



Spatiotemporal Diversifications of Urban Activities and Travels in Egaleo Municipality, Attica Region

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Abstract. This paper presents diversifications of systematic activities and correlated systematic travels, within 12 years a period. As systematic activities and correlated systematic travels are defined those urban activities and travels that are frequently repeated, have same start and end time, travels have same origin and destination, using same transport means and activities take place in the same spatial location. Data derive from qualitative questionnaire survey, Systematic Activities – Travels (SAT) Survey, specifically designed for easy and fast implementation, resulting to large volumes of data on systematic activities and correlated systematic travels characteristics. As 2004–2005 initial SAT Survey covered the Greater Athens Metropolitan Area and for the 2018 survey Egaleo was selected as a low income, high population density. Municipality facing the outcomes of Greece’s recent economic crisis. Egaleo is also a typical example of Metropolitan’s Area deprived western region. Research results indicate significant changes in transport mode choices, travels’ length and duration, as well as changes to activities’ participation, due to the economic recession. At the same time, the Metro Line 3 expansion and the operation of the new Egaleo Metro Station has a significantly positive impact in systematic activities participation choices, especially in the economic recession period.

Keywords: Systematic urban travels · Systematic urban activities · Diversifications

1 Introduction

The complexity of cities’ structure and functions affects urban activities participation and urban travels. The choice of an individual to participate in an activity, which takes place in a specific location at a specific time, affects transport mode choice and travel duration. The activity – based approach launched in 1954 by Mitchell and Rapkin’s landmark study established the link between activities participation process and urban travel characteristics [1]. In 1970 Hägerstrand described constraints that influence and determine individual selections and participation in activities in time and space [2]. Chapin identified particular spatiotemporal activity – travel patterns [3], while Jones argued that the need for urban travels derives from the need to participate in activities

[4]. According to Jones et al. travel is an essential component of activities participation and decision on urban travels originating from an activity participation sequence [5].

Daily participation in activities is part of an overall way of life, thus activity and urban travel planning has a specific weekly frequency [6, 7]. Short term activity scheduling and rescheduling process, affects travel choices [8, 9], while individuals should be asked for their typical activity programs [10]. The need for more field data to identify activities – travels inter-actions is always a necessity [11, 12].

Public transport choice can be affected by residence change and free public transport tickets offer [13]. While there are no significant diversifications on personal, business and free time activities, men's journey distance to work is greater than women's, while women spent more time for shopping than men [14]. Non-work activities for women are more intense than those of men within 8 km from home [15]. Walking for educational activities is dominant among youngsters, while young women walk more for shopping activities and older men walk more for entertainment [16]. Besides gender and activities type (work and non-work activities) various socio-economic characteristics like income, residence area, number of available cars per household, affect transport mode selection and travel distance [17–21].

2 Method

2.1 Systematic Activities and Travels

Urban activities have a specific scheduling process and daily, weekly or monthly – systematic - repetition frequency, as part of citizen' way of life. Based on the methodology developed for the record and analysis of systematic urban activities and correlated travels by Perperidou [21], two travels correspond to a frequently repeated, systematic, urban activity: one for going to activity's location and one for returning from it.

By the term systematic activities and correlated systematic travels are defined those urban activities and travels that: i) are frequently repeated within the week, ii) have same start and end time, iii) travels have same origin and destination, using same transport modes and iv) activities take place in the same spatial location and residence is the departure and return destination for the majority of systematic travels, to and from an activity's location.

Systematic activities and correlated systematic travels are affected by various parameters and city functions, such as: residence's spatial allocation and its distance from the location of individual's activities, spatial distribution of activities locations both for work and non-work activities, activities start and end time (day-time), transport networks' availability and provided services, selected transport modes for systematic travels, travel day-time and travel duration, working timetables, household-members relationships (especially in cases of protected members, like children and elderly people) and household socioeconomic background (income, availability of private car, motorcycle or bicycle).

