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Maltese Building Blocks for Geographical and Crime Science

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Abstract

The study of urban ecology cannot be separated from geographical space; however the limitation of access to spatio-temporal information is a reality. Creating a crime information system for the Maltese Islands has entailed bridging the gap between analogue social information and spatial planning information which rarely talk. This paper covers the process employed to initiate an understanding of the legislative and operational tools available to crime and security geographers through to the preparation for the launching of country-wide baseline datasets for effective future socio-technic analysis. The decade long process to implement a major project using ERDF funds is at the final stages prior to the initiation of cross-thematic studies that span the physical and social domains. Both environmental and green criminology is now set to take off employing one of the most comprehensive GI systems spanning urban and rural offences (person and property-oriented), census data together with the natural, social and physical environments. The study reveals issues on access to data, mitigating processes undertaken and the forward planning initiatives to ensure free dissemination of environmental data to the academic and general public. Initial studies based on the analysis of crimemaps, poverty and crimes related to the environment show correlation between the different social and geographical spaces.

Keywords: geographical information systems, Maltese Islands, planning, access to data, crime, environment

1. Introduction

1.1 Spatio-Temporal Data Dearth in the Socio-Technic Environment

In a rapidly developing world where the introduction of massive online information systems has enabled both the scientist and the general public to interact with remotely-located data from across the globe, the reality of access to data and eventually to information is slowly bringing forth the realisation that decades-old barriers to access to data still need to be overcome. Whilst the massive volumes of data at hand can easily lead one to acquire a perception that there is everything one could require at the touch of a button, reality speaks with another voice; the data is there, the issue of reliability and free access speaks otherwise. The fundamentals of research lie in the availability of reliable data, a phenomenon that has left disciplines struggling with issues of repeatability of scientific outcomes. Whilst technology and legislative measures have caught up with the realities facing researchers, access to that data through interactive interfaces is still limited.

Data availability suffers from a plethora of scourges that have left entire countries with a dearth of reliable baseline information, particularly small states which have limited human capacity to manage the whole datacycle in the physical, social and environmental domains. Whilst the main limitations include the fact that there are few homogeneous structures in operation, other limitations included a governance situation where data is not made available or is charged at unsustainable rates. The latter has been tackled through the Aarhus Convention and the Freedom of Information Act, whilst others require initiatives that generate tools which gather, analyse and disseminate the data for free, an exercise sought in the European Regional Development Fund described herein.

Other more technical issues include the fact that there are too many standards to follow, data is not dynamic (gathered ad hoc as a one-off and not real-time), data is not quality assured/controlled, queries are not organised and recorded, data is not secured – (‘illegal’ use of storage on personal storage devices and other digital media) and that versioning is not practiced.

In addition, even where the data is available, there is an upsurge in requests for access to such data which has increased drastically since Tim Berners-Lee’s (1989) world wide web (WWW) proposal changed society as

never before. The WWW changed a medium that was at best techno-centric to one that is now essentially socio-technic. Increasing requirements for bandwidth has resulted in a need for a reanalysis of Dahrendorff's (1990) access issue in contemporary worlds, both real and virtual, where not all society has access to the information through on-line services. This lack of access is leading to a situation where a new type of poverty is being created: that related to information drought, with users lacking internet-access losing out on progress in the various socio-economic themes. This is already being seen in the North-South divide across European countries in terms of access to the medium that transports this data, where internet access disparities range from 33% in Greece to 88% in Iceland (NSO, 2009).

The other most important issue relates to access to standardised processes for information-creation which though not targeted exclusively for the criminological domain, is being tackled from various legislative loci such as the Data Protection Act (OJ, 1995), the Århus Convention (OJ, 2003a; OJ, 2003b), the Freedom of Information Act (OJ, 2003c) and the INSPIRE Directive (OJ, 2007), as well as other guidance documents that are targeted to enable the smooth and free flow of effective information.

1.2 The Information Dilemma - Tower of Babel or Valhalla?

Research methodology is currently facing a period unprecedented in history, where a data-rich but information poor scenario is the norm but which situation risks resulting into a Tower of Babel re-enactment.

The issue of access to data is spread across diverse realities covering the real world – real world data, real-virtual and virtual-virtual. Dahrendorff's (1990) argument that information has become a social issue where users are confronted with various barriers to access that data becomes a reality when power is viewed from an access point of view. The method of accessing data in analogue format in order to analyse exclusively in analogue format is not a throwback to decades past but a shocking reality in various fields of study, mainly the social sciences and the arts. Though many tools are available in proprietary and open-source formats, they may not be enough to bring the schools into the modern era where researchers use high-end technology; such needs a cultural and generational change. This is the trumpet call for a veritable plethora of potentially society-changing themes as data needs to be depicted as a real-time scenario, not something that can be gathered ad hoc.

