmar), for whom the entrance fee is reduced.

FIGURE 9. Al-Hakim Mosque
The courtyard of Al-Hakim Mosque serves as one of the few open spaces available in Cairo for a group of boys to play soccer.

Several social and political factors add to the complexities involved in solving Cairo's physical, environmental, and economic challenges. A French research organization conducted a detailed satellite imagery assessment in 2001, documenting the extent of informal (slum) housing, formal (licensed) housing, infrastructure, and green space, but the extent of informal settlements have been only reluctantly acknowledged by the Egyptian government (Golia 2004). Estimates of informal housing vary, but can range from 2.8 million to 10.7 million. An inaccurate definition of poverty line and ongoing census undercounting of informal settlements severely underestimates the incidence of poverty in Cairo (Sabry 2010). Various official government attempts to reduce urban population concentrations and upgrade public facilities have arguably been unsuccessful in achieving intended goals (Sutton and Fahmi 2001, Fahmi and Sutton 2008, AlSayyad 2011).

Cairo's natural and built environment reflects many of these societal and environmental challenges. Despite the river's potential to provide open space and a link to different parts of the city, Cairo residents have few opportunities to access the Nile. Private clubs, restaurants, informal settlements, and commercial establishments occupy most of the river banks (Figure 10). The river is typically cut off from adjacent neighborhoods by heavily used roads and congested traffic. The entire length of the Nile running through Cairo, particularly those reaches that allow public access, contain disturbing amounts of trash, litter, debris, and other forms of human waste.

In spite of the degraded river conditions, however, city residents flock to the riverbanks, its crowded and noisy bridges, and the city's dilapidated pedestrian pathways, to seek out some form of public space for congregating, socializing, and recreating. It is not uncommon to see families gather with folding chairs and picnics on bridges mid-river, sharing the open space and river views with dense traffic, its sluggish, viscous flow across the bridge marked by liberal honking of horns.

FIGURE 10. Blocked access
Ventilation units and storage facilities for private clubs prevent pedestrian access to the Nile waterfront from the sidewalk.

Cairo and the Nile

The Nile, the world's longest river, rises in the highlands of Ethiopia and the Equatorial Lake Plateau, flows northward for 6,700 km, and debouches into the Mediterranean Sea (Figure 11). It is the only permanent river flowing across the Sahara Desert and drains almost three million square kilometers (km^2) (approximately 10% of the African continent). Estimated average discharge amounts (prior to dam modifications) vary between 80 and 90 cubic kilometers (km^3) per year. These estimates are equivalent to average flows of approximately 2,500-2,800 cubic meters per second (m^3/s), relatively small flows for a river of its size and watershed area. For example, the Nile's average annual discharge is only a fraction of the Mississippi River's annual discharge even though the two rivers have similar lengths and comparable drainage areas (Table 3) (Ibrahim 1984, Ribbe and Ahmed 2006, Dumont 2009, Milliman and Farnsworth 2011).

NILE ANNUAL FLOOD: "It is the annual monsoon rains drenching the Ethiopian Highlands that create the 'Inundation', the bursting of the Nile's banks that, before the construction of the Aswan Dam, occurred every June and formed the most vital event in the Egyptian year" (Beattie 2005, 215).

The Nile crosses several climatic zones and is often described by its major subbasins: Blue Nile, White/Equatorial Nile, Main Nile, and Atabara. The Blue Nile originates in the Ethiopian Highlands and contributes almost twice the annual flow of the White/Equatorial Nile, which originates on the Equatorial Lakes Plateau. Together, the Ethiopian and Equatorial Lakes Plateaus contribute nearly 100% of the flow through Aswan. At lower elevations, the river flows through the Sudd marshland and the Main Nile channel, which (south of Aswan) is characterized by a series of rapids or "cataracts," some of which were inundated following dam constructions (Dumont 2009). The central and northern portions of the basin receive no significant precipitation, which results in the Nile's relatively small discharge. The average annual rainfall in Cairo is 25 millimeters (mm) per year and in over half of the Nile's watershed, the average annual rainfall is less than 150 mm per year.

TABLE 3. SELECTED IMPORTANT RIVERS OF THE WORLD WITH NEARBY LARGE CITIES

River	Length (km)	Catchment area (10^3 km^2)	Annual discharge (km^3/yr)	Large cities
1. Nile	6,700	2,900	30 (80)	Cairo, Khartoum
2. Amazon	6,400	6,300	6,300	Manaus
3. Chang Jiang[1]	6,300	1,800	900	Chongqing, Shanghai
4. Mississippi	5,900	3,300	490	New Orleans, St. Louis
5. Huang He[2]	5,500	750	15	Jinan, Yinchuan
6. Ob	5,400	3,000	390	Novosibersk
7. Mekong	4,800	800	550	Phnom Penh
8. Congo	4,700	3,800	1,300	Kinshasa, Brazzaville
9. Niger	4,000	2,200	160	Bamako
10. Danube	2,900	820	210	Vienna, Budapest

Length, watershed area, and discharge data in Table 3 compiled from Milliman and Farnsworth 2011. Mean annual discharges were measured at the seaward-most hydrologic station. Pre-diversion data for the Nile River is shown in parentheses.

[1] Common name: Yangtze River
[2] Common name: Yellow River
[3] Burundi, Rwanda, Democratic Republic of Congo, Tanzania, Uganda, Kenya, Sudan, Ethiopia, Eritrea, and Egypt

From its headwaters to the Mediterranean Sea, the Nile traverses ten countries[3]. According to a 1959 agreement between Egypt and Sudan, the average yearly Nile discharge is divided as follows: 67% for Egypt and 22%

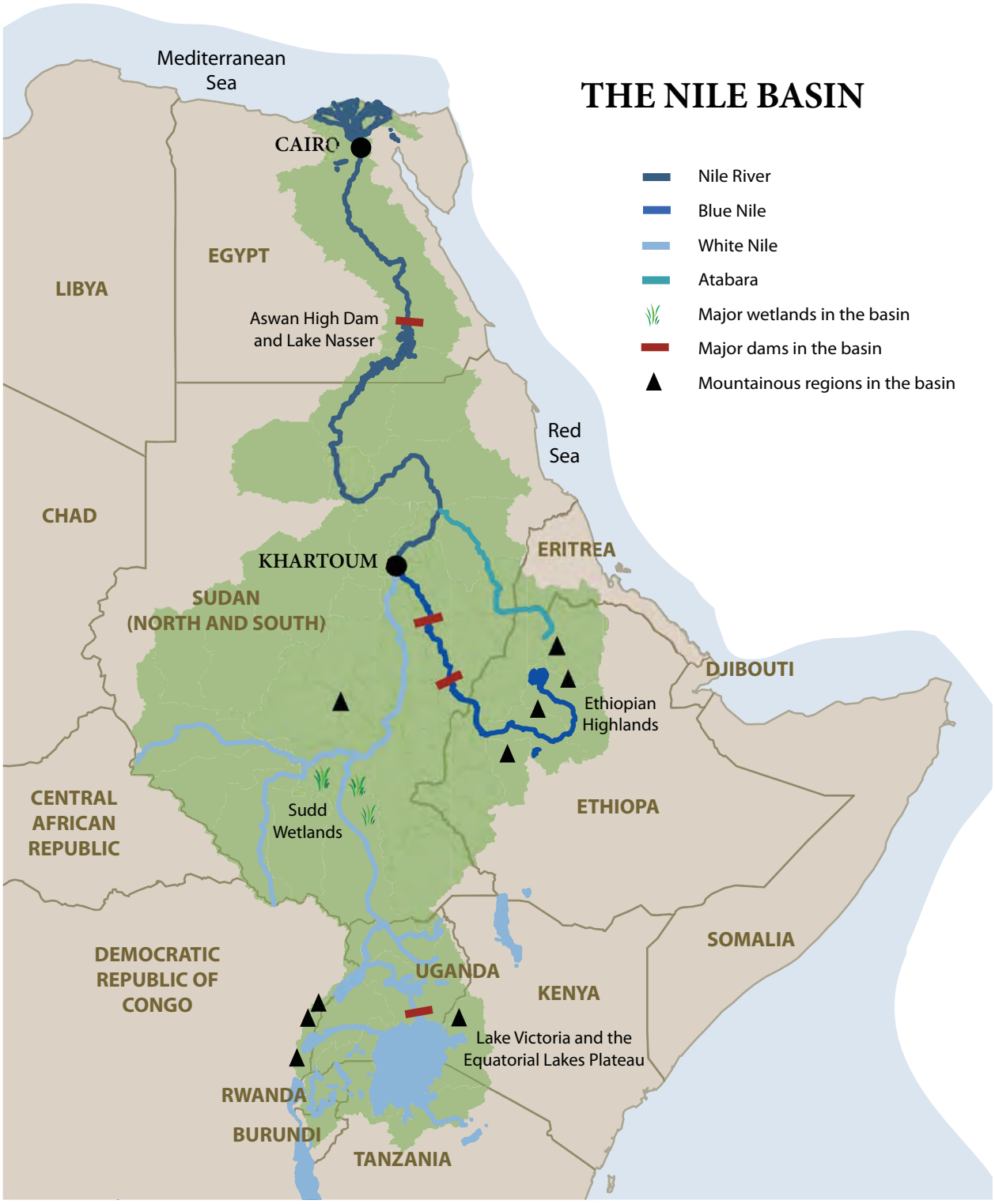


FIGURE 11. Map of the Nile Basin
The Nile Basin (highlighted in green) showing the Main Nile, Blue Nile, White Nile, and Atabara, and selected major dams and storage facilities.

for the Sudan; remaining amounts are lost to evaporation and infiltration (Dumont 2009). In addition to providing navigation, trade, and water supply connections among the countries, the river corridor provides longitudinal connectivity for many species from the tropics to the Mediterranean Sea and Arabia. Where the Nile meets the Mediterranean Sea, the highly productive 25,000 km^2 Nile river delta is one of Egypt's most important agricultural areas. Cairo and its urban agglomeration sit on the Nile just south (i.e., upstream) of the river's transition into the delta.

The Nile as a Resource

FIGURE 12. **Nilometer on Roda Island**

Approximately 280 million people live within the Nile basin (Ribbe and Ahmed 2006), and prosperity for both ancient and modern civilizations in Egypt has been closely tied to annual flooding of the Nile. Prior to the building of sophisticated irrigation structures in the 19th century, Egyptian communities depended on floods extensive enough to inundate crops, but low enough to prevent destruction of farmland or irrigation structures. Historically, levels of flooding were used to predict years of feast and famine. Years with moderate flooding were associated with increased water supply and sediment deposition, which created fertile floodplains for farming. Years of extreme flooding, where flood stages sometimes rose as much as seven meters, resulted in widespread disaster from whole valleys being inundated. Similarly, years with little or no flooding could result in famine and political turmoil unless governments had stored grain surpluses from previous years.

Because of the importance of annual flooding on prosperity and survival, Egyptians have recorded flood levels since antiquity using Nilometers, and treated these records as some of the state's most important documents. A Nilometer typically consisted of a covered stairway leading down from high ground to the elevation where the river normally reached its lowest level. River water could be channeled into the stairway and water levels could be recorded using measurement scales on the walls of the stairwells. The Roda Nilometer in Cairo (Figure 12) provided the government's official height measurements until the beginning of the twentieth century. Although many of the original height registers have been lost, enough information survived (some through other sources) that a comprehensive record exists of annual maxima and minima since just before the Arab conquest of Egypt (i.e., a longer period than for any other river). Nilometers and other water measurement structures remained useful until modern times when the Nile's natural flows were disrupted by large water storage reservoirs (Said 1993).

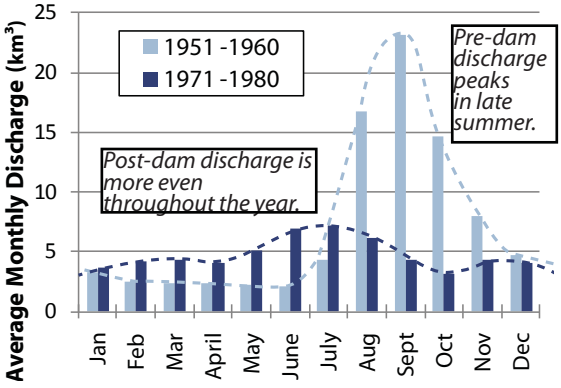


FIGURE 13. **Mean monthly discharge at Aswan**

Light blue represents Nile River discharge at the Aswan gauging station for 10 years prior to dam construction (1951-1960). Dark blue represent discharge for 10 years following dam construction (1971-1980) (based on data from Milliman and Farnsworth 2011).

Dam building on the Nile began in the late-nineteenth century. In 1882, a surge in population increased water demands for agriculture and industry, motivating construction of the first Aswan Dam, completed in 1902, with a capacity of 1 x 10^9 m^3. The current Aswan High Dam, completed in 1970, has a capacity of 160 x 10^9 m^3, nearly twice the annual discharge at Aswan. The Aswan High Dam impounds floodwater for release in the dry season (Figure 13) for irrigation, navigation, and to generate hydroelectricity. As a result, downstream settlements have been protected from disastrous floods, and annual river level fluctuations have been so reduced that low-lying flood plains adjacent to the channel are now rarely (if ever) subject to flooding and can offer year round access not formerly possible.

The High Dam generates 2.1 gigawatts (GW), 75% of Egypt's hydroelectric power. While its reservoir supports a fishery, by reducing nutrient flow downstream to the river and sea, the High Dam has led to the loss of many Nilotic fish and a crash in the offshore Mediterranean fishery (Dumont 2009). In the lower riparian countries of Sudan and Egypt, irrigated agriculture is an important land use. Agricultural land under irrigation increased from about 3 x 10^6 feddans[4] in 1821 to 11 x 10^6 feddans in the 1980's (consuming 48 x 10^9 m^3 of water annually), with additional land brought into production in later years (Ibrahim 1984). Apart from irrigated areas, barren land prevails in the region due to the desert climate (Figure 14).

Despite year-round access to freshwater granted by the High Dam, every drop of Egypt's water remains a precious resource and has been recycled up to three times by the time it reaches the Mediterranean Sea. Only about ten to fifteen percent of the Nile's water, consisting mostly of wastewater unsuitable for further uses, now reaches the Mediterranean (Figure 15). Many believe that even more water use efficiency is needed. The elimination of annual flooding by the High Dam (and associated reduction of flows), combined with intense water use, has led to the cessation of regular flushing of pollutants out of the Nile system, and increases in suspended-sediment, dissolved-solid, and salinity concentrations. Pollution has emerged as a major problem as factories, cities, and villages release untreated or partially treated wastewater and industrial waste into the river. Solid waste management is also inadequate, and trash and debris piles are visible in many places along the Nile (Dumont 2009, Milliman and Farnsworth 2011).

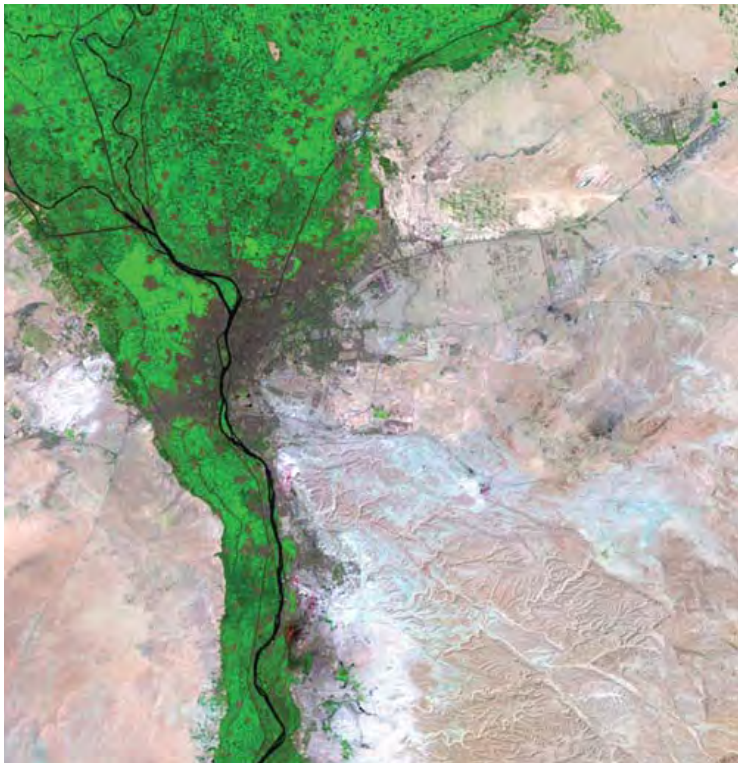


FIGURE 14. Satellite image of Cairo and the Nile

Cairo sits on the Nile about a hundred miles south of the Mediterranean Sea and covers an area of 214 square kilometers. The city appears as a large dark brown and purple mass. The only green visible in the image is along the fertile banks of the river and within the Nile Delta. Outside of the green swath is the light brown, arid landscape of the Sahara Desert. Image and caption data from http://earthobservatory.nasa.gov (Landsat).

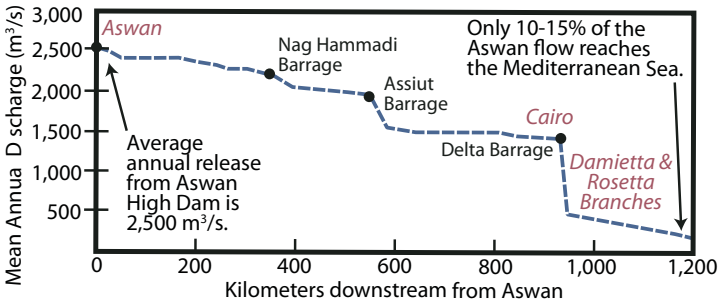


FIGURE 15. Change in Nile discharge from Aswan to the Delta

Approximately 10-15% of the Aswan flow reaches the Mediterranean Sea after flowing through the Damietta and Rosetta Branches, two of the remaining active channels in the Delta (based on data from Milliman and Farnsworth 2011 and Dumont 2009).

The High Dam prevents annual flooding and impounds sediment in reservoirs, thereby eliminating the deposition of rich, fertilizing silt onto floodplains and farmland. In response, farmers apply artificial fertilizers to make up for the lack of natural silt fertilization in the annual floods. These artificial fertilizers constitute additional sources of decreased downstream water quality. Sediment-trapping by the High Dam and reduced supply to the Delta has increased coastal erosion rates along the Mediterranean Coast.

[4] A feddan is a unit of area commonly used in certain Middle Eastern countries and is equivalent to 0.42 hectares.

CHAPTER 2

Data Collection

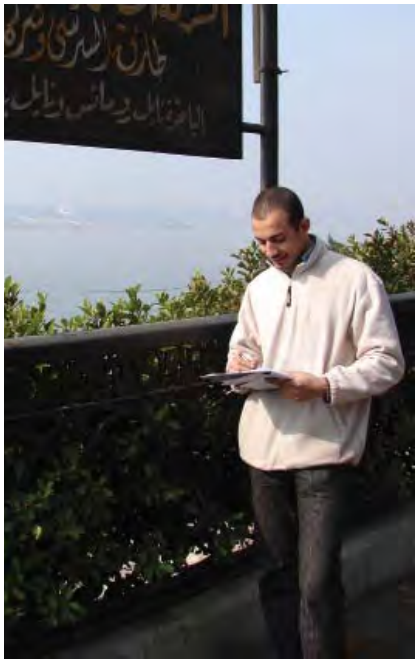


FIGURE 16. Ahmed surveys the Nile waterfront in the Cairo suburb of Maadi

To assess potential for a continuous Nile waterfront trail, student teams studied a 12-km reach of the Nile waterfront from central Cairo to the southern suburb of Maadi, subdivided into four smaller subreaches, within which teams evaluated the hydrologic, environmental, socioeconomic, cultural, and land use characteristics of four distinct districts along the east bank. They also evaluated the characteristics of two small islands situated within the Nile's main channel: Roda and Gezira Islands.

FIGURE 17. Rachael and Malak sketch cross-sections near the private yacht club in Maadi

Student teams focused on collecting specific data to inform planning for increased public access to the river, increased urban green space along the river corridor, and improved connections between the Nile and Cairo's urban fabric. Teams also focused on identifying potential waterfront pedestrian promenade and bicycle routes, and determining unique characteristics of each study site that could be preserved or rehabilitated during recommended potential restoration and planning efforts.

For detailed field observations of the four subreaches, teams consisting of one or two students and faculty members from each participating university undertook an intensive, synoptic day-long field survey on Monday,

with follow-up field work as needed on Wednesday and Thursday. Teams studied the 12-km reach of the Nile waterfront from central Cairo to the southern suburb of Maadi.

The teams documented conditions using the following methods (Figures 16-20):

- Sketches of representative cross-sections of riverbank land use and major transitions, based on measurement, pacing, and/or estimates of bank heights, or terrace widths
- Identification of potential opportunities and challenges for riverside trail placement, keeping in mind the long-term (40-year) planning horizon
- Visual inspection of river and riverbank conditions
- Photo documentation of river, riverbank, waterfront, and Nile Corniche features and characteristics
- Identification of land uses adjacent to the riverbanks and along the Nile Corniche (Figure 21)
- Assessment of building heights and relative conditions (Figures 22-23)
- Assessment of physical and visual access, and public connections to the Nile (Figure 24)
- Occasional interviews with pedestrians, nursery and business owners, and other users of the Nile Corniche encountered during fieldwork

Teams also measured airborne particulate matter at selected locations along the Corniche to assess air quality and determine if gradients were measurable from the waters edge and riverbank top to the center of the Corniche. Following field data collection, teams reconvened at AUC to assemble data, discuss findings, conduct opportunities and constraints analyses, and present results for each site to the larger workshop group. Each group identified additional field work needed on follow-up field days. Students generated maps and figures to document and communicate each category of collected data, and to prepare for creating a strategic plan for the study site.

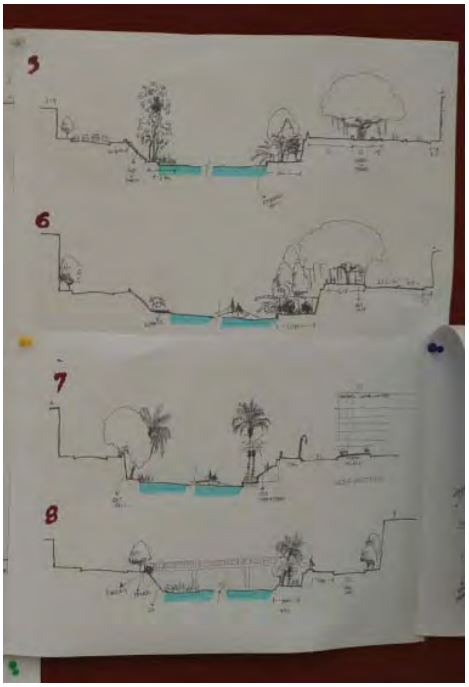


FIGURE 18. Collected data
Students sketch cross-sections of the Nile to assess constraints and opportunities for each study site.

FIGURE 19. Strategic plan team
One of the student workshop teams (including Rob, Ereny, Michal, Malak, and Aly) focuses on developing a strategic plan for the Nile waterfront (bottom left).

FIGURE 20. Detailed intervention teams
Salsabil works with the student team developing a detailed intervention for Old Cairo (bottom right).

A selection of maps created for the 12-km study reach based on compiled student data

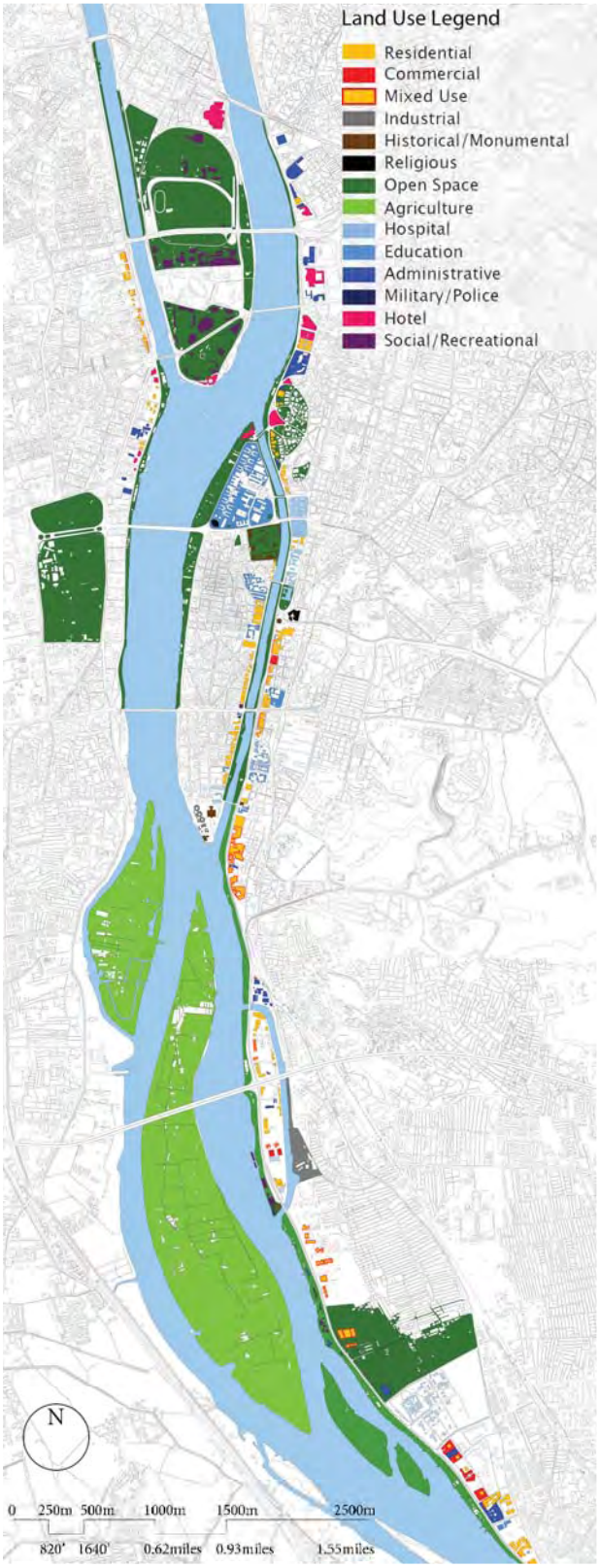


FIGURE 21. **Land use**

FIGURE 22. **Building condition**

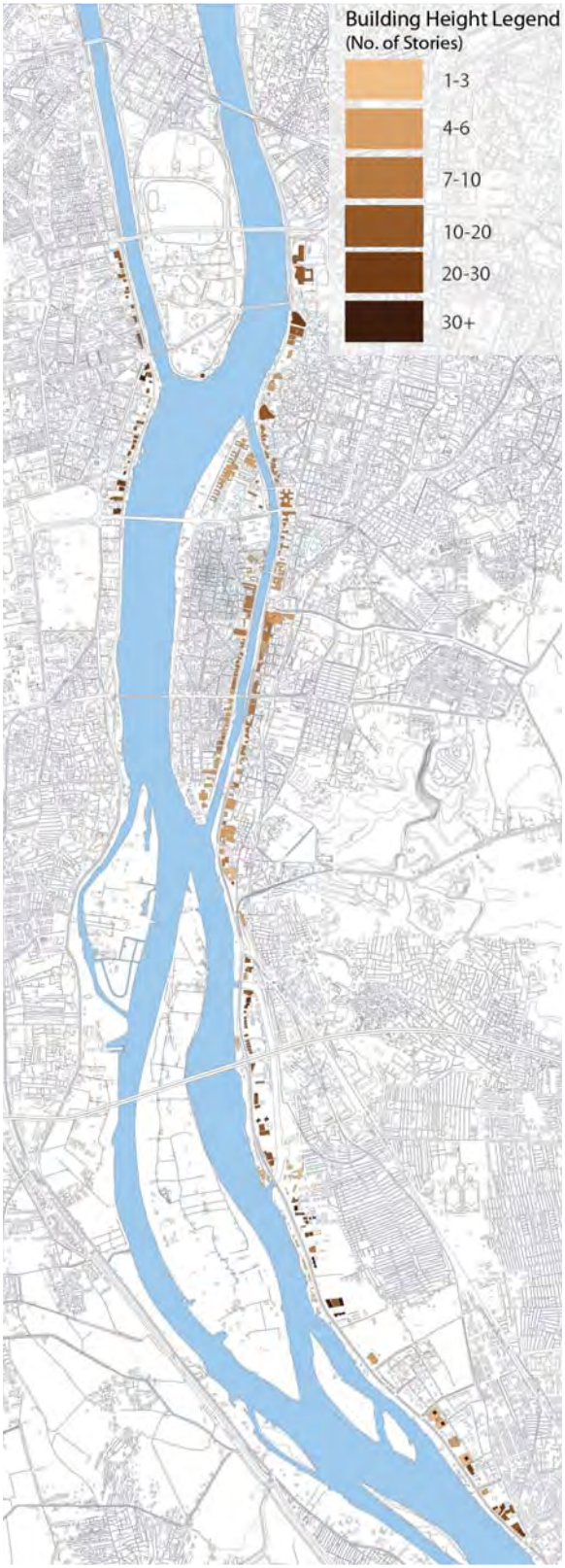


FIGURE 23. **Building height**

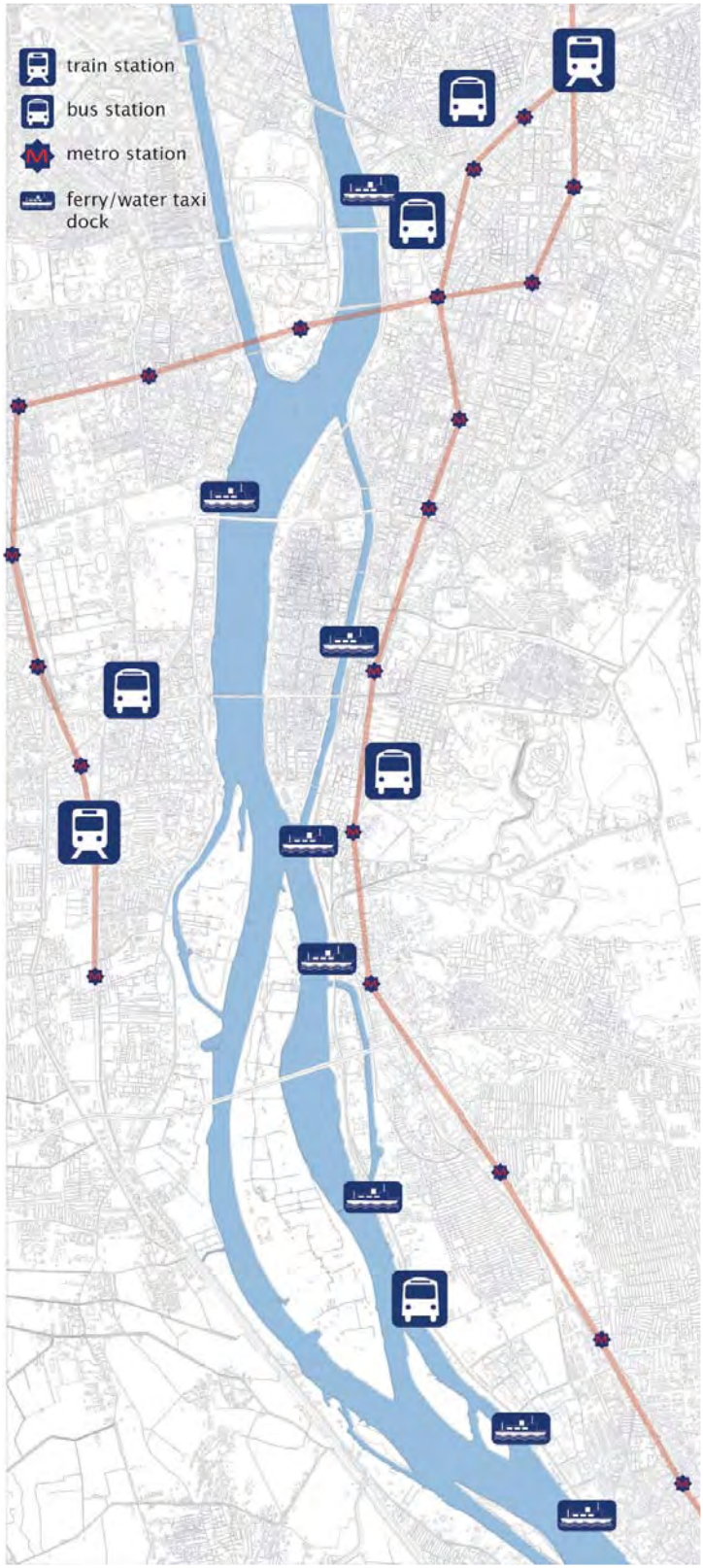


FIGURE 24. **Public transportation network**

CHAPTER 3

Current Conditions and Analysis

The 12-km study reach was subdivided into four districts for systematic surveys of current site conditions:

Central Business District (Site 1)

Central Business District (CBD), the northernmost of our study sites and home to Tahrir Square, includes the city's downtown and functions as the social, economic, and political heart of Cairo. Many Cairo residents travel daily for work to CBD, which forms a hub for commercial and governmental services, and includes parts of Zamalek and Roda Island. Therefore, this part of the city would function as a critical commuter node along any potential Nile trail (Figures 25-45).