Systematic activities and correlated systematic travels are divided into:

- Programmed – compulsory: work and education, which are repeated usually 5 times per week and take place mainly during working days, Monday to Friday;
- By choice (non – work activities): shopping, sports, entertainment, visiting friends or social gathering, public or private services transactions activities (tax office, banks etc.) and others activities like person accompany, church etc. Compared to programmed – compulsory their repetition frequency varies from 1 to 3 times per week and they take place not only during week days but also in weekends.

2.2 Survey Method

A specialized qualitative questionnaire survey, based on interviews, the Systematic Activities Travels Survey (SAT Survey) is designed for systematic activities and correlated systematic travels data acquisition [21]. SAT Survey’s advantages are:

- Simultaneous record of systematic activities and correlated systematic travels characteristics, such as: start and end time, activity type and location, used transport mean (or means), etc.
- Systematic activities – travels frequency record,
- Easy and fast Questionnaire fill in.

To facilitate data collection, process and analysis and in order to minimize interview time, systematic activities – correlated systematic travels are divided into 9 categories and sub-categories (Table 1).

Table 1. Systematic activities–correlated Travels Categories/Sub-categories.

Systematic activities–Travels category	Systematic activities–Travels sub - categories
Work	(No sub-categories)
Shopping	Daily shopping: supermarkets, kiosks, street market, groceries, etc. Long term shopping: Clothing, books, electronics, cosmetics, household equipment, etc.
Education	Nursery – kindergarten, primary school, high school, technical high school, learning center, professional training institute, technological institute, university
Health	Visit to doctor, pharmacy, rest home, etc.
Entertainment	Coffee shops, cinema, theater, concert, restaurants/tavern, night club/bar, sport event (spectator)
Social	Visit to friend’s house, cultural events, private club, participation to political party
Sports/Leisure	Walk in park/open spaces, playground, exercise sports, gym
Transactions with Public Services/Banks	Bank, tax office/public pay office, ministry/municipality/prefecture services
Other	Dog walk, hairdresser’s/beauty salon, church, person accompany (in case of children and elderly)

The SAT Questionnaire Survey Method, combines and uses elements from travel – based, activity – based and time-use surveys, so thus this combination facilitates large collected data volumes regarding usual citizens' activities and travels patterns, in respect to qualitative social research principles and classification [22].

For each systematic activity and its correlated systematic travels their exact start & end time is recorded (in day-time basis), along with their repetition frequency. The end time of a travel to an activity's spatial location is activity's start time, while this location corresponds to travel's destination. Furthermore, activity's end time indicates return travel's start time and activity's location corresponds to return travel's origin. Residence's spatial location is origin and destination of an activity's forth and return travels respectively, unless otherwise stated. Any outdoor time spent, during participation to activities, is recorded. For travels, walking time from/to car or public transport stations is also recorded. Participants' demographic and social characteristics (age & gender, marital status, residence address, education level, professional status and annual income) and participant's household characteristics (number of members, household members' age & gender, education level, professional status and financial level, residence status - owned or rented, cars' ownership - number, type & CC, motorcycle ownership - number, type & CC) are also recorded for further statistical analysis and sample classification.

Implementing SAT Survey, systematic activities – travels characteristics are easily collected and analyzed. Intercorrelations between systematic activities & correlated travels and participants sociodemographic characteristics are also determined, thus is facilitated understanding of citizens activities, travel pattern (or patterns) and their overall way of life [16, 23]. Survey's implementation to smaller or larger urban areas or to smaller or larger population groups, generates volumes of information, that can be used to evaluate transport modes in various periods, travel choices, or even exposure to outdoor air pollution [16, 21, 23].

3 Results

The data used herein were collected during 2004–2005 SAT Survey [21] and 2018 SAT Survey, Sfakianaki [24], conducted in Egaleo Municipality.

