UNIVERSITY OF WARSAW

Inter-Faculty Studies in Environmental Protection

Titus Kimutai Suter

Student's book no.: K-5064

Quality of Urban Life in European Capitals

Second cycle degree thesis

Field of study: Environmental protection

Speciality: Geo-information Science and Earth Observation

for Environmental Modelling and Management

The thesis written under the supervision of

Prof. dr hab. Katarzyna Dabrowska-Zielinska

Prof. dr hab. Tomasz Zylicz

Warsaw, July 2014

Oświadczenie kierującego pracą

Oświadczam, że niniejsza praca została przygotowana pod moim kierunkiem i stwierdzam, że spełniła ona warunki do przedstawienia jej w postępowaniu o nadanie tytułu zawodowego.

Data Podpis kierującego pracą

Statement of the Supervisor on Submission of the Thesis

I hereby certify that the thesis submitted has been prepared under my supervision and I declare that it satisfies the requirements of submission in the proceedings for the award of a degree.

Date Signature of the Supervisor

Oświadczenie autora (autorów) pracy

Świadom odpowiedzialności prawnej oświadczam, że niniejsza praca dyplomowa została napisana przeze mnie samodzielnie i nie zawiera treści uzyskanych w sposób niezgodny z obowiązującymi przepisami.

Oświadczam również, że przedstawiona praca nie była wcześniej przedmiotem procedur związanych z uzyskaniem tytułu zawodowego w wyższej uczelni.

Oświadczam ponadto, że niniejsza wersja pracy jest identyczna z załączoną wersją elektroniczną.

Data Podpis autora (autorów) pracy

Statement of the Author(s) on Submission of the Thesis

Aware of legal liability I certify that the thesis submitted has been prepared by myself and does not include information gathered contrary to the law.

I also declare that the thesis submitted has not been the subject of proceedings resulting in the award of a university degree.

Furthermore I certify that the submitted version of the thesis is identical with its attached electronic version.

Date Signature of the Author(s) of the thesis

Summary*

Quality of life comparisons among urban areas is known to attract the attention of policy makers, business managers, workers and residents. One important reason for the immense interest in quality of life lies in the question of effective allocation of scarce resources. The overall objective of this study is to make a comparison of the Urban Audit's subjective perception on quality of urban life in European capitals and compare this with objective analysis of Urban Atlas. On subjective quality of life, secondary data, which was obtained from telephone (landline and mobile phone) interview (Urban Audit), was used. The objective quality of life on the other hand was achieved through Urban Atlas analysis. The results indicate that Urban Atlas parameters in comparison with Urban Audit parameters shows a low correlation, for example the percentage of green urban areas (Urban Atlas) and satisfaction with green spaces such as parks and gardens (Urban Audit), with R^2 of 0.0874.

Key words*

Quality of life, Urban Audit, Urban Atlas, European capitals, life satisfaction, environment

Summary in Polish

Wyniki porównawcze jakości życia w obszarach miejskich powszechnie przyciągają uwagę decydentów, prezesów spółek, pracowników czy mieszkańców. Istotną przyczyną ogromnego zainteresowania jakością życia leży w kwestii efektywnej dystrybucji skąpych zasobów. Głównym celem niniejszego badania jest porównanie subiektywnych ocen jakości życia w europejskich stolicach i porównanie ich z obiektywną analizą danych pochodzących z programu Urban Atlas. Subiektywna ocena jakości życia w Urban Audit wykonana została na podstawie danych uzyskanych w wywiadach telefonicznych (za pomocą telefonów stacjonarnych i komórkowych). Obiektywna ocena jakości życia została natomiast sformułowana w oparciu o analizę danych programu Urban Atlas. Porównanie danych z Urban Audit Urban Atlas wykazało słabą korelację poziomu satysfakcji i powierzchni parametrów środowiskowych, np. R^2 0,0874 w odniesieniu do powierzchni terenów zielonych (dane z Urban Atlas) i satysfakcji z zieleni miejskiej takiej jak parki i ogrody (dane z Urban Audit).

Key words*

Jakość życia, Urban Audit, Urban Atlas, stolice europejskie, satysfakcja, środowisko

Area of study (codes according to Erasmus Subject Area Codes List)

07.2 Environmental Sciences, Ecology

The title of the thesis in Polish

Jakość życia miejskiego w stolicach Europy

* Written in Polish

Acknowledgements

I wish to acknowledge the support of my lecturers both at ITC and University of Warsaw. Special thanks to both Dr. Michael Weir and Dr. Małgorzata Roge-Wiśniewska for coordinating my studies at ITC and University of Warsaw respectively.

I also acknowledge the immense support received from my supervisors Prof. dr hab. Katarzyna Dabrowska-Zielinska and Prof. dr hab. Tomasz Zylicz. Thank you to European Commission for the Erasmus Mundus Scholarship award. I cannot forget my family and friends who stood by me and encouraged me throughout the study period. You are part of my success.

Table of Contents

List of figures

List of tables

1.0 Introduction

1.1 Background information

Researchers from various disciplines have studied quality of life since the 1930's (Wish, 1986). In addition to researchers, international organizations such as United Nations Development Programme, UNDP (1994), UN and Overseas Development Council developed their own quality of life.

One important reason for the immense interest in quality of life lies in the question of effective allocation of scarce resources (Megone, 1990). Given limited resources at the disposal of policymakers, they need to find the most efficient way of distributing them according to the needs and the priorities of the people. This is possible given the results of related research as input in the decision-making process. Consequently, such studies are the means of producing appropriate policy recommendation for authorities.

The recommendations are of crucial importance to policy makers. As globalization and regionalization (integration) removes the physical and economic barriers between nations, some of the leading multinational companies become the actors of the global economic system, and cities as opposed to countries, constitute the building blocks of this system, and this leads to a global hierarchy of cities (Ülengin et al. 2001). As a result, cities need to fulfill a number of conditions in order to attract investments from multinational companies. Quality of life affects business location decisions and usually, play an important role in local economic development plans (Mulligan et al., 2004).

Cities will have to offer high-quality infrastructure, communications, transportation, safety, well-trained personnel, legal systems and a technological basis that provide the necessary medium for economic growth. Ultimately this will in turn lead to a significant increase in the residents' standard of living.

`Quality of life' factors are those elements which define the livability of a place (Rogerson, 1999). Urban quality of life describes a new urban issue that gained popularity in the 1980s by initiating new forms of environmental rules as well as regulations, while introducing alternative strategies and tactics to mainstream environmentalism (Floyd and Johnson 2002). Furthermore, urban quality of life has become a major focus for planners together with funding agencies, and local

communities (Steinberg 2000). At the centre of this focus is recognition as well as awareness of the distribution of environmental costs and benefits (Jensen, et al. 2004). Recent urban quality of life studies have used geographic techniques, for instance geographic information systems (GIS) and remote sensing, to carry out analysis of observed urban conditions as well as elucidate the core policy issues and strategies that improve the material conditions of everyday life, as well as the overall quality of life of residents (Harner et al. 2002, Mennis 2002, Porter and Tarrant 2001).

Quality of life comparisons among areas is known to attract the attention of policy makers, business managers, workers and residents (Blomquist et al., 2001). People are interested in comparing the bundle of amenities available in one location to bundles in another location.

Quality of life can be undertaken using indicators that are either objective or subjective. Objective indicators are useful especially at neighbourhood, city and country levels. (Liu, 1976; UNESCO, 1976, Rogerson et al 1989). Subjective indicators on the other hand have been employed at the individual level and are used to measure individual's level of satisfaction with life, this is as someone experiences it. Thus they represent a subjective as well as introspective and personal experience-based concept (Seik, 2000). As a result, subjective quality of life is indicated by the psychological state of life satisfaction as opposed to objective conditions and settings (physical, social and economic settings), however both are inter-related.

The results obtained from quality of urban life study can be used to rank cities. This in turn will help planners to identify the target areas of improvement needed for poorly ranked cities. Consequently, corrective measures could be formulated once underlying causes of dissatisfaction have been identified. Some of the corrective measures could be provision of better education, health or transport. Furthermore, well-publicized and regular quality of urban life rankings can spur local leaders and residents to take action so as to improve or maintain their area's ranking (Seik,2000).

1.2. Problem Statement

European policy makers need various data acquisition and information so as to help them with solutions to make informed decisions for policy domains and development as well as act as guide to regional funding. However, part of this information lacks spatial component while the other collected by cities is not comparable. Furthermore, there is the problem with inter-comparable land use data. Urban Audit and Urban Atlas were developed to solve these problems. Whereas Urban Audit lacks geographical information, it provides for a comparable statistics. The Urban Atlas on the other hand has the spatial component added via satellite imagery/remote sensing images, providing a solution to land cover and land use with detailed information at high resolution.

Harmonized geographic and statistical data is required so as to enable policy makers have a neutral and objective criterion on which to justify allocation of money to one city and not another. Cities across Europe have questioned why their own data collected by their local authorities was not used for the basis of policy making, and the response lies in the establishment of a harmonized basis for comparison purposes. The data from city authorities are not comparable since comparability is the key when it comes to equal treatment of all Larger Urban Zones. There is the desire to have one nomenclature and one methodology to serve as a basis on matters of funding decision as related to development policies for cities. This will enable cities to be ranked, and perhaps convince local politicians to consider investing in a given area to improve their ranking. Policy makers are thus presented with a tool to start to find solutions.

The maps provided by Urban Atlas will be used to monitor how boundaries are shifting, and help in understanding the land cover and land use change. Also more details will be available for the areas within administrative boundaries. The Urban Atlas project covers the whole of Europe at high level of detail in the maps produced with a resolution of 2-2.5 metres. This will ensure that the exact type of land cover and land use is mapped correctly and can be used for instance on modeling population densities. Examples of the application of Urban Atlas include modeling project which measures access to public transport in cities using BIG data. The Urban Atlas can also be used to model a more detailed spatial distribution of urban densities with the results

matching those of censuses. This study, therefore, makes use of both Urban Audit and Urban Atlas to solve the above problems in the European Union capital cities.

1.3. Justification

The study entails both objective and subjective analysis of urban quality of life in European capitals. The objective analysis involves the use of Urban Atlas, which has geographic information to make a comparison of various land cover and land use types. The high resolution maps ensure that the exact type of land cover and land use is mapped correctly. Subjective analysis includes Urban Audit with comparable statistics. Additionally is climate data such as precipitation and temperature which are analyzed in order to represent the climate conditions in the cities and to ascertain climate change in key cities. There is also data for air pollution for the different OECD countries in Europe.

1.4. Knowledge gap

There is a knowledge gap on how to link or relate Urban Audit information with Urban Atlas. For example, how to determine the percentage of Urban Atlas parameters by comparing it with Urban Audit? Additionally it is important to establish Urban Atlas parameters per capita and make a comparison with Urban Audit.

1.5. Novelty of the Research

The author developed a novel approach on how to calculate the percentage of the environmental parameters in the Urban Atlas. This is done by calculating the area of the individual environmental parameters then multiplying by a hundred and the results divided by the total area of the urban atlas as opposed to the area of the cities. Further information is explained on the methodology section.

1.6. Objectives

1.6.1 Overall Objective

The overall objective is to make a comparison of the Urban Audit's subjective perception on quality of urban life in European capitals and compare this with objective analysis of Urban Atlas

1.6.2 Specific Objectives

There are five specific objectives as follows:

1. To explore the relationship between Urban Audit parameters

2.To compare the relationship between Urban Atlas parameters with those of Urban Audit.

3. To establish Urban Atlas parameters per capita and compare with Urban Audit

4. To compare population above 15 years old with Urban Atlas parameters

5.To carry out analysis of climate data such as precipitation and temperature to ascertain climate change in key cities.

The findings are expected to benefit policy makers, urban planners as well as civil society and even citizens to help them tackle urban development problems in an integrated manner.

2.0 Literature Review

80% of Europeans are satisfied with life in their city with public spaces, green areas and cleanliness as well as feeling a sense of safety scoring highly (EC, 2013). Some cities have strengths while others are encountering challenges. Some wide disparities exists between cities and even countries as relates to how their inhabitants are able to rate the quality of life in certain areas. The impact of economic crisis had some negative developments on people's well-being and on cities' financial resources.

People of different kinds have different perceptions as regards environmental quality which cities will have to try to help fulfill their ambitions. In the 21st Century, the vision of a city is one which solves conflicting interests through involvement and negotiation as well as strives towards an integrated and diverse cityscape (Nyström, 2011). It is necessary to look at the requirements of mainstream society so as to understand and manage the future of a city. The same applies to the diverse preferences and ambitions.

It is a universal need to desire quality of life of certain standard. This desire generates consensus across political and popular arenas. It is a concern for every social group to enjoy quality life, though there are some persistent inequalities. There are individual searches for better quality of life, for instance a better quality of domestic living environment (EEA, 2009)

Almost 75% of European citizens live in urban areas today. This is expected to increase to 80% by 2020. Indeed in many respects the European Union may be seen as a union of cities since approximately 1,600 urban areas have more than 50,000 inhabitants, enough to be defined as functional urban areas (ESPON, 2005a).

Based on a survey of 75 cities across Europe, overwhelming majority of European citizens seem satisfied with the quality of life in their cities (EEA, 2009). One definition of quality of life is that it exists when people can live healthy, pleasant and safe life, are free to be who they want to be and do what they want to do (Sen, 2003). However, individuals have their own visions and preferences, and this leads to a great diversity of personal definitions (EEA, 2009)

Nevertheless, what constitutes quality of life has the basic idea is much the same throughout Europe. Common concerns for all exist, for instance making a living and

having an income. The same is true of enjoying a satisfactory family life and having good health, though assessments at individual level tend to vary (Eurofound, 2004 and 2007). Early studies on quality of life established that growth in objective material comfort did not necessarily match with similar growth in satisfaction, well-being or happiness (Campbell et al., 1976; Andrews & Withey, 1976).

The objective perspective is able to highlight issues such as income level, living conditions and job situation whereas the subjective approach focuses on individual appreciation of these issues (EEA, 2009). However, from an urban planning perspective, quality of place is used to describe the state of the external environment and the requirements for good quality of life (Massam, 2002). The latter approach to quality of life deploys various socio-economic as well as environmental indicators including air or water quality and material welfare (EEA, 2009).

Growing incomes, better paid jobs together with rising levels of education as well as good health and secure family with social relations remain key determinants of individual happiness and fulfillment (Eurofound, 2008).

It is important to note that cities occupy just 2% of the world's surface yet it is home to half of the world's population while being responsible for three quarters of natural resources that is consumed globally (UNEP, 2008). One of the determinants of quality of life is adequate housing conditions (EEA, 2009). People also value green space and those who live close to green spaces gain a higher appreciation for the nature around them (Velarde et al., 2007). The total area is important in individual satisfaction together with the quality of the green open places are likely to be more physically active and 40% less likely to be obese or overweight (Ellaway et al., 2005).

Similarly school children with access to, or even sight of, green space show higher levels of concentration than those without space as well as the accessibility, possibilities for outdoor recreation, their distribution and the overall design of the urban area (EEA, 2009). It is also important to note that compact city which is based on efficient public transport, provision for walking and cycling allied with high quality public and green space can provide the much needed model for enhanced quality of life as well as sustainable urban development (EEA, 2009).

The importance of quality of life is that it determines whether population groups such as young, elderly, families, immigrants, poor or rich etc. are attracted or repelled by the city and decide to live there, or if conditions are unfavourable they leave (EEA, 2009). Also population growth in cities will increase the impact of cities on the environment; however the higher proportion of people living in relatively dense urban areas will offer potential for sustainability.

Even though there is no consensus on the definition of quality of life, it has been agreed by most researchers that quality of life is a multidimensional construct that encompasses psychology, economy, social and physical wellbeing (Li and Weng, 2007). As a result of advances in remote sensing and geographical information systems (GIS) technologies, it is now possible to make quality of life research possible as it can be conducted using digital remotely sensed imagery and as such to incorporate digital imagery with census data (Li and Weng, 2007). For example, Weber and Hirsch (1992) developed urban quality of life indices through combination of remotely sensed SPOT data together with census data for the city of Stasbourg, France. They found that there was strong correlation between census and remotely sensed data, especially with housing related data. It can be seen that integration of remote sensing and GIS technologies has been widely applied and as a result recognized as an effective and useful tool in both urban analysis and modeling (Ehlers et al. 1990, Treitz et al. 1992, Harris and Ventura 1995, Weng 2002).

The technology provided by GIS provides a flexible working environment for entering, analyzing and displaying digital data obtained from various sources that are necessary for urban feature identification, change detection as well as database development (Weng 2001). The physical properties of the environment are recorded by remote sensing data which provide large quantities of timely and accurate spatial information. These are then used widely in mapping and monitoring changes in both land cover and land use (Welch 1982, Forster 1985, Pathan et al. 1993, Weng 2002). An effective environment for spatial analysis of both remotely sensed data and other sources of spatial data is provided by GIS technology (Burrough 1986, Donnay et al. 2001). Consequently there is a lot of attention accorded to the integration of remote sensing imagery and GIS (including census) data (Li and Weng, 2007).

Wilkinson (1996) was able to summarize three main ways to combine remote sensing and GIS technologies and make them enhance each other: remote sensing can be used as tool to gather data that can be used in GIS; GIS data can act as ancillary information so as improve the products derived using remote sensing; and both remote sensing and GIS are used together for modeling and analysis.

3.0 Study Area

The study area is the 28 European Union capitals. Figure 1 shows the 28 member states of the European Union while table 1 summarizes the 28 member states, their capitals, year of entry into the European Union and population above 15 years old.

Figure 1: The 28 member states of the European Union (European Commission, 2013)

Table 1: The 28 member states, their capitals, year of entry into the European Union and population above 15 years old are as follows:

No.	Country	Capital	Year of Entry into EU	Population above 15 years old (Urban Audit)
1	Austria	Vienna	1995	1 484 966
2	Belgium	Brussels	1952	916 829
3	Bulgaria	Sofia	2007	1 055 205
4	Croatia	Zagreb	2013	652 959
5	Cyprus	Nicosia	2004	204 179
6	Czech Republic	Prague	2004	1 077 005
7	Denmark	Copenhagen	1973	464 858
8	Estonia	Tallinn	2004	336 683
9	Finland	Helsinki	1995	514 611
10	France	Paris	1952	1 844 243
11	Germany	Berlin	1952	3 035 226
12	Greece	Athens	1981	659 664
13	Hungary	Budapest	2004	1 550 299
14	Ireland	Dublin	1973	1 028 000
15	Italy	Rome	1952	2 384 127
16	Latvia	Riga	2004	423 118
17	Lithuania	Vilnius	2004	453 866
18	Luxembourg	Luxembourg	1952	86 022
19	Malta	Valletta	2004	5 479
20	Netherlands	Amsterdam	1952	661 407
21	Poland	Warsaw	2004	1 502 571
22	Portugal	Lisbon	1986	477 239
23	Romania	Bucharest	2007	1 718 888
24	Slovakia	Bratislava	2004	378 952
25	Slovenia	Ljubljana	2004	236 011
26	Spain	Madrid	1986	2 825 353
27	Sweden	Stockholm	1995	722 386
28	United Kingdom	London	1973	5 807 285

4.0 Methodology

This is a descriptive research that uses the descriptive analytical approach. This method can only describe a set of observations or the data collected using the survey method. However, it cannot draw conclusions from that data about which way the relationship goes, for example, does A cause B, or does B cause A?

On subjective quality of life a telephone (landline and mobile phone) interview was carried out by TNS Political & Social at the request of the European Commission (EC, 2013). The interview took place between the 15th of November and 7th of December 2012. The methodology used is that of Eurobarometer surveys as carried out by the Directorate-General for Communication. This study makes use of these secondary data (Urban Audit) collected during the survey.

The objective quality of life on the other hand was achieved through Urban Atlas analysis. For example by calculating the total surface area for the different classes and making comparison per capita/individual by dividing the total surface area by the total population above 15 years of age. Comparison is also made by dividing different Urban Atlas classes by the total area of the Urban Atlas. The data used was obtained from Urban Atlas (EEA, 2014).

The author developed the following procedure in the Urban Atlas analysis:

1. Load the map into ArcGIS/ArcMap e.g. Amsterdam
2. Go to selection by attribute
3. Choose “ITEM”
4. Get unique values for example “Forests”
5. Right click on the map “Amsterdam” and select “Open Attribute Table”
6. Go to “Shape Area”
7. Right click on “Shape Area” and choose “Statistics”
8. Copy and paste into excel the “Sum” from the “Statistics”, in the case of Amsterdam: 45951675

9. Take the above sum in number 8 and multiply by 100 (this is done because the figure is too small when divided by the total Urban Atlas sum) to get 4595167500.
10. Close the map and load again “Amsterdam”.

11. Right click on the map “Amsterdam” without a selection and select the “Open Attribute Table”
12. Go to “Shape Area” and right click on it.
13. Choose Statistics and copy paste the “Sum” into excel sheet, 1172049658
14. Take the results from number 9 and divide by the Urban Atlas results from number 13.
15. The answer is 3.92%, the forest cover in Amsterdam!
16. Do the same for all the cities and all the environmental parameters such as Sports and Leisure facilities, Green urban areas, Mineral extraction and dump sites, Other roads and associated land, Railways and associated land, Fast transit roads and associated land and Water bodies etc.
17. The sum of all Urban Atlas/environmental parameters for a particular city should add up to 100%; an example is the results for the Amsterdam as illustrated below in table 2.