Old Cairo (Site 2)

Old Cairo and Roda Island, our second study site, lies directly south of CBD. Old Cairo houses numerous historic landmarks and resources. Most of Roda Island, primarily a residential district, sits in the main channel of the Nile across from Old Cairo (Figures 46-72).

Athur El Nabi (Site 3)

Athur El Nabi, our third study site, lies just south of Old Cairo. As a de-industrializing section of the Nile waterfront, Athur El Nabi contains large swaths of land that could potentially become available for redevelopment. (Figures 73-87).

Maadi (Site 4)

The Maadi District, the most southern reach in our analysis, presents its own set of unique challenges. Consisting primarily of private or government clubs and businesses, Maadi currently provides very little direct public access to the Nile (Figures 88-110).

Site 1: Central Business District (CBD)

For purposes of data collection, the 15th of May Bridge forms the northern boundary of CBD and Roda Bridge forms the southern boundary. The 2.7-km study reach includes the east and west banks of the Nile, the east and west banks of the southern portion of Zamalek Island, and the east and west banks of the northern tip of Roda Island. As the economic, cultural, and social center of Cairo, CBD consists of dense, commercial high-rises, government administrative buildings, embassies, educational and cultural centers, and high-rise apartment buildings. Tami Church (UCB), Fekria El-Bialy (CU), Heba Ezzat (CU), Mirette Khorshed (AUC), Momen Hosseiny (AUC and UCB), Mohamed Tarek (AUC), Robert Tidmore (UCB), and Professor Linda Jewell (UCB) conducted the survey of CBD.

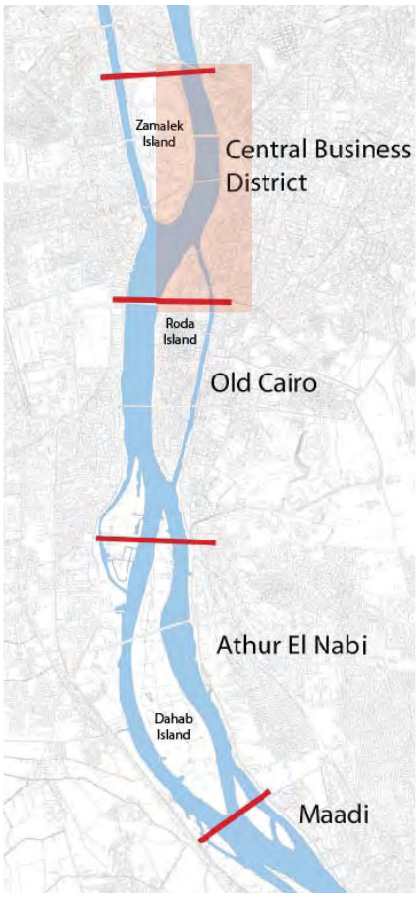


FIGURE 25. Map of the Nile in Cairo highlighting the first study site

Land Use

Land use in CBD varies according to several distinct zones. Governmental, commercial, and tourist areas dominate downtown Cairo. The Garden City district houses mostly embassies, hotels, and upper-class residential buildings. The northern end of Roda Island is anchored by the Hyatt Hotel and the teaching hospital of Cairo University, and the island's west bank consists of private residences or other restricted access areas. Land use on the southern tip of Zamalek Island consists primarily of open space and private, recreational facilities and clubs. Relatively high density commercial and residential towers characterize the west bank of the Nile in CBD.

The Built Environment

The built environment in CBD consists primarily of buildings maintained for economic, cultural, and civic purposes. Generally buildings are in good condition, though we noted some minor deviations from this overall trend.

Landmarks, Unique Sites, and Important Nodes

The CBD study reach contains a number of important landmarks and attractions. For purposes of our assessment, we divided the landmarks into cultural, touristic, civic, and commercial categories. Cultural and touristic landmarks include the Egyptian Museum and Tahrir Square. Civic landmarks include the Egyptian Television and Radio building, embassies in Garden City, Ramses Square, and administrative buildings surrounding Tahrir Square. Commercial landmarks include the Cairo Marriot, the Cairo Hilton, the World Trade Center, and the Cairo Tower.

Site 1: Central Business District

FIGURE 26. Satellite image of the Central Business District

(Google Earth)

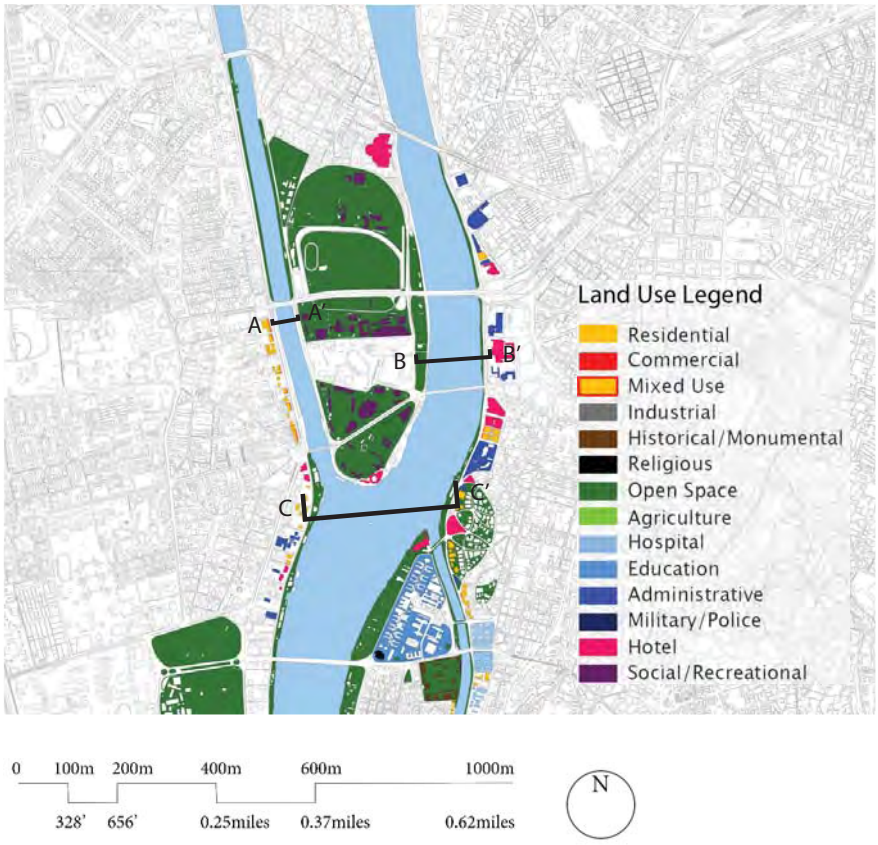
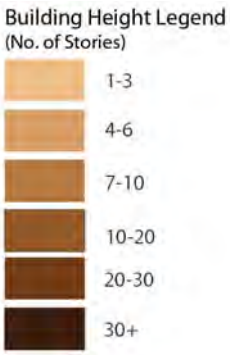


FIGURE 27. Land use data collected for the Central Business District

Also shown are approximate locations of cross-sections presented in figures 35-37.

FIGURE 28. Building condition data collected for the Central Business District

FIGURE 29. Building height data collected for the Central Business



Site 1: Central Business District

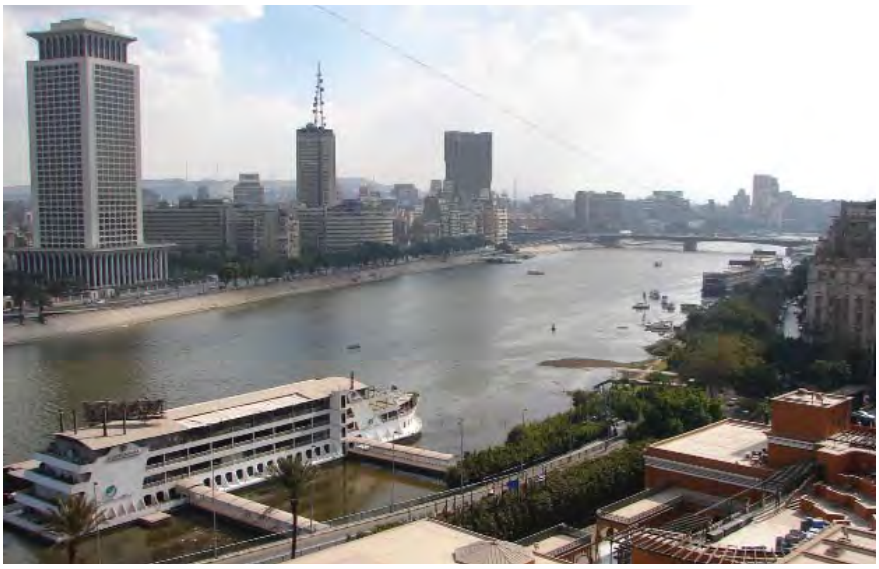


FIGURE 30. View of the Nile's east bank in CBD from the Marriott Hotel

Landmarks visible on the east bank include (from left to right) the Ministry of Foreign Affairs building, the radio and TV building, the Ramses Hilton Hotel, and the 6th of October Bridge.

FIGURE 31. East bank of the Nile near Ramses Hilton Hotel in CBD

Riverbanks at the east end of the 6th of October Bridge provide few cultural, recreational, or aesthetic amenities for city residents.

FIGURE 32. New pedestrian promenade along the southeastern edge of Zamalek Island

A recently constructed waterfront park and promenade on Zamalek Island at the west end of the 6th of October Bridge showcase the popularity and potential of a revitalized Nile waterfront.

FIGURE 33. View of the Nile's west bank in CBD from the Al-Gamaa Bridge

FIGURE 34. Major landmarks observed along the Nile in CBD

Representative cross-sections of the Nile in CBD

All cross-sections looking downstream. See Figure 27 for approximate location of each section.

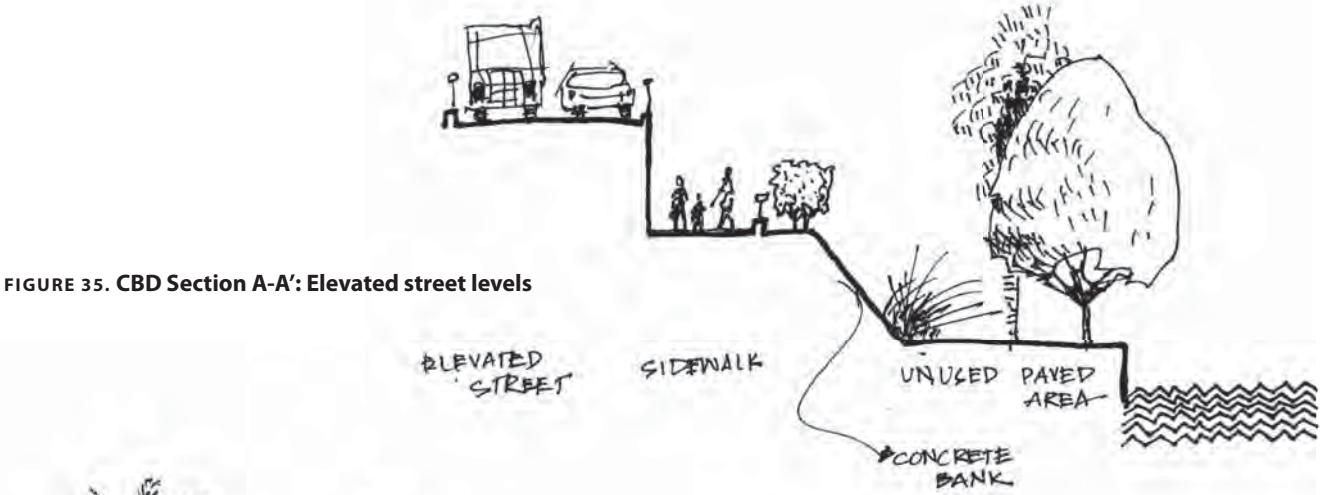


FIGURE 35. CBD Section A-A': Elevated street levels

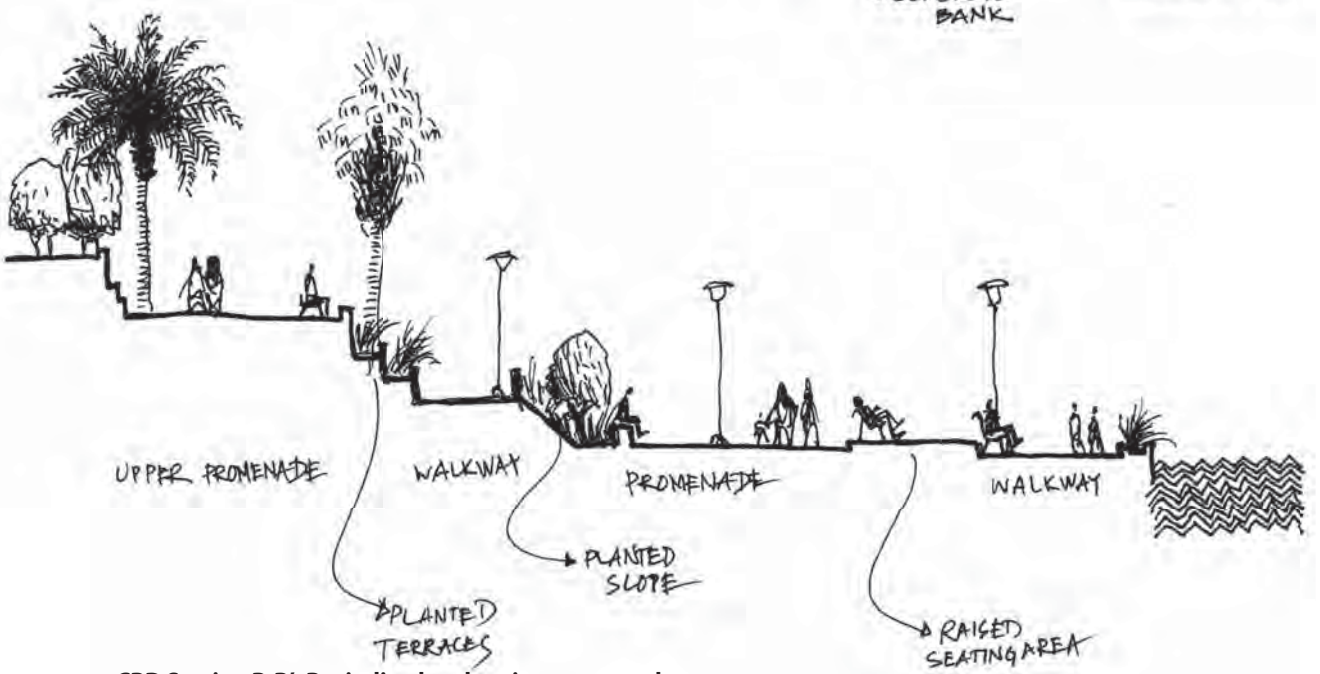


FIGURE 36. CBD Section B-B': Revitalized pedestrian promenades

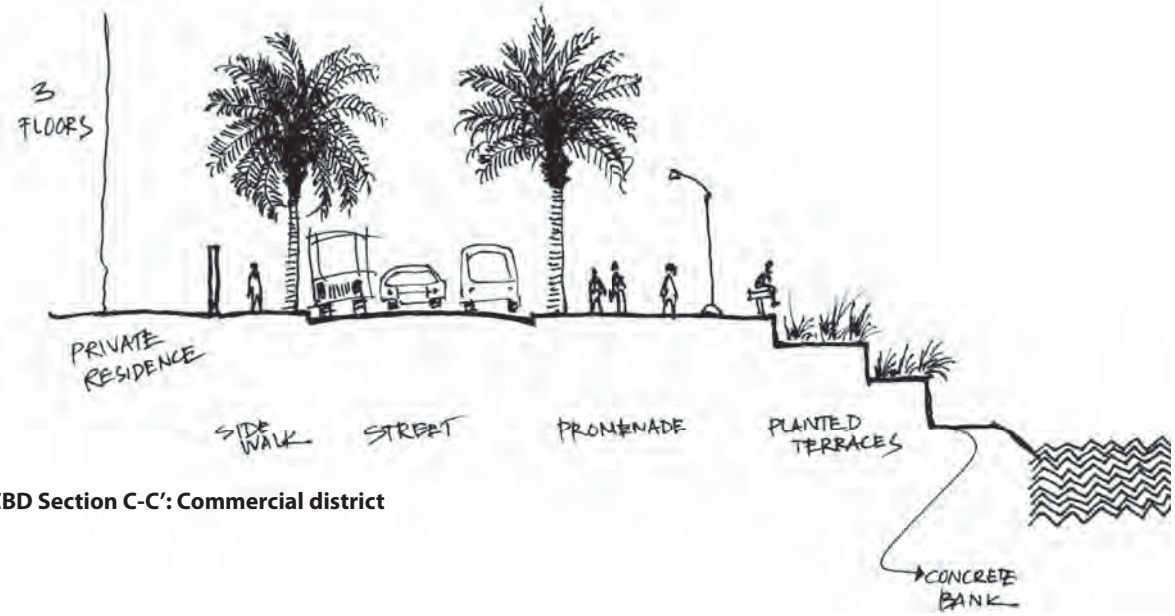
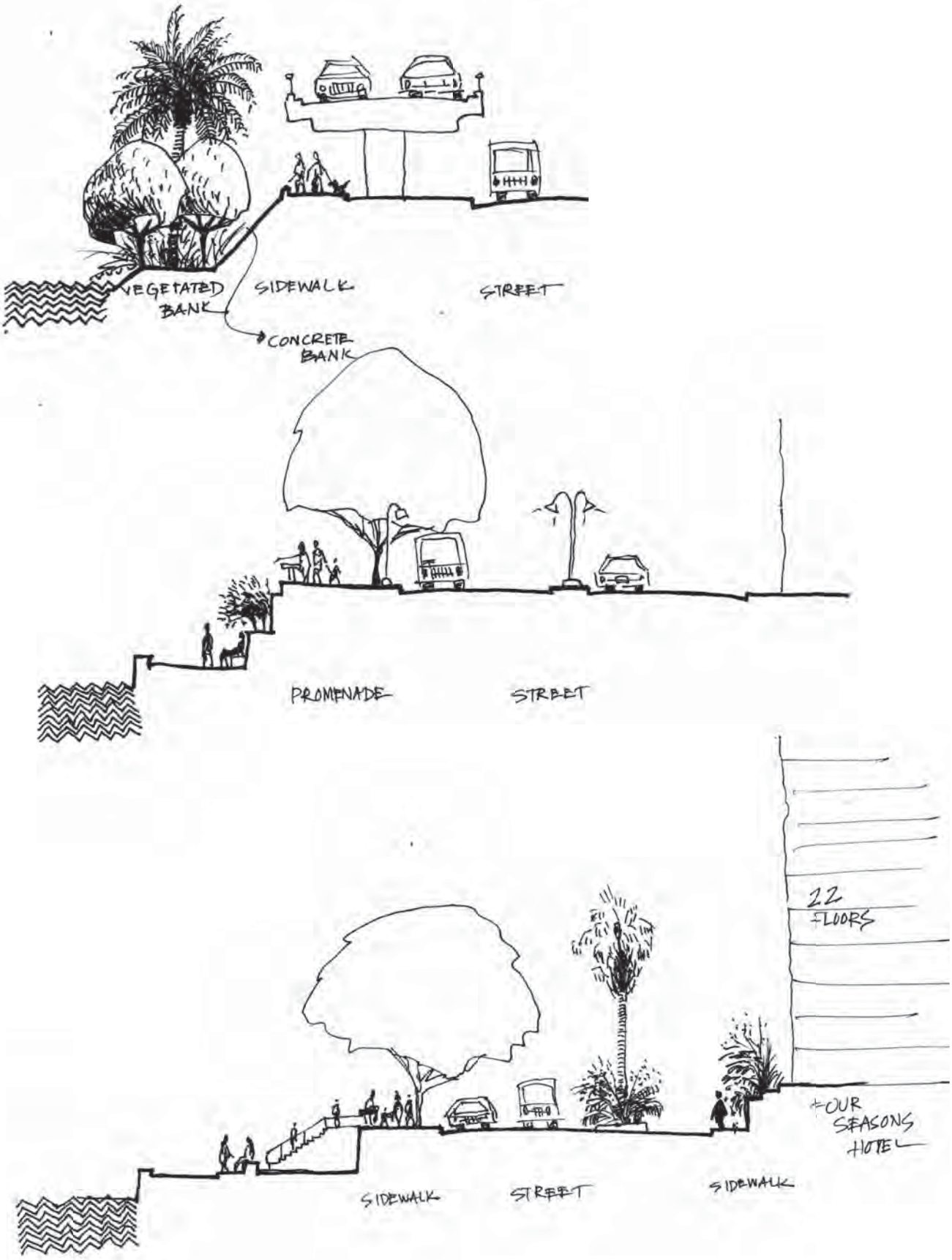


FIGURE 37. CBD Section C-C': Commercial district

Representative cross-sections of the Nile in CBD



Access - visual, physical, and transportation connections

We determined physical and visual access to the Nile from existing streets and the many pedestrian promenades within the study area. In most areas, government installations, private clubs and restaurants, police harbors, or commercial interests (e.g., tourist boats, houseboats, plant nurseries) either prohibit or limit public access to the riverbanks. To access the river along the east bank of the downtown area, a user would need to descend a steep slope armored in rocks and concrete, making access possible, but quite difficult. This portion of the study site has the least explicitly defined access. In addition, strict security around the embassies in Garden City, or any of the police clubs, preclude the possibility of lingering around those areas for recreation. The southeastern corner of Zamalek Island provides the most accessible stretch of riverfront and consists of a newly built promenade, plantings, benches, streetlights, and an entrance fee of two Egyptian pounds. The northwest tip of Roda Island provides additional open space, but is divided into parcels, each reserved for different professional groups. In general, bridges crossing the Nile provide the few publicly accessible sites along the CBD waterfront. These sites offer panoramic views up and down the river, which results in heavy public use of the bridges for this purpose. At night, people often congregate on the bridges for social gatherings, informal dining engagements, and parties.

FIGURE 38. View potential in CBD

Left figure indicates locations along the waterfront with potential for direct visual access of the river or pyramids. Right figure (black arrows and lines) indicates where much of the area is privatized, leaving only the bridges for public visual access.

Bank Conditions

Bank conditions in CBD vary considerably. In the northern end of the district on the east bank, an armored levee with a 45 degree slope extends down to the water level. Public access, while difficult under these conditions, is presumably allowed. Adjacent to the armored levee, a pedestrian promenade lines the Corniche and presents a considerable opportunity for a potential waterfront trail location and improved public access. A heavily used water taxi loading station in this vicinity could serve as a model for a river ferry system expansion. Just north of Garden City, the riverfront access becomes severely limited due to private clubs, restaurants, and police facili-

FIGURE 39. Concrete-lined levee along the Nile's east bank in CBD

A steep, concrete bank and fence prevent access to the river along much of the east bank in CBD. Significant potential exists for a trail to be located along the base of the levee here.

FIGURE 40. Unused lower terraces

Unused lower terraces also provide opportunities for the establishment of a trail and public spaces along the river.

FIGURE 41. Revitalized areas

A revitalized promenade near the water level in CBD demonstrates the potential of the Nile banks as a pedestrian trail.

ties. The narrow channel between Roda Island and the east bank possesses wide, extensive low banks in many places. A preponderance of nurseries occupies flat portions of the banks in this section, and spontaneous riparian vegetation has grown along other portions. Private clubs, restaurants, and military sites also limit public access on the west bank along this stretch of the river. Zamalek Island provides the only developed, publicly accessible waterfront park in the study area, but is limited to users who can afford the entrance fee. In spite of the entrance fee, families, couples, and children generally fill the park. The channel between Zamalek and the west bank consists of a mix of empty small plots, nurseries, and private restaurants.

Opportunities and Constraints

FIGURE 42. **Traffic in Tahrir Square**

The existing pedestrian promenade running from downtown to the southern end of Garden City stands out as a primary opportunity for situating a waterfront trail in CBD. Abundant public transit infrastructure exists adjacent to the riverfront along this stretch of the Nile, including Ramses Square (major transit hub), a water taxi loading point, and numerous informal minibus stops. A trail in this vicinity would provide access to the important civic and tourist sites concentrated near the east bank. Furthermore, many recent public gatherings related to political changes in Egypt suggest that Tahrir Square, located just east of the Corniche, could serve as a potential location for a new memorial open space downtown, adjacent to the waterfront trail. Nursery land concentrated along the river's edge could potentially be reorganized or incorporated into the riverside trail and its adjacent public spaces.

Primary constraints in CBD include the preponderance of privately owned or leased land along the river's edge and the proliferation of embassies in Garden City. Security related to the embassies limits public access and activities along this stretch of the Corniche.

Data collected from CBD suggest that a potential waterfront trail should be located along the east bank of the river to take advantage of the existing concentration of opportunities here. Furthermore, frequent use of the limited existing ferry services suggest that water taxi service along the Nile could be greatly expanded. In addition to the major trail running north to south along the river, we recommend creating east-west connector trails to provide pedestrian and bicycle access to major landmarks, transit centers, and commercial nodes prevalent throughout the study site.

FIGURE 43. Views from CBD bridges

Bridges that cross the Nile provide some of the few uninterrupted views up and down the river, and are gathering places for local residents of all ages.

FIGURE 44. Ferry landing in downtown Cairo

This existing ferry stop in CBD is heavily used in spite of its poor facilities, lack of public services, and limited routes.

FIGURE 45. Narrow pedestrian paths

The existing pedestrian promenade narrows in many places, preventing the establishment of a continuous pedestrian path.

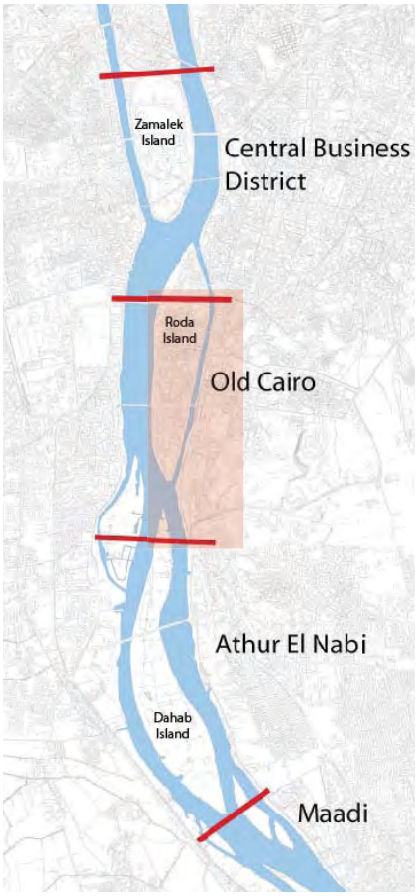


FIGURE 46. Map of the Nile in Cairo highlighting the second study site

Site 2: Old Cairo

Our 'Old Cairo' reach extends from just south of Garden City southward to Coptic Cairo. Workshop participants Noha Abbassy (AUC), Nada Abd El-Aziz (CU), Aly Abd el-gawad ali ghaly (CU), Krishna Balakrishnan (UCB), Salsabil Fahmy (AUC), Nada Nafeh (AUC), Adrienne Smith (UCB), and Professors Louise Mozingo (UCB) and Sami Sabri Shaker (CU and AUC) surveyed this 3.6-km reach of the Nile, its riverbanks, and the Corniche running through Old Cairo. The survey area extends from Roda Bridge in the north to Al-Mahmoud Mosque in the south, and includes middle and southern portions of Roda Island. The Amr Ibn Al-Aas Mosque, Fustat Gardens, and the outer wall of Coptic Cairo form the eastern edge of the study site.