The second case where researchers do take up the digital data option and convert analogue data into digital form for analysis is growing, however the fear of data itself is not a reality that one can ignore, particularly where that analysis requires comparison with data from a virtual reality and where the data being reviewed sits in a distributed database. The latter could be located somewhere in another country where the source is not clearly defined, due to the lack of knowledge and availability of metadata.

The third concept is one where all data sources are virtual and users may not have access to such dissemination services and thus experience a new form of poverty called the digital divide. This is a reality that proponents of fully-digital systems can rarely afford to ignore and need to cater for through easily understandable tools such online databases and visual mapservers with help files. The spate of technologies that have been created over the past decade has been mind-numbing to the effect that users are lost for choice: the first webmap technologies which included the early XEROX PARC Map Viewer (Note 1) (launched June 1993) were primitive but today's access to real-time data download and access to information will leave all those who have yet to make the jump on the wayside. Thus it is important that all users are accounted for and that technology is unobtrusive enough to ensure that those not adept to the virtual worlds do not feel alien to their own thematic domain as it develops in another reality.

The study of crime and location, as based on urban ecology theory, whilst initially slow on take up, has jumped the barrier with such initiatives as CMAP, CrimeStat and other initiatives, however the ancillary services such as spatial planning and national statistics such as population and housing data have yet to make the score. Two decades ago, most crime investigations concentrated on non-spatial sociological issues whilst some painstaking geographic research looked into specific locations but only in a descriptive way (Campbell, 1993). The advent of high-end information systems and spatial software was envisaged to change the direction that these studies are taking. Environmental criminology has been brought back as a theoretical issue through the use of Geographical Information Systems (GIS), which was seen as one of the main means of bringing together previously disparate research analysis (Openshaw, 1993). Twenty years later, the use of GIS together with other tools (such as SPSS, Vertical Mapper, CrimeStat, 3DAnalyst) has enhanced analysis over more than 2 dimensions. GIS integrates both spatial and temporal crime, whilst linking crime statistics to such information layers as development and urban sprawl, crime hotspots, social and community facilities, locations of policing infrastructure and location of crime near bus stops, amongst others (Hirschfield, 2001; Haining, 1987; Clarke, 1995). In addition, analysis and dissemination tools such as 3-Dimensional mapping, Virtual Reality Modelling Language (VRML), LIDAR

Viewers and Web-mapping give access to researchers to carry out comparative spatio-temporal analysis. This said, caution must be taken to understand the limitations of such systems and methodologies (Pease, 2001) (Note 2). The developments led to a major improvement from Sauer's (1925) early assertion that geography without a substantive content remained an abstract relationship, a statement that held true where the essential content being the socio-cultural landscape (Hirschfield et al., 2001). The status quo has been challenged through the integration of processes emanating from non-social initiatives as described in the next section.

2. Creating a Methodological Case for Techno-Centric and Socio-Technic Approaches

Data analysis in the diverse domains has traversed a path that evolved from a scenario employing purely techno-centric approaches based on the concentration of technology as the fulcrum for research to one that is gathering pace towards the implementation of such technologies as a tool for the social sciences (socio-technic).

The socio-technic approach took off due to the initiation of the analysis process outlined by CMAP (2002) in their criminological process which was based on the concept of creating information based on the analysis of social interactivity (the what, why, who, when, where, why not and how phenomena (W6H)). Such data phenomena has helped users to build a real or virtual structure that pushes the data remit away from the pure technology to one where focus is on what actually constitutes the data remit. The assumption was that once data became available, the technologies would follow suit.

Analysts seek to investigate each of the W6H pivots to identify patterns to reach conclusions whether correlations between the thematic variables exist or not (CMAP, 2002). Crime analysis is a case in point: understanding crime and its locational structure can only occur through a robust understanding of the spatial structures within which the W6H occur.

