近代以前アレクサンドリア(1517-1801 CE)の 歴史的な土地利用・土地被覆の変化 ナポレオン地図-1801の地理空間分析

ソリマン モハメッド*・宇佐美 智之**・今村 聡**・矢野 桂司**

Historical LULC Change of Pre-modern Alexandria (1517-1801 CE) Homogeneity of Authenticity & Modernization

Mohamed SOLIMAN *, Tomoyuki USAMI**, Satoshi IMAMURA**, Keiji YANO**

Geostrategic location exposed Alexandria to upside down change, which effect on the historical LULC. Since, geographic discoveries movement in late 15th C. and early 16th C. in line with the Mamluk-Ottoman struggle that ended by fallen of the Mamluk Empire and converted Egypt to be an Ottoman subordinate state, 1517 CE. As a result, Alexandria lost its historical importance as a world trade harbor in favor of Rosetta. This critical condition shaded the urban of medieval Alexandria causing a frequent land change, which identified by the Napoleonic map 1801 CE. In the age of digital humanities, geospatial approach, remote sensing and GIS support understating the historical attributes of pre-modern Alexandria and analyzing its LULC change that carried out over three centuries (1517-1801 CE).

Keywords: Premodern Alexandria, LULC change, Napoleonic map, digital humanities, RS, GIS

1. Introduction

Napoleonic map 1801 C. identifies pre-modern Alexandria on village scale, neither that great ancient Ptolemaic capital nor a medieval harbor on world trade line that generated the main tax income of Islamic Egypt. The global land cover is rapidly changing due to anthropogenic activities and natural processes (Phiri *et al.* 2020). Since 1801, the premodern Alexandria LULC had been entirely changed, responding to modernization tendency that trespassed the city during Mohamed Ali's dynasty (1805-1952). Consequently, the Napoleonic map is considered one of the most accurate historic maps assigned premodern natural and human landmarks emphasize the LULC.

However, geospatial approach, mainly remote sensing and GIS, is outlining this contribution based on the appropriated LULC categorization, adhering to the French attributes of the Napoleonic map, hence, to reach up reasonable diagnosis for overlapped historic evolution.

2. Historical Urban Context of the Study Area

Boundary covers 42.375 km² of contemporary Alexandria adheres the historical borders and human activities over 2300 years. A narrow strip of land between the Mediterranean Sea to the north and Lake Mareotis to the south was an excellent strategic city. Alexandria access to the Mediterranean through two harbors as well as access to the rest of Egypt via the inland harbor on Lake Mareotis. Alexander the Great appointed Deinocrates of Rhode in 332 BC to plan his new city, according to Hippodamic urban pattern (Carole 2012). Ptolemaic erected splendid buildings, e.g. magnificent lighthouse of Pharos. Heptastadium, a thick wall, linked Pharos with the

* 正会員 JSPS 外国人特別研究員・立命館大学、(JSPS International Research Fellow, Ritsumeikan University) 〒603-8577 京都市北区小松原北町 58 番地 歴史都市防災研究所 E-mail: msoliman8@yahoo.com

^{**} 正会員 立命館大学 (Ritsumeikan University)

landmass encompassed the Great Harbor to east and Eunostos Harbor to west. Water system of a canal, subterranean channels and cisterns conduct fresh water of the River Nile to the waterless city (Carole 2012).

Alexandria declined after the Arab conquest in 641 CE (Abouseif 1989). The city was growing, steadily during the successive Islamic eras, since Tulunid, Fatimid, Ayyubid and Mamluk (9th-16th C.) reconstructed the city. "Alexandria should only be seen as a warehouse of goods", Gratien Le Pére expressed the Ottoman city1798 (Le Pére 1991). Population mobilized to the Heptastadium that became the modern city 1789 (Salem 1982).

War, economy and natural hazard changed the urbanism of Alexandria and create 2-10m of multi-archaeological layers, furthermore the submerged antiquates (Table 1). Alexandria has archaeological survived landmarks such as "Pompey's Pillar", "Alexandria's catacombs" and the "Roman theatre" (Abdelhady 2014).

 Table 1 Samples of the most destructive earthquakes on Alexandria (Source: Riad et al. (2005)

Date	Date H	Lat. N	Long. E	1	M	Location	Source
396		31.3	29.55	VI	5.1	Alexandria	Lyons, 1907
672	108	30	29.21	VII	6	Alexandria	Sieberg, 1932, a,b,7,9,11
1303	702	22.9	32.8	VII-VIII	5.8	Mediterranean	Maamoun, 1984

3. Land Cover Characteristics and Identifications Context of the Study Area

3.1. Urban Area

The bulk of the compact urban fabric, known as *Ville Moderne* (modern city), concentrated in the northern part of the city (Le Pére 1991). Six neighbourhoods scattered inside *Enceinte Des Arabes* (the ancient Arab city), four existed next to the main gate for accessibility and local trading consideration; two west to *Porte de Rosette*, two north to *Porte de la Calonne* (Table 2). Other two scattered buildings, one extends S/N in the middle of *Enceinte Des Arabes* destinated to the Sea Gate, while the other extends S/N parallel with the western wall, next to *Porte des Catacombes* (Figure 1).

3.2. Hilly land

Sand accumulated on ruins everywhere, resembling sand dunes, due to the urban decline. Kom al-Nadoura and Kom al-Dikka, formed by late Roman and medieval human activities, used as sailing landmarks (Léon 1983, Le Pére 1826). However, sand accumulation represented most of the hilly land of the premodern city 19th C. could lead archaeologists as a landmark for promising discoveries (Figure 1). limestone heaps extended (SW/NE) north to *Canal d'Alexandrie* outside south wall of *Enceinte Des Arabes*. Likewise, *cap des figuiers*, west Pharos Island (SW/NE), which Mohamed Ali began removing for preparation of constructing Ras al-Tin Palace in 1830. Gradually, was still fading away until early 20th C. (Mubarak 1888, Al-Serouji 1963).