Moving from north to south, the zone includes educational institutions between the metro line and the Corniche, the Suleiman Pasha El-Faransawy (the "French general") tomb, informal settlements on both sides of Athur Al Nabi (between Coptic Cairo and the Nile Corniche), and the Al-Mahmoud Mosque.

Land use along Old Cairo's Corniche consists predominantly of mixed-use commercial and residential buildings, and also includes several cultural institutions. The bustling east bank contains several large commercial establishments on both ground and upper floors, while the west bank (i.e., Roda Island's east bank) consists of a variety of residential dwellings for members of Cairo's middle class. On this side of the island, the ground floors of tall residential structures house smaller businesses than those found on the east bank. At the southern end of the east bank, Coptic Cairo houses tranquil religious and cultural institutions for Egypt's indigenous Christian community.

FIGURE 47. Buildings in poor condition along the Corniche in Old Cairo

The Built Environment

Mixed-use buildings line both sides of the Corniche in Old Cairo. A variety of architectural styles characterize the buildings in this district and very few consistencies in building design, structure, or condition exist throughout the study site. Most buildings stand four or more stories tall and house commercial uses on the ground floor. Building conditions range from exceptional to deplorable, though we ranked most buildings as "moderate." Buildings along the west bank (i.e., Roda Island) generally seemed to be better maintained than buildings on the west bank.

Landmarks, unique sites, and important nodes

Throughout Old Cairo, both banks feature unique and significant cultural institutions. On Roda Island at the north end of the study site, the Manial Palace and gardens create a quiet haven. At the island's southern tip, the Manasterly Palace, Nilometer and Om Kolthoum Museum create a large cultural complex requiring a ticket for entry. From the more urbanized east bank, visitors can reach these cultural sites by ferry or by the popular Manasterly Pedestrian Bridge.

FIGURE 48. Frequently-used Manasterly Pedestrian Bridge leads from Old Cairo to Roda Island

Cultural uses on the east bank include a large school directly on the Corniche and several religious institutions located a few blocks east of the waterfront. Further to the east, Amr Ibn Al-Aas Mosque stands as a major landmark and place of worship. Just south of the mosque, historic Coptic Cairo houses several religious structures. The Hanging Church, Church of Saint George, and Babylon Fortress provide important places of worship for Egypt's Christian population. These religious monuments attract numerous tourists and could benefit from improved accessibility.

Old Cairo possesses a wealth of landmarks and unique sites, but the concentration of historical and culturally significant sites between Coptic Cairo and Amr Ibn Al-Aas Mosque form the primary attractions. These exceptional sights attract both local and international visitors. They form a dense, walkable cluster of unique destinations, but are not easily accessible. Tourists generally arrive in chartered buses despite the presence of a metro station adjacent to St. George Church. By creating an obstacle to pedestrians crossing between historic sites and the Corniche, the metro line actually functions as a barrier between Coptic Cairo and the Nile.

Access - visual, physical, and transportation connections

The Corniche along Old Cairo generally features good visual access to the river for both vehicles and pedestrians. However, several conflicts exist between vehicle and pedestrian users. In addition, waterfront establishments, bank conditions, and other physical factors prevent direct access to riverbanks throughout the Old Cairo study site. Along the east bank at the southern edge of Old Cairo, private security officers hired by private clubs and floating restaurants control and closely monitor access to the waterfront. Farther north, along both riverbanks, plant nurseries create an attractive, wide green terrace sloping down to the water, but limit public access. While these nurseries do not completely restrict access by hiring security guards, they also do not provide full public access.

FIGURE 49. Nurseries line the riverbanks in Old Cairo and Roda Island

Site 2: Old Cairo

FIGURE 50. Satellite image of Old Cairo
(Google Earth)

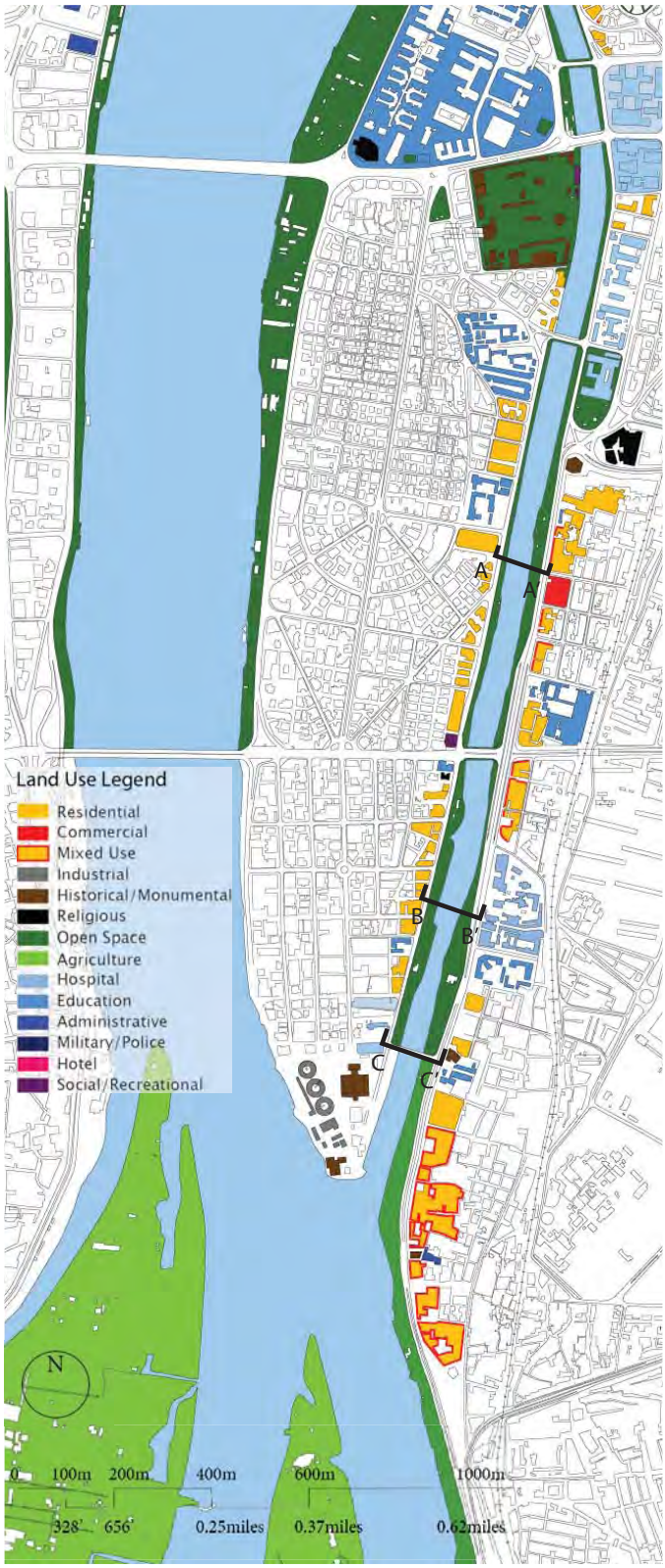


FIGURE 51. Land use data collected for Old Cairo
Also shown are approximate locations of cross-sections presented in figures 59-61.

FIGURE 52. **Building condition data collected for Old Cairo**

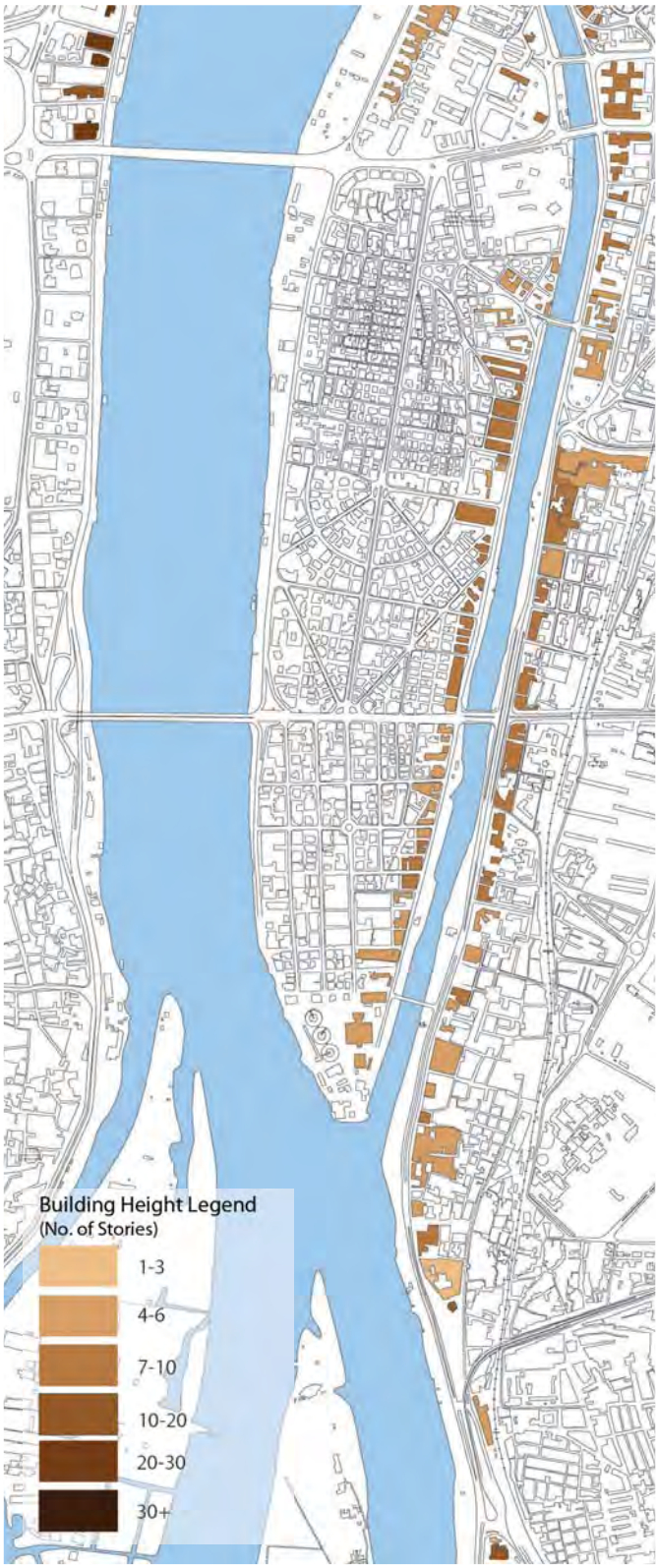


FIGURE 53. **Building height data collected for Old Cairo**

FIGURE 54. **Mosaic in the courtyard of the Coptic Christian "Hanging Church"**

FIGURE 56. **Babylon Fortress located at the base of the Hanging Church**

FIGURE 57. **Tomb of Suleiman Pasha El-Faransawy (the "French general")**

FIGURE 55. **Amr Ibn Al-Aas Mosque**

Site 2: Old Cairo

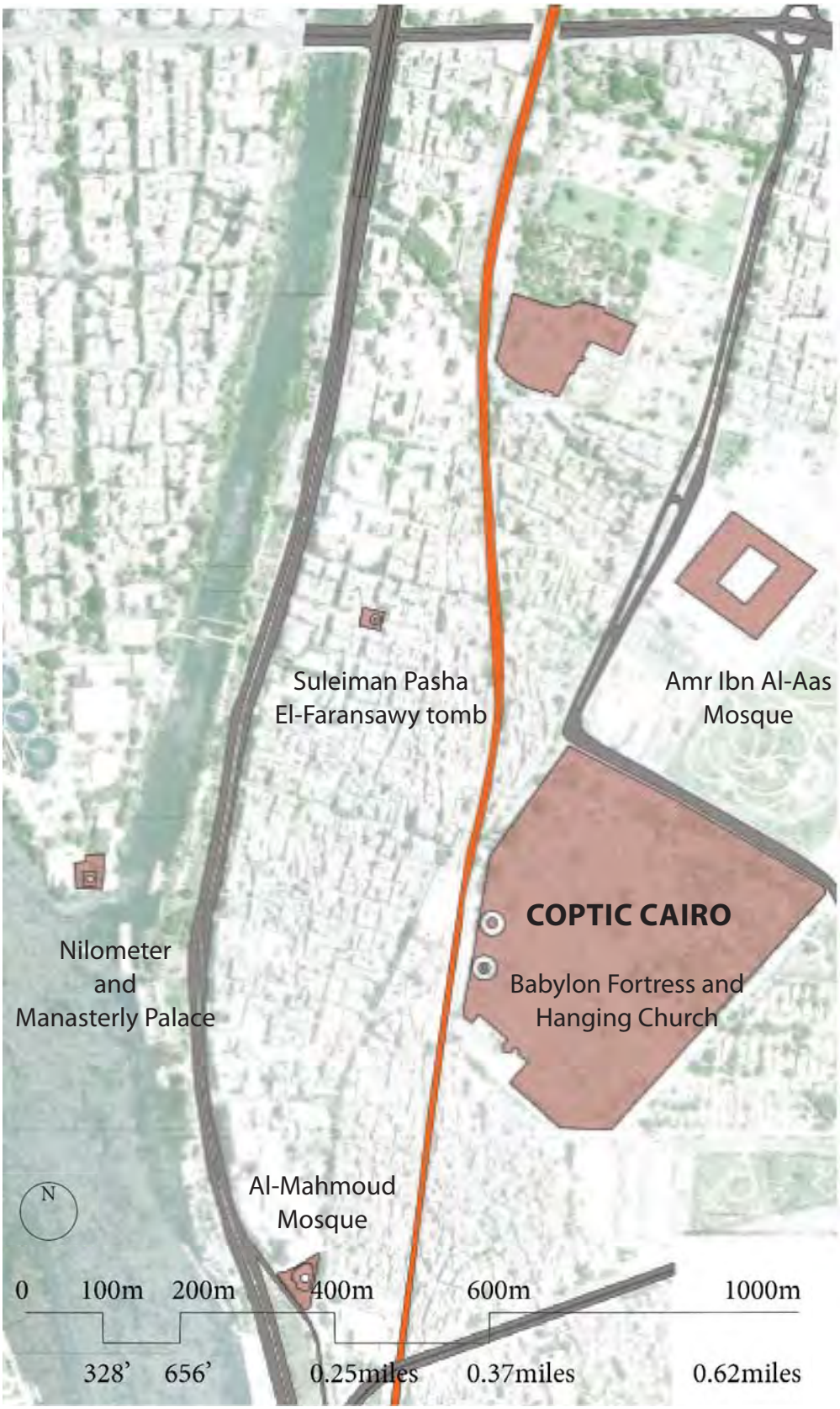


FIGURE 58. Map of historic landmarks in Old Cairo

Representative cross-sections for the Nile in Old Cairo

All cross-sections looking downstream. See Figure 51 for approximate location of each section.

FIGURE 59. Old Cairo Section A-A': Unused banks and terraces

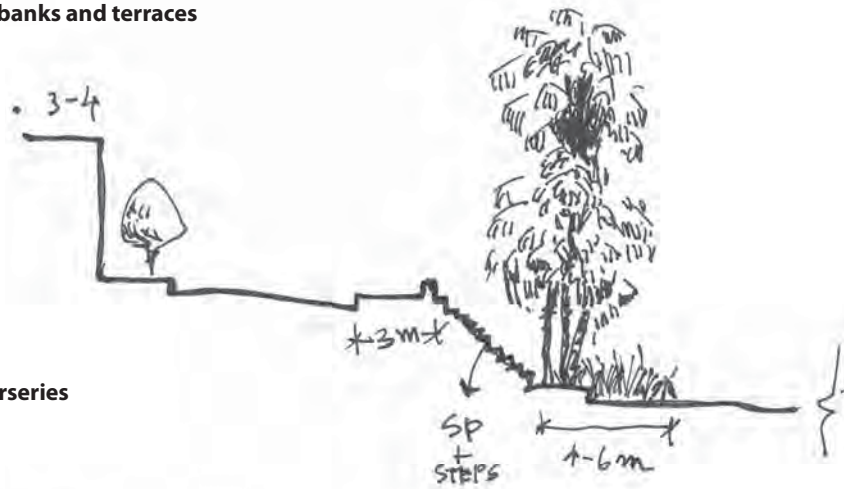
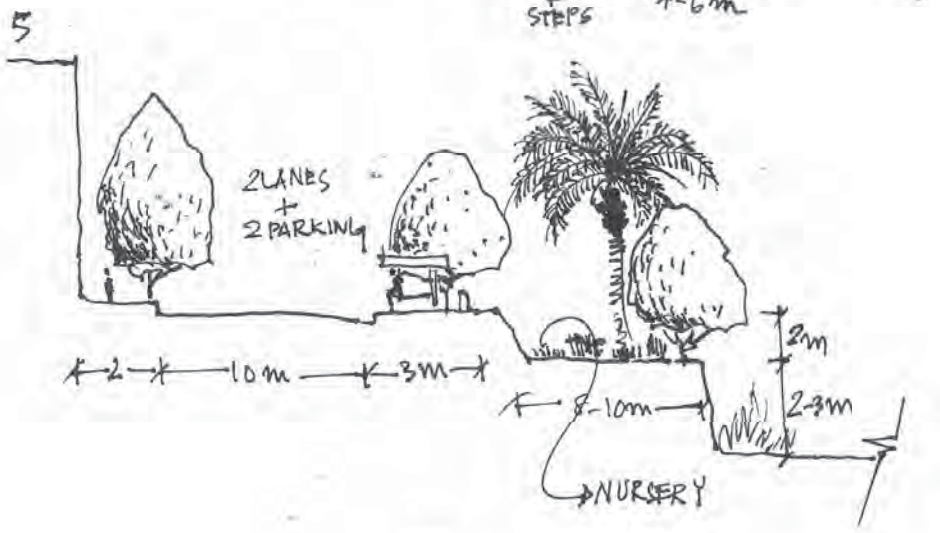


FIGURE 60. Old Cairo Section B-B': Plant nurseries



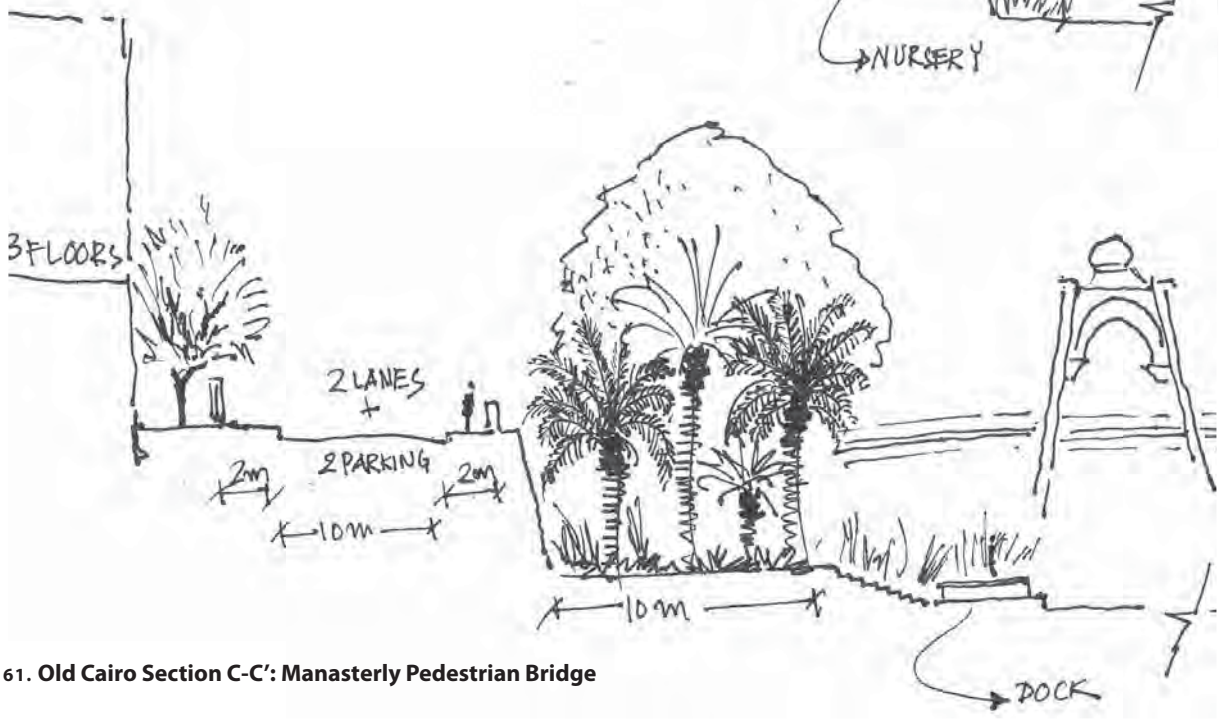


FIGURE 61. Old Cairo Section C-C': Manasterly Pedestrian Bridge

Representative cross-sections for the Nile in Old Cairo

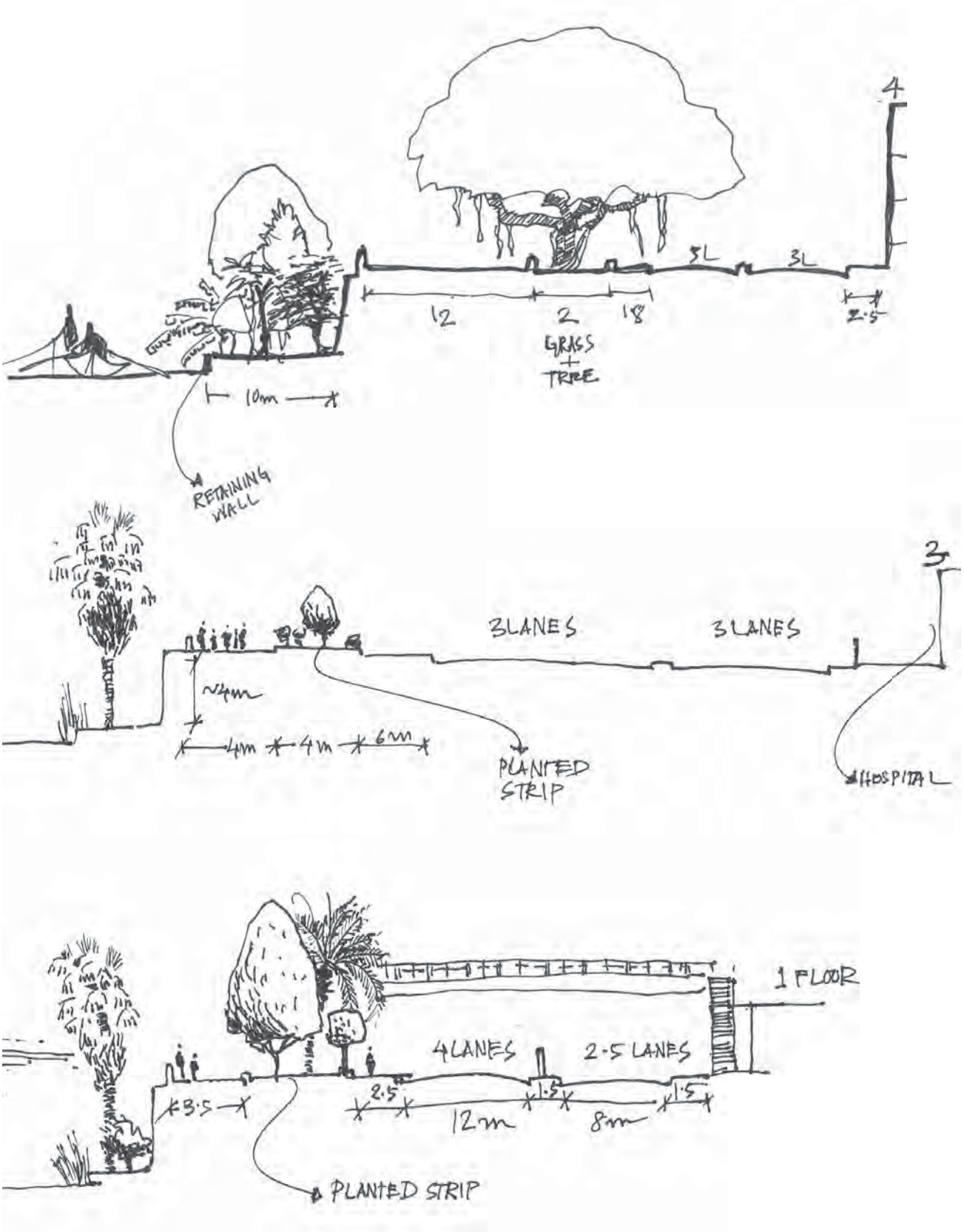


FIGURE 62. **Steep concrete walls serve as riverbanks on Roda Island**

FIGURE 63. **Planters occupy a large portion of the sidewalk**

FIGURE 64. **A single pedestrian bridge crosses the Corniche in the Old Cairo study site**

At sites where waterfront public access exists, vertical or nearly vertical concrete walls serve as riverbanks. The pedestrian promenade sits above these concrete walls, often two to three meters above the water surface, and metal railings or fences discourage people from climbing down to the river. Age and infrequent maintenance have caused formerly grand-looking sections of the promenade to appear unattractive and unsafe. Pedestrians sit atop crumbling walls far above the river and some younger visitors attempt to scramble down cement banks and stairwells at sporadic, informal access points.

Auto Access to Corniche

We studied the Corniche running along the river's east bank, which consists of fast moving traffic in four lanes for each direction (north and south). At the major Salah Salem intersection (study site midpoint), the roadway rises in the form of an elevated overpass. Parked vehicles generally occupy the space beneath this overpass, as very few parking and stopping opportunities exist along the Corniche. An elevated overpass and lack of signals, stop signs, and pedestrian crossings encourages a continuous flow of traffic. On Roda Island, traffic moves more slowly. The narrow waterfront streets of Al-Manyal Museum and El-Malek El-Saleh have parking lanes on both sides. On these streets, a width of about three meters must accommodate two lanes of traffic, which results in fewer speeding cars.

Pedestrian Access to Corniche

Old Cairo's Corniche features a continuous pedestrian sidewalk, which varies in width but can reach up to five or ten meters in some sections. However, plantings of grass, palms, and ornamental shrubs commonly occupy a significant percentage of the sidewalk width, leaving little pedestrian walking space. The east bank offers good north-south connectivity for the stretch we surveyed. However, crossing the Corniche from east to west to reach the waterfront remains nearly impossible. We observed only one elevated pedestrian bridge over the busy road. No other formal crossings exist. A narrow median - sometimes occupied by a fence - provides a pedestrian's only refuge while attempting to cross the busy street. The median at times, including at the Salah Salem intersection, dwindles to less than one meter in width.

The picturesque Manasterly Bridge provides the best option for connecting pedestrians to Roda Island. Once on Roda Island, the west bank offers a usable pedestrian sidewalk. The sidewalk offers a nearly continuous promenade along the riverfront, though it is frequently interrupted by large trees and situated several meters above the water level. A row of parked cars offers an additional buffer from the slow-moving traffic along this reach.

FIGURE 65. **Steep concrete banks, unused terraces, and informal settlements along the water's edge**

FIGURE 66. **View looking north from the popular Manasterly Pedestrian Bridge**

FIGURE 67. **Wide sidewalks and unused river terraces north of Manasterly Pedestrian Bridge**

FIGURE 68. **Old Cairo survey team on the Manasterly Pedestrian Bridge**

(from left to right: Adrienne, Professor Mozingo, Ahmed, Nada, Krishna, Salsabil, Rachael, Nada, Aly, Noha)

Public Transportation

Student teams observed few opportunities for non-motorized or public transit along the Corniche in Old Cairo. Street edges lack bicycle lanes and disjointed, narrow, crowded sidewalks would make cycling a challenge. Bus stops appear relatively frequently, but could benefit from improved signage. In general, very little proper signage, few benches, and few bus shelters exist along the Corniche. When present, they appear to be poorly maintained. The streets running between the Corniche and metro stations would benefit from being labeled as connectors. We encountered difficulty even locating metro stations as a result of convoluted streets adjacent to the stations and poor direct station visibility. Few pedestrian overpasses exist above Metro rail tracks. The ones that do exist seem difficult to find, and appear filthy and poorly maintained. Ferry stops along the Nile waterfront are also rare. The most visible landing sits adjacent to the Manasterly-Nilometer complex and presumably serves tourists more than commuters.

Bank conditions and cross-sections

Human activities have transformed the Nile banks along Old Cairo into highly constructed stone and concrete walls that armor the edge. Few formal entry points to the river exist. Vegetation exists only as a narrow band confined to the base of concrete walls. The few waterfront locations featuring a more gently sloping bank contain landscaped nurseries and private gardens, where public access is extremely limited.

Opportunities and Constraints

FIGURE 69. A young boy fishes next to litter and debris along the bank of Roda Island

Rich cultural resources, potential to create a diverse range of visitor and residential services, and feasibility of improving pedestrian and public transit connections constitute the primary opportunities for improving public access to the Nile in Old Cairo. Coptic Cairo, Amr Ibn Al-Aas Mosque, and Roda Island's cultural assets sit within easy walking distance of the Corniche and attract many visitors to this part of the city. Basic infrastructure to facilitate a Corniche connection already exists in the form of wide, continuous waterfront promenades and convenient metro stops. While these facilities do not function optimally in their current condition, they represent major pieces of infrastructure that could be greatly enhanced with minimal adjustments to their design, organization, and construction.