The steps Malta took to initiate the process to ensure that W6H base data is made available to all comprised the setting-up of a series of data-management processes that ensured that data can be verified and used across the thematic domains. This data collection process was carried out over a period of twenty-five years from 1985 to 2010 and included such agencies as the National Mapping Agency, the Planning Authority, the Local Councils, the Land Registry, Transport Authority, Resources Authority, National Statistics Office, the Common Database Agencies and the utilities (water, electricity, infrastructure-roads, cable TV, telecoms and posts). This phase was followed by a series of application-based processes that enables information to take a new road towards data dissemination and dataflows. These processes include the implementation of development planning at strategic and local levels, the issue of dataflows to the EU which gave an impetus to the implementation of this phase such as the implementation of the Environmental Acquis, the creation of mapservers, the establishment of an Environmental Impact Assessment regime, the implementation of legislation based on access to data and datacycle management (data design, gathering, inputting, cleaning, analysis and output). This was carried out in conjunction with membership in such activities as ESPON, GMES, GEOSS, EIONET, CLC, amongst others.

The main factors that were taken up to ensure that the social and geographical domains were given space for integration are depicted in the following series of steps:

2.1 Data Input and Verification

This initial step looked at the availability of data and the requirement for data acquisition issues and included the implementation of a package of different technologies such as scanning, digitisation, manual data capture and use of manual and automated tools to capture such data from remotely sensed imagery. Such data acquisition also required users to verify sources, remove errors, and carry out essential quality control exercises.

2.2 Data Storage and Database Management

Essentially concerned with hardware constraints and the need for more storage space, this step saw users going beyond the physical issues and identified methods to store data in reliable and easily accessible formats. This major process involves the building up of such entities as are datasets where users can access data in a variety of forms and designs. However, care needs to be taken to ensure that the correct structures are used, with the implementation of protocols such as the INSPIRE implementation rules. The main advantage of such databases is the ability to access attributes within different databases situated in remote sites, facilitating the access to data across networks such as national and global internet, through so-called distributed databases.

2.3 Data Analysis and Modelling

Data models helped to create a system of information processes such as layering, cross-dataset linkages and integration of internal and external datasets. Analysis took the form of querying functions through languages supporting the data. Structured Query Language (SQL) is a useful tool, though even more rudimentary tools such

as functions within Excel and other base software can help achieve good results. Other software such as Statistical Package for the Social Sciences (SPSS) helped in the analysis of socio-economic data, though SQL and spatial options within SQL help environmental scientists to carrying out multi-dimensional analysis: such as in the case of spatio-temporal analysis of habitat change and the effect of green crime on these habitats. Modelling is important at this stage as it aids the researcher to build up a functional model that could also be dynamic and deliver automated analysis for eventual report development. Interestingly, whilst various models exist for environmental monitoring such as the SIMO (Briguglio & Portelli, 2002) initiative and the EEA environmental models, there are few socio-spatial models that are being considered except for those related to the impacts of climate change on the coastal areas. Such models require further study for their impact on displacement, social upheaval and unrest, something evidenced in the aftermath of hurricane Katrina in 2005 and the 2004 Indonesian Tsunami as examples.

2.4 Data Display and Outputs

The final aspect of the data process concerns the issue of data display and output. This can take a variety of forms: histograms, tables, maps and interactive maps. On the dissemination side there are a variety of technologies that help users to publish their research results, ranging from on-line html reports to dynamic web-mapping services to fully-fledged GIS mapservers. In Malta this has evolved to the dissemination of data through dedicated sites such as CrimeMalta (2012) that distribute crime data in spatial format for various variables. This initiative is being developed to disseminate social data from the Census (NSO, 2012) and a full SEIS-compliant system that will enable all environmental data to be disseminated for free.

3. Resultant Steps: The International Imposition: A Trauma or Heaven-Sent?

The resultant data structures emanating from the above mentioned process called for the setting up of various data management functions which were based on a three-pronged approach: the data-function, the GI-function, and the research function. The data function included the setting up of a series of data and information processes that sought to lay the foundation for dissemination protocols inclusive of data protection, which were followed by the integration of standards for data management. This process included the integration of the physical sciences data together with the socio-related data thereby ensuring data interactivity and synergies through the integration of both tabular and spatial processes. In turn, the functionality could integrate such processes as the Geographical Information (GI) function which took the data to a new level, mainly that employing visualisation methodology. This data resulted in the setting up of a series of information systems that allowed for spatial and geo statistical analysis through an integrative function targeted at ensuring scientific analytical functionality and reporting streamlining. It was only when Malta became an EU member state in 2004 and more specifically a member of the European Environment Agency (EEA) that the structures began to take form. Thus, the impetus to create such structures resulted from the need to submit data to the EEA and the EU which data required the necessity to conform to international standards on such issues as metadata, common protocols, common projections and calibration methodologies. Something, that unfortunately is not yet fully structured for social data but has served as the launching pad for the same disciplines.