Table 2 LC analysis of pre-modern and contemporary Alexandria based on the Napoleonic map 1801

			1 1		
Classification	Pre-mod	lern attribute 1801	Contemporary attribute 2020	Contemporary System 2020	Pre-modern Geomaterial Calculation 1801
Urban Area		Porte de Rosette	Bab Sharqi	bysical 2020	0.0659 km ²
	1		Kom al-Dikka	1	0.0281 km ²
	Enceinte	Porte de la Colonne	Bab Sedra	1	0.0250 km ²
	Des Arabes		Al-Nagaa al-Qadim	Urban area	0.0119 km ²
		middle of Enceinte	Attarin & Mesalla	Croan area	0.0301 km ²
		Des Arabes	(Scattered buildings)	-	0.0222 km²
		Torie des Calacomoes	(Scattered buildings)		0.0223 KH
		Total			0.161 km ²
	Ville Modern	e	-Gomrok District:		0.7607 km ²
			-Gomrok		
			-Antousni		0.05101
Hilly I and	Total		-Wasat District	1	0.9549 km ²
Filly Land			-Attarin		0.3978 KH
		Enceinte Des Arabes	-Gomrok District:		
			-Mansheya al-Kubra		
			-Al-Ginina al-Soghra		
	Natural		-Frahda		
			-Mashmas al-Basal		
			-Al-Nagaa al-Gadid		
		Ville Moderne	-Gomrok District:	The second	0.2470 km ²
			-Ras al-Tin		
		Outside Urban Area	-Wasat District:	Orban area	2.9515 km ²
			-Azarita -Meralla		
			-Moharam Bek		
			-Pawalino		
			-Hadara Wabour al Mayah		
			-Al-bab al-Gadid		
			-Raghib Basha		
			-Al-Soury		
			-Gharb District:		
			-Karmuz		
			-Mina a-Basal to al- Max		
		Total			3.7963 km ²
	Industrial	Fort Cafarelli Fort Crátin	Kom al-Nadoura	CULTH	0.0476 km ²
		Total	Roman Amphitucau c	COLIII	0.1463 km ²
	Total				3.9426 km ²
Shoreline	Port Neuf	Sec I Pharillon/	Sec 1 Silsila -	1	W 25 34-141 11 m ×
Shorenne	I OFT IVEN	Cap Palais Ruiné	Mohamed Abd el-		739.48 m L
		-	Wahab Theatre		(Area: 0.0831 km ²)
		Sec. II Cape Palais	Sec.2 Mohamed Abd	Dried as urban	W 6.92-58.45 m × L
		Cape	Immortal park	Road	Area 0.00767 km ²
		Sec. III Unknown	Immortal park -	1	W 2.37-260.41 m × L
		Cape/ Pont du le	Egyptian Yacht Club		3,478.28 m
	Total	rnare			(Area: 0.527 km°) W 2.37-260.41m × L
	10111				4,396.43m (0.6178 km ²)
	Port Veiux	Parallel to the	Alexandria Harbour	Dried as	W 42.35-1.4541 km× L
Waterbodies	Mareotis Lac	snoreline us	Lake Mariotes	Partly dried as	1.7059 km (2.087 km ²) 7.9679 km ²
	(northern sho	re)		developed area	
	Lac Salin		Playground in Ra el-	Entirely dried	0.0077 km ²
			Tin palace	urban use	20241
	Total				1.976 km ²

3.3. Shoreline

Elven small islands were scattered along the SW/NE Pharos Island. *le Diamant* Island was the most important among located north to Pharos island, the only survived remain of demolished Pharos at early 19th C. (Le Pére 1826). This assert the island had been formed due to earthquake and tsunami, which submerged the other islands later (Le Pére 1826, Riad 2005). The long jetties which in ancient times closed the Eastern Harbour from the north did also disappear under sea level, leaving the *Megas Limin* wide open and totally unprotected (Figure 2). Ancient Cape Lochias submerged except a promontory remained visible (Tzalas 2020).

Fortunately, the premodern shoreline is not fully buried under the construction of the corniche road of the eastern harbor in 19th and 20th C., where SE part can still be seen for divers. This discovery made possible to determine the dimensions and structure of these jetties in the harbor (Abdelaziz 2008). Three sections extended between the two ends of the eastern harbour arch, L 3,478.28 m, and connect two capes (Table 2 and Figure 2). Western harbor *Port Veiux* not was away of modern development of 19th and 20th C., as well.

3.4. waterbodies

Napoleonic map present Cape *Molis* in the northern shore of *Mareotis Lacus* containing urban feature and shelter old port *Portus Flurii* (Le Pére 1826), which is now entirely changed (Figure 2). *Lac Salin* (Saline pond) located in *Cap des figuiers*, entirely buried and replaced by playground within developing Ras al-Tin palace (Table 2).

4. Land Use Analysis Within Authentic Framework

4.1. Low Density Housing (LDH)

The Mediterranean residential style prevailed in premodern Alexandria, some still survived, with a height of 1-4 stories (Table 3 and Figure 1), built of burned bricks and logs discriminate the urban fabric of *Enceinte Des Arabes* and *Ville Moderne* (Badr 2004).

4.2. Institutional (INST)

Douane (municipality) overlooking Port Neuf in Ville Moderne was assigned. Fortification was limited, three forts were guarding Port Neuf and one for Port Veiux (Figure 1).

Medieval fortification discriminates *Enceinte Des Arabes* were valid to defend. Rectangular Walls with five gates were surrounding and fortified with five forts. Figure 1. Digitized Napoleonic Map of Alexandria 1801



Islamic, Christiane and Jews worship house diversity reflects cosmopolitanism of *Enceinte Des Arabes* represented in the two main mosques, two monasteries and synagogue. Cemetery was excluded around *Ville Moderne*, two at the south edge and one at north between the two ports for Muslims. Kom Wala (al-Nadoura) was deserted cemetery for Muslims inside *Enceinte Des Arabes*, while Jews cemetery east out, add to another one for Muslim next to *Porte de la Colonne* (Le Pére1826) (Table 3).

4.3. Commercial/Industrial (COMIND)

French attributes of the Napoleonic map assign four COMIND buildings (Table 3). Or du Consulat on Port Neuf, fortunately was renovated as the modern building of Gold Market, despite demolishing the premodern structure. Buildings for marine logistics concentrated and overclocking on Port Veiux, the main harbour that developed, frequently (Figure 2).