The sizeable and swift Corniche road presents the major challenge to developing Old Cairo into an integrated waterfront, neighborhoods, and public spaces. The dense, fast-moving traffic severs the waterfront from the city's activities. Without safe crossings, pedestrians can hardly be expected to move back and forth between the waterfront and the area's cultural offerings. Although some forms of public transit do exist, a private car provides the easiest, safest option for moving through this part of the city. Any attempt to convince Cairenes and visitors to use other forms of transport in this area would require some reorganization of basic infrastructure.

FIGURE 70. **Vehicular overpass on the Corniche**

FIGURE 71. **Dilapidated pedestrian bridge over the metro line in front of Coptic Cairo**

FIGURE 72. **Heavy traffic and few pedestrian overpasses limit public access to the Nile waterfront**

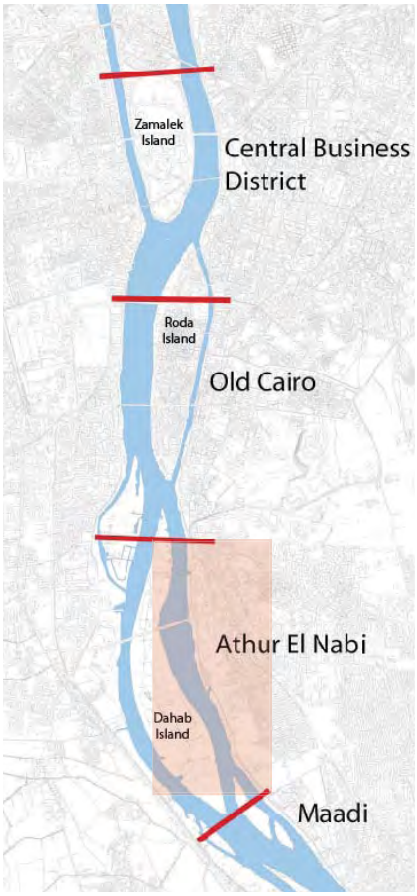


FIGURE 73. **Map of the Nile in Cairo highlighting the third study site**

Site 3: Athur El Nabi

The Athur El Nabi neighborhood sits on the east bank of the Nile between Old Cairo and the residential suburb of Maadi. This densely populated district includes residential, industrial, commercial, government, and educational land uses. Richard Crockett (UCB), Mohamed El-Kharbotly (AUC), Ereny Kamal (CU), Michal Kapitulnik (UCB), Madonna Maher (CU), Bahaa Stephanos (AUC), and Professor Sami Sabri Shaker (CU and AUC) surveyed the neighborhood, identifying land-uses, building and pedestrian walkway conditions, access to the Nile, and city-wide connectivity. The 3.5-km study reach extends from Old Cairo in the north to the courthouse in Maadi in the south, and includes two islands. The natural island of Dahab sits in the middle of the Nile, consists only of agricultural land uses, and is inaccessible by car. The other "island" was created when a channel was dredged parallel to the Nile to create a harbor.

The land uses of the waterfront include large residential towers (both formal and informal), government ministries, private clubs on the river, and aging industry. Given the deteriorating condition of Athur El Nabei's industrial waterfront and the numerous already-vacant lots, significant pieces of land could be available for redevelopment or for ecological restoration along the Nile. By capitalizing on existing transit networks, this area could become a new hub of activity in Cairo.

Land Use

Its diverse land uses make Athur El Nabi an interesting location to explore new relationships between its residents and the Nile. Rows of high-rise buildings, including several informal housing developments, line the east edge of the Corniche. The ground floors of these high-rise buildings house commercial uses, including small markets, banks, and other businesses. Many of these commercial spaces currently appear to be vacant. Two large hospitals, a court house, and smaller government administrative buildings stand within the rows of residential buildings.

FIGURE 74. **Trash piles accumulate at entrances to informal housing settlements**

Small agricultural lands and several vacant lots dot the river's east bank, interspersed throughout the buildings. Many of the vacant lots sit in front of residential towers and generally consist of dirt surfaces, which provide informal areas for trash piles to accumulate, stray animals to roam, and schoolchildren to play soccer. As we documented our observations, residents of the high rise buildings routinely emerged from their apartments to empty bags of trash onto the already overflowing piles.

Site 3: Athur El Nabi

FIGURE 75. Elevated Corniche alongside informal housing

The busy six-lane Corniche and pedestrian sidewalks passes over the man-made ship channel.

FIGURE 76. Informal housing buildings have emerged on former agriculture lands

Vacant lots and a parking lot provide open space for a game of soccer.

FIGURE 77. Typical Athur El Nabi streetscape along the Corniche

Building setbacks along the Corniche create flexible open spaces at street level that are often used as informal parking.

Site 3: Athur El Nabi

FIGURE 78. **Satellite image for Athur El Nabi**
(Google Earth)

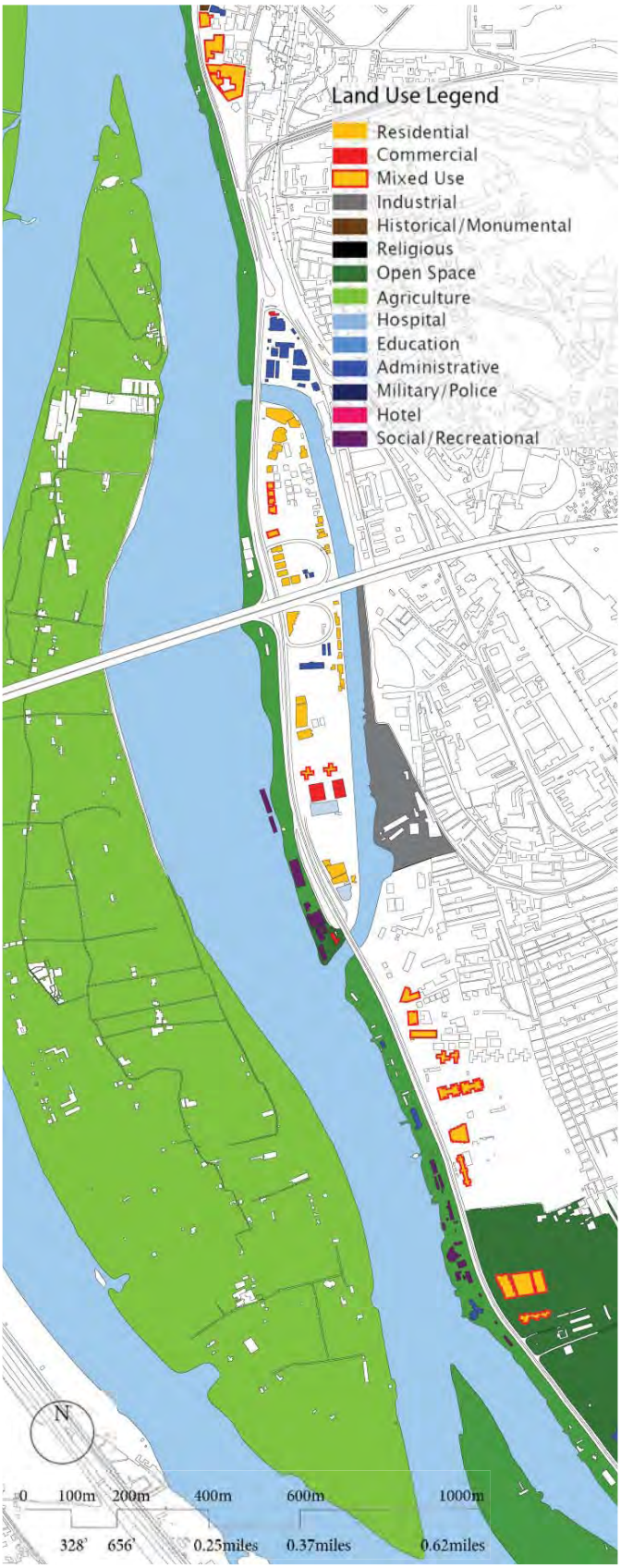


FIGURE 79. **Land use data collected for Athur El Nabi**

FIGURE 80. **Building condition data collected for Athur El Nabi**

FIGURE 81. **Building height data collected for Athur El Nabi**

FIGURE 82. Apartment building

Typical building style and condition of residential structures on the harbor island.

FIGURE 83. Row of residential buildings

Relatively new high-end residential buildings are located on the southern half of the island.

A series of commercial nurseries, including both active and abandoned sites, line the west bank of the Corniche. The west bank also contains private clubs, government or military outposts, and several vacant lots. Some of the clubs appear to be affiliated solely with tourism companies.

Dahab Island, an agricultural island in the main Nile channel, consists primarily of flat alluvial farmland and a small community of residents. No bridges link Athur El Nabi and the island, but two informal ferries provide access for island residents. An industrial ship canal dredged in the 20th century creates another "island." The Corniche occupies this island, bridging the canal at the island's northern and southern extremities. The island consists of a few high-rise apartment buildings in poor condition, which provide housing for a small community. The canal itself has no pedestrian access on either bank. On the west bank, residential parcels face the canal. Thebes University and decommissioned barges occupy the east side of the canal and its banks. Industrial land in Athur El Nabi lies along most of the canal and includes a decommissioned boat yard, along with other boat-repair and shipping facilities.

Built environment, building conditions and heights

Private clubs or businesses and riverside nurseries dominate most of the Nile waterfront in Athur El Nabi and limit public access to the river. Physical barriers often obstruct views. Most of the buildings on the east side of the Corniche are between ten and thirty stories high, in poor to fair condition, and house commercial establishments on the ground floor and residential dwellings on upper floors. Many of the ground floor units do not currently have occupants. Behind the single row of high-rise buildings generally lies a strip of vacant or agricultural land, or informal housing developments.

Access - visual, physical, and transportation connections

Similar to other areas of Cairo, very little public access to the Nile exists in Athur El Nabi. Private clubs or nurseries block most visual access to the water with tall trees, shrubs or fences. In addition to access issues, the sidewalk along the Corniche lacks continuity and at times disappears completely, which forces pedestrians to walk directly along the heavily trafficked road. In addition, no formal crosswalks exist to allow pedestrians to cross the Corniche safely. This severely limits east-west connectivity to the Nile from sites located further within the city. Two informal ferry launches provide limited service to Dahab Island.

Bank conditions and cross-sections

In areas occupied by nurseries (some in operation, some abandoned), the riverbank generally splits into two or three terraces, each approximately five meters wide, with staircases connecting them. These terraces contain potted shrubs and trees. Short fences (one or two meters high) separate nurseries from the Corniche sidewalk; some have locked gate access.

Site 3: Athur El Nabei

FIGURE 84. Ring Road off-ramp

Off-ramps from Cairo's Ring Road create barriers between the Nile and vacant parcels or other opportunities for connections to the city.

FIGURE 85. Barge parking in the harbor channel

Industrial land uses dominate the south bank of harbor channel and a hospital stands on the north bank.

FIGURE 86. Banks of the harbor channel
Underused land and waterfront property along the former shipping canal have potential for redevelopment

Private clubs form the other most prominent land use along Athur El Nabi's waterfront. Most of these clubs have one or two paved terraces with tables overlooking the river. At street level, fences between two and four meters high, along with dense hedges, block access to the clubs and obstruct river views. More natural appearing bank segments emerge at a few places along the waterfront, some of which have been converted to informal ferry stops.

Opportunities

FIGURE 87. Barge parking in the harbor channel

Aging, deteriorating barges obstruct the canal and leach pollutants into the water.

Athur El Nabi provides many opportunities to connect and enhance relationships between the public and the Nile. The transportation system could be leveraged and expanded. Two metro stations and two ferry landings exist within walking distance of the Nile, which could be expanded and enhanced. In addition, although no bus stations currently exist along the Corniche, many buses run north to south through Athur El Nabi, and new stations could be added to bring users to the river. Several existing institutions, such as a hospital, banks (national and international), a constitutional court, government ministries, and clubs could be used as nodes along the Corniche to establish parking and transit centers, and leverage parking infrastructure. The shipping boat yard, as well as the undeveloped fenced-off vacant parcels throughout Athur El Nabi could be redeveloped as open space, connecting users to the Nile and extending the green network further into the city to improve east-west connectivity.

The undeveloped agricultural land on Dahab Island could be linked by a formal, efficient ferry system to provide water taxi services to residents and tourists. The land itself could be preserved for recreational or agro-tourism uses. Vacant nurseries and land on the island could be used as sites to promote bird habitat and treat storm or wastewater before it enters the river. Existing clubs along the river could be leveraged to create a continuous riverside trail with nodes of activity connecting users to the Nile.

Constraints

Several constraints in Athur El Nabi must also be considered. No formal pedestrian crossings over the Corniche exist, and ferry and bus stops are limited. Parking is inadequate, and informally parked cars interfere with traffic circulation and block pedestrian movement. As a busy thoroughfare, the Corniche suffers from noticeable traffic-related air pollution. Private clubs and military outposts restrict river views and access, and government complexes and other public buildings provide no public gathering spaces.

The many vacant lots in Athur El Nabi attract informal dumping of solid waste, which pollutes the waterway. Fences limit access and connectivity to these areas, and create "dead-zones", preventing circulation and development opportunities. The canal next to the man-made island contains deteriorating boats, which obstruct the canal, leach pollutants into the water, and serve to trap garbage in the waters beside them.

Site 4: Maadi

The Maadi district of Cairo lies just south of Athur El Nabi and houses many of the city's wealthiest establishments and residents, including embassies, large commercial centers, and expatriate communities. Maadi emerged in the early 20th century as Cairo expanded southward along the Nile and residential nodes, transport axes, parks and public lands replaced agricultural land. The district remained primarily residential until the mid-20th century when commercial units, small factories, and military training areas emerged (Mahmoud and Selman 2010). Maadi now forms one of the most western-looking parts of Cairo, and is characterized by a strong military presence, many private restaurants and clubs, and residential sections that include some of the most attractive green spaces and leafy trees in the greater Cairo region (Beattie 2005). Maadi sits alongside a relatively wide reach of the Nile near the Wadi Degla protected area, which provides recreation and tourism opportunities.

Ahmed Farouk (CU), Amir Gohar (UCB), Malak Maher (AUC), Rachael Marzion (UCB), and Professors Matt Kondolf (UCB) and Sami Sabri Shaker (AUC), surveyed a 2-km reach of the Nile, its riverbanks, and the Corniche running alongside the Maadi district. We started our survey at the private Maadi Yacht Club at the southern end of Maadi and headed north to the military hospital. We documented conditions in this reach by taking notes, sketching cross-sections of the four representative land use types dominating the Maadi waterfront, and taking photos of the riverbanks, land uses along the banks and Corniche, traffic, and pedestrians. Photos could not be taken along the northern portion of our study reach due to the presence of police and military facilities and personnel. Military personnel did not allow our team to cross a small bridge and survey Geziret El-Maadi (an island primarily used for recreation), as this area is reserved for Egyptian nationals.

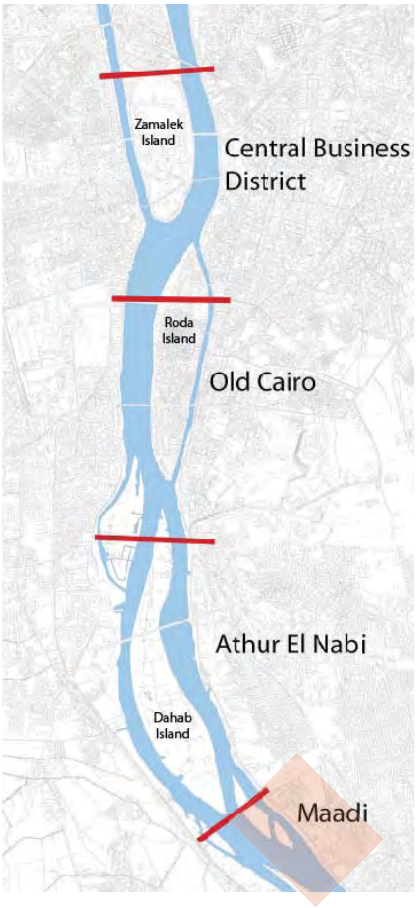


FIGURE 88. Map of the Nile in Cairo showing the location of the fourth study site

Land use

The Maadi waterfront and Corniche comprise a wide variety of land uses, though very few of these land uses allow public access to the Nile. Along the southern waterfront, private restaurants and clubs, including the Maadi Yacht Club and the western T.G.I. Fridays restaurant, occupy the riverbanks and provide seating on landscaped terraces overlooking the river. Along the middle stretch of our surveyed reach, dilapidated ferry landings, several nurseries, and informal settlements (on land and boats) dominate the riverbanks. A large military helicopter pad, police social club, and bridge to a state-sponsored recreational island occupy the banks of the northern reach. Although the street-level sidewalks in front of these waterfront establishments are generally narrow, they widen at intervals to allow pedestrians to stroll above the river alongside the Corniche.

FIGURE 89. Professor Kondolf and Amir interview a felucca owner along the Maadi waterfront

Site 4: Maadi

FIGURE 90. Satellite image of the Maadi study site (Google Earth)

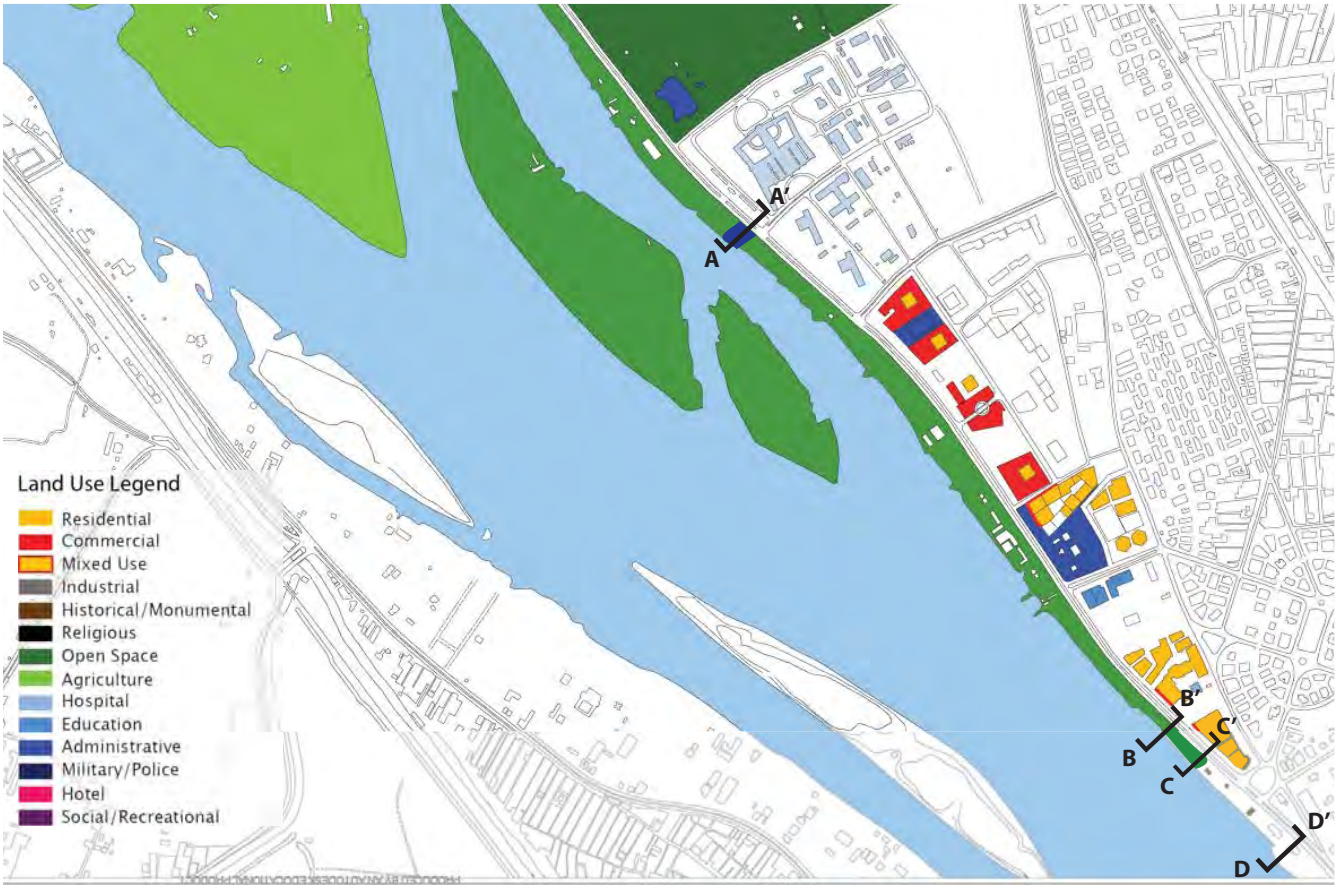


FIGURE 91. Land use data collected for Maadi Also shown are approximate locations of cross-sections presented in figures 94-97.

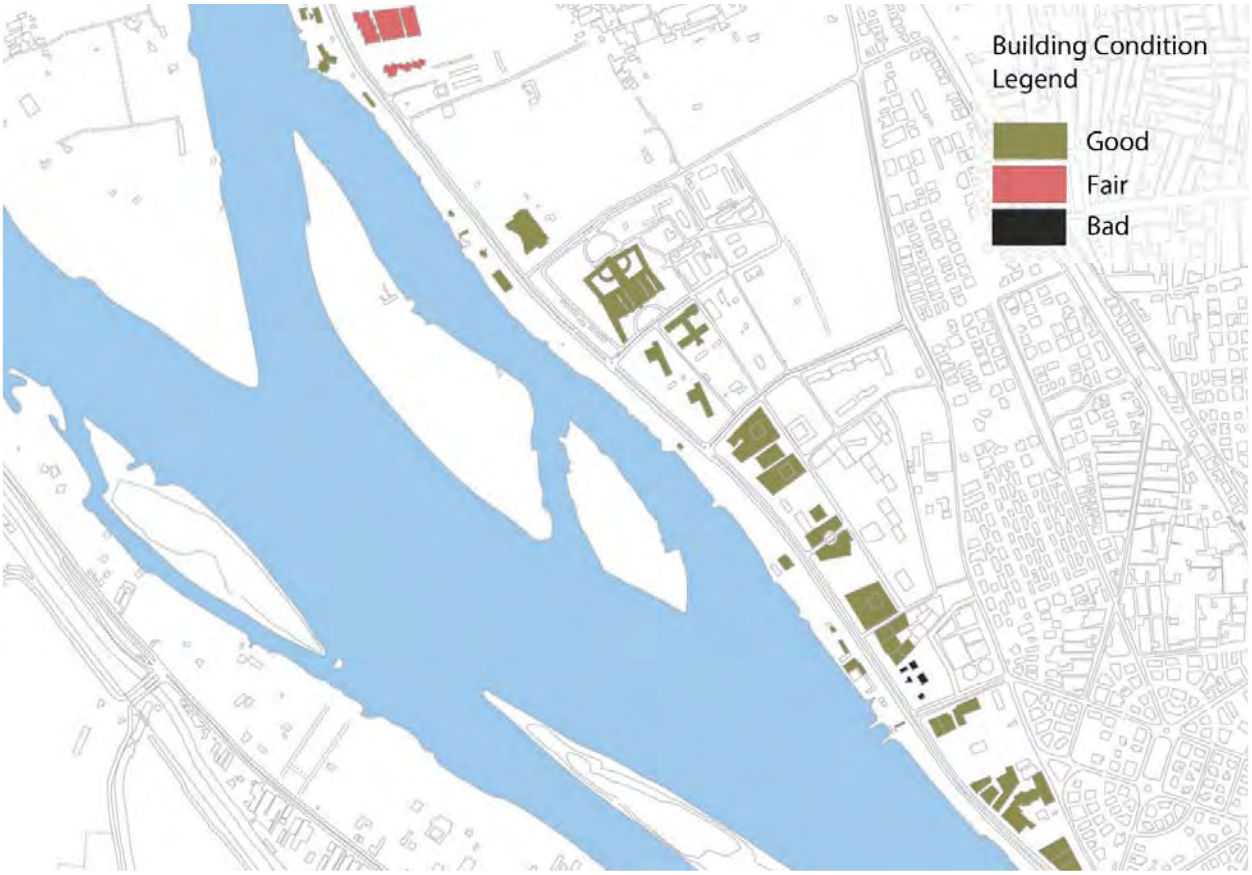


FIGURE 92. **Building condition data collected for Maadi**

FIGURE 93. **Building height data collected for Maadi**

Representative Cross-sections along the Nile at Maadi

All cross-sections looking downstream. See Figure 91 for approximate location of each section.

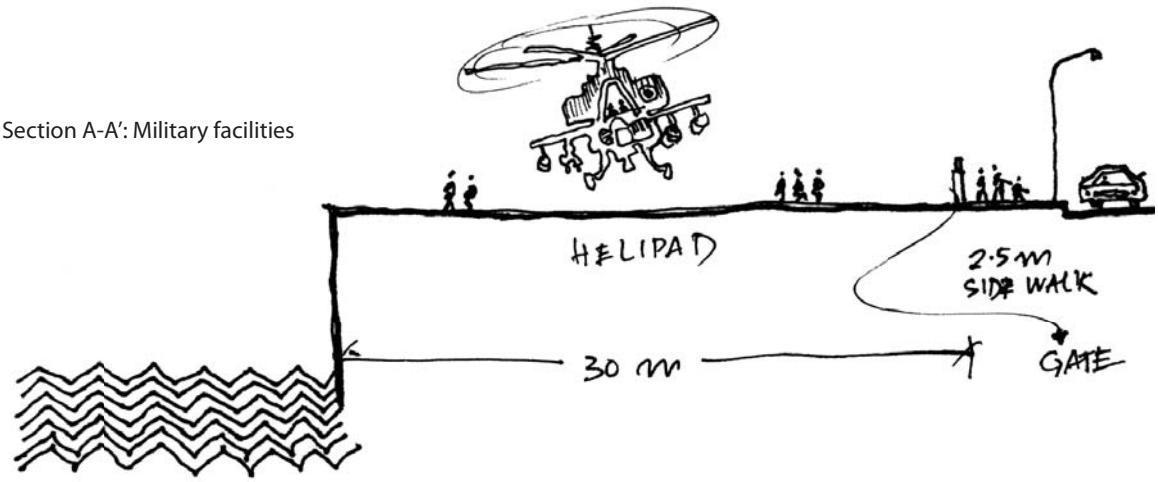


FIGURE 94. Maadi Section A-A': Military facilities

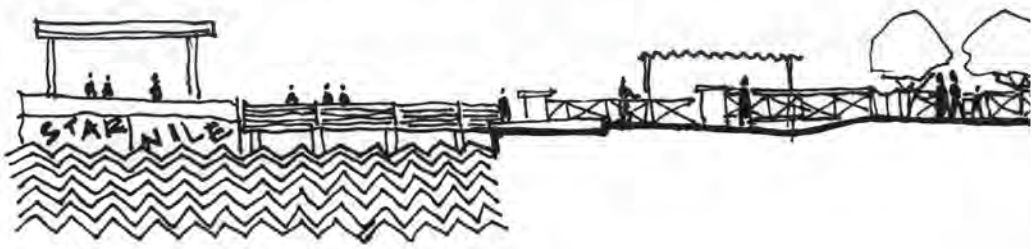


FIGURE 95. Maadi Section B-B': Ferry terminal

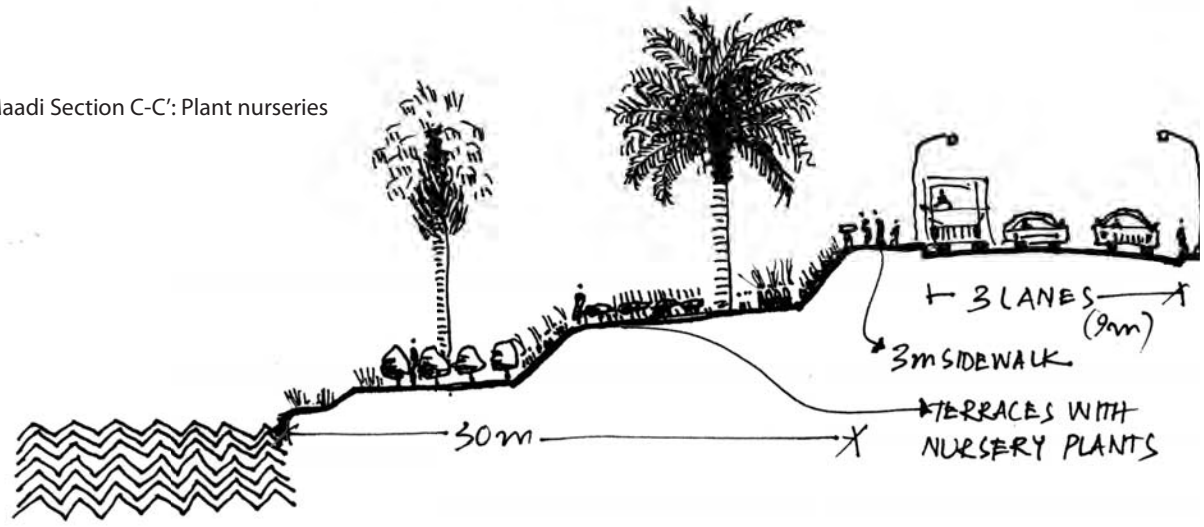


FIGURE 96. Maadi Section C-C': Plant nurseries

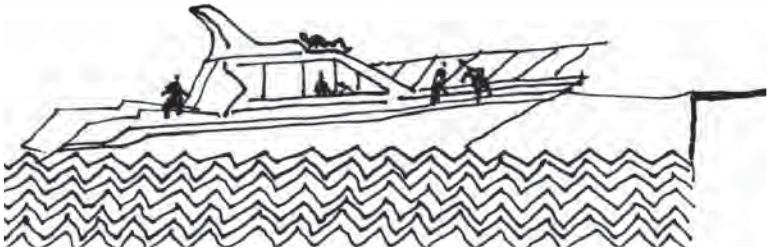


FIGURE 97. Maadi Section D: Private yacht club

Representative Cross-sections along the Nile at Maadi

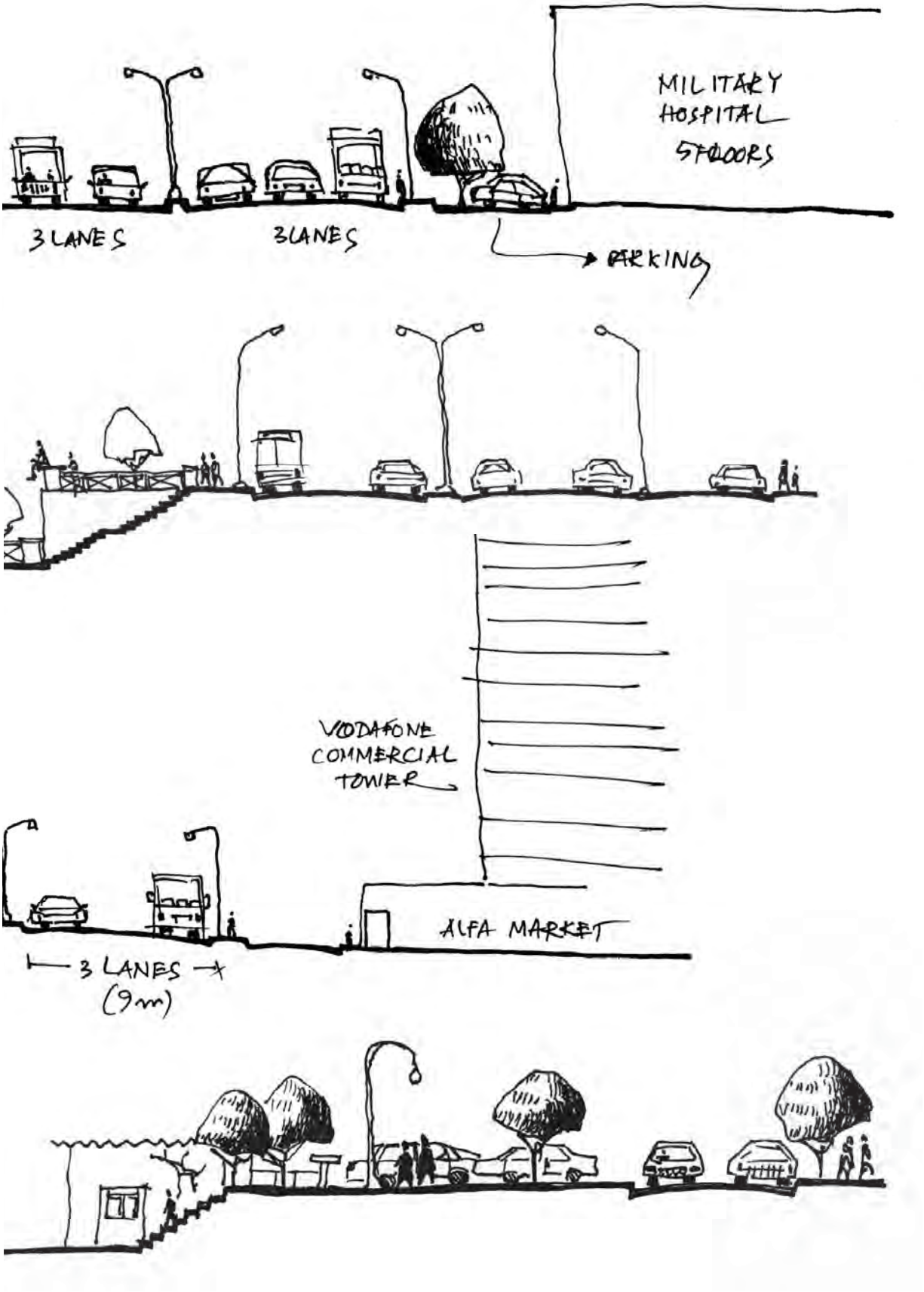


FIGURE 98. Maadi landscape

Relatively new highrise residential buildings, landscaped terraces with lush vegetation, and private boat parking characterize the landscape in Maadi.