The process was enabled through a number of organizational setups and legislative tools that helped initiate the process to deliver data at the national level and also at the international level. In effect this was due to the collaboration with the EEA, EUROSTAT, Joint Research Centre and the various EU Directorates General as well as being signatory to a number of UN Conventions. Legislative tools such as the Data Protection Act, the Freedom of Information Act, the Aarhus Convention, and the INSPIRE Directive were essential for the resultant preparedness. Whilst the first three have had a major impact on how one can access information through formal procedures and thus have a heavier socio-technic outcome, the INSPIRE Directive took up a more techno-centric role, directing the countries to implement a series of protocols to ensure that data is created in a homogenous manner that allows for analysis across the different states. Such protocols called implementation rules have resulted in the setting up of a smoother process to disseminate data in both visual and tabular formats. Data can now be created following a structure enabling analysis across the different disciplines. This said, INSPIRE caters for spatial data but being a small country, Malta has taken up the initiative to use the metadata forms both for spatial and non-spatial data, thus ensuring that for the first time social, economic and other non physical data can be structured through the same process as the spatial one. The relatively low expert capacity has led these few experts to effectively create the metadata reports for both spatial and non-spatial without major requirements for organisational and business restructuring. Dissemination has also been helped through the implementation of the Aarhus Convention which ensures the free dissemination of data related to the environment to users, which in effect has broken the data hoarding and access-limitation that had been imposed on an ad hoc basis by the respective agencies (Note 3).

The following section describes the input that the different international process had on the access to data and creation of the tools in the Maltese Islands serving as the building blocks for spatial analysis.

3.1 The Conveyor: EIONET

The European Environment Agency's EIONET (expert network) has managed to bring together experts in the different countries (EU member states and other neighbouring countries) through the setting up of National Focal Points, European Topic Centres, National Reference Centres, and Main Component Elements. The EIONET resulted in the setting up of an excellence network that discussed datacycles and dataflows which eventually laid the ground for quicker take-up of the main Aarhus Directives and the implementation of the INSPIRE Directive, apart from ensuring that all data is sent on a yearly basis to the CDR (Common Data Repository) which served and still serves as the repository for all countries, but which benefitted the small states such as Malta and Cyprus in that there was no need to replicate the CDR on a local CIRCA (Note 4) server and thus compliance for such state was quicker than for those who decided to install their own networks, hardware and software systems as well as dataflow methodologies.

The main impact that the EEA had on the Maltese dataflow process was through the identification and reporting of data for priority data flows on an annual basis. The process enabled the experts to ensure that data hoarding is no longer the case, that data is sourced and gaps identified, that formats are identified and that information is updated and validated, something that was not necessarily the case due to the lack of protocols on calibration and validation. Finally the EEA required the data to be consolidated and eventually submitted respecting target dates and deadlines, the latter especially imposing a regime that ensures data dissemination to the EEA and through its website to the general public.

The main impetus in this international process was the setting up of an expert network that enabled data to flow to a common source for easy download by users as well as ensuring a timely delivery of the relevant datasets. This resulted in the setting up of a network of geographical and social scientists who had access to knowledge streams.

3.2 The Instrument: Århus Convention

Malta is party to the Århus Convention with its requirements for Access to information, Access to justice and Public participation. The Convention's Article 4 covers Access to Environmental Information which relates to how public authorities must make information available in the form requested unless such requests are unreasonable or where the information already exists in another form. The Convention also mentions specific deadlines for submission of such information emphasizing that data must be submitted by one month and two if such data request comprises a complex issue.

What is very interesting in the requirements of the Århus Convention is the fact that it outlines the cases where refusal is recommended, striving to limit the cases of refusal which should be only entertained if the requested information not held, it is manifestly unreasonable or too general and that it concerns material that has yet to be finalised and also that relating to internal communications.

In terms of collection and dissemination of information, the Convention (Article 5) states that public authorities need to create and update environmental information relevant to their function as well as establish systems that ensure the smooth flow of information about existing and proposed activities and also to inform the public in case of imminent threats.

Finally, the main impact that the Convention had on Maltese data processes concerned the requirement to ensure that each country needs to make its information accessible through free cataloguing and dissemination services in a transparent manner employing electronic databases.