Table 2: Summary of Urban Atlas statistics for the city of Amsterdam

Individual Environmental parameter	Area of individual environmental parameter	Area of individual environmental parameter *100	Urban Atlas Area	% of individual environmental parameter
Forests	45951675	4595167500	1172049658	3.92
'Agricultural + Semi-natural areas + Wetlands'	429478557	42947855700	1172049658	36.64
Airports	19896533	1989653300	1172049658	1.70
Construction sites'	14052974	1405297400	1172049658	1.20
Continuous Urban Fabric (S.L. > 80%)	45484781	4548478100	1172049658	3.88
'Discontinuous Dense Urban Fabric (S.L.: 50% - 80%)'	59574531	5957453100	1172049658	5.08
'Discontinuous Low Density Urban Fabric (S.L. : 10% - 30%)'	4143512	414351200	1172049658	0.35
Discontinuous Medium Density Urban Fabric (S.L. : 30% - 50%)'	20375794	2037579400	1172049658	1.74
'Discontinuous Very Low Density Urban Fabric (S.L. < 10%)'	232273	23227300	1172049658	0.02
'Fast transit roads and associated land'	13004927	1300492700	1172049658	1.11
'Green urban areas'	36172160	3617216000	1172049658	3.09
'Industrial, commercial, public, military and private units'	63962955	6396295500	1172049658	5.46
'Isolated Structures'	4592280	459228000	1172049658	0.39
'Land without current use'	6514822	651482200	1172049658	0.56
'Mineral extraction and dump sites'	1560151	156015100	1172049658	0.13
'Other roads and associated land'	51386379	5138637900	1172049658	4.38
'Port areas'	12567230	1256723000	1172049658	1.07
'Railways and associated land'	5899789	589978900	1172049658	0.50
'Sports and leisure facilities'	24449013	2444901300	1172049658	2.09
Water bodies	312749313	31274931300	1172049658	26.68
SUM/TOTAL				100

The interview questions for the Urban Audit (EC, 2013) as used by the TNS Political & Social for the subjective perception survey were as follows:

Q1 Generally speaking, please tell me if you are very satisfied, rather satisfied, rather unsatisfied or not at all satisfied with each of the following issues in [CITY NAME]?

ANSWERS: Very satisfied Fairly satisfied Not very satisfied Not at all satisfied DK/NA4

1. Public transport, for example the bus, tram or metro
2. Health care services, doctors and hospitals
3. Sports facilities such as sport fields and indoor sport halls
4. Cultural facilities such as concert halls, theatres, museums and libraries
5. The state of the streets and buildings in your neighbourhood
6. Public spaces such as markets, squares, pedestrian areas
7. Green spaces such as parks and gardens
8. Availability of retail shops
9. Schools and other educational facilities
10. The quality of the air
11. The noise level
12. Cleanliness

Q2 I will read you a few statements. Please tell me whether you strongly agree, somewhat agree, somewhat disagree or strongly disagree with each of these statements?

ANSWERS: Strongly agree Somewhat agree Somewhat disagree Strongly disagree DK/NA

1. I am satisfied to live in [CITY NAME]
2. It is easy to find a job in [CITY NAME]
3. The presence of foreigners is good for [CITY NAME]
4. Foreigners who live in [CITY NAME] are well integrated
5. It is easy to find good housing at a reasonable price in [CITY NAME]
6. The administrative services of [CITY NAME] help people efficiently

7. I feel safe in [CITY NAME]

8. I feel safe in my neighbourhood

9. [CITY NAME] is committed to fight against climate change (e.g.: energy efficiency, green transport)

10. Generally speaking, most people in [CITY NAME] can be trusted

11. Generally speaking, most people in my neighbourhood can be trusted

12. Generally speaking, the public administration of [CITY NAME] can be trusted

Q3 On the whole, are you very satisfied, fairly satisfied, not very satisfied or not at all satisfied with...?

1. Your personal job situation

2. The financial situation of your household

3. The life you lead

4. The place where you live

5.0 Results and Discussion

5.1. The relationship between Urban Audit parameters

Overall satisfaction to live in the city

The results show that all capitals scored above 80% in the satisfaction to live in the cities except Athens which scored 52%. Copenhagen topped the list with 97%, followed by Amsterdam and Stockholm with both scoring 96%. The results for Athens agree with those of another survey that was conducted by consultant group Mercer which they found out that Athens offers its residents the worst quality of life throughout Western Europe (Greek Reporter, 2012). They also found out that Athens was the world's 78th most expensive city for non-locals, among 214 cities. Compared with the city of Copenhagen, the city in 2011 beat popular European cities such as London, Barcelona and Stockholm in a survey of quality of life for expatriate executives and their families (Study in Denmark, 2014).

Satisfaction with public transport

Helsinki has the highest score of 89% satisfaction with public transport; this is followed by Vienna at 87%. The lowest ranked city is Valletta with 37%. Some of the challenges that are facing Valletta include traffic congestion and lack of adequate car parking facilities. The result for Helsinki is also not a surprise as another survey by the international BEST survey ranked the Helsinki Region public transport services at the top (EnterpriseHelsinki, 2012).

When satisfaction with public transport is compared with overall satisfaction to live in the city, there seems to be low correlation between the two. This is better illustrated in figure 2(a), where an increase in satisfaction with public transport may mean an increase in overall satisfaction to live in the city. The trend line is an increasing one meaning that an increase in satisfaction with public transport means an increase in overall satisfaction to live in the city. When the data for Athens is omitted, the R^2 is increased to 0.3274. as shown in figure 2(b).

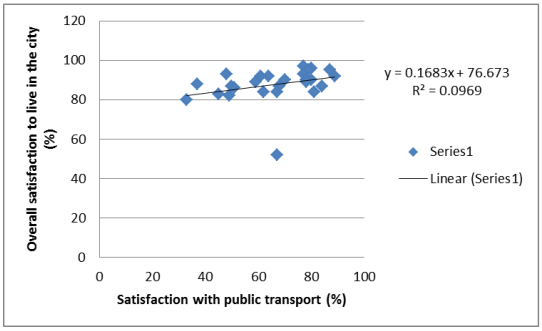

Figure 2(a): Overall satisfaction to live in the city and satisfaction with public transport (Urban Audit), with Athens data R^2 is 0.0969.

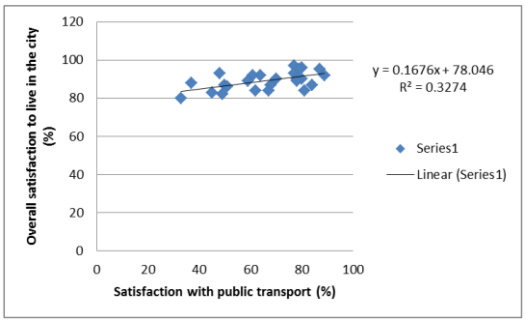

Figure 2(b): Overall satisfaction to live in the city and satisfaction with public transport (Urban Audit), without Athens data R^2 is 0.3274

Satisfaction with health care services, doctors and hospitals

Access to health care varies across cities, largely influenced by social and economic conditions as well as the health policies in place. Cities have different policies and plans in relation to personal as well as population-based health care goals within their jurisdiction. Health care can contribute significantly to country's economy.

There is high variation as regarding health care services, doctors and hospitals. Vienna is leading at 90% level of satisfaction followed by Amsterdam at 88%. The last is Athens at 27%. A study in Athens by Papanikolaou and Ntani (2008) found that patients had to wait long hours to get an appointment with a doctor or after their examination to be admitted to the hospital. Some of the patients had to rely on a personal nurse while others had to pay extra money to the medical and nursing staff. The main drawback of the hospitals was considered to be lack of staff. The Austrian health care system on the other hand is characterised by a high density of easily accessible health care facilities. Furthermore, the density of physicians in Austria is above the European average and amounted to 5 physicians, including dentists, per 1,000 inhabitants in 2008. The nation of Austria has a two-tier health care system whereby virtually all individuals receive publicly funded care; however they also have the option to purchase supplementary private health insurance. Nevertheless, some individuals choose to completely pay for their care privately.

When compared with overall satisfaction to live in the city, there is some relationship as shown in figure 3(a). This relationship is further improved when the data for Athens is omitted as in figure 3(b). The more the satisfaction with healthcare services, doctors and hospitals, the more the satisfaction to live in the city. The trend is an increasing one meaning that an increase in satisfaction with health care services, doctors and hospitals means an increase in overall satisfaction to live in the city.

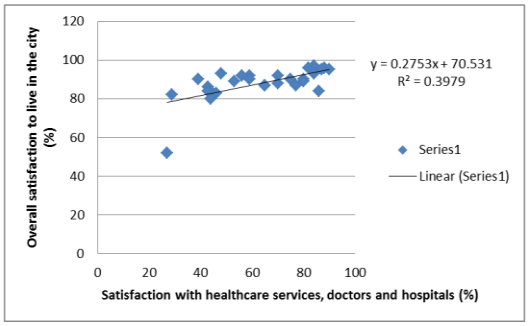

Figure 3(a): Overall satisfaction to live in the city and satisfaction with healthcare services, doctors and hospitals (Urban Audit), with Athens R^2 is 0.3979.

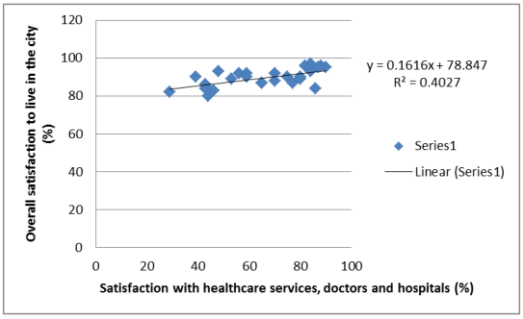

Figure 3(b): Overall satisfaction to live in the city and satisfaction with healthcare services, doctors and hospitals (Urban Audit), without Athens R^2 is 0.4027.

Satisfaction with sports facilities

Urban Audit's satisfaction with sports facilities shows that Helsinki is leading at 84% followed by Luxembourg at 80% while Athens is the last at 30%. In 7 European capitals, less than half of the respondents are satisfied with their city's sports facilities. These cities are Athens, Riga, Valletta, Sofia, Vilnius, Bucharest and Bratislava (Malta Today, 2013). Helsinki offers a high-quality, affordable as well as free basic services attracting millions of people to sports facilities together with competitions, tournaments and sporting events. In the year 2012, the Sports department of Helsinki used a total of EUR 14.8 million in the design, construction, and renovation of sports facilities (City of Helsinki, 2012). In a study that was conducted by municipal services in 2012, respondents particularly praised the city's swimming halls as well as its jogging and outdoor tracks. Sports together with playing fields, outdoor areas as well as parks, beaches, outdoor swimming pools and other indoor sports facilities also received good grades. When compared with overall satisfaction to live in the city, the

relationship is low, with R^2 equivalent to 0.3102 as shown in figure 4(a). When the result for Athens is omitted, the R^2 is reduced to 0.2246 as illustrated in figure 4(b). The figure shows an increasing trend meaning an increase with satisfaction with sports facilities may mean an increase in the overall satisfaction to live in the city.

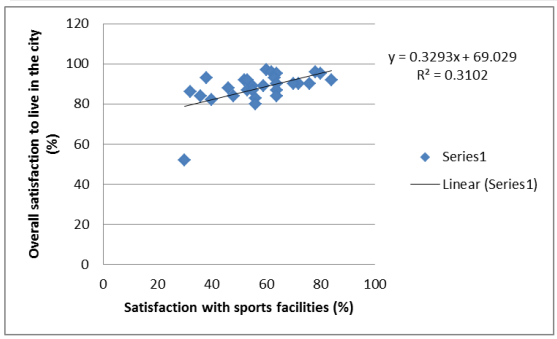

Figure 4(a): Overall satisfaction to live in the city and satisfaction with sports facilities (Urban Audit), with Athens R^2 is 0.3102.

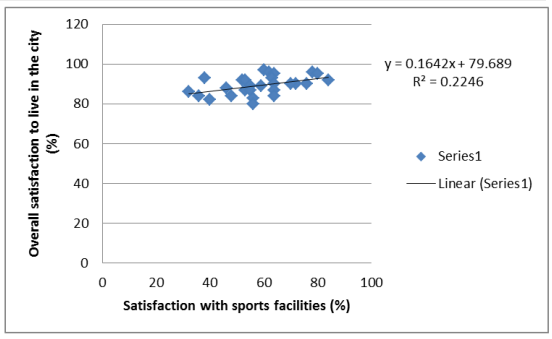

Figure 4(b): Overall satisfaction to live in the city and satisfaction with sports facilities (Urban Audit), without Athens R^2 is 0.2246

Satisfaction with cultural facilities

Some of the cultural facilities include museums and theatres, together with their related collections storage comprising of scene shops and offices; they all build identity and economic strength in our communities. As a result they provide creative opportunities to residents and visitors to the city, jobs to local citizens as well as bring traffic to surrounding businesses.

A majority of respondents in almost all the capital cities are satisfied with their cities' cultural facilities. Vienna and Helsinki are leading in satisfaction with cultural facilities, both having a score of 95%. This is followed closely by three cities: Amsterdam, Prague and Paris both achieving 92%. The least satisfied city is Valletta with 37% followed by Athens with 55%. 79-city survey finds Valletta the only city where less than 50% feel they are satisfied with their city's cultural facilities (Malta Today, 2013). Valletta too emerges as the only EU capital city where less than a majority of those interviewed say they are satisfied with their cultural facilities; a category that includes theaters, museums, concert halls as well as libraries. The only city where dissatisfaction exceeded satisfaction with respect to cultural facilities is Valletta. There, only 37% of respondents were satisfied and 46% were dissatisfied. On

the other hand the city of Helsinki is an active and versatile promoter of arts and culture (City of Helsinki, 2008). The city manages a large cultural sector of its own as well as subsidizes cultural activities produced by other actors. Furthermore, the city maintains an extensive network of public libraries, cultural centres and adult education centres, while it ensures that the services are easily accessible. In the City's 2007 budget, funding for arts and culture amounted to €193 per capita in Helsinki, while the cultural sector accounted for three per cent of the City's budgeted expenses. In another study in Vienna as many as 92 percent of respondents were satisfied with cultural opportunities (Wien, 2014). Another survey show that 94 percent of all Viennese are completely satisfied with the city's cultural facilities such as concert halls, theatres, museums and libraries (Wien International, 2014). There is a low relationship between the overall satisfaction to live in the city and satisfaction with cultural facilities as shown in figure 5(a). The relationship is improved when the data for Athens is omitted as in figure 5(b). There is an increasing trend which means that the higher the satisfaction with cultural facilities, the higher the satisfaction to live in the city.

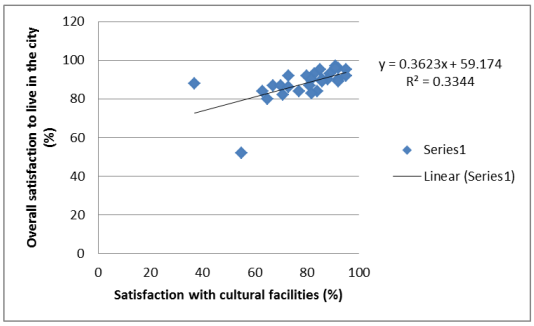

Figure 5(a): Overall satisfaction to live in the city and satisfaction with cultural facilities (Urban Audit), with Athens and Valletta data R^2 is 0.3344.

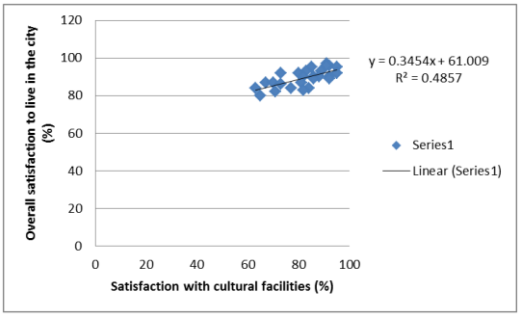

Figure 5(b): Overall satisfaction to live in the city and satisfaction with cultural facilities (Urban Audit), without Athens and Valletta data R^2 is 0.4857

Satisfaction with schools and other educational facilities

Ljubljana is the leading with 87% when it comes to satisfaction with schools and other educational facilities. This is followed by Nicosia with 80%. The rest of the cities scored less than 80% with Athens coming last at 39% followed by Bucharest at 43% and Rome at 44%. A well-educated as well as well-trained population is essential for a country's social and economic well-being. Education plays a key role by providing

individuals with the knowledge, skills as well as competences needed to participate effectively in society and in the economy. Those with a good education greatly improve their likelihood of finding a job as well as earning enough money. Across OECD countries, 83% of all the people with university-level degrees have a job, compared with only 55% for those with a secondary school diploma. Lifetime earnings as well increase with each level of education. Following a decline in manual labour over previous decades, employers now prefer a more educated labour force. A good indication of whether a country is preparing its students to meet the minimum requirements of the job market is provided by high school graduation rates. In Slovenia (Ljubljana), 84% of adults aged 25-64 have earned the equivalent of a high-school degree, higher than the OECD average of 75%, while in Greece (Athens), 67% of adults aged 25-64 have earned the equivalent of a high-school degree. In Italy (Rome), 56% of adults aged 25-64 have earned the equivalent of a high-school degree, this is much less than the OECD average of 75%. When compared with the overall satisfaction to live in the city, the R^2 is 0.3667 as shown in figure 6, thus there is a low relationship with satisfaction with schools and other educational facilities. The trend is an increasing one which means that the more the satisfaction with schools and other educational facilities the more the overall satisfaction to live in the city.

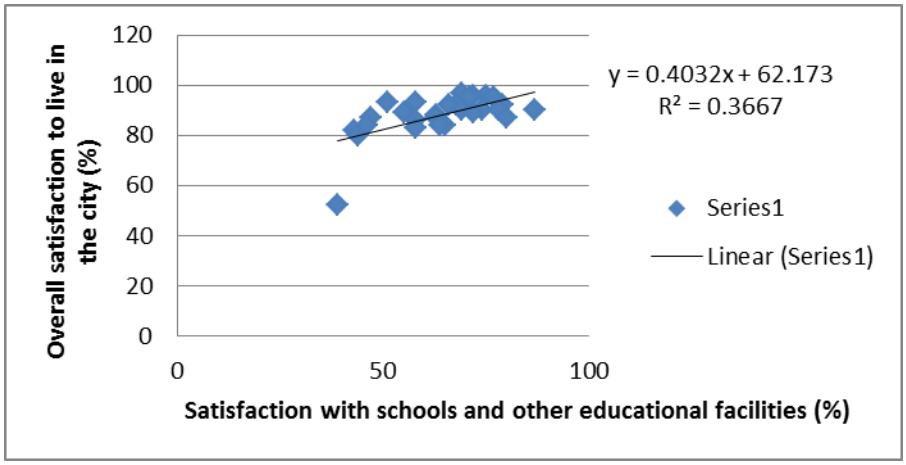

Figure 6: Overall satisfaction to live in the city and satisfaction with schools and other educational facilities (Urban Audit)

Satisfaction with the state of the streets and buildings in the neighbourhood

Stockholm and Luxembourg are the leading with 89% satisfaction with the state of the streets and buildings in their neighbourhoods. The last place is taken by Athens and

Rome both scoring 27%. When compared with the overall satisfaction to live in the city, R^2 is 0.4702 as shown in figure 7. There is an increasing trend which shows that the higher the satisfaction with the state of the streets and buildings in their neighbourhoods, the higher the overall satisfaction to live in the city.

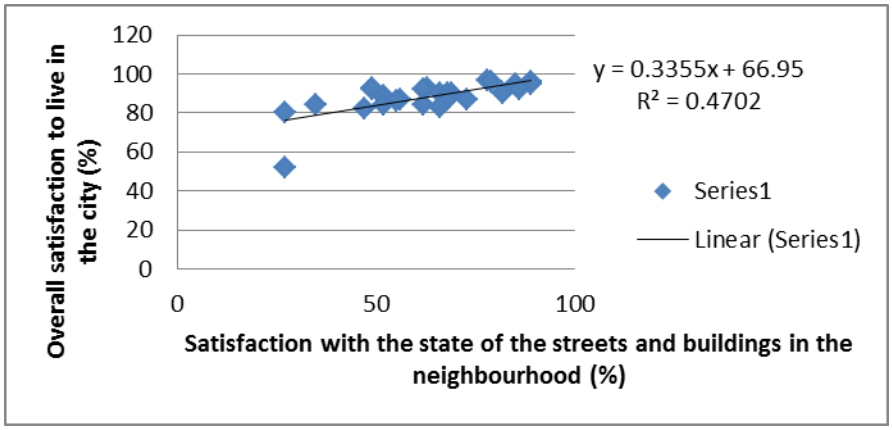

Figure 7: Overall satisfaction to live in the city and satisfaction with the state of streets and buildings in your neighbourhood (Urban Audit)

Satisfaction with public spaces such as markets, squares, pedestrian areas

There is generally high satisfaction with regard to public spaces such as markets, squares and pedestrian zones. When asked about satisfaction with public spaces such as markets, squares and pedestrian areas, Luxembourg scored highly with 90% level of satisfaction. This is followed by Copenhagen and Vienna both scoring 88%. The last place is taken by Athens with 32% followed by Valletta with 42%. Figure 8 shows that there is a high correlation between the overall satisfaction to live in the city and satisfaction with public spaces such as markets, squares, and pedestrian areas. There is a positive trend, thus the higher the satisfaction with public spaces such as markets, squares and pedestrian areas the higher the overall satisfaction to live in the city.