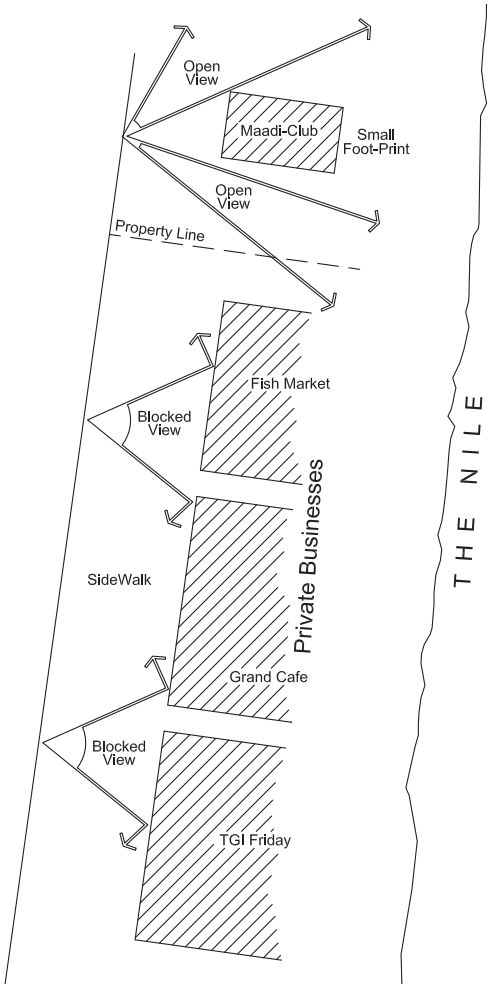


FIGURE 99. Diagram indicating blocked river views along the Corniche near private Maadi businesses

The landscape alongside the east side of the four-lane Corniche (across the street from the waterfront establishments) includes commercial buildings, mixed-use and residential towers, and some vacant lots (the largest vacant lot is owned by the Ministry of Petroleum). A few small open-air parking lots—not nearly large enough to accommodate all visitors to the commercial centers—dot the landscape at streetside. The commercial buildings include a mixture of grocery stores, trendy retail stores, businesses, and western-style malls. A military hospital, one of the largest hospitals in the Middle East, and the supreme constitutional court stand out at the northern end of the Maadi Corniche (Beattie 2005).

Built environment, building conditions and heights

A variety of buildings and structures occupy both sides of the Corniche in Maadi. Well-maintained one or two-story private clubs and restaurants dominate the bankside of the Corniche in the southern part of our survey area. These private establishments along the waterfront offer members and relatively wealthy customers landscaped terraces overlooking the river, plentiful seating, social and dining facilities, and direct river access. Large umbrellas and mature, leafy trees shade customers from the sun, and flowering plants decorate the terraces. A marina for yachts extends deep into the Nile channel.

Along the middle portion of Corniche, nurseries, private ferryboat landings, and a dilapidated public ferry landing dominate the riverbanks. Although the nurseries showcase some healthy-looking potted plants and trees, they lie in the midst of aging cement structures, such as storage houses, gate posts, and crumbling steps that lead down to the river. Trash and debris accumulate along dirt pedestrian pathways and litter the banks. Also in this section, just a few feet offshore, families live on old boats situated together in informal settlements, and their laundry dries on makeshift clotheslines along the shoreline. At the northern end of Maadi's Corniche, a helicopter landing pad, private military social club, and entrance to a private island occupy the riverbanks and prevent public access to the river.

Development across the Corniche from the river banks consists primarily of new or well-maintained, mixed-use, high-rise buildings of varying architectural styles. In many areas along the corridor, particularly where high-rise residential blocks stand very close to each other, they seem to form an intimidating barrier between the Corniche (and hence the riverfront) and the rest of Maadi. Many of these buildings consist of dense, high-rise residential towers located above lower level commercial businesses. The lower level commercial spaces house businesses such as RadioShack, Starbucks, a Sofitel Hotel, large grocery stores, Vodafone and Mobileshop cell phone distributors, a Daewoo car dealership, and other western-style companies. A few vacant lots, gas stations, or miscellaneous smaller buildings (e.g., the Japanese Embassy) lie interspersed between the high-rise buildings. A nar-

FIGURE 100. Private western-style waterfront establishments

T.G.I. Friday's with outdoor seating occupies a large piece of the Nile waterfront in Maadi.

FIGURE 101. Landscaped terraces overlooking the river

Inside the yacht club and private restaurants, landscaped terraces with attractive vegetation and plentiful seating are available to members or customers.

FIGURE 102. Data collection at the Maadi Yacht Club

Mature, leafy trees surround the second floor of the private Maadi Yacht Club terrace overlooking the river.

row median separates the traffic and provides a foundation for street lamp posts decorated with signs for commercial products and political messages.

Landmarks, unique sites, and important nodes

Major Maadi landmarks include the Nile Mall, the Constitutional Court and military hospital, recreational island, large family cinema, and row of private clubs. Most of these landmarks either directly block public access to the river or direct attention away from the riverfront. The Nile Mall, for example, lies directly across the street from the river, but houses a purely indoor and introverted activity. Similarly, the military establishments promote discreet behavior. Police or military personnel monitor all pedestrian activity in the vicinity, which inhibits social gathering, photography, and general enjoyment of the waterfront.

Access - visual, physical, and transportation connections

Lack of public spaces, heavy traffic, and blocked river views characterize the Corniche in Maadi. The ferry terminal provides the only gathering space for people to access and directly enjoy the Nile. Informal food sellers congregate here and the small terminal platform becomes crowded and chaotic during ferry arrivals and departures. Ferry arrivals create Maadi's most prominent pedestrian nodes as departing passengers gather at informal minibus stops along the Corniche and create traffic jams. Two main entrances from the Corniche to Maadi neighborhoods also lead to frequent traffic jams. A general lack of sufficient parking spaces, particularly in evenings when private waterfront establishments open for business, contributes to additional traffic congestion.

FIGURE 103. The Nile Mall houses purely indoor land uses but occupies a prime spot on the waterfront

FIGURE 104. Feluccas, ferryboats, and informal settlements in Maadi

The traffic congestion along the Corniche coupled with obstructed views and unpleasant sounds and smells from the private waterfront facilities contribute to a suboptimal pedestrian experience along the Corniche in Maadi. Buildings, rooftops, and exposed garbage areas and ventilation systems not only block views of the Nile, but create unpleasant sidewalk conditions. Unpleasant odors and noise radiate from the restaurants along very narrow sidewalks. At certain points where the sidewalks widen, military or police facilities, or electrical transformer boxes often block the pathway. At these widened areas, the lawn and sidewalks are in poor condition, the formerly grand decorative promenade elements look old and decayed, and debris lines the sidewalks. Additionally, although the river is wide at this stretch of the Nile, most days the haze from air pollution obstructs the view across the channel even at the few places where pedestrians can reach the river's edge.

FIGURE 105. Trash accumulation

Trash is abundant in the river below the ferry waiting areas.

FIGURE 106. Overcrowded ferries

Overcrowded ferries arriving at Maadi's ferry landing demonstrate the need for a more robust and efficient ferry system.

FIGURE 107. Maadi's ferry terminal

The current ferry terminal consists of a small platform and dilapidated structures for waiting passengers .

FIGURE 108. **Dense highrise residential towers along the Corniche in Maadi**

FIGURE 109. **Landscaped pedestrian promenades**

FIGURE 110. **Tall modern residential buildings are common in Maadi**

Bank conditions and cross-sections

We sketched cross-sections of four representative land uses types dominating the Nile banks along the Maadi waterfront: private establishments, nurseries, ferry landings, and military facilities. In general, riverbanks in private areas consist of landscaped terraces and piers. Banks in public areas consist of unkempt slopes, earthen terraces, poorly maintained structures, and informal boat landings. Empty bottles, plastic bags, trash, and debris from informal settlements and other human activities saturate the riverbanks and edges of the river itself.

Opportunities

Based on the widespread use of the overcrowded ferry terminal, Maadi provides a clear opportunity for a large, efficient, public ferry transport terminal and small commercial center. The low, wide terraces provide plenty of space for a riverside trail and light structural activities (e.g., cafes, food stands, outdoor seating). The connection of Maadi to other parts of the city by both an expanded ferry system and a riverside trail would allow for commuting from the residential Maadi neighborhoods without contributing to congested Corniche traffic. Formal bus stops and regular bus schedules instead of randomly timed minibus pick-ups could eliminate the informal, crowded pedestrian node generated whenever a ferry arrives.

Maadi's established vegetation and wide sidewalks in some areas provide opportunities for pleasant pedestrian sites with river overlooks. Simply removing some of the dilapidated structures blocking the views, lightly redesigning current sidewalk spaces, and taking better care of existing vegetation would allow for improved public access with minimal construction effort. Maadi's close proximity to the recreational island and the Wadi Degla Nature Reserve Area provide opportunities for short connections to established open green space.

Constraints

Blocked river access by military, police, and private establishments along the waterfront creates the primary constraint when developing a riverside trail and improved access to the Nile in Maadi. It is conceivable that some of these establishments could maintain their privacy by situating the trail below private terraces and balconies. However, some relocation or forced public access might need to be implemented. Poor maintenance of existing public space, as well as societal tolerance of water pollution and unkempt riverbanks also form constraints in this area.

General Site Analysis Observations

We observed several key recurring opportunities and constraints along the Nile Corniche during our field work. Many of these observations were evident at all four of our study sites.

FIGURE 111. **Low wide flood plains in Maadi could be used for cafes, food stands, outdoor seating, and a ferry plaza**

Opportunities

- Many reaches of the Nile are flanked by flat, 'inset' floodplains 20-100m wide and typically two meters above the water surface; because of the High Dam they are no longer subject to flooding and are thus suitable for trails and other features.
- Historic landmarks and tourist attractions are prevalent throughout the city.
- Some stretches of the Corniche already have wide public sidewalks.
- Open agricultural land exists in many location, though this land could be susceptible to future informal housing developments.
- Several existing vacant lots could be used to support open space connections.
- Visible public interest in ferry transportation exists and well-defined nodes of sources and destinations for ferry services and other public transit options are prevalent.
- Unobstructed views of the river, pyramids, and other prominent landmarks are available from many waterfront locations.
- Many banks and floodplains offer opportunities for ecological restoration.
- Visible public interest exists for social and recreational opportunities along the river.

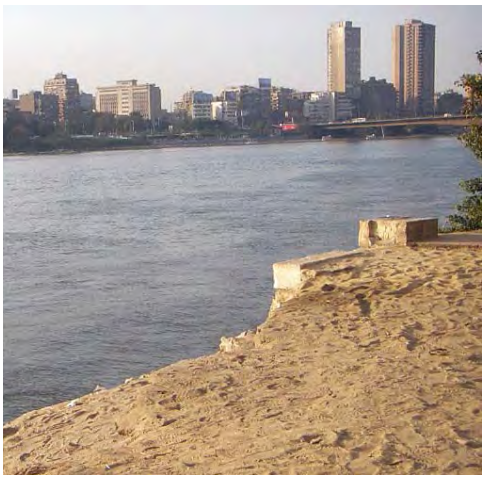


FIGURE 112. **Unused dirt terraces in Old Cairo**

Constraints

- Some public and private land users would need to be relocated or reorganized to accommodate a riverside trail.
- Institutional support is lacking to resolve many existing environmental issues (especially waste disposal regulation and enforcement).
- A culture of pollution along the riverfront encourages city residents to dispose of plastic bags, bottles, and other garbage into the Nile.
- Formal and informal developments continue to develop in close proximity to irrigation ditches and canals, and many have no formal connections to water and sewer facilities.
- The Nile Corniche is characterized by heavy traffic flows in close proximity to the waterfront.

FIGURE 113. **Unused vegetated terraces in Maadi**

The most significant opportunity relates to the low, wide floodplain that exists along most of the riverbanks and could potentially house light structural development and landscaping. In many waterfront cities, light development along floodplains could be damaged by recurring flooding. However, the Aswan High Dam's elimination of recurring high water means that these low floodplains no longer flood, and could thus provide unique recreational and development opportunities, such as a riverfront trail (Figures 111-113).

An additional clear opportunity relates to many plots of land leased to public and private plant nursery owners for the establishment and operation of their nurseries (Figure 114). These nurseries form one of the most prevalent land uses along the waterfront and although not all of the nurseries are well-maintained, most of them showcase healthy plants, large trees, landscaped grounds, and some of the most attractive green spaces in Cairo. The potential construction of pedestrian paths through, alongside, or between these nurseries provides a clear opportunity for city residents to access green spaces alongside large stretches of the waterfront. The associated increase in pedestrian traffic could potentially stimulate nursery sales.

FIGURE 114. Images of four plant nurseries along the Nile in Maadi and Old Cairo

Pedestrian paths could be easily constructed through or around nurseries, which showcase some of the most beautiful landscaping and green spaces along the Nile.

Air Quality Measurements

Students made several observations related to air quality along the Nile Corniche. During the first day of research, teams observed that some of the most congested stretches of the Corniche run through CBD. Following this initial observation, a team returned to CBD for a follow-up day of research to conduct air pollution measurements at several sites along the Corniche using a Model 8520 DustTrak aerosol monitor with a 2.5 micrometer nozzle to measure particulate matter.

The air quality team began at the transportation terminal next to the Ramses Hilton and walked west (toward the river) at street level while measuring particulate matter at fifteen second intervals. They also took measurements while walking north along the Corniche from the Ramses Hilton for approximately 100 meters. While taking particulate measurements, they observed the following:

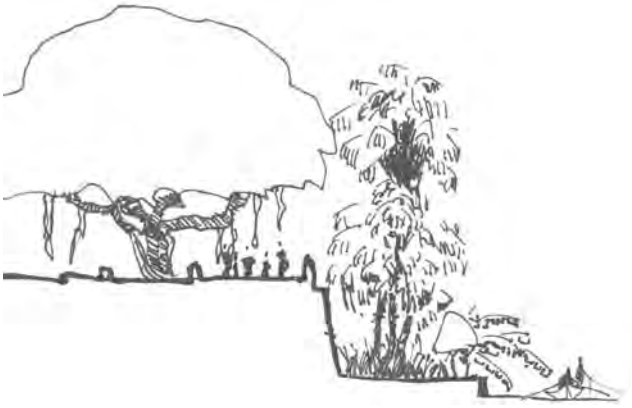


FIGURE 116. Low wide flood plain
Existing low wide flood plains provide unique opportunities for providing public space along the Nile terraces, especially in the form of a continuous riverside trail.

- All particulate matter measurements exceeded the World Health Organization (WHO) air quality guideline maximum annual mean of 10 $\mu g/m^3$ and maximum 24-hour mean of 25 $\mu g/m^3$ (WHO 2006).
- The passing of certain cars, especially mini-buses (Figure 115), increased the particulate matter reading up to eight times the average reading, which suggests that policy interventions would be needed (i.e., to limit polluting vehicles) to make significant improvements in this area.
- The average reading while walking along the river bank at the water level was approximately 30% lower than the average readings taken while walking at street level. The observation of cleaner air at river level supports the idea of a riverside trail near the water surface level providing healthful benefits to the city (Figure 116).
- While walking along the river next to the Corniche, readings increased and decreased as the sidewalks narrowed and widened, respectively, which suggests that larger pedestrian or recreational areas alongside the river could provide some respite from traffic air pollution along the Corniche.

FIGURE 115. Traffic in Old Cairo
The passing of micro-buses and other old buses and vehicles increases particulate matter readings up to eight times more than the average reading for other vehicles. Pedestrian access along the Corniche is so limited in certain areas that some micro-buses exist simply to help passengers cross the busy street.

CHAPTER 4

Urban History and Planning Process

The city of Cairo that we see today has a history that goes back thousands of years. To place contemporary urban planning efforts in perspective, it is important to understand the history, evolution, and recent growth and urbanization of Cairo.

Political and Urban History

The city of Memphis, located just south of modern Cairo and the Nile River Delta, was established around 3100 B.C. when a conquest of the Nile Delta led to the establishment of the Egyptian nation. At this time, Memphis provided an important Nile crossing point and served as a meeting point between Upper and Lower Egypt, which had formerly existed as two distinct kingdoms. Over the next several centuries, various societies occupied the banks of the Nile in this region. The Nile played a central role in the functioning of these societies, beginning with the construction of a Persian fortress for protection (Babylon) on the riverbanks and a Pharaonic Canal to connect the river to the Red Sea (Antoniou 1998).

The riverbanks near the site of modern Cairo (and surrounding areas) have housed citizens worshipping many religions. Under the Roman Empire, Christianity reigned as the official religion until Muslim armies eventually conquered Egypt and introduced Islam to Africa. Eventually large chunks of land used by Arab conquerors merged into a single inland entity to provide protection from surprise Byzantine Navy attacks. A split between Byzantine and Egyptian Christianity (prior to the Arab conquest) resulted in the establishment of several Coptic Christian institutions, some of which still exist along the Nile banks today and form part of the workshop's Old Cairo survey area (AlSayyad 2011).

Following their conquest, the Arab military established the city of Fustat near the Babylon fortress. The city remained important to Arab leaders, partially because of its proximity to the canal that linked the Nile to the Red Sea and the rest of the Arab Empire. Fustat and a new city named Al-Mansouriyah continued to expand northward and southward along the Nile. In the tenth century, Al-Mansouriyah was renamed Al-Qahira or 'the victorious' and Italian traders later changed the name to al Cairo. Al-Fustat and Al-Qahira lived distinctly separate lives, with the former acting as a commercial and financial center while the latter functioned as a princely suburb. The combined population of both cities was about 500,000, making it one of the largest urban centers of the 11th Century (Raymond 2000).

Some significant events over the next several centuries contributed to the growth of the city and character of its built environment, and led to the emergence of some of the major landmarks observed during field work (Figures 117-124):

- Around the time of the city's renaming, the Al-Azhar Mosque was built and served as the new congregational mosque. It also functioned as a Shii university and eventually one of the great centers of Sunni learning. Al-Azhar remained the greatest teaching institution in the Islamic world for the next 1000 years.

- Severe floods of 1050, the plague of 1063, the earthquake of 1138 and finally a two-month long fire set off by Crusaders in 1168 destroyed Al-Fustat completely. Residents moved into Al-Qahira, which underwent considerable expansion to the south.

- In 1169, a Syrian army invaded, abolished the previous Caliphate (Islamic ruler), and began to construct the Citadel and surround Al-Qahira with a series of fort walls.

- In 1250, Mamluk Sultans captured power and ruled until 1517 when Turks invaded and made Egypt a province of the Ottoman Empire.

- Napoleon invaded in 1798 and the British took control from the French in 1801. In 1805, an Albanian mercenary named Muhammed Ali Pasha seized power, established a new dynasty, and introduced European ideas regarding city planning and architecture. Similar to Haussmann's mid-19th century redesign of Paris, Muhammed Ali constructed a boulevard linking the Citadel with Azbaqiyah, cutting through the heart of the old city.

- The Azbaqiyah and areas between Cairo and the Nile developed based on European conceptions of city planning. In 1906, one of the first new suburbs of Cairo, Heliopolis, emerged northeast of the city (Antoniou 1998).

Growth of Cairo Over the Centuries

Mosques of Al-Hakim, Al-Azhar, Ibn Tulun, and Amr Ibn Al-Aas are highlighted for reference.

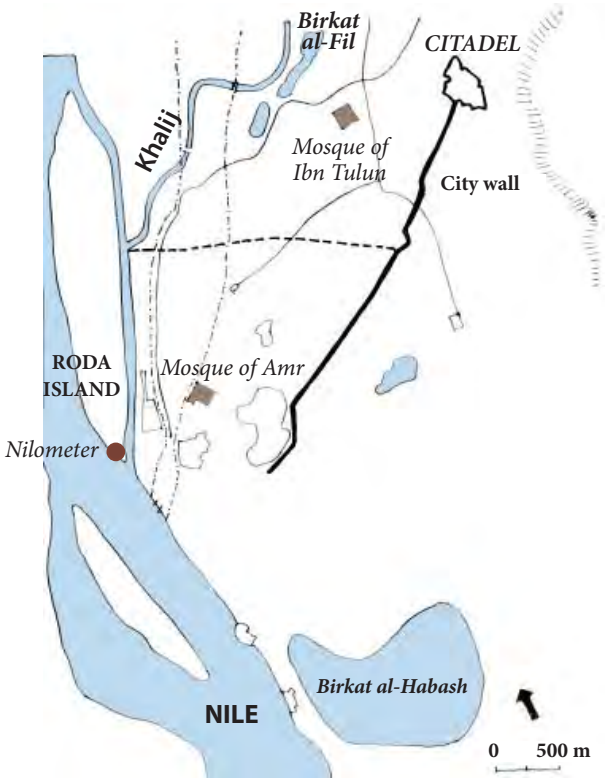


FIGURE 117. **Fustat Cairo**

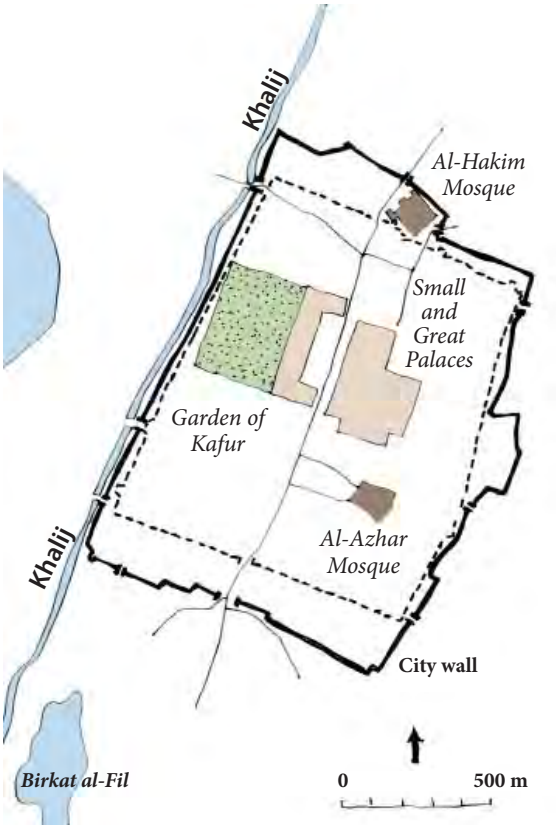


FIGURE 119. **Fatimid Cairo**

FIGURE 118. **Ayyubid Cairo**

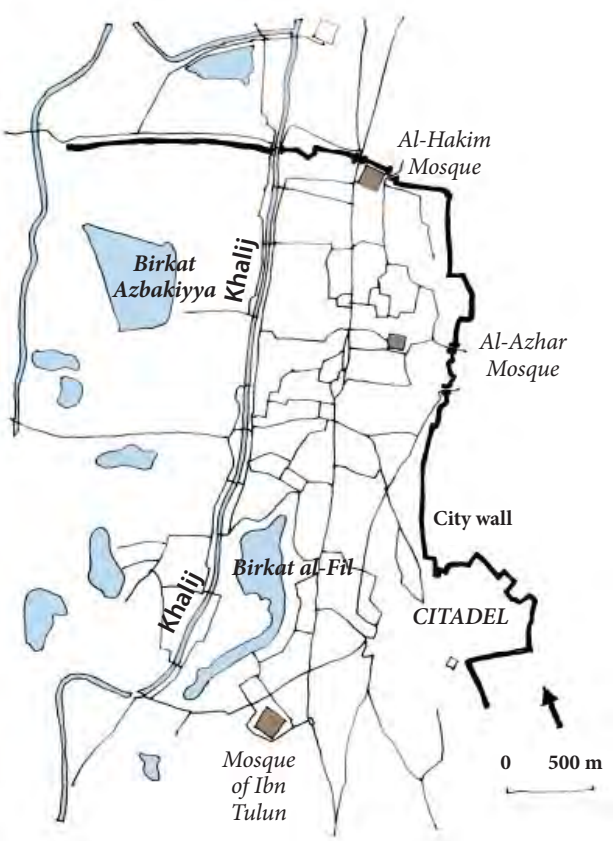


FIGURE 120. **Mamluk Cairo**

All maps based on data from Raymond 2000.

