

PART C

Spatial Analysis of Welfare Spread and Hotspots Identification

Saviour Formosa, Janice Formosa Pace

Introduction to the Spatial Research Process

The theoretical constructs discussed earlier in the chapter enabled investment into the study of crime within a spatial construct. The leap from non-spatial to spatial study led to the conceptualization of Environmental Criminology theory which can be defined as the study of crimes based on complex relationships structured through space and place (McLaughlin et al: 2001, 132). This includes the study of offender residence, offence location, offender-offence relationship and the myriad interactions between the three pivots of incidence (crime), space (relationship) and place (geographical location).

Each of these pivots are central to this research since crime in Malta has only been reviewed through its absolute levels and rarely statistically or even spatially, let alone through an investigation of the interactivity between crime, space and place. In view of this, this research took up the role to review the main theories as they apply to the Maltese context, as well as having investigated related theories that have built upon environmental criminology approaches. The study initially places emphasis on the 'wider' theoretical approaches such as those investigated in the early part of the 20th Century as based on offender rate analysis inclusive of residential construct as well as those taken up by revival research that has concentrated on offence rate analysis. The study then looks at the relationship between the two theoretical components through a detailed analysis of the land-use and social constructs of the Maltese Islands, basing its encompassing approach on Structuration Theory, Opportunity Theory and Routines Activity Theory. Each of these analysis types is essential to the study in order to establish the geography of crime in the Maltese Islands. Concentrating on one theoretical approach to the exclusion of the others will not do justice to understanding what makes a small island's crime tick.

Theoretical Approaches

Environmental criminology is the study of crime and victimisation in its relation to place and space. It is also described as 'the geography of crime and 'the ecology of crime', and attempts to develop an insight into the analysis of the relationships between place, crime and offending (Bottoms et al, 2001). Criminological studies have integrated the study of 'locational' crime to the activities of the individuals and organisations involved in the criminal activity, whether they are perpetrators, victims or observers.

The relationship of crime to place has been developed into one of space due to the multiple linkages making up social realities related to that place. The term spatial takes on a sociological meaning to cover crime activities in the holistic approach of what constitutes crime: why, when and where it occurs, with consideration given to the baggage that the offender carries. The spatial activities of offenders take on a new role due to the diverse links related to their activity, it is not simply a case of who commits a crime or where it occurs, but how the links enforce or make possible the activity opportunities.

Environmental criminology takes into account the boundaries within which people act, such as work spaces, meeting-points and recreational areas. It explores the spatial concepts inherent in the wider scenario of criminal activity, such as the widening reaches of offenders due to access to new technologies and inventions (better vehicles, instant mobile communication devices), as well as 'zoning' policies instituted by planning authorities and transport. Interesting to note is the opportunity for emerging crime scenarios where offenders engage in computer crime that does not recognise any border or state, with the offender using remote technology to commit an offence from fraud to pornography.

Historical Development of the Theory

The main influence for the study of environmental criminology grew from the work of the Chicago School of Sociology, with the main proponents being Shaw and McKay, and their 1930s' theory of social disorganisation. This was based on urban work by Park and Burgess in the 1920s, who created the concept of human ecology¹¹ (Maguire et al, 1997; 308).

¹¹ *Human Ecology is derived from the botanical sub-discipline of plant ecology. The concept was based on the analysis of the spatial and temporal relations of human beings, by the selective, distributive and accommodative forces of the environment (Maguire, 1997; 308). The theory was also called the 'ecology of crime' due to the relationship between crime and the urban environment.*

Burgess's zone model of urban development conceptualised that there are five concentric zones in a city (Figure C.1) where each zone is characterised by different types of residents who migrate away (transit) from the centre as their status improves. Over time, growing cities would engulf other peripheral towns that would become zones of transition themselves. Since urban areas contain disproportionately high rates of social problems, the larger the city the higher the concentration of poverty, welfare dependency and crime (Maguire et al, 1997; 308).

Figure C.1: Park and Burgess's zone model of urban development

The Concentric Zone Model:

1. Central Business District

2. Transitional Zone

***Recent Immigrant Groups*

- Deteriorated Housing
- Factories
- Abandoned Buildings

3. Working Class Zone

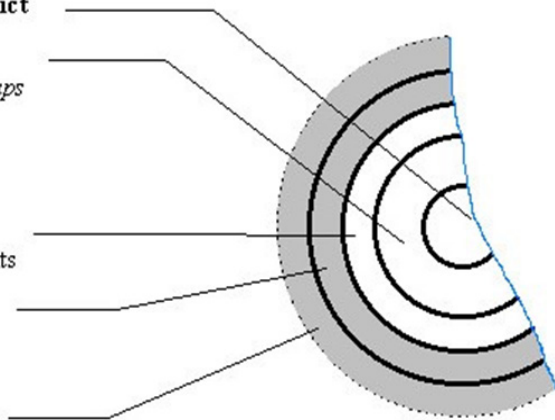
- Single Family Tenements

4. Residential Zone

- Single Family Homes
- Yards/Garages

5. Commuter Zone

- Suburbs



Source: <http://www.csiss.org/classics/content/66>

Urban ecology posits that there is a positive correlation between population density, city size and crime rates especially where population density is high and the possibility of bypassing danger is small (Messner et al, 1992; Entorf et al, 2000¹²). Entorf et al (2000) found a high association between high population density and violent crime, where an increase in one results in an increase in the other.

¹² cf *Bundeskriminalamt, Polizeiliche Kriminalstatistik (various issues, 1975-1996), Wiesbaden, Germany*

This is further enhanced due to the boundaries imposed by such phenomena as urban sprawl, where inelastic cities are created, that have no opportunity to keep on expanding. By the very fact that they are constrained by boundaries (such as sea, peninsulas, etc) they end up being even more segregated and higher degrees of poverty flourish (Shaw-Taylor, 1998). “A high number of persons per room would lead to “irritable, weary, harassed, inefficient” parents, a repulsive environment for children, and a consequently high level of juvenile autonomy, which in turn contributes to the development of gangs of delinquents” (Galle et al, 1972: 85; Harries K.D., 1974).

Wang (1999), on the other hand postulates that the shrinking living space in urban areas in effect reduces crime rates, stating that this could be due to the proximity of people to each other. Wang posits that an increasing population density is directly related to crime reduction. However, this may also increase the possibility of unknown crime as well as the ‘dark figure of crime.’ These two opinions seem contradictory but are a source of debate on the possible outcome for future mega-cities and what they are expected to experience. Further study is needed in this area especially on population density and the relationship to crime. This is particularly due to the fact that areas with a high population density offer a higher concentration of crime opportunities and effectively higher potential crime targets (people and property).

The Next Steps

The early 1920s research led to a number of theories, namely the ‘Culture Conflict Theory’ of Sellin in the late 1930s and Sutherland’s ‘Theory of Differential Association’ (Maguire, 1997: 308). Sellin, followed by Vold, Dahrendorf and Turk based their theories on the issue of diversity in an industrialised society¹³. Such diversity causes conflict to materialise moving through such constructs as conduct norms required from citizens coming into conflict with the prevalent crime norms. Dahrendorf’s move from a Marxist concept of material hases-haves-not to power hases-haves-nots easily highlights the realities of society, based on the power- holding/hoarding elite and the powerless masses. Sutherland stated that through social interactionism, offenders learn favourable definitions through mixing with others who find lawbreaking acceptable (Hochstetler A., 2002). However, the main impact was produced by Shaw and McKay since their research concentrated on the analysis of Chicagoan juvenile crime in the early 1930s through the mapping of offender residences at different points in time.

¹³ <http://www.umsl.edu/~rkeel/200/culflic.html>

The Chicago researchers ventured further than just spatially analysing the offender community through a quantitative study. They also looked into the social aspect of the offenders and what was termed 'low life' in the cities. The second aspect of the study concentrated on qualitative case studies and life histories. They managed to bring together these two diverse methodologies as well as integrating the new concept of spatial analysis in crime.

Shaw and MacKay (1942) identified the existence of delinquent subcultures, which adhere to a set of norms relative to that subculture. Shaw and McKay noted that the cultural heterogeneity and constant population movements in 'zones in transition' influenced delinquency through a process termed 'social disorganization'. They tried to decipher how the conventional value systems may not adhere to all the units within the same entity, mainly where there was a lack of structurally located social-bonds that encourage legitimate and discourage illegitimate behaviour. Where these norms break down, disorganisation occurs.

This social disorganisation process occurs mainly through the concentration of persons who are liable to offend in specific areas of a city or town with a high degree of illegitimate enterprises and immoral worlds (Finestone, 1976). In this situation, the structure of the locality starts to deteriorate due to incapacity of the traditional institutions to maintain control and solidarity. These institutions include the family, the church and the local community. Due to lack of common and non-delinquent values, the areas in question become hotspots for crime.

The central discoveries emanating from Shaw and McKay's research was based on three concepts (Finestone, 1976: 25):

- Rates of juvenile delinquency conformed to a regular spatial pattern, higher in the middle zones and tended to decline with distance from the centre of the city;
- The same spatial pattern was shown by many other indices of social problems in the city:
- The spatial pattern of rates of delinquency showed considerable long-term stability, even though the nationality makeup of the population in the inner-city areas changed from decade to decade.

The theory of social disorganisation has had both attractors and detractors, the former due to its solidity in relation to the offender aspect of the theory, whilst detractors criticised the fact that crime may not only be a case of disorganisation, but may be a case of organisation (Whyte, 1943 in Bottoms and Wiles, 2001). An organisation may offer social capital¹⁴ to its members but disrupt the social cohesion¹⁵ of the area it operates in (Kawachi et al, 1999). As an example, one can take the case of the Mafia, which is a very organised structure both in the USA, China, Albania, and Sicily and is emergent in countries such as Taiwan (Snodgrass, 1976; Wang, 1999). Matza (1964) claimed that the social disorganisation theory is over-deterministic and over- predictive. There were few developments in this area of study following a peak in interest in the period between the two world wars.

From the Chicago School to revival research

Following on the work by Park and Burgess, and, Shaw and McKay, other researchers such as Tibbits, McKenzie, Anderson, Wirth, and Zorbaugh collectively developed the first large-scale theoretical approach to the study of the nature of crime and American urbanism, an approach that was spatial as well as sociological (Georges-Abeyie et al, 1980: 1). The developments over the decades lead to the development of crime pattern theory that looks at both the established and changing nature of crime. Crime patterns can only happen due to the constructs that make them, inclusive of the location they occur in, and the sociological and psychological relationships to space. Heal (2001, 268) states that the imposition of crime pattern analysis on recorded crime statistics helped researchers to make a leap towards understanding crime and space and well as fill in information gaps. He states that the early 1980s' work enabled the development of crime pattern analysis, however the main limitations were those imposed by small samples and observed pattern reliability and stability. This also included limited attempts to analyse crime patterns with socio-demographic data. Over the last decade these issues have been resolved or facilitated through the use of widely-available datasets and spatio-statistical software.

¹⁴ *Social Capital*: "Those features of social organisation, such as networks, norms of reciprocity, and trust in others, that facilitate cooperation between citizens for mutual benefit" (Coleman, 1990; Putnam, 1993; Sampson, 1995).

¹⁵ *Social Cohesion*: the process describing "communities with high stocks of social capital and low social disorganisation" (Wilkinson, 1996; Kawachi and Kennedy, 1997; Sampson et al, 1997).

Other researchers covered different socio-economic/socio-cultural aspects. Schmid (1960) identified 6 types of hypothesis that could be used to account for patterns of crime.

These were: i) the “ecological segregation/contingent control” hypothesis where high frequencies of crime reflect opportunities, ii) the “drift” hypothesis - certain areas attract offenders, iii) the “differential association/cultural transmission” hypothesis - areas characterised by distinct sub-cultural patterns of delinquency and crime, iv) the “social alienation” hypothesis - areas characterised by social problems, v) the “anomie” hypothesis - delinquency is a disruption of the collective order, and vi) the “illegitimate means/differential opportunities” hypothesis - differentials in access to illegitimate means.

Other sociological theories on delinquency areas are based on a threefold structure (Gill, 1977):

i) the “ecological approach” investigating why people live where they do; ii) the “sub-cultural approach” that analysis how localised and distinctive life styles exist; and iii) the “social reaction approach” that highlights how labels are given to individuals and areas.

Practical problems exist where the question of the ecological fallacy arises. This is the erroneous assumption that an overlap of problems at an area level (e.g. high levels of criminal victimization and high unemployment) also occurs at the level of the individual household (e.g. all victims of crime are unemployed). The relationship between victimization and unemployment can only be revealed through surveys that record the employment status of victims of crime.

Early environmental criminology studies suffered from this fallacy which assumed that “the descriptive characteristics of areas having high proportions of offenders resident identified both areas where crime control programs should be undertaken, and the individuals who were likely to commit crimes” (Brantingham et al, 1981:17)¹⁶. Every area hosts non-delinquents though studies concentrate on the delinquents rather than the whole.

¹⁶ In Malta, an Ecological Fallacy would serve such statements as stating that Libyans commit more crime as they reside in a small area in Bugibba when in fact an analysis of individual basis (eg crime rate per 100,000 for Libyans as against for Maltese) may show otherwise.

An area hosting delinquent residents has a good chance of being stigmatised and labelled. Mays (1963) argues that whilst there would still be significant numbers of persons who would not be offenders, but there are sufficient numbers who are criminal, then that area as a whole could be termed as “delinquency producing”. Where crime rates are high, potential offenders realise that foregoing an opportunity means that someone else will take it whilst the fact that they act may make them heroes in their community as a sort of badge of honour (Schrag et al, 1997). Some offenders anticipate arrest even if they do not commit a crime, thus the incentive is doubly attractive, further stigmatising an area.

Dunn (1980) looks at the association of land use with offence occurrence and offender residence areas, in line with Shaw’s (1929) study of delinquency areas. He states that “crime... consists of a complex set of transactions of individuals with their environments ... which vary in setting, time, objects, participants and activities” (Dunn, 1980). He identifies four ways to look at in the study of crime and land use: i) offence location crime in urban places, ii) areas with commercial activity and high-density residential development in poor condition, iii) quality of residential land use (substandard housing), and iv) land uses related to specific offences, due to different targets reflecting the area function or structure.

McLaughlin (2001: 133) identified four new spatial approaches to the topic: i) mainly the spatial distribution of crime, ii) risk of crime victimisation in space, iii) spatialised fear of crime and iv) particular crime flows from one area to another.

Giddens’ Theory of Structuration (Giddens, 1984) has again brought to the fore the agenda that sociological studies must be based on the analysis of ‘social practices ordered across space and time’, which theory reflects the take-off point of the Chicagoan School. Bottoms and Wiles (1997) have taken up the concepts of space and time as the major point of departure for environmental criminology studies, stating that Giddens’ concept is central to its theoretical base. They bring as evidence his explanations on humans as knowledgeable agents, practical consciousness, his move away from the traditional dualism of objectivism and subjectivism, the duality of structures as both motivators and constraining agents, as well as the importance of routine activity. Structures result in a practical consciousness that is able to follow regular patterns in space and time. One needs to understand how place, over time, is part of the practical consciousness of social actors who engage in behaviour, including actions defined as criminal (Bottoms and Wiles, 2001: 19).

Pivots of Crime

The offender residence perspective allows researchers to analyse patterns in residence preference, areas that are more attractive to offenders based on their particular norms and values. An analysis of the diverse social variables would describe the activities that offenders partake in at individual, co-familial and community-career levels.

Following the relative superiority of Shaw and McKay's theory, there was a lull of fifty years in spatio-temporal crime analysis until the 1970s when a revival of interest occurred from another aspect: offence distribution. Shaw and McKay's work had concentrated on offenders and their life-histories as well as the relationship of their offences to the place¹⁷ they reside in.

The refocusing of the theory indicated that there is a difference between offender residence and offence locations. Offenders aggregate in specific residential areas for social, economic and cultural reasons. Squatting possibilities, vacant housing in stigmatised areas, little financial clout to move to better areas are but a few examples. On the other hand, offence areas posit other scenarios. They could be either the same areas of residence, areas in the vicinity of the offender's day-to-day activities, areas of recreation and well as opportunity-presenting areas.

The 1970s research introduced studies on 'defensible space' (Newman, 1973) and on the constitution of crime: mainly the law, offender, target and place of crime (Brantingham et al, 1981). However, they were criticized as they left out the basic tenet of Shaw and McKay's effort: the offender's residence. This said, they do state that movements bring offenders and their targets together (Bottoms and Wiles, 1997).

Shaw and McKay's theory of concentric ring zonal distribution of crime was challenged both outside the USA and in Chicago itself after World War II (Taub et al, (1984) in Bottoms and Wiles, 1997:331; Bursik (1986) in Bottoms and Wiles, 1997:331). The 'old areal regularities broke down' and the 'theory of concentric rings was discarded together with the formulation of urban process that went with it' (Bottoms and Wiles, 1997: 331). One has to note however, that Shaw and McKay's theory of Social Disorganisation is still supported.

¹⁷ *Sociological concept of place: the social organisation of behaviour at a geographical place (Bottoms and Wiles, 2001).*

The new surge of research in the 1980s and 1990s identified a number of issues that showed variations from the classical circular concentric zone theory. These variations may have been due to the fact that European urban areas such as Croydon in London (Morris, 1957 in Bottoms and Wiles, 1997, 312) and Sheffield (Baldwin and Bottoms, 1976 in Bottoms and Wiles, 1997, 312) were built for different purposes, with the higher status areas concentrated around the city-centre and in other formations that do not conform to the Chicagoan model where the centre was industrialised.

Generally the contrast is between cities such as Paris and Glasgow that have disadvantaged areas on their periphery and those that conform to the Anglo-American pattern (e.g. London, Chicago, and Los Angeles) where deprivation is in the inner cities and affluence is in the suburbs.

Recent studies have focused on the housing market and came up with an analysis of the direct and indirect consequences of the operation of the market on crime. A study in Sheffield in the late 1960s (Rex and Moore, 1967) launched a series of studies in the field that brought up new concerns on how the modern industrial situation affects the crime patterns in both rust-belt and sunrise cities (Craglia et al, 2000). Industry is becoming dispersed and less zonal and is challenging the concentric-ring theory (Harries et al, 1998), especially where the dispersion could be effective in reducing crime (Wang, 1999). Studies are needed in the latter to identify if dispersing industry actually results in reducing crime or else in dispersing it over a wider area.

Harris et al (1998: 623) state that the zonal model had two major faults. One was that the divisions were based on the social, political and economic fault zone between the city and suburbs. The other fault was that the zonal model misrepresented Burgess's model and the cities and suburbs of his day. Hoyt (1939 cf Harries et al, 1998) indicated that single family units lived in the periphery and in the suburbs, whether the latter were industrial or residential. They did this based on their consumption patterns (Douglass, 1925 cf Harries et al, 1998).

Another input to the theory looked at the housing market which is intrinsically linked to offender rates. As dwellings are occupied according to the residents' income, households of similar status tend to group together. Higher status groups tend to segregate themselves into small close-knit areas and try to keep other categories from moving in, whilst lower status groups tend to be dispersed (Ladanyi, 2001). In his 1979 group status analysis of prisoners in Budapest, Ladanyi identified that inequality changes with time and new forms of crime manifest themselves to reflect structural changes. In this study, areas

zoned for agriculture and industry showed high offender rates as against the highest status parts of the city exhibiting very low proportions of detected and convicted offenders.

The higher-status segregation makes it difficult to separate social class from area of residence (Pain, 1997). This is also marked where the middle class is conscious of being suburban and aggregates around the city periphery (Singleton, 1973). Where middle class values start to decline, a high incidence of delinquency and crime in urban settings is linked to the loss of social buffers (Kawachi et al, 1999). Schnore (1963 in Harris et al, 1998) claimed that income, education and occupational standing increased in proportion to distance from the urban conglomeration, moving out from inner poverty city centres to outer affluence (Jackson, 1985). An increase in delinquency is found in the population of low-income earners, the elderly and poorly educated people demanding additional social services (Goldfield et al, 1979 IN Harries et al, 1998).

Offenders and Offences

Offender Rates: An Analysis

The offender analysis looks at the crimes committed by an offender based on his/her location of residence and role in crime. Whilst crime analysis concentrated on community studies between the 1920s and 1940s through work carried out in Chicago by Shaw and McKay, the emphasis slowly changed to an analysis of individual behaviour. This has been recently revived by looking out for the “criminal careers” of communities that could enhance the understanding of crime and its causes (Reiss, 1986). Just as one describes individual offender crime careers, Reiss (1986) argues that one could extend this concept to the communities that experience changes, through analytic studies of both offender rates and offence rates (Schuerman and Kobrin, 1986; Bottoms and Wiles, 1986, 1992; Bottoms, Claytor and Wiles, 1992).

Residential Issues and Offenders

The local housing market came into focus through such work as Rex and Moore’s (1967) Sheffield study where they analysed housing patterns through a Census Enumeration District analysis. The results showed that there was a correlation of housing type with offender rates (Baldwin and Bottoms, 1976). Major variations occurred within the areas with a predominant housing type, which was further analysed to reveal that it is different from the Chicago study; there was no relationship between the rate of

tenant turnover on estates and offender rates (Baldwin and Bottoms, 1976). This study and another conducted by Wikstrom in 1991 in Stockholm (Wikstrom, 1991) indicated that the studies went beyond a simple social-class analysis since they included such external elements as landuse. Wikstrom's Stockholm path- model approach hypothesised that housing tenure variables would feed through to population composition variables: in effect half the area offender rates variation in several districts was explained by housing type and social composition. This created a further inroad into the study of offenders and the locality they reside in¹⁸.

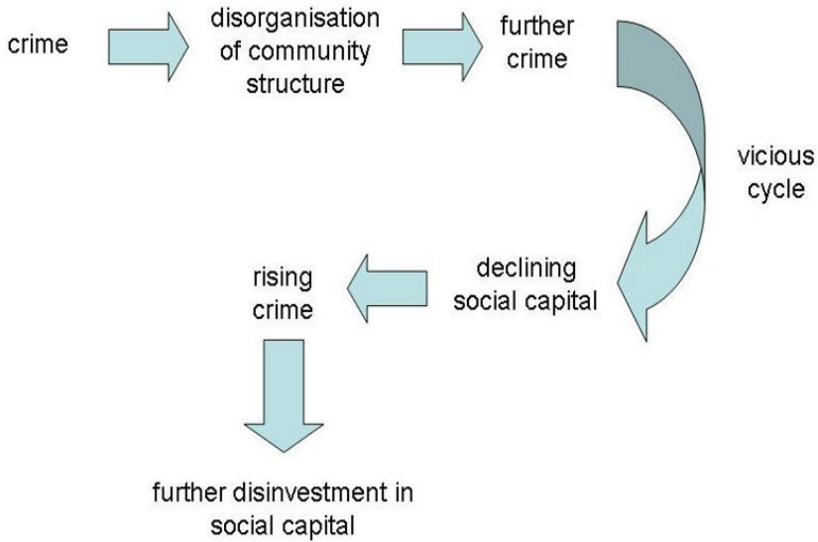
Schuerman and Kobrin (1986) looked at the physical makeup of the locality and the shifts in land-use, particularly the housing sector, as well as demographic changes, mainly in household and absolute population structure. They argue that even small changes in land-use can bring about a change in population structures, implying that an increase or decrease in the real-estate purchases or renting could change the framework of operation in a spatial area. The same changes reflect who enters or exits the locality and in turn changes the offender/offence relationships related to that area. An increasingly degraded area would result in a reduction of rents and an influx of low-income earners effectively changing the make-up of that community (Ellul, 2003).

A classic example assessing the different types of dwelling zones was based on the analysis of two towns for three categories of housing: low-rise council, high rise-council, and privately rented areas. The classic study was the "Stonewall and Gardenia" housing estates in Sheffield case study (low-rise council) where Gardenia had 'tipped' in the 1940s. Once 'tipped' it continued to attract categories of persons who were prone to offending due to the allocation of homes to such persons. There were also indications that the negative reputation of this town created an effect on its residents, schools and networks. Stonewall did not go through the same changes and retained its crime-free structure (Bottoms, Mawby and Xanthos, 1989).