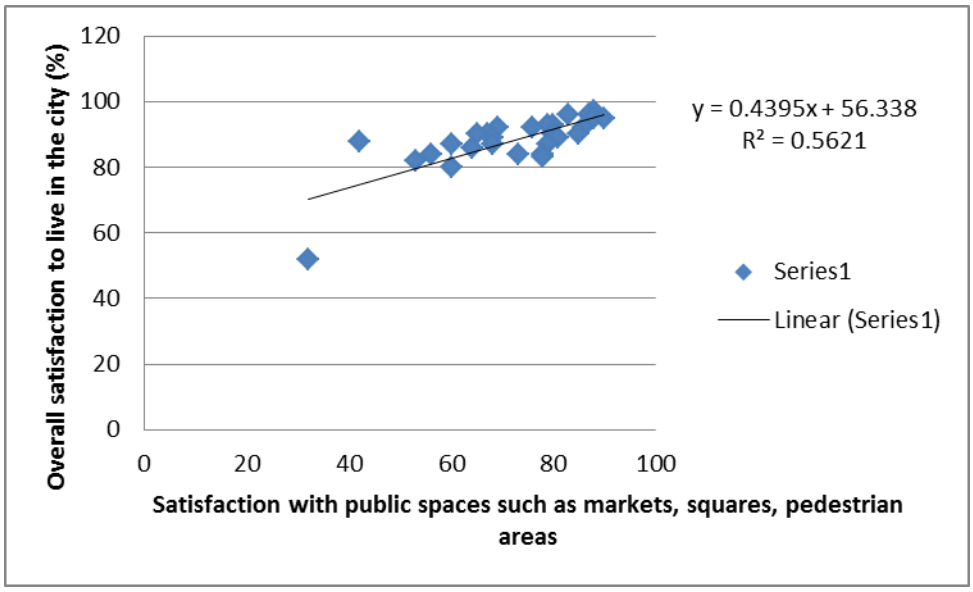

Figure 8: Overall satisfaction to live in the city and satisfaction with public spaces such as markets, squares, pedestrian areas (Urban Audit)

Satisfaction with the availability of retail shops

Stockholm is leading at 93% level of satisfaction with the availability of retail shops. This is followed by three cities: Amsterdam, Vilnius and Riga both scoring 92%. The last place is taken by Madrid at 67% followed by Athens at 69%. The city of Stockholm has a retail which is classified into the principal shopping streets in the downtown area as well as other facilities in the residential suburbs (C&W Global Cities, 2014). The retail catchment area of the city of Stockholm is vast on account of the city's strong transport network as well as road infrastructure. The Stockholm's region is one of Europe's most attractive and competitive regions. The region tops several rankings that measure purchasing power and at the same time the expenses of living in the region is relatively low. Today, Amsterdam is a great place for shopping; this is because it has imports from all over the world (Amsterdam Info, 2014). Along with the world's top brands, you will find there products from many small and underdeveloped countries. Additionally Amsterdam departmental stores often organize weeks of Asian or African countries. Except for one (Villa Arena), all the departmental stores and shopping malls in Amsterdam are located within a short walking distance from the Dam square. It is possible for one to compare their actual choice within couple of hours. It is said that shopping in Amsterdam may not save you

money, but it will save you time and effort. With everything from multistorey departmental stores and exclusive boutiques to antiques as well as contemporary Dutch design, the city of Amsterdam inspires even the most discerning shopper (I amsterdam, 2014). There is a weak relationship between overall satisfaction to live in the city and satisfaction with the availability of retail shop (%). The R^2 is 0.1268 as shown in figure 9. There is a slight increasing trend which shows that an increase in satisfaction with the availability of retail shops leads to an increase in the overall satisfaction to live in the city.

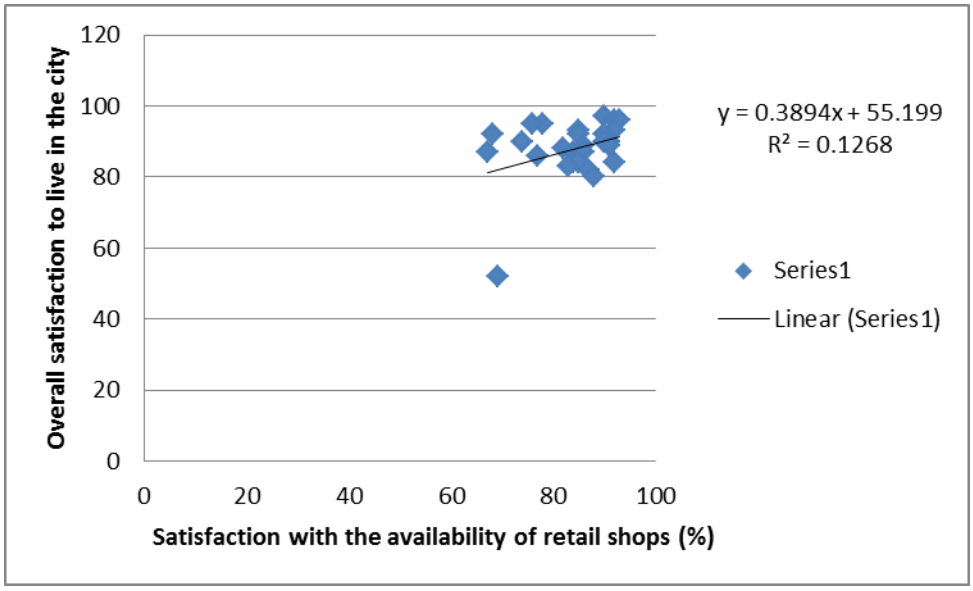

Figure 9: Overall satisfaction to live in the city and satisfaction with the availability of retail shop (Urban Audit)

The presence of foreigners is good for the city

A majority of respondents agree that the presence of foreigners is good for the city. The presence of foreigners is good for Copenhagen at 89%, followed by both Stockholm and Luxembourg at 88%. The last city is Athens with 26% and Nicosia with 35%. Monacle, an international global affairs magazine, has once again named Copenhagen the world's most liveable city (Denmark DK, 2014). Copenhagen is well known for a well-balanced family as well as work life. It is also an excellent business climate and an efficient welfare state. These are just some of the reasons why many foreigners want to come to Copenhagen. In recent years, Copenhagen has attracted foreign workers in a wide range of areas, and the expectation is that in the near future

even more foreigners who are willing to be part of the Copenhagen's work force and society will be needed.

Foreigners who live in the city are well integrated

In many cities, the level of agreement regarding the benefit of the presence of foreigners is significantly higher than regarding their integration. Ljubljana has the highest level of agreement at 73% followed by Luxembourg at 70% while the last place is taken by Athens at 14% followed by Berlin at 30%. In Ljubljana the Ministry of the Interior with the help of the European Fund for the Integration of third-country nationals are able to provide for funding for Slovenian language learning programmes, together with programmes for getting acquainted with Slovenian history, culture as well as constitutional system and provides for the first free-of-charge basic level Slovenian language exam (Republic of Slovenia, 2014). Furthermore, foreigners may also participate in other projects or programmes as well as workshops intended to help them with integration into Slovenian society. In addition to the above programmes, the Ministry of the Interior and the European Refugee Fund provide for other projects and programmes that are mainly intended to help refugees integrate into Slovenian society. These projects and programmes include the promotion of intercultural dialogue, assistance in the field of integration as well as courses of Slovene language. The Ministry of the Interior also has prepared a brochure for foreigners in the Republic of Slovenia, which contains detailed as well as various information on the integration of foreigners into Slovenian society, entry as well as residence in the Republic of Slovenia, integration programmes together with other useful information. There are also brochures in other languages such as English, Chinese, Serbian, Croatian, Bosnian, Albanian, Macedonian, French and Russian.

Greece (Athens) on the other hand is grappling with issues related to its highly porous borders as well as mounting asylum applications and faltering immigrant detention system. Additionally are allegations of human-rights violations as well as the effective integration of the country's many foreign-born permanent residents (Migration Policy Institute, 2012). Based on its position at the southeastern "gate" of the European Union as well as with extensive coastlines and easily crossable borders, Greece/Athens has become a common transit country/city for those seeking entry into Europe. The

available evidence now show that almost all illegal immigration to the European Union flows via the country's porous borders. In the year 2010, 90 percent of all apprehensions for unauthorized entry into the European Union took place via Greece, compared to 75 percent in 2009 and 50 percent in 2008. Figure 10 shows a low correlation between foreigners who live in the city and the presence of foreigners as good for the city. The increasing trend shows that an increase in foreigners' integration means also an increase in the level of agreement that their presence is good for the city.

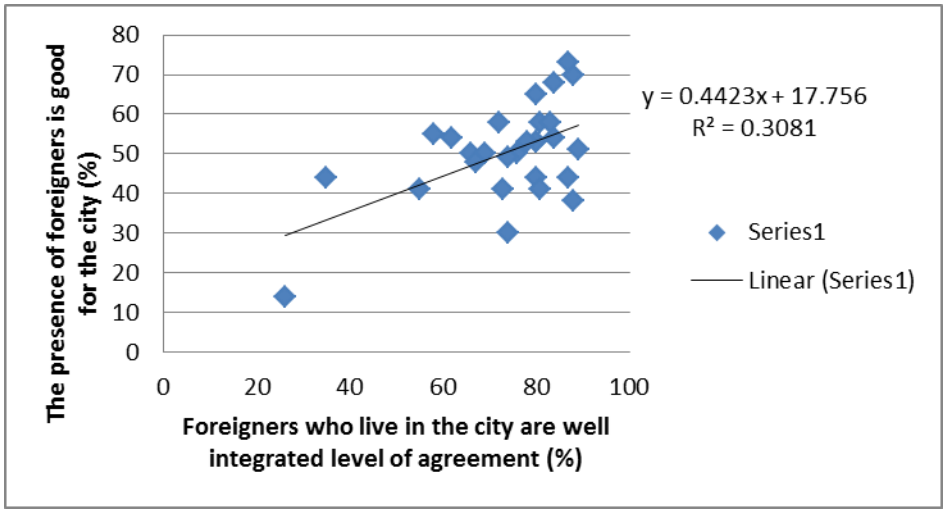

Figure 10: Foreigners who live in the city are well integrated and the presence of foreigners is good for the city (Urban Audit)

Safety in the city

Urban safety is one of the most important topics when it comes to quality of life in the cities. It is observed to be an important problem in European cities. A majority of respondents feel safe in Copenhagen at 92% followed by three cities: Stockholm, Luxembourg and Helsinki both at 91%. The last place is occupied by Athens with 19% followed by Sofia with 42%. Copenhagen was in 2010 named as the world's second safest major city in the world (Huffington post, 2013). The citizens in Copenhagen have discovered the formula for an enviously safe city: they work together, help each other out and trust those around them. Copenhagen again is considered relatively safe, compared to other European capitals (Trip Advisor, 2014). The locals in Copenhagen are known to be very friendly and willing to help so you

should not have any problem getting around. Greece on the other hand continues to experience sporadic violence attributed to terrorist organizations (US Department of State, 2014). It is noted that in 2012, a previously unknown domestic group placed an improvised explosive device (IED) that failed to detonate in a metro train car, while another group crashed a stolen van into the lobby of a corporate headquarters in Athens and thereafter activated an attached improvised incendiary device (IID, also known as a Molotov cocktail). Again in 2013, unknown individuals conducted attacks on the homes of journalists as well as judges, together with several political party offices, in Athens and Thessaloniki; similarly a previously unknown domestic group claimed responsibility for planting a small bomb in a prominent shopping mall in a northern suburb of Athens, which caused minor injuries to two people; and alleged members of the domestic terrorist group Conspiracy of Fire Nuclei were arrested for armed bank robbery in northern Greece. Furthermore, strikes and demonstrations are a regular occurrence. As a result of austerity measures that were imposed by the government and the ongoing economic recession in the country, labor unions, certain professions, as well as other groups affected by the current financial crisis hold frequent demonstrations together with work stoppages and marches throughout the center of Athens.

Safety in the neighbourhood

Generally the majority of respondents say they feel safe in their neighbourhood. Level of agreement on the safety in the neighbourhood is high at Stockholm with 96% level of agreement, this is followed closely by Copenhagen with 95%. The last place is taken by Athens at 38% followed by Sofia with 60%. There is a general reduction in assault rates in the past five years while in many OECD countries feelings of security have declined (OECD, 2014). In Greece, 53% of people feel safe while walking alone at night, lower than the OECD average of 69%. In Sweden, however, 78% of people feel safe walking alone at night while in Denmark, 80% of people feel safe walking alone at night, and this is higher than the OECD average of 69%.

Nevertheless, in many cities significantly more people feel safe in their neighbourhood than in the city as a whole. It is evident that there is a strong correlation between respondents' sense of safety in their neighbourhoods and safety in their cities. The

more they agree that they feel safe in their city the more they agree that they feel safe in their neighbourhood. This is illustrated in figure 11. The same applies to the overall satisfaction to live in the city whereby there is a high correlation with both safety in the city (figure 12) and safety in neighbourhood (figure 13). The increasing trend shows that the more they feel safe in the city and the neighbourhood the higher the overall satisfaction to live in the city.

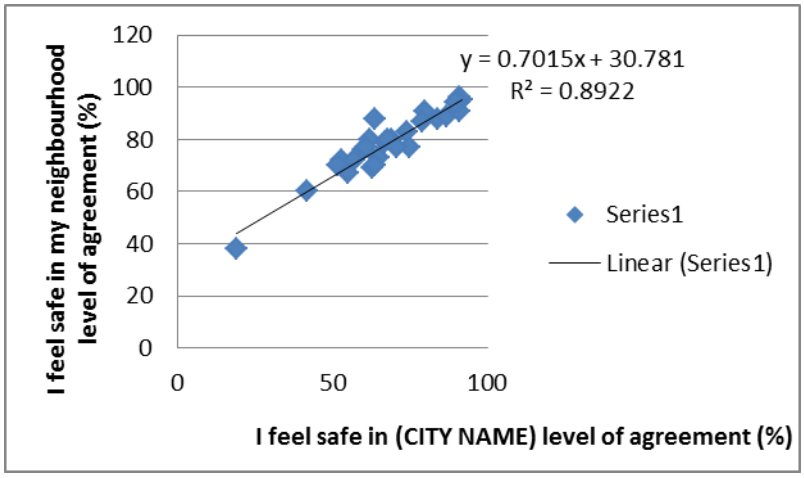

Figure 11: Safety in the city and safety in the neighbourhood (Urban Audit)

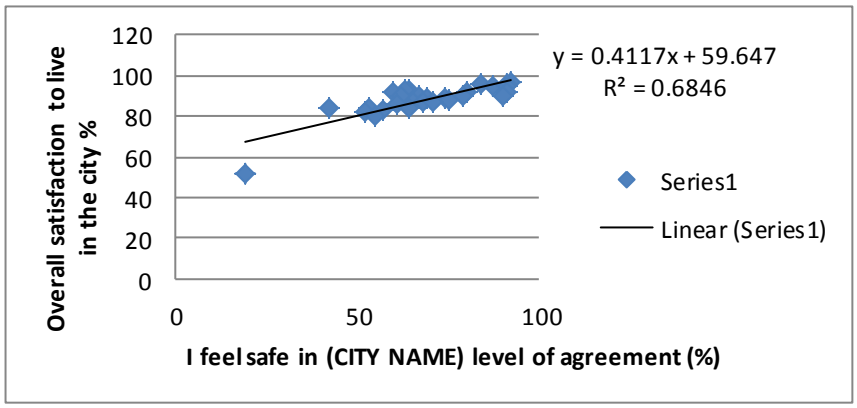

Figure 12: Safety in the city and overall satisfaction to live in the city (Urban Audit)

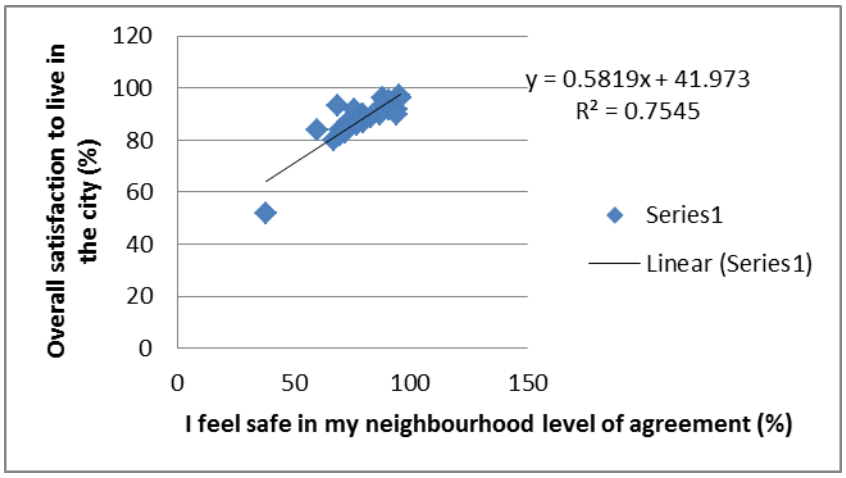

Figure 13: Overall satisfaction to live in the city and safety in the neighbourhood (Urban Audit)

Generally speaking, most people in the city can be trusted

Trust in fellow citizens is highest in Copenhagen and Helsinki both at 86%. This is followed by Stockholm at 82%. The last place is taken by Athens at 20% followed by Bucharest at 31%. Denmark is often named as the world's happiest country, the most recent one being in 2013 in the World Happiness Report that was commissioned by the UN (Happiness Research Institute, 2014). But what are some of the reasons for the high levels of happiness in Denmark? It is for the first time that the reasons are explained in a comprehensive report that was published by the Happiness Research Institute, a think tank based in Copenhagen. The report entitled "The Happy Danes – Exploring the reasons behind the high levels of happiness in Denmark" explains how a strong civil society together with a good work-life balance and a high level of social security are causes of happiness. It may come as no surprise too that free health care as well as generous unemployment benefits reduce un-happiness; however, the report also points towards some surprising reasons like a high level of trust among the citizens which makes life easier and a little happier. In recent years an increasing body of evidence has illustrated that happiness can be measured as well as can be used to inform policy makers. The policy makers are increasingly becoming more open to the ideas of how to find new ways to measure progress while enhancing the quality of life for citizens. There are 8 ingredients in the Danish recipe for happiness: Denmark holds the highest level of trust in the world (Danes are known to happily leave their babies in strollers outside shops and cafés while running errands), while the high level of social

security is known to reduce concerns and anxiety for the Danes. Wealth as well explains why some countries are happier than others, and also Danes enjoy a high level of freedom through free university education as well as gay rights. Work in Denmark is characterized by autonomy as well as flexibility, while allowing for time with family and friends through a world class work-life balance. Furthermore, Denmark is known to have a well-developed democracy with a high level of political participation together with good governance as well as a low level of corruption, and finally a strong civil society which ensures that there is high quality social relationships among the citizens, all these are a major determinants for happiness.

Generally speaking, most people in the neighbourhood can be trusted

On the level of trust of most people in the neighbourhood, those in Copenhagen can be trusted at 93% followed closely by Stockholm at 92%. Level of trust is lowest in Bucharest where only 45% of the neighbourhood can be trusted, followed by Athens at 51%. There is a significant difference between Bucharest and the other Romanian cities when it comes to trusting people in one's neighbourhood and in the city (European Commission, 2014). Residents of Bucharest are considerably less likely to trust people in both contexts compared to residents of Cluj-Napoca and Piatra Neamt. The proportion of respondents who agree that most people in their neighbourhood can be trusted in Bucharest is the lowest of all the 83 European cities that were surveyed. When it comes to trust of most people in one's city, the scores of Bucharest is fourth lowest result in Europe. A positive trend is seen in all Romanian cities when it comes to trusting most people in one's city. A comparison of trust in cities and trust in neighbourhood shows a high correlation. The trend is positive which means the more the people in a city can be trusted the more those in the neighbourhood can be trusted as well as shown in figure 14.

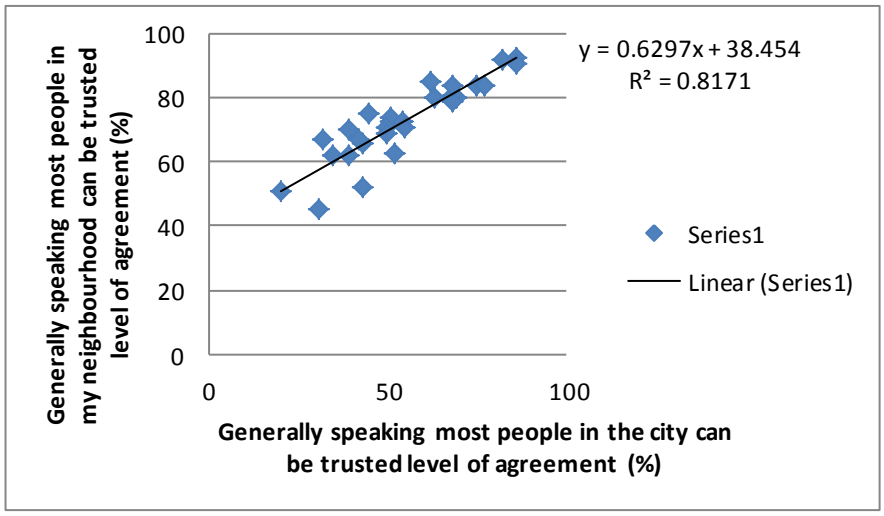

Figure 14: Trust of people in the city and trust of people in the neighbourhood (Urban Audit)

The administrative services of the city help people efficiently

The administrative services of Luxembourg help people efficiently at 78%. This is followed by those in Valletta at 66%. The lowest ranked city is Rome at 21% followed by Bratislava at 28%. Luxembourg offers political and economic stability, together with an excellent tax, legal, regulatory as well as administrative framework (Capita Asset Services, 2013). As the world's second largest fund centre as well as eighth largest financial centre, it's a hub for international together with European business. There are benefits associated with Luxembourg such as highly stable, political, economic as well as social environment; attractive legal, regulatory as well as administrative framework; the wide network of double taxation treaties; multicultural as well as multilingual workforce; one of the founding members of the European Union; and host to major European institutions.