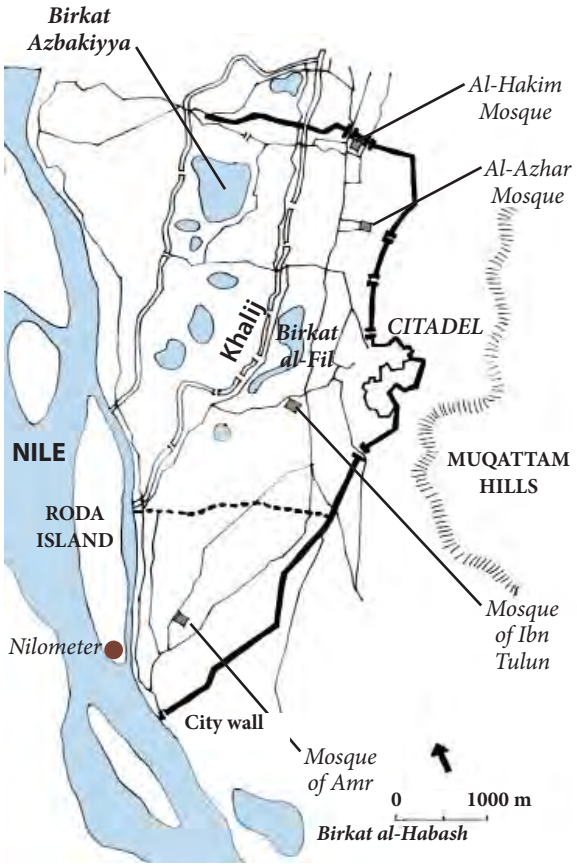


FIGURE 121. **Cairo in early 15th century**

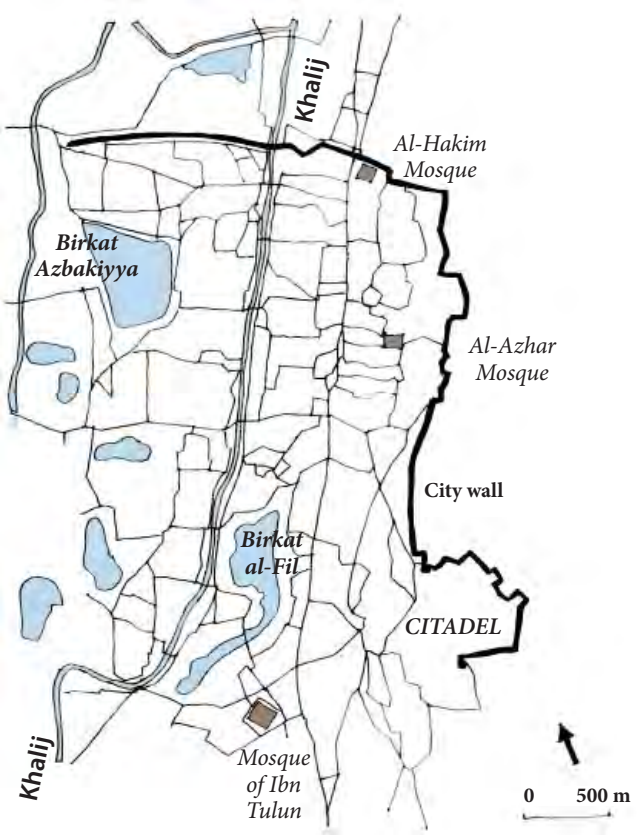


FIGURE 123. **Ottoman Cairo**

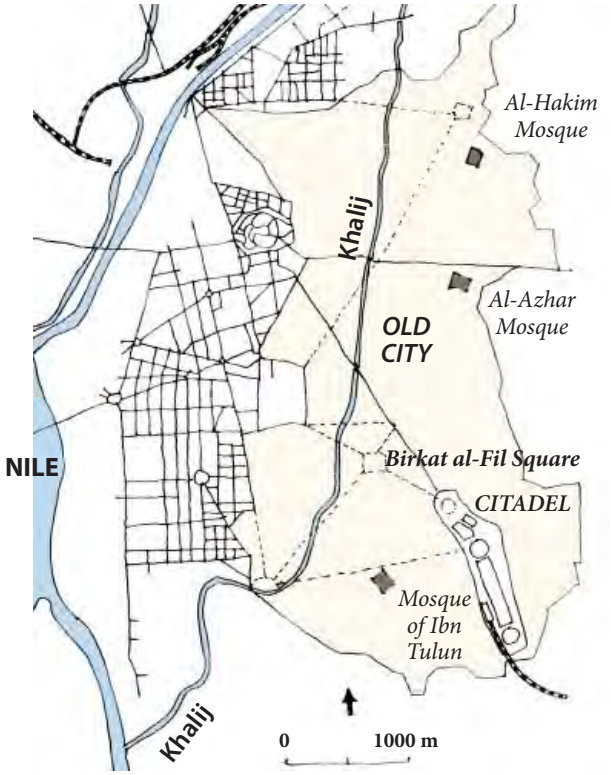


FIGURE 122. **Cairo in 1870**

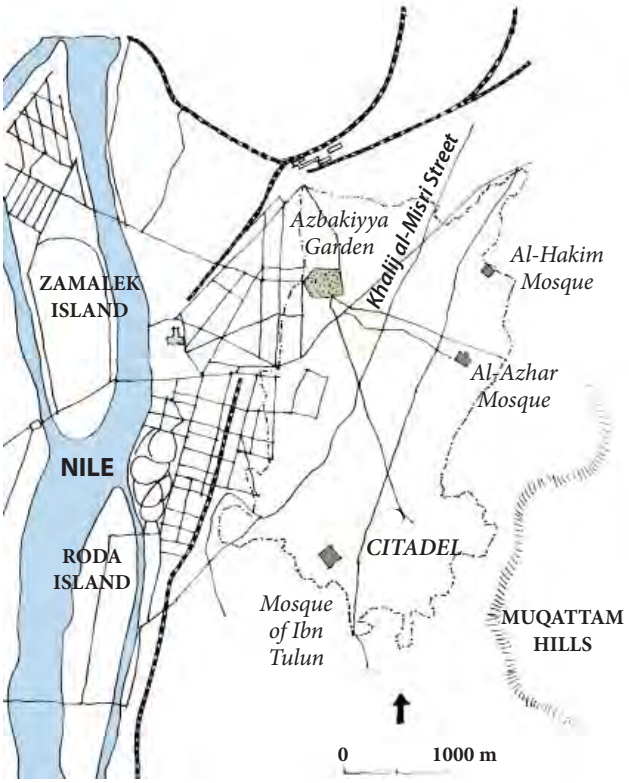
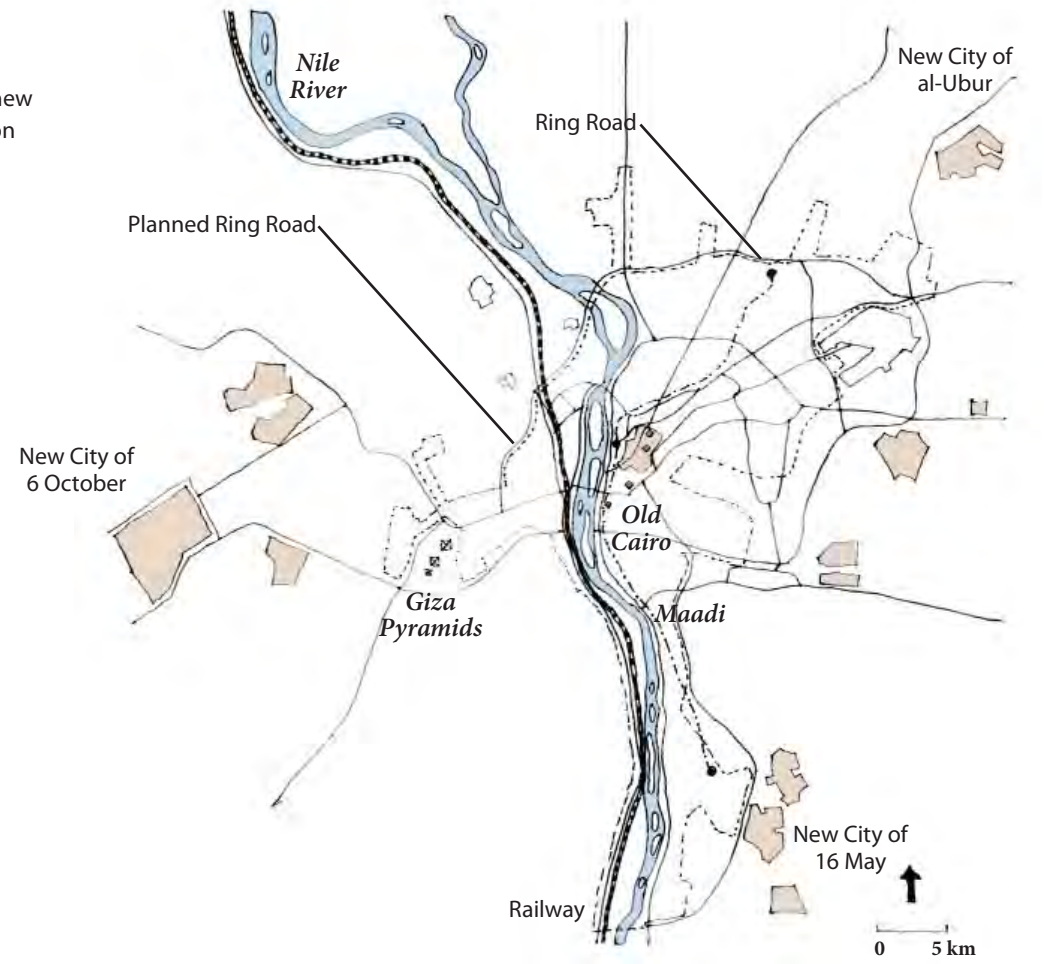


FIGURE 124. **Cairo in 1933**

FIGURE 125. Cairo in 1991

Highlighted blocks indicate new settlements or cities (based on data from Raymond 2000).



Master Planning and Conservation Efforts

Greater Cairo Region Master Plans (Figures 125-129)

The 'Greater Cairo Region' generally refers to the governorates of Cairo, Helwan, Giza, Sittah Uktubar and Qalyubiyah though definitions vary and have been debated and adjusted in recent years. Since 1970, various government leaders have undertaken attempts at developing Master Plans intended to guide urban growth in this region.

FIGURE 126. First masterplan of Cairo (1970)

(El Kouedi and Madbouly 2007)

1970 First Master Plan

In 1966, the population of Cairo was 6.1 million. The 1970 master plan proposed to accommodate a projected population of fourteen million by the target year of 1990. The total planning area was 685,000 acres.

1983 Long Term Development Master Plan

This Master Plan, developed in collaboration with a planning institute in Paris, proposed to divide the existing city into sixteen sectors along with the addition of ten new urban settlements. The plan proposed that these urban settlements (or satellite cities) would be connected through development corridors, effectively a hub and spoke scheme.

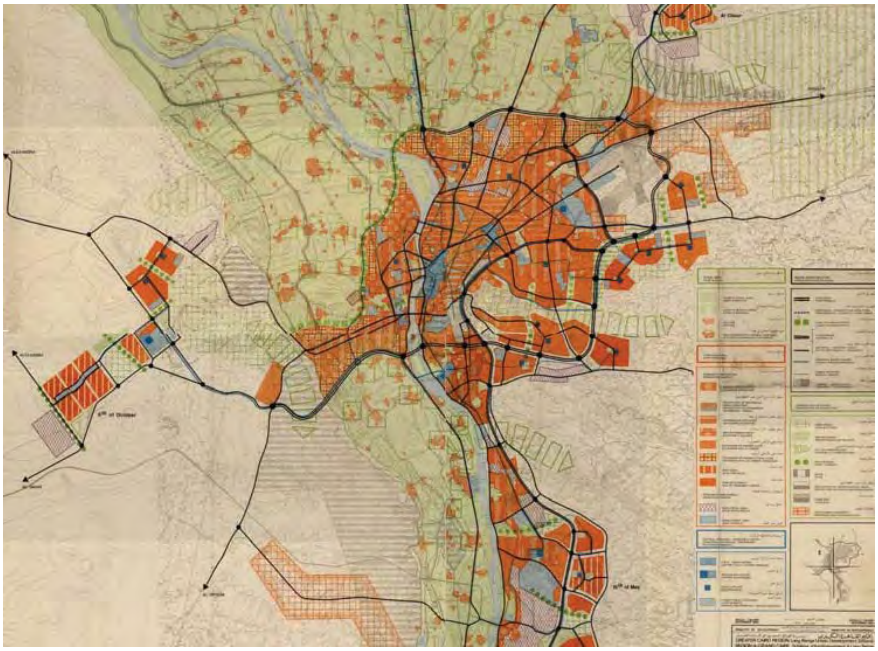


FIGURE 127. Long-term development master plan (1983)

(El Kouedi and Madbouly 2007)

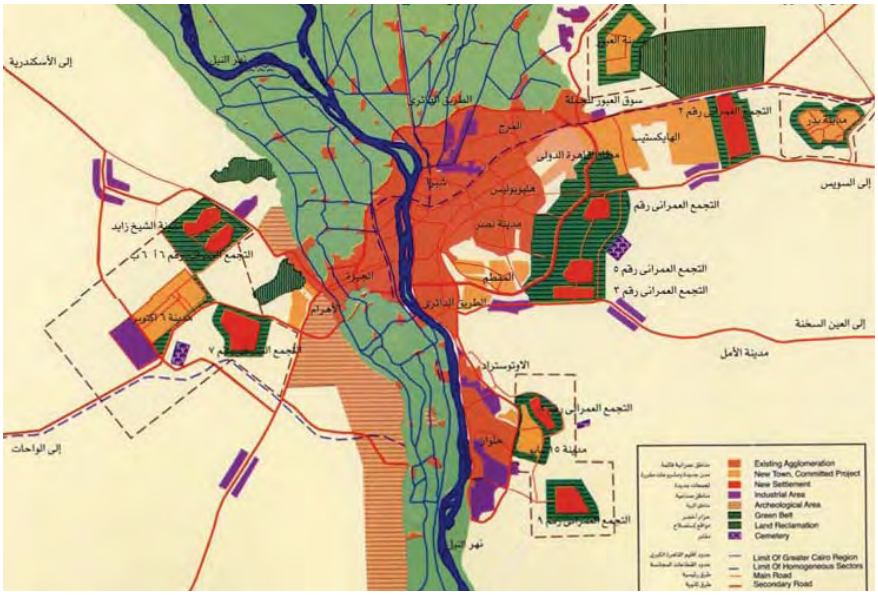


FIGURE 128. First update (1991)

(El Kouedi and Madbouly 2007)

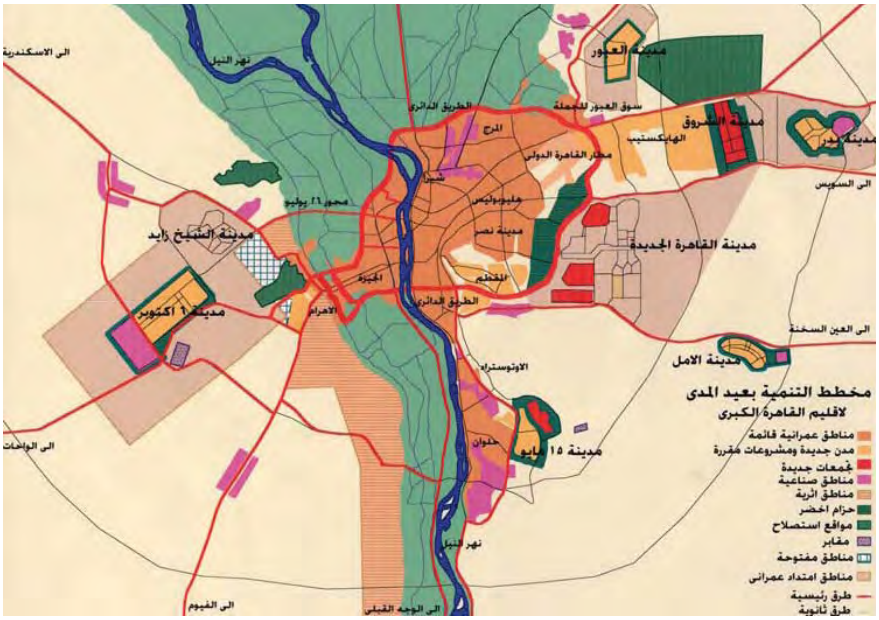


FIGURE 129. Second update (1997)

(El Kouedi and Madbouly 2007)

- 1991 First update of the Master Plan

The years 1991–92 saw some modifications to the 1983 master plan as population forecasts were increased to sixteen million for the year 2000. "The Ring Road" route was diverted 2 km to the east (through the desert) for military reasons and a western arc was introduced to this road on arable land in Giza's outer fringes (toward the 6th of October satellite city). Such modifications affected the location of some new settlements and contributed to the cancellation of the green belt project between Cairo and the eastern new settlements (Sutton and Fahmi 2001).

- 1997 Second update of Master Plan

By 1990 the population was thirteen million and was projected to rise to 24 million by 2022. The new settlements proposed in the 1983 plan were now proposed to be converted into new cities (Kouedi and Madbouly 2007).

Conservation Reports

In 1980 and 1997 the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the United Nations Development Programme (UNDP), respectively, proposed conservation and development plans for the historic area of Islamic Cairo.

- 1980 UNESCO Report (Figure 130)

This report proposed a practical conservation strategy for specific areas as part of an emergency action over the following five years. This followed the designation of Islamic Cairo as a World Heritage Site in 1979 and called for an immediate action proposal rather than a master plan. The report recommended infrastructure upgrades, improvements in living conditions, and attempted to reduce the exodus from the old city. The report cited the replacement of traditional manufacturing communities with new large manufacturing establishments as a major driver of change in the old city. The report also proposed land consolidation strategies and conservation strategies for dealing with the high water table threatening many old buildings. At an institutional level, the report recommended setting up a Cairo Conservation Agency (Sutton and Fahmi 2002).

- 1997 UNDP Report (Figure 131)

This report consisted of a tourism based development plan as an opportunity for economic development for local communities. Theoretically, this would lead indirectly to improvements in living conditions and would limit overall deterioration of the built environment. Nine clusters of monuments were identified for restoration and rehabilitation, and proposed to be used for social and community functions. A tourist corridor or heritage spine would link the nine clusters and could serve as an Al-Fina type of market or bazaar street (Sutton and Fahmi 2002).

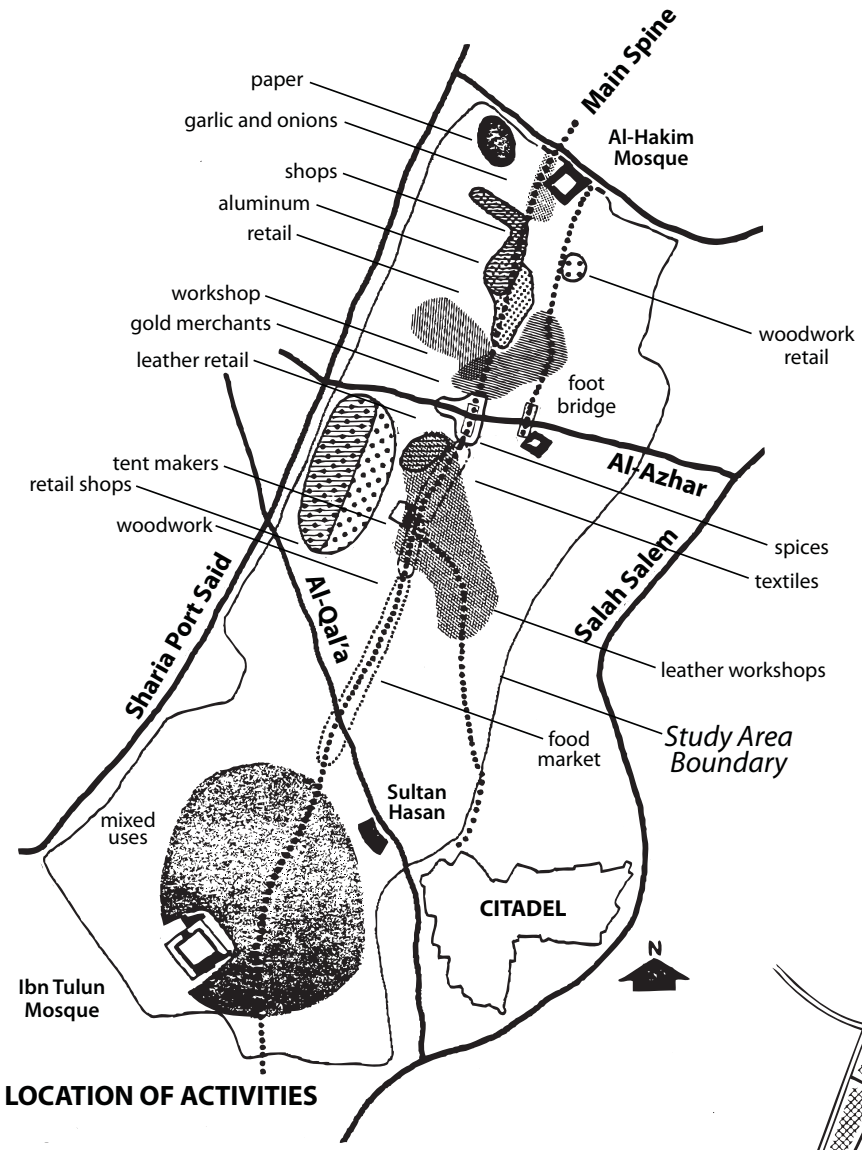
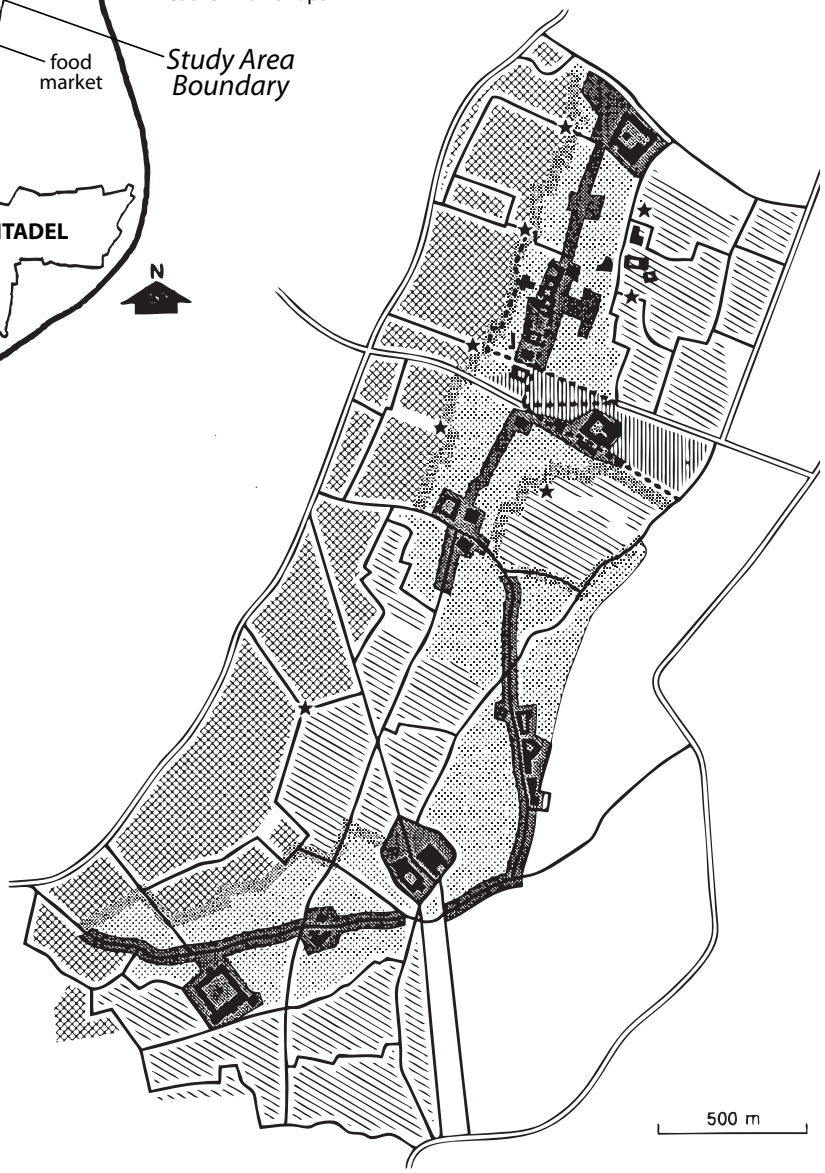


FIGURE 130. 1980 UNESCO report proposal showing locations of major activities in Islamic Cairo

(modified from UNESCO 1980)

FIGURE 131. 1997 UNDP proposal showing monument clusters and heritage corridors

(modified from UNDP 1997)



Legend for 1997 UNDP Plan

- Arterial road
- Local street
- Pedestrian path
- Community oriented activities
- Business oriented activities
- Intermediate services
- Institutional corridor
- 19th century corridor
- Tourist services
- Monuments
- Unloading/ loading area

Cairo 2050 Vision Plan

The Cairo 2050 Vision Plan ("2050 Plan"), developed by the General Organization for Physical Planning (GOPP), describes the most recent government proposal for future development in Cairo. During the workshop, participants learned about major features of the proposal and looked for opportunities to integrate government objectives with ideas generated in the workshop. The workshop ended just one week before public demonstrations brought about major political changes that will likely stall or modify many of the former administration's planning initiatives. As interim ruling parties work to transition power, the fate of the 2050 Plan implementation remains uncertain. In light of this situation, we identified several of the plan's strengths and weaknesses, which could be expanded upon or modified as new city and regional plans are developed. It is likely that some fundamental goals of the 2050 Plan, such as reducing air pollution and mitigating for population growth, will remain priorities of any future administration.

The 2050 Plan depicts a visionary new Cairo and consists of a collection of broad goals, strategies, concepts, and illustrative design renderings. The plan, as presented in our workshop, sets forth several goals and suggests specific methods for achieving them. It does not rank priorities, prescribe phasing, set timelines, or combine disparate pieces of the planning vision (GOPP 2011). Some of the goals in the 2050 Plan include:

- Accommodate population growth with licensed, safe housing.

FIGURE 132. Informal settlements near Roda Island

Although previous planning efforts have attempted to direct housing development to licensed areas at the city's edges, more than 50 percent of Cairo's built environment consists of informal housing developments in various forms (Figure 132). These developments provide the only affordable housing for much of Cairo's population. Often constructed on agricultural land, informal housing can lack connections to water and electricity, and use adjacent irrigation ditches as sewers, but eventually some residents obtain illegal connections to city utilities (AlSayyad 2011). Cairo's planning officials must not only accommodate current citizens living in unsafe or substandard housing, but must also plan for expected population growth. The 2050 Plan proposes to formalize existing housing (presumably through infrastructure upgrades), create alternative housing to replace unsafe housing, and accommodate new growth by constructing new suburban housing developments (GOPP 2011).

- Increase green space

Cairo has one of the lowest per capita availability of green space among all major cities of the world. The 2050 Plan cites green space as important for quality of life and recommends dramatically increasing the amount of green space per resident.

- Improve transportation (Figures 133-134)

The plan suggests numerous measures to help with Cairo's traffic congestion and air pollution problems. Automobile transportation would become more efficient by adding new connections between highways and an outer ring road would be established to serve expanding suburbs. Metro and train service would be extended and routed through new transit hubs. These hubs, between the city center and the suburbs, would serve as transfer points for auto and rail commuters.

FIGURE 133. The current "Ring Road," developed as part of previous government planning efforts

- Improve tourist and heritage sites

The plan features aesthetically pleasing renderings of restored tourist and heritage sites along the Nile and at the pyramids, and attempts to implement restoration goals using public and private collaboration and resources.

- Establish a new administrative system for Greater Cairo Region

The plan points out the many challenges of administering a metro region that falls under the auspices of several state and national agencies, and proposes the creation of a new administration to administer only GCMR.

The workshop goals overlap with several of the 2050 Plan goals. In particular, both focus on increasing green space along the Nile and improving tourist and heritage sites. Many workshop ideas also focus on creating more efficient transportation routes within the city of Cairo, though not necessarily by providing amenities for automobile traffic. Instead student teams propose to redevelop Cairo's historical transit corridor (the Nile), to efficiently and sustainably move people through metro Cairo, and improve connections between the river and adjacent neighborhoods. In place of grand redevelopment schemes, student recommendations focus on modest improvements to existing infrastructure and access points.

Workshop teams did not attempt to study housing and administrative concerns expressed in the 2050 Plan, though student proposals do not necessarily support large-scale suburbanization of the city. Based on field work observations, movement of private vehicles across long distances will not generate solutions to Cairo's environmental problems. Creating usable transit nodes and redundancies in transportation modes for short-distance travel could be more effective.

FIGURE 134. Emissions from decades-old mini-buses and cars contribute to poor air quality

Although much uncertainty surrounds future planning initiatives in Egypt, this uncertainty has the potential to bring about real change. Several precedents for large-scale revitalization already exist in Cairo (e.g., Al-Azhar Park and Al-Darb Al-Ahmar) and proposals from this timely workshop could be used to inform new government agencies, academics, international aid programs, and private consultants, who will likely take part in transitional and future planning initiatives.

CHAPTER 5

Strategic Plan

In Egypt, the Nile is the flowing origin of culture, history and life itself. Connecting Cairo to the Nile renews access to the spiritual, recreational, social, and cultural vitality embodied within this great river.

Vision

This statement reflects the vision behind the workshop's strategic plan. In creating the plan, the strategic plan team attempted to highlight the 7,000-year continuous history and linkages between the Nile and Egypt. Historically, the Nile has not only provided water resources to sustain human populations, but also habitat for a great diversity of other species. The river has played a central role in Egyptian culture for millennia and, without it, civilization would have been virtually impossible in the warm, arid climate of northern Africa. However, in recent years, public access to the Nile has been restricted, riparian habitat has disappeared, the congested Corniche has obstructed the waterfront, and many Egyptians no longer perceive the river as playing a central role in Egyptian culture. This strategic plan attempts to re-establish Cairo's connections to the Nile.