The main impetus emanating from the Århus Convention was the setting up of a requirement for free data which could be disseminated using the EIONET CDR conveyor. The second component was thus established for the spatial and non-spatial domains.

3.3 The Techno-Centic Protocol: INSPIRE

The need was subsequently felt for a technical instrument that would enable GIS users to create their data in a standardized structure for cross-thematic analysis. The INSPIRE Directive is the most robust Directive that has enabled data processing to be taken to a higher level as it encompasses the networks of the EIONET and the dissemination issues of the Århus Convention with the added functionality of creating a technical base for the data ensuring that it conforms to standardization and that any spatial data can be compared across the different themes.

The main tenets of the INSPIRE Directive include the requirement for member states' public authorities to provide datasets and services that can be used for policy making, reporting and eventual monitoring. Though requiring only public bodies to comply, in actual fact this will result in a ripple effect since most private entities engage in work with the public sector and any creation, analysis and subsequent transfer of data needs to comply with the public authorities' structures, thus in effect ensuring that all sectors comply with the legislation.

In terms of access, datasets need to be made accessible through readily-accessible interfaces that would be capable of being discovered, viewed, and downloaded. Another requirement is related to the need to create metadata (data about data which allows users to acquire knowledge of which datasets exist and what they hold prior to acquiring such datasets). Malta is highly advanced in the implementation of the metadata process through its employments of a two-pronged approach based on an Excel-based input tools and the use of the JRC online editor that creates an xml-based tool and is available also non social research.

The main impetus of INSPIRE is set at removing obstacles to access as well as making data that is currently used by only a few GI specialists, available to the general public. In fact, this process was hastened with such developments as Google Map and the related services that have pushed such data in the hands of the public even to the extent that it is transmitted in real-time should a researcher own a dedicated GPS handheld or even a smartphone, an exercise easily handled by traffic wardens, field surveyors, security agents and other enforcement officers.

3.4 The Disseminator: SEIS

The set up of a high-level EU group entitled G4 as composed by the EEA, JRC, DG-Env and EUROSTAT, took over the initiative to consolidate the diverse information-related activities in order to enable the setting-up of a common information system. This was called the Shared Environment Information System (SEIS). Though not legislation, such a process enabled the groups to bring together the various datacycle initiatives and tools in order to propose the best way forward for the reduction of redundancy and multiple-reporting, employing the gather-once/use-many dictum.

The G4 calls for the need for certified standards, the need for data-exchange, the need for an expertise audit of data, the take-up of the Århus EU-wide access standards and the integration of the INSPIRE as the integrative tool for SEIS implementation.

The SEIS initiative led to an integrated framework that has been expanded to the wider geographical, environmental, physical, social and economic data enabling a reliable base for data analysis across the different thematic disciplines. The Malta SEIS initiative took off as a prototype for the development of an integrated system that spans the physical and social domains.

3.5 The Socio-Technic Tool: ERDF for Spatial and Social Sciences

Whilst Malta has experienced various access hiccups and limitations to data creation and access to data, the above four international activities have enabled it to set-up legislative and implementation procedures that ensure that data is reliable, consistently produced, validated and disseminated.

The resultant step was to integrate the requirements of the international activities and prepare a physical structure for data collection, input, storage, analysis and dissemination. Such was created through an ERDF project entitled "Developing National Environmental Monitoring Infrastructure and Capacity", which initiative complies with the requirements of EEA dataflows due to its remit to establish monitoring networks in line with EIONET requirements. This process ensures the free data dissemination to the public inclusive of spatial, environmental and physical data through Åarhus requirements, builds its structures through the Implementation Rules of the INSPIRE Directive and creates its own shared information system. The initiative was based on the concept that the thematic disciplines would have available a comprehensive infrastructure that enables NGOs, academia and the general public to download/upload thematic data and carry out cross-thematic analysis without the need to create their own systems.

4. Discussion: The CRISOLA Outcomes and a Tool to Integrate Thematic, Social and Physical Themes

The setting up of the procedural structures enabled the author to investigate the potential for the creation of a SEIS based on a criminological construct relative to environmental criminology theory also known as urban ecology. As a case study to investigate the integration of data from the various themes into one integrated system, the CRISOLA (crime, social, landuse) model (Formosa, 2007) was implemented based on the SEIS design. The model reviews the different urban, social and crime data and integrates them into a spatial structure which delivered some interesting cross-thematic results. It integrates both spatial and temporal crime, whilst linking social and environmental statistics to such information layers, inclusive of development and urban use, and

zoning activities, which context enables researchers to visualise a social construct such as crime in the space it occurred in.