Egaleo Municipality is located four kilometers west of Athens city center, in Greater Athens West Regional Unit. The West Regional Unit is characterized as low living standard Unit. Egaleo area is 650 HA, out of which 112 Hα form the Eleonas industrial Area and another 134 Ha the Baroutadiko Park and is crossed by five major urban high ways (Fig. 1). Both campuses of the University of West Attica (with over 10.000 students) are located within municipality's administrative boundaries. The Egaleo Metro Station began its operation in May 2007 and is part of Metro Line 3 extension to Greater Athens West Regional Unit. Prior to Metro Line 3 extension the West Regional Unit was not properly served by public transport and in combination with the poor road network, faced heavy road traffic. Egaleo is characterized as low financial level (annual income/household €6,000 to €20,000), high population density (106 residents/hectare in total area, 404 residents/hectare in urban area) municipality.

Its population dropped to 69400 residents in 2011 [24] from 74046 residents in 2001 [25], probably as a result of Greece's recent economic recession and domestic or international migration.

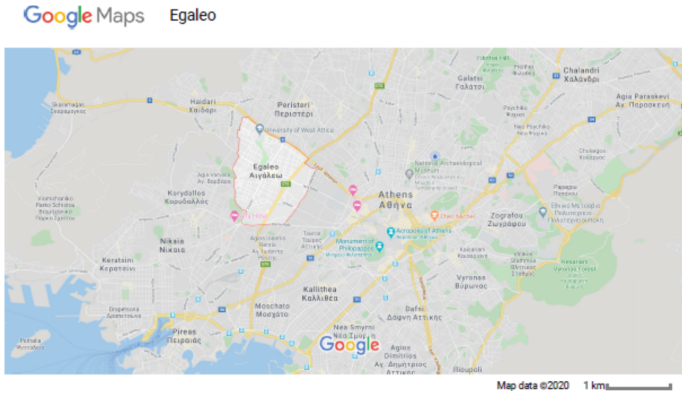


Fig. 1. Map of Greater Athens Metropolitan and Egaleo Municipality

The 2004–2005 SAT Survey covered Greater Athens Metropolitan Area and was conducted right after 2004 Athens Olympic Games, when Greece's economy was strong and growing. The 2008 Global Financial Crisis led to Greece's economic recession, which affected low living standards areas, like West Regional Unit (of Athens Metropolitan area), further deteriorating living conditions in such urban areas. In this context for the 2018 SAT Survey, Egaleo Municipality was selected in order to investigate changes in activities and transport habits prior to and within the economic crisis, as well as the impact of Metro Line 3 and Egaleo Metro Station operation, especially in the era of the economic recession.

Both 2004–2005 and 2018 SAT surveys, include detailed data on systematic activities and correlated systematic travels. Activities locations and travels origins and destinations were geocoded. Precise travels distances were calculated, along with precise calculation of travels duration and activities participation duration correlated on day-time basis.

From 2004–2005 SAT Survey 291 systematic activities corresponding to 582 correlated systematic travels referring to Egaleo were extracted, from 54 participants (out of 5456 systematic activities corresponding to 10912 systematic travels from 1081 participants), while in 2018 Survey 480 systematic activities and 960 correlated systematic travels were recorded, 65 participants, classified according demographic and socioeconomic characteristics Table 2.

Table 2. SAT Survey 2004–2005/2018 participants' demographic characteristics.

Variable	SAT Survey 2004–2005	SAT Survey 2018
<i>Participant characteristics</i>		
Gender: Male/Female	54.3%/45.7%	52.3%/47.7%
Marital Status: Single/Married	55%/45%	70.7%/30.3%
Age: 0–19/20–34/35–64/65+	15.8%/45%/32.3%/6.9%	14%/46.9%/30.4%/8.7%
<i>Household characteristic</i>		
No household members: 1/2/3 4/5/6	17.5%/8.9%/24.4% 45.7%/3.4%/0%	7.7%/21.5%/33.8% 30.8%/3.1%/3.1%
No of cars: 0/1/2/3	14.4%/41.9%/34%/9.6%	26.15%/56.92%/13.85%/3.08%
No of motorcycles: 0/1	90%/10%	37.7%/64.3%
Residence ownership status: rented/owned	15%/85%	45.25%/54.75%