Low Density		Pre-modern a	ttribute	1801	Contemporary attribute 2020	Contemporary	Pre-modern
Manhamma 1	Ville Mo	derne			-Gomrok S.DIST.	HDH	0.7184 km ²
(LDH)	ig) Enceinte Porte de Ri				-Antousni S.DIST. Bab Sharqi S.DIST.	LDH	0.0659 km ²
	Des Arabes	Porta 2-1	Colorm		Kom al-Dikka S.DIST. Bab Sedra S.DIST	μην	0.0281 km ²
	Porte de la middle of E		Joionne		Al-Nagaa al-Qadim	LDH	0.0230 km ²
			nceinte i	Des Arabes	Allay Attarin & Mesalla	HDH	0.0301 km ²
	D			S.DIS1. (Scattered buildings)			
	Porte des Catacombes		Al-Seka al-Gadida S.DIST. (Scattered	LDH	0.0223 km ²		
		Total		buildings)		0.1833 km ²	
Institutional	Total Ville	Douane	ane Port Neuf		Souq Turk Allay	MIX	0.9017 km ² 529 m ²
(INST)	Moderne	Cemetery	Al-Mir	awin	(Domestic building) Savala Allay	LDH	79.576 m ²
			Qarafa Saa Gotta		Boloqtrya Allay Hamamil Allay	HDH	10,545 m ² 3.267 m ²
			Total	inc .	riamanni Anay		90,124 m ²
		Fortification	Le Pho Le Pho	re rillon	Listed Arch. Site Military base	CULT INST	17,550 m ² 875 m ²
			Rukn (Corner) Fort		Anfoushi Children Hospital		704 m ²
		Fort Co		ap des figuiers	Ras al-Tin Military School		5,247 m ²
		Total	Total				24,376m ² 114,500m ²
	Enceinte Des	Fortification	Walls	E	Salah Mostafa ST. -Salah Mostafa ST.	TRANS	
	Arabes				-Safia Zaghloul ST. -Saad Zaghloul ST		
					-Adel Khairy ST.		
				W	-Esmat Om al-Baharya ST Acald al Chilal ST		
					-Bab al-Akhdar ST.		
				s	-Surrier S.f. -Ismael Mehana ST.		
			Total		-Omar Tousun ST.		P 7,893 m
			Gate	Porte de Rosette	Horeya Salah/ Mostafa Cross	TRANS	
				Porte de la Colonne	Shrief/al-Amoud Cross	1	
				Porte des Catacomhes	Bab al-Akhdar/Asakl al-Ghlal Cross		
				Qarafa	Bab al-Akhdar/ Warsha Tobgeva		
					Cross		
			Fort	Tour des	Raml Tram Station	TANS	691 m ²
				Romains Sharqi	Listed Arch. Site	CULTH	566 m ²
				Zohary Crétin			557 m ² 750 m ²
				Cafarelli Triangle	Kafr Ashri	COMIND	500 m ² 16,600 m ²
		Worship	Total Mosau	ée des	St. Rita Church	INST	19,664 m ² 14,742 m ²
		houses	Septan	te ée St.	Attarin Mosone		3.348 m ²
			Athanase		Elishu Hammi		5.663 m ²
			Sinago	zae wes Juifs	Synagogue		5,005 in*
			Monastère chrétien Monastère Grec		St. Catherine's Church St. Sabbas Monastery		4,467 m ⁴ 2,800 m ²
			Unider Total	ntified	Nazir Agha Mosque		310 m ² 31,330 m ²
	Out Enceinte	Cemetery	Cimetière des Juifs Tombeaux Cimetière des Colonne		Cemetery of Jews	INST	160,909 m ²
	Des Arabes				Cemetery of the Pillar		4,275 m ²
Commercial/	Villa	Port Neuf	Total Or du	Consulat	Gold Market /France	COMIND	165,184 m ² 5,901 m ²
Industrial (COMIND)	Moderne	Port Veiux	Maga	ins de la	ST. Houseware/		15,710 m ²
			Magasins de la Marine		Alexandria harbour Admin, building/	INST	7.110 m ²
			Arsenal de la Marine			******	
			Arsene Marin	e ior do lo	Alexandria harbour		22 860 m ²
	Total		Arsen Marin Chant constr	e ier de la uctions	Alexandria harbour Admin. building/ Alexandria harbour		22,860 m ²
AGR	Total Enceinte	Des Arabes	Arsen Marin Chant constr	e ier de la uctions	Alexandria harbour Admin. building/ Alexandria harbour -Bab Sharqi S.DIST.		22,860 m ² 51,581m ² 0.7003 km ²
AGR	Total Encointe	Des Arabes	Arsen Marin Chant constr	e ier de la uctions	Alexandria harbour Admin. building/ Alexandria harbour -Bab Sharqi S.DIST. -Attarin S.DIST. -Labban S.DIST.	Urban area	22,860 m ² 51,581m ² 0.7003 km ²
AGR	Total Encointe Ville Mo	Des Arabes derne	Arsen Marin Chant constr	e er de la uctions	Alexandria harbour Admin. building/ Alexandria harbour -Bab Sharqi S.DIST. -Attarin S.DIST. -Labhan S.DIST. Al-Manshiya al Kubra S.DIST.	Urban area	22,860 m ² 51,581m ² 0.7003 km ² 0.0485 km ²
AGR	Total Enceinte Ville Mo Canal d' Total	Des Arabos derne Alexandrie	Arsen Marin Chant constr	e ier de la uctions	Alexandria harbour Admin. building/ Alexandria harbour Bab Sharqi S.DIST. -Attarin S.DIST. -Labban S.DIST. Al-Manshiya al Kubra S.DIST. Lumbroso S.DIST.	Urban area	22,860 m ² 51,581m ² 0.7003 km ² 0.0485 km ² 0.0814 km ² 1.1753 km ²
AGR Vacant land (VL)	Total Enceinte Ville Mo Canal d' Total Ville Mo	Des Arabes derne Alexandrie derne	Arsena Marin Chant. constr	e ier de la uctions	Alexandria harbour Admin. building/ Alexandria harbour Bab Sharqi S.DIST. -Attaria S.DIST. -Labban S.DIST. Al-Manshiya al-Kubra S.DIST. Lumbroso S.DIST. -Gomrok District: -Anfousti	Urban area	22,860 m ² 51,581m ² 0.7003 km ² 0.0485 km ² 0.0814 km ² 1.1753 km ² 0.945 km ²
AGR Vacant land (VL)	Total Enceinte Ville Mo Canal d' Total Ville Mo	Des Arabes derne Alexandrie derne	Arsen Marin Chant constr	e er de la uctions	Alexandria harbour Admin building/ Alexandria harbour -Bab Sharqi S DIST. -Attarin S DIST. -Attarin S DIST. -Athona S DIST. -Athona S DIST. Lumbroto S DIST. -Gomrok District: -Aafouthi -Ras al-Tin -Mantheya al-Kubra	Urban area	22,860 m ² 51,581m ² 0.7003 km ² 0.0485 km ² 0.0814 km ² 1.1753 km ² 0.945 km ²
AGR Vacant land (VL)	Total Encointe Ville Mo Canal d Total Ville Mo	Des Arabes derne Alexandrie derne Des Arabes	Arsen Marin Chant. constr	ier de la uctions	Alexandria harbour Admin building/ Alexandria harbour -Bab Sharqi S DIST. -Attarin S DIST. -Attarin S DIST. -Athona S DIST. Al-Manshiya al-Kubra S.DIST. Lumbroto S DIST. -Gomrok District: -Anfoushi -Ras al-Tin -Mantheya al-Kubra -Gomrok District: -Mantheya al-Kubra	Urban area	22,860 m ² 51,581m ² 0.7003 km ² 0.0485 km ² 0.0514 km ² 1.1753 km ² 0.945 km ² 2.416 km ²
AGR Vacant land (VL)	Total Encointe Ville Mo Canal d Total Ville Mo Encointe	Des Arabes derne Alexandrie derne Des Arabes	Arsen Marin Chant. constr	er de la uctions	Alexandria harbour Admin. building/ Alexandria harbour Bab Sharqi S.DIST. -Attarin S.DIST. -Labban S.DIST. -Labban S.DIST. -Lumbrois S.DIST. - Commex District: - Anfoudui - Res al - Tin - Mantheya al Aubra - Gommex District: - Mantheya al Kubra - Gommex District: - Mantheya al Kubra - Al-fuinna al S-a-bra	Urban area	22,860 m ³ 51,581m ² 0.7003 km ² 0.0485 km ² 0.0485 km ² 0.945 km ² 0.945 km ² 2.416 km ²