¹⁸ *This situation can be tackled in a number of ways. One study carried out in Public Housing Authorities in the USA (Hyatt et al, 1999: 18) looked at the housing setup within the authorities' jurisdictions and carried out concentric ring analysis based on a series of six 50m interval buffer zones. They introduced a new factor called blockface analysis where crimes occurring in areas facing the authority boundaries are also analysed. The theory assumes that crime does not stop abruptly around these housing areas but continues further away from the immediate boundary area.*

Neighbourhoods ‘tip’ towards crime through a process described by the ‘broken windows hypothesis’ where a locality’s crime status deteriorates over time (Wilson and Kelling, 1982). The components keeping an area together include the offender’s role, power with respect to crime by others, and the extent of the criminalisable space (Van der Wurff et al, 1989: 144-145). The rate of change of signs of disorder (broken windows, housing abandonment, litter and graffiti) is relative to the process where the community loses control. Once the community abandons control, vandalism occurs and an unintended invitation is given to persons involved in the crime trade to move in. Skogan (1986, 1990) investigated this decay and called it the ‘spiral of decay in American Neighbourhoods’, where the physical (abandoned or ill-kept buildings, etc) and social constructs (public drinking, prostitution, etc) are strongly correlated.

Figure C.2: Kawachi et al’s description of the Social Capital Disinvestment



Source: Adapted from Kawachi et al, 1999, pg 727

The fear of offenders leads to a vicious cycle until no investment in social capital occurs through withdrawal from community life, out-migration, loss of jobs, loss of networks, fewer opportunities for network and social organisations and exit of businesses (Figure C.2) (Kawachi et al, 1999; Farrall et al, 2000). This effectively results in a perpetuating situation of decay and where such areas remain disorganised for long decades.

Offence Rates: an Analysis

Offence-location research provides valuable data on the patterns of crime by type, time, and location but also poses a problem of relationship. How does one equate the issue of offences with the area in question as well as the offender committing the crime?

There are various issues at stake in offence analysis, particularly due to its complex structure of what classifies an area as a crime attractor or crime generator which issues are investigated in chapter 9 of this study. Offences occur due to the intrinsic relationships between the offender and the offence: is it a crime of chance or a crime of choice? Does an offender choose to carry out an offence in an area because of its affluence (such as a villa area) or because of its inherent social structure such as that where there is no social cohesion and social capital?

Crime attractors offer high-level visual, psychological and sociological imperatives to offenders to commit crime therein such as opportunities provided by sparsely-populated residential areas. On the other hand crime-generators may be a result of land-use designation such as in recreational areas that provide easy-target opportunities such as vehicles, highly-dense patron-packed bars. Irrespective of the type of crime-function, the offender has a role to play, mainly due to his/her modus operandi and the relationship to the crime target, whether kick-started through routine activity, or specific target hot-spotting. The research questions investigated in chapters 8 and 9 specifically target areas within the Maltese Islands in order to investigate their potential as attractors or generators of crime.

In order to identify specific issues that help offenders to operate within the attractor-generators pivot, in-dept studies are required such as those reviewed in Stockholm by Wikstrom (1991) and in Germany by Entorf et al (2000).

Per-Olaf Wikstrom in a study of offences in Stockholm in 1991 (Wikstrom, 1991), considered the fact that the measurement of areal offence rates poses quite a problem due to the use of resident population as a denominator (Harries, 1981). Stating that crime in a historic town is related to the number of its residents is erroneous especially where most crime results from theft of for example cars in car-parks reserved for tourists visiting that area.

Wikstrom (1991) was building on a study in Sheffield where crime in traditional cities tends to concentrate around the centre of the city, particularly for violence in public, vandalism in public, and theft of and from cars. Bottoms and Wiles (1991) stress that though this is the case in most cities; one has to keep an open mind that changes in land-use could bring about changes in the distribution of these offences. Through his study Wikstrom showed that residential burglaries tend to occur in areas of high socio-economic status, especially those that are nearby to areas with high offender rates. He indicated that there are specific geographical skews in the patterning of offence locations and that these can vary significantly by type of offence.

High income was found to be positively correlated to crime rates in Germany, indicating that richer persons are better targets (Entorf et al, 2000). This is due to the higher incentives that persons living in disadvantaged areas have (Kosbela and Viren, 1997). The higher the income inequality the worse the legal income opportunities become and in turn better illegal income opportunities are sought.

Can one be studied to the exclusion of the other?

The last two decades of the twentieth century brought the offender and offence-based theories together. Though both can be studied in isolation, the main progress being carried out by contemporary criminology is the study of this relationship.

Such a process of understanding both offender and offence relationships can be strengthened through a review of the related theories of Structuration, Opportunity and Routine Activity.

Related Theories

Structuration Theory

There are various theories of crime that have attempted to call themselves general theories of crime. Few have managed to integrate the issues of crime with the issue of space. For example those of Braithwaite (1989) and Gottfredson et al (1990) rarely cover the issue of spatiality, concentrating on issues such as social control (cf Bottoms and Wiles, 2001 IN Evans et al 2001: 12). One of the closest approaches to an integrated approach to Environmental Criminology is Structuration Theory proposed by Giddens. It is also a popular debating issue between human geographers and social theorists (Gregory and Urry, 1985).

Environmental criminology studies have not always looked at the collective study of offence and offender rates. Each has been researched to the exclusion of the other. The Chicago School concentrated on offender studies whilst others (Newman, 1972) have focused on offences. Giddens went beyond the classic theories as posited by the founding fathers of sociology and argued that these two tenets cannot be and must not be studied in isolation, rather they have to be considered as inseparable (Giddens, 1984: 2). For him societal change can only occur as 'social practices ordered across space and time' which evolve through the activities of human beings as knowledgeable agents acting in the context of social life. He also looks at structures and how they exist within, constrain and enable social actions as well as the issues of routine activity, social change and social processes.

Giddens based his analysis of the routinised character of daily-life space-time on Hagerstrand's concept of time-geography (Giddens, 1984: 111). Hagerstrand had analysed movements of individuals in a local parish in Sweden over their lifespan and composed time-space analysis through charting their movements. The issue deriving from these movements indicate that there may be patterns to the way people conduct their lives and this includes offenders in their relationship to the offence location. Carlstein (Giddens, 1984: 116) indicated that these 'ecological constraints' derive from specific modes of 'packing', mainly the packing in small areas of materials, artefacts, organisms, and human population in settlement time-space, and their activities in the related space. This results in a 'clustering of institutions' across time and space, giving rise to offender locations that may not be desirable to reside in and offence locations that are attractive to offend in (Giddens, 1984: 164). Structuration theory in effect offers an understanding of the ongoing processes of interaction between the elements making up a crime. Any model of crime analysis should look at these in an understanding of the spatial aspects of offending and offences and their relationship.

Opportunity Theory and Routine Activity Theory

Offenders commit crime for a variety of reasons, varying from the need to survive to taking advantage of opportunities that present themselves. Two theories that investigate these reasons are Opportunity Theory (Bursik and Grasmick, 1993; Felson and Clark, 1998), and Routine Activities Theory (Cohen and Felson, 1979; Ekblom, 2001). Each fits in with environmental criminology theory in that the fundamental issue at stake is space: where does an opportunity present itself and how does one get to make use of an opportunity and act accordingly, if not through the familiarity of the spaces inherent in his/her cognitive mindmap?

Opportunity Theory looks at crime from the point of view of the offender: the opportunity to carry out an offence and; the level of target attractiveness of the area. Such issues posit fundamental questions, especially in determining what a researcher must look for in determining attractors. When does a car become enough of an attraction to steal and for what purpose? An offender looking for a car for 'mere use'¹⁹ may not be attracted by a specific make of car, but a car thief looking for a lucrative catch may visit areas of high affluence. Another aspect that makes an area attractive relates to the accessibility of the location. The accessibility issue leans on four parameters; visibility, ease of physical access, the absence of adequate surveillance and, the modus operandi of the target. Areas within easy reach of transport routes would pose a hazard for residents due to the opportunity offered (Mayhew, 1976). Brantingham and Brantingham (1984) further argue that all individuals carry in them a cognitive map of the city and engage in search patterns to identify areas of interest. Bottomley et al (1986) state that it is difficult to decipher whether the increase in the number of crimes is due to the form of increased opportunities such as the car or a decline in respect for property.

Accessibility becomes an issue due to the offender's knowledge of both the real physical and cognitive space (Beavon et al, 1994). Potential offenders will not offend in previously unknown areas but where criminal opportunities intersect with their cognitively known areas (Bottoms and Wiles, 1997: 324). Rengert (1980: 21) adds that 'the relative magnitude of an opportunity is proportional to its relative degree of accessibility which will partially determine its probability of being exploited'. This indicates that even though an area may be affluent or has commercial aspects that could prove lucrative to a potential offender; its accessibility plays a major part in the commissioning of an offence. Also, a high-attraction area (such as a secluded villa area) that has few visible people tends to suffer more crime since there would be fewer witnesses (Jacobs, 1961).

¹⁹ *Such as joy-riding.*

Newman (1972) argued that the solution to this situation would be the creation of territorial subdivision, whether conscious or unconscious, to identify outsiders. This occurs where residences along less accessible streets are not familiar to non-resident criminals and so will experience less burglary episodes (Bevis and Nutter, 1977).

Further developing this area of research within the domain of situational crime prevention, Felson and Clarke (1998: 9) posited their ten 'principles of crime opportunity theory' which outline those issues that can be considered as the 'root causes of crime' as well as leading towards reduction measures:

- Opportunities play a role in causing all crime
- Crime opportunities are highly specific
- Crime opportunities are concentrated in time and space
- Crime opportunities depend on everyday movements
- One crime produces opportunities for another
- Some products offer more tempting crime opportunities
- Social and technological changes produce new crime opportunities
- Opportunities for crime can be reduced
- Reducing opportunities does not usually displace crime
- Focused opportunity reduction can produce wider declines in crime

Source: Cohen and Felson, 1998, pg 9

Opportunity Theory has its own sister theory entitled Routine Activities Theory which looks at the day-to-day activities of victims and offenders in relation to the location and timing of offences. Crime is closely related to the offenders' activities as well as the activities of potential victims. New opportunities offer themselves, such as attacks on the elderly. Perceived high standards of living produce an opportunity to those who normally act around a few spatial locations either as part of their day-to-day activities such as a work transport route. The mere fact that an action is a routine activity implies that there is an element of social activity – there is an interaction that is being portrayed (Cohen and Felson, 1979). Furthering this concept, Felson and Clarke (1998) highlight the fact that there is a veritable target (as preferred over victim's) role in creating opportunity through their VIVA model (value, inertia, visibility and access).

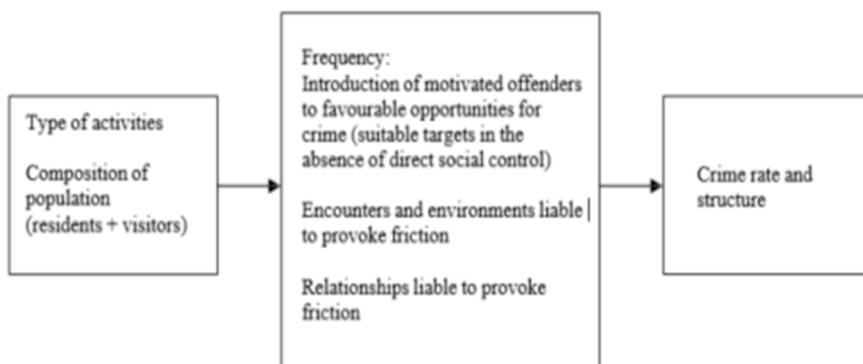
These routine daily activities fit into the framework set up by Giddens in his theory of Structuration, due to the fact that the social action being interpreted needs a human being who relates repeatedly to a social structure in a particular place (Giddens, 1984: 110). His concept of 'locale' looks at a wider aspect than just place, integrating the interactions occurring therein. An analysis of crime in particular areas (by type of crime and activity in that area, for example retail) may bring up specific time-periods when offences occur. "The probability that a violation will occur at any specific time and place might be taken as a function of the convergence of likely offenders and suitable targets in the absence of capable guardians' (Cohen and Felson, 1979).

Such a description helps to counter the preoccupation that studies such as the Minneapolis study conducted by Sherman et al (1989) queried when they posited that 'places cause crime' as they are criminogenic generators of crime. This is different to the concept that places host crime (serving as attractive receptors of crime) due to the interaction of a routine activity by a potential offender and that same place. The fact that persons go to have a 'good time' in recreational places does not mean that the area creates a potential murder, since the interactions of the offender and victim could have occurred anywhere (Karlsson, 1998).

Wikstrom's approach is a combination of opportunity and routine activity theory where he introduced the concept of time-crime. He states that the inner-urban activities fluctuate over time and space to the extent that different times of the day experience different activity types and frequencies as reflected in Figure C.3 (Wikstrom, 1990: 23). Each of these components can only be studied by understanding the localities they occur in: the physical structure and the prevailing social issues that term an activity as a crime.

When reviewing the various pivots of crime from either an opportunity or routine viewpoint together with the social structure it occurs in, Ekblom's (2001) Conjunction of Criminal Opportunity theory provides a unified approach towards what is eventually the main aim of criminological research: prevention and reduction of crime as well as promoting to the fore community safety (Figure C.4). Its target is the identification of all the issues that occur at a specific point in time which make criminal occurrence happen. This leads to action on assessing risk of crime (prevention), actively aiming to reduce (number and seriousness) as well as enhancing social activities through quality of life and improved state of existence.

Figure C.3: Wikstrom's model of variations in and types of crime in the urban environment

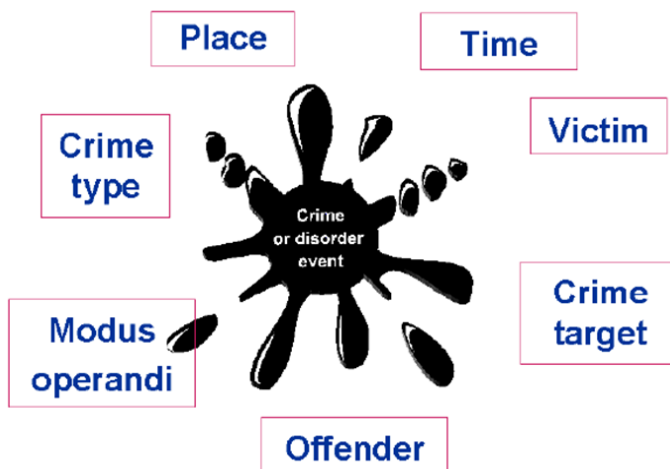


Source: Wikstrom, 1990: 24 IN Bottoms and Wiles, 1997:328

In effect, Ekblom outlines a strategy that ropes in the main tenets of opportunity theory, routine activity theory as well as Structuration aimed at developing preventive strategies that have an impact on the ground through such actions as that outlined in his CLAMED model. The latter model takes on the role of task Clarification, preventive agent Locating hence Alerting them to the crime problem whilst Motivating them to take on the crime reduction task, at the same time Empowering and Directing them to take on capacity issues and to follow guidelines, select targets or implement particular activities. The latest update to the implementation of the theory is the 5Is²⁰ initiative (Intelligence, Intervention, Implementation, Involvement (of the community) and Impact).

²⁰ <https://www.gov.uk/government/policies/crime-prevention>

Figure C.4: Ekblom's Problem Space: A Map of Symptoms and Crime Reduction Objectives



Source: Ekblom (2001), pg 20

In conclusion, the review of the main theories that have promoted environmental criminology to its current status has shown that in its ultimate stage, crime can be analysed in its spatio-temporal constructs and based on the findings strategies can be implemented to impact and reduce crime occurrences.

Physical and Social Issues

Environmental criminology research with its related theories and components as described above would be bare without a review of two main related components: land use and social issues. Each places an impact into the analysis of what constitutes the environment and how crime interacts with each.

Land-use component

The relationship of crime and landuse has been recognised since the thirteenth (13th) Century when Edward I tried to control crime by introducing the Statute of Winchester in 1285. This Statute covered instructions on the communities' obligations with regard

to possession of weapons and to maintenance of the King's peace (Summerson, 1992). UK street widening in the nineteenth century led to the dispersion of concentrated criminal elements (Beavon et al, 1994). In more recent post-war times, urban development was based on the automobile and mass transportation that led to changes in opportunities for crime due to the concentration of people in specific areas. As an example, arresting an offender committing snatch and grabs in the vicinity of subway exit-points would be very difficult to conclude as it provides a number of escape routes (Brantingham et al, 1984).

Urban planning and the subsequent impact on crime were brought to focus in the quest for 'livable streets' (Appleyard, 1981). Like the theory of social disorganisation before it, the analysis of street systems and their associated land-uses was shelved for over half a century but new studies have indicated that street development concentrates on increasing the carrying capacity but neglect the social and environmental costs (Appleyard et al, 1972). In the urban world, streets and roads play a major role since their setup constrains flow and accessibility to offenders in their routine activities whilst inducing an opportune environment for offending.

Urban planning clusters offence targets in specific areas, through increasing or reducing accessibility for opportunities. As against opportunities in rural areas where a person is more conspicuous, urban areas become attractive to offenders especially where an area becomes prosperous (Entorf et al, 2000).

Zoning practice and urban design has been found to alter crime patterns due to the presence of high volume land, accessibility, design, private and public spaces, and a host of other causes (Beavon et al, 1994; Pain, 1994).

Social component

Socio-economic studies and its major component, deprivation, play an important part in understanding social structures and their relationship to studies in crime. Deprivation has evolved from the study of poverty to a wider 'contextually dependent' concept with the inclusion of issues as accessibility, isolation and peripherality (McCorquodale, 2001). The use of spatial analysis in GIS to measure poverty takes on a significant role as it brings the traditional 'poverty' studies in relation to offence location by showing the mechanisms each operates in: what is the background of an offender and where does he/she prey?

Deprivation comes in two forms: absolute or relative. Absolute deprivation refers to the unavailability of resources to meet the basic needs for healthy living and is the result of various factors particularly unemployment, lack of housing and schooling as identified by the UN Human Development Index, which indicate a 'weakening social fabric' and in turn a deteriorating social cohesion. There is little evidence to suggest that absolute deprivation is an automatic precursor for crime as against relative deprivation that may in 'certain conditions lead to crime' (Young, 1997: 488; Lea et al IN Muncie et al, 2000).

Relative deprivation is the result of poverty where some citizens have significantly less access to income and wealth than others in their society. Crime is most prevalent in societies with these disparities, even in areas where absolute poverty is non-existent (Kawachi et al, 1999). Such societies move away from integrative social norms and in turn resort to an anomie situation (Merton, 1968).

Left realist criminology²¹ asserts that the realisation that social 'goods' are within physical reach but grossly out-of-reach from acquisition by relatively-poor persons may in effect cause crime. Relative poverty and deprivation from 'goods' may lead these persons to attempt to make up for this perceived lack by 'acquiring' the 'goods' illegally.

Relationship of social issues and landuse to crime

Kawachi et al (1999), use crime as an indicator of collective social well-being both in the social and health aspects, by analysing the degree of relative deprivation and the degree of cohesion in a society. The former looks at income inequality and the latter looks at the social relationship/social capital in that society. They state that crime is a mirror of the quality of the social environment and use state-level ecologic data to analyse deprivation.

²¹ "Left Realism emerged in the early 1980s in Britain as a response to both the punitive and exclusion policies of conservatism and to the utopianism of New Left radical criminologies" (McLaughlin et al, 2001, 163).

Variables for Analysis

Diverse variables are used to analyse crime and deprivation. The main one, unemployment, indicates a direct causality to crime particularly when the economy falls into recession and crime rates increase (Eitzen et al, 1988: 431). US federal prison population in the US tends to increase fifteen months after periods of high unemployment (Keebler, 1975). In another study, Craglia et al (2000) based their Sheffield studies on the analysis of households and unemployment, through the use of Townsend Index (Townsend et al, 1988), pointing out that crime statistics need to be based on young-male unemployment, population turnover and the DETR index of local conditions. Wang (1999) found associations between unemployment and crime with the link being stronger with structural unemployment.

Other researchers base their analysis on economic factors. Entorf et al (2000) use GDP and relative distance to average income. They include the % of population on welfare, the % of population below the poverty line and the Gini Coefficient as reliable variables for within-state studies of crime. One interesting point that they bring up is that offenders rate themselves in relation to national income rather than that of their own areas.

Other variables also employed include population density (especially in small island states), education advancement, high school dropout rate (Shaw-Taylor, 1998, 317) and per capita GNP (Wang, 1999). These factors highlight the importance of social cohesion since a high population density can induce a reduction of social capital due to the indifference attributed to knowledge of who one's neighbours are, and very little incentive to develop viable relationships. Interestingly, whilst school dropout is identified by Shaw-Taylor (1998), Rutter et al (1979) identified that at the other extreme school intake is just one factor that causes delinquency (where the best students are chosen by the best schools and low-achieving non-academically inclined students are then grouped together in low-achieving and inadequate schools). They found that delinquency is not directly linked to school activities but to offending outside school. Though this area requires further research, it is assumed that high school dropout rates may lead to more time to engage in activities where there is no adult supervision and could lead to offending.

Kawachi (1999) includes single parent households as a factor in crime analysis stressing that this family structure reduces control and supervision of potential offenders, again resulting in reduced cohesion and lack of role models. They also include educational attainment and average alcohol consumption levels in their analysis. They found

that as the socio-economic status increased, homicide and assault rate declined but larceny increased. In addition, where poverty and unemployment increased homicides increased. One interesting factor was that median income was positively associated to robbery rates and motor vehicle theft. Alcohol was not found to correlate to violent and property crime.

Urban planning also plays a part in the dynamics of the interactions of offenders and offences, affluence and deprivation. Once an area has been zoned either as recreational or has 'tipped' following the deterioration of its demographic stock, urban issues have an impact on crime structures and vice-versa. As an example, out-migration can be linked to changes in the economic scenario such as the loss of jobs from a de-industrialised city. Taub et al (1984: 347) identified three issues for area deterioration analysis: i) crime levels are an issue in judging the quality of an area, ii) there is evidence of a 'threshold model' where people move out of an area until tipping occurs, which few can stop, and iii) neighbourhood change is based on ecological facts²², individual and corporate decisions.

In summary, these factors bring into focus the need to identify the causal factors that result in the creation of a realistic evaluation of the crime, social and urban relationships. How does each variable lead to the commission of a crime? Which activities attract the highest crime rates? This issue is best tackled through the identification of the context within which an urban activity has been implemented.

The Need for Further Research

This study looks at such issues through a quantitative analysis of crime in the Maltese Islands based on spatial methodologies. Geographical Information (GI) would help identify the links through an analysis of crime, the social construct it operates in and the landuse aspect pertaining to the offender and offence locations. The GI factor helps identify such links however further study is needed in order to identify the multi-faceted relationships inherent in the social, urban and crime scenarios.

²² *Ecological facts include an employment base for neighbourhood residents, housing market and demographic pressures, age and quality of the housing stock and external amenities such as vistas.*

In effect, researching social and land-use issues in isolation may lead to unattainable understanding of what makes an area host offenders and/or attract offences. This study aims to identify whether there is a relationship between crime and land-use and social issues in the Maltese Islands. This will be carried out through an analysis of the spatial relationship between crime and social aspects as poverty through studies on welfare and Census data. In the case of the relationship between crime and landuse, spatial layers on zoning and structural planning will be analysed.

Summary

The document described the development of the theory of environmental criminology and how it fits within other related theories such as Structuration, Opportunity and Routine Activity theories. It described crime in relation to the offender and offence location and identified how these different aspects of the theory fit together to form a comprehensive background for the analysis of crime.

Whilst the study aims to analyse crime in its spatio-temporal aspect based on an analysis of location of where offenders live and where they commit crime, the theories mentioned above point at the need to move one step beyond the geographical aspect and analyse criminal activity in relation to the structures of the areas the offenders live in, interact and commit crime.

This study aims to review spatial distribution of crime in Malta through offence statistics, the analysis of criminogenic areas through offender-offence analysis and the relationship of crime to social and landuse issues.

The Conceptual Model

Why create a conceptual model? Such a question lingered through the reviews of the environmental criminology literature, the GIS literature and the Maltese scenario readings. The reviews, together with an understanding of the complex Maltese data availability situation, highlighted the need to bring together each aspect and build a mindmap that helps set out a process to depict a basic and generic model on how crime, social and landuse issues interact together.

The review process also identified techniques and datasets that can be used in the identification and understanding of crime. The use of these datasets is best explained through a conceptual model that is relevant to CRIME and to the SOCIAL and LANDUSE aspects, herein embedded as the acronym CRISOLA.

The model took shape through a tiered 3-phase process, with each iterative phase building up from an abstract level (Phase 1) through the identification of the main datasets (Phase 2) to a final individual attribute listing (Phase 3). The model is not exhaustive as it covers potential datasets that yet need to be created/surveyed, statistical measures identified as well as inclusion of other crime-relevant theories. The model can be evolved in future studies as it attempts to highlight areas of study that will not be tackled in this research and which may/may not be found to be significant, entailing further change.