4.1 The Initial Maps and Dissemination Tools: The Case for Maltese cross-Thematic Structures

The CRISOLA output was based on a ten-year process that saw various activities aimed at the setting up of baseline data for social analysis which process led to the creation of various web-maps that serve as the eventual structures identified in the processes identified in the international requirements for data creation and dissemination.

The results included the creation of various datasets and maps required for each of the pivots of the model with the physical landuse maps being the first created, followed by the social maps and finally the crime-related maps. Figures 1 to 3 depict base maps created for each theme respectively: landuse map (Figure 1), social (unemployment) map (Figure 2) and reported crime (Figure 3).

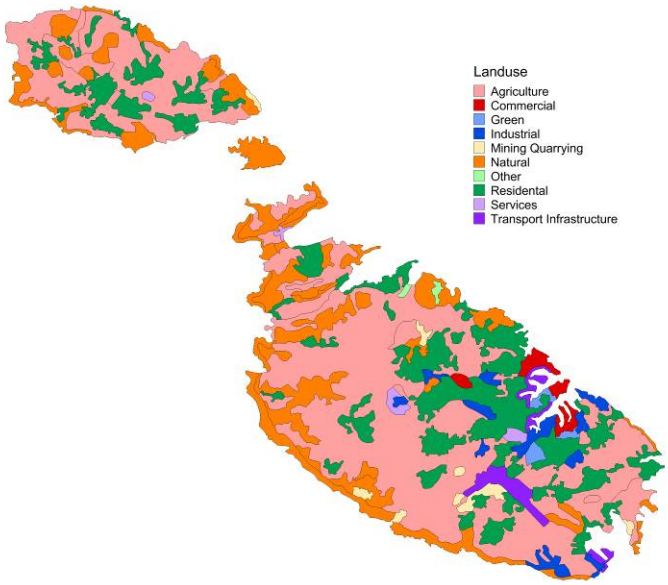

Figure 1. Landuse map

The figure depicts the landuse categories in polygon format.

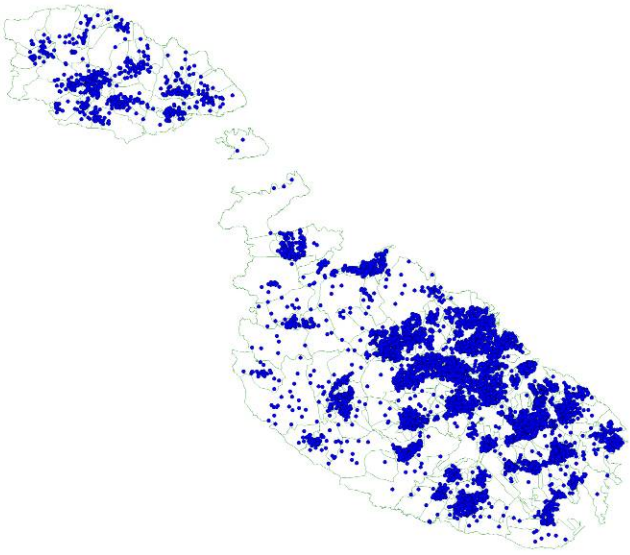

Figure 2. Unemployment map

The figure depicts the incidence of unemployed persons at street level in point format.

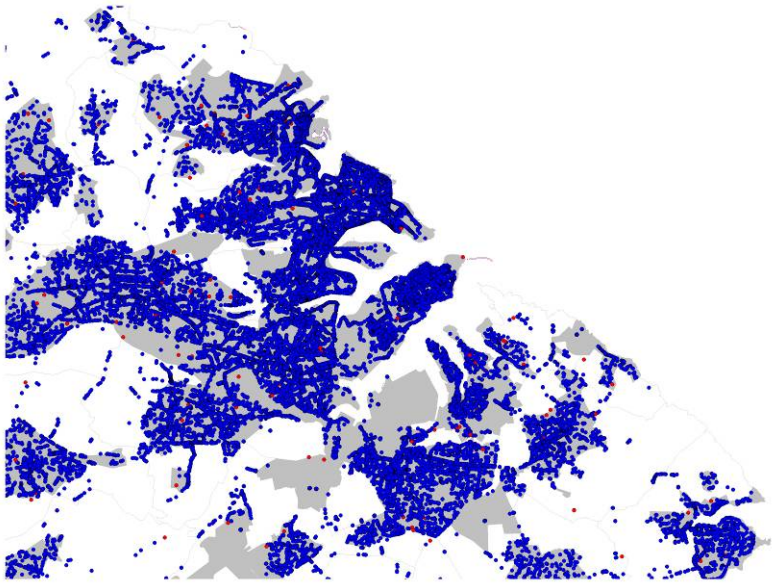

Figure 3. Crime Map

The figure depicts reported offences in point format.