AGR Vacant land (VL)	Total Enceinte Ville Mo Canal d Total Ville Mo	Des Arabes derne Alexandrie derne Des Arabes	Arsen Marin Chant constr	er de la ler de la uettions	Alexandria harbour Admin. building/ Alexandria harbour Babs Sherej S DIST. -Artunia S DIST. -Artunia S DIST. -Artunia S DIST. -Artuna S DIST. -Commok District: -Commok District: -Mantheya al-Kubra -Mantheya al-Kubra -Al-Grinia al-Kubra -Al-Grinia al-Kubra -Al-Grinia al-Kubra	Urban area	22,860 m ² 51,581an ² 0.7003 km ² 0.0485 km ² 0.0485 km ² 0.9454 km ² 2.416 km ²
AGR Vacant land (VL)	Total Encointe Ville Mo Canal d' Total Ville Mo Encointe	Des Arabes derne Alexandrie derne Des Arabes	Arsena Marin Chart constr	er de la er de la actions	Alexandris harboar Admin buildingi Alexandris harboar Bab Sharqi S DIST. - Admin S DIST. - Admin S DIST. - Admin S DIST. - Alexandris and Kuben S DIST. - Lumbrono S DIST. - Generado Patricis - Adroschi Manthong al Kuben - Al-Ginnia al Suben - Al-Ginnia al Suben-	Urban area Urban area	22,560 m ³ 51,551m ³ 0.7003 km ² 0.0485 km ² 0.0485 km ² 0.345 km ² 2.416 km ² 2.416 km ²
AGR Vacant land (VL)	Total Encointe Ville Mo Canal d Total Ville Mo Encointe	Des Arabes derne Alexandrie derne Des Arabes	Arsena Marin Chart constr	er de la er de la actions	Alexandris harboar Admin bulkagi Alexandris harboar Labos Starys SDIST. Aturia SDIST. Aturia SDIST. Atabas SDIST. Atabas SDIST. Lumbroo DDIST. Lambroo DDIST. Consul: SDIST. And Starys and Alexandrist And Starys and Alexandrist And Starys and Alexandrist And Starys and Alexandrist Admin al Kohen. Consul District Admin al Kohen. Al-Giana al-Soften Al-Giana al-Soften Al-Giana al-Soften Al-Giana al-Soften Al-Giana al-Soften Al-Giana al-Soften Al-Giana al-Soften Al-Giana al-Soften Al-Sogte al-Giana Al-Sogte al-Giana Al-Soften al-Giana	Urban area	22,560 m ³ 31,581m ³ 0.7003 km ² 0.0485 km ² 0.0485 km ² 0.9485 km ² 2.416 km ² 2.416 km ²
AGR Vacant land (VL)	Total Enceinte Ville Mo Canal d Total Ville Mo	Des Arabes derne Alexandrie derne Des Arabes	Arstin Marin Chant constr	e training and the second seco	Alexandris harboar Admin bulkarj Alexandris harboar Labes Stares S DIST. Antrais S DIST. Antrais S DIST. Alexandris S DIST. Alexandris S DIST. Alexandris S DIST. Lumbros DIST. Commok Daristic Anfondui Res at STin Muntheon al Kohra Commok Daristic Anfondui Al Gianna de Startis Al Gianna de Startis	Urban area	22,560 m ³ 31,581m ³ 0.7003 km ² 0.0485 km ² 0.9485 km ² 0.9485 km ² 2.416 km ²
AGR Vacant land (VL)	Total Enceinte Ville Mo Canal d Total Enceinte	Des Arabes derne Alexandrie derne Des Arabes	Arsena Marin Chant constr	e or de la cer de la acctions	Alexandris harboar Admin buildiagi Alexandris harboar Davis Status S DIST. Antrin S DIST. Alexandris S DIST. Alexandris S DIST. Lumbros S DIST. Lumbros S DIST. Lumbros S DIST. Addoministica Alexandris Andoministica Alexandris Andoministica Alexandris Andoministica Alexandris Andoministica Alexandris Andoministica Alexandris Membroy al Kohra Alexandris Membroy al Kohra Alexandris Membroy al Kohra Alexandris Alexandr	Urban area	22,560 m ³ 31,581m ³ 0,7003 km ² 0,045 km ² 0,045 km ² 0,945 km ³ 2,416 km ² 2,416 km ²
AGR Vacant land (VL)	Total Enceinte Ville Mo Canal d' Total Ville Mo Enceinte	Des Arabes derne Alexandrie derne Des Arabes Enceinte Des	Arsono Marin Chant constr	e to intervent of the second s	Alexandris harboar Admin buildiagi Alexandris harboar Alexandris harboar Alexandris harboar Admin buildiagi Alexandris harboar Alexandris and Kuben SDIST Lumbros SDIST Alexandris Alexandr	Urban area	22,560 m ³ 31,541m ³ 0.7003 km ² 0.0453 km ² 0.0414 km ² 1.1753 km ² 2.416 km ² 11.730 km ²
AGR Vacant land (VL)	Total Encointe Ville Mo Canal d Total Ville Mo Encointe	Des Arabes derne Alexandrie derne Des Arabes Enceinste Des .	Arson Marin Chant constr	e to intervent of the second s	Alexandris harboar Admin bulkagi Alexandris harboar Labes Sharg S DIST. Aturia DIST. Aturia DIST. Aturia DIST. Atabas S DIST. Atabas S DIST. Lambroo S DIST. Lambroo S DIST. Control District AnOmin Passa Alexandristic Statistic Anomin Passa Alexandristic Anomin Passa Alexandristic Anomin Alexandristic Anomin Alexandristic Anomin Alexandristic Anomin Alexandristic A	Urban area	22,860 m ³ 31,581m ³ 0.7005 km ² 0.0485 km ² 0.0485 km ² 0.9485 km ² 2.416 km ² 11.730 km ² 11.730 km ²
AGR Vacant land (VL)	Total Encointe Ville Mo Canal d' Total Ville Mo Encointe	Des Arabes derne Alexandrie derne Des Arabes Enceinte Des	Arson Marin Chant Chant constr	e ter de la cuertions	Alexandris harboar Admin bulkagi Alexandris harboar Labos Stares (SDIST, -Attris SDIST, -Attris SDIST, -Attris SDIST, -Athone SDIST, -Athone SDIST, -Athone SDIST, -Athone SDIST, -Athone SDIST, -Athone SDIST, -Athone SDIST, -Athone Alexandris, -Athona al-Solar -Athona al-Solar -	Urban area	22,860 m ³ 31,581m ³ 0.7003 km ² 0.0455 km ² 0.0455 km ² 0.9455 km ² 2.416 km ² 1.1730 km ² 1.1730 km ²
AGR Vacant land (VL)	Total Enceinte Ville Mo Canal d Total Ville Mo Enceinte	Des Arabes derne Alexandrie derne Des Arabes Enceinte Des .	Arsen Marin Chant Chant constr	e er de la succions	Alexandria harboar Admin bulkarj Alexandria harboar Labos Shares S DIST. Antrin S DIST. Antrin S DIST. Alexandria S DIST. Alexandria S DIST. Alexandria S DIST. Lumbros S DIST. Lambros S DIST. Cannob S DIST. Androubi et al. Manbros J District Manbros al Kubra Adroubi et al. Manbros al.	Urban area	22,560 m ³ 31,581m ³ 0.7003 km ² 0.0455 km ² 1.1755 km ² 0.9455 km ³ 2.416 km ³ 11.730 km ²