The Three CRISOLA Radials: Crime, Social and Landuse

Initially the conceptual Model catered for the crime aspect in isolation, but crime does not stand alone: it interacts within a wider and more complex environment. The mindmap exercise soon sought the inclusion of social and landuse parameters within the model aimed at streamlining the process to facilitate the analysis. The result brings together the three CRISOLA disciplines and attempts to identify theoretical links between the different datasets.

The decision to model crime together with the sociological and landuse disciplines is based on an understanding of the interactivity between the three as identified in the literature. The model attempts to understand criminal activity within the social and physical structures it operates in. The main area of study is the interaction between:

- the crime characteristics through an analysis of offender and offence composition and the interactivity between them;
- the social characteristics of an area through an analysis of its poverty/deprivation;
- the physical characteristics of an area, particularly its landuse, structural and zoning parameters.

The social characteristics of a human society are linked to the physical surroundings it operates in, which two characteristics are directly caused by or affect crime. Offender analysis requires an understanding of the social construct that the offender operates in, such as affluence and poverty. Offence analysis requires an understanding of the landuse structure crime occurs in; the opportunities offered, the mode of travel, and the activities that may lead to the occurrence of crime, amongst others.

Phase 1 – The Abstract Level

Table C.1 outlines the Phase 1 thought-process needed to reach an initial structure within which to analyse any relationships between the three disciplines. It is a high-level abstract model that attempts to look at parallel processes between the three disciplines and how an understanding of the processes can be achieved. It develops the concept through a series of five linear steps that can be tackled in order to facilitate later cross-thematic crime studies. It is aimed at an analysis of the thematic structure, focusing on the main parameter in the themes that affect change, identifying the spatial construct within the theme, highlighting the impact on capital and cohesion and finally leading to a change phase.

The latter phase can only be tackled through longitudinal studies that would draw a better long-term picture of what constitutes change. Although the current study looks at crime over a period of time, this model needs to be revisited with longer-term data if one needs to analyse sturdier change processes. This is needed particularly in the final phase that covers change for each of the CRISOLA themes.

Table C.1: Phase 1 - Conceptual Model Logical Matrix

Social	Crime	Urban
Analysis of the Social structure of the area under study	Analysis of crime in the area under study through offences and the behaviour of offenders	Analysis of spatial constructs through a study of landuse zoning, spatial aggregates and physical structures
↓	↓	↓
Focuses on socio-economic and socio-cultural parameters towards an understanding of poverty and deprivation as a surrogate for social and community health	Focuses on offences as a measure of attractiveness of an area and focuses on offender data as a measure of social disorganization	Focuses on landuse zoning as a measure of affluence, leading to an understanding of opportunity structures
↓	↓	↓
Identifies the social-spatial constitution of the areas, leading to a social-zoning structure	Identifies the criminal-spatial constitution of the <u>areas</u> leading to a crime-zoning structure	Identifies the physical constitution of the <u>areas</u> leading to a landuse-zoning structure
↓	↓	↓
Impact on social capital – social cohesion	Impact on security and safety	Impact on spatial capital
↓	↓	↓
Social change	Crime change	Landuse change

Phase 2 – Identifying the linkages

Whilst, the high-level Phase 1 Model enables a generic focus on the study in question, a more detailed second level model was required which helped point at and identify the interactivity between the three parameters. This is accomplished preferably through the identification of datasets that may be used for analysis. Being a mindmap model, Phase 2 (Figure C.522) sought to identify those literature-related issues and integrate them within the model. It also sought to bring together the different Theories, Datasets, Spatio-Temporal Aspects, predictors and the main tenets that can be used in such a study on crime. These include such parameters as are age and density, which have been described in the literature review chapter.

The deeper one moves into the model (towards the bottom part of each section and where the predictors are highlighted) the more research is needed to identify the real relationships and how each parameter can be predicted. The model does not attempt to solve these issues in this study but depicts the potential future studies that can be attempted.

The other sections follow the same logical process and each successive branch highlights its particular theme, theory base and dataset pertaining to it. The best way to follow this is within the model is to once again look at the proximity index example in Figure C.5. The level 2 model in Figure C.5 is accompanied by a description and spatial levels key (Figure C.6). The key describes the different spatial data aggregates available from national to regional to enumeration areas, which data layers can be employed for most datasets listed. The description section, however lists the different datasets available (D), the theories (T), the main data tenets (M) as well as other relevant information.

Once again, taking the proximity index as an example, the proximity-to-centre data-box (3) is tagged with 3 codes, amongst them D2A. The D2A refers to the key: Data (D) is available at (2A) Address-point spatial detail. Similarly the vacancy (4) data-box is tagged with T3A and D2I, where as an example T3A refers to social disorganisation theory and potential to analyse the data based on concentric rings and broken windows concepts.

Other model issues include the identification of a potential to integrate a dark figure of crime, once this is carried out. To date this has not been covered in Maltese crime studies, except for a study carried out by the author where the sample return was too small to prove reliable.

The coloured data-boxes indicate some kind of major studies that were not found in the literature review but are deemed essential to understanding crime, such as the analysis of spatial-temporal- prediction-fragmentation (31) which attempts to understand the spatial aggregate (ex: council, enumeration area, street) at which predictability starts to deteriorate over time and which would allow researchers to know how far to predict at each level in order to remain statistically significant. Such a model would help crime understanding for operational and tactical levels.

Phase 3 – Identifying the datasets and attributes

Taking the model one step further to Level 3 (Figure C.7), a series of statistical measures are listed for the variables within each dataset identified for model integration. This level is theoretical as each link needs to have a theoretical construct attached to it with the relevant research studies carried out which would validate that such a model can work.

The Phase 3 is highly detailed where it looks at each data-box, identifies the relative dataset as indicated in Phase 2, lists the attributes within that dataset and then attempts to identify statistical measures for each level within the process. In most cases, the statistical measures call for further research into the potential measures to be employed. Also, at this stage new indexes were inputted such as insurance, sentencing practice and recidivism, each of which was identified as vital to a particular complex index.

As in the Phase 2 case, the best way to understand Phase 3 would be through an example, that pertaining to the proximity-to-community-centre data-box (3). In Phase 3, a statistical measure is listed as distance-to-centre which is further explained through the use of a distance ranking index based on GI buffering techniques employing 100m intervals.

New indexes are also identified in Phase 3, which indexes help to clarify how a more complex index is created. The following example is based on the welfare index (2) that is split into two component indexes (persons-at-risk and structural-dependency). Each of these is composed of three data complexes (ex: pensions, social assistance, widows survivors), where each complex is composed of the sum (Σ) of a number of welfare benefits pertaining to that category (attributes within the welfare index dataset). For example, widows survivors is composed of Widows pensions (NM and NMWP), Survivors pension (SRP and ESRP). The results are then integrated with other categories as in the Phase 2 process described earlier.

Conceptual Model Summary

In summary, the main aim of producing these three Phases was primarily targeted at understanding the potential relationships between the CRISOLA constructs. These relationships operate within a human environment that is intrinsically dynamic, where any change in one sector would affect the other two, positively or negatively. The model will be used post-research to further refine the theories and carry out in-depth studies in each of the sectors and linkages.

The conceptual model was drafted to enable the author to focus the direction this study would take through the identification of some of these areas that can be analysed, whether data exist to support such studies and also to identify further areas of research. It also helped to list the relevant theories, the data availability, the spatial and temporal aspects and the potential relations between the different CRISOLA constructs.

Once the conceptual model was drafted, the next stage of the study concentrated on the drafting of the research questions.



Figure C.5: Conceptual Model Phase 2 – Linkages – Themes – Key

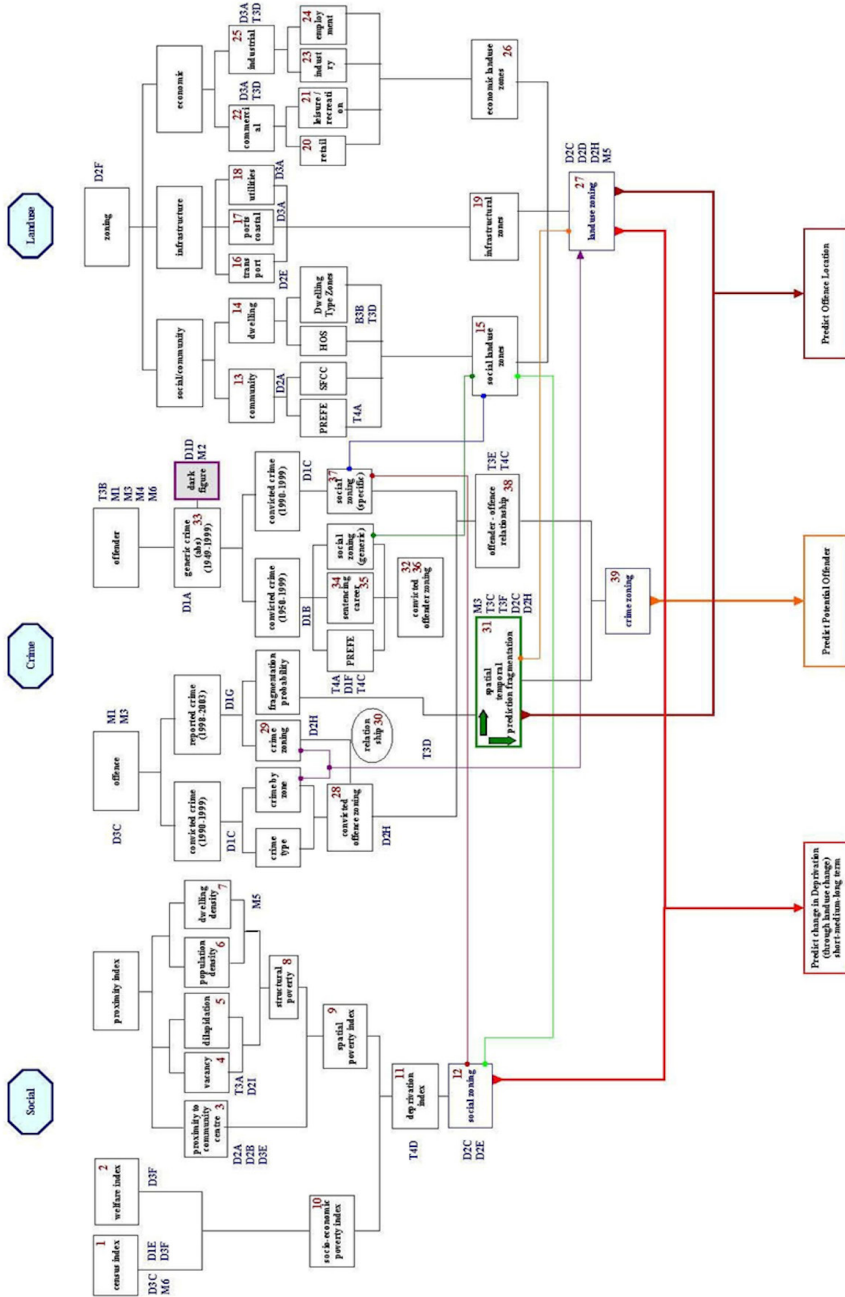


Figure C.6: Conceptual Model Phase 2 – Linkages – Themes – Key

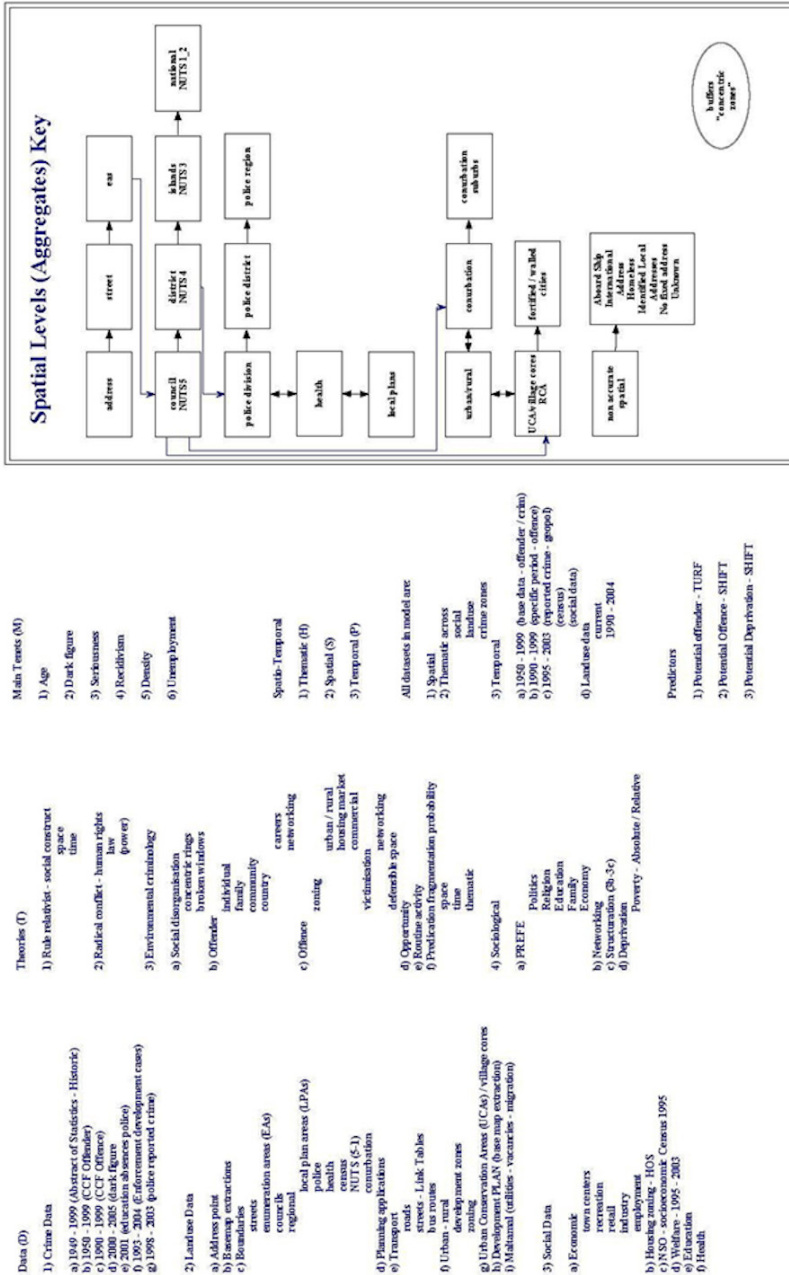
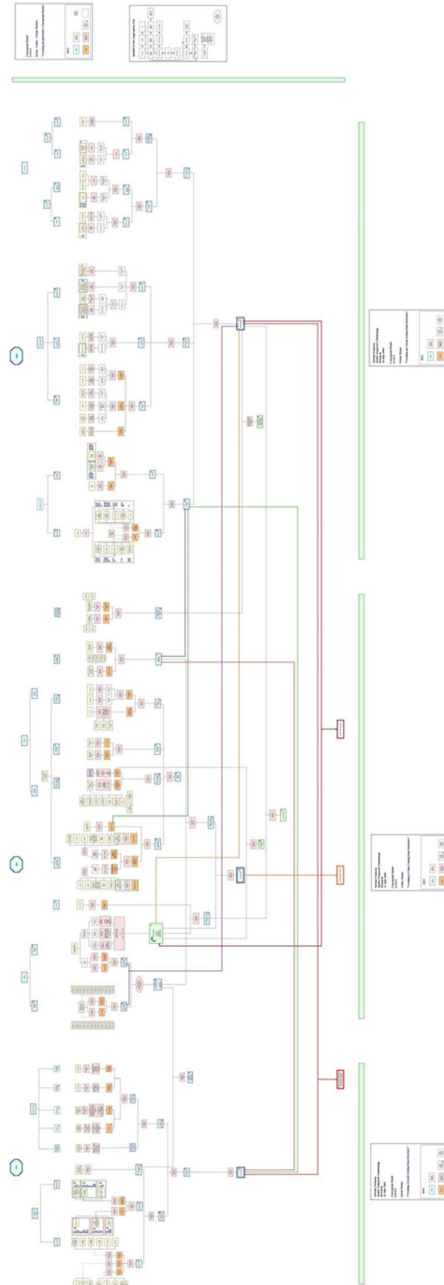


Figure C.7: Conceptual Model Phase 3 – Datasets, variables and Statistical measures model cont...



Data Issues

Data cleaning and verification

Next to data inputting, data cleaning and verification is also a tedious phase of any research of this scope, where large datasets are involved.

Georeferencing is the process of placing an image onto an Earth projection through a number of referencing points on the Earth that correspond to those points on the image, normally represented by easily discernable topography and land cover such as monuments, natural land outcroppings, roads, etc. Once an image is georeferenced, any further overlaying misalignments can be adjusted through a rubber-sheeting process that helps stretch the image to form an acceptable overlay. The image is a raster and can be placed below a vector layer for ease of use in the rubber-sheeting process.

This is a slow aspect of the project, particularly due to the numerous multiple-interpretation street names errors, alphanumeric errors in location names, offence information, as well as intentional errors by data-inputters. This process entailed going through the whole list that did not match the official street names and interpret those same names and locations. This process was repeated for the welfare data where correctness is even more vital due to the fact that persons receive benefits on a monthly basis and incorrect addresses mean non-issuing of cheques vital to such persons. In this case the issue was mainly identifying the local names of streets, multiple street names, alley-correction (integration of alley names with connecting street names) and other quality assurance measures.

In the case of available spatial layers, data cleaning was also necessitated due to the need to identify lacunae, overshoots, gaps, intersecting and overlaid polygons as well as missing data. This is important especially where Census data is involved due to the intersecting street centrelines and their subsequent polygon structure having a considerable part overlapping the corresponding street polygon. The resultant data can be misleading and depict an erroneous output leading to a wrong interpretation.

Geocoding procedures

Once the data was digitised, the next phase entailed the processing of all data to spatial format. This is possible through a process called geocoding where data in tabular format is given a spatial construct by assigning each data item some kind of spatial

element. In most cases this entailed assigning a point element such as a street centroid (central node) or assigned to a polygon such as an Enumeration Area or Local Council.

This process is once again time-consuming and highly challenging, especially since no readily available software existed that could cater for the specific requirements of this study. Malta has no street-gazetteer, which is a data layer that would include street segments and dwelling numbers. The author sought to geocode a number of points along a street centreline when only the street address (with no address location given) was available. As no mbx programme existed that automatically disperses a number of points randomly around a centerline, each having the same locational attribute (such as a street name). This induced the following process and rationale:

- Creating a buffer around the street centrelines in order to prepare a series of polygons in which a number of points can be generated, which points would serve as anchors for the addresses (Figure C.8);
- Converting the buffers from a vector polygon to a raster grid file, which process actually creates a base of pixels for later conversion to the points described in a);
- Converting the grid file to a series of points (Figure C.9);
- Processes a to c would have retained the attribute data, thus the next step is to clean and check the attribute generated in the raster-to-vector conversion. This was accomplished through a join with the centreline buffers through manual or automatic means (Figure C.10);
- Once each point was validated, a unique numbering system was created so that each point could be queried individually;
- Cleaning the non-geocoded data (Figure C.11);
- As not all street names were captured through this method, other technologies were used. These included on-line searches such as checking for missing data in MEPA's mapserver and other on-line datasets (Figure C.12);
- Once the street-name validation was concluded, the next step sought to link the non-spatial data layers such as the police reported crime dataset to the unique points generated as per above process. This entailed the geocoding of the non-mapped layer into the dispersed points (refer to c) through a simple geocoding exercise following the insertion of the unique numbering system in the same dataset in line with e) (Figure C.13);
- Overlaying the geocoded data onto other base data for verification purposes (Figure C.14).

Figure C.8: Creating a buffer of 5metres for each street helped to develop a series of raster and vector maps that generated points for geocoding anchors

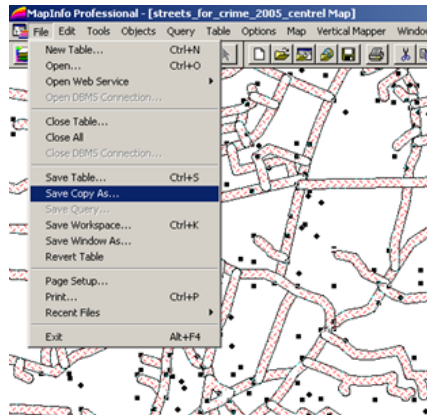


Figure C.9: Rasterising the buffer points

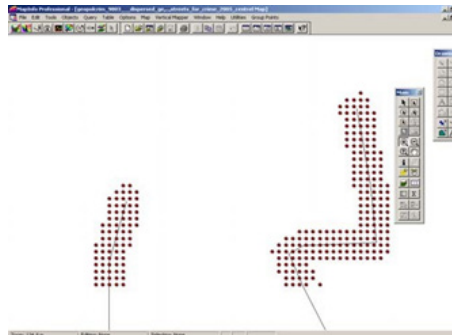


Figure C.10: Checking attribute data for matching to centreline through manual or automatic means



Figure C.11: Cleaning the tabular data prior to geocoding

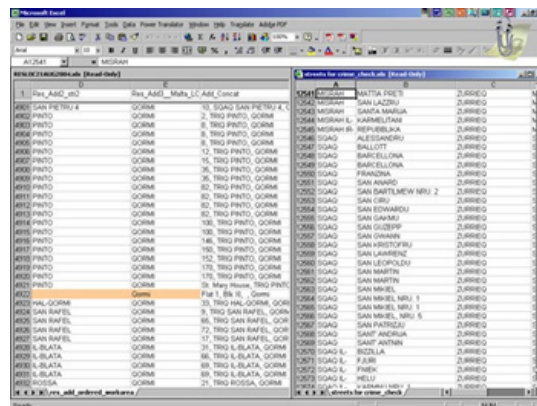


Figure C.12: Checking for missing data in MEPA mapserver and on-line datasets



Figure C.13: Geocoding the dataset based on dispersed points within the buffer

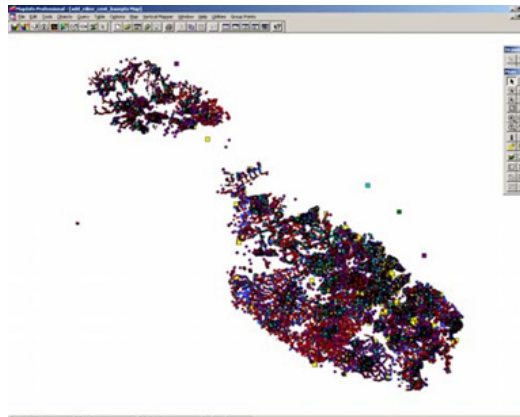
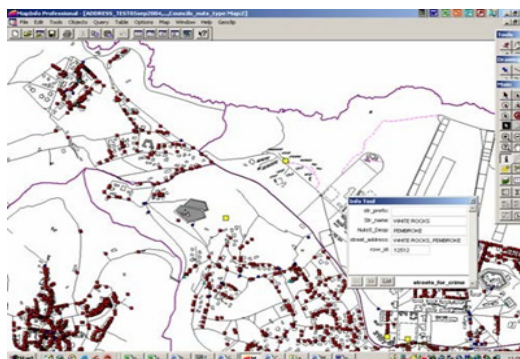


Figure C.14: The final Result overlaid on other base data layers



A lineage depicting the process undertaken to geocode a map was created, where a manual for the creation of such datasets was drafted. This process sought to investigate the possibility of preparing the base data for crime analysis in spatial format, as per objective 3 of this research. This target was reached through the process of geocoding and georeferencing crime, social and landuse data into spatial format and creating the first Maltese crime, social and landuse-related base-maps.

Data Reliability

The main issue at stake that needs to be highlighted at this stage concerns the data currency that is employed throughout the study. As this is a first study of crime at high-detail in the Maltese Islands the source data is spread in many places, rarely accessible and disjointed. Every effort was taken to acquire as much data as possible pertaining to the period under study, though this was a major problem as little consistent data is available.

Harries (1974) identifies problems as regards to spatial analysis due to the fact that substantial spatial distortions can be found when analysis was carried out based on decennial censuses. If one uses the population of an area based on the census figures and then analyses crime for one year between the census periods using that same decennial data, the results would be erroneous – using 1993 crime data and compare it to the census population of 1985 and then to that of 1995. One would prefer to have the same years' data coverage, however this is only possible in an ideal world once all required datasets are acquired, converted to tabular format and subsequently geocoded. Only then can they be maintained and an annual update be created. That phase would then allow exact period analysis across all disciplines.

