

Foreword

This has been a great year for the Institute to gain more exposure locally and internationally, produce the first research outputs, successfully obtain local and international funds for research and run the first taught study programme. The report will highlight in all the detail the events, conferences and fora in which the Institute's members of staff participated actively. It was the first year during which a lot of time and effort was dedicated to preparing proposals for applications under various EU programmes with other universities and industry partners. This experience will serve us well for the future in applying for funding under the various programmes. It was also very satisfying to see the Institute, with its partners, being awarded funding for some of its initiatives. The Institute opened its doors to the first students following the Post-graduate Certificate in Geographic Information Systems. The feedback from the students was particularly encouraging and showed us how hard work at the development stage of the study programme paid off with very good reviews on all the aspects related to the study programme delivery. In 2012 the Institute will see eight of its students graduating under the Post-graduate Certificate in GIS and the Master by Research programmes. In addition we increased the number of staff to support the growing activities and research interests. The collaboration between the Institute and the Cleaner Technology Centre was further intensified with the latest addition in the staff complement dedicating much of her research to the work of the CTC. Formal integration between the CTC and the Institute is envisaged in the coming year. Other initiatives which the Institute is coordinating such as the Green Travel Plan have also started producing outputs.

I am particularly pleased with the quality and the interdisciplinary nature of the research that has been conducted so far. Our students will have the possibility to present their work at the first national conference which we are organising at the end of 2012. This, we hope will bring together many stakeholders from the academic, industry and government sectors to think about innovative projects and ways of collaboration.

I take the opportunity to thank our supporters, being the staff at the Institute, industry partners, government and the academic staff that have formally accepted to collaborate with us from the various University departments and international institutions.

Dr Maria Attard

Director, Institute for Sustainable Development

Introduction

The Institute for Sustainable Development was established in 2009.

During 2011-2012 the Institute strengthened its study programmes, prepared a number of project proposals for funding, embarked on new projects and continued with its research efforts to promote interdisciplinarity.

The Board of the Institute met regularly during this year where a number of key decisions were taken with respect to the work of the Institute and the development of study programmes and projects.

This report outlines the work and achievements of the Institute for Sustainable Development during the period October 2011 and September 2012.

THE BOARD OF THE INSTITUTE 2011-2012

Chairman

Prof. Juanito Camilleri

Vice-Chair and Director

Dr Maria Attard

Members:

Prof. Richard Muscat

Dr Mario Tabone

Dr Gordon Cordina

Prof. Simon Fabri

Prof. Alex Torpiano

Dr Sandro Lanfranco

Dr Ing. Saviour Zammit

Dr John A. Schembri

AIMS OF THE INSTITUTE

- (a) to assist by interdisciplinary research in the realisation of national plans to improve the infrastructure, productivity, entrepreneurship and the quality of life in Malta;
- (b) to provide advice and assistance on issues of sustainable development in Malta;
- (c) to promote the use of, and deploy Geographic Information Systems and other information systems as a tool for decision support and strategic planning;
- (d) to promote and catalyse science and technology commercialisation, the creation of start-ups and new business ventures, and the transfer of innovation and technology to industry;
- (e) to organise undergraduate and postgraduate courses within the scope of the Institute subject to the Statutes and Regulations of the University;
- (f) to network and liaise with similar, university institutions and centres for sustainable development overseas; and
- (g) to disseminate the knowledge acquired by publication, seminars and teaching programmes.

The University of Malta Institute for Sustainable Development

The University of Malta Institute for Sustainable Development

The Administrative Office

During 2011-2012 the Institute was located in Regional Building, Triq I-Imhalled Paolo Debono, outside the University Msida Campus. This temporary office housed the administrative as well as the academic staff, whilst also offering space for interns, students and project work which the Institute maintained and ran throughout the year.

The Institute's Human Resources

In April 2012 the Institute saw Ms Stephanie Stellini, administrative graduate trainee with the Institute since 2009 resign to pursue her career in the private sector. Subsequently in July 2012 **Ms Romina Zammit**, took over the administrative position within the Institute as Executive Officer.

Ms Thérèse Bajada, appointed as Resident Assistant Lecturer in January 2010 has continued successfully her PhD studies at UCL's Civil, Environmental and Geomatic Engineering Department and contributed to the various projects and teaching duties within the Institute. She has also completed a Higher Level Certificate in Travel Planning from the Open University.

Dr Ing. Saviour Zammit (Lecturer in the Faculty of Information and Communication Technology) continued to coordinate the Science and Technology Entrepreneurship Unit within the Institute.