AGR Vacant land (VI.)	Total Enceinte Frille Mo Canal d Total Fried Enceinte Outside	Des Arabes derne Alexandrie derne Des Arabes Enceinte Des	Arsen Marin Chant	e ter de la uetions	Alexandria barboar Admin buildagi Alexandria barboar Dado Sharey S DIST. Antrin S DIST. Alexandri S DIST. Alexandri S DIST. Alexandri S DIST. Lumbros S DIST. Lumbros S DIST. Androda S DIST.	Urban area Urban area	22,560 m ³ 31,581m ³ 0.7003 km ² 0.0485 km ² 1.1735 km ² 0.945 km ³ 2.416 km ² 11.730 km ² 11.730 km ² 5.14 km,17 544 km ²
AGR Vacant land (VL)	Total Enceinte Frille Mo Canai d'I Total Enceinte Enceinte Outside	Des Arabes derne Alexandrie derne Des Arabes Enceinte Des Enceinte Des	Arsen Marin Chant	e estate	Alexandris harboar Admin buildiagi Alexandris harboar Alexandris harboar Admin buildiagi Alexandris harboar Admin buildiagi Alexandris harboar Alexandris and Kubra SDIST Lumbros SDIST Alexandris Ale	Urban area Urban area	22,860 m ³ 31,581m ³ 0.7005 km ² 0.0485 km ² 0.0485 km ² 0.0485 km ² 2.416 km ³ 11.730 km ² 11.730 km ² 11.730 km ² 15.091
AGR Vecant land (VL)	Total Enceinte Fille Mo Canal d Falle Mo Enceinte Enceinte Outside.	Des Arabes derne Alexandrie derne Des Arabes Des Arabes Encebtte Des Encebtte Des	Arsena Marin Chant constr Constr Chant constr Chant constr Chant constr Chant constr Chant constr Constr	e or de la sections 	Alexandris harboar Admin bulkagi Alexandris harboar Labos Starys S DIST. -Attris DIST. -Attris DIST. -Attris DIST. -Atboar S DIST. -Atboar S DIST. -Atboar S DIST. -Atboard S DIST. -Androuh; -Andro	Urban area Urban area TRANS	22,860 m ³ 31,581m ³ 0.7003 km ² 0.0485 km ² 0.9485 km ² 0.9485 km ² 2.416 km ² 2.416 km ² 11.730 km ² 11.730 km ² 13.091 km ² 13.091 km ² 13.091 km ² 13.091 km ² 14.754 km 15.558 km
AGR Vecant land (VL)	Total Enceinte Ville Mo Canal d' Fotal Ville Mo Enceinte Enceinte Coutside	Des Arabes derne derne derne derne Des Arabes Des Arabes Des Arabes Des Arabes Des Utile Mede Dessinoe Des Utile Mede Double En	Arsena Marin Chant constr Constr Chant constr Chant constr Chant constr Chant constr Chant constr Chant constr Chant constr Chant constr Chant constr Constr Constr Chant constr Constr Constr Constr Constr Constr Constr Constr Constr Constr Constr Constr Constr Con	a to de la succions de la succiona d	Alexandris harboar Admin bulkarj Alexandris harboar Labos Stares S DIST. Antrais S DIST. Antrais S DIST. Alexandris and S DIST.	Urban area Urban ares TRANS	22,860 m ³ 31,581m ³ 0.7003 km ² 0.0485 km ² 0.9485 km ² 0.9485 km ² 2.416 km ² 2.416 km ² 11.730 km ² 11.730 km ² 11.730 km ² 15.991 km ² 15.901 km ² 15.901 km ² 15.901 km ² 15.901
AGR Vscant land (VL) Transportation (TRANS)	Total Enceinter 7/16 Mo 7/16 Mo	Dea Arabes derne derne derne derne Dea Arabes Dea Arabes Dea Arabes Dea Arabes Dea	Arsen Marin Chant constr Chant constr	e de la sections sections s s Arobas de Rosette	Alexandria barboar Admin buildiagi Alexandria barboar Dab Sharey S DIST. -Amira S DIST. -Amira S DIST. -Amira S DIST. -Antonis S DIST. -Antonis S DIST. -Antonis C DIST. -Antonis C DIST. -Antonis C DIST. -Antonis - Antonis -Antonis 	Urban area Urban area TRANS TRANS	22,560 m ³ 31,581m ³ 0.7003 km ² 0.0485 km ² 0.9485 km ² 0.9485 km ² 2.416 km ³ 2.416 km ³ 11.730 km ² 2.416 km ³ 11.730 km ² 0.945 km ³ 0.945 km ³
AGR Vecant Ind (VL) Transportation	Total Enceinte Ville Mo Total Enceinte Enceinte Outside Secondary street	Des Arabes derne derne derne derne Des Arabes Des Arabes Des Arabes Des Arabes Utile Made Deceine De Deceine De Deceine De Arabes	Arsen Marin Chant	e e de la succions	Alexandris harboar Admin buildiagi Alexandris harboar Dab Sharey S DIST. Antrin S DIST. Alexandris Alboar S DIST. Lumbros S DIST. Lumbros S DIST. Lumbros S DIST. Alexandris Alexandris Antonia S DIST. Antonia S DIST. Albana S DIST. Albana S DIST.	Urban area Urban area TRANS TRANS	22,860 m ³ 31,581m ² 0,7003 km ² 0,9483 km ² 0,9483 km ² 0,9483 km ² 0,9483 km ² 2,416 km ³ 2,416 km ³ 11,730 km ² 11,730 km ² 11,730 km ² 11,730 km ² 11,730 km ² 3,458 km 12,588 km 13,748 km 13,748 km 2,408 km 13,748 km 13,748 km 2,408 km 13,748 km 13,748 km 2,408 km 13,748 km 13,748 km 2,408 km 13,748 km 14,748 km 1
AGR Vacant land (VL)	Total Enceinte Ville Mo Canal d' Total Enceinte Coutside Coutside Secondary street	Des Arabes derne derne derne derne Des Arabes	Araba Marin Chant constr Chantr Chant constr Chant constr Chant constr Chant constr Chant constr Chant constr Chant constr Chant constr Chant constr Constr Constr Chant constr Chant C	s s s s de Rosette de Rosette	Alexandris harboar Admin bulkarj Alexandris harboar Labos Stary S DIST. -Attris DIST. -Attris DIST. -Attris DIST. -Atboar S DIST. -Atboar S DIST. -Atboar S DIST. -Androuis -And	Urban area Urban area TRANS TRANS	22,860 m ³ 31,581m ² 0.7005 km ² 0.0485 km ² 0.0485 km ² 0.9485 km ² 2.416 km ² 2.416 km ² 11.730 km ² 2.416 km ² 11.730 km ² 10.750 k
AGR Vecant land (VL)	Total Dreeinte Ville Mol Canol d' Total Faceinte Enceinte Enceinte Coutside.	Das Arabes derne derne derne derne Das Arabes Das Arabes Das Arabes Das Arabes Das Arabes Desenter Des Testi derne	Arsen Marin Marin Chant constr	a control de la	Alexandris harboar Admin bulkarj Alexandris harboar Labos Stars SDIST. Admin bulkarj Alexandris harboar Labos SDIST. Alexandris and Kohra SDIST. Lambron SDIST. Alexandris and Kohra Alexandris and Ko	Urban area Urban area Urban area TRANS TRANS	22,860 m ³ 31,581m ³ 0.7005 km ² 0.0465 km ² 0.0465 km ² 0.0465 km ² 0.9465 km ² 2.416 km ² 2.416 km ² 1.1753 km ² 0.945 km ³ 2.416 km ² 1.1730 km ² 1.1750 km