Generally speaking, the public administration of the city can be trusted

Generally speaking, the public administration of Luxembourg can be trusted at 87%; this is followed by Copenhagen at 79%. The last city is Prague at 28% followed by Bratislava at 30% and Rome at 31%. There are no provinces as well as departments in the Grand Duchy/Luxembourg (UN, 2006). The commune is the only political subdivision of the country. The commune is classified as a legal entity. It manages its own assets and raises taxes through local representatives that are overseen by the

central authority which is represented by the Minister of the Interior. There are a total of 118 communes. Each commune has a communal council which is directly elected for a six-year term by those inhabitants of the commune who are entitled to vote. The mayor is entrusted with the day-to-day management of the commune, together with the municipal council; these are bodies that emanate from the communal council. There is a civil society which is consensus-based approach and is sometimes referred to as the "Luxembourg Model". It was the creation of the "tripartite" at the institutional level that brought together employers together with workers as well as the authorities. The social dialogue occurs at two levels: collective agreements are concluded and institutions with "tripartite" membership ensure that their action is extended to the whole country. Thus the social dialogue in Luxembourg is usually low-key as well as based on concerted action, consultation as well as monitoring.

There is a very high correlation between the administrative services of cities in the way they help people efficiently and the trust in public administration of the cities. This is illustrated in figure 15 which shows the more people agree that public administration can be trusted, the more they agree that administrative services in the city help people efficiently.

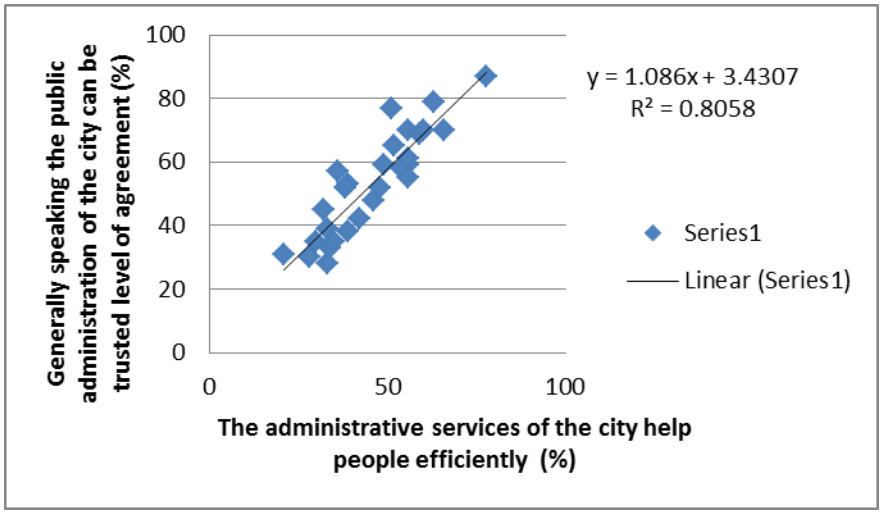

Figure 15: Efficiency of administrative service of cities and trust in the public administration of cities (Urban Audit)

Satisfaction with the quality of the air

Air pollution, as expected, appears to be a serious problem, especially in European capital cities. Satisfaction with the quality of air is highest at Luxembourg with 86% followed by Dublin at 81%. The lowest satisfaction is at Bucharest with 17% followed by Athens at 21%. Outdoor air pollution is one of the most important environmental issues that directly affect the quality of peoples' lives (OECD, 2014). Despite national as well as international interventions and decreases in major pollutant emissions, the urban air pollution health impacts continue to worsen, with air pollution set to become one of the top environmental causes of premature mortality globally by 2050. Air pollution in urban centres is often caused by transport as well as the use of small-scale burning of wood or coal, and this is linked to a range of health problems, such as minor eye irritation as well as upper respiratory symptoms in the short-term together with chronic respiratory diseases such as asthma, cardiovascular diseases as well as lung cancer in the long-term. Children as well as the elderly may be particularly vulnerable. PM10, tiny particulate matter small enough to be inhaled into the deepest part of the lung, is monitored in OECD countries simply because it can harm human health as well as reduce life expectancy. In Luxembourg, the levels of PM10 are 12.5 micrograms per cubic meter; this is much lower than the OECD mean of 20.1 micrograms per cubic meter as well as the annual guideline limit of 20 micrograms per cubic meter set by the World Health Organization. In Ireland/Dublin, PM10 levels are 12.8 micrograms per cubic meter. Due to Ireland's location together with weather patterns that supply predominantly clean air, the relative lack of heavy industry as well as the bans on coal burning in many urban areas since the early 1990s, air quality is generally good. In Greece, however, PM10 levels are 27.3 micrograms per cubic meter, much higher than the OECD average of 20.1 micrograms per cubic meter, also much higher than the annual guideline limit of 20 micrograms per cubic meter set by the World Health Organization. The major sources of PM emissions are burning of fossil fuels for electricity generation, together with the industrial and residential sectors. Table 3 summarizes air pollution levels in OECD EU countries.

Table 3: Air pollution levels in OECD EU countries (OECD, 2014).

No.	Country	PM10 levels micrograms per cubic meter
1	Austria	27.4
2	Belgium	21.2
3	Czech Republic	16.2
4	Denmark	15.0
5	Estonia	9.3
6	Finland	15.2
7	France	11.9
8	Germany	15.6
9	Greece	27.3
10	Hungary	15.0
11	Ireland	12.8
12	Italy	20.6
13	Luxembourg	12.5
14	Netherlands	30.0
15	Poland	32.9
16	Portugal	18.1
17	Slovak Republic	12.7
18	Slovenia	25.6
19	Spain	23.7
20	Sweden	10.2
21	United Kingdom	12.8

Satisfaction with the noise level

Dublin is leading when it comes to satisfaction with the noise level at 83%. This is followed by Luxembourg at 79%. The lowest city is Bucharest at 27% followed by Madrid at 31%. Noise Pollution can be referred to as unwanted sound that unfairly intrudes into our daily activities (Dublin, 2014). There are many sources of noise pollution, whereby most of them are associated with urban development; road, rail as well as air transport; industrial noise; neighbourhood together with recreational noise. In the year 1994, the Minister for the Environment in Ireland addressed the problem

of noise pollution by making regulations under the Environmental Protection Agency (EPA) Act, 1992, as a consequence any individual person, or a local authority, may make complain to a District Court seeking an Order to deal with the noise nuisance, for instance noise which is loud, so continuous, which is repeated, of such pitch or duration or that occur at such times that it gives a person reasonable cause for annoyance. This may be the reason why satisfaction with noise is highest in Dublin. They also have an active twitter account "@dublincitynoise", which they report the latest averaged noise level.

There is a strong correlation between the satisfaction with the quality of the air and satisfaction with the noise level as illustrated in figure 16: The higher the satisfaction with noise levels the higher the satisfaction with air quality as well.

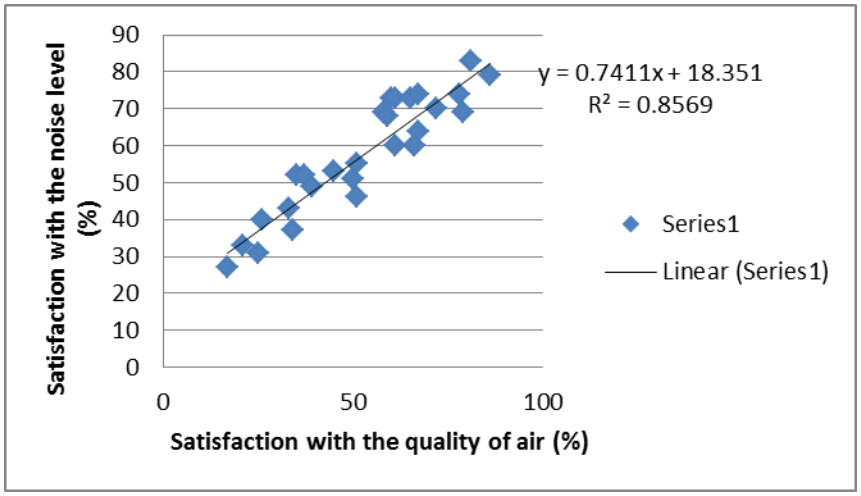

Figure 16: Satisfaction with air quality and satisfaction with noise level (Urban Audit)

Satisfaction with green spaces such as parks and gardens

There are environmental services associated with green space such as air and water purification, filtering of wind and noise and microclimate stabilization. Some of the health services associated with green spaces is that it can reduce stress as well as provide rejuvenation of people and provides peacefulness (Gedikli, 2011). There are some economic services such as purification of air by trees and this reduces the cost of pollution prevention as well as it promotes city as a tourist destination and leads to an increase of property values.

Copenhagen is the leading city with green urban spaces such as parks and gardens at 91%. This is closely followed by Helsinki with 89%. The least rated city is Athens with 23% followed by Bratislava 43%. The quality of our local living environment is said to have a direct impact on our health and well-being. Having access to green spaces for instance, is essential for quality of life. An unspoiled environment is known to be a source of satisfaction that improves mental well-being as well as allows people to recover from the stress of everyday life and to perform physical activity. In Denmark, 3% of people feel they lack access to green spaces or recreational areas; this is much less than the 12 % average of OECD European countries. Furthermore in Finland, less than 4% of people feel they lack access to green spaces or recreational areas, again much less than the 12 % average of OECD European countries. In Greece, however, 25% of people feel they lack access to green spaces or recreational areas; this is much more than the 12 % average of OECD European countries. In the Slovak Republic, 19% of people feel they lack access to green spaces or recreational areas, much more than the 12 % average of OECD European countries. There is a high correlation between overall satisfaction to live in the city and satisfaction with green spaces such as parks and gardens: the higher the green spaces the higher the satisfaction to live in the city. This is illustrated in figure 17.

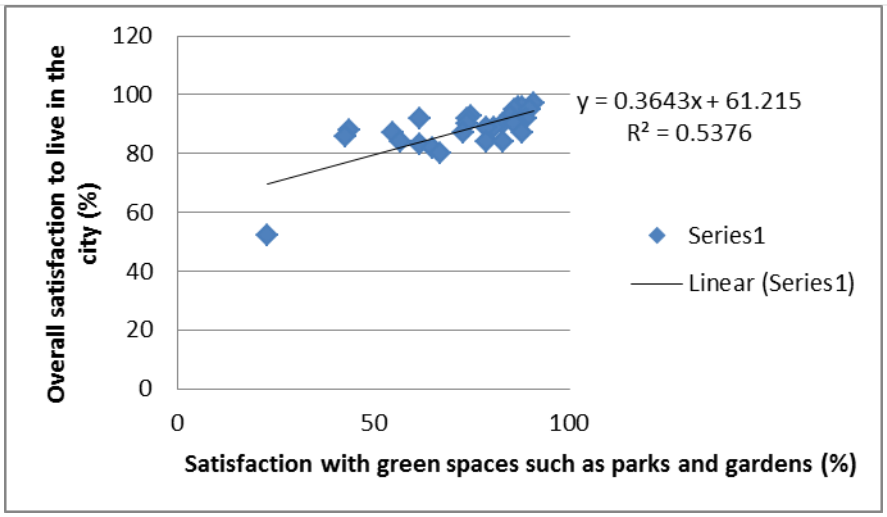

Figure 17: Overall satisfaction to live in the city and satisfaction with green spaces such as parks and gardens (Urban Audit)

Satisfaction with the life respondents lead

Satisfaction with the life respondents lead is most fulfilling in Copenhagen with 97% followed by Helsinki with 96%. The last place is taken by Athens with 45% followed by 61% in Budapest. Life satisfaction measures how people evaluate their life as a whole as opposed to their current feelings. Life satisfaction captures a reflective assessment of which life circumstances as well as conditions are important for subjective well-being. When the Danes were asked to rate their general satisfaction with life on a scale from 0 to 10, they gave it a 7.6 grade, this is one of the highest scores in the OECD, where life satisfaction average is 6.6. When the same was asked of Finns, they gave it a 7.4 grade; again this is much higher than the OECD average of 6.6. When the Greeks were asked to rate their general satisfaction with life on a scale from 0 to 10, they gave it a 4.7 grade, the lowest score in the OECD, where life satisfaction average is 6.6. When the same was asked of Hungarians they gave it a 4.9 grade, one of the lowest in the OECD. There is a strong correlation between the overall satisfaction to live in the city and satisfaction with the life respondents lead: the more the satisfaction with the life the respondents lead the higher the overall satisfaction to live in the city. This is shown in figure 18.

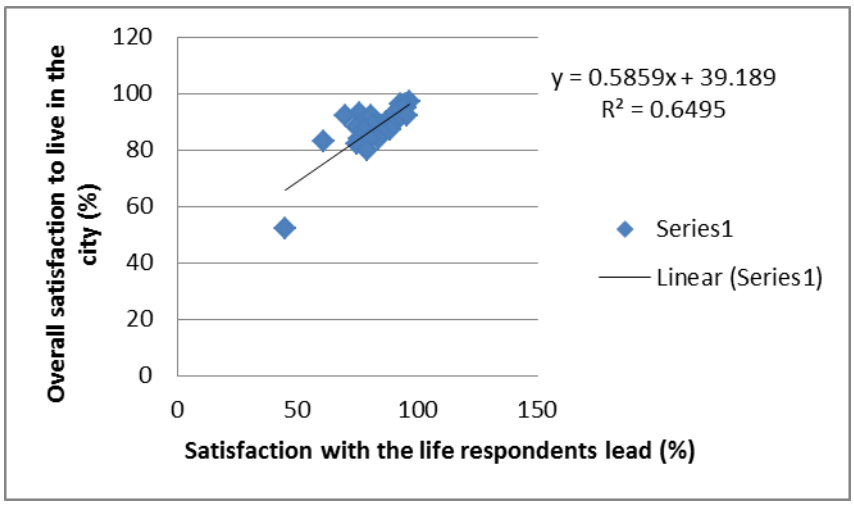

Figure 18: Overall satisfaction to live in the city and satisfaction with the life respondents lead (Urban Audit)

5.2. The relationship between Urban Atlas parameters with those of Urban Audit

Other roads and associated land vs. satisfaction with public transport

Comparison with Urban Atlas shows that 'other roads and associated land' have very little relationship with satisfaction with public transport as shown in figure 19. Some of the cities which recorded lowest % of other roads and associated land are Tallinn 0.88%, Vilnius 1.11%, Nicosia 1.19%, 1.42% Bratislava and Riga 1.45%. Compared with Urban Audit satisfaction with public transport, the lowest ranked cities are Rome 33%, Valletta 37%, Budapest 45%, Vilnius 48% and Bucharest 49%.

The highest ranked cities in Urban Atlas are Valletta 7.23%, Lisbon 4.8%, Amsterdam 4.38%, London 3.71%, Brussels 3.99% and Rome 3.11%. Again compared with Urban Audit, the highest ranked cities are Helsinki 89%, Vienna 87%, London 84% and Riga 81%. There is decreasing trend meaning that the more the other roads and associated land the less the satisfaction with public transport, this is a surprising result!

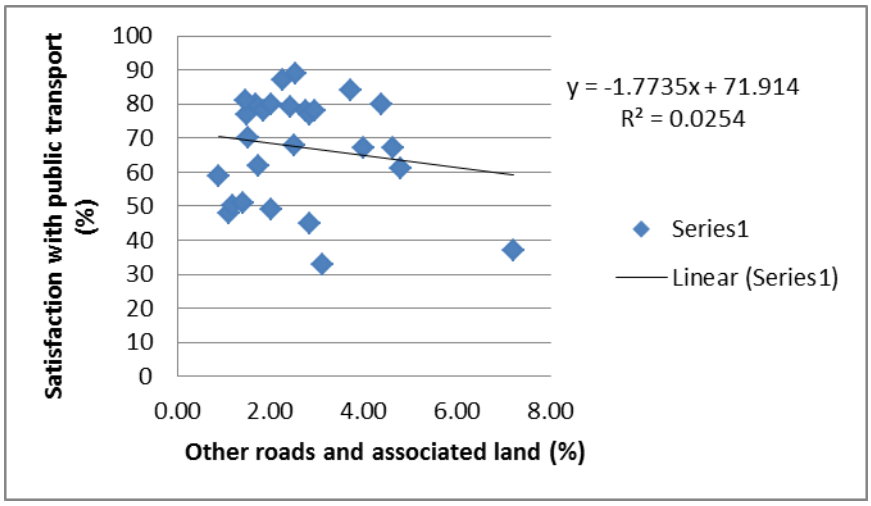

Figure 19: Other roads and associated land (Urban Atlas) and satisfaction with public transport (Urban Audit)

Fast transit roads and associated land vs. satisfaction with public transport

Comparison of satisfaction with public transport with Urban Atlas' 'fast transit roads and associated land' shows weak relationship as shown in figure 20. The Urban Atlas area covered by fast transit roads and associated land is lowest in Sofia 0.05%, Vilnius 0.06%, Nicosia 0.07% and Bucharest 0.08%. The highest % areas were in Amsterdam

1.11%, Brussels 0.92%, Lisbon 0.58%, Budapest 0.38% and Copenhagen 0.37%. Compared with Urban Audit, the lowest ranked cities are Rome 33%, Budapest 45%, Vilnius 48% and Bucharest 49%, while the highest ranked cities are Helsinki 89%, Vienna 87%, London 84% and 80% in Amsterdam, Stockholm and Warsaw. There is a positive trend that implies that the more the fast transit roads and associated land the greater the satisfaction with public transport, this is not a surprise result!

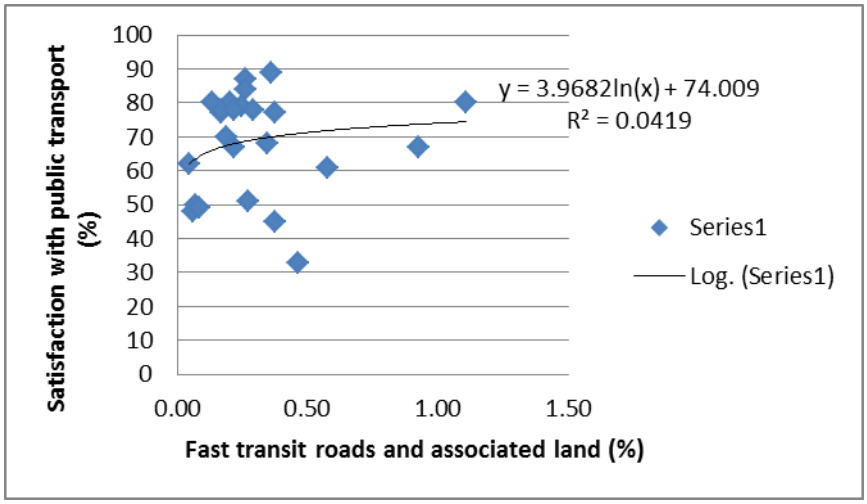

Figure 20: Fast transit roads and associated land (Urban Atlas) and satisfaction with public transport (Urban Audit)

Railway and associated land vs. satisfaction with public transport

The same applies to Urban Atlas' 'Railway and associated land' which has very low correlation with satisfaction with public transport as shown in figure 21. The area covered by railway and associated land (Urban Atlas) is almost insignificant in all the cities. However, it is lowest in Dublin 0.08%, Athens 0.10%, Stockholm 0.12%, Vilnius 0.13% and Tallinn 0.14%. It is highest ranked in Bucharest 0.62%, Brussels 0.60% and Amsterdam 0.50%. Compared with Urban Audit, the lowest ranked and highest ranked cities are similar to those in other roads and associated land and fast transit roads and associated land.

Other roads and associated land vs. noise level

On comparison with Urban Atlas, noise is also as a result of 'Other roads and associated land' (figure 22). Some of the cities which recorded lowest % of other roads and associated land are Tallinn 0.88%, Vilnius 1.11%, Nicosia 1.19%, 1.42%

Bratislava and Riga 1.45%. while the highest rankings in Urban Atlas were Valletta 7.23%, Lisbon 4.8%, Amsterdam 4.38%, London 3.71%, Brussels 3.99% and Rome 3.11%. In comparison with Urban Audit, the lowest rankings were in Bucharest 27%, Madrid 31%, Athens 33% and Rome 37% while the highest rankings were in Dublin 83%, Luxembourg 79%, Riga 74% and Helsinki 74%. The trend is negative which means the more the other roads and associated land the less the satisfaction with noise levels. This is not a surprise result!