Aggregation levels of data available

Spatial data layers are aggregated in a number of levels that are primarily internationally recognised (such as NUTS nomenclature) or local boundaries specified by each entity requiring such an exercise. The main aggregation levels available in the Maltese Islands are listed in Table C.1.

Table C.1: Spatial data Aggregations that have been used to analyse the research data

Spatial Aggregations		
Data Aggregate	Spatial Data Model	Entities
NUTS 1_2 (National)	Area	1
NUTS 3 (Islands (Malta and Gozo-Comino))	Area	2
NUTS 4 (Districts)	Area	6
NUTS 5 (Local Councils)	Area	68
EAS (Enumeration Areas – 150-180 households)	Area	1,157
LPA (Local Plan Areas)	Area	7
Police Regions	Area	2
Police Districts	Area	11
Police Divisions	Area	20
Health Centre Regions	Area	8
Rural (Out of Development Zone)	Area	3
Village Core / UCA (Urban conservation Areas)	Area	94
Dev Zone (Limits to Development Zone)	Area	129
Streets Combined	Line	7,565
Streets	Line	13,098
Address Points	Point	199,694

Very few organisations follow NUTS districting, having predated it. Usage of the aggregate layers from different entities posed new problems in analysis: in fact it seems that each organisation made it a point to be different, using different aggregations based on operational logic. This said, the police are looking at using the NUTS nomenclature as the basis for districting.

This issue was solved through the generation of data at the highest detail possible: at street level. This allows any researcher to build up rather than using the top-down approach that hinders analysis once an aggregate cannot be split up further into its component parts due to lack of data at that high-detail level. Thus, from basic street data, the different organisational districts (such as police or health) can be catered for.

At the social level, data on welfare was provided at street level, and Census data at Enumeration Areas (EAs) level, thus this ensured that the real highest-detail level of analysis is the EAs. This implies aggregating data one level up from address-point or streets to EAs level.

Analysis

What are the social parameters that affect offenders?

Following a review of the relationships between offenders and their environment, the next step entails the understanding of poverty in Malta, which would lay the ground for further analysis in the relationship between offender residence and poverty.

This review takes a wider look at which parameters distinguish specific areas in having higher or lower rates of poverty. The analysis is based on residential zones and their different components, which study tries to identify whether the areas that offenders live in and that had earlier been identified as having high rates of offenders, are significantly different from other low-offender-rate areas.

This section investigates the level of relationships that can be found between poverty and categories of residential units. The data is calculated using welfare data hotspots that indicate poverty based on the unemployment data (in this case unemployment benefit). The hotspot layers resulting from the 1NNH were analysed using SQL spatial querying against different residential- related data layers.

Is poverty related to dwelling type?

A poverty against dwelling unit analysis shows that relatively 'poorer' persons live mainly in terraced units with over 51.5% spatial intersections of poverty hotspots as layered over dwelling category. This figure is higher than that of 41.2% for apartments. The relatively high terraced dwelling figure indicates that 'poor persons' may have access to large dwellings though they do not necessarily claim ownership, either due to renting, subsidised renting as well as squatting. In view of this, a direct relationship between poverty and residence type could not be established and in turn the research question is not readily answered.

Poverty and the Cores

Interestingly, the next analysis shows a very high relationship between poverty and UCA_Village Cores which areas contain nearly 62% of all poor persons. The rest of the poverty component are analysed using buffering methodology to facilitate a better understanding of poverty, which analysis shows that poverty decreases steadily with every 100 meters movement outwards from the village core, from 49% contained within the first buffer to 2.9% one kilometre out from the UCA boundary.

Do poor areas tend to be located nearer to the old (village cores) areas?

A buffer analysis based on the UCA_VC was carried out at the standard set of 100m buffers radiating out from the UCA boundaries up to 1000m. The analysis of poverty was based on an unemployment per 1000 persons in the buffer areas as based on a street centroid point data within the 100m buffers²³.

Results show that the immediate buffer zones out from the boundary experience an increase in poverty rate which alternatively declines and increases though generally declining over distance from 0.207 per 1000 persons at 100m to 0.116 at 1000m. Figures C.15-C16 depict the poverty buffers results using region-to-grid interpolation in top and perspective views, through a colour scheme representing high rates as red declining to yellow and eventually blue for low rates. Whilst the top view shows a clear distinction from low to high to low movements, the perspective views facilitates viewing the movement in peaks and troughs, with high concentrations in the old cities and village cores (yellow areas).

²³ Unemployment data was given at street level, with a spatial entity registered through a street centerline centroid.

Figure C.15: Poverty Buffering Grid File – Top View

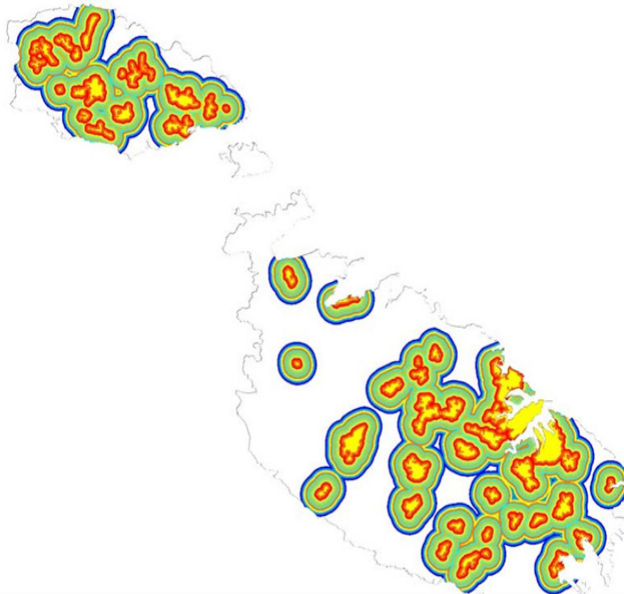
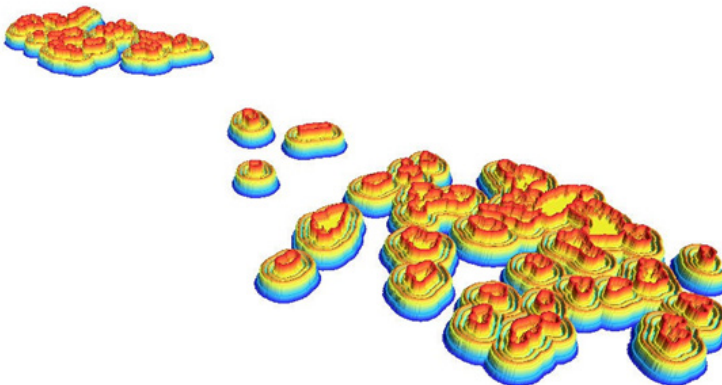


Figure C.16: Poverty Buffering Grid File – Perspective View



Poverty and Dwelling Density

Dwellings density is a major issue in the Maltese Islands with an ever growing stock that is also changing in character leading to small and denser units clustered together.

How far is poverty higher in high dwelling density areas?

An analysis to show whether there is a relationship between poverty and dwelling density resulted in the hypothesis being refuted as the statistical analysis did not elicit any relationship where Spearman's rho of 0.079 and a significance of 0.023, shows that the figure is higher than a probability (Table C.2).

Table C.2: Crosstabulations and Spearman Correlation Tests for Poverty Risk and Dwelling Density

Poverty_Risk_Recode * Dwelling_Density Crosstabulation

			Dwelling_Density				Total
			Less than 100	101 to 500	501 to 1000	1000 plus	
Poverty_Risk_Recode	Less than 100	Count	93	169	94	74	430
		% within Dwelling_Density	53.4%	56.3%	53.4%	41.8%	52.0%
	101 to 500	Count	81	131	82	103	397
		% within Dwelling_Density	46.6%	43.7%	46.6%	58.2%	48.0%
Total		Count	174	300	176	177	827
		% within Dwelling_Density	100.0%	100.0%	100.0%	100.0%	100.0%

Symmetric Measures

		Value	Asymp. Std. Error ^a	Approx. T ^b	Approx. Sig.
Interval by Interval	Pearson's R	.084	.035	2.408	.016 ^c
Ordinal by Ordinal	Spearman Correlation	.079	.035	2.274	.023 ^c
N of Valid Cases		827			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

As per direction of clustering strength, Moran's I spatial statistics results indicate that whilst both variables show evidence of clustering (Moran's I of 0.028094 for poverty is higher than that for dwellings densities at 0.010079), there is a higher concentration of poverty rate than would be expected based on dwelling density (Table C.3).

Table C.3: Moran's I Spatial Statistics tests for Poverty Risk and Dwelling Density

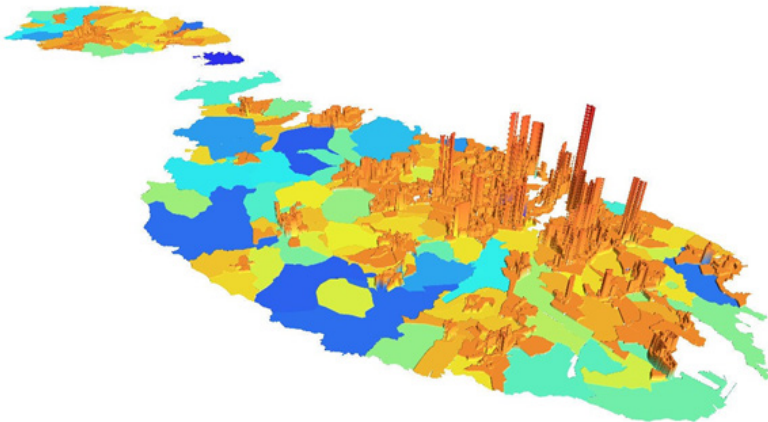
Spatial Autocorrelation for Point Data:		Spatial Autocorrelation for Point Data:	
Sample size	: 843	Sample size	: 843
Measurement type	: Direct	Measurement type	: Direct
Start time	: 11:56:22 AM, 07/20/2006	Start time	: 12:12:22 PM, 07/20/2006
Moran's "I"	: 0.028094	Moran's "I"	: 0.010079
Spatially random (expected) "I"	: -0.001188	Spatially random (expected) "I"	: -0.001188
Standard deviation of "I"	: 0.001468	Standard deviation of "I"	: 0.001468
Normality significance (Z)	: 19.948440	Normality significance (Z)	: 7.675656
p-value (one tail)	: 0.0001	p-value (one tail)	: 0.0001
p-value (two tail)	: 0.0001	p-value (two tail)	: 0.0001
Randomization significance (Z)	: 19.950019	Randomization significance (Z)	: 7.679327
p-value (one tail)	: 0.0001	p-value (one tail)	: 0.0001
p-value (two tail)	: 0.0001	p-value (two tail)	: 0.0001
End time	: 11:56:23 AM, 07/20/2006	End time	: 12:12:23 PM, 07/20/2006

Poverty Risk Moran's I

Dwelling Density Moran's I

A spatial analysis of dwelling density shows a dispersed 3D map with a wider area within the conurbation as well as outside the suburbs. Figure C.17 shows a large number of peaks representing dwelling density. This situation has more to do with lack of space than poverty. Most of the areas are being developed as apartments, which situation results in higher densities. Apartment pricing is not cheap and very few areas, such as the Three Cities, have high dwelling densities and high poverty. Some of the highest densities are in Sliema with the most expensive apartments available on the local market.

Figure C.17: INNH hotspot analysis for offender residence and poverty



Poverty and the Housing Estates

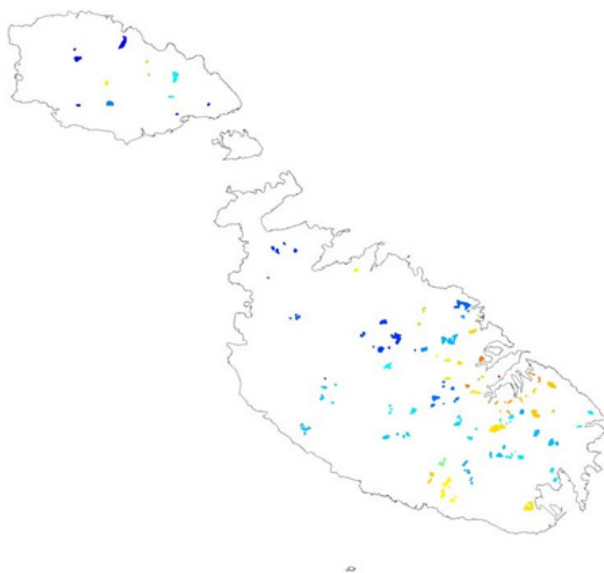
A final analysis of poverty areas and residential aggregation centres on the HOS and reviews whether they are centres of poverty.

Do Housing Estates have higher rates of poverty than elsewhere?

Analysing whether HOS host poorer persons at different rates than other areas that did not have HOS within them, results in the fact that 37.3% of all poverty hotspots have some kind of spatial intersection with the HOS boundaries. In addition HOS host 46.9% of all persons who registered as falling above the national standard poverty rate, indicating a large percentage of poorer residents.

A spatial analysis using MapInfo and Vertical Mapper show that there is an aggregation of poorer HOS around the Grand Harbour depicted by the yellow to orange range (Figure C.18). This shows that even within the HOSs there are easily discernable poorer estates than other estates in the periphery.

Figure C.18: HOS-poverty relationship



Summary of the Poverty Parameter

In summary, as a preparation for the offender and poverty analysis, this section's results show that there is no easily discernable relationship between dwelling type and poverty. They also show that poor people live close to the village core but not essentially within, as well as there being no relationship between dwelling density and poverty, and finally HOS host nearly half of all poor areas, with particular concentration of the latter close to or within the harbour region.

Offenders and Poverty

Once the offender residence and poverty groundwork has been laid, the next phase attempts to look at the relationships between offender location and a number of social parameters. Each parameter is analysed in relation to the selected others using both tabular statistical tools such as SPSS and spatial statistical tools as CrimeStat III. This section relies heavily on and extends Craglia et al's (2000) risk assessment methodology that essentially creates rates of offences for small areas as compared to national rates. This methodology was used to define those areas that have a lower or higher than the national standard rates and the resultant rate is compared to the other variable's rate in order to identify any relationship.

The workings employed through this method were created through a stepped process aimed at identifying any relationships between offender densities, population density and poverty rates. The rates as calculated were based on the entire Maltese Islands' Enumeration Areas (EAs – totaling 843). The Craglia methodology initially elicits the national rate (for example, employment) against which to compare the small-area results. It then establishes the expected number of persons pertaining to that category within specific small areas such as the EAs and then rates the result against the observed figure, in turn calculating the potential rate for that particular parameter.

Note that the resultant categories are regrouped further into 4 categories for better understanding of the analysis result. These were grouped as follows: those below or at the national standard rate (100), with the subsequent categories grouped between 100 – 500 (upto 5 times national rate), 500 – 1000 (upto 10 times national rate), and 1000 plus (higher than 10 times national rate). These regrouped categories represent the figures compared between the different variables, eliciting if there is a significant relationship between the different categories. Note that the 5- times and 10-times grouped categories were chosen since it was deemed too complex to review each multiple of the national rate for each of the 843 Enumeration Areas (EAs) as well as such a large number of groupings would render any mapped outputs unreadable in understanding polygon shading. Thus the 200, 300, 400, 600, 700, 800 and 900 were not utilised for the results.

The first analysis carried out was based on the need to review if population density is related to offender density.

Offender Density and Population Density

Do some locations have a high offender density than one would expect on the basis of their population density?

Using a Spearman's correlation test, the study shows that there is a modest significant relationship (Cohen and Holliday, 1982) between population density and offender density at a rho of 0.394 at a significance of $p = 0.000$ (Table C.4). The relationship is a positive one indicating that the higher the population density, the higher is the probability of increasing offender density (52.9%).

Table C.4: Crosstabulations and Spearman Correlation Tests for Population and Offender Densities

Risk_Population_Density_Recode * Risk_Offender_Recode Crosstabulation

			Risk_Offender_Recode				Total
			Less than 100	101 to 500	501 to 1000	1000 plus	
Risk_Population_Density_Recode	Less than 100	Count	146	8	0	0	154
		% within Risk_Offender_Recode	30.9%	5.9%	.0%	.0%	18.3%
	101 to 500	Count	127	67	19	20	233
		% within Risk_Offender_Recode	26.8%	49.3%	25.7%	12.7%	27.7%
	501 to 1000	Count	117	53	26	54	250
		% within Risk_Offender_Recode	24.7%	39.0%	35.1%	34.4%	29.8%
	1000 plus	Count	83	8	29	83	203
		% within Risk_Offender_Recode	17.5%	5.9%	39.2%	52.9%	24.2%
Total		Count	473	136	74	157	840
		% within Risk_Offender_Recode	100.0%	100.0%	100.0%	100.0%	100.0%

Symmetric Measures

		Value	Asymp. Std. Error ^a	Approx. T ^b	Approx. Sig.
Interval by Interval	Pearson's R	.424	.027	13.535	.000 ^c
Ordinal by Ordinal	Spearman Correlation	.394	.030	12.394	.000 ^c
N of Valid Cases		840			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

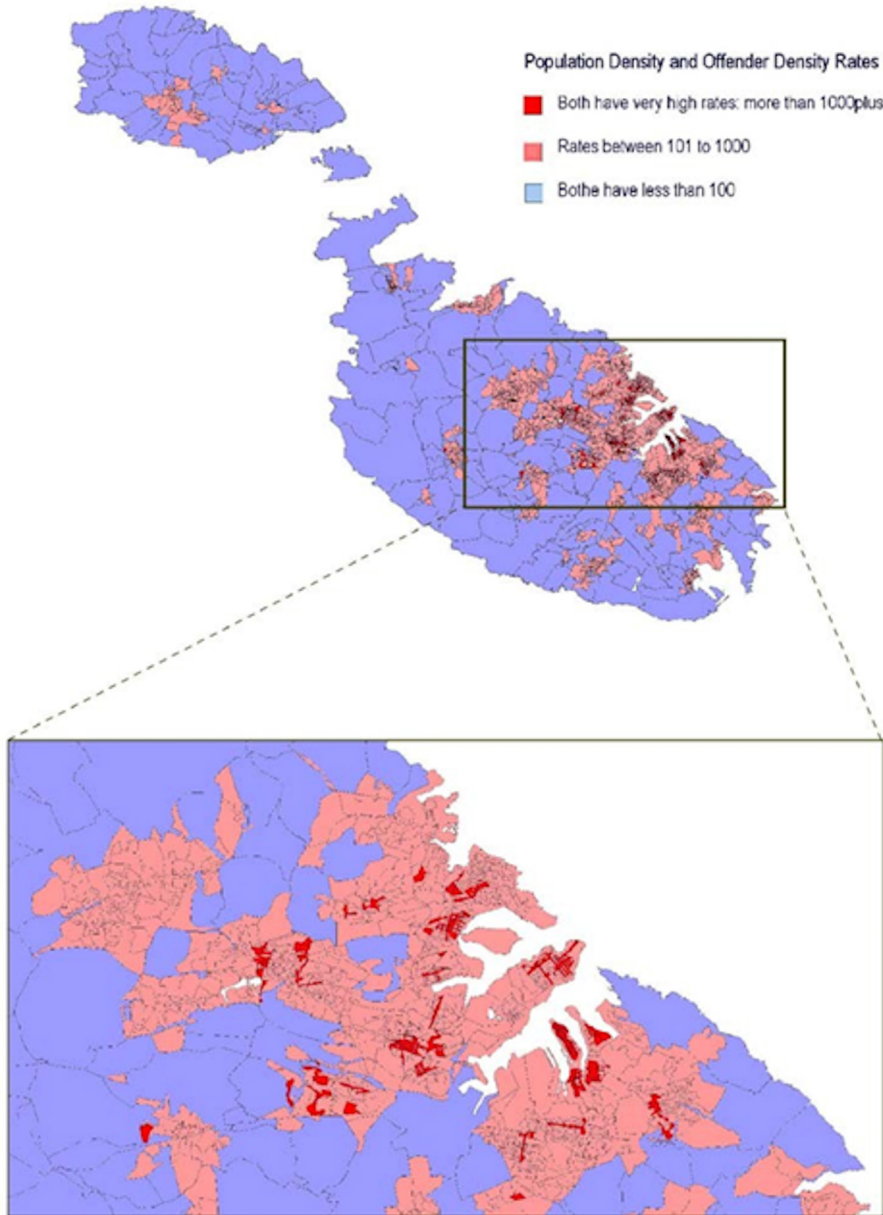
Translating the statistics into Table C.5 shows that the lower the population density living in an area the lower the offender density is. At the other extreme end of the matrix a very high population density rate (at 1 factor above the national level) there is a corresponding very high offender density. A description of Table C.5 shows that the shaded cells indicate the highest percentage of Enumeration Areas (EAs) that have the corresponding density type; as an example at the top left cell 30.9% of EAs that have a population density less than the national (100) also have an offender rate less than national. At the other end of the matrix (bottom right) 52.9% of EAs that have registered more than ten times (10x100 = 1000 plus) the national rate, also register more than ten times the offender rate.

Table C.5: Crosstabs Rate assessment of Population and Offender Densities

Rate of Offenders Residing in Area				
Population Density	Less than 100	101 to 500	501 to 1000	1000 plus
Less than 100	30.90%	5.90%	0.00%	0.00%
101 to 500	26.80%	49.30%	25.70%	12.70%
501 to 1000	24.70%	39.00%	35.10%	34.40%
1000 plus	17.50%	5.90%	39.20%	52.90%

The results were translated into spatial format that sought to identify which EAs fall within each of the categories. Figure C.19 depicts the rate maps: blue indicates a rate of less than 100, with pink depicts increasing rates up to more than 1000. The detailed map takes a closer look at which EAs have a very high (1000plus - red) rates essentially highlighting those areas that have both very high population and offender densities, mainly the Three Cities and Valletta as well as such areas as Gzira, Qormi and Marsa.

Figure C.19: Map of Population and Offender Densities Rate Assessment



Through the use of spatial statistics based on Moran’s I Spatial Autocorrelation for Point Data of 0.009482 for offenders is less than that for population at 0.028428 (Table C.6), the results show that there is a clustering of offenders and population though in effect there is a slightly less concentration of offenders than would be expected based on population.

Table C.6: Moran’s I Spatial Statistics tests for Offender Rate and Population Density

Spatial Autocorrelation for Point Data:	Spatial Autocorrelation for Point Data:
Sample size: 843	Sample size: 843
Measurement type: Direct	Measurement type: Direct
Start time.....: 11:50:13 AM, 07/20/2006	Start time.....: 11:40:41 AM, 07/20/2006
Moran’s “I”: 0.009482	Moran’s “I”: 0.028428
Spatially random (expected) “I”: -0.001188	Spatially random (expected) “I”: -0.001188
Standard deviation of “I”: 0.001468	Standard deviation of “I”: 0.001468
Normality significance (z): 7.268992	Normality significance (z): 20.175965
p-value (one tail): 0.0001	p-value (one tail): 0.0001
p-value (two tail): 0.0001	p-value (two tail): 0.0001
Randomization significance (Z): 7.271064	Randomization significance (Z): 20.176473
p-value (one tail): 0.0001	p-value (one tail): 0.0001
p-value (two tail): 0.0001	p-value (two tail): 0.0001
End time.....: 11:50:14 AM, 07/20/2006	End time.....: 11:40:42 AM, 07/20/2006

Offender Rate Moran’s I

Population Density Moran’s I

Analysing the Variables at a different Spatial Level: Local Council

Note must be also made that the majority offenders live in high population density areas, which is made more interesting when reviewed against a council-based analysis based on Table C.16 with the population densities calculated for each local council. Table C.23a&b shows that those areas that experienced a decreasing population density also experienced a decreasing offender density and vice versa (33 in total), except for 19 localities that experienced decreasing offender change as against increasing population change. Whilst this is a positive occurrence, the most concerning issues that is highlighted again refers to the 7 localities that have experienced an increase in offender change in the face of decreasing population change. These councils as identified in Table 8.16 comprise Bormla, Valletta, Qormi, Gzira, San Giljan, Paola and the small town of Pieta. Between them these localities host 45.8% of all offenders. This is definitely a case where the relationship between population density and offender change needs to be reviewed further in future to elicit significance at the different spatial levels.

Population Density and Poverty Rates

Once it has been established that offenders tend to cluster in high population density areas, the best way forward to understand what these areas constitute is to look at the relationship between population density and poverty rates and then logically to review offender density with poverty rates. This would help identify consistencies in the population and offender analysis in terms of correlations to poverty.

Is unemployment and poverty higher in more densely populated areas?

The analysis for poverty is based on risk assessment where unemployment is being used as a surrogate for poverty. Spearman's rho (Table C.7) indicates a very weak relationship between population density and poverty at 0.107 and a p at 0.002, which is not significant at the stringent rating of 0.001 used in this study but still significant at $p = 0.05$.