OBJECTIVES:

1. CREATE A continuous pedestrian and bicycle network along the Nile from CBD to Maadi

2. EXPAND the water-based ferry transit system along the Nile

3. IMPROVE air quality by reducing automobile traffic along the Nile

4. CREATE walkable connections to transit nodes and landmarks

4. DEVELOP an open-space network for all Cairenes, as well as tourists, to experience the Nile

Connecting Cairo to the Nile: Detailed Objectives

Continuous Trail (Figures 135-136)

The primary objective for the Strategic Plan consists of creating a continuous pedestrian and bicycle trail running north to south along the Nile Corniche. This trail would initially connect downtown Cairo to the suburb of Maadi, and could be expanded to connect to the greater Cairo area through a linked greenway network. Currently, north-south pedestrian access and movement along the Nile corridor is fragmented at best. In many instances,

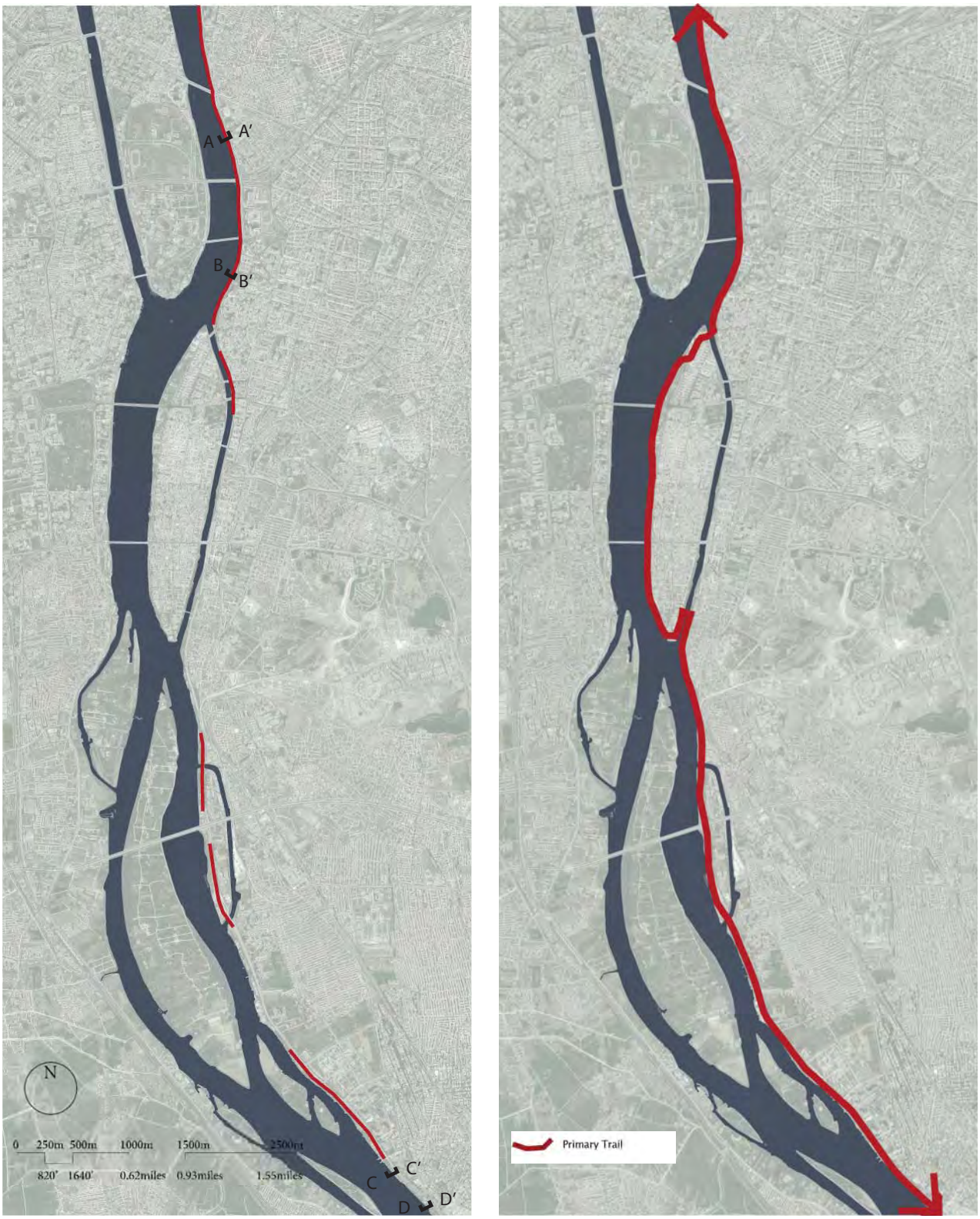


FIGURE 135. Existing pedestrian zones along the riverfront (left) and proposed continuous trail (right)
Also shown are approximate locations of cross-sections presented in Figures 141-148.

private riverfront development completely blocks pedestrian access. The proposed location for the main trail corridor takes advantage of existing sporadic pedestrian promenades and sidewalks by linking them to the trail. In determining a location for the trail, student teams considered proximity to important cultural, touristic, commercial, and civic centers. The proposed trail would link existing and proposed open spaces along the Nile, and connect to existing and proposed multi-modal transit opportunities.

Numerous advantages could result from this type of trail. The trail would allow people to bicycle, walk, or sit along the riverbanks, while benefitting from cleaner air along the waterfront (i.e., away from the street traffic). The trail would also increase the amount of open green space in Cairo, which currently consists of less than one square foot per person. By increasing access to the river, a trail would enable residents to establish personal connections to the river. These connections could potentially result in increased environmental awareness and motivation to protect the river from further environmental degradation. Based on the experience of city dwellers around the world, as citizens become invested in the river's health, water quality might improve and the preponderance of trash currently lining the riverbanks could gradually disappear.

FIGURE 136. Informal riverside activity demonstrates the need for accessible public space such as a waterfront trail

Ferry System Expansion (Figure 137-138)

The second objective is to plan an extensive ferry system along the Nile. The Nile effectively provides an existing transit corridor that needs only light structural additions to optimize its use. Simply adding ferries and building ferry terminals at strategic locations could dramatically increase the number of commuters who elect water transit as an alternative to driving on congested roads.

Six ferry stops currently exist along the river (five on the east bank, one on the west bank) and provide alternatives to automotive transit. The proposed system would incorporate greater east-west connectivity across the Nile, and would add five additional ferry stops within the study area. Finally, two systems of water ferries are proposed: an express service that runs north and south, and a regular service that crosses the river back and forth. In combination, these two systems would accommodate an express commuting service running north to south as well as more casual east to west crossings across the main channel of the Nile.

Proposed Ferry System Expansion

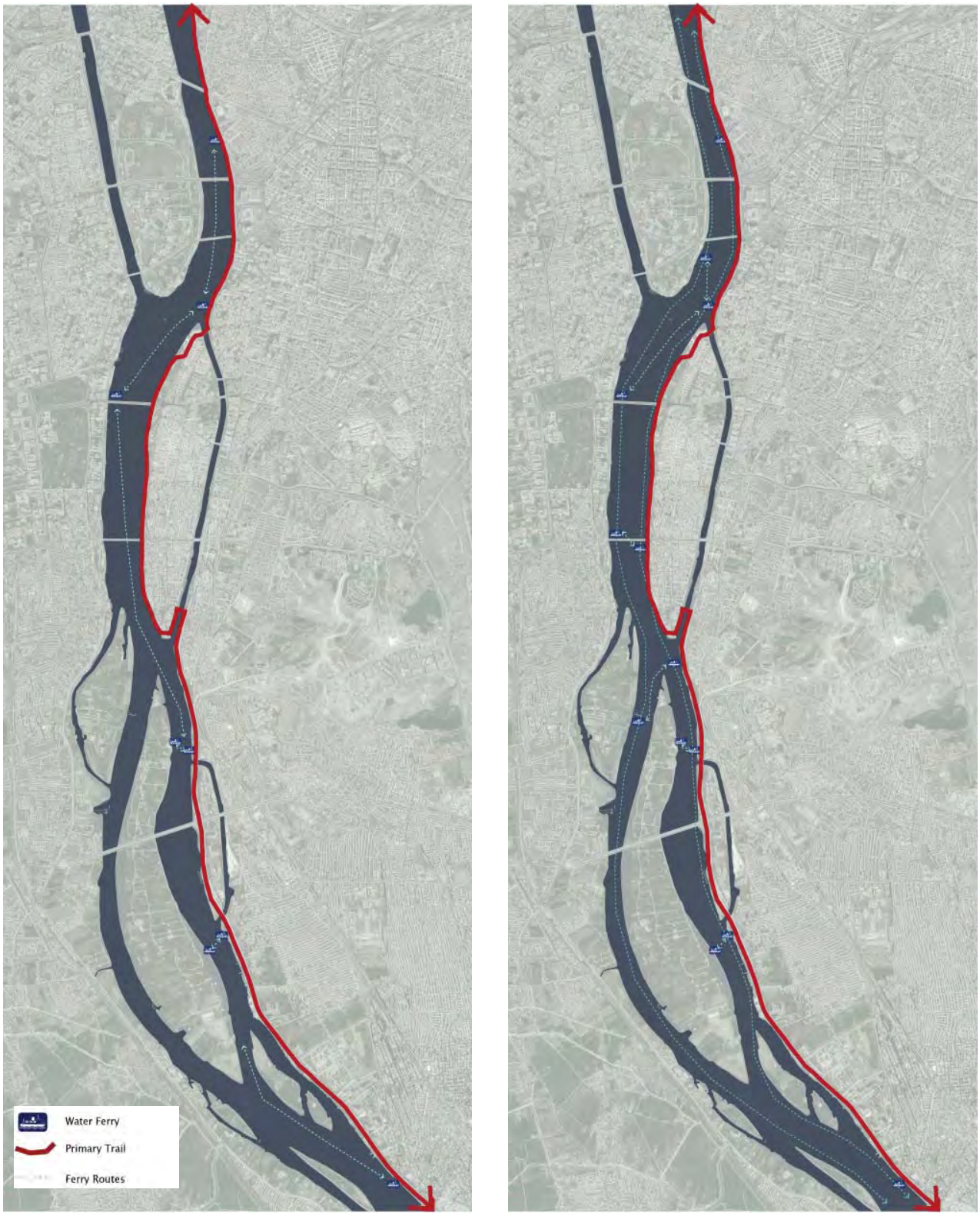


FIGURE 137. **Existing ferry stops along the Nile (left) and proposed ferry system expansion (right)**

Air Pollution Reduction

The third objective consists of reducing air pollution along the Nile by limiting automobile traffic along the Corniche. Air pollution monitoring in CBD measured high levels of particulate matter suspended in the air along streets adjacent to the Corniche, which represents a significant threat to public health and enjoyment of existing pedestrian pathways. However, the study also showed lower levels of particulate matter at the water's edge and in areas with wider sidewalks. This demonstrates the potential to mitigate air pollution effects along the Nile by moving the north-south arterial automobile connections from the river's edge to existing main streets farther inland. This design strategy would not only reduce air pollution at the river's edge, but also reduce noise and visual pollution, and improve safety and enjoyment. By moving the main arterial road inland, Corniche traffic lanes could be reduced, which would allow additional bike and pedestrian lanes, and more space for tree planting.

Establishment of an Open Green Space Network (Figure 139)

Currently, Cairo suffers from a lack of publicly accessible open green space and the strategic plan addresses this problem in two ways. First, the plan proposes new open spaces in suitable locations. Student teams chose these locations for their potential to be converted to publicly accessible open space without displacing residents. In many cases, the chosen sites consist of government or military installations that will likely be available for conversion within the next decade. Secondly, the strategic plan proposes trail connections to both existing and proposed open spaces. This results in a networked system of open space that would be readily accessible by most citizens through a combination of public transit, bicycling, and walking.

Improved Connections to Transit Nodes (Figure 140)

The final objective consists of creating walkable connections between the proposed waterfront trail to transit centers and city landmarks. Most existing Metro stops sit within 500m of the proposed trail location, which could provide quick and easy pedestrian access to many areas of the city. Proposed east-west trail connections into the city have been designed and strategically placed to take advantage of existing multi-modal transit centers. Finally, the trail will provide pedestrian and bicycle connections to proposed bus and ferry system expansions.

FIGURE 138. An overcrowded ferry approaching a ferry stop is visible in the smog haze near Maadi

When choosing locations for the main trail corridor and east-west connectors, students considered the proximity of these locations to important cultural, civic, government, recreation, and tourist sites. Thus, the proposed trail system would create walkable connections between the Nile and important landmarks, between landmarks themselves, and between transit centers and landmarks. This ensures that the trail could benefit the maximum number of residents possible, and could serve as a viable transportation alternative to the automobile.

Proposals for Improving Waterfront Connectivity and Walkability

FIGURE 139. **Existing green spaces (left) and proposed green spaces with improved waterfront connectivity (right)**

Proposals for Improving Waterfront Connectivity and Walkability

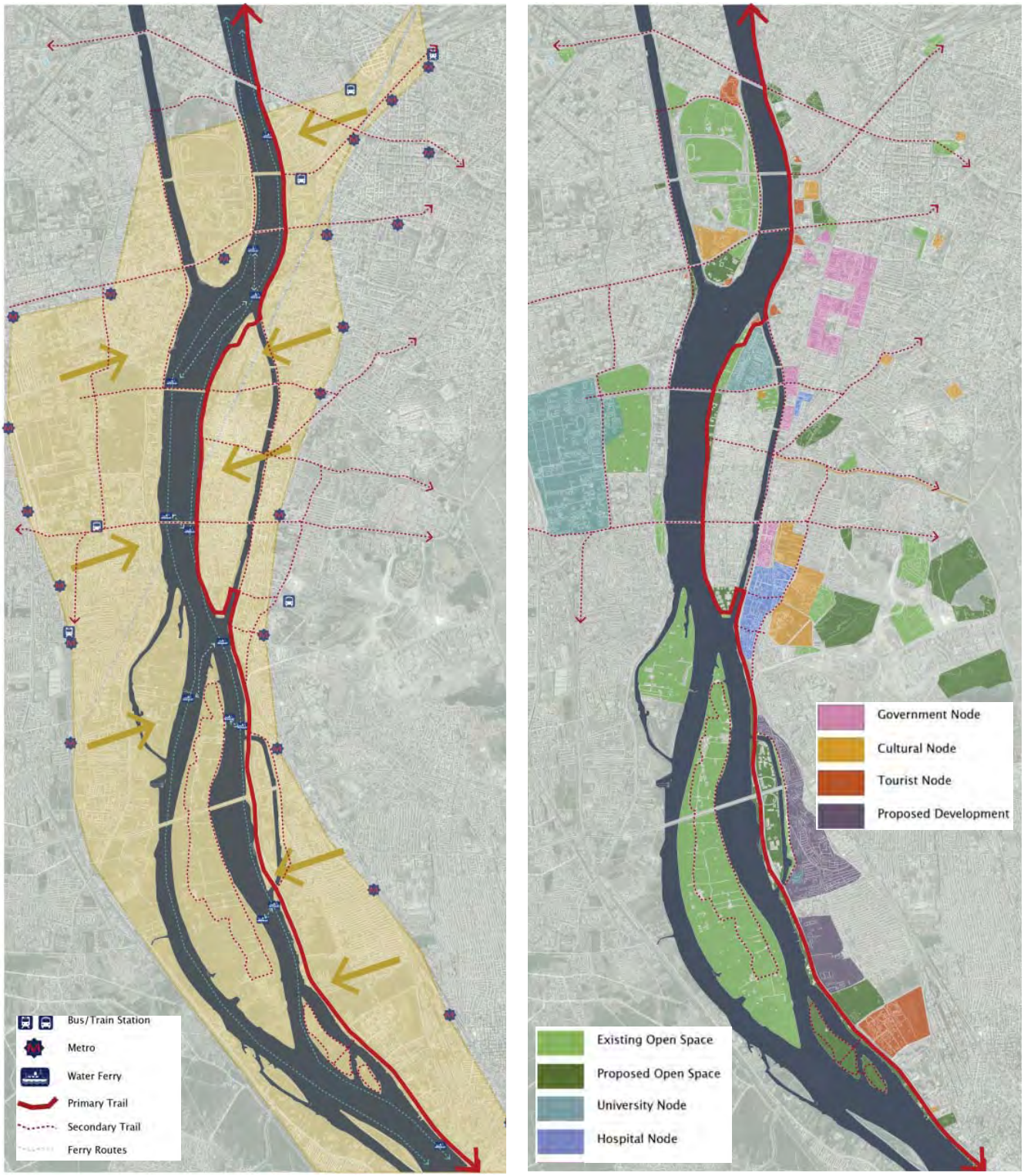


FIGURE 140. Proposed public transit network (left) and proposed network of walkable connections (right)

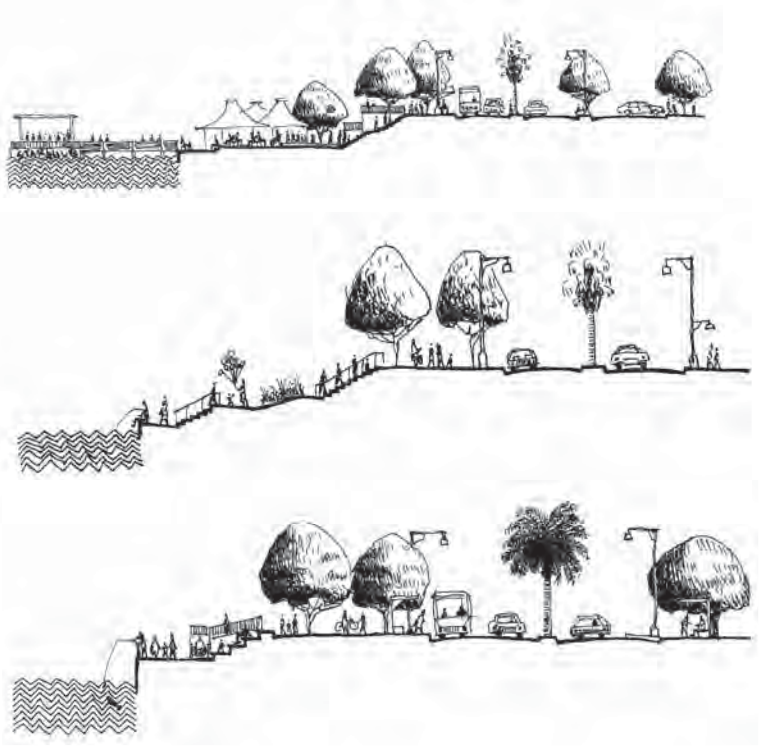
Walkable connections promote movement between transit centers and city landmarks.

Trail Character

When creating this continuous trail network, student teams proposed a common landscape vocabulary to maintain consistency between all districts in terms of street trees, pavement, furniture, lighting, and signage. Yet, within each district the character could be expressed through subtle changes in signage and flowering trees. In addition, students designed open space nodes in each district area to host different events and festivals throughout the year.

In the cultural district, the trail network opens in certain locations to accommodate gatherings for concerts and other cultural events. In the business district, spaces for light structural activities (e.g., vending or small markets) exist along the waterfront and larger gathering spaces exist for large, outdoor markets. In the historical district, public spaces accommodate religious gathering for holidays such as Mouloud. Finally, in the recreation district, areas accommodate sports fields and seasonal festivities.

Throughout the trail corridor, bike and pedestrian lanes provide both safe access to the Nile waterfront and connectivity to the city itself. Over time, this network can be expanded through boulevards that extend into the heart of Cairo, as well as across to the west bank, extending both open space and bicycle access across the city.



Design Section A: Existing versus proposed typical CBD section

Current bank conditions allow very little interaction between people and the Nile. By narrowing vehicle access to two lanes, our proposal establishes a pedestrian and bike lane, and allows for street tree planting to separate trail and vehicle users. In addition, terracing the bank provides areas for both passive and active use of the river.

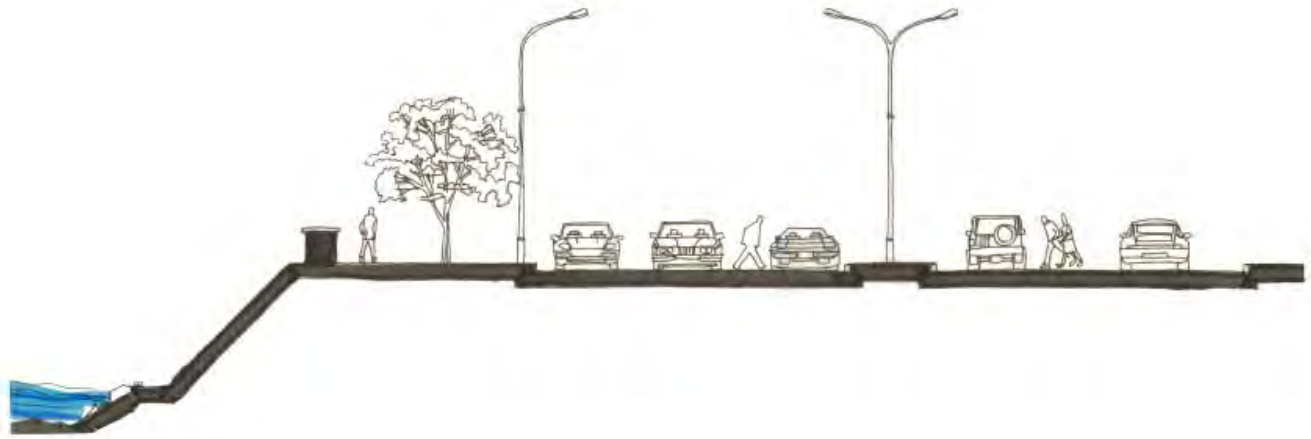


FIGURE 141. **Existing section A-A': Typical sidewalk in CBD next to steep cement banks blocked by walls**

FIGURE 142. **Proposed section A-A': Revitalized pedestrian area with easy access to the river's edge**

All cross-sections looking downstream. See Figure 135 for approximate location of each section.

Design Section B: Existing versus proposed water ferry section CBD

In addition to providing space for recreation and gathering along the Nile, narrowing the road and terracing the banks of the waterfront provide opportunities for creating transportation nodes along the Nile. Increasing bus access and ferry stops could reduce the automobile use and urban air pollution.

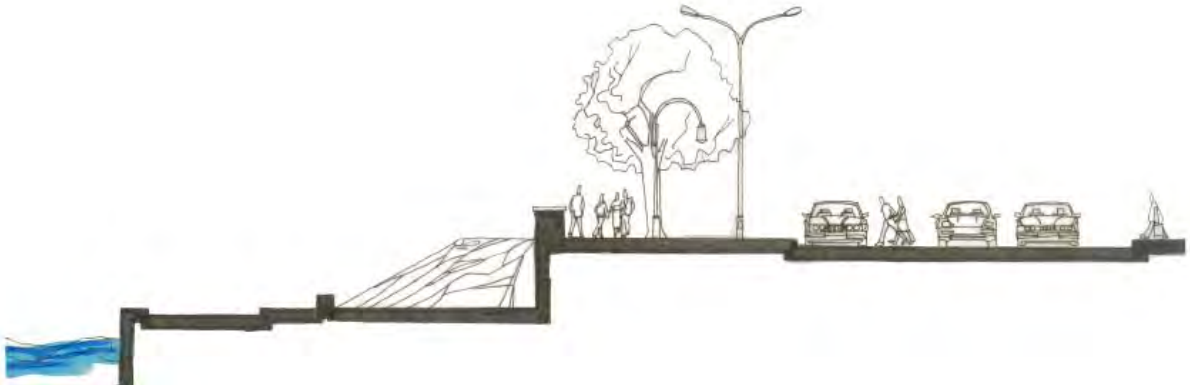


FIGURE 143. **Existing section B-B′: Ferry stopping point next to dirt mounds and vacant lots in CBD**

FIGURE 144. **Proposed section B-B′: Designated ferry station near a formal public transit access point**

All cross-sections looking downstream. See Figure 135 for approximate location of each section.

Design Section C: Existing ferry terminal versus proposed ferry terminal in Maadi

Maadi's current overcrowded ferry landing lacks a comfortable waiting area and benches for passengers. A revitalized ferry terminal could provide opportunities for gathering and recreation, and new economic venues such as vending and markets could provide services to passengers.

FIGURE 145. **Existing section C-C': Dilapidated ferry landing and vacant lots in Maadi**

FIGURE 146. **Proposed section C-C': Landscaped ferry terminal with benches and services for passengers**

Design Section D: Existing private establishments versus public open space in Maadi

Several private docks line the waterfront in Maadi. This infrastructure could be redeveloped for public use as the water-ferry system is expanded. Particularly in a suburb such as Maadi, residents could use these stations as a replacement for automobile commuting to work. Many vacant or abandoned parcels line the Nile Corniche. These parcels could be strategically developed as open-space nodes. These areas could include water recreation docks, as well as plazas for festivals and weddings.

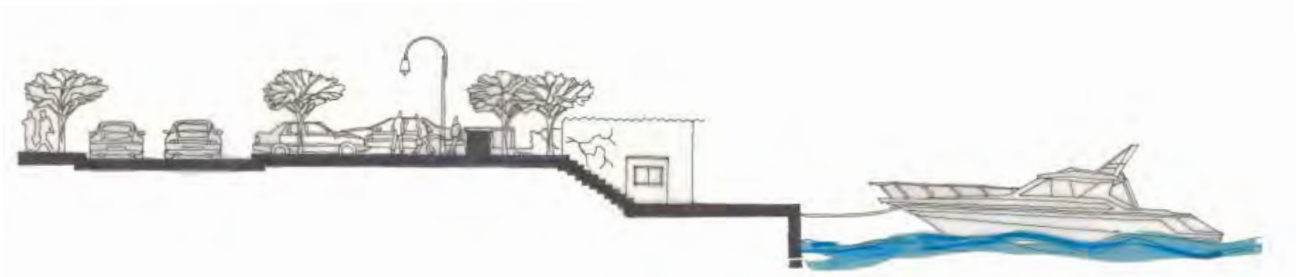


FIGURE 147. **Existing section D-D': Private waterfront and yacht zone**

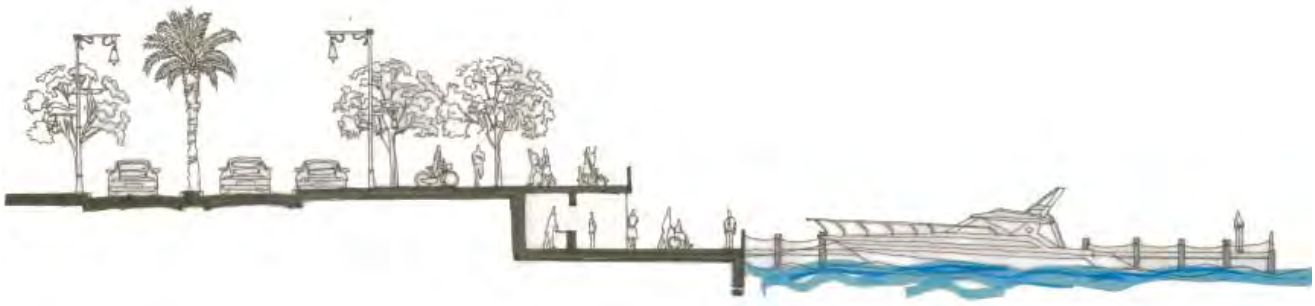


FIGURE 148. **Proposed section D-D': Waterfront zone with a mixture of public and private terraces**

All cross-sections looking downstream. See Figure 135 for approximate location of each section.

CHAPTER 6

Interventions

Following data collection and analysis, students and faculty chose two promising reaches of the Nile waterfront for more in-depth design intervention studies.

These two districts, Old Cairo and Athur El Nabi, offer unique opportunities to reconnect the city to the waterfront. Old Cairo harbors a wealth of historic features and landmarks, and Athur El Nabi holds hidden open space and revitalization potential. To supplement strategic plan and city planning objectives, two student teams developed design and planning strategies for the redevelopment of these two areas. Given the wide variety of land uses that characterize the intervention sites, certain strategies could be selected from these two proposals and used as precedents for other improvement plans along the Nile waterfront.

Old Cairo: Promoting Historic Institutions and Tourism Potential

The Old Cairo district is home to many features providing opportunities for waterfront revitalization. A sizable waterfront promenade, ferry stops, the Manasterly Pedestrian Bridge (connecting Old Cairo to Roda Island), and numerous fishing sites already provide actively used public spaces, which could be enhanced and more widely used by implementing these proposed interventions. In addition, Old Cairo contains many historic buildings that could be conserved and restored to facilitate revitalization of the entire area.

Although mostly built up, Old Cairo does have a few valuable open spaces that could contribute significantly to the revitalization process. In addition, the structure and function of nearby informal settlements demonstrate a strong sense of community, which could potentially aid in the transformation. The site presents a significant opportunity to reconnect Coptic Cairo with the Nile waterfront, Roda Island and the Nilometer, and adjacent neighborhoods. Developing pedestrian connections between these sites

HISTORIC SITES include Coptic Cairo, which houses several Christian churches and dates to Roman times, the Amr Ibn Al-Aas Mosque which is the oldest mosque in Africa, the Suleiman Pasha El-Faransawy tomb, the Al- Mahmoud Mosque, and the Nilometer Complex (Figure 153).

could capitalize on tourism potential to enhance economic development and revitalization.

The vision for Old Cairo attempts to resolve several issues. As a result of heavy use and poor planning, litter, garbage, ineffective sidewalks, and obstructive or broken street lamps characterize the waterfront promenade (Figure 149). The sidewalks need maintenance and repairs, and more seating is needed to accommodate frequent visitors. Across the Corniche, ground floor businesses deter pedestrians from using the sidewalks for recreation, and heavy traffic makes crossing between the storefronts and waterfront difficult and dangerous.

FIGURE 149. Broken lampposts and crumbling pavement along Roda Island's formerly grand sidewalks

The presence of a metro rail line between Coptic Cairo and the waterfront constitutes another major weakness of the site. The aboveground train tracks, flanked by fencing, function as a major barrier between historic attractions and the Nile. Although many pedestrian overpasses already exist, relocating some of them would improve overall functionality and pedestrian continuity.

To address these constraints and take advantage of Old Cairo's unique historic sites, the Old Cairo design team developed a multi-phase proposal (Figures 150-162). Although each of the proposed intervention steps builds upon the previous phase, the site remains fully functional at the end of each intervention step. This strategy could prevent the project from being delayed or stalled by complex regulatory and political processes, or the need to obtain funding for the entire project prior to commencing work. A phased strategy approach could begin relatively quickly with simpler interventions, which would provide tangible societal benefits without requiring inordinately high real estate or funding inputs. As benefits from initial implementation phases become evident, more political and public support for complex future stages would likely emerge.

First Phase: Improve Connections and Revitalize the Waterfront

Establish two connections between Coptic Cairo and the Nile waterfront, and revitalize the waterfront between these two connections.

- Convenient connecting streets exist between Coptic Cairo and the waterfront. Clean and comfortable pedestrian overpasses above the Corniche can be added at these points with minimal interruption to current site facilities, and could provide access to the existing Manasterly Pedestrian Bridge.

- A clean and safe route for visitors between Coptic Cairo and the waterfront would provide new economic opportunities for residents along the connecting streets. The tourist circulation network would be activated naturally once these enhancements are completed.