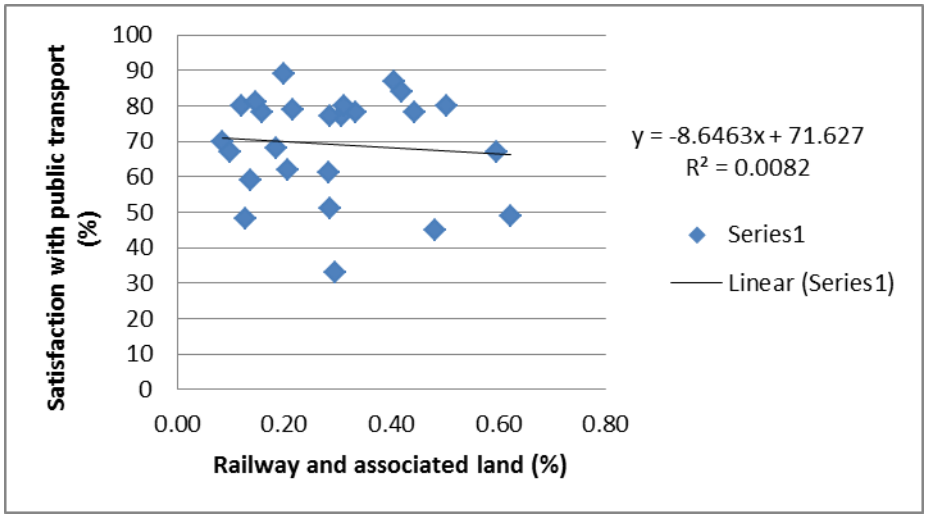

Figure 21: Railways and associated land (Urban Atlas) and satisfaction with public transport (Urban Audit)

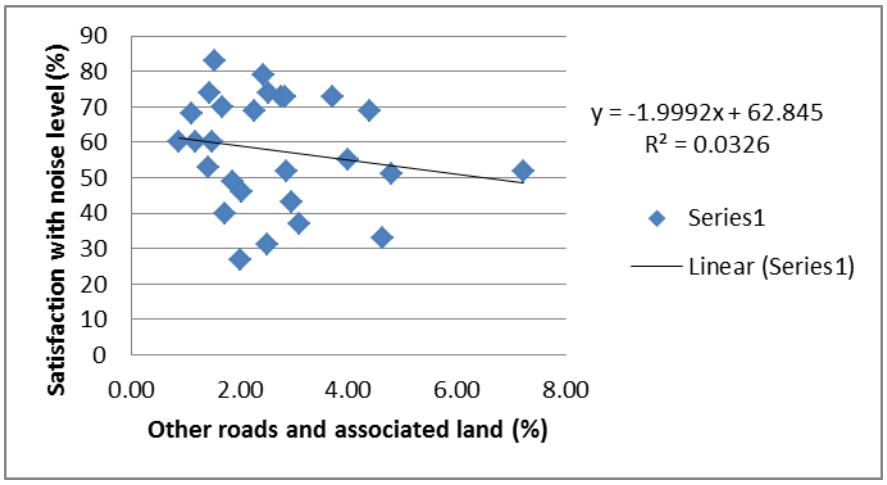

Figure 22: The effect of other roads and associated land (Urban Atlas) on noise level (Urban Audit)

Fast transit roads and associated land vs. noise level

Similarly 'Fast transit roads and associated land' (figure 23) shows very low correlation with satisfaction with noise level. The Urban Atlas area covered by fast transit roads and associated land is lowest in Sofia 0.05%, Vilnius 0.06%, Nicosia 0.07% and Bucharest 0.08%. The highest % areas were in Amsterdam 1.11%, Brussels 0.92%, Lisbon 0.58%, Budapest 0.38% and Copenhagen 0.37%. On comparison with Urban Audit, the lowest ranked cities are Bucharest 27%, Madrid 31%, Athens 33% and Rome 37% while the highest ranked are Dublin 83%, Luxembourg 79%, Riga 74% and Helsinki 74%. Although the trend is positive, the R^2 value of 0.0079 shows that there is insignificant correlation between fast transit roads and associated land and satisfaction with noise level.

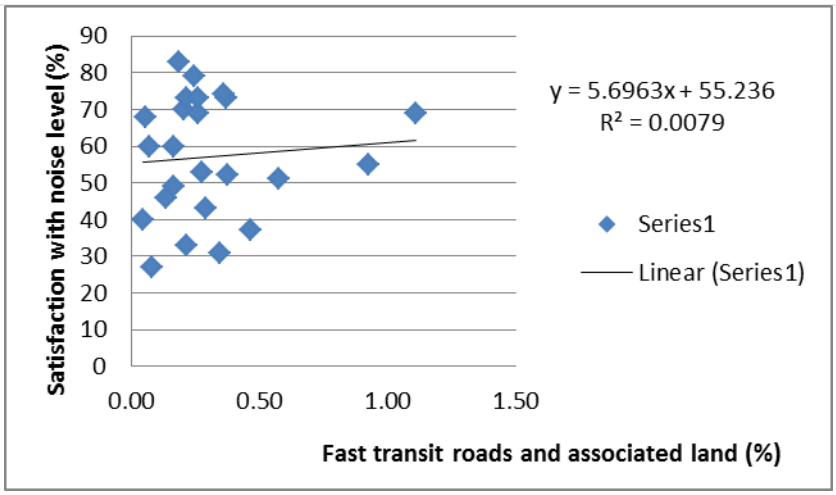

Figure 23: The effect of fast transit roads and associated lands (Urban Atlas) on noise level (Urban Audit)

Mineral extraction and dump sites vs. cleanliness

A majority of respondents are satisfied with the state of cleanliness of Luxembourg at 92% followed closely by Ljubljana at 87%. Athens is the last at 23% followed by Rome at 25%. On comparison with Urban Atlas, there is insignificant rank in almost all the cities while the lowest ranked cities are Warsaw 0.11%, Vilnius 0.11%, Amsterdam 0.13%, Ljubljana 0.13% and Brussels 0.14%. The highest ranked cities in Urban Atlas are Madrid 0.70%, Rome 0.60%, Lisbon 0.64%, and Helsinki 0.63%. Figure 24 shows that there is low correlation between satisfaction with cleanliness

(Urban Audit) and objective analysis of Urban Atlas' mineral extraction and dump sites. The trend is a negative line showing that an increase in mineral extraction and dump sites leads to a decrease in the satisfaction with cleanliness. Examples of mineral extraction and dump sites include open pit extraction sites (sand, quarries) including water surface, their protecting dikes and/or vegetation belts and associated land such as service areas. Also included are the public, industrial or mine dump sites, raw or liquid wastes.

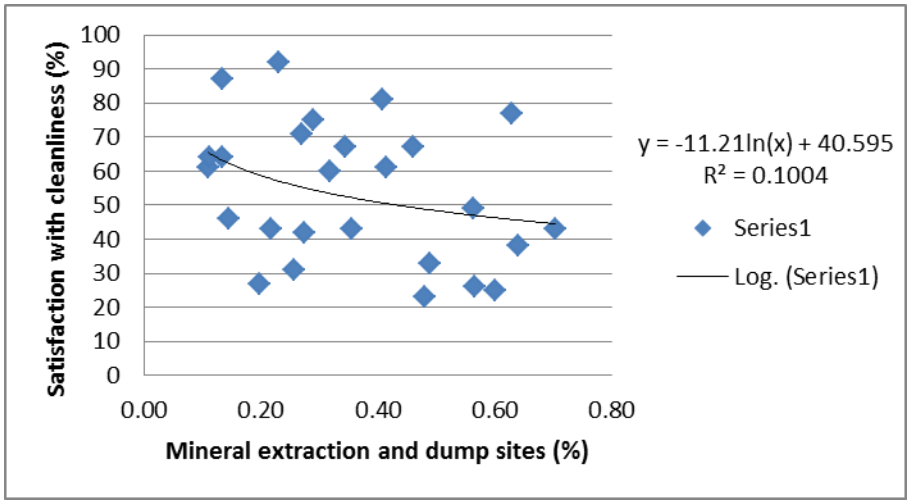

Figure 24: Mineral extraction and dump sites (Urban Atlas) and satisfaction with cleanliness (Urban Audit)

Water bodies vs. green spaces such as parks and gardens

There is a low correlation between water bodies (Urban Atlas) and satisfaction with green spaces such as parks and gardens (Urban Audit) as illustrated in figure 25. The lowest ranked cities in Urban Atlas are Nicosia 0.15%, Sofia 0.41%, Rome 0.42%, Athens 0.44%, Ljubljana 0.39% and Luxembourg 0.48% while the highest ranked cities with water bodies are Amsterdam 26.68%, Stockholm 10.29%, Copenhagen 7.55%, Lisbon 5.57% and Helsinki 4.23%. On comparison with Urban Audit, the lowest ranked cities in satisfaction with green spaces are Athens 23%, Bratislava 43%, Nicosia 55% and Sofia 57% while the highest ranked cities are Luxembourg 90%, Helsinki 89%, Stockholm and London both 88%, and Warsaw 87%. The trend is a positive line which shows that the more the water bodies the greater the satisfaction with green spaces such as parks and gardens.

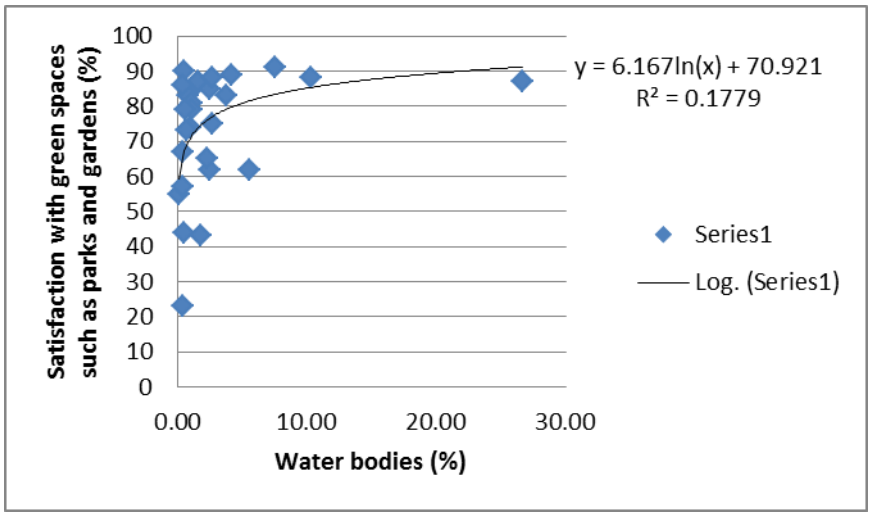

Figure 25: Water bodies (Urban Atlas) and satisfaction with green spaces such as parks and gardens (Urban Audit)

Examples of water bodies include sea, lakes, fish ponds (artificial,natural), rivers including channeled rivers and canals. Clean water is life (UN Water, 2010). Our lives depend on how we protect the quality of our water. This is because water is the basis of all life on earth. The quality of life depend on water quality. Water bodies can be referred as the only living Oasis of the Cities; they play an important role of not only controlling temperature but also a source of vegetation. Of late, cities all over the world are realizing the importance of these water bodies not only for recharging ground water but also acting as tourist attractions and more of public space for the citizens by restoring. Similarly it also acts as a source of livelihood for many in urban areas that depend on its products and services.

Commitment to fight against climate change

Most of Europe's riches are generated in cities, and these urban areas are particularly at risk as a result of climate change. Thus it is imperative for Europe to seize the opportunity of improving quality of life while at the same time adapting to climate change in cities.

It is important to note that the effects of urbanization and climate change are converging in dangerous ways. It is a known fact that cities are major contributors to climate change: this is despite the fact that they cover less than 2% of the earth's surface (UN Habitat, 2011). Cities consume 78% of the world's energy as well as

produce more than 60% of all carbon dioxide and other significant amounts of greenhouse gas emissions; this is mainly through energy generation, as well as vehicles together with industry, and biomass use.

Consequently, cities and towns are heavily vulnerable to climate change. It is estimated that hundreds of millions of people in urban areas across the world will be affected by rising sea levels, increased precipitation which leads to more inland floods, as well as frequent and stronger cyclones and storms together with periods of more extreme heat and cold. For example, many major coastal cities with populations of more than 10 million people are already under threat. Some of the other negative consequences of climate change include negative impact on infrastructure and worsen access to basic urban services as well as quality of life in cities. Additionally, most of the vital economic as well as social infrastructure, together with government facilities and assets are located in cities.

The city of Rome is the most committed to the fight against climate change at 62% level of agreement, this is closely followed by Madrid at 58% and the third place is taken by Riga at 57%. The city which is least committed in the fight against climate change is Luxembourg at 18% followed by Stockholm at 23%. When comparison is made with the overall satisfaction to live in the city, the results show a decreasing/negative trend as illustrated in figure 26. It shows the commitment to the fight against climate change does not translate into overall satisfaction to live in the city. It shows that the cities with less commitment to the fight against climate change have the highest satisfaction to live in the city, this is a surprise result!

One way to fight against climate change is to establish a forest. Forests are vegetation with ground coverage of tree canopy >30%, tree height >5m, including bushes and shrubs at fringe of the forest. They also include plantations such as populus plantation, Christmas tree plantation, forest regeneration, re-colonization, clear cut, new forest plantation. Urban forestry refers to the sustained planning, planting, and protection of trees, including residential tree lines, and forests in urban areas (Blouin and Comeau 1993); trees are valued for aesthetic, ecological, and economic reasons. Some of the aesthetic benefits include pleasant landscape, peace as well as quiet, screening and privacy, and recreation opportunities, together with the intangible benefits of an

improved quality of life for residents (Sheets and Manzer 1991, Summit and Sommer 1998, Kennard et al. 1996, Tyrvainen and Vaananen 1998, Hull 1992).

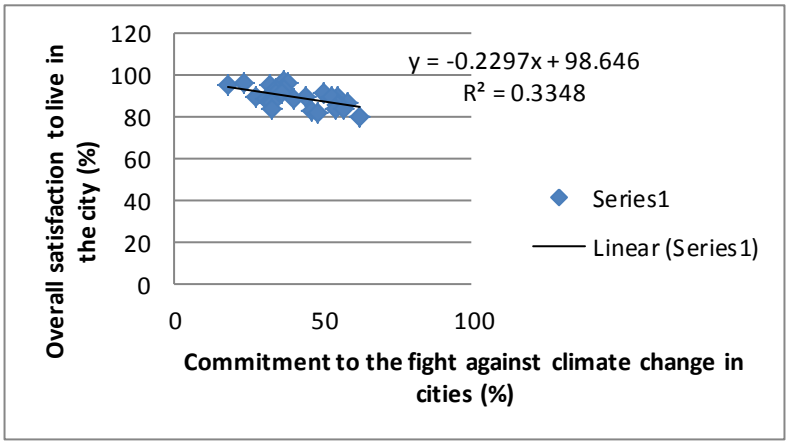

Figure 26: Satisfaction to live in the city and commitment to the fight against climate change

In addition to intangibles benefits, such as improved psychic capital, trees have been known to increase property values as well as influence the decision-making process of potential homebuyers or renters, as well as partially structure local real-estate markets (Getz et al. 1982, Anderson and Cordell 1985, Laverne and Winson-Geideman 2003 and Sydor et al. 2003). In summary, research suggests that natural spaces improve urban environments as well as make communities more liveable.

Urban forests also have been found to have many environmental benefits. For instance, trees absorb gaseous pollutants through leaf stomata as well as dissolve or bind water-soluble pollutants onto moist leaf surfaces. Tree canopies on the other hand intercept particulates and reduce local air temperatures in the summer through increased albedo and evapotranspiration; by reducing air ozone concentrations, through direct or indirect absorption of ozone or other pollutants such as NO_2, or through reduction of air temperature that reduces hydrocarbon emission as well as ozone formation rates (McPherson et al. 1998).

Sports and leisure facilities vs. satisfaction with sports facilities

The percentage of sports and leisure facilities (Urban Atlas) and satisfaction with sports facilities (Urban Audit) shows a low correlation. The R^2 is 0.1197 as shown in

figure 27. The Urban Atlas analysis shows the lowest ranked cities as Vilnius 0.14%, Ljubljana 0.14%, Nicosia 0.15%, Sofia 0.16% and Tallinn 0.18% while the highest ranked cities are London 4.54%, Amsterdam 2.09%, Copenhagen 2.04% and Dublin 1.80%. On comparison with Urban Audit, satisfaction with sports facilities is lowest ranked in Athens 30%, Bratislava 32% and Vilnius 38% while the highest ranked cities are Helsinki 84%, Luxembourg 80% and Amsterdam 78%. The trend is a positive one meaning that an increase in the percentage of sports and leisure facilities leads to an increase in satisfaction with sports facilities.

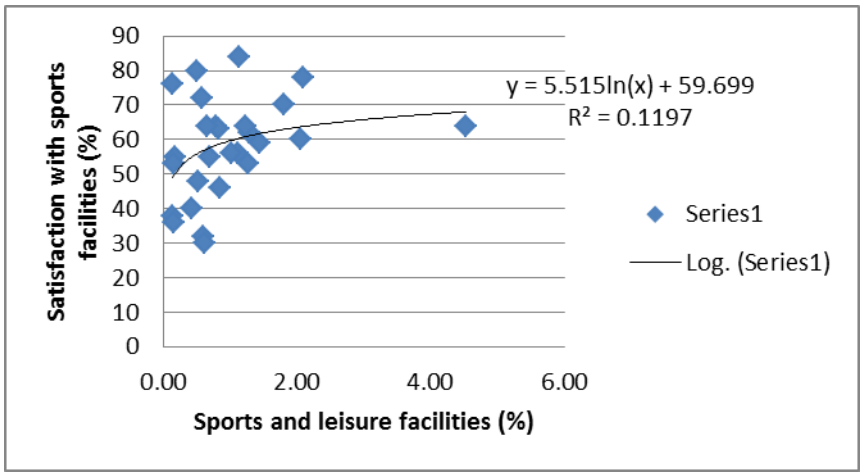

Figure 27: Percentage sports and leisure facilities (Urban Atlas) and satisfaction with sports facilities (Urban Audit)

The sports and leisure facilities (Urban Atlas) was calculated as a percentage of the area of the Urban Atlas. This was then compared with the satisfaction with sports facilities (Urban Audit) and the results presented in table 4.

Green urban areas vs. green spaces such as parks and gardens

There is very low correlation between percentage green urban areas (Urban Atlas) and satisfaction with green spaces such as parks and gardens (Urban Audit), the results are difficult to explain. The lowest ranked cities in Urban Atlas are Nicosia 0.14%, Ljubljana 0.20%, Luxembourg 0.23% and Bratislava 0.36% while the highest ranked cities are London 3.31%, Amsterdam 3.09%, Brussels 2.54% and Copenhagen 2.10%. Compared with Urban Audit, the highest ranked cities are Copenhagen 91%,

Luxembourg 90%, Helsinki 89%, London 88% and Stockholm 88% while the lowest ranked cities are Athens 23%, Bratislava 43%, Nicosia 55% and Sofia 57%. This is illustrated in figure 28(a). The trend is a positive one meaning an increase in percentage green urban area translates to a more satisfaction with green spaces such as parks and gardens.

Table 4: Urban Atlas' sports and leisure facilities (%) and Urban Audit's satisfaction with sports facilities (%)

EU capital	Sports and leisure facilities in Urban Atlas	Sports and leisure facilities *100	Total Urban Atlas area	[%] sports and leisure facilities	Satisfaction with sports facilities [%]
Amsterdam	24449013	2444901300	1172049658	2.09	78
Athens	18764229	1876422900	3042235353	0.62	30
Berlin	144868295	14486829500	17455740143	0.83	63
Bratislava	12084976	1208497600	2045915346	0.59	32
Brussels	20050519	2005051900	1623038820	1.24	64
Bucharest	4541863	454186300	1073616538	0.42	40
Budapest	28225095	2822509500	2521777471	1.12	56
Copenhagen	61345990	6134599000	3001957816	2.04	60
Dublin	126516385	12651638500	7015551298	1.80	70
Helsinki	35286940	3528694000	3110132218	1.13	84
Nicosia	3966937	396693700	2710229757	0.15	53
Lisbon	18141427	1814142700	1435974373	1.26	53
Ljubljana	3565283	356528300	2553477858	0.14	76
London	412644672	41264467200	9096653602	4.54	64
Luxembourg	12695869	1269586900	2596594191	0.49	80
Madrid	54659195	5465919500	8016496027	0.68	55
Paris	173083355	17308335500	12059707449	1.44	59
Prague	40413001	4041300100	6969211325	0.58	72
Riga	27942275	2794227500	5390290097	0.52	48
Rome	36353969	3635396900	3599925754	1.01	56
Sofia	5450625	545062500	3420221015	0.16	36
Stockholm	91604269	9160426900	7161328991	1.28	62
Tallinn	7676407	767640700	4338562542	0.18	55
Valletta	2093827	209382700	246518542	0.85	46
Vilnius	5904085	590408500	4244936270	0.14	38
Warsaw	34052414	3405241400	5197661195	0.66	64
Vienna	36038643	3603864300	4615763323	0.78	64

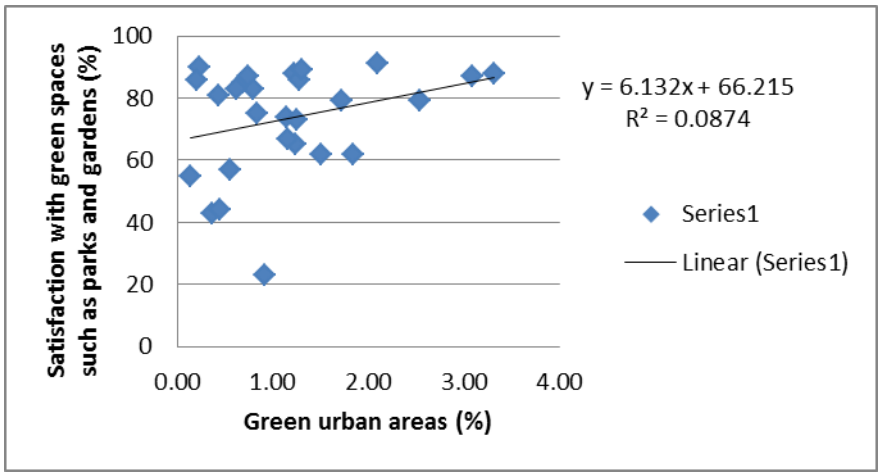

Figure 28(a): Percentage green urban (Urban Atlas) areas and satisfaction with green spaces such as parks and gardens (Urban Audit)

Forests vs. green spaces such as parks and gardens

Forests and satisfaction with green spaces such as parks and gardens shows a low correlation, with R^2 of 0.1982 as illustrated in figure 28(b). The cities with the lowest forest cover are Valletta 0.05%, Nicosia 0.31%, (it seems the forest data for Valletta and Nicosia are incomplete/data gaps), Amsterdam 3.92%, Lisbon 4.73% and Madrid 7.47% while the highest forest cover are in the cities of Ljubljana 61.44%, Tallinn 56.16%, Stockholm 55.29%, Riga 54.08% and Helsinki 50.07%. Compared with Urban Audit, the highest ranked cities are Copenhagen 91%, Luxembourg 90%, Helsinki 89%, London 88% and Stockholm 88% while the lowest ranked cities are Athens 23%, Bratislava 43%, Nicosia 55% and Sofia 57%.