Results show that 402 or 47.9% of all EAs register a higher than the national poverty rate. This indicates that relative poverty is quite high. When analysing the above-100 poverty group, 16.2% fall within low population density areas with the rest experiencing higher than standard poverty and higher than standard population density. Surprisingly, some areas exhibit huge differences between the expected and the observed poverty data, reaching an extreme of 363 (recoded to 101 to 500) or 3.63 times the expected figure. This is alarming, especially since the worst five areas registering a rate of poverty over 300 are located as follows; an area in Valletta with the 363 figure, followed by another area in Valletta, Marsa, Hamrun, and two areas in Bormla; all areas within the harbour region.

Figure C.20 identifies those EAs that have a higher than standard poverty rate, the results clearly showing the high rates of poverty within the Grand Harbour region with the main highlights once again being the Three Cities and Valletta. This finding is in line with the Malta Economic Survey (2000), which reports that when compared to a national average, the Grand Harbour area registered drastically lower income.

The best way to review this result is to generate a series of maps in 3D that allow both population (Figure C.21) and poverty (Figure C.22) to be interpolated with the poverty map overlaid onto the population density. Visual analysis is then carried out to identify if the high-rate offender density colour can be found in the population density spikes (Figure C.23).

Table C.7: Crosstabulations and Spearman Correlation Tests for Population Density and Poverty

Risk_Population Density_Recode * Poverty_Risk_Recode Crosstabulation

		Poverty_Risk_Recode		Total
		Less than 100	101 to 500	
Risk_Population Density_Recode	Less than 100	Count 90	65	155
		% within Poverty_Risk_Recode 20.6%	16.2%	18.5%
	101 to 500	Count 120	110	230
		% within Poverty_Risk_Recode 27.5%	27.4%	27.4%
	501 to 1000	Count 149	101	250
		% within Poverty_Risk_Recode 34.1%	25.1%	29.8%
	1000 plus	Count 78	126	204
		% within Poverty_Risk_Recode 17.8%	31.3%	24.3%
Total	Count	437	402	839
	% within Poverty_Risk_Recode	100.0%	100.0%	100.0%

Symmetric Measures

		Value	Asymp. Std. Error ^a	Approx. T ^b	Approx. Sig. ^c
Interval by Interval	Pearson's R	.107	.034	3.116	.002 ^c
Ordinal by Ordinal	Spearman Correlation	.107	.034	3.108	.002 ^c
N of Valid Cases		839			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

Step 1: The population density map (Figure C.21) depicts those EAs at the national level of 1,200 persons per square kilometer in blue and the areas that have high densities in red.

Step 2: The risk of poverty (Figure C.22) depicts the EAs that have high poverty as red, green being the national level and blue indicating low poverty.

Step 3: A combination map of Risk of Poverty map draped over a population density map is given in Figure C.23. The result indicates that the areas of high poverty risk coincide with the areas of high population density, mainly in the areas within the Grand Harbour with red poverty spikes in Figure C.21 highlighting the red population density spikes in Figure C.22. Other areas, such as the northern part of the conurbation show that population density there is not related to poverty as most spikes are green in colour mainly representing the national poverty rate.

Figure C.20: Graphical Poverty Rate – Enumeration Areas

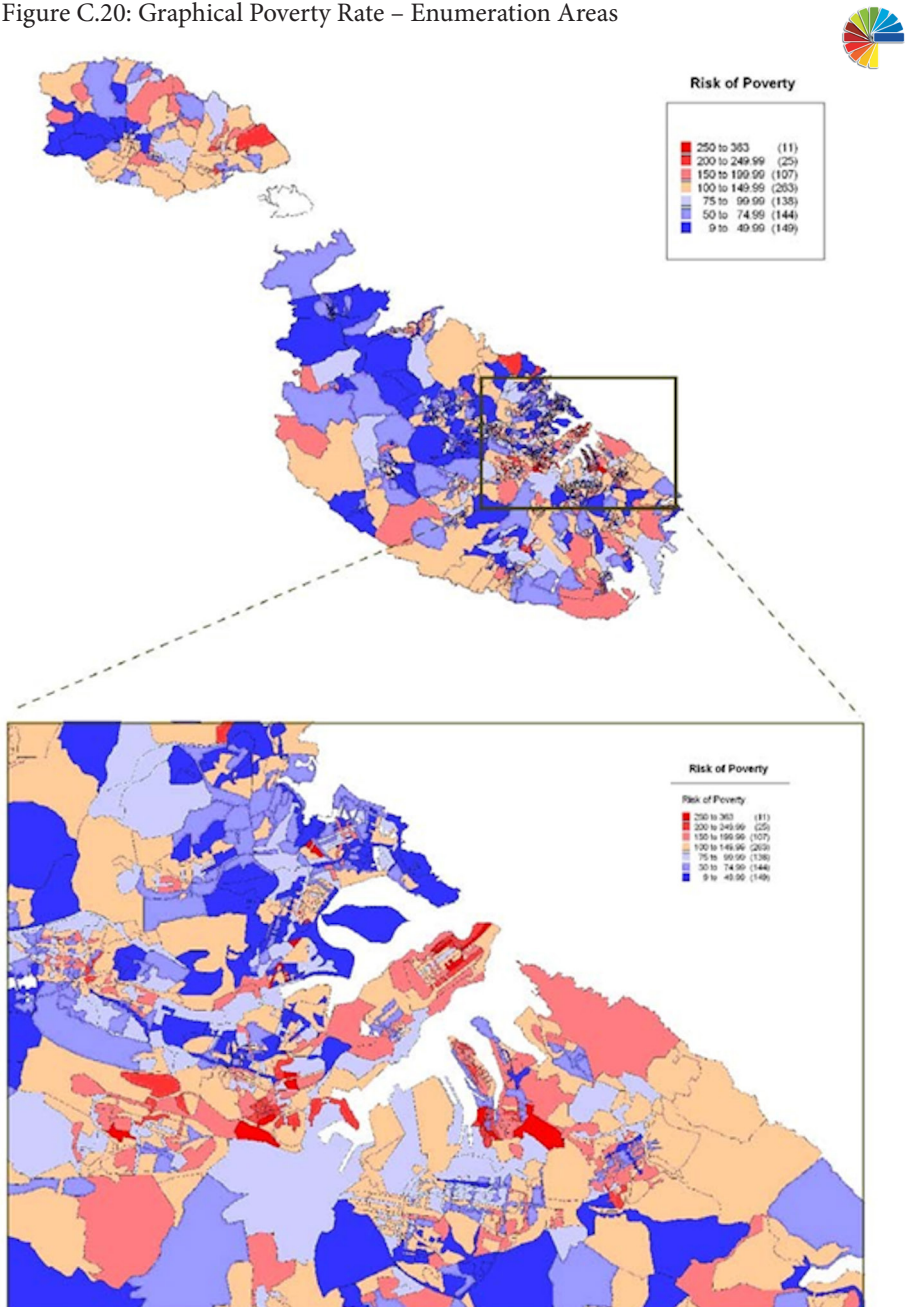


Figure C.21: 3D Population Density Map – Enumeration Areas

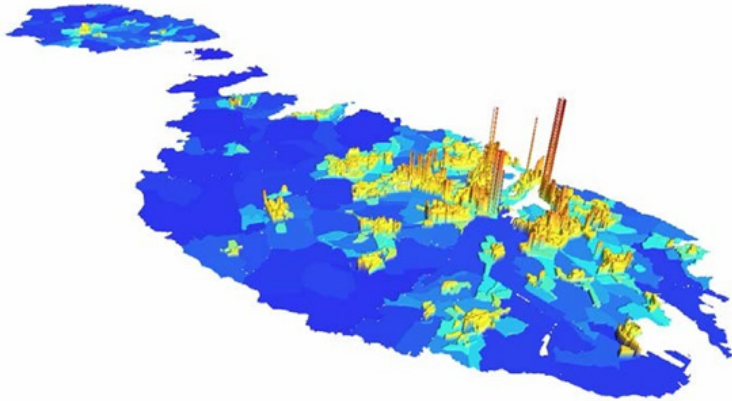


Figure C.22: 3D Risk of Poverty Maps – Enumeration Areas

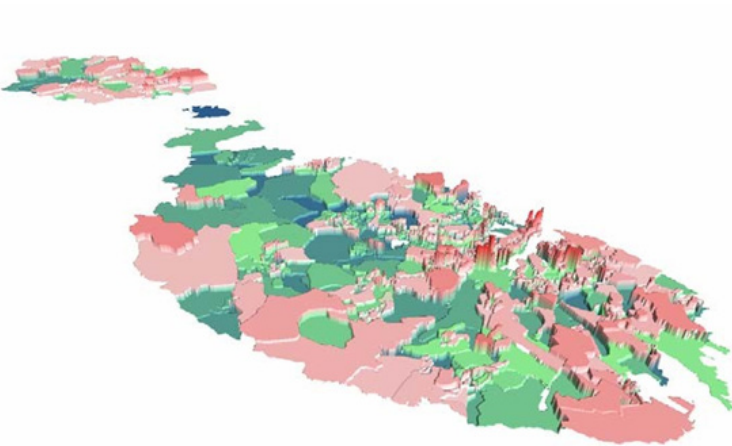
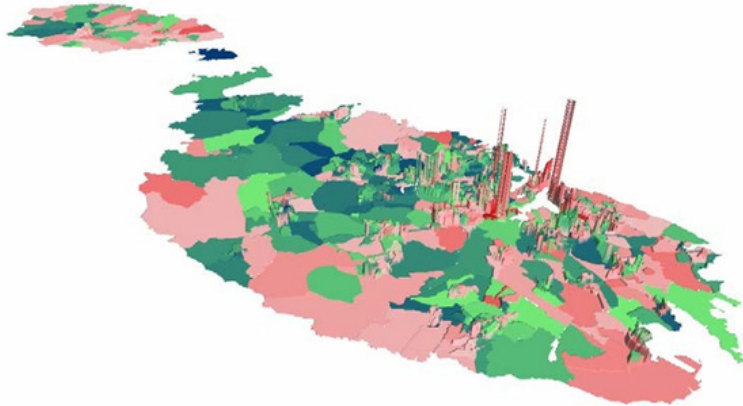


Figure C.23: Risk of Poverty Map draped over a Population Density Map



As in the case of population/offender densities analysis, a Moran's I exercise shows that at Moran's I of 0.028094 for poverty this is very slightly less clustering than that for population at 0.028428 (Table C.8). This indicates a very small but lower concentration of poverty rate than would be expected based on population.

Table C.8: Moran's I Spatial Statistics Tests for Poverty Rate and Population Density

Spatial Autocorrelation for Point Data:		Spatial Autocorrelation for Point Data:	
Sample size	843	Sample size	843
Measurement type	direct	Measurement type	direct
Start time	11:56:22 AM, 07/20/2006	Start time	11:40:41 AM, 07/20/2006
Moran's "I"	0.028094	Moran's "I"	0.028428
Spatially random (expected) "I"	-0.001188	Spatially random (expected) "I"	-0.001188
Standard deviation of "I"	0.001468	Standard deviation of "I"	0.001468
Normality significance (Z)	19.948440	Normality significance (Z)	20.175965
p-value (one tail)	0.0001	p-value (one tail)	0.0001
p-value (two tail)	0.0001	p-value (two tail)	0.0001
Randomization significance (Z)	19.950019	Randomization significance (Z)	20.176473
p-value (one tail)	0.0001	p-value (one tail)	0.0001
p-value (two tail)	0.0001	p-value (two tail)	0.0001
End time	11:56:23 AM, 07/20/2006	End time	11:40:42 AM, 07/20/2006

Poverty Rate Moran's I

Population Density Moran's I

Offenders and Poverty

Having found a positive relationship between population and offender density and a subsequent positive relationship between population density and poverty, the next step looks at the potential strength and direction of the offender and poverty relationship, if any.

Do poor areas host offenders?

An analysis of offender and poverty relationships show that there is a significant relationship between the two factors at Spearman’s rho of 0.18 and a p = 0.000 (Table C.9). The analysis of offender density and risk of poverty shows that areas with higher than the national standard poverty rate of 0.02 host 52% of all offenders. Half of them again live in zones that have a factor difference (over a 1000 rate as against a national 100). Only a few offenders live in low poverty rate (less than national) areas. In fact 63.9% of those living in areas with less than national poverty rates have less than the national offender densities.

Table C.9: Crosstabulations and Spearman Correlation Tests for Offender Density and Poverty Rate

Risk_Offender_Recode * Poverty_Risk_Recode Crosstabulation

		Poverty_Risk_Recode		Total	
		Less than 100	101 to 500		
Risk_Offender_Recode	Less than 100	Count	278	195	473
		% within Poverty_Risk_Recode	63.9%	48.4%	56.4%
	101 to 500	Count	69	66	135
		% within Poverty_Risk_Recode	15.9%	16.4%	16.1%
	501 to 1000	Count	35	38	73
		% within Poverty_Risk_Recode	8.0%	9.4%	8.7%
	1000 plus	Count	53	104	157
		% within Poverty_Risk_Recode	12.2%	25.8%	18.7%
Total	Count	435	403	838	
	% within Poverty_Risk_Recode	100.0%	100.0%	100.0%	

Symmetric Measures

		Value	Asymp. Std. Error ^a	Approx. T ^b	Approx. Sig.
Interval by Interval	Pearson's R	.187	.034	5.506	.000 ^c
Ordinal by Ordinal	Spearman Correlation	.180	.034	5.296	.000 ^c
N of Valid Cases		838			

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.
- c. Based on normal approximation.

However this is not a direct indication that areas that suffer from poverty directly attract more offenders as areas of residence. The pointers seen in previous sections indicate that 50.8% of offenders are unemployed, thus this does not mean that all offenders are poor or the areas that they live in poor areas. However, there is an indication that the latter areas tend to attract offenders for a diversity of reasons, amongst them the issue of available residence provision that is either rendered 'free' through squatting or through cheap rents, decreasing population and in turn again more available housing and other issues that are not tackled here such as stigma, bias and an acceptable-to-offenders social cohesion, which studies require in-depth qualitative analysis.

In addition, the above situation is enhanced through the previous finding, which showed that 7 councils between them host 45.8% of all offenders and these comprise Bormla, Valletta, Qormi, Gzira, San Giljan, Paola and the small town of Pieta. Such a situation indicates that offenders are grouping in a few towns where they would gauge high on significance in the diverse parameters that those areas are strong in, such as in this case poverty. In the following spatial analysis one can see this bias that the areas where offenders live also host high levels of poverty; though there is no direction which variable is the cause or effect.

A spatial analysis using 1NNH hotspots at 1 standard deviation indicates that 95.2% (37) of the 40 1990s offender hotspots are located within or intersect with poverty areas as identified through the 2003 welfare hotspots (an annual poverty surrogate based on unemployment benefits that serve to update Census data). The results in Figure C.24 show that those areas that did not overlap are located in southern Birgu, (Vittoriosa), Paola and San Giljan. Others, such as those in Isla, Birgu and Valletta, have near perfect overlap, with others such as San Gwann, Qormi, Gzira, Pieta and Marsa experiences large overlaps.

Combining the NNH analysis with Moran's I Spatial Autocorrelation for poverty rate and offender density the results show that there is a clustering of both poverty and offenders, at a Moran's I of 0.028094 for poverty this is higher than that for offenders at 0.009482 (Table C.10). In effect there is a higher concentration of poor areas than would be expected based on offender rate.

Figure C.24: 1NNH Hotspot Analysis for Offender Residence and Poverty

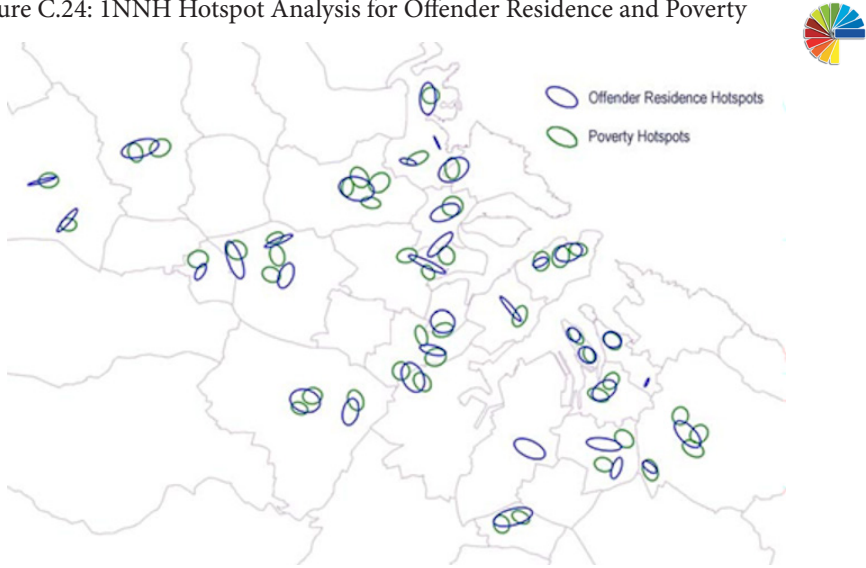


Table C.10: Moran's I Spatial Statistics Tests for Poverty Risk and Offender Rate

Spatial Autocorrelation for Point Data:		Spatial Autocorrelation for Point Data:	
Sample size	843	Sample size	843
Measurement type	Direct	Measurement type	Direct
Start time	11:56:22 AM, 07/20/2006	Start time	11:50:13 AM, 07/20/2006
Moran's "I"	0.028094	Moran's "I"	0.009482
Spatially random (expected) "I"	-0.001188	Spatially random (expected) "I"	-0.001188
Standard deviation of "I"	0.001468	Standard deviation of "I"	0.001468
Normality significance (Z)	19.948440	Normality significance (Z)	7.268992
p-value (one tail)	0.0001	p-value (one tail)	0.0001
p-value (two tail)	0.0001	p-value (two tail)	0.0001
Randomization significance (Z)	19.950019	Randomization significance (Z)	7.271064
p-value (one tail)	0.0001	p-value (one tail)	0.0001
p-value (two tail)	0.0001	p-value (two tail)	0.0001
End time	11:56:23 AM, 07/20/2006	End time	11:50:14 AM, 07/20/2006

Poverty Risk Moran's I

Offender Rate Moran's I

Summary of the offender and poverty relationship

An analysis of offenders and their environment results in a positive relationship between offender density and population density. A spatial study shows that the areas experiencing both high densities are those localities found in the harbour region, those areas that form part of the so-called inelastic cities (Shaw-Taylor, 1998). Whilst population density and poverty resulted in a very weak relationship, a further analysis shows that there is a positive relationship between offender density and poverty risk indicating a tendency for offenders to live in poor areas.

New Parameters for Analysis

The 2010-2014 analysis that feed into the identification of potential zones for intervention and funding.

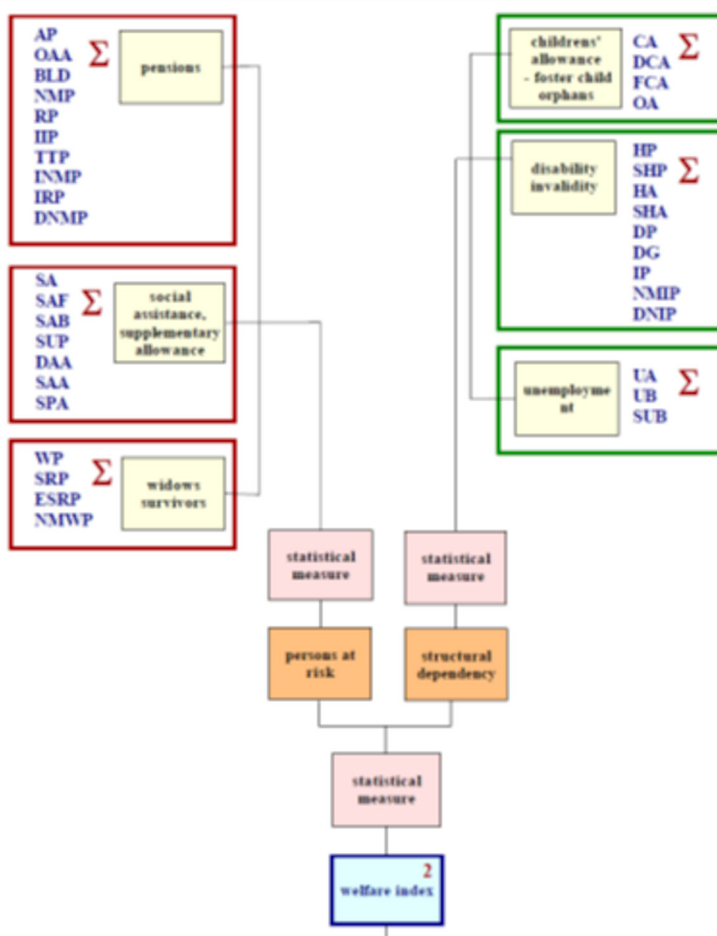
Calculating Welfare Focus points:

Based on CRISOLA (Formosa, 2007):

The identification of persons at risk is calculated as based on the Crimestat methodology and the analysis of both individual benefits at NNH1, NN2 and NNH3. Each benefit was identified through its importance in the relative structural dependency aggregates and the persons-at-risk aggregates as per Figure C.25.

Benefits listed under the Maltese Welfare categories show that there are 57 different benefits as at end 2014 (most current complete year statistical provision) as sourced from MFSS. These benefits range from Age Pension, to Milk Grant to Unemployment benefit. Note should be taken that the welfare parameters can be reviewed as through sole recipients and multiple recipients where the same person may be receiving more than one benefit. This study investigated the individual benefits but also sought to investigate those areas where multiple benefits are being partaken to, though such an exercise would elicit combinations of 4×10^7 different combinations. In effect, the study first sought to identify the list of available benefits as listed in Table C.11, then reviewed them for their combined (total) and individual concentrations, whilst finally employing the purposed method to analyse the main indicators of poverty, that relating to unemployment.

Figure C.25: CRISOLA Welfare Benefits model. Note that the benefits have seen an increase in new benefits such as the ENRG benefit. The core benefits are identified in Figure C.25.



Source: Formosa (2007)

Table C.11: Welfare Benefits as at end 2014

Type	Description
AP	Age pension (AP)
BLD	Blind pension (BLD)
CA	Children's allowance
CAFR	Children's allowance flat rate
CLBO	
DAD	Social assistance (DAD)
DCA	Disabled child allowance (DCA)
DG	Disablement gratuity (DG)
DNIP	Decreased national invalidity
DNMP	Pensjoni ghal irtirar (DNMP)
DP	Disablement pension (DP)
ENRG	Energy benefit
ESRP	Survivors pension-ESRP
FCA	Foster child allowance
HA	Disability allowance (HA)
HP	Disability pension (HP)
IB	Injury benefit (IB)
IIP	Increased invalidity pension
INMP	Increased national minimum
IP	Invalidity pension
IRP	Pensjoni ghal irtirar (IRP)
LA	Medical (leprosy) assistance (LA)
MB	Maternity benefit (MB)
MG	Milk grant (MG)
MLB	Maternity leave benefit
MRG	Marriage grant
NMIP	National minimum invalidity
NMP	National minimum pension
NMWP	Widows pension-NMWP

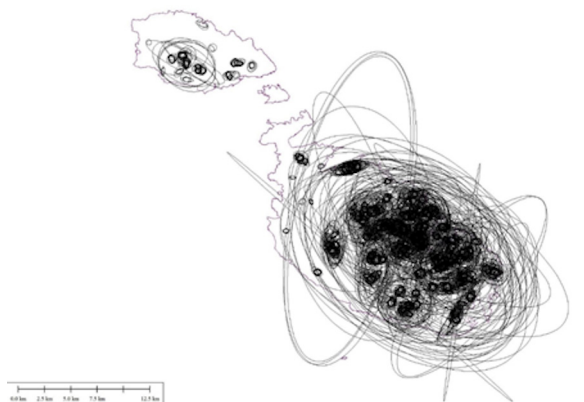
Type	Description
OA	Orphans allowance-OA
OAA	Old age allowance(OAA)
PNK	
PW	Carer's pension (PW)
RP	Retirement pension (RP)
SA	Social assistance (SA)
SAA	Social assistance (SAA)
SAB	Social assistance (SAB)
SAF	Social assistance (SAF)
SB	Sickness benefit (SB)
SCG	Social assistance care givers
SHA	Disability allowance (SHA)
SHP	Disability pension (SHP)
SKA	Sickness assistance(SKA)
SPA	Supplementary allowance
SRP	Survivors pension-SRP
SUA	Special unemployment assistance
SUB	Special unemployment benefit
SUP	Social assistance (SUP) - single unmarried parents
TA	Medical 9tuberculosis0 assistance (TA)
TTP	Two thirds pension
UA	Unemployment assistance
UAT	Unemployment assistance transition
UB	Unemployment benefit
WCH	Widows pension (WCH)
WP	Widows pension-(WP)
WRG	Re-marriage gratuity
WRM	Widows pension (WRM)

Source: MFSS (2014)

An initial overview of all the welfare benefits combined together shows a highly complex data structure that though visually is too complex to decipher, shows the main hotspot zones pertaining to the benefits being taken up by the recipients. The Part C Appendix depicts each welfare benefit (those that have enough data points to elicit spatial statistical outputs) in graphical form. The different maps show the structure of the ellipsoid the direction and the interaction between the three levels (NNH3, NNH2 and NNH1).