Research results, revealed major diversifications in systematic activities and correlated systematic travels between 2004–2005 and 2018, as well as significant changes in social and demographic characteristics of participants' households. There has been a huge decrease in car ownership, while motorcycle ownership increased, indicating efforts to minimize systematic travels costs and expenditures. 2004–2005 SAT Survey systematic activities/correlated systematic travels mean weekly repetition frequency is 2.51 (2.64 men/2.41 women), while in 2018 SAT Survey repetition frequency is 2.65 (2.48 men/2.83 women), Table 3.

Table 3. Weekly frequency per systematic activity and gender.

Activity	SAT Survey 2004–2005		SAT Survey 2018	
	Men	Women	Men	Women
Work:	3.93	4.27	5.17	4.92
Shopping:	3.00	2.23	2.52	2.33
Education:	3.93	3.77	3,50	4,20
Health:	1.00	0.00	1,00	1,00
Entertainment:	2.12	2.06	1,52	1,33
Social:	1.67	2.12	1,39	1,71
Sports/Leisure:	2.43	1.00	2,29	2,25
Transactions Public Services/Banks:	1.00	1.33	1,14	1,64
Other:	1.20	1.44	4,80	6,00

Significant diversifications both for compulsory and non-compulsory systematic activities between 2004–2005 and 2018 are also revealed. Shopping (daily and other) is

the dominant systematic activity, along with entertainment (Table 4). Systematic activities for work, shopping and health were increased, while those for entertainment and social gathering were dramatically decreased.

Table 4. Distribution of systematic activities.

Variable	SAT Survey 2004–2005	SAT Survey 2018
Work	8.93%	19.45%
Shopping Daily	13.06%	17.77%
Shopping other	9.62%	10.14%
Education:	18.56%	16.68%
Health	0.69%	2.45%
Entertainment	23.02%	14.70%
Social	15.81%	4.14%
Sports/Leisure	6.19%	8.03%
Transactions Public Services/Banks	2.06%	1.97%
Other	2.06%	4.67%

The need to support family income resulted to systematic activities for work increase, while participation in entertainment and social activities has decreased due to their expenditures (travel and service costs). Furthermore, in the case of systematic entertainment activities, there is a considerable drop of their repetition frequency. The drop of educational systematic activities could be attributed to inadequate household financial means, especial for non-school and personal training. In the case of systematic activities for health purposes there has been a notable increase due health care services development, within a 500 m radius from Egaleo Metro Station. The increase of sports/leisure and other (which mainly includes dog walk) systematic activities indicates a growing trend for participation to low cost (or zero cost) non-work systematic activities, which at the same time offers the opportunity for exercise either in organized sports facilities (mainly outdoor) or in open spaces. The 134 hectares Baroutadiko Park is a characteristic recreational attraction pole, not only local but also regional, providing the opportunity for low cost outdoor exercise and walk in frequent basis.

According to 2004–2005 Survey, travelling on foot and travelling by car (driver & passenger) were the two dominant transport modes. The situation is completely reversed on 2018 Survey, travelling on foot and Metro are the two dominant transport modes (Table 5).

Table 5. Systematic travels modal split

Systematic travels modal split	SATS 2004–2005	SATS 2018
Travelling on foot	36.42%	46.77%
Bicycle	0.68%	0.00%
Motorcycle	2.10%	5.23%
Motorcycle/Metro	0.00%	0.50%
Private car passenger	32.60%	8.55%
Private car driver	10.30%	4.28%
Private car driver/Metro	0.70%	1.66%
METRO	0.70%	19.71%
METRO/Public buses	3.40%	1.43%
Public buses	11.00%	11.40%
Taxi	2.10%	0.48%

Due to Greece's economic recession there has been a tremendous drop of private car modal split between 2004–2005 and 2018. From 42%, in total, for both private car driver and passenger, in the 2004–2005 Survey, private car use dropped to 15% in 2018 Survey. On the other hand operation of Egaleo Metro Station and metro line, resulted to sharp increase of Metro modal split and to new modes Motorcycle/Metro combination, which was recorded on 2018 Survey. The expansion and operation of Metro network at Greater Athens West Regional Unit, facilitated inexpensive and longer distance travels for low income residential areas.