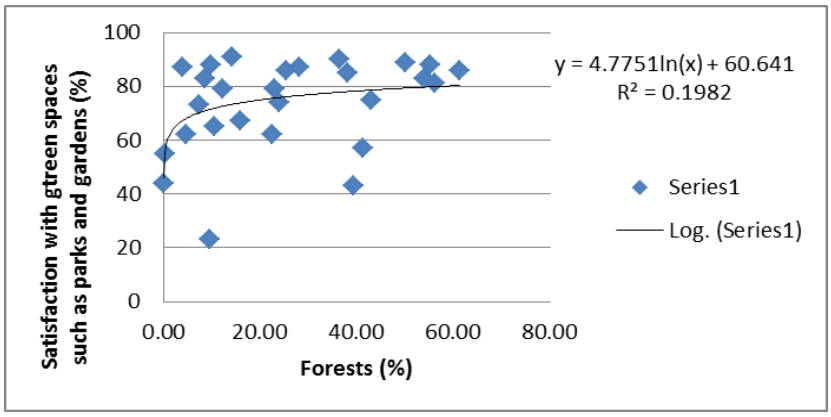

Figure 28(b): Forests (Urban Atlas) and satisfaction with green spaces such as parks and gardens (Urban audit).

Table 5 shows the summary of how the calculations of percentage green urban areas were done by multiplying by 100 the green urban areas then dividing by the total Urban Atlas areas.

Table 5: Percent green urban areas and green spaces satisfaction

EU capital	Green urban areas	Green urban areas *100	Total Urban Atlas area	[%] green urban area	Satisfaction with green spaces such as parks and gardens [%]
Amsterdam	36172160	3617216000	1172049658	3.09	87
Athens	27964742	2796474200	3042235353	0.92	23
Berlin	119946966	11994696600	17455740143	0.69	85
Bratislava	7449008	744900800	2045915346	0.36	43
Brussels	41231046	4123104600	1623038820	2.54	79
Bucharest	13265137	1326513700	1073616538	1.24	65
Budapest	37851760	3785176000	2521777471	1.50	62
Copenhagen	62917333	6291733300	3001957816	2.10	91
Dublin	56178422	5617842200	7015551298	0.80	83
Helsinki	40466097	4046609700	3110132218	1.30	89
Nicosia	3837100	383710000	2710229757	0.14	55
Lisbon	26373687	2637368700	1435974373	1.84	62
Ljubljana	5097545	509754500	2553477858	0.20	86
London	301440842	30144084200	9096653602	3.31	88
Luxembourg	6097975	609797500	2596594191	0.23	90
Madrid	100020019	10002001900	8016496027	1.25	73
Paris	207059887	20705988700	12059707449	1.72	79
Prague	79732558	7973255800	6969211325	1.14	74
Riga	33397214	3339721400	5390290097	0.62	83
Rome	41862220	4186222000	3599925754	1.16	67
Sofia	19086481	1908648100	3420221015	0.56	57
Stockholm	87560055	8756005500	7161328991	1.22	88
Tallinn	18891691	1889169100	4338562542	0.44	81
Valletta	1114780	111478000	246518542	0.45	44
Vilnius	35330294	3533029400	4244936270	0.83	75
Warsaw	38269223	3826922300	5197661195	0.74	87
Vienna	59196318	5919631800	4615763323	1.28	86

5.3 The relationship between Urban Atlas parameters per capita and Urban Audit

Sports and leisure facilities per capita vs. satisfaction with sports facilities

Sports and leisure facilities per capita (Urban Atlas) and satisfaction with sports facilities (Urban Audit) show a low correlation with a positive trend. This is illustrated in figure 29. The sports and leisure facilities per capita is highest in Luxembourg with 148m^2, followed by Copenhagen 132m^2, Stockholm 127m^2 and Dublin 123m^2 while the lowest per capita are in the cities of Bucharest 3m^2, Sofia 5m^2, Vilnius 13m^2, Rome 15m^2 and Ljubljana 15m^2. Compared with Urban Audit, the highest ranked cities are Helsinki 84%, Luxembourg 80%, Amsterdam 78%, and Ljubljana 76% while the lowest ranked cities are Athens 30%, Bratislava 32%, Sofia 36% and Bucharest 40%. The trend is an increasing one meaning that an increase in sports and leisure facilities per capita leads to an increase in the satisfaction with sports facilities.

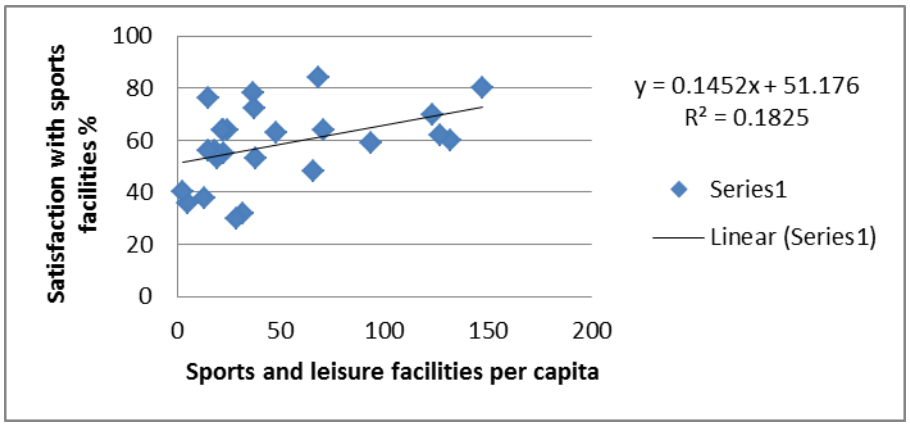

Figure 29: Sports and leisure facilities (m^2) per capita (Urban Atlas) and satisfaction with sports facilities (Urban Audit)

Green urban areas per capita vs. green spaces such as parks and gardens

Furthermore, there is no correlation between green urban areas per capita (Urban Atlas) and satisfaction with green spaces such as parks and gardens (Urban Audit). The highest per capita in the Urban Atlas are in the cities of Valletta 203m^2, Copenhagen 135m^2, Stockholm 121m^2 and Paris 112m^2. The lowest per capita are in the cities of Bucharest 8m^2, Rome 17m^2, Sofia 18m^2, Nicosia 19m^2, and Ljubljana 21m^2. Compared with Urban Audit, the lowest ranked cities are Athens 23%, Bratislava 43%, Valletta 44% and Nicosia 55% while the highest ranked cities are

Copenhagen 91%, Luxembourg 90%, Helsinki 89%, and both Stockholm and London having 88%. This is illustrated in figure 30. Although the trend is positive, it is not sufficient to conclude that an increase in green urban areas per capita leads to an increase with satisfaction with green spaces.

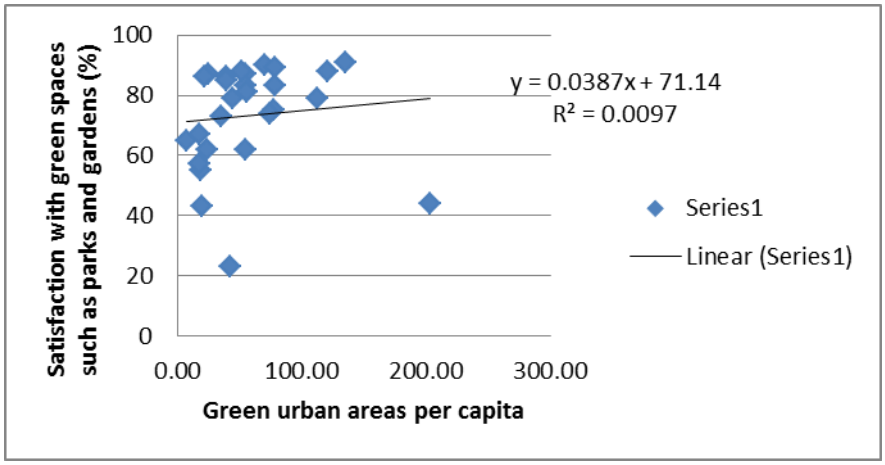

Figure 30: Green urban areas (m^2) per capita (Urban Atlas) and satisfaction with green spaces such as parks and gardens (Urban Audit)

The calculations on per capita were done based on the area of green urban areas and this was divided by the population above 15 years old. The green urban areas were obtained from the Urban Atlas while the population above 15 years old were obtained from Urban Audit. The results were summarized in table 6. An assumption is made that the units of measurement in the Urban Atlas are m^2.

5.4 The relationship between population above 15 years old and Urban Atlas parameters

Sports and leisure facilities vs. the population above 15 years old

There is a strong correlation between Urban Atlas' sports and leisure facilities and the population above 15 years old. The trend is a positive one meaning that the more the population above 15 years old the more the sports and leisure facilities required. This is not a surprise since larger population require more of sports and leisure facilities as illustrated in figure 31. The goal was to find out the availability of sports and leisure facilities to the population.

Table 6: Green urban areas per capita (Urban Atlas) and satisfaction with green spaces such as parks and gardens (Urban Audit)

EU capital	Green urban area in m^2	Population above 15 years	Green urban areas per capita [m^2 per person]	Satisfaction with green spaces [%]
Amsterdam	36172160	661407	54.69	87
Athens	27964742	659664	42.39	23
Berlin	119946966	3035226	39.52	85
Bratislava	7449008	378952	19.66	43
Brussels	41231046	916829	44.97	79
Bucharest	13265137	1718888	7.72	65
Budapest	37851760	1550299	24.42	62
Dublin	56178422	1028000	54.65	83
Helsinki	40466097	514611	78.63	89
Lisbon	26373687	477239	55.26	62
Ljubljana	5097545	236011	21.60	86
London	301440842	5807285	51.91	88
Luxembourg	6097975	86022	70.89	90
Madrid	100020019	2825353	35.40	73
Nicosia	3837100	204179	18.79	55
Paris	207059887	1844243	112.27	79
Prague	79732558	1077005	74.03	74
Riga	33397214	423118	78.93	83
Rome	41862220	2384127	17.56	67
Sofia	19086481	1055205	18.09	57
Stockholm	87560055	722386	121.21	88
Tallinn	18891691	336683	56.11	81
Valletta	1114780	5479	203.46	44
Vienna	59196318	1484966	39.86	86
Vilnius	35330294	453866	77.84	75
Warsaw	38269223	1502571	25.47	87

Green urban areas and population above 15 years old

Furthermore, objective analysis of Urban Atlas to find out the availability of green urban areas shows a strong correlation between green urban areas and population above 15 years old, again this is not a surprise since the more the population the greater the need to have more green urban areas. For instance Valletta has a green urban area of $1km^2$ with a population of 5000 whereas Luxembourg has a green urban area of $6km^2$ corresponding to a population of 86,000. Ljubljana has a green urban area

of 5km^2 with a population of 236,000 while Bratislava has a green urban area of 7km^2 corresponding to 379,000 city residents. On the other hand London has a green urban area of 301km^2 and a total population of 5,807,000 while Paris has a green urban area of 207km^2 equivalent to a population of 1,844,000. Berlin has a green urban area of 120km^2 and a population of 3,035,000 while Madrid has a green urban area equivalent to 100km^2 and a population of 2,825,000. This is illustrated in figure 32.

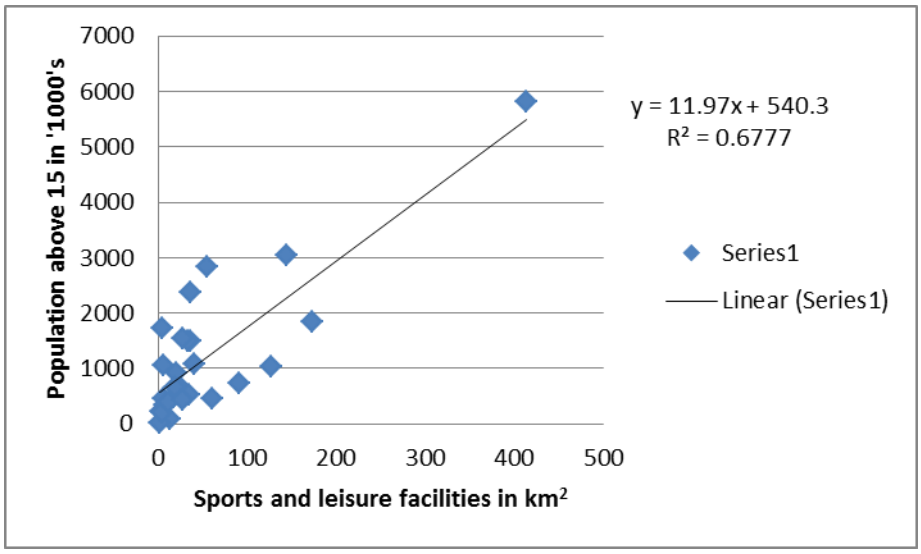

Figure 31: Sports and leisure facilities and population above 15 years old

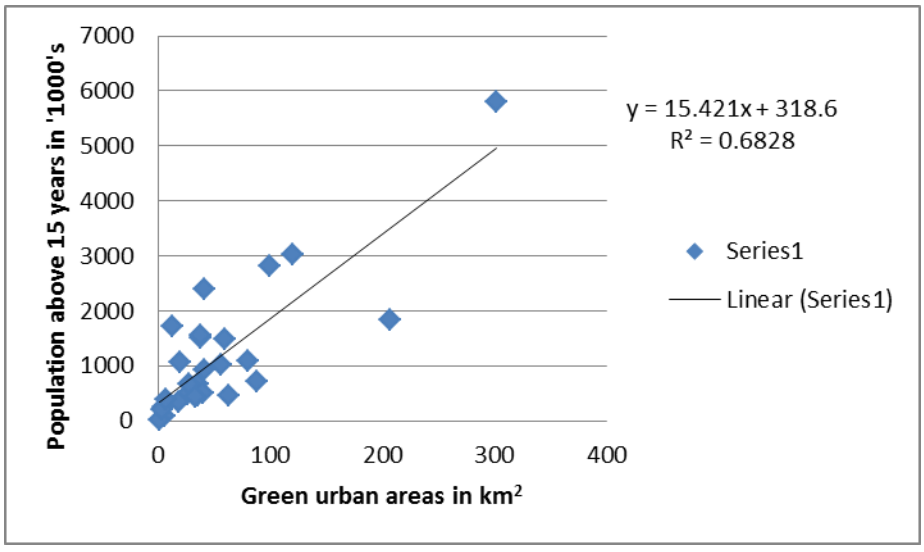

Figure 32: Green urban areas and population above 15 years old

5.5 Analyses of climate data such as precipitation and temperature in key cities

Only those cities with climate data from 1973 to 2013 were taken into consideration in the analysis of climate data such as precipitation and temperature. The data used was obtained from Tutiempo website (Tutiempo, 2014). The website has climate information for every country in the world with historical data in some cases which date back to 1929. For this analysis, the information used is total annual precipitation of rain and/or snow and annual average temperature.

The results are illustrated in figures 33 to 70. The results for precipitation show a fairly horizontal trend in Brussels, Amsterdam, Warsaw, Sofia, Tallinn, Athens, Dublin, Riga and Bratislava. Thus the rainfall data is not enough to determine climate change in these cities. Precipitation shows decreasing trend in Bucharest, Prague, Copenhagen, Madrid, Paris, Rome, Luxembourg, Valletta and London. This decrease in annual precipitation can be attributed to climate change. The only city with increasing precipitation is Vienna where the annual precipitation increased from 550mm to 700mm, and this can be due to climate change. When it comes to annual average temperature, there is a general upward trend in almost all the cities except Dublin which does not show any trend. Thus in Dublin there is no sign of climate change both in temperature and annual precipitation. In the rest of the cities, the annual average temperature shows a slight to an increasing trend and this can be attributed to climate change.

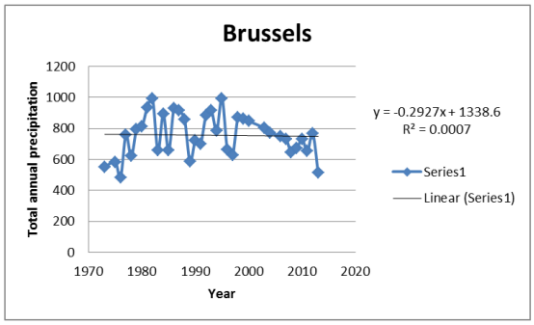

Figure 33: Total annual precipitation for Brussels. The trend is a horizontal line and does not show climate change, even though the rains have been decreasing since 2000

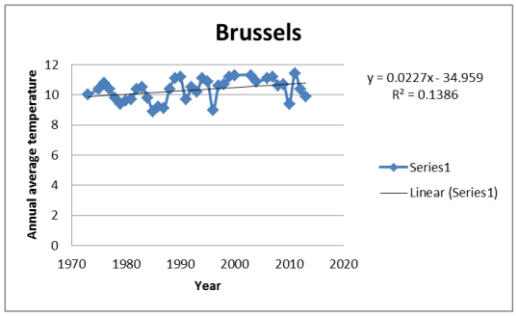

Figure 34: Annual average temperature for Brussels. The trend is a slight increase which may be due to climate change

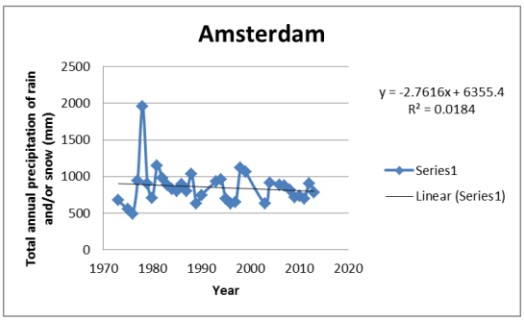

Figure 35: Total annual precipitation for Amsterdam. The trend is a fairly horizontal line and does not show climate change.

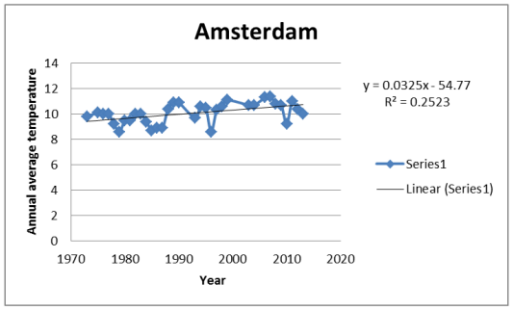

Figure 36: Annual average temperature for Amsterdam. The trend shows a slight increase which may be attributed to climate change

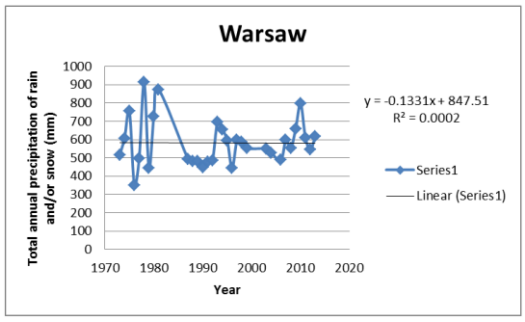

Figure 37: Total annual precipitation for Warsaw. The trend is a horizontal line which indicates absence of climate change.

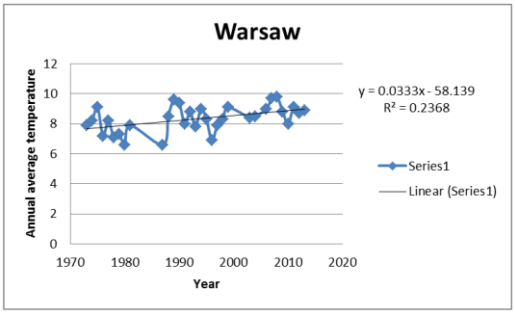

Figure 38: Annual average temperature for Warsaw. The trend shows a slight increase in temperature as a result of climate change.

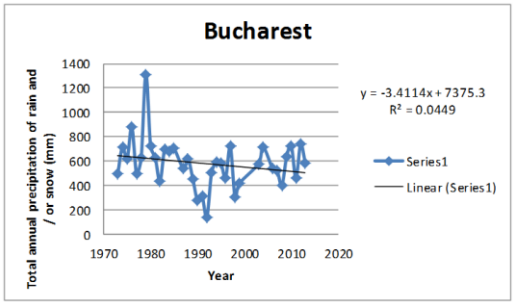

Figure 39: Total annual precipitation for Bucharest. The trend shows a slight decrease in rainfall and this can be attributed to climate change.

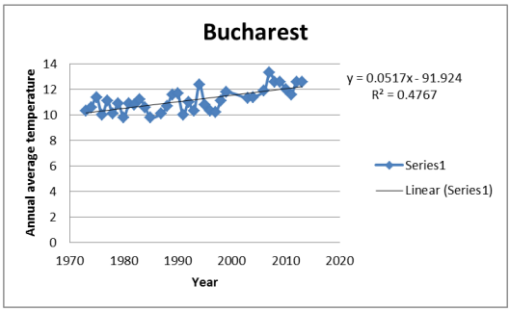

Figure 40: Annual average temperature for Bucharest. The trend shows an increase from 10^0C TO 12^0C and this can be as a result of climate change.