FIGURE 150. Existing land use in Old Cairo

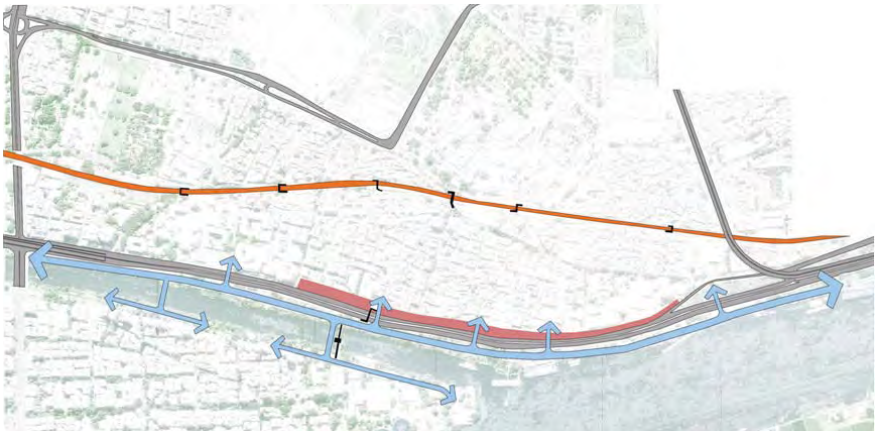


FIGURE 151. Promote activity at the waterfront by improving pedestrian bridges over the metro line

FIGURE 152. Existing open spaces could contribute to the revitalization effort

FIGURE 153. Possible connections between Coptic Cairo, the waterfront, and Roda Island

FIGURE 154. **Old Cairo Intervention Phase I**

FIGURE 155. **Old Cairo Intervention Phase II**

FIGURE 156. **Old Cairo Intervention Phase III**

FIGURE 157. **Old Cairo Intervention Phase IV**

FIGURE 158. **Old Cairo Intervention Phase V**

- Poorly situated floating restaurants and a wastewater treatment facility currently line the waterfront and limit public access to the Nile. Although they would likely need to be accommodated, renovating their facades and maintaining their appearance would improve the promenade's continuity and character.

Second Phase: Create a Major Pedestrian and Tourist Node

Create a major pedestrian node by constructing an internal cross street to intersect with the Suleiman Pasha tomb site.

- The tomb provides an attraction and incentive to revitalize the adjacent square. The node would lie between the two connecting streets established in the previous phase, increase accessibility to the neighborhood, and contribute to economic development.

- These first two phases are closely aligned with UNESCO recommendations, which suggest that economic development and heritage conservation can be best combined by drawing on tourism potential and encouraging interaction between the community and visitors through the establishment of pedestrian circulation networks (Sutton and Fahmi 2002).

Third Phase: Reorganize and Invest in Existing Infrastructure

- Shift the road and bus station (between Fustat Gardens and Coptic Cairo) to a location farther north of Amr Ibn Al-Aas Mosque to allow for the establishment of a large public plaza between Coptic Cairo and the mosque.

- A large public square would solidify the area as a social, tourist, and economic center.

- Dilapidated buildings could be rebuilt at higher densities to free up open space in strategic locations without displacing existing residents.

- This proposed phase requires substantial political will and financial investment. Ideally, this site will be perceived as worthy of this public investment as a result of the successful small-scale interventions from phases one and two.

Fourth Phase: Reroute the Road near the Al-Mahmoud Mosque

- Reroute the road at the southern edge of the site to improve connections and free up open space.

- Once the previous three phases are in place and positive impact of the interventions are evident, this should be a relatively easy task

as the land is already available and the street that requires rerouting is a relatively minor one.

- Fustat Gardens and the park-like median near the Al-Mahmoud Mosque present large open space opportunities. Smaller but strategically located open spaces around Suleiman Pasha Mosque and at the north end of Athur El Nabi also present opportunities adjacent to the pedestrian overpass, which provides access to Coptic Cairo over the metro line.

- The traffic island near Al-Mahmoud Mosque at the south edge of the study site could be attached to the mosque by rerouting the street. The street separating Coptic Cairo from Fustat Garden could also be rerouted behind the Amr Ibn Al-Aas Mosque.

- In conjunction with bus station relocation, the rerouting could free up substantial open space, which can function as a connecting plaza and public square between Coptic Cairo and the Amr Ibn Al-Aas Mosque, both of which are significant tourist attractions and heritage sites.

FIGURE 160. **Al-Mahmoud Mosque**

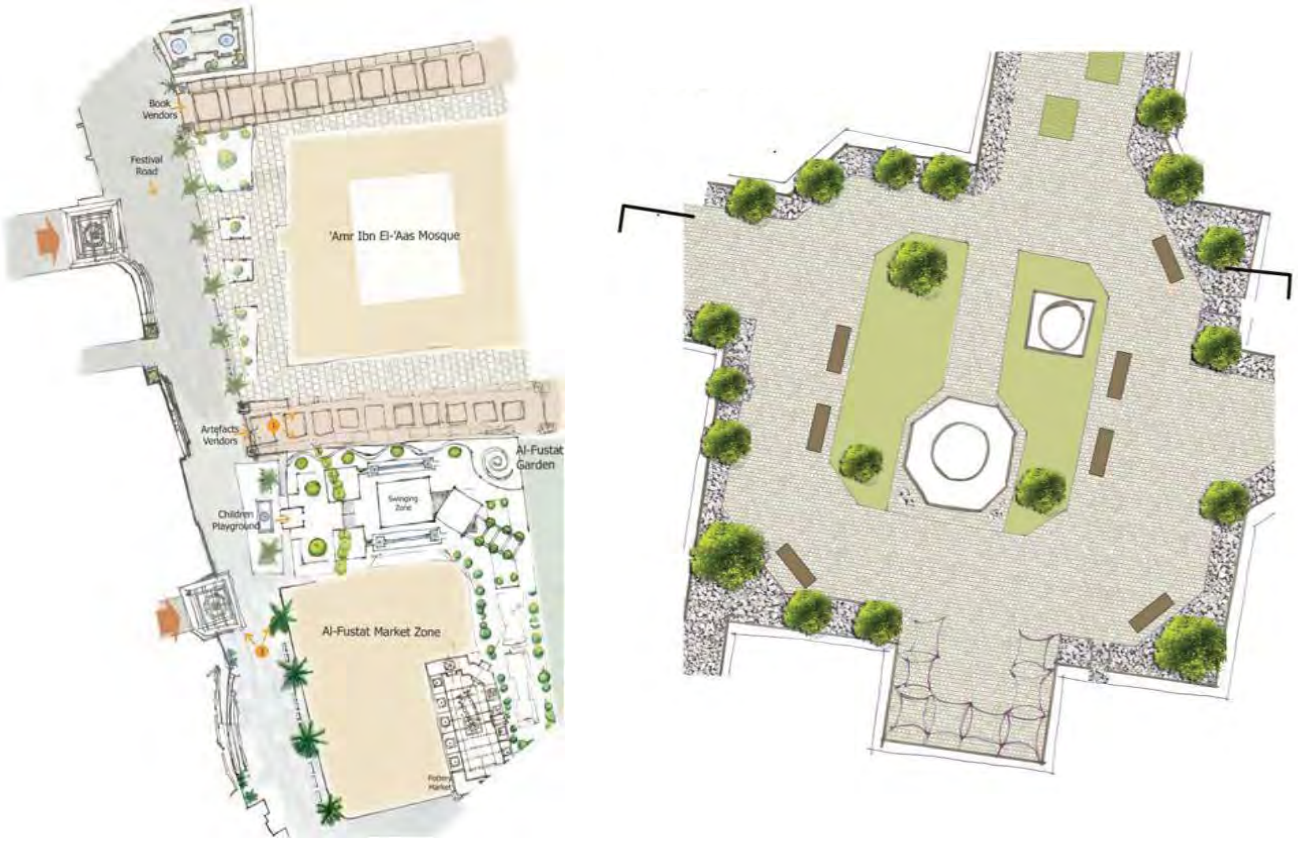


FIGURE 159. **Images of a revitalized Old Cairo (left) and Suleiman Pasha Square (right)**

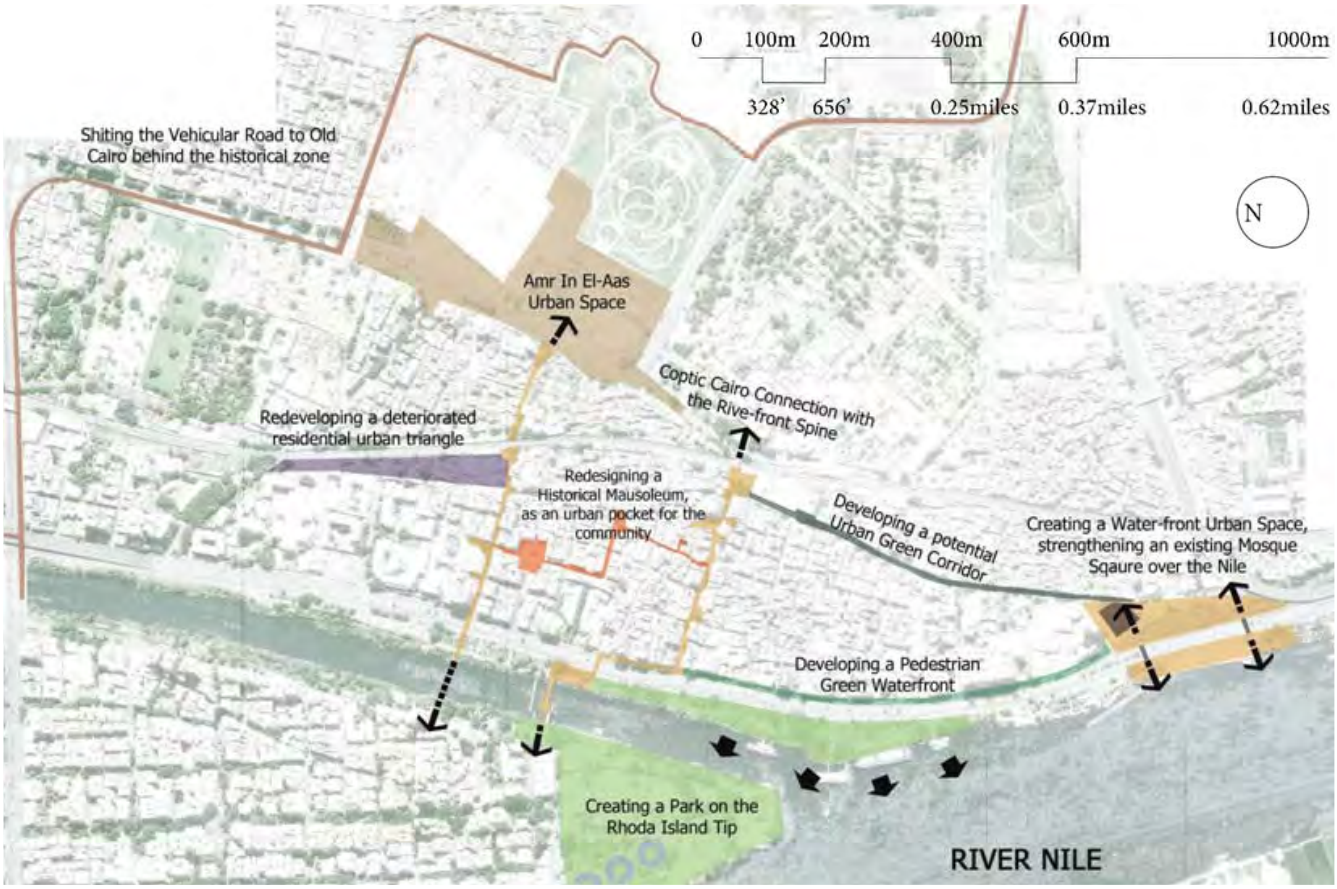


FIGURE 161. Plan showing all five phases of the proposed interventions in Old Cairo

Fifth Phase: Improve Connections Across the Manasterly Bridge

- Improve connections from Coptic Cairo to Roda Island near the Manasterly Pedestrian Bridge, and the proposed trails for Roda Island.
- Coptic Cairo and the Nilometer constitute two major tourist attractions. Establishing additional pedestrian links could potentially assist with economic development of the informal settlement in between.
- The timing of this intervention coincides with the completion of the trail network along the Nile, the revitalization of the Nilometer and Manasterly Palace area, and the land occupied by the wastewater treatment plant at the southern tip of Roda Island.

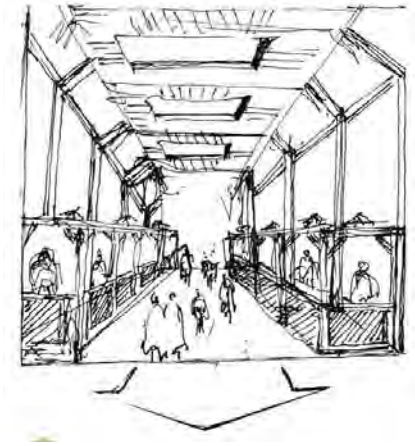


FIGURE 162. Sketch of a revitalized market for book vendors and artisans

Factors that could threaten proposal implementation

- Given the informal nature of much of this area and the age of the properties involved in revitalization, this effort could run into ownership and tenure issues.
- Given development trends north of the site (in busy CBD), this area could be susceptible to indiscriminate development as land values rise.
- Institutional arrangements might be needed to ensure that building controls and guidelines prescribed by revitalization plans are followed.

Athur El Nabi: Return to the Green Nile

The Athur El Nabi design team drew inspiration from Fredrick Law Olmsted's Back Bay Fens project in Boston, Massachusetts. Established in 1879, the park replaced a polluted waterway that threatened prosperity of the nearby Fenway neighborhood. Olmsted's proposals to flush out stagnant waterways and restore native tidal marsh habitat resulted in an ecological and recreational amenity, elimination of public health issues, and valuable real estate (City of Boston 2011). The Athur El Nabi neighborhood's vacant lots, aging and unused industrial structures alongside a canal, and open island space make it a prime candidate for a similar revitalization effort.

The vision for Athur El Nabi relies on converting its underused industrial properties to open space and mixed-use developments, and reinventing, rehabilitating, and restoring its waterfront. Athur El Nabi has the potential to provide riparian habitat, which will enable birds and other wildlife to return to the Nile's shores. Athur El Nabi not only has the potential to provide open space, recreational opportunities, and visual access to historical sites, but also to restore ecological functions and showcase the great diversity of life once supported on the Nile's banks.

Strategies described here are listed in order of importance, but each is essential to creating a revitalized Athur El Nabi. These strategies would transition Athur El Nabi into a major open space destination unlike any other in Cairo by simultaneously generating economic development, providing a variety of public open spaces, and allowing environmental restoration. (Figures 163-171).

Strategy 1: Reroute the Corniche

Remove the major barrier between the city residents and Nile waterfront by relocating the Corniche.

- Reroute the Corniche from the island to the natural boundary between residential neighborhoods and industrial redevelopment. Rerouting the road eliminates the need for pedestrians to cross several lanes of fast-moving traffic to reach the river, and results in reduced noise and air pollution along the waterfront.

- Remove Ring Road access ramps from the island. Relocate access ramps at the intersection of the new Corniche and Ring Road to provide citywide access to Athur El Nabi by driving.

- Decrease the size of the road barrier by reducing the number of traffic lanes along the Corniche.

FIGURE 163. Existing transit corridors in Athur El Nabi

FIGURE 164. Strategy I: Reroute the Corniche and other transit connections

FIGURE 165. Strategy II: Transform the canal island into an open green space

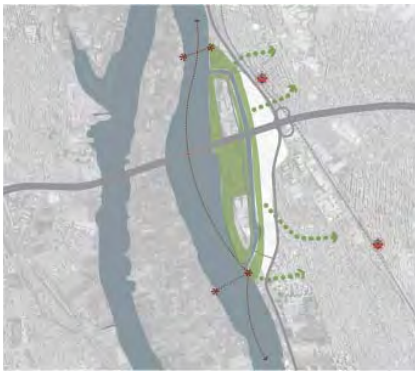


FIGURE 166. Strategy III: Revitalize the canal island and improve connections to Dahab Island

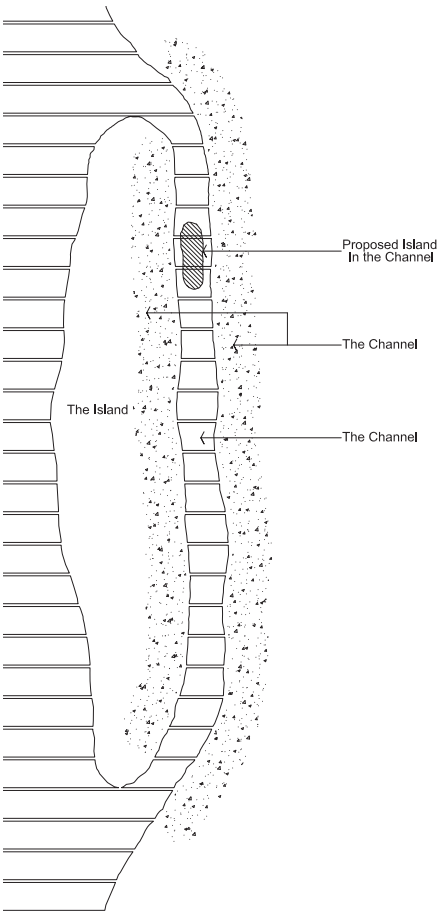


FIGURE 167. Plan for island riparian habitat

Strategy 2: Transform the Canal Island to an Open Green Space

Convert the predominantly industrial man-made island in Athur El Nabi's canal to an island for recreational and public waterfront uses.

- Create active and passive park activities for the resulting open space.
- Establish a trail network to generate north-south connections and loop around the island. North-south connections will extend tourism opportunities south from Old Cairo and offer tourists a glimpse of Cairo's rich environmental history.
- Phase out portions of the island's existing aging development.
- Integrate some existing development, such as the large hospital complex on the southern tip of the island and relatively new residential towers on the northern tip, into the active island park.

Strategy 3: Revitalize the Canal Island and Improve Connections to Dahab Island

Facilitate east-west movement to the Nile waterfront by strengthening connections between residential neighborhoods, Dahab Island, the canal island, and public access points. Revitalize industrial areas.

- Construct a series of greenways and trails from the waterfront to surrounding informal and formal residential neighborhoods.
- Develop new ferry terminals at the northern and southern sections of Athur El Nabi for transport to the islands.
- Create direct connections between the existing El-Zahraa metro station, the adjacent development areas, and the new island park.
- Convert existing industrial lands on and along the canal island to mixed-used developments, and establish a new neighborhood market and boulevard to link the new development to existing neighborhoods.

Strategy 4: Habitat Construction and Restoration

Support riparian and wetland habitat for birds and aquatic life through construction of a new wildlife refuge.

FIGURE 168. Sketches of a revitalized recreational area, including a pedestrian bridge over the canal

- Renovate the harbor and canal to provide riparian and wetland habitat for birds and aquatic life. Create a lush "bird island" and vegetated canal.

- Construct trails for strolling and biking throughout the refuge to allow Cairenes and tourists to explore the wetland without disturbing the wildlife.

- Organize paths and nodes along both sides of the canal for gathering and bird watching. These points will serve as primary public access points and facilitate entry and movement throughout the wildlife corridor.

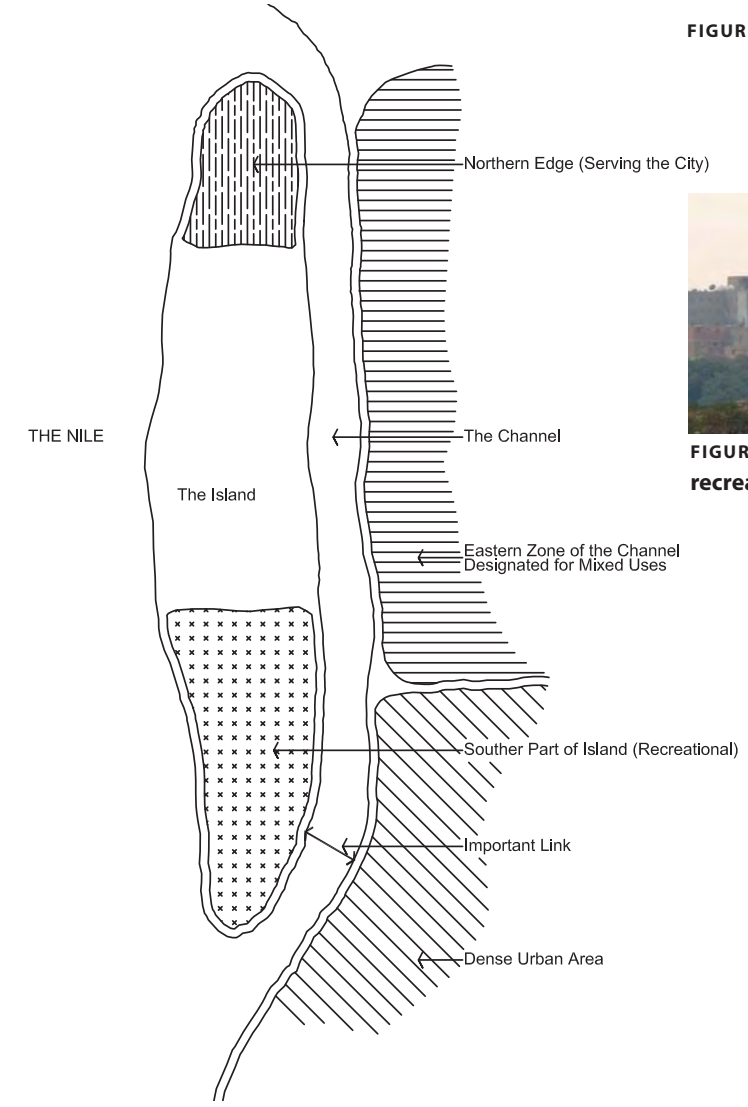


FIGURE 169. Site plan of a revitalized Athur El Nabi

FIGURE 170. View potential from Athur El Nabi recreational areas

FIGURE 171. Plan showing the implementation of all four strategies in Athur El Nabi

CHAPTER 7

Conclusions

THESE unalleviated expanses of tan [buff-coloured buildings with few green spaces] are perplexing, to say the least, for a city lying at the apex of the bountiful Nile, one of the mightiest rivers in the world and the greening agent of its own valley (Rabbat 2004, 43).

At the conclusion of the workshop, students from all three participating universities presented the strategic plan for the Nile from Maadi to the city centre, along with detailed intervention studies for Old Cairo and Athur El Nabi to faculty, community members and government officials (Figures 172-173).

While recognizing the limits of a short study, the workshop nonetheless made clear that the Nile could be the fundamental, unifying structure in the regeneration of Cairo's civic spaces. In a new period in history, it can serve the city's citizens in ways that can transform everyday urban experiences for the better. Around the world, urban rivers that seemed to be in a hopelessly degraded state have been brought to fresh social, economic, and environmental vitality by incremental yet persistent improvement, usually over decades. The Nile provides a tremendous opportunity to be a global model for a river renewed, a reflection of a city and nation meeting the challenges of the future.

Beyond specific design proposals, the workshop revealed some fundamental conclusions that would guide any renewal effort of the Nile:

The Nile is a public resource for urban revitalization.

Like most urban rivers, the process of urbanization and modernization has degraded the river and severed obvious functional and visual links to the city that surrounds it. The basis of any improvement strategy is to re-conceive the river as essential to the civic improvement of Cairo.

The historical hydrologic modification of the Nile, while altering the original ecological conditions, also presents significant opportunities in the context of urban design and planning.

The Nile now has a highly predictable hydrologic regime, with greatly-reduced seasonal variations and minimal rise in its flood stages. This allows for modifications along the Nile to occur with greater certainty as to their long-term benefits. Investments in public access, recreation, transportation, economic development and restoration can occur with more predictable outcomes than usually associated with a river of this scale.

Re-conceiving the Nile as an improved civic space is dependent on public awareness, and public awareness is dependent on public access.

Experience in other global cities has shown that river renewal projects require the support of a public constituency to preserve and enhance the river and riverfront. The best way to build a constituency that supports improvement of the environmental conditions of the Nile is to make the river edge as broadly accessible as possible. People can see, through their own experience, river conditions that demand amelioration and the river's potential as a public space.

FIGURE 172. Dr. Sami preparing materials for display during the workshop's final presentation

A combination of ongoing actions by citizens, government, advocates, and the private sector can recover the environment of the Nile and its waterfront.

Like many rivers, the current conditions along the Nile reflect a pattern of neglect that in turn generates behavior that adds to the river's environmental deterioration. Right now, the residents of Cairo see the Nile and Nile edge as an appropriate place to dump trash and decant effluents. We want to emphasize that this condition was typical of other urban rivers across the world such as the Thames through London (where pollution began during the Roman era) or the Hudson in New York City. Through the 1970s, the conditions of these rivers were notoriously foul. The Nile in Cairo is no different than any of these rivers a few decades ago, and perhaps even a bit

better as industrial pollution is not as intense. As the current conditions demonstrate, the Thames and Hudson have markedly improved in both water quality and edge conditions through a steady combination of public awareness, regulation enforcement, strategic improvements, public access, and ongoing stewardship at both the grassroots and official levels. This is possible in Cairo as well.

The Nile and the Nile edge have the potential to alleviate some of the overwhelming traffic congestion of central Cairo, by providing alternative, more sustainable means of north-south movement through the city.

The Nile has a wide, serene expanse perfect for an expanded, robust, and reliable ferry system to move large numbers of people quickly and efficiently. Our preliminary studies show that the Nile edge—the ample cross section of the right-of-way between the first row of buildings and the water's edge—has significant capacity to provide other means of movement along the Nile rather than just automobiles through reconfiguration of the existing roadways, sidewalks, and embankments. Pedestrians and bicycles can have their own thoroughfares to provide safe and pleasant non-automobile routes through the city. This in turn could provide a backbone for extended east-west bicycle and pedestrian routes through the city.

FIGURE 173. Students, faculty, and community members gather to watch the presentation at AUC

Improvement of the public Nile riverfront will have considerable economic benefits for private sector.

As Cairo has grown and the river quality has deteriorated, privatization of the water's edge has been a strategy to enhance sections of the riverfront while removing them from wider public access. While this has short-term benefits for a select group of people it actually adds to the deterioration of the overall quality of the river. As the contiguous public access is interrupted, the parts of the river between the private zones become the occasion of even more neglect, further justifying expanded privatization of the waters edge. The principle of a public waterfront does not require all private uses disappear but rather to insure that private uses coexist with public access. Along the San Francisco Bay, this principle has been in force for the last three decades, significantly enhancing both the social and economic benefits of waterfront development. As cases in other global cities have shown, well managed, well-designed public riverfronts spur private sectors investment in riverside properties, often creating some of the most active economic zones of the city.

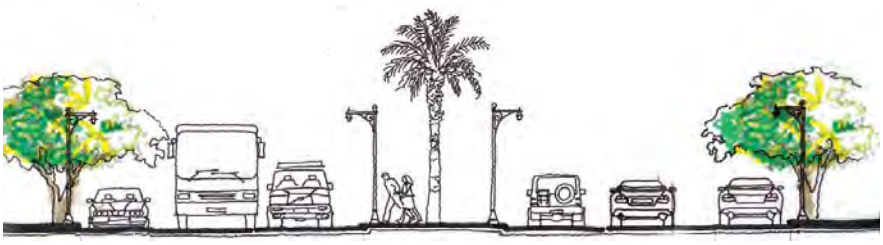


FIGURE 174. CU, AUC, and UCB workshop students and faculty at Al-Azhar Park in January, 2011

The workshop's intensive fieldwork, methodical analysis, and exploratory planning and design generated these conclusions. While the details and specifics of the proposals certainly require further study, this larger framework of ideas is based on considerable evidence from the experience and results in other cities that have reversed decades, and even centuries, of negligence and deterioration of their rivers and waterfronts. Cairo can join in this global transformation of rivers and waterfronts and bring a new era of greatness to the Nile.

We were privileged to participate in this interdisciplinary, cross-cultural, and collaborative research project to explore the promise for the future of Cairo and the Nile. That we brought our collective efforts to bear to a place and at a time that became propitious for a future committed to equity and sustainability was unexpected, but especially fortunate.

We hope our timing was fateful and look forward to continued collaborations and partnerships.

"Cairo is in dire need of public recreational space. Tahrir Square is the political arena now and the only natural space for recreation is the River Nile. However, the waterfront is currently either ill-perceived, fenced off, or occupied by private facilities. Therefore, reconsidering and redesigning the riverbanks is of utmost importance as we consider how all members of society can engage with this natural green network."

--Malak Maher (AUC)

"The importance of our project is that it could result in the first true public space in Cairo - connected to the Nile, open for multiple uses, and available to all Egyptians."

--Aly Abd el-gawad ali ghaly (CU)

"Public spaces are places for freedom."

--Ahmed Farouk (CU)

"Tahrir Square has turned into a public space for Cairo. I mean a REAL public space - celebrate, eat, and have fun there! People can even party, get angry, or express whatever they feel there."

--Fekria el Bialy (CU)

Appendix

Data Collection Format

Item #	Data Category	Description
1	**Land use** (*Categories include:)*	Agricultural
		Riverbank nurseries
		Industrial
		Residential
		Commercial
		Mixed use (commercial/residential)
		Hotel
		Hospital
		Education
		Administrative/Civic
		Military/Police
		Social/Recreational
		Public, fee-based, private (including membership through profession syndicates)
2	**Building Heights**	Number of Stories
3	**Building condition**	Qualitative assessment of building condition as a means for evaluating redevelopment potential
4	**Landmarks** (*Categories include:)*	Historical buildings
		Religious (mosques, churches, sacred sites)
		Administrative buildings
		Cultural and visual landmarks (e.g., malls, commerce centers)
		Other points of interest
5	**View quality**	Qualitative assessment of views
		Panoramas
		Scenic areas
		Views of landmarks (e.g., Giza Pyramids)
		Unobstructed views of the Nile
6	**Transportation**	Bus, water taxi, ferry, metro, and train stations
7	**Waterfront accessibility**	Public, fee-based, or private
8	**Traffic patterns and public transit**	Major pedestrian and transit nodes
9	**Vegetation**	Riverfront nurseries, green parks, old tree growth
10	**Places of social significance**	Gathering spaces
11	**Ecological potential**	Large open space along riverbanks
12	**Air quality assessment**	Samples performed with a Dustrak meter along the Corniche in the Central Business District

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As urban waterfronts around the world de-industrialize, cities are increasingly capitalizing on these opportunities to provide open space and alternative commuting routes along riverbanks, bringing residents and visitors back to the waterfronts. In January 2011, graduate students from Cairo University, The American University in Cairo, and University of California, Berkeley worked together in interdisciplinary teams to develop long-term plans and designs for the Nile waterfront in Cairo. Our research demonstrates that Cairo has remarkable opportunities to reconnect its people with the river through increased access to the waterfront, environmental improvements, pedestrian pathways, and attractive public spaces. Reclaiming the banks of the Nile for the people of Cairo will provide much-needed green space and make the river once again the heart of a dynamic and richly-textured city.

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