The monochrome output (Figure C.26) shows that every town has some form of hotspot, which however does not mean that every benefit is partaken to in the town.

Figure C.26: Welfare_Benefits_2014_0_All



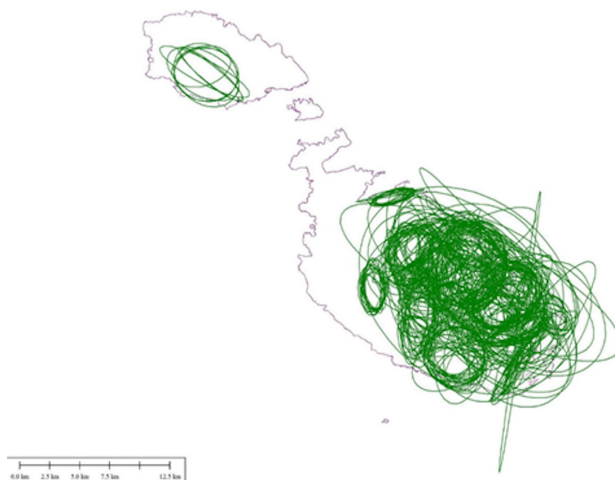
The NNH3 figure (Figure C.27) shows a concentration in the island of Malta and none in Gozo, which is resultant from the low-population parameter in Gozo which elicits statistical insignificance at the NNH3 level and thus the ellipsoids are not pulled towards the island of Gozo.

Figure C.27: Welfare_Benefits_2014_0_All_NNH3



In terms of NNH2 level, benefits are distributed across most districts, except for the North-East Gozo and North-West Malta, areas with lower urbanity (Figure C.28).

Figure C.28: Welfare_Benefits_2014_0_All_NNH2



NNH1 benefit analysis shows that all towns/villages have some kind of welfare beneficiaries. These beneficiaries, across the 57 benefit types show high levels of concentrations in the conurbation and the main towns, however, one needs to analyse the output in greater detail, extracting different types of benefits as identified by the CRISOLA model, where the Welfare Benefits sub-section is depicted in Figure C.29.

Figure C.30 combined the different NNH levels as an example of benefit concentrations, pointing towards a need to focus on the niche areas depicted by the red ellipsoids (NNH1) since the more abstract levels (NNH2 and NNH3 respectively) indicate wider potentials for intervention and funding, with the potential resultant loss of fine targeting and investment in areas that are peripheral to the hotspots and needy areas, which are better depicted by the red NNH1 ellipsoids.

Figure C.29: Welfare_Benefits_2014_0_All_NNH1

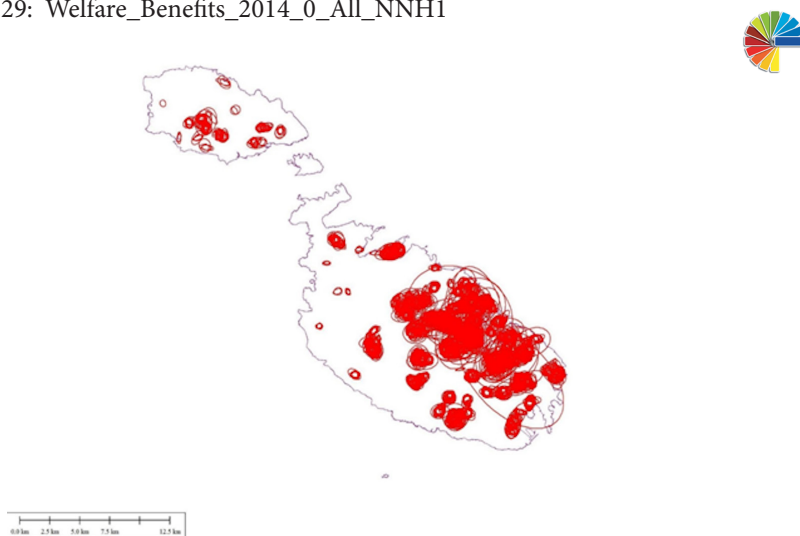
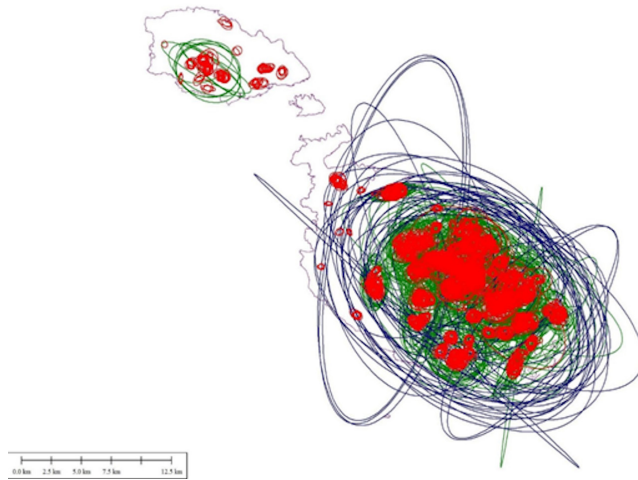
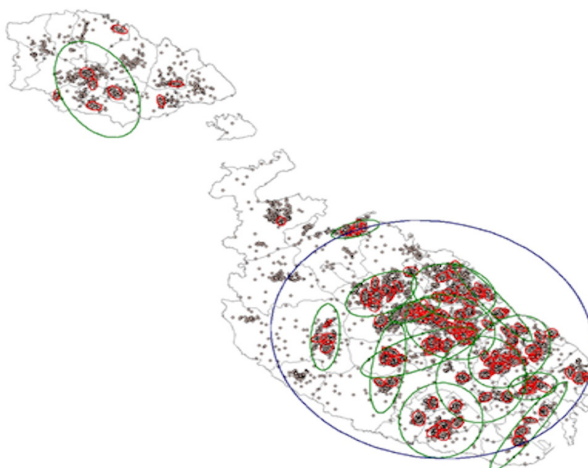


Figure C.30: Welfare_Benefits_2014_0_Allcol



Loading the highest detail data layer that of the point level data (street-level point data) for one of the benefits, the result shows that whilst the individual beneficiaries are spread over all the island, the concentrations in the red ellipsoids is highly dense and in ten significant enough to create the relevant concentration ellipsoid (Figure C.31).

Figure C.31: MI_welfare_benefits_2014



The method employed to extricate the data related to welfare benefits was based on the spatial combining of the different NNH levels into an integrated data layer which allowed one to carry out point-in-polygon analysis that resulted in the statistical outputs pertaining to the presence of welfare categories (individual benefits or combined series). The following series of figures depict the resultant combined layers for each NNH level which were employed for the unemployment parameter (Figure C.32 – C35).

Figure C.32: 2014_NNH1_combined

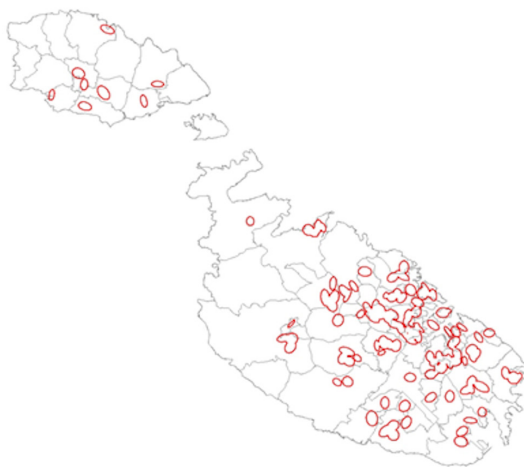


Figure C.33: 2014_NNH2_combined



Figure C.34: 2014_NNH3_combined



Figure C.35: 2014_NNH123_combined



Unemployment and hotspot identification

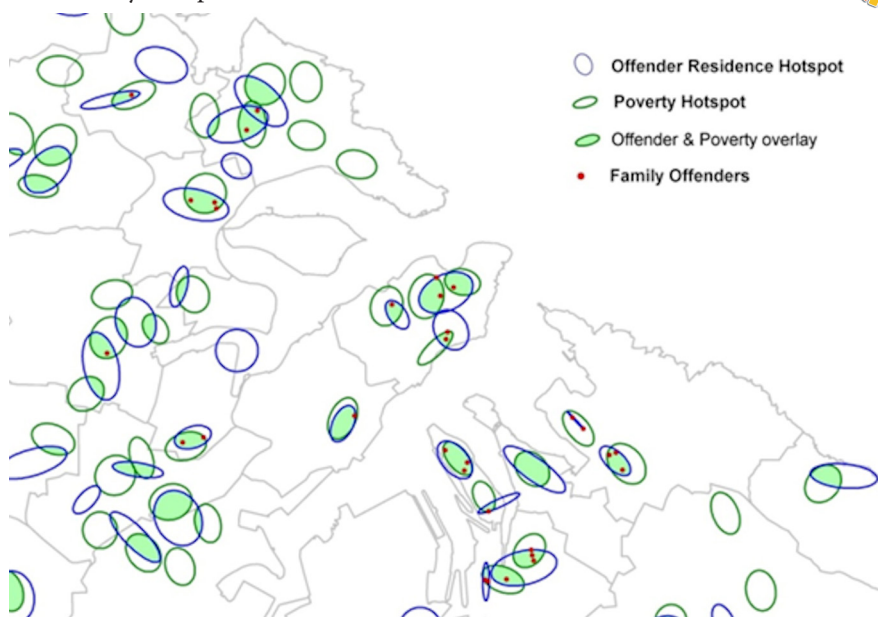
Whilst an analysis of the different benefits shows varied morphologies and concentration, the main issue focused upon relates to the Unemployment-related benefits that comprise UA, UB and SUB. The aggregate of these benefits shows that the pointers for poverty and intervention focus, particularly since it has been established that children at risk and who fall within offending risks are located in the Poverty hotspots (Formosa Pace, 2015).

In addition, social constructs such as unemployment, the absence of an “education culture” (Tabone, 1994) and residing in neighbourhoods characterised by poor collective efficacy (Wikström et al., 2010), poverty and offender hotspots (Formosa, 2007) have been identified as constraints to social mobility in the islands. It also is noted that these factors have been linked to crime and criminal propensity at the individual level in a number of studies. The Formosa Pace (2015) study identified unemployment, poverty and offender hotspots as potential risk factors and transmission proxies that compound and reinforce continuity of offending characterised by the clustering of offending in Maltese families (Formosa Pace, 2015, p. 92).

In the Formosa Pace (2015) study, the offender residence hotspots are based on the proximity analysis of those residential locations pertaining to the offenders. The hotspots are spread over the islands and highlight those ellipsoids that depict those specific areas that host a concentration of offenders who live in proximity to each other. Once the family offenders are mapped, a point-in-polygon analysis was carried to determine which family individuals reside in such offender hotspots, which scope was set to determine the concentration of these families in the specific offender zones or whether they reside outside of such zones. The offender residents’ hotspots were created through the same process employed in the poverty hotspot approach.

Around 40% of the individuals belonging to crime families lived in poverty hotspots whilst around 47% lived in offender-residence hotspots in the 2000s. Thus findings from the Formosa Pace (2015) study indicate that individuals belonging to crime families are likely to set residence in offender-residence hotspots and poverty pockets in the Maltese Islands. Also, findings indicate that crime families concentrate in the localities of Valletta, Bormla and Santa Lucia which localities could serve as Wikström’s (2008) activity fields providing one with role models on exposure to crime (Formosa Pace, 2015, p.242). Figure C.36 is referenced from Formosa Pace (2015) Figure 8.7b page 242.

Figure C.36: Map of Individuals Residing in Offender Residence Hotspots and Poverty Hotspots: Detail of the Grand Harbour Area



Adapted from Formosa, 2007

The analysis that helped identify the final base maps that would help target the areas identified as requiring intervention for future projects was based on UA and SAB (unemployment assistances) together with UB and SUB (short term benefits). The resultant update to the Figure C.24 identified in the CRISOLA Model helps to refine the output for better for better focusing of policy intervention as listed in Table C.12.

Table C.12: Specific Targeted Welfare Benefits Identified for Future Project Interventions

Code	Benefit	Benefit Category
UA	Unemployment assistance	Unemployment assistances
SAB	Social assistance (SAB)	Unemployment assistances
UB	Unemployment benefit	Short term benefits
SUB	Special unemployment benefit	Short term benefits

The resultant data was converted to spatial format as identified in the literature and methodology section above. The number of recipients who pertained to the 2014 dataset were analysed for their presence within the national, NNH 3, NNH2 AND NNH1 levels. Interestingly, the main component of the recipients live in concentrated areas mainly 72% of the beneficiaries. More refined spatial statistics could be computed to help focus further on the areas under study that may need more niche-focusing for particular benefit analysis (Table C.13 and Figure C37).

Table C.13: Beneficiaries within Different Spatial Levels

Beneficiaries	NNH level
12,269	National: All population
10,586	NNH3
10,652	NNH2
8,886	NNH1

Figure C.37: Welfare_Benefits_2014_UA_SAB_UB_SUB



Table C.14 further identifies the localities that host the largest unemployment concentrations (51% of the total), mainly Birkirkara, San Pawl il-Bahar, Bormla, Hamrun, Qormi, Valletta, Zabbar, Birzebbugia, Fgura, Paola, Marsaskala and Msida in decreasing order. Whilst these are large localities hosting large populations, the respective unemployment levels are heavily concentrated in their respective micro-zones identified by the NNH analysis.

Table C.14: Percentage Concentration of Unemployment Beneficiaries within NNH1 Zones

Locality	Beneficiaries within NNH1	% Concentration of Total
Birkirkara	564	6.3
San Pawl il-Bahar	562	6.3
Bormla	467	5.3
Hamrun	427	4.8
Qormi	416	4.7
Valletta	388	4.4
Zabbar	333	3.7
Birzebbuga	302	3.4
Fgura	294	3.3
Paola	283	3.2
Marsaskala	270	3.0
Msida	251	2.8
Sliema	247	2.8
Zejtun	235	2.6
San Gwann	229	2.6
Zebbug	227	2.6
Mosta	214	2.4
Gzira	205	2.3
Tarxien	203	2.3
Isla	197	2.2
Zurrieq	181	2.0
Marsa	179	2.0

Locality	Beneficiaries within NNH1	% Concentration of Total
Santa Venera	140	1.6
Rabat	135	1.5
Birgu	131	1.5
Naxxar	113	1.3
Siggiewi	107	1.2
Santa Lucija	103	1.2
Pieta'	99	1.1
Luqa	94	1.1
Floriana	85	1.0
Victoria	84	0.9
San Giljan	80	0.9
Swieqi	80	0.9
Xghajra	68	0.8
Ghaxaq	63	0.7
Kirkop	60	0.7
Qrendi	57	0.6
Ghajnsielem	55	0.6
Kalkara	55	0.6
Safi	54	0.6
Gudja	49	0.6
Marsalforn	49	0.6
Xewkija	45	0.5
Attard	44	0.5
Ta' xbiex	44	0.5
L-Imqabba	42	0.5
Sannat	32	0.4
Marsaxlokk	29	0.3
Nadur	29	0.3
Iklin	28	0.3
Mtarfa	27	0.3

Locality	Beneficiaries within NNH1	% Concentration of Total
Pembroke	24	0.3
Gharghur	22	0.2
Mellieha	21	0.2
Balzan	16	0.2
Xlendi	16	0.2
Zebbug (Gozo)	14	0.2
Munxar	12	0.1
Fontana	4	0
Mdina	2	0
Bahrija l/o Rabat	0	0
Burmarrad	0	0
Dingli	0	0
Is-Swieqi Madliena	0	0
L-Imgarr	0	0
Lija	0	0
Mriehel	0	0
Xaghra	0	0
Total	8886	100

An analysis of the unemployment categories shows that whilst for the highest level (NNH3), the conurbation (Greater Valletta metropolis) is covered entirely, it is interesting to note that the ellipsoid is nearly spherical, which situation indicates that the unemployment and by inference, the poverty rates are concentrated into the main dense population clusters. This does not however infer that there are no pockets of poverty in the outer zones and hence no investment/intervention needs to be carried out (Figure C.38).

In fact the NNH3 blue ellipsoid only renders a high level approach to spatial analysis as it indicates where to investigate in higher detail the successive nearest neighbour hierarchical clustering hotspots.

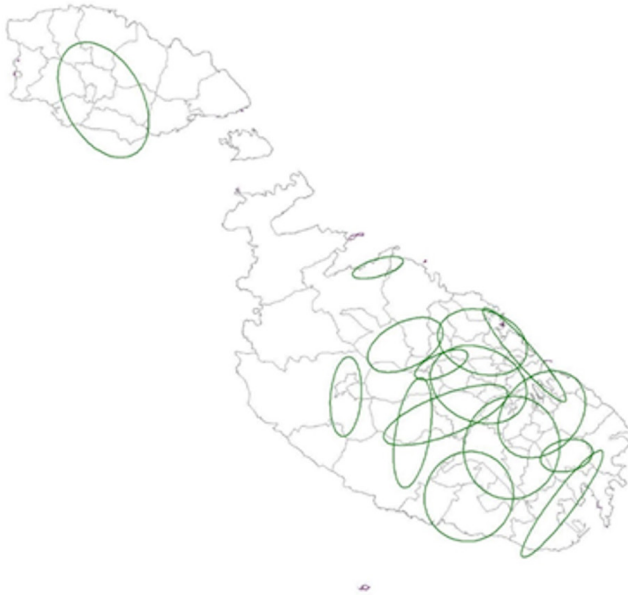
Figure C.38: Welfare_Benefits_2014_UA_SAB_UB_SUB_NNH3



In effect at a deeper level analysis, at NNH2, the green ellipsoids (Figure C.39), which represent the NNH2 concentrations, the unemployment categories elicit explicit zones that are distinct from the conurbation, notably the Gozo Victoria-Sannat pivotal hotspot and the Qawra (San Pawl il-Bahar) ellipsoid, a zone that has gradually become synonymous with a rapidly evolving multi-cultural, multi-income-level, multi-use (building) area with the result that incidences of poverty, social disorganisation and crime are resultant, mainly effecting vulnerable social groups and children (JANUS, pg 86-91).

The latter publication stated that “St. Paul’s Bay: Apparently, crime is a daily occurrence in St Paul’s Bay. This includes cases of: vandalism, theft, hold-ups, fights (particularly behind the Qawra Palace and the Suncrest hotels), drug abuse, child abuse, prostitution and a few cases of incest. There are two police stations in St Paul’s Bay: one in Qawra and another one in the area called “Tal-Ghazzenin”... Contact with the police is good, however it is held that police presence in St Paul’s Bay is lacking. There are no CCTV systems installed in the streets and neither is there a neighbourhood watch scheme”. Several problematic issues are evident in St Paul’s Bay.

Figure C.39: Welfare_Benefits_2014_UA_SAB_UB_SUB_NNH2



These include: mental health problems, school-related behavioural problems, single parenting, the fast-developing multi-ethnic community, the black economy, unemployment, non-registered migrants, marital separations and illiteracy (particularly in Bugibba and Qawra where social problems seem to be rampant). Identity crisis features highly amongst children of foreigners whilst poverty tends to remain hidden within these households.

The St Paul's local council refers several people, in need of counseling, to Agenzija Appogg. In addition, the local council provides community work in Qawra via Agenzija Access. Residents tend to migrate internally from one flat to another, in the same area. This is a consequence of the fact that land-owners ask for reasonably low rents and offer short-let options. As a result, these flats now constitute hotspots for social problems...

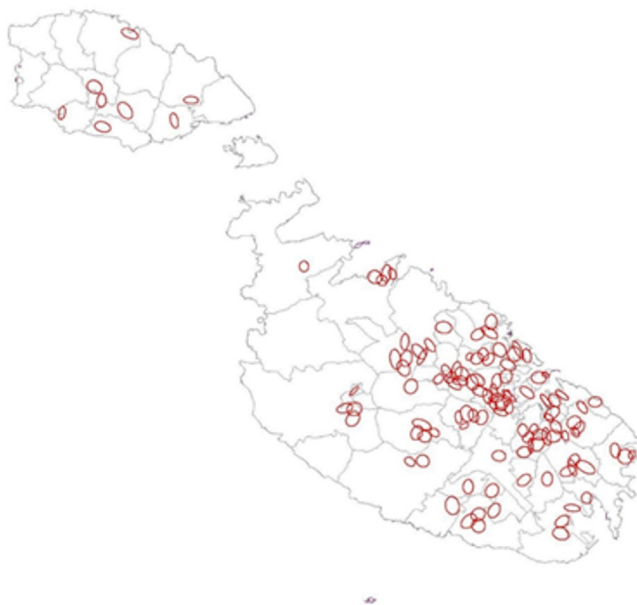
In terms of demographics, JANUS outlined that "these included internal migration of low socio-economic status persons from central areas to what might be called new satellite towns (with St Paul's Bay, Qawra and Bugibba being the most frequently mentioned),

often with a disproportionate percentage of single parents, with consequential effects on adults and children and without an appropriate level of community support or cohesion. These areas would be seen formally as areas of extreme social dislocation (JANUS, p86-91).

Interestingly, the Mtarfa-Rabat pivot is also evident as an isolated hotspot, evidently due to the rural aspect of the towns in question. The rest of the NNH2 ellipsoids are consistent with the conurbation NNH3 output, with a particular multi-council hotspot that links Marsascala with Marsaxlokk and Birzebbugia, where the former had not been depicted as a main unemployment driver.

At the highest level of detail (NNH1 depicted by red ellipsoids) the distinct unemployment areas are highly discernable due to their smaller zonal depictions (Figure C.40) that help policy makers to identify the detailed zones that require intervention. These zones highlight highly specific areas in each town/village that have seen high rates of unemployment as identified by the spatial statistical methodology. These areas are shown in more detail in the individual town figures later in this section.

Figure C.40: Welfare_Benefits_2014_UA_SAB_UB_SUB_NNH1



On a high level review, the main zones of poverty/unemployment are identified through the red ellipsoids that depict such new areas as are Xlendi in Munxar Gozo and Marsalforn in Zebbug Gozo, areas that only appeared very recently, such areas that are identified as summer recreational areas and that rarely host annual habitation, however such a study shows that these zones are emergent as unemployment concentrators or attract persons with low income who settle in such locations due to the glut of vacant of low-rent dwelling units. The other areas around the islands are distinct in the rural zones and the outer-areas that do not form part of the conurbation, such as San Pawl il-Bahar, easily identifiable through four distinct poverty zones that overlap each other, which overlaps should be investigated further due to their multiplicity in unemployment and other poverty-related impinging factors.

Focusing on the Zones that require intervention in future projects

The next figures depict the concentrated zones identified by the hotspots pertaining to the different towns.

Whilst SeCollege sought to identify those zones that suffer from unemployment and subsequently point towards those children who need help, one cannot simply assume that these children, once having successfully graduated from the SeCollege, would return to a stable environment, an environment that remained in the same rate of flux or disorganisation that pertained to their pre-entry period.

The following maps depict those areas that need intervention if such children on the long-term are to move back into more organized societies. The concept here is to identify those areas that require intervention and which show that most intergenerational-transmitted offending occurs due to their relation to living in poverty zones (Formosa Pace, 2015). Thus it is imperative that funding mechanisms work on these zones and higher detailed hotspot analysis to ensure that the best outcome is sought as against blanket funding that does not necessarily empower societies but where funding is lost or watered over such a wide zone that the benefits are not discernable or factually beneficial.

Thus it is imperative that each red ellipsoid in the figures below is highlighted in future applications for social projects.

As an introduction to the spaces under study, Figures C.41 and C.42 depicts those areas in Malta and Gozo that have shown evidence of concentrations of poverty as investigated through the surrogate data of unemployment-related welfare benefits, mainly UB, UA, SAB and SUB.