The resultant cross-thematic spatial analysis rendered correlations between poverty areas and dilapidated zones, poverty and offender residence zones (Figure 4), retail and offence hotspots (Figure 5), and other geostatistical outputs.

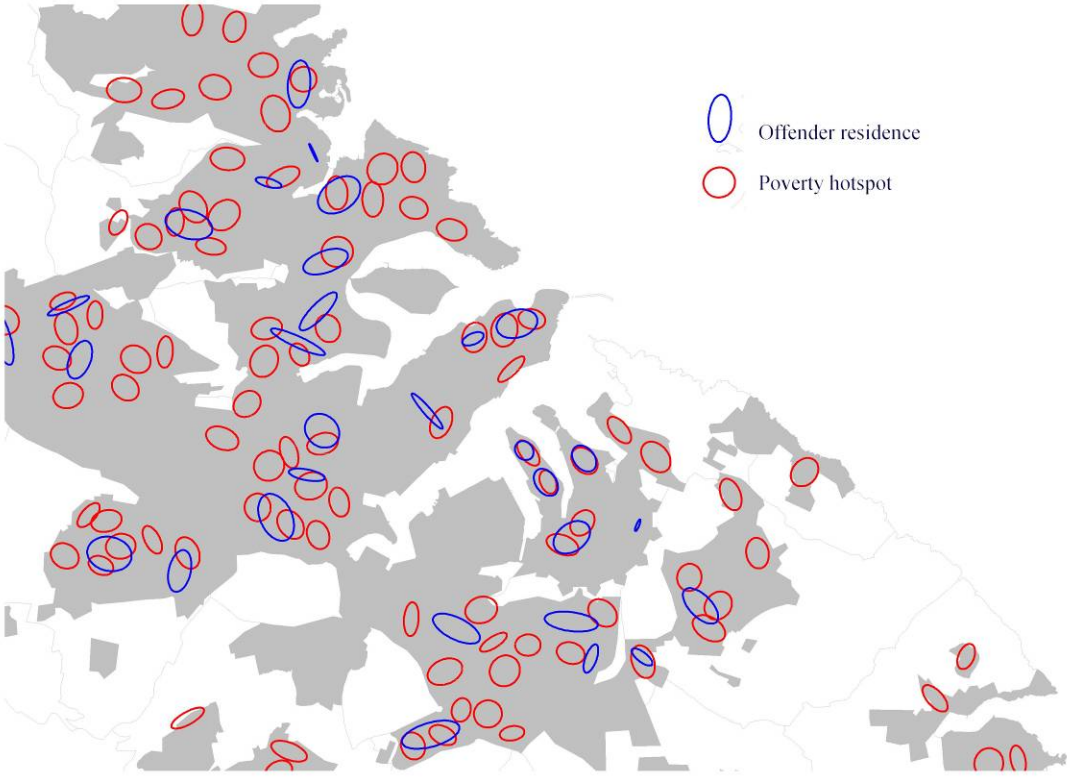

Figure 4. Poverty and Offender residence overlay

The figure depicts the correlated themes as standard deviational ellipsoids (SDE).

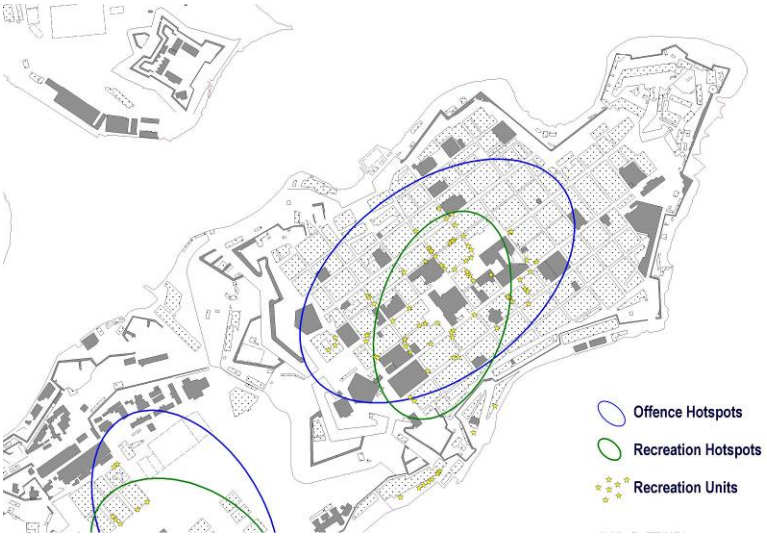

Figure 5. Crime Map

The figure depicts the offence and retail hotspots as standard deviational ellipsoids (SDE) overlaid on the point retail locations.