AGR Vscant land (VL)	Total Dreeinte Prille Mo Canal d' Total Enceinte Enceinte Cutside. Succedary street	Dea Arabes derne derne Alexandrie derne Dea Arabes Dea	Araba Marin Chant Chant constr Chant constr Chant constr Arabes s Arabes s Arabes Parte Porte Porte Total Esplan Neuf	e er de la succions s as Arabes de Roseste de la Colonne sade de Port	Alexandris harboar Alexandris harboar Admin bulkarj Alexandris harboar Dab Shares S DIST. Antrais S DIST. Alexandris S DIST. Bab Starts S DIST. Ba	Urban area Urban area TRANS TRANS Urban Area	22,860 m ³ 31,581m ³ 0.7003 km ² 0.0485 km ² 0.9485 km ² 0.9485 km ² 0.9485 km ³ 2.416 km ³ 2.416 km ² 11.730 km ² 2.416 km ³ 11.730 km ² 2.416 km ³ 11.730 km ² 2.416 km ³ 11.730 km ² 11.730 km ² 2.416 km ³ 11.730 km ² 11.730 km ² 11.740 km ²
AGR Vecant Ind (VL)	Total Encentre Fille Mo Canal d Total Enceinte Dutside Mo Successful Street Square	Des Arabes derne derne derne derne Ville Medadrie Des Arabes Ville Medad Des Arabes Ville Medad Des Arabes Testal Testal Testal Deschere Des Arabes Testal Deschere Des Deschere Des Deschere Des Deschere Des Deschere Des Deschere Des Deschere Des	Araba Marin Chant	e e de la succions succions succions succions succions succions de Rosette de la Colonne la Colonne succio de Port	Alexandris harboar Admin bulkarj Alexandris harboar Alexandris harboar Labos Stary S DIST. -Attrin S DIST. -Attrin S DIST. -Athene S DIST. -Athene S DIST. -Anonic S DIST. 	Urban area Urban area TRANS TRANS Urban Area	22,860 m ³ 31,51m ² 0,7005 km ² 0,0485 km ² 0,0485 km ² 0,0485 km ² 0,0485 km ² 2,416 km ² 2,416 km ² 2,416 km ² 11,730 km ² 2,416 km ² 11,730 km
AGR Vacant land (VL)	Total Discente Pille Mo Canal d Total Diffe Mo Dutside Discente Secondary Secondary Secondary	Das Arabes derne Alexandria derne Das Arabes Das Arabes	Arsem Amarin Marin Chant constr Constr Chan	s source de la source de la source de la source de la contraction de Rosette de la Colomne sade de Port	Alexandris harboar Admin bulkarj Alexandris harboar Alexandris harboar Dab Sharej S DIST. -Attris S DIST. -Athen S DIST. -Athen S DIST. -Athen S DIST. -Athen S DIST. -Androuis	Urban area Urban area TRANS TRANS Urban Area Wi	22,860 m ³ 31,581m ² 0,7003 km ² 0,0485 km ² 0,0485 km ² 0,9485 km ² 2,416 km ² 2,416 km ² 2,416 km ² 11,730 km ² 11,750 km ² 11,750 km ² 11,750 km ² 11,750 km ² 11,750 k
AGR Vscant land (VL) Transportation (IRANS) Water infra. (WT)	Total Encentre Fille Mo Const d Total Enceinte Enceinte Enceinte Storad Sacondary street	Das Arabes derne Alexandrie derne Das Arabes Das Arabes Das Arabes Das Arabes Das Arabes Das Arabes Das Arabes Tosil Exection Tosil Exection Tosil Conside Exection Tosil Conside Exection Tosil Conside Exection Tosil Conside Exection Arabes	Araba Marin Chanti constr Chan	a control de la	Alexandris harboar Admin bulkarj Alexandris harboar Labos Stars SDIST. Admin bulkarj Alexandris harboar Labos SDIST. Alexandris SDIST. Alexandris and Alexandris Alexandris and Alexandris Antonia SDIST. Alexandris and Alexandris Alexandris and Alexandris Alexandris and Alexandris Alexandris and Alexandris Al	Urban area Urban area TRANS TRANS Urban Area WI	22,860 m ³ 31,581m ³ 0.7003 km ² 0.0485 km ² 0.0485 km ² 0.9485 km ² 2.416 km ² 2.416 km ² 2.416 km ² 1.1730 km ² 2.416 km ² 1.1730 km ² 1.1730 km ² 1.1730 km ² 1.1730 km ² 0.945 km ³ 1.1730 km ² 1.1730 km ² 1.1750 km
AGR Vscant land (VL) Transportation (TRANS) Water infin. (WI)	Total Discounter Pitte Mo Constit Total Pitte Mo Enceinter Enceinter Total Street Sacondary street Square Canal d'	Dea Arabes derne derne derne derne derne Dea Arabes Dea	Araema Marin Chant contr Chant contr Chant contro Parte Parte Parte Parte Neuf	s sa Arabes de Rosette de la Colorane sade de Port	Alexandris harboar Alexandris harboar Admin bulkarj Alexandris harboar Labos Shares S DIST. - Antrais S DIST. - Antrais S DIST. - Antonis Alexandrist - Antonisi - Antonis - Antonisi - Antonisi - Antonisi - Antonisi	Urban area Urban ares TRANS TRANS Urban Area WI	22,560 m ³ 31,581m ³ 0,703 km ² 0,703 km ² 0,703 km ² 0,945 km ² 0,945 km ² 0,945 km ² 2,416 km ² 2,416 km ² 11,730 km ² 2,416 km ² 11,730 km ² 2,416 km ² 11,730 km ² 1,153 km 1,254 km 1,454 km 1,454 km 1,455 km 2,222 km 1,403 km 2,923 km 1,403 km 2,7643 km 2,7647 km
AGR Vacant Innd (VL)	Total Discount Pitte Mo Const d' Total Pitte Mo Constitue Enceinte Enceinte Constitue Secondary street Secondary street Canal d'	Des Arabes derne derne derne derne derne Des Arabes Des Arabes Des Arabes Des Arabes Des Arabes Des Des Arabes Des Des Arabes Testal Des Des Des Arabes Testal Des	Araema Marin Chanti constr Constr Constr Constr Constr Arabes est Arabes Parte Parte Parte Parte Neug Neug	e este de la succions	Alexandris harboar Admin bulkarj Alexandris harboar Alexandris harboar	Urban area Urban area TRANS TRANS Urban Area WI	22,860 m ³ 31,581m ² 0,7003 km ² 0,9483 km ² 0,9483 km ² 0,9483 km ² 2,416 km ² 2,416 km ² 2,416 km ² 11,730 km ² 2,416 km ² 11,730 km ² 11,750 km
AGR Vecant land (VL)	Total Enceinte Fille Mo Const d' Total Fille Mo Enceinte Enceinte Constide Enceinte Enceinte Constide Constide Enceinte Constide Co	Das Arabes derne derne derne derne derne derne Das Arabes Das Arab	Araema Marin Chanti constr Constr Constr Constr Arabes Arabes Arabes Parte a Porte a Porte a Neuf	s ser de la sections sections sectors sectors de Rosette de Rosette de la Colonne sade de Port	Alexandris harboar Admin bulkarj Alexandris harboar Alexandris harboar Dab Sharej S DIST. -Attrin S DIST. -Attrin S DIST. -Athene S DIST. -Athene S DIST. -Androuis -A	Urban area Urban area TRANS TRANS Urban Area WI	22,860 m ³ 31,581m ³ 0,7003 km ² 0,0485 km ² 0,0485 km ² 0,9485 km ² 2,416 km ² 2,416 km ² 2,416 km ² 11,730 km ² 2,416 km ² 11,730 km ² 1,745 km 1,755 km ² 1,755 km