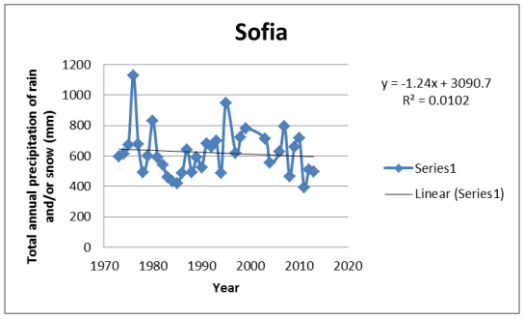

Figure 41: Total annual precipitation for Sofia. The trend is fairly horizontal and does not show the presence of climate change.

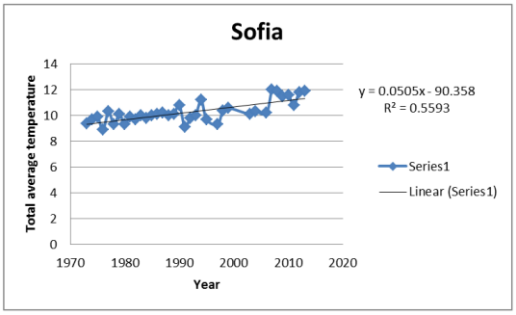

Figure 42: Annual average temperature for Sofia. The trend shows an increase in temperature and this can be attributed to climate change.

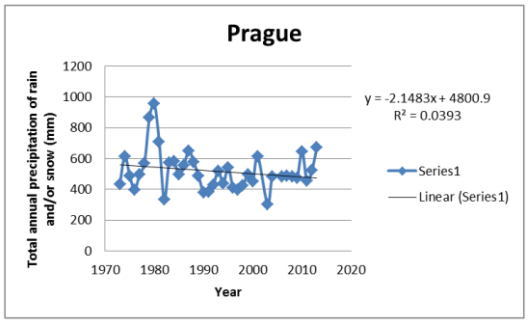

Figure 43: Total annual precipitation for Prague. The trend shows a slight decrease which is not enough to conclude there is climate change.

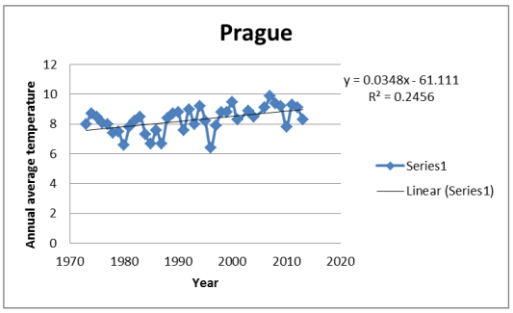

Figure 44: Annual average temperature for Prague. The trend shows a slight increase in temperature and this can be as a result of climate change.

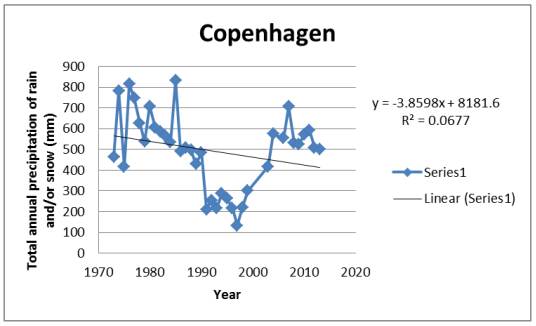

Figure 45: Total annual precipitation for Copenhagen. There is a decrease in precipitation and this can be attributed to climate change.

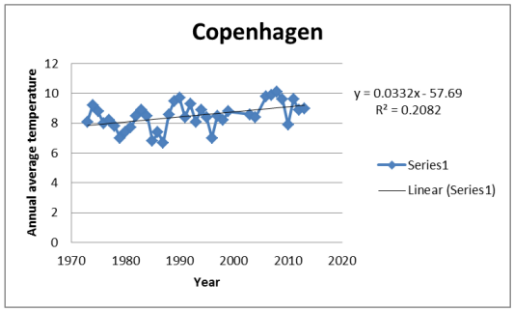

Figure 46: Annual average temperature for Copenhagen. There is a slight increase in temperature and this can be as a result of climate change.

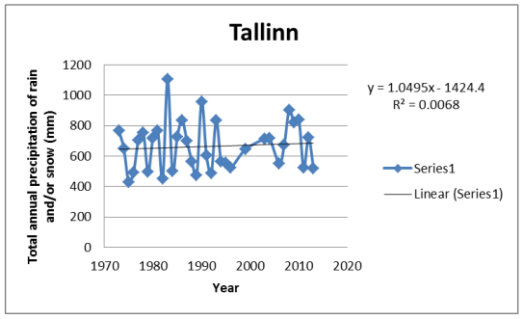

Figure 47: Total annual precipitation for Tallinn. The trend shows a fairly horizontal line which does not signify the presence of climate change.

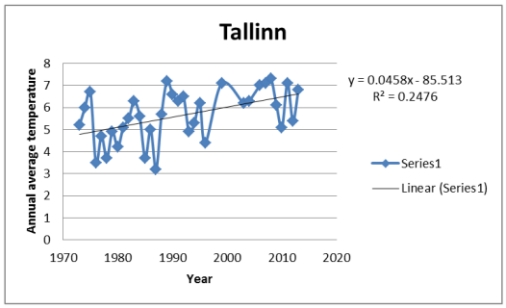

Figure 48: Annual average temperature for Tallinn. The trend shows an increase in temperature and this can be as a result of climate change.

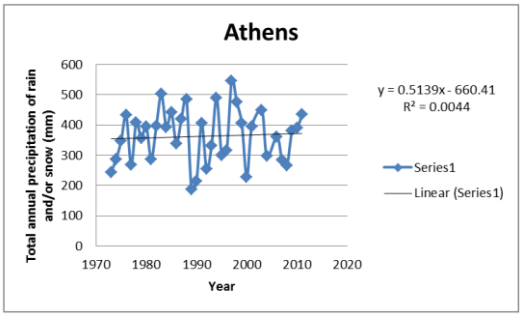

Figure 49: Total annual precipitation for Athens. The trend shows a fairly horizontal line which signify the absence of climate change

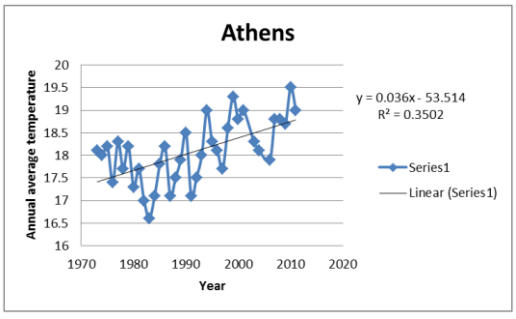

Figure 50: Annual average temperature for Athens. The trend shows an increase in temperature and this can be attributed to climate change.

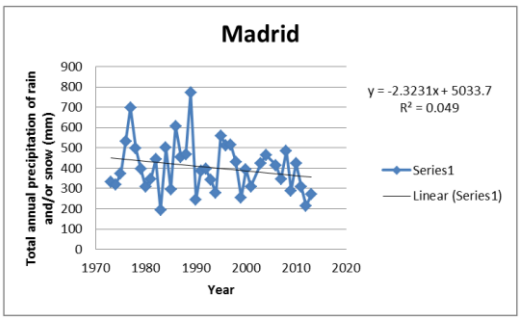

Figure 51: Total annual precipitation for Madrid. The trend shows a slight decrease in precipitation and this can be attributed to climate change.

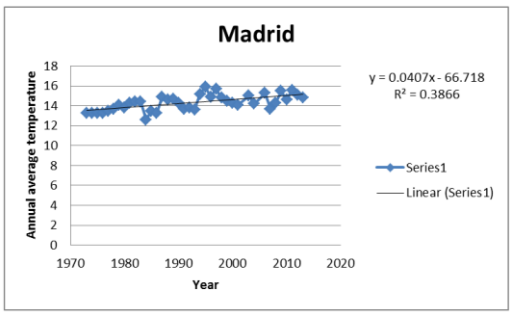

Figure 52: Annual average temperature for Madrid. There is a slight increase in temperature and this can be said to be as a result of climate change.

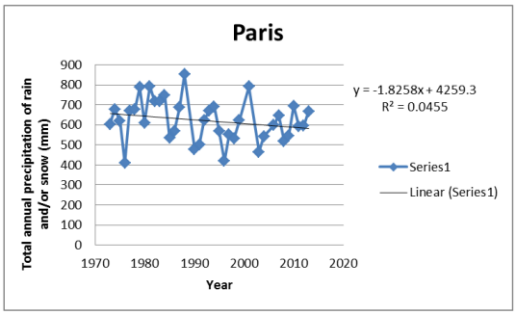

Figure 53: Total annual precipitation for Paris. The trend shows a slight decline in precipitation which can be attributed to climate change.

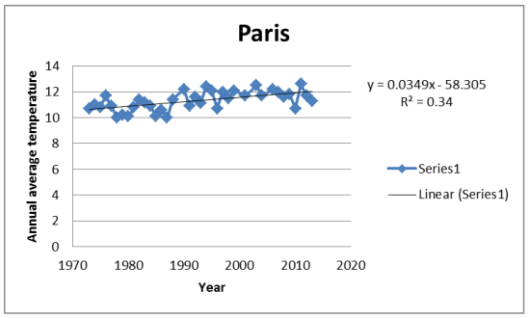

Figure 54: Annual average temperature for Paris. There is a slight increase in temperature and this can be attributed to climate change.

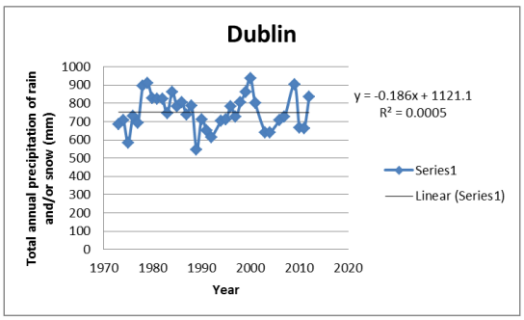

Figure 55: Total annual precipitation for Dublin. The trend is a horizontal line which shows lack of climate change in Dublin.

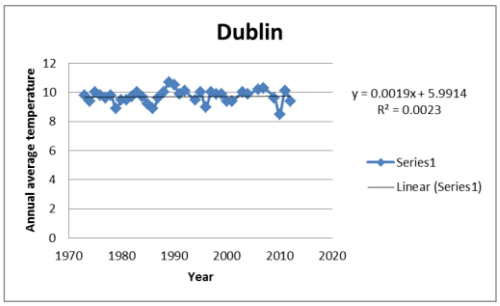

Figure 56: Annual average temperature for Dublin. The trend is a horizontal line which shows lack of climate change in Dublin.

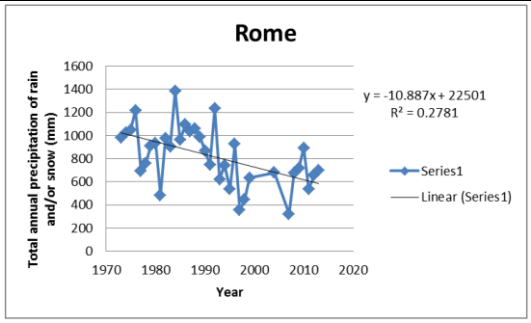

Figure 57: Total annual precipitation for Rome. The trend is a decrease in precipitation from 1000mm to 600mm and this can be attributed to climate change.

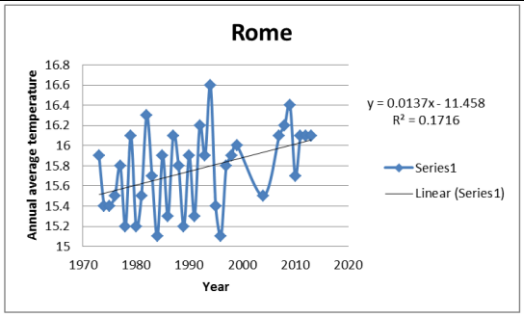

Figure 58: Annual average temperature for Rome. There is a slight increase in temperature and this can be attributed to climate change in Rome.

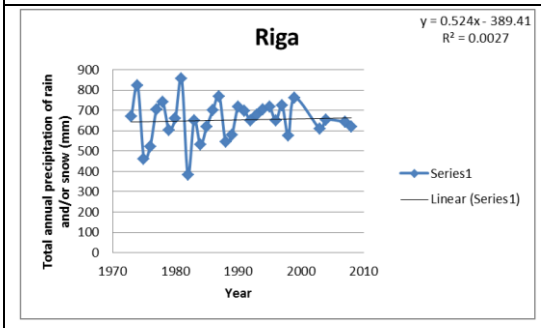

Figure 59: Total annual precipitation for Riga. The trend is a horizontal line which does not show the presence of climate change in Riga.

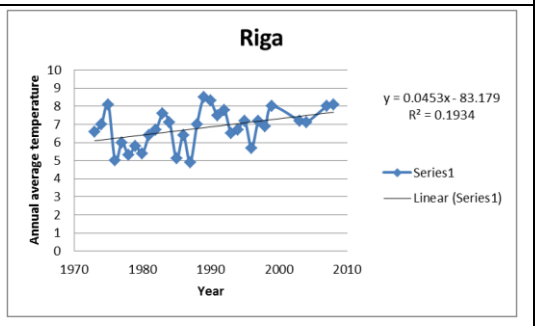

Figure 60: Annual average temperature for Riga. The trend shows an increase in temperature and this can be attributed to climate change in Riga.

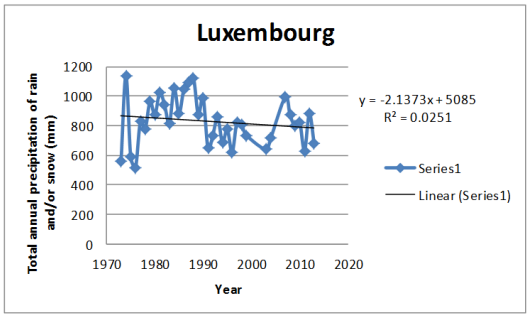

Figure 61: Total annual precipitation for Luxembourg. The trend shows a slight decline in precipitation which is can be attributed to climate change.

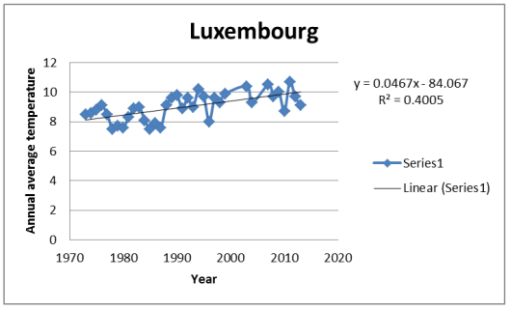

Figure 62: Annual average temperature for Luxembourg. The trend shows an increase in temperature from 8^0C to 10^0C as a result of climate change.

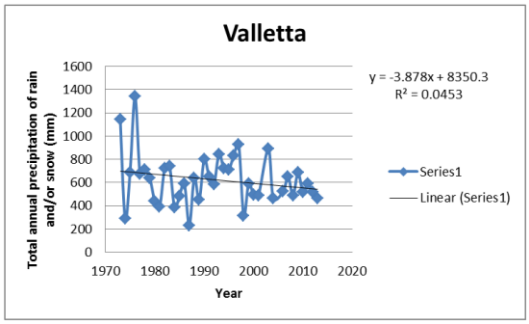

Figure 63: Total annual precipitation for Valletta. The trend shows a slight decline in rainfall amount and this can be attributed to climate change in Valletta.

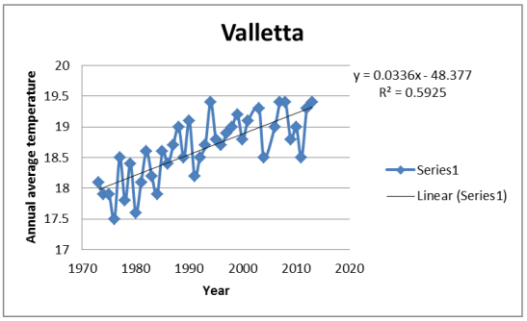

Figure 64: Annual average temperature for Valletta. The trend shows an increase in temperature and this can be attributed to climate change in Valletta.

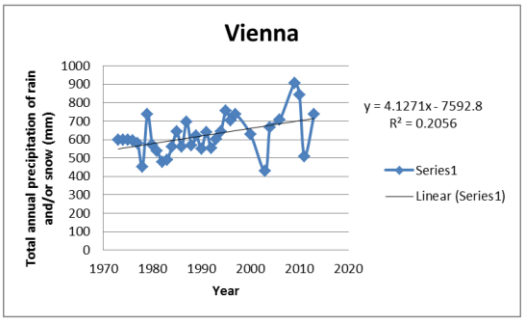

Figure 65: Total annual precipitation for Vienna. The trend shows an increase in the amount of rainfall and this can be attributed to climate change

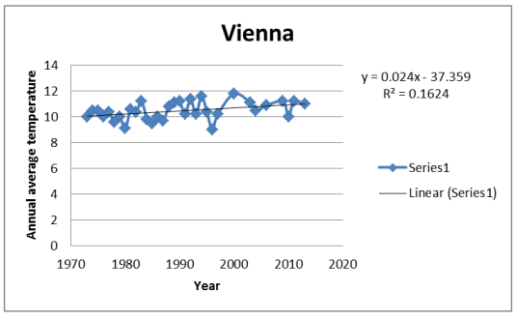

Figure 66: Annual average temperature for Vienna. The trend shows a slight increase in temperature from 10^0C to 11^0C and this can be as a result of climate change.

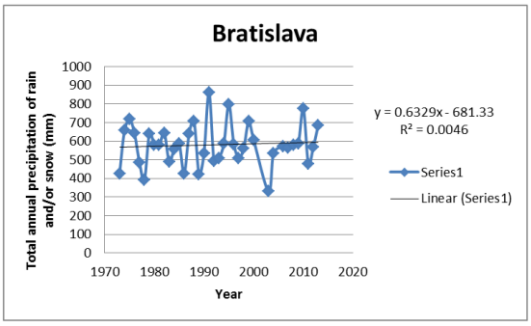

Figure 67: Total annual precipitation for Bratislava. The trend is a fairly horizontal line which shows absence of climate change.

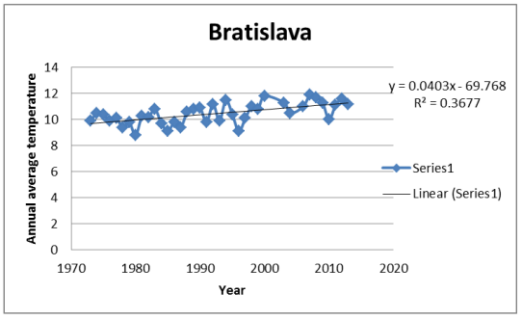

Figure 68: Annual average temperature for Bratislava. The slight increase in temperature can be attributed to climate change.

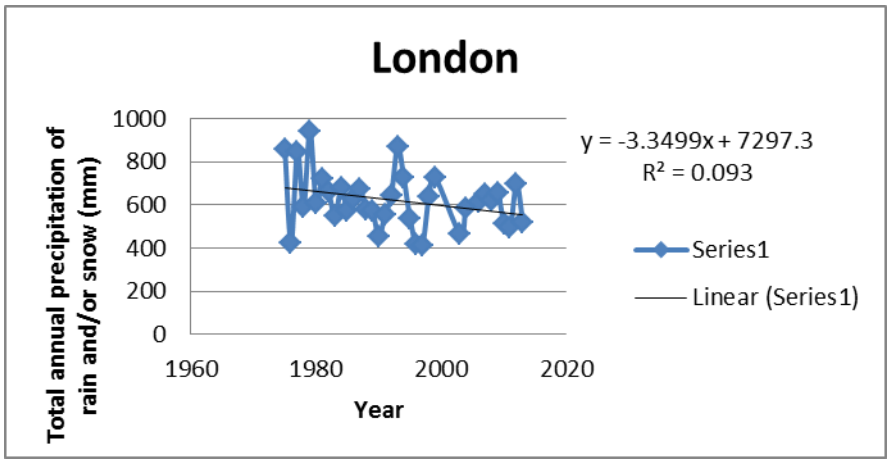

Figure 69: Total annual precipitation for London. There trend shows a decline in precipitation and this can be attributed to climate change.

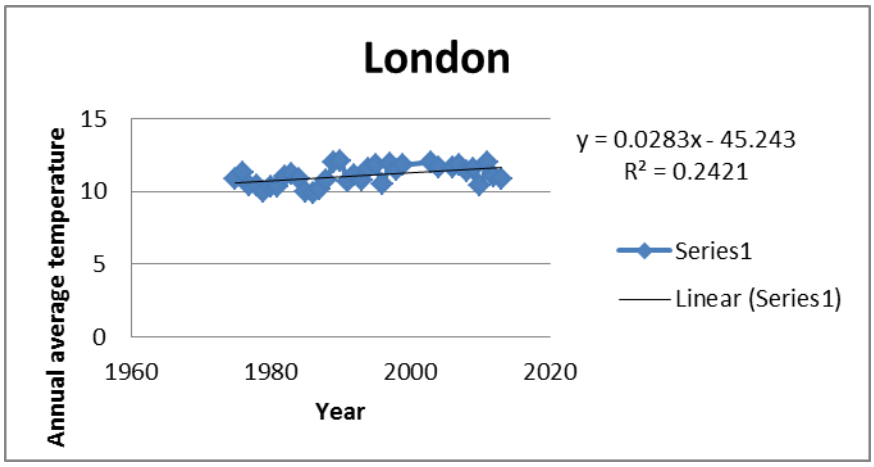

Figure 70: Annual average temperature for London. The trend shows a slight increase in temperature and this can be attributed to climate change.