The integetration of the three CRISOLA themes as depicted in the Figures 4 and 5 enabled the creation of other maps through an interactive online map (Figure 6) that employed the use of flash technology (precursor to a full SEIS), which enables users to view the Malta map at enumeration area levels (small spatial units comprising 150 households as based on Malta Census designations). Other tools experimented upon as conveyors for dissemination include a geoserver structure that is being reviewed for its client-based interactivity (Note 5).

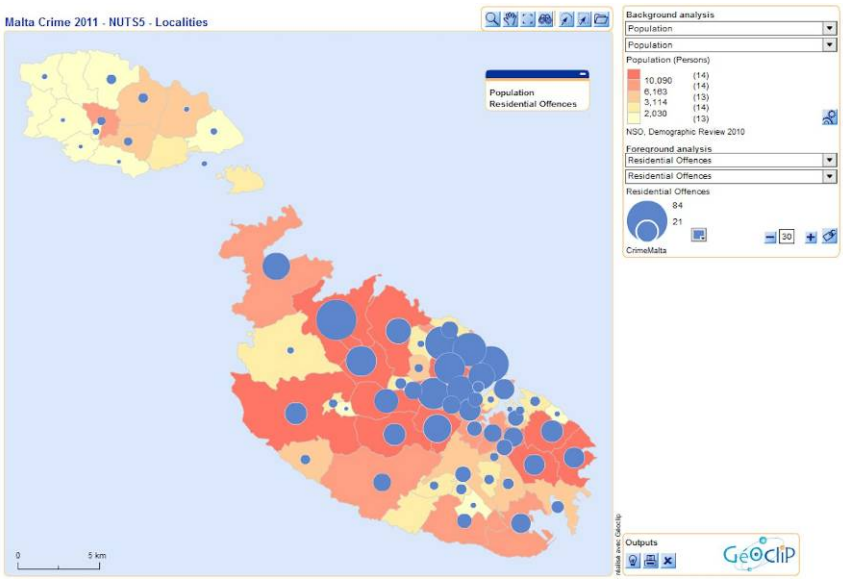

Figure 6. Interactive crime map

The figure depicts an online interactive mapping tool, available at www.crimemalta.com.

4.2 The Next Steps for Data and Webmap Access in the Maltese Islands: Employing SEIS

The usefulness of the cross-thematic approach has been successful due to the adherence to and implementation of the various data creation protocols. The next phase is aimed at webmapping and dissemination and is currently being developed as part of the ERDF project which entails the integration of physical, social and environmental data within a comprehensive Shared Environmental Information System structure.

In summary, the next phases will be based on the outcomes of the process employed in this study in order to encompass a number of operational and implementation changes that will lead to the dissemination of and access to a very wide range of information. These changes may require further legislation updates through the reviewing of current legislation and the publishing of new legislative outcomes. Data Management and dissemination have taken the path of no-return; the legislative and technological advancements have ensured that access to data takes pole-position in the research process, where data reliability is ensured through a system of verifiable processes. Such will be enhanced through updates to GI layers, the creation of a full metadata list and the installation of triggering alerting systems that inform researchers when specific information points to an increase or displacement of an activity, irrespective of domain; physical or social.

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Notes

Note 1. Xerox PARC Map Viewer (1.0X). originally sourced at http://mapweb.parc.xerox.com/mapdocs/mapviewer.html

Note 2. Such a methodological debate is a hot topic in the CrimeMap list (15th August 2006) between the digital- leaning school Dr. Ned Levine (CrimeStat III) creator and Prof. Marcus Felson who promotes the traditional methodologies of crime analysis.

Note 3. One must note that whilst environmental data is disseminated for free, there may still be some charges related to the data creation and analysis work required for the particular query.

Note 4. Country-based server system.

Note 5. FTZ Geoserver. Available online: http://ftzgeo.org:8080/geoserver/web/ (retrieved on October 2010 - September 2012).