Mean travel distance for all transport modes was increased for the majority of motorized modes among 2004–2005 and 2018 Surveys (Table 6), mean travel time duration was decreased (Table 6). The operation of Egaleo Metro Station, after 2007, provided quick and easy access to low cost and long distance travels, while the

Table 6. Systematic travels mean distance & mean duration

	SATS 2004–2005	SATS 2018	SATS 2004–2005	SATS 2018
	Systematic travels mean distance (m)		Systematic travels mean duration (min)	
Travelling on foot	817.5	688.2	8.3	11.3
Bicycle	2591.0	0.0	15.0	0.0
Motorcycle	5979.3	4372.4	25.0	12.5
Motorcycle/Metro	0.0	6341.2	0.0	30.0
Private car driver	5247.6	6595.7	22.4	17.3
Private car pass	2531.0	7621.2	35.0	25.0
P.Car driver/Metro	5233.7	4950.1	40.0	36.1
Metro	4284.7	8532.8	35.0	29.4
Metro/PB	6374.5	6250.6	65.5	44.9
Public buses	5038.4	5554.3	39.4	27.8
Taxi	3530.3	6119.5	20.0	16.6

decrease of private car use, resulted to less traffic along road network and thus faster trips. There was no significant change in public buses modal split between 2004–2005 and 2018. Systematic travels with public buses distance was increased by 10%, while their mean travel time was drop by 25%, indicating that the decrease of car use has a positive impact on public buses travel time.

Table 7. Systematic travels mean walking time per mode

Variable	SAT Survey 2004–2005	SAT Survey 2018
<i>Systematic travels walking time per mode</i>		
Bicycle	2.00	0.00
Motorcycle	3.33	0.00
Motorcycle/Metro	0.00	5.00
Private car driver	3.85	0.19
Private car passenger	2.00	1.00
Private car driver/Metro	15.00	8.21
METRO	15.00	10.50
METRO/Public buses	12.50	9.67
Public buses	8.44	7.28
Taxi	5.00	1.25
Total mean	6.71	5.38

Walking time to and from motorized means decreases in 2018 compared to 2004–2005 Survey. In the case of public transport, walking time decrease indicates that the expansion of Metro lines, combined with local public buses routes rescheduling and increase, facilitates the fast and easy accessibility to public transport stations. In the case of private cars and motorcycle, ownership reduction provides easier access to parking place closer to both departure (mainly residence) and destination locations (Table 7).

4 Conclusions

The majority of urban activities has a specific repetition frequency, thus are systematic. Systematic activities are correlated to systematic travels and have specific characteristics, which are recorded by specialized quantitative questionnaire survey, the Systematic Activities – Travels Survey (SAT Survey). This research presents the outcomes of SAT Survey in a low income, high populated municipality in two periods: 2004–2005 right after 2004 Athens Olympic Games and prior to economic recession and 2018 within the economic crisis as well as the impact by Egaleo Metro Station and metro line operation.

Results revealed that in economic recession periods activities' participation is limited only to the absolute necessary or low/non costs activities (mainly sports and recreation), affecting also correlated systematic travels. The dramatic reduction of

private car ownership and subsequently use indicates that in low living standards regions car use is prohibitive due to its cost. The operation of Metro proved to be a valuable alternative for easy, fast and mainly low cost travels, enhancing the opportunities for longer distance travels e.g. for work. The decrease of private cars use, results to faster travel times for public buses routes. Public transport network expansion eases and facilitates participation to activities, as individuals have access to low cost and extended spatial coverage transport network.

Further analysis of the research data could reveal correlations between systematic activities – travels patterns, geographic diversifications between activities locations and selected transport mode.

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