The resultant maps show that not all towns and villages experience poverty hotspots due to their lower rates of beneficiaries seeking unemployment benefits, which can point towards a higher affluence, engagement on natural-environment and agri-industry activities. The latter statement needs to be researched in depth to identify the linkages and spatial relationships as well as verification of such a statement.

Councils such as Mgarr and Dingli in Malta do not exhibit any hotspots. Interestingly, Gozo hosts more towns that exhibit no hotspots which comprise Kercem, San Lawrenz, Ghasri, Gharb, Xaghra and Qala.

Mdina, though not hosting an unemployment hotspot, is however shown as a hotspot on the entry location, which ellipsoid is due to the strong ellipsoid hotspot pertaining to Rabat.

The local councils that exhibit the hotspots exhibit various levels of complexity in terms of hotspot availability. Some councils may exhibit one hotspot which could designate a very small zone or a wider town-spanning hotspot. In other cases, more than one hotspot is identified, either as separate isolated zones or overlapping zones, which indicates both the presence of single isolated areas requiring intervention and those areas where the ellipsoids overlap indicating a more urgent need for intervention due to the multiple factor that may have effected each ellipsoid and which may be total different in each zone. As an example, one zone can fall within a dilapidated village core, whilst another may fall within a housing estate, where the overlaps may indicate the presence of poverty in transition, due to persons who are second or third generation estate inhabitants who are moving into the dilapidated zones due to a lack of space or lower renting rates. In addition such an overlaid hotspot may indicate a potential for broken windows which relates to the identification of zones that are on the verge of tipping and may become victims of broken windows, a theoretic approach that sees a morphing of an area from a depopulating zone to an area that is dilapidated, where children play and break windows, then access the buildings over time, eventually resulting in usage of the units for illicit activities, and eventually serving as a squatting zone.

Figure C.41: Malta

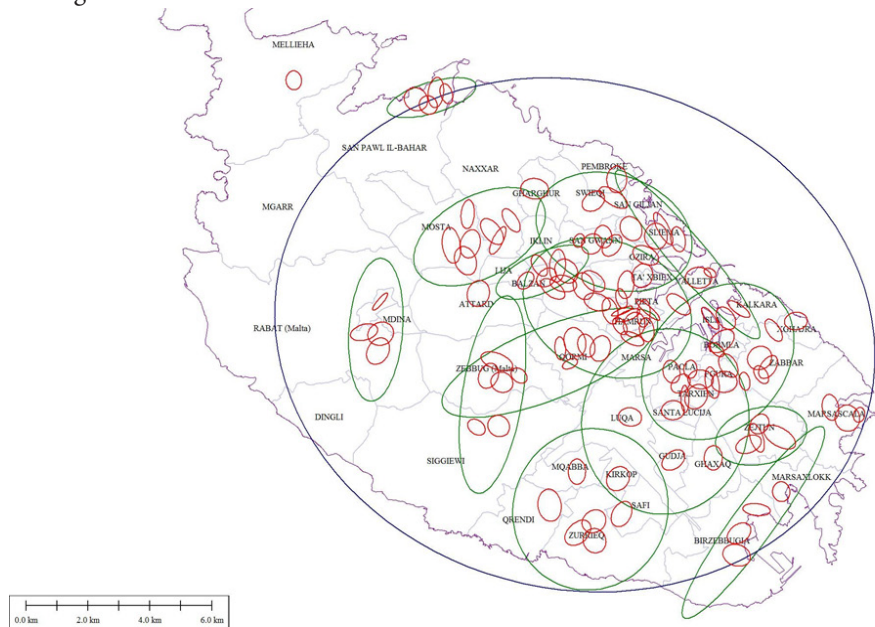
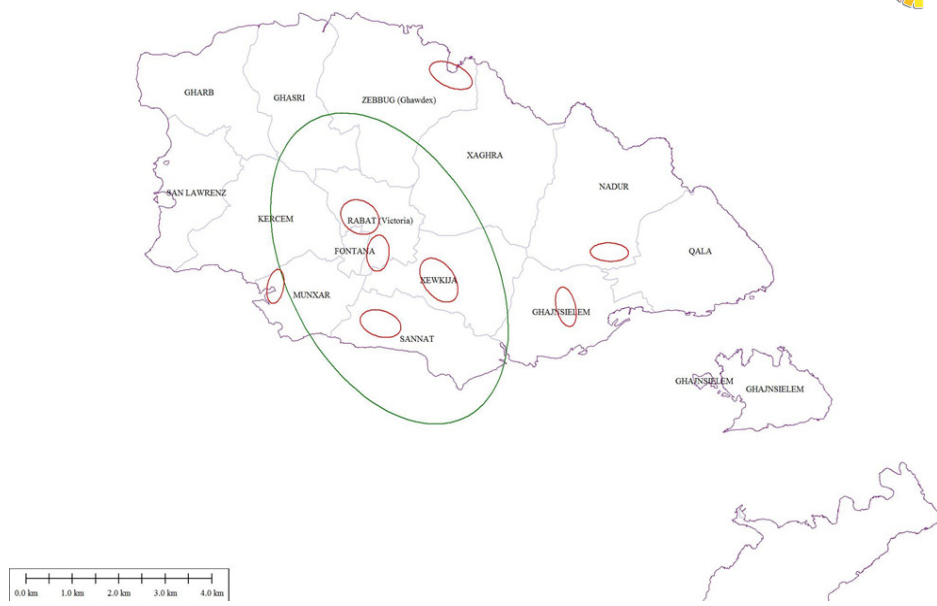


Figure C.42: Gozo



Caution must be maintained on the interpretation of every zone that interpretation can only be partaken to when the researchers and policy-makers have access to the contextual realities on the ground as each town, village and sub-zone within the councils experience different realities.

It is not the scope of this study to carry out a study of the context as such would entail a multi-thematic study and the creation of new datasets and qualitative data. Thus the zones are depicted for their presence and overlap aspects as well as the locational construct, which hotspots serve as a veritable information source for further research and project conceptualisation for future funding opportunities.

Each hotspot needs further investigation for its social, physical, crime and other characteristics both through individual theme analysis and multi-thematic approaches. Such a process would require months of work, which could be utilised as part of the preparation of each individual intervention/project. It is imperative that these hotspots resultant from the SeCollege study are used as baselines for the furthering of such knowledge and the eventual implementation, ideally within the 2014-2020 funding period.

Malta

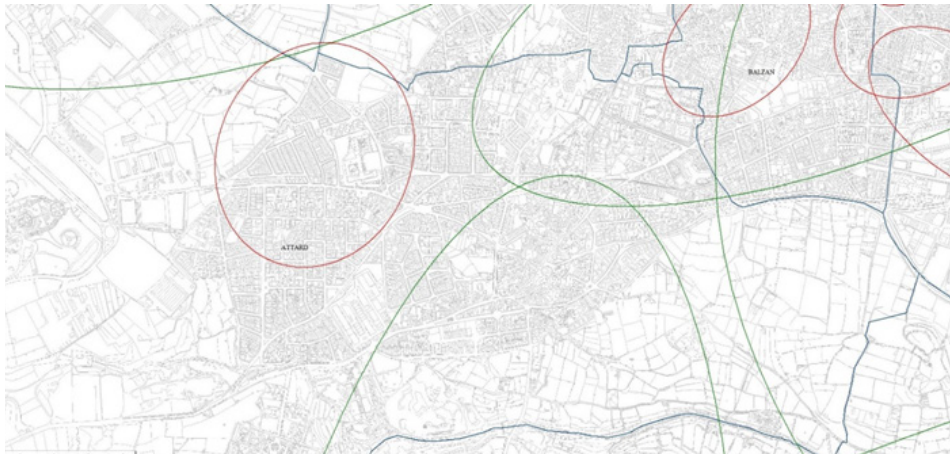
The island of Malta offers a canvas for the investigation of the social, physical and thematic disciplines which study shows that the areas requiring further analysis and intervention are spread across the whole island. There are very few towns that do not exhibit a hotspot which are Mgarr and Dingli, whilst the rest naturally follow a conurbation spread with outliers such as Mellieha, San Pawl il-Bahar, Rabat, Siggiewi and Marsascala as well the other peripheral towns and villages that are located in the suburbs to the Greater Valletta metropolis.

In difference to the Gozitan hotspot dispersion, which follows the rural satellite formation, the Maltese hotspots are clustered to the extent that some overlap heavily forming corridors of unemployment pointers. In addition, the close clustering is such that the overlaps and multi-faceted and have double or triple overlaps, indicating strong forces at play, heavily leveraged by high incidences of unemployment and subsequently poverty. This high-density clusters at NNH1 level eventually render themselves densely clustered such that they form distinct collectivities as rendered by the spatial statistical outputs of NNH2 and in turn formed the major ellipsoid that centres on the conurbation at NNH3.

Individual Council Review: Island of Malta

A review of each area that depicted a hotspot shows that Attard (Figure C.43), though traditionally not viewed as a potential hotspot for unemployment and poverty, has in the most recent data highlighted a NNH1 hotspot which could indicate that there is a movement of unemployed persons to the zone, potentially fuelled by the availability of low-rents and small dwelling units, mainly in the form of apartments and older dwellings that could have been abandoned and are now being repopulated by benefit-dependent recipients. This is an area of investigation as there may be a wide range of variables that may be causing such a zone of clustering.

Figure C.43 Attard



The Cottonera zone (composed of Bormla, Isla, Birgu) and Kalkara depict distinct unemployment zones (Figure C.44), which zones host unique ellipsoids for the Isla, Birgu and Kalkara, which ellipsoids identify wide areas that whilst not covering the whole council boundary (Birgu and Kalkara), in terms of Isla, the poverty zone covers the whole city. This is interesting due to the fact that such a phenomenon is different to that reported in Formosa (2007) which had depicted two distinct ellipsoids located in parallel to the orientation of the city. This change could refer to the diffusion of poverty across the entire city or that the level of poverty has been diluted to a level that there are no longer high concentrations of individuals located in specific spots and have reached lower levels of unemployment that the statistical output outputted a homogenous hotspot of lower level instances.

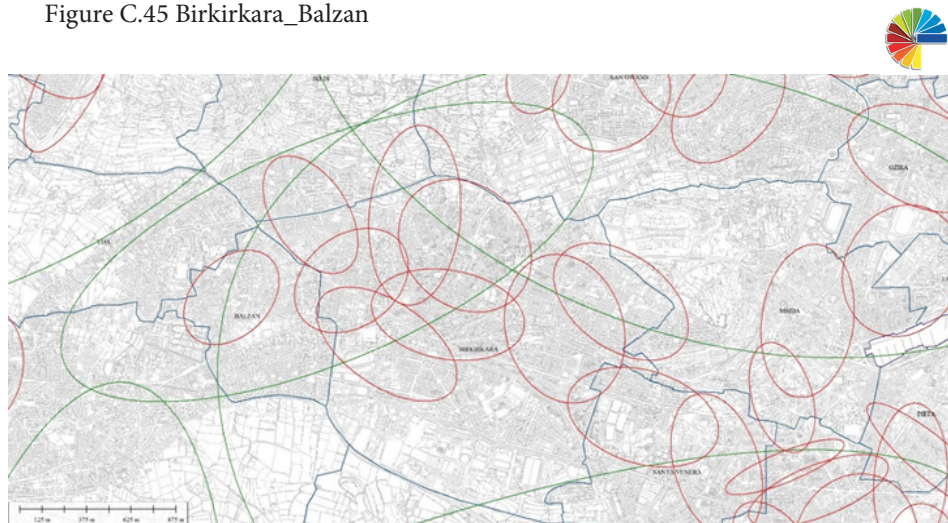
Note that Bormla, on the other hand has two distinct but overlapping zones, which are perpendicular to each other and where the overlap occurs (the zone opposite the No 1 Dock), such zones require deeper intervention in order to mitigate a lowering of poverty in the zones. The two hotspots are relatively large with the result that the overlap zone itself measures as large as halve of the Isla zone. This outcome indicates very high concentrations of unemployment rates and subsequent poverty in highly specific zones.

Figure C.44 Birgu – Isla – Kalkara - Bormla



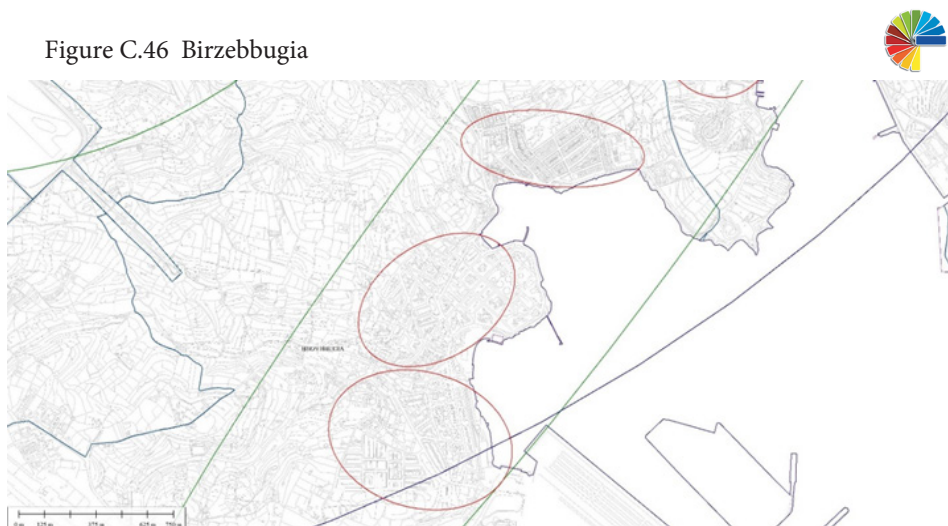
Birkirkara which has the highest population presence in Malta can be defined as a veritable investigative template due to its hosting of nine distinct hotspots (Figure C.45). Whilst some overlap with adjacent councils due to the council's spatial location within a continuous conurbation, the phenomenon that is most distinctive pertains to the zones where three hotspots overlap, creating pointers for maximal intervention. Balzan, in turn, depicts a specific and contained hotspot.

Figure C.45 Birkirkara_Balzan



Birzebbugia, as shown in Figure C.46, shows three distinct zones, relating to the older cores and two peripheral zones that are represented by public and private housing investment. The latter areas host first and second generation Maltese internal migrants (caused through the housing estates and home ownership scheme as resultant in intended or unintended social engineering), in addition to new forms of international migration. These issues need further in-depth studies that include qualitative approaches.

Figure C.46 Birzebbugia



In terms of the southern harbour zones of Fgura, Paola and Tarxien, the continuous urban fabric does not distinguish between administrative borders, thus hotspots overlap throughout the zone, requiring a combined effort to tackle the incidence of poverty, rehabilitation and intervention (Figure C.47).

Figure C.47 Fgura_Paola_Tarxien



The village of Gharghur has a characteristic hotspot spread over the village which covers the entire town, indicating a general spread of unemployment instance which is interesting due to the fact that this village hosts a varied demographic and income profile (Figure C.48). This village requires detailed analysis due to its on-the-ground reality linked to agricultural activity and whether unemployment is virtual or real, Swieqi and Pembroke in turn experience a different reality. The presence of government housing in Pembroke and its potentially related-unemployment levels (there is a need to investigate the level of such a phenomenon in future studies) falls within the statistical hotspot. Swieqi, on the other hand exhibits two main hotspots consonant with the urban core, which exclude the affluent areas that serve as barriers to the hotspots, pushing them towards the cores.

Figure C.48 Gharghur_Swieqi_Pembroke



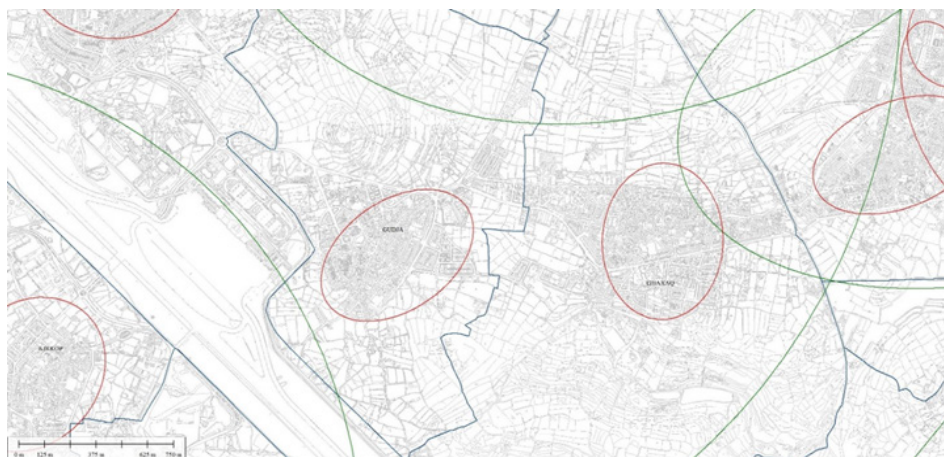
The Ghaxaq-Zejtun duality was surprisingly resultant as different to the expected scenario (Figure C.49). The urban bridge known as Bir-id-Deheb was thought to serve as a linkage for a wider hotspot that spanned the two towns. Bir-id-Deheb actually served as an isolation zone between the two town which have exhibited a distinct Ghaxaq hotspot centered on the village core, whilst Zejtun exhibited four hotspots, with one central hotspot actually overlapping on another two hotspots, indicating a high concentration of poverty and which require intense intervention.

Figure C.49 Ghaxaq_Zejtun



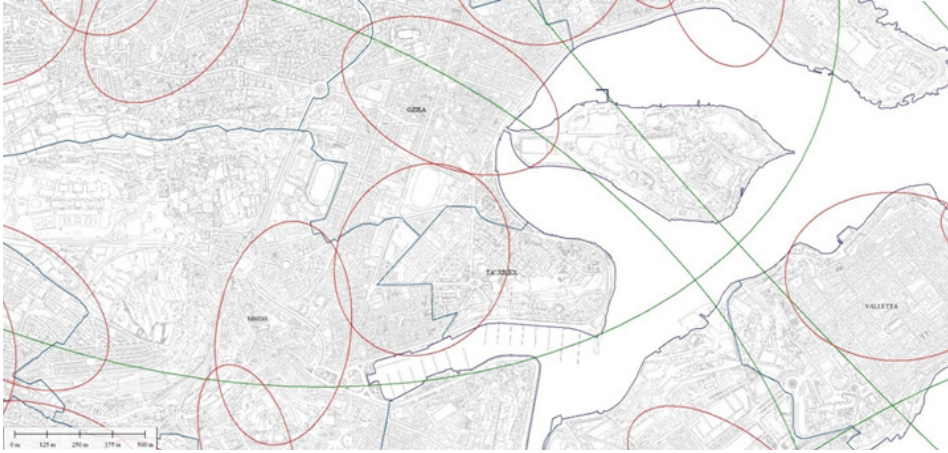
Gudja (Figure C.50) offers one main hotspot that is spread over the town particularly due to its housing estates located at the end of the village. The presence of these constructs and the central core have rendered a wider-ranged zone potentially indicating a lower but evenly spread unemployment presence.

Figure C.50 Gudja



The Gzira-Ta' Xbiex and Msida urban zones are continuous and can be analysed as a larger city exhibiting a distinct Msida-Swatar-Valley hotspot and another distinct Gzira core hotspot. The most interesting aspect is that the third hotspot points towards the absolute need for inter-council investment and cooperation when requesting funds for investment and aid (Figure C.51). The Msida-Ta' Xbiex-Gzira integrated hotspot, centered on Testaferrata Street and its environs, requires intervention on poverty through a new mechanism that brings together different councils, which may not operate collectively but which need to initiate such activity in the 2014-2020 period.

Figure C.51 Gzira_Ta' Xbiex_Msida



Qormi offers a typical case where poverty is spread over a large area but does so in a highly spatially defined way: the sequential hotspots are ranged along the main street, which indicates an urban mixed use where the residential zones intermingle with the retail and recreation zones (Figure C.52). This type of hotspot elicits the need for intervention that offers a realistic balance between the uses and the social needs as identified in the CRISOLA model.

Figure C.52 Qormi



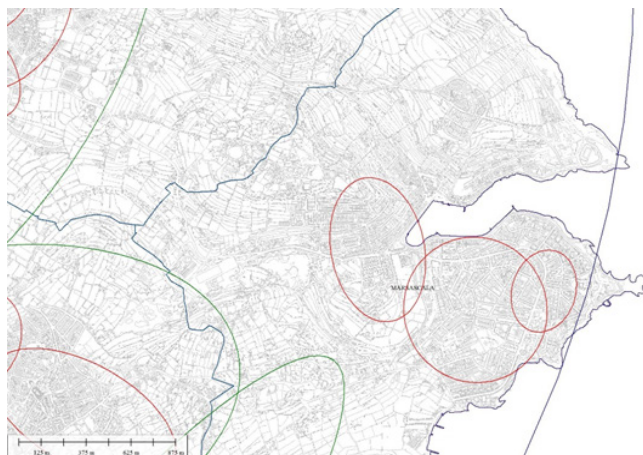
A review of Luqa (Figure C.53) exhibits a unique hotspot centered around the core but spread over the new build hat surrounded the old village cores and which is now undergoing 2nd and 3rd generation habitation. The unemployment levels are spread evenly across the village and requires further investigation at more detailed level and multi-benefit overlays to understand better the incidence of the phenomena.

Figure C.53 Luqa



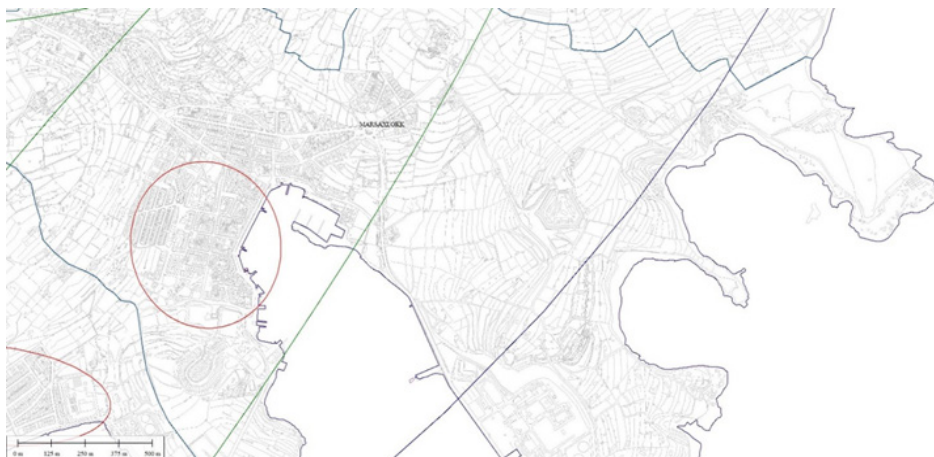
Marsascala, though having a historical part pertaining to the church area, is exhibiting three areas that overlap in two zones (Figure C.54). These comprise the newer zones that are increasingly taking a denser structure through the development of apartments. Interestingly, the Zonqor area, one of the government schemes zones, does not fall within a hotspot.

Figure C.54 Marsascula



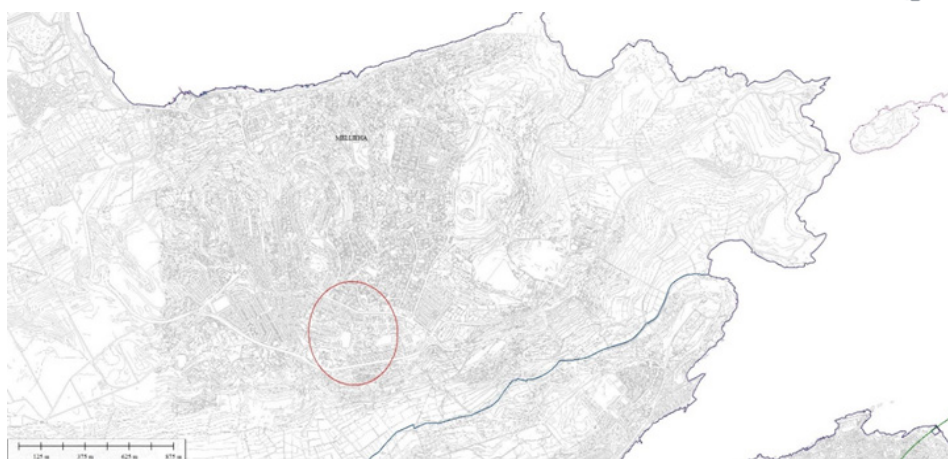
Marsaxlokk exhibits one distinct zone (Figure C.55), which zone is centered around the market zone but which excludes the church and Tas-Silg zone, the latter synonymous with affluence. The zone peripheral to the Birzebbugia side is also outside of the hotspot, an area having similar characteristics to the Marsascula Zonqor Point areas.