Table 3, Land U	Jse analysis i	for the city of	f pre-modern and
contempora	ry based on	the Napoleor	nic map 1801

		Aqueduc	E		Urban Area	1.648 km
		Souterrain	M			1.429 km
			w			1.243 km
			Total			4.320 km
		Total			11.937 km	
	Citerne G1:		Sinagogue des Juifs &	Attarin/Mesalla S. DIST		9906 m ²
		G2:	Mosquée St Athanase			1716 m ²
		G3:	E/ Mosquée des Septante	Al-Seka al-Gadida ST.	Urban Area	7660 m ²
		G4:	Green Gate	Boloqtrya Alley		1839 m ²
		Total			19,282 m ²	
	Aqueduc	Aqueduc		Mansheya al-Kubra S. DIST	Urban Area	0.595 km
Archaeo.	Archaeo. Enceinte Des Arabes		Panium	Kom el Shoqafa	CULTH	55,543 m ²
Ruins			Colored as	Catacomos	770 1 2 10	10.1052
(CULIH)	4) Catacomies 50 50 50 50 50 50 50 50 50 50		Catacomoes	Qabary Rail. station	IRANS	19,125 m²
			Möles	Dwelling	Urban Area	5,823 m ²
			Timonium	26 July Road /Abdel Wahab Theatre	TRANS	844 m ²
			Posudomam	Quta Parking Lot	TRANS	1161 m ²
			Ruines-1	Al-Max	INST	425 m ²
			Ruines-2	Lumbroso S.DIST.	Urban Area	9,395 m ²
			Deux Oblisques	Le Metropole Hotel	COMIND	5.62 m ²
				Dwelling	MIX	5.62 m ²
			Ruines-3	HCCA	CULT	2,315 m ²
						94,644 m ²