6.0 Conclusion and Recommendation

There is high correlation between the overall satisfaction to live in the city and other parameters such as safety in the neighbourhood (figure 13), safety in the city (figure 12), satisfaction with public spaces (figure 8) and satisfaction with the life respondents lead (figure 18). Other high correlations are between sports and leisure facilities and the population above 15 years old (figure 31), safety in the city and safety in the neighbourhood (figure 11), trust of people in the city and trust of people in the neighbourhood (figure 14), efficiency of administrative service of cities and trust in the public administration of cities (figure 15), satisfaction with air quality and satisfaction with noise level (figure 16) and green urban areas and the population above 15 years old (figure 32).

It was also found that overall satisfaction to live in the city had little relationship with satisfaction with public transport (figure 2a and 2b), satisfaction with healthcare services, doctors and hospitals (figure 3a and 3b), satisfaction with sports facilities (figure 4a and 4b), satisfaction with cultural facilities (figure 5a and 5b), satisfaction with schools and other educational facilities (figure 6), satisfaction with the state of streets and buildings in the neighbourhood (figure 7) and satisfaction with the availability of retail shop (figure 9).

The author of this thesis was able to make a comparison of Urban Audit with Urban Atlas, and all the calculations on the Urban Atlas are the work of the author. On comparison with Urban Atlas, noise is also as a result of 'Other roads and associated land' (figure 22) and 'Fast transit roads and associated land (figure 23)' which both show very little correlation with satisfaction with noise level. Comparison with Urban Atlas also shows that 'other roads and associated land' have little relationship with satisfaction with public transport (figure 19). The same applies to fast transit roads and associated land (figure 20) and railway and associated land (figure 21) which both show little relationship with public transport.

Percentage of sports and leisure facilities and satisfaction with sports facilities shows low correlation (figure 27). Similarly the relationship between Urban Atlas' sports and leisure facilities per capita and satisfaction with sports facilities (figure 29) shows little correlation between the two. Also mineral extraction and dump sites and satisfaction

with cleanliness shows little relationship (figure 24). The same applies to green urban areas per capita and satisfaction with green spaces such as parks and gardens which shows little correlation (figure 30). Furthermore, percentage green urban areas and satisfaction with green spaces such as parks and gardens shows little correlation (figure 28). There is a low correlation between water bodies and satisfaction with green spaces such as parks and gardens (figure 25). These low correlations could be as a result of high satisfaction with the quality of life in some of the cities regardless of the availability of environmental parameters. For example the cities of Amsterdam, Copenhagen, Vienna, Helsinki and Luxembourg show high satisfaction with almost all the parameters.

Analysis of climate data such as precipitation and temperature was also done by the author to determine if there is climate change in the cities. The results show that in most capital cities the precipitation is decreasing while temperatures show an increasing trend and these can be attributed to climate change. Most changes in precipitation can be observed in the city of Rome while the temperature changes can be observed in the city of Luxembourg. In these two cities the commitment to the fight against climate change (figure 26) is highest in Rome (62%) while it is lowest in Luxembourg (18%). The city of Dublin is unique because analysis of both temperature and rainfall does not show climate change while the commitment to the fight against climate change is 44% in Dublin.

A review of information on air pollution in the OECD European countries (table 2) shows that Greece has 27.3 PM10 levels micrograms per cubic meter while Luxembourg has 12.5 PM10 levels micrograms per cubic meter. Ireland has 12.8 levels micrograms per cubic meter. When compared with satisfaction with the quality of air (clean environment), the satisfaction is highest in Luxembourg (86%) and Dublin (81%) while it is lowest in Athens (21%). Thus there is a strong correlation between air pollution levels and satisfaction with air quality. Those cities with lowest air pollution levels have highest satisfaction with air quality; this is not a surprise result.

There are data gaps in fast transit roads and associated land which show missing data in Tallinn, Valletta and Riga. Zagreb is missing Urban Atlas data while Nicosia is

missing in climate data. There are also some data missing in climate data of some of the cities. Due to data inconsistencies, all those cities with data from 1973 to 2013 were taken into consideration in the analysis of climate data.

There is a strong correlation between the overall satisfaction to live in the city and satisfaction with the life respondents lead. There is also a strong correlation between the satisfaction with the life respondents lead and life satisfaction in OECD. For example, satisfaction with the life respondents lead is highest in Copenhagen (97%), followed by Helsinki (96%) while in OECD rating Danes score 7.6 grade (one of the highest score in OECD) while Finns score 7.4 grade, much higher than OECD average of 6.6. Again the lowest in satisfaction with the life respondents lead is Athens (45%) followed by Budapest (61%). Similarly OECD ranking of Greeks is 4.7 grade (the lowest score in OECD) while that of Hungarians is 4.9 grade, one of the lowest in the OECD).

Generally, quality of life is highest in Copenhagen, Amsterdam and Stockholm and lowest in Athens, Rome, Valletta and Bucharest as shown in overall satisfaction to live in the city as well as satisfaction with the life respondents lead. Thus more needs to be done to improve the quality of urban life in Athens, Rome, Valletta and Bucharest.

Athens needs to improve on satisfaction to live in the city (52%); health care services, doctors and hospitals (27%); sports facilities (30%); cultural facilities (55%); schools and educational facilities (39%); the state of streets and buildings in the neighbourhood (27%); public spaces such as markets, squares, pedestrian areas (32%); Availability of retail shops (69%); the presence of foreigners (26%); integration of foreigners 14%); safety in the city (19%); safety in the neighbourhood (38%); trust in fellow citizens (20%); trust of most people in the neighbourhood (51%); satisfaction with air quality (21%); satisfaction with green spaces such as parks and gardens (23%); and satisfaction with the life respondents lead (45%).

Valletta needs to improve on cultural facilities (37%); public transport (37%); and public spaces such as markets, squares, pedestrian areas (42%). Bucharest needs to improve on schools and educational facilities (43%); trust in fellow citizens (31%); trust of most people in the neighbourhood (45%); satisfaction with air quality (17%); and satisfaction with noise level (27%). Rome needs to improve on schools and

educational facilities (44%); the administrative services of the city (21%); and trust in the public administration (31%).

The author recommends further study on the Urban Atlas to determine its units of measurement and to recalculate sports and leisure facilities per capita (figure 29) as well as that of green urban areas per capita (figure 30). This is because the Urban Atlas area is different from that of the cities, for example the Netherlands has an Urban Atlas area of 1,172,049,658 square units as opposed to the city area of 219,320,000m^2. All the calculations in km^2 in the Urban Atlas need to be looked into, for example green urban areas and the population above 15 years (figure 32) and sports and leisure facilities and the population above 15 years (figure 31). When making the above calculations in figures 31 and 32 the author made an assumption that the Urban Atlas units are in m^2.

References

Amsterdam Info, (2014). Department stores and shopping centres in Amsterdam. http://www.amsterdam.info/shopping/malls/ Accessed 01/07/2014.

Anderson, L. and Cordell, H., (1985). Residential property values improve by landscaping with trees. *Scandinavian Journal of Applied Forestry* 9:162–166.

Andrews, FM. and Withey, S. B., (1976). *Social indicators of well‐being: American's perceptions of life quality*, Plenum Press, New York.

Blomquist, G.C., Berger, M.C. and Hoehn, J.P., (2001). New Estimates of Quality of Life in Urban Areas.

Blouin, G. and Comeau, R., (1993). *First Canadian urban forests conference*. Canadian Forestry Association, Ottawa, Ontario, Canada.

Burrough, P.A., (1986). Principals of geographical information systems for land resource assessment (New York: Clarendon Press).

C&W Global Cities, (2014). Retail Guide, Stockholm. http://cwglobalretailguide.com/stockholm/ Accessed 01/07/2014.

Campbell, A., Converse, P. E. and Rodgers, W. L., (1976). *The quality of American life: perceptions, evaluations, and satisfactions*. Russell Sage Foundation.

Capital Asset Services, (2013). Luxembourg: A global centre for European and international business. http://www.capitaassetservices.com/countries/luxembourg.cshtml. Accessed 29/06/2014

City of Helsinki, (2008). Review of Arts and Culture in Helsinki. http://www.hel.fi/hel2/tietokeskus/julkaisut/pdf/08_10_14_tilasto_30_askelo.pdf. Accessed 29/06/2014.

City of Helsinki, (2012). Summary – Review by the Head of the Sports Department. http://www.hel.fi/static/liv/2013/tktiivistelmaenkku.pdf. Accessed 29/6/2014

Denmark DK, (2014). The official website of Denmark. Copenhagen is the most liveable city in the world. http://denmark.dk/en/practical-info/work-in-denmark/ Accessed 01/07/2014.

Donnay, J.P., Barnsley, J.M. and Longley, A.P., (2001). Remote sensing and urban analysis. In Remote Sensing and Urban Analysis, J.P. Donnay, M.J. Barnsley and P.A. Longley (Eds) (New York: Taylor and Francis).

Dublin, (2014). Noise pollution. http://www.dublin.ie/environment/noise-pollution.htm. Accessed 29/06/2014

EEA (2014). Urban Atlas. http://www.eea.europa.eu/data-and-maps/data/urban-atlas

Ehlers, M., Jadkowski, M.A., Howard, R.R. and Brostuen, D.E., (1990). Application of SPOT data for regional growth analysis and local planning. Photogrammetric Engineering and Remote Sensing, 56, pp. 175–180.

Ellaway, A., Macintyre, S. and Xavier, B., (2005). 'Graffiti, greenery and obesity in adults: secondary analysis of European cross sectional survey'. *British Medical Journal* 331: pp. 611–612.

EnterpriseHelsinki, (2012). Helsinki Region Public Transport top of Line in Europe. http://www.yrityshelsinki.fi/en/news/helsinki-region-public-transport-top-of-line-in-europe Accessed 29/06/2014.

ESPON — European Spatial Planning ObservationalNetwork, (2005a). *ESPON 1.1.1: Potentials for polycentric development in Europe.* www.espon.eu/mmp/online/ website/content/projects/259/648/index_EN.html [accessed April 2009].

Eurofound — European Foundation for the Improvement of the Living and Working Conditions, (2004). *Quality of life in Europe, first European quality of life survey 2003*. Dublin. www.eurofound.europa.eu/pubdocs/2004/105/en/1/ef04105en.pdf [accessed April 2009].

Eurofound — European Foundation for the Improvement of the Living and Working Conditions, (2007). *First European quality of life survey: key findings from a policy perspective*. Dublin.

Eurofound — European Foundation for the Improvement of the Living and Working Conditions, (2008). *Second European quality of life survey — first findings*. Dublin.

European Commission, (2014). Quality of life in European cities country report Romania. Flash Eurobarometer 366 - TNS Political & Social. http://ec.europa.eu/public_opinion/flash/fl_366_nat_ro_en.pdf

European Commission, EC., (2013). Perception survey in 79 European cities, Quality of life in cities, Luxembourg.

European Commission, (2013). European Union map 2013. http://ec.europa.eu/avservices/photo/photoDetails.cfm?sitelang=en&mgid=38#0

European Environment Agency, EEA., (2009). Ensuring quality of life in Europe's cities and towns, Tackling the environmental challenges driven by European and global change. No 5/2009, ISSN 1725-9177.

Floyd, M. F. and Johnson, C. Y., (2002). Coming to terms with environmental justice in outdoor recreation: a conceptual discussion with research implications. Leisure Sciences 24:59-77.

Forster, B., (1985). An examination of some problems and solutions in monitoring urban areas from satellite platforms. International Journal of Remote Sensing, 6, pp. 139–151.

Gedikli, B., (2011). Contribution of Open Spaces to Quality of Life & Urban Sustainability: an Example from Ankara, Turkey. Website: http://www.livablecities.org/presentations/contribution-open-spaces-quality-life-urban-sustainability-example-ankara-turkey Accessed 28/04/2014.

Getz, D., Karow, A. and Kielbaso, J. J., (1982). Inner city preferences for trees and urban forestry program.*Journal of Arboriculture* 8:258–263.

Greek Reporter, (2012) Worst Quality of Life is in Athens. http://greece.greekreporter.com/2012/12/04/worst-quality-of-life-is-in-athens/#sthash.uIw9rlWa.dpuf Accessed 29/06/2014.

Happiness Research Institute, (2014). The Secret Behind Those Happy Danes. http://www.happinessresearchinstitute.com/danish-happiness-explained/4578972751. Accessed 02/07/2014

Harner, J., Warner, K. W., Pierce J. and Huber, T., (2002). Urban environmental justice indices. Professional Geographer 54:318-331.

Harris, P.M. and Ventura, S.J., (1995). The integration of geographic data with remote sensed imagery to improve classification in an urban area. Photogrammetric Engineering and Remote Sensing, 61, pp. 993–998.

Huffington post, (2013). Has Copenhagen Found the Formula for a Safe City? http://www.huffingtonpost.co.uk/lizzie-davey/has-copenhagen-formula-for-a-safe-city_b_3615711.html. Accessed 29/06/2014.

Hull, R. B., (1992). Brief encounters with urban forests produce moods that matter. *Journal of Aboriculture*18:322–324.

I amsterdam, (2014). Shopping in Amsterdam. http://www.iamsterdam.com/en-GB/experience/what-to-do/shopping. Accessed 01/07/2014.

Jensen, R., Gatrell, J., Boulton, J. and Harper, B., (2004). Using Remote Sensing and Geographic Information Systems to Study Urban Quality of Life and Urban Forest Amenities. Ecology and Society 9(5): 5. [online] URL: http://www.ecologyandsociety.org/vol9/iss5/art5/ .

Kennard, D. K., Putz, F. E. and Niederhofer, M., (1996). The predictability of tree decay based on visual assessments. *Journal of Arboriculture* 22:249–254.

Laverne, R. J. and Winson-Geideman, K., (2003). The influence of trees and landscaping on rental rates at office buildings. *Journal of Arboriculture* 29:281–290.

Li, G. and Weng, Q. (2007). Measuring the quality of life in City of Indianapolis by integration of remote sensing and census data. International Journal of Remote Sensing, 28(2): 249-267

Liu, B.C., (1976). Quality of life indicators in US metropolitan areas: a statistical analysisPraeger, New York (1976).

Malta Today, (2013). Level of cultural satisfaction lowest in Valletta, survey finds. http://www.maltatoday.com.mt/arts/valletta_2018/30952/level-of-cultural-

satisfaction-lowest-in-valletta-survey-finds-20131024#.U7aYBvmSzzI. Accessed 04/07/2014

Massam, B. H., (2002). 'Quality of life: public planning and private living'. *Progress in Planning* 58 (3):pp. 141–227.

McPherson, E. G., Scott, K. I. and Simpson, J. R., (1998). Estimating cost effectiveness of residential yard trees for improving air quality in Sacramento, California, using existing models. *Atmospheric Environment* 32:75–84.

Megone, C., (1990). The quality of life: Starting from Aristotle. In: Baldwin, S., Godfrey, C., Propper, C. (Eds.), Quality of Life: Perspectives and Policies. Biddles, London, pp. 28–41.

Mennis, J., (2002). Using geographic information systems to create and analyze statistical surfaces of population and risk for environmental justice analysis. Social Science Quarterly 84:281-297.

Migration Policy Institute, (2012). Greece: Illegal Immigration in the Midst of Crisis. http://www.migrationpolicy.org/article/greece-illegal-immigration-midst-crisis. Accessed 29/06/2014

Mulligan, G., Carruthers, J. and Cahill, M., (2004) Urban Quality of Life and Public Policy: A Survey. Contributions to Economic Analysis Volume 266, 2004, Pages 729–802.

Nyström, L., (2011). Urban Quality of Life in Europe Reflections on the relationship between urban life and urban form. Theme: On the quality of the built environment, Nr 4: 2001.

OECD, (2014). Better Life Index. Luxembourg. http://www.oecdbetterlifeindex.org/countries/luxembourg/. Accessed 29/06/2014.

Papanikolaou, V. and Ntani, S., (2008) "Addressing the paradoxes of satisfaction with hospital care", International Journal of Health Care Quality Assurance, Vol. 21 Iss: 6, pp.548 - 561 http://www.emeraldinsight.com/journals.htm?articleid=1746777. Accessed 29/06/2014.

Pathan, S.K., Sastry, S.V.C., Dhinwa, P.S., mukund, R. and Majumdar, K.L., (1993), Urban growth trend analysis using GIS techniques: a case study of the Bombay metropolitan region. International Journal of Remote Sensing, 14, pp. 3169–3179.

Porter, R. and Tarrant, M. A., (2001). A case study of environmental justice and federal tourism sites in southern Appalachia: a GIS application. Journal of Travel Research 40:27-40.

Rogerson, R.J., (1999). Quality of Life and City Competitiveness. Urban Studies, Vol. 36, Nos 5-6, 969-985, 1999.

Republic of Slovenia, (2014). Ministry of the interior, Integration of Foreigners. http://www.mnz.gov.si/en/services/slovenia_your_new_country/integration_of_foreigners/ Accessed 01/07/2014.

Rogerson, R.J., Findlay, A.M., Morris, A.S. and Coombes, M.G., (1989). Indicators of quality of life: Some methodological issues. Environment and Planning A, 21 (1989), pp. 165–166.

Seik, F.T., (2000). Subjective assessment of urban quality of life in Singapore (1997–1998). Habitat International Volume 24, Issue 1, March 2000, Pages 31–49.

Sen, (2003). 'Development as Capability Expansion' in Readings in Human Development, S. Fukuda-Parr et al., (eds.). New Delhi and New York: Oxford University Press.

Sheets, V. and Manzer, C., (1991). Affect, cognition, and urban vegetation: some affects of adding trees along city streets. *Environment and Behavior* 23:285–304.

Steinberg, M.W., (2000). Making sense of environmental justice. Forum for Applied Research and Public Policy Fall: 82-89.

Study in Denmark, (2014). Copenhagen tops in quality of living for expatriates. http://studyindenmark.dk/news/copenhagen-tops-in-quality-of-living-for-expatriate-executives Accessed 29/06/2014.

Summit, J. and Sommer, R., (1998). Urban tree-planting programs—a model for encouraging environmentally protective behavior. *Atmospheric Environment* 32:1–5.

Sydor, T., Newman, D. H., Bowker, J. M. and Cordell, H. K., (2003). Trees in a residential landscape: a hedonic study of property values. *In* Proceedings of the

Southern Forest Economics Annual Workshop. March 16–18, 2002. New Orleans, Louisiana, USA.

Treitz, P.M., Howard, P.J. and Gong, P., (1992), Application of satellite and GIS technologies for land-cover and land-use mapping at the rural-urban fringe: a case study. Photogrammetric Engineering and Remote Sensing, 58, pp. 439–448.

Trip Advisor, (2014). Copenhagen: Health & Safety. http://www.tripadvisor.com/Travel-g189541-s206/Copenhagen:Denmark:Health.And.Safety.html. Accessed 29/06/2014.

Tutiempo, (2014). http://www.tutiempo.net/en/Climate/europe.htm. Accessed 29/04/2014.

Tyrvainen, L. and H. Vaananen., (1998). The economic value of urban forest amenities: an application of the contingent valuation model. *Landscape and Urban Planning* 43:105–118.

Ülengin, B., Ülengin, F. and Güvenç, U., (2001). A multidimensional approach to urban quality of life: The case of Istanbul. European Journal of Operational Research Volume 130, Issue 2, 16 April 2001, Pages 361–374.

UN Habitat, (2011). Climate Change, http://unhabitat.org/urban-themes-2/climate-change/. Accessed 21/05/2014.

UN Water, (2010). World Water Day, 2010. Clean Water for a Healthy World, UNEP, FAO Water. http://www.unwater.org/wwd10/downloads/WWD2010_LOWRES_BROCHURE_EN.pdf. Accessed 29/04/2014.

UN, (2006). Grand duchy of Luxembourg Public Administration. Country profile. Division for Public Administration and Development Management (DPADM), Department of Economic and Social Affairs (DESA). http://unpan1.un.org/intradoc/groups/public/documents/un/unpan023316.pdf

UNDP, (1994). Human Development Report, 1994. Oxford University Press, New York.

UNEP — United Nations Economic Commission for Europe, UN-HABITAT, (2008). Launch publication *Local action for biodiversity*.

UNESCO, (1976). *The use of socio-economic indicators in development planning*. Paris: UNESCO Press.

US Department of State, (2014). US passports and international travel. Greece: Safety and Security. http://travel.state.gov/content/passports/english/country/greece.html. Accessed 29/06/2014.

Velarde, M. D., Fry, G. and Tveit, M., (2007). 'Health effects of viewing landscapes: landscape types in environmental psychology'. *Urban Forestry & Urban Greening* 6: pp. 199–212.

Weber, C. and Hirsch, J., (1992). Some urban measurements from SPOT data: Urban life quality indices, International Journal of Remote Sensing, 13(17):3251–3261.

Welch, R., (1982). Spatial resolution requirements for urban studies. International Journal of Remote Sensing, 3, pp. 139–146.

Weng, Q., (2001). A remote sensing-GIS evaluation of urban expansion and its impact on surface temperature in the Zhujiang Delta, China. International Journal of Remote Sensing, 22, pp. 1999–2014.

Weng, Q., (2002). Land use change analysis in the Zhujiang Delta of China using satellite remote sensing, GIS, and stochastic modeling. The Journal of Environmental Management, 64, pp. 273–284.

Wien International, (2014). Culture: From historical heritage to thriving young art scene. http://www.wieninternational.at/en/content/from-historical-heritage-to-thriving-young-art-scene-en. Accessed 29/06/2014.

Wien, (2014). New survey on quality of life in Vienna. https://www.wien.gv.at/english/politics-administration/survey-quality-of-life.html

Wilkinson, G.G., (1996). A review of current issues in the integration of GIS and remote sensing data. International Journal of Geographic Information Systems, 10, pp. 85–101.

Wish, N.B., (1986). Are we really measuring the quality of life? Well-being has subjective dimensions, as well as objective ones. American Journal of Economics and Sociology, 45 (1) (1986), pp. 93–99.