Figure C.55 Marsaxlokk



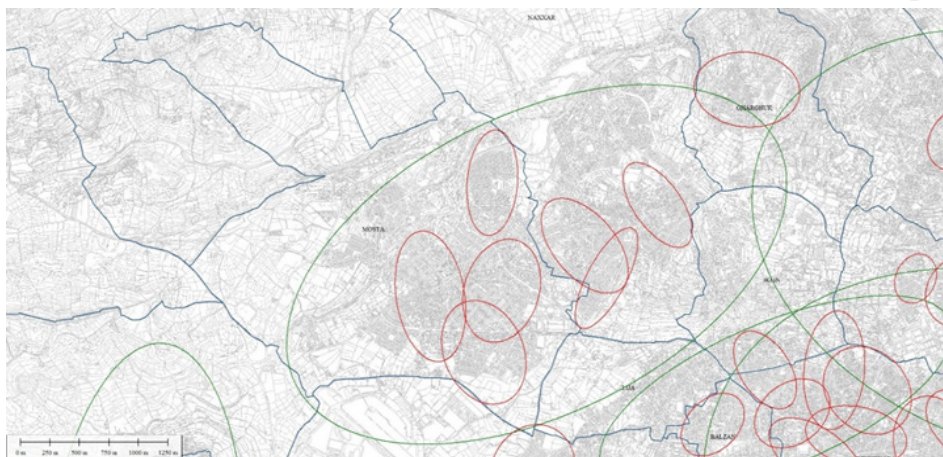
Mellieha has a very small area exhibiting a poverty hotspot, one that is situated on the by-pass to the Gozo Ferry and which zone can serve as a test case for niche-intervention (Figure C.56). The rest of Mellieha, whether village core, affluent zone, summer residential zones or new build exhibit a lack of hotspots, thus aiding the investigative and intervention process.

Figure C.56 Mellieha



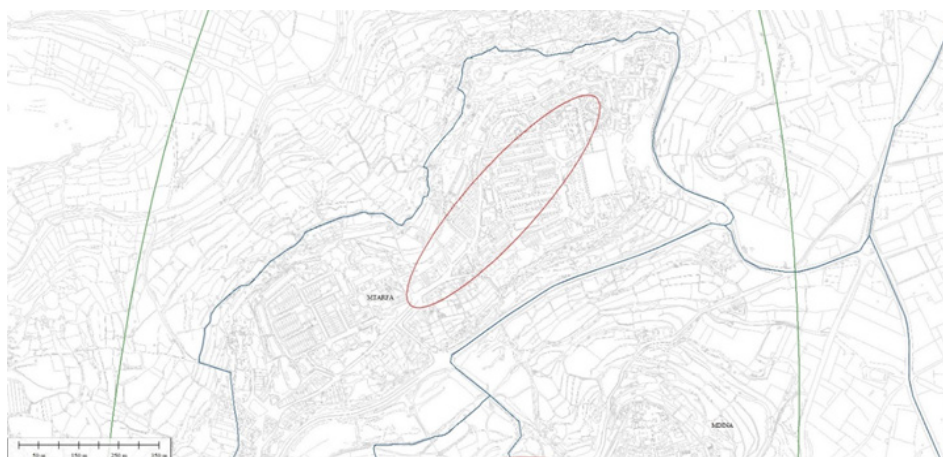
Mosta and Naxxar (Figure C.57) form a continuous urban fabric, characterised by a distinct hotspot in each town with a more central aggregation of hotspots close to the town cores. In the case of Mosta such a phenomenon is exhibited through three overlapping hotspots with one particular ellipsoid overlapping the other two which in turn slightly overlap each other. On the other hand, Naxxar has two overlapping ellipsoids that indicate a need for more thematic studies and intervention.

Figure C.57 Mosta_Naxxar



Mtrafa, (Figure C.58), through its extensive input of governmental intervention and housing investment, exhibits a particular hotspot that spans the newer build overlooking the Ta' Qali vista, whilst the Rabat side does not host a hotspot.

Figure C.58 Mtrafa



The councils of Pieta, Hamrun and Santa Venera exhibit a high requirement for intervention due to their heavy hotspot presence which overlap even the Marsa council and the Msida council (Figure C.59). Very few zones are exempt from this continuous urban fabric, such being the St. Luke's Hospital G'Mangia hamlet and the Santa Venera-Qormi boundary. The rest could be perceived as a highly concentrated poverty zone with multiple instances of overlapping hotspots that are chained together forming a homogenous unemployment hotspot with distinct areas of hotspot and high level hotspot activity.

Figure C.59 Pieta_Hamrun_Santa_Venera



The rural zones comprising Qrendi, Mqabba, Safi and Kirkop (together with Zurrieq) falling outside of the conurbation as depicted in Figure C.60, depict distinct village core-centered unemployment hotspots, except for Zurrieq, which a large town and formed three hotspots overlapping each other and also forming three areas requiring high intervention with the central zone experiencing overlap of the three zones.

Figure C.60 Qrendi_Zurrieq_Mqabba_Safi_Kirkop



Rabat, whilst a large urban zone, falls outside of the conurbation and exhibits three areas that though distinct form a continuous coverage across most of its urban zone (Figure C.61). There are three hotspots that depict a village core central hotspot which overlaps the two other hotspots.

Figure C.61 Rabat



San Giljan and Sliema (Figure C.62) comprise another continuous urban fabric duality which offer four hotspots with San Giljan exhibiting one hotspot whilst Sliema has three overlapping hotspots, formed away from the Sliema front and the Tigne zones.

Figure C.62 San_Giljan_Sliema



San Pawl il-Bahar (Figure C.63), as identified in the Formosa (2007) study exhibits four highly concentrated overlapping hotspots located in the Qawra area with presence in the Bugibba pjazza area. This zone has already been highlighted as requiring a one-stop shop for social services and which areas are metropolitan in nature as described elsewhere in this document, with their multi-ethnic, multi-functional, multi-use structures. Interestingly the areas of Xemxija and San Pawl il-Bahar do not exhibit hotspot presence.

The concentration of hotspots (NNH1 – red ellipsoids) is so intense that the Qawra zone elicits a concentration aggregation that forms a highly distinct hotspot at NNH2 level (green ellipsoid).

Figure C.63 San_Pawl_il-Bahar



Santa Lucija exhibits a council-wide hotspot which overlaps slightly with the Tarxien hotspot (Figure C.64). Another Tarxien hotspot also overlaps the eastern part of Santa Lucija, showing evidence that the two towns form part of the same socio-physical structure where the only distinction between the two pertains to the arterial road that serves as a physical barrier. The zones in Santa Lucija need to be analysed in greater detail to ensure that specific niche intervention zones be identified. This said, it is imperative that the whole council area is given intervention priority as the spread appears at NNH1 to be a homogeneous one which compared to other towns (as the NNH method places all hotspots on the same level), the fact that the entire town falls within hotspot zones is indicative of intervention requirements. When more detailed (sub NNH1) studies are carried out, then even more intensive intervention is required.

Figure C.64 Santa_Lucija



Siggiewi (Figure C.65) hosts two distinct and isolated hotspots on the northern areas of the town, areas identified through their housing estate status and home ownership schemes, which are now moving into later first, second and early third generations. Interestingly the older areas to the south do not exhibit any hotspots indicating economic stability and affluence, which issue needs to be investigated in a cross-thematic approach.

Figure C.65 Siggiewi



The Valletta-Floriana peninsula is characterised by two overlapping zones in Valletta and one zone in Floriana (Figure C.66). The Floriana hotspot covers both the Balzunetta and the eastern side that are separated by St Anne Street, which hotspot indicates a general poverty zone that needs further study. The Valletta council, on the other hand depicts a generic hotspot that covers the central and Marsamxett zones, however a more specific hotspot is found in the St Elmo area which has already been identified as a major area requiring intervention (Formosa, 2007; Formosa Pace, 2015).

Figure C.66 Valletta_Floriana



An analysis of the Zabbar-Xghajra councils (Figure C.67) show that the seaside town of Xghajra is experiencing a distinct zone situated close to the Smart City development, which area has attracted unemployed persons, a phenomenon identified in San Pawl il-Bahar, but which however need period analysis to ascertain when such a tipping or shift occurred. Zabbar, on the other hand, exhibits three overlapping town hotspots that experience hotspot overlaps and a triple hotspot high-intervention central area. In addition, Zabbar has two peripheral hotspots, one close to Fgura and one close to Xghajra.

Figure C.67 Zabbar_Xghajra



The town of Zebbug (Figure C.68) depicts four hotspots that cover most of the town, with one distinct hotspot situated on the eastern side, which area is comprised of a housing estate as well as a home ownership scheme. The other three hotspots overlap to a certain extent and interestingly form a coverage of the old pre-integration hamlets of Hal-Dwin, Hal-Mula and Hal-Muxi, a phenomenon that has not been highlighted in any social or physical study and which entails the need for further research on why the distinction is so evident, which however could have no connectivity with the social structure.

Figure C.68 Zebbug



Gozo

The island of Gozo has fewer zones exhibiting poverty with lower statistical ellipsoids being generated though these are by no means non-existent. Whilst smaller communities tend to be more curative of their wellbeing, Gozo is exhibiting an increasingly concentrated zonation of new areas of poverty. This is exhibited by the summer-localities of Marsalforn and Xlendi, areas that till a few years prior to this study were solely inhabited by summer residents and holiday-makers, a phenomenon that is slowly giving way to annual habitation. In turn the lower rental rates have induced low-income earners and new family-formations to move into these zones, composed mainly of apartments. Interestingly, till a few years ago, Gozitans were very reluctant to move into apartments, such having been labelled as indicative of slums and poverty.

In effect the Ta' Cawla housing project in Victoria Gozo took seven years for the government apartments to be inhabited, an indicator of the stigma associated between apartments and poverty. This perceptions appears to be changing and changing rapidly too, as the new hotspots show. It is imperative that these zones are investigated in detail to ensure that the Qawra phenomenon is not repeated; Qawra, within San Pawl il-Bahar council underwent a major shift in demographic structures due to its lower rents, heavy apartment:terraced dwelling ratio and a large number of vacant dwelling units. The latter combination resulted in the creation of new poverty hotspots, offered a refuge to lower income-earners who could no longer afford the increasing rents in the other zones, single parents, new family types, elderly, foreign and other individuals who were attracted by the metropolitan structures.

The resultant social disorganisation has been a focus of social planners for the last decade and is expected to generate new research outcomes aimed at mitigating poverty, crime and social disorganisation.

Xlendi and Marsalforn are still embryonic in comparison, but any ESF and targeted funding should focus on the investigation and mitigation of the phenomenon and ensure change before it happens in a disruptive way.

In effect, the Gozitan hotspot analytical approach shows that the NNH1 ellipsoids are isolated and distinct and only form a major collective ellipsoid at NNH2 as against the Maltese scenario where the close proximity of the clusters form larger concentrated hotspots at NNH2. In effect, only one such cluster formed in Gozo, pulled together by the presence of the main town Victoria, which hosted two such ellipsoids and due to the close

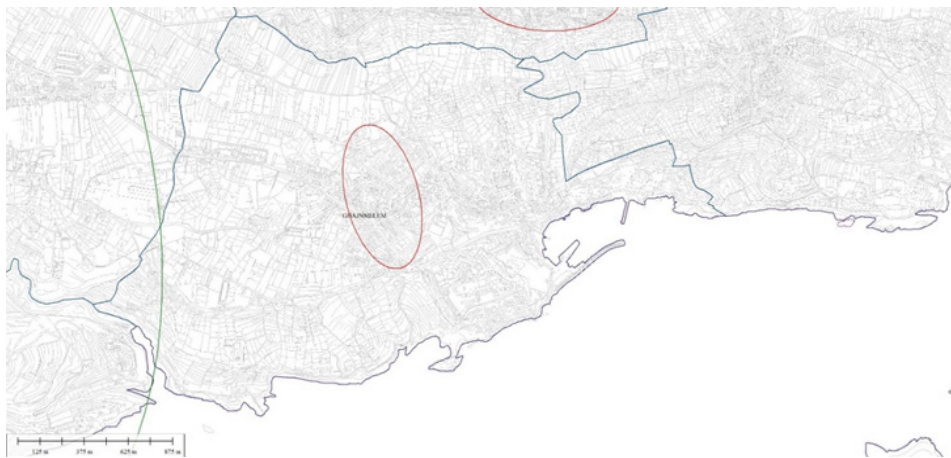
proximity of the urban areas of Xewkija and Sannat, the NNH2 ellipsoid formed towards such villages. No NNH3 ellipsoids were formed in Gozo, mainly due to the heavy pull of the conurbation with its relatively high incidence of ellipsoids at NNH2 and NNH1 weightings.

Note that Gozo hosts a number of villages (6 out of the 14 councils) that exhibit no hotspots; those of Kercem, San Lawrenz, Ghasri, Gharb, Xaghra and Qala.

Individual Council Review: Gozo

The village of Ghajnsielem (Figure C.69) exhibits a distinct hotspot centered on the village core, which is an expected outcome considering the isolated nature of this rural town, which however does not exhibit and formation in the seaside/part area of the town, that of Mgarr.

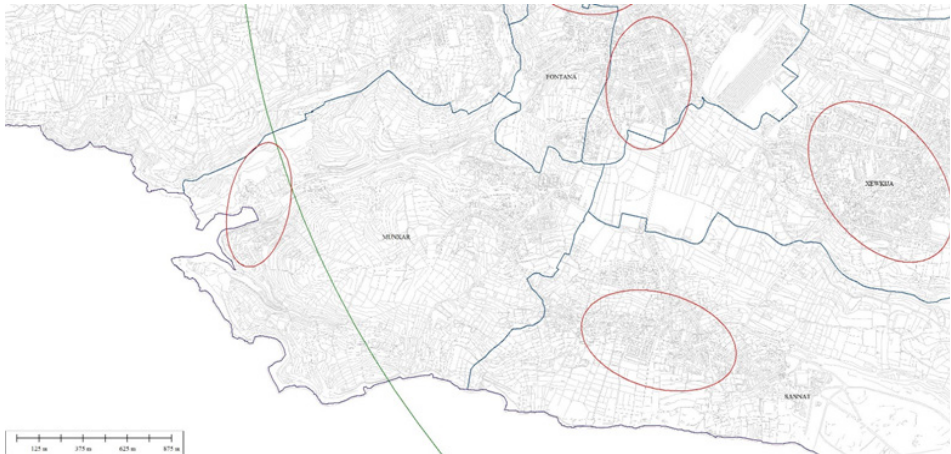
Figure C.69 Ghajnsielem_Gozo



As described in the Gozo introduction, Munxar’s council exhibits a hotspot in the seaside zone of Xlendi. This zone was primarily inhabited by summer residents and holiday-makers, a phenomenon that is slowly giving way to annual habitation (Figure C.70). The lower rental rates resulted in more families and individuals to move into this zone, which is mainly of apartments and which in turn could be smaller in size and render lower rents, thus serving as an attractor for low-income earners and hence may generate poverty hotspots in consequence.

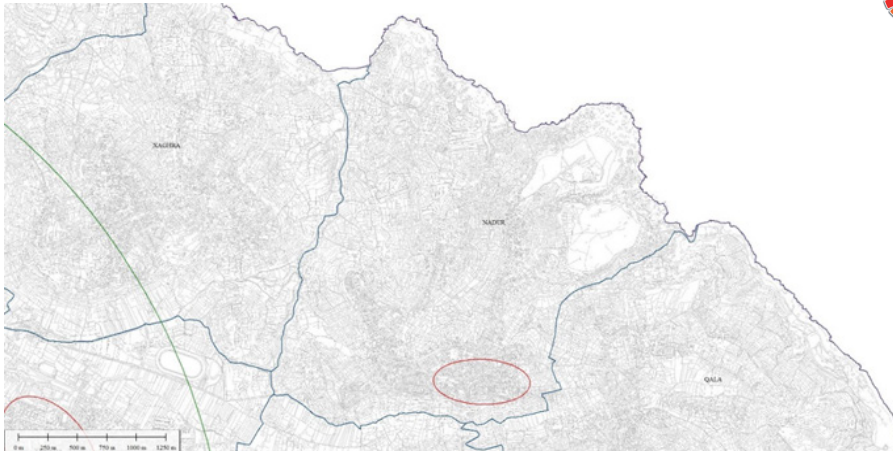
The village of Munxar does not host a hotspot.

Figure C.70 Munxar_Gozo



Nadur (Figure C.71) is an interesting case that depicts a small ellipsoid centered on the church proximity area, an area dominated by the village core. The rest of the village does not exhibit and ellipsoid, an area that comprises a significant part of the village. The fact that development in the Gozitan towns is based on a ribbon-structure (buildings set on narrow ridges) renders the generation of ellipsoids difficult due to the dispensed and elongated nature of the potential unemployment instances, which is effect are dispersed along a thin string that makes it difficult for the statistical constructs to form.

Figure C.71 Nadur_Gozo



The Rabat-Fontana duality in effect is not a dual continuous urban outcome of the statistical output but is the result of a heavy presence of poverty in the central area of Victoria, which overlapped on the Fontana northern boundary, thus roping in this tiny council as part of a poverty cluster (Figure C.72). This said, the areas are so small that such debate could be rendered theoretical since there is no real border between the two towns and for analytical purposes could be considered to form the same urban zone. Rabat, also exhibits another hotspot located on the Tac-Cawla housing estate, an area identified as a poverty zone in both Formosa (2007) and the JANUS project (Formosa, Scicluna and Azzopardi, 2013; Scicluna, Formosa, and Azzopardi, 2013).

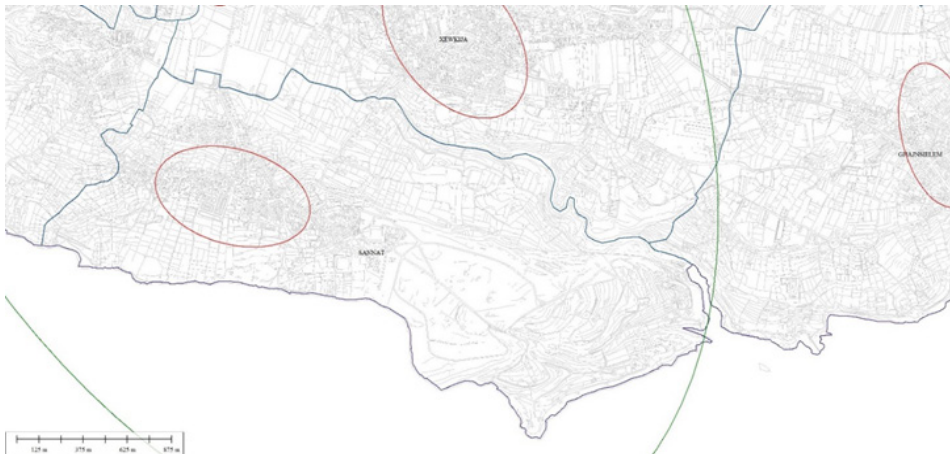


Figure C.72 Rabat_Fontana_Gozo



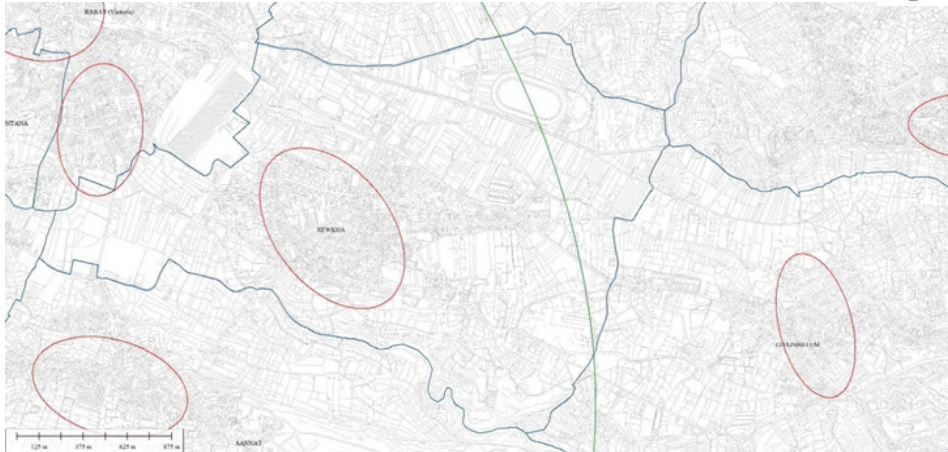
As described in the previous village analysis such as that pertaining to the village of Ghajsielem (Figure C.73), Sannat, another rural village, exhibits a distinct hotspot centered on the village core, which again is an expected outcome considering the isolated nature of this rural town. The hotspot approach shows that the zone adjacent to the Ta' Cenc Touristic establishment does not host any hotspot, potentially due to land and dwelling pricing amongst other potential precursors of poverty, which require further study at more detailed level.

Figure C.73 Sannat_Gozo



Xewkija, an industrial town, which also comprises a large residential area hosts one distinct hotspot centered on the village cores, where the peripheries are not identified as hotspots of poverty (Figure C.74).

Figure C.74 Xewkija_Gozo



As described earlier, whilst the village of Zebbug (Figure C.75) does not exhibit a hotspot, its seaside zone exhibits one main ellipsoid in the area known as Marsalforn. As in Xlendi, the zone was primarily inhabited by summer residents and holiday-makers, but has started to take on the form of an annually habituated zone. The lower rental rates resulted in more families and individuals moving into this zone, which is mainly of apartments and which in turn could be smaller in size and render lower rents. This zone, together with that of Xlendi needs to be monitored to ensure that poverty and social disorganisation is mitigated before or as soon as they occur.

Figure C.75 Zebbug_Gozo



Conclusions

This research component served as an intensive study on spatial formations within the Maltese Islands focusing on the spatial statistical approach to identify those zones that require intervention for funding mechanisms. It is imperative that each of the zones undergo further study in a triangulated methodological approach where the quantitative (spatio-statistical) outcomes are reviewed in terms of the evolving nature of the composition of these zones as already investigated through the JANUS project.

The result from that project need to be updated to analyse whether poverty is in motion in conjunction with the changing social compositions of the Maltese and Gozitan localities and their sub-zones.

Recommendations emanating from this part of the SeCollege project are varied across the different thematic approaches.

- Policy makers can now review the outcomes of decades-long mixed social- engineering efforts either through:
 - direct intervention in the housing market which created housing estates that served to displace offenders
 - or through their recent non-intervention in the housing market, which situation has resulted in a veritable broken windows situation in some towns and in the urban cores.
- Policy changes are required at national level to instigate change in the areas that have been identified as being offender-hotspot localities and have high-levels of clustering of offenders, mainly the cities of Bormla and Valletta which towns have a disproportionate offender concentration when compared to their shrinking population concentration.
- The social planners must also initiate policy measures in those areas that have been identified as having highly clustered offenders, implementing measures to reduce poverty, increase social cohesion and social capital. This would help alleviate the problems related to the tendency for offenders to aggregate and live in poor areas.

- Planners also need to be aware of the fact that areas of high population density would also relate to high levels of offender density, particularly in the inelastic walled cities.
- Educators and criminologists must concentrate their efforts to identify and monitor those juveniles who have already clashed with the judicial and police systems in order to reduce the probability of the establishment of a criminal career. The implications here are varied since the need for synergies between the educational, corrective and welfare systems are required, together with the provision of highly skilled early-intervention personnel. This can be followed up for those aged up to 30 to initiate self-employment strategies in order to overcome the issue of non-employability as identified by the ESF3110 Better Future project (Formosa, Scicluna, Formosa Pace and Azzopardi, 2013).
- Policy makers should ensure that access to data and information is made available to the entities involved in security to ensure timely action and implementation of enforcement actions which are still in need of upgrading and lack ownership by the authorities.
- Intervention within the cluster hotspots is required in order to reduce the incidence of poverty and in turn the potential for offender and their at-risk children to embed themselves in a vicious cycle that does not aid the implementation of such activities as identified in the SeCollege study.
- The hotspot approach has enabled one to understand the potential location of the intervention zones that are highly weighted by poverty and unemployment and in turn the potential for offending and social disorganisation. The study elicited in-depth outputs to the investigation of those areas that require intervention and further study prior to the commitment of funds towards rehabilitation.

- Children who are identified as potential candidates for SeCollege could only be fully re-established in their community if the latter has also been tackled. Whilst such may take a long-term approach to social, physical and thematic restructuring, one cannot simply let the issues pass by and not intervene in the case of these children. One child less in the offending cycle is one offending issue less for society and one less potential future family-in-crime appearing.