4.4. Agriculture (AGR)

Premodern Alexandrian community of less than 8,000 concentrated in Ville Moderne, reclaimed flatlands inside Enceinte Des Arabes (Table 3) (Le Père 1826). Subterranean channels and cisterns provide limited irrigation to cultivate scattered orchards of palm trees and oranges, moreover vegetables; eggplants, cabbage, artichokes (Figure 1). etc (Le Pére 1826). Anfoushi north to Ville Moderne and Cap des figuiers/Ras al-Tin (Cape of fig trees) was suitable to cultivate fig and palm trees regarding low water consumption and suitable calcareous soil. SE the study area, 1.810 km of 6,000-7,000 km among the main four subterranean channels of Canal d' Alexandrie were cultivated with resilience crops count on wells and cisterns. Fields of alfalfa, barley and wheat were cultivated, add to some legumes denser in the orchards of Enceinte Des Arabes; such as beans, eggplant, onions, etc. (Le Pére 1826).

4.5. Vacant land (VL)

Ali Mubarak conclues Le Pére observations on Alexandria (Mubarak 1888). Urban dysfunction outbreaks *Enceinte Des Arabes* generates vacant land (VL), including hilly lands, and seize *Enceinte Des Arabes* + *Ville Moderne* (Table 3 and Figure 3).

4.6. Transportation (TRANS)

High density of narrow and irregular secondary roads discriminated the survived compact urban fabric of *Ville Moderne*, essentially that a main road penetrated it vertically (SE/NW) and branched into other two, east to *Le phare* and west to *Cap des figuiers* (Figure 3).

The four neighbourhoods inside Enceinte Des Arabes

had the same secondary road pattern, while fractioned long roads extended among the hilly lands. Network of random long roads connect the city to its external context, Rosetta road in the east that leads to Cairo, was the most important and authentic of which, furthermore *Esplanade de Port Neuf* outside the Sea Gate (Table 3).

4.7. Water infrastructure (WI)

Schedia / *Canal d' Alexandrie* was closely linked to Rosetta, the closest Nile western branch. *Canal* penetrated south wall of the city, diverged into four main subterranean channels "*Aqueduc Souterrain*" that flowed northward into the sea (Table 3), from which a network of subterranean secondary channels branched out, reaching to the houses and orchards (Soliman 2014).

Citerne gathered in *Enceinte Des Arabes* (Table 3), Le Pére estimated 380-400 *Citerne* of the city by 1801 preserve water supplied from *Canal d' Alexandrie*, annually (Le Père 1826).

Aqueduc, high-water archways were carrying water from *Enceinte Des Arabes* to the huge tower at the east gate overlooking *Port Neuf* square, is either a modern or a medieval (Table 3). Unfortunately, it had been demolished for new French fortifications (Le Pére 1826).

Figure 3 Spatial analysis of Alexandria 2020 (Pladeas/ ORT 20191119)



4.8. Archaeo. Ruins (CULTH)

Napoleonic map explored ten archaeological features at least within the study area. Most of which allocated around *Enceinte Des Arabes*. Internal heaps blocked detailed survey (Figure 1).



Conclusion

Inter-disciplinarily is an established and vital characteristic of the theory and practice of geography in its various fields, but while there is increasing acknowledgement in heritage studies and management that inter-disciplinarily should be fostered (Ripp & Rodwell 2015).

geospatial analysis outlined historical facts of the contemporary urbanism intersects the pre-modern city, generating the LULC change. Geospatial approach became required to interpret and manage the cultural heritage, along with melting and visualizing the scattered compatible historical material. In the same context, LULC methodology is not exclusive for building futuristic change model of an existing status, but interpretation of historical features that support decision makers, as well. Accordingly, changing mindset of the classic approach of the cultural heritage became required to guarantee realistic perception and providing accurate data support ambitious site management plan.

Subsequently, digitizing the Napoleonic map identifies the LULC attributes, essentially the urban fabric and topographic features, add to classification and calculation interpret pre-modern Alexandria status over three centuries of downfall. However, Alexandria still owns a lot of mysteries, such this contribution help for building historical informatics database for the premodern city, as well as leading to promising exploration of the hidden treasures of Alexandria.

Acknowledgement

The authors greatly acknowledge appreciate the Japan Society for the Promotion of Science (JSPS) for supporting this contribution. Where, this contribution comes out within the first author as International Research Fellow of Japan Society for the Promotion of Science of Postdoctoral Fellowships for Research in Japan.

References

- Abdelhady K. (2014) Factors affecting the conservation and regeneration of the urban fabric of old cities: case study of Old Alexandria. The Sustainable City IX 2: 1175. DOI: 10.2495/SC140992.
- Abdelaziz Y. (2008) Discovery of Submerged Antiquities in Abu Qir and Alexandria. Dar Shrouk, Cairo.
- Abouseif, D. B. (1989). Islamic Architecture in Cairo. Cairo: the American University in Cairo Press.
- Al-Serouji M. (1963) Alexandria in Modern Ages. Book of Alexandria History Since Ancient Times. pp. 327-483. Alexandria.
- Badr A. (2004) The urban and architectural development of Alexandria from Mohamed Ali to Ismail. Ph.D. diss., Faculty of Archaeology, Cairo University.
- Carole E. (2012) Ancient Alexandria, Bibliotheca Alexandrina.
- Le Pére G. (1826) MEMOIRE sur la Ville d'Alexandrie. Description de l'Egypte. Pp. 381-496. Imprimerie de C. L. F. Pajnckoucke, Paris.
- Mubarak A. (1888) Khutat al-Taufiqya. 1st edition, Vol. 7. Amirya Press, Cairo.
- Phiri D., Simwanda M., Salekin S., Nyirenda V., Murayama Y. & Ranagalage M. (2020) Sentinel-2 Data for Land Cover/Use Mapping: A Review. MDPI. pp. 1-36. Doi :10.3390/rs12142291
- Léon J. d'Afrique. (1983) Description of Africa. 2nd edition. 2 vol. Dar el-Gharb el-Islamy, Beirut.
- Riad S., Tealab A., El-Hadidy S., Mohamed A., Basta N., Abdel Azizi M. & Khalil H. (2005) Ancient Earthquakes from Some Arabic Sources & Catalogue of Middle East Historical Earthquakes. (NARSS), Cairo.
- Ripp M. & Rodwell D. (2015) The historic environment: policy & practice, vol.6 issue 3. Pp. 240-276. Doi.org/10.1080/17567505.2015.1100362
- Salem A. (1982) History of Alexandria and its civilization in the Islamic Period, University Youth Foundation Alexandria.
- Soliman M. (2014) The water Installations in Alexandria city from Islamic conquest to the end of Mohamed Ali dynasty. Ph.D. diss., Helwan University.
- Tzalas H. (2020) The Underwater Archaeological Surveys of the Greek Mission in Alexandria, 1998-2012. Fifteen years of uninterrupted research. Pp. 320-348. Alexander, the Greek Cosmos System and the Modern World Society. Academy of Institutions and Cultures, Greece. ISSN: 2241-9993.