In January 2012 the Institute welcomed **Dr Anton Theuma**. Dr Theuma joins the ISD from the Department of Pharmacy on a part-time position as Visiting Senior Lecturer (TR4). Dr Theuma joined the work of the Science and Technology Entrepreneurship Unit.

In April 2012 Council approved the appointment of **Ms Margaret Camilleri** as Visiting Assistant Lecturer (TR4) to the Institute. Ms Camilleri will be pursuing her PhD in Waste Management as well as contributing on a part-time basis to the development of the Institute. Ms Camilleri joined the Institute in the beginning of September 2012.

In June 2012 the Institute welcomed **Mr Raphael Mizzi** who joined the Institute as graduate trainee in charge of implementing the University's Green Travel Plan.

Finally in July 2012 the Institute employed on a short-term contract **Ms Nicolette Formosa** as Research Officer I to support the TISTA led project on *Transport Models: Capacity Building and Application Potential for Malta*. Ms Formosa worked at the Institute over the summer period, up until September 2012.

Community Outreach

The Institute Website

The Institute website has continued to act as a medium for communication with the University community and the general public. The Institute's website contains reference to almost all the work that the Institute engaged in since its opening in 2009. Sections in the website include:

- The Homepage which provides an introduction to the Institute, the latest news, and direct links to the study programmes (Courses) offered by the Institute;
- An About page containing the link to the Institute Statute, the composition of the Board, its Director;
- A Staff page containing the contact details and link to personal pages of the staff compliment of the Institute;
- A new link called Info for Students was introduced to assist the students registered for courses within the Institute;
- A News page listing all the news events published by the Institute;
- An Events page providing information on the various events organised by the Institute;
- The ISD Conference page has been added to promote and facilitate access to the Conference information;
- A Research page where interested researchers wishing to carry out research with or at the Institute can download the Guidelines for the Preparation of Research Proposals;
- A Links page which lists interesting and relevant websites;
- A page dedicated to the European Commissions Joint Research Centre (JRC) initiatives and events;
- A Working Papers page where interested researchers can download the Guidelines for the Preparation and Submission of Working Papers to the Institute's Working Paper Series;
- A Media Coverage page which lists the instances where the Institute was reported on the media;
- A UOM Green Travel Plan Initiative page where staff and students at the University can refer to the developments on the University's Green Travel Plan.
- A TISTA page providing information about the Institute's new initiative Transport Information Systems and Telematics (TISTA) Research Group;
- The Institute's Annual Reports have now a dedicated page to increase their visibility.

Pages from the Homepage link to the study programmes offered by the Institute including the Diploma in GIS, the Diploma in Sustainable Land and Real Estate Management, the Post-graduate Certificate in Geographic Information Systems and Science and the MSc by Research.



www.um.edu.mt/isd

The Institute in the Media

Press Releases

The 2012 Summer School in Geographic Information Systems

The Institute for Sustainable Development, University of Malta in collaboration with the Department of Civil, Environmental and Geomatic Engineering, University College London (UCL) and the Department of Geography of the University of Portsmouth has once again successfully completed the fifth Summer School on Geographic Information Systems which was held between the 22nd and 28th of June 2012 at the University Msida Campus.

The Summer School attracted a group of delegates who were interested in creating and analysing spatial data. The delegates had the opportunity to apply GIS using spatial statistical techniques available in GIS software and investigate aspects of data quality. This year students experienced hands on sessions on the creation of spatial data from digitizing to the use of GPS (Global Positioning Systems). The use of GPS equipment during the summer school allowed for students to appreciate how spatial data is created and how GPS interface with GIS. A first "mapping party" was organised where students collected information about the University and updated the OpenStreetMap data online. The method used in the delivery of the summer school was a mix of lectures and hands-on sessions. The delegates included research students, technical staff from utility companies and government agencies as well as foreign students.

The summer school participants also received a one year student licence of ESRI's ArcGIS 10, kindly donated by GEOSYS Ltd, local distributors of ESRI software products.

The teaching faculty consisted of Dr Maria Attard (UOM), Dr Kate Jones (Portsmouth), Dr Claire Ellul (UCL) and Ms Thérèse Bajada (UOM). Mr Raphael Mizzi, a graduate trainee from the Institute for Sustainable Development assisted the faculty with the running of the summer school.

The success of the summer school in this growing area of study is very encouraging and will certainly ensure that the Institute continues to further develop study programmes in this area and continue the collaboration and research with leading institutions abroad.



This press release featured in:

The Malta Independent on Sunday 15th July 2012

The Sunday Times 15th July 2012

Direction Magazine (online) 17th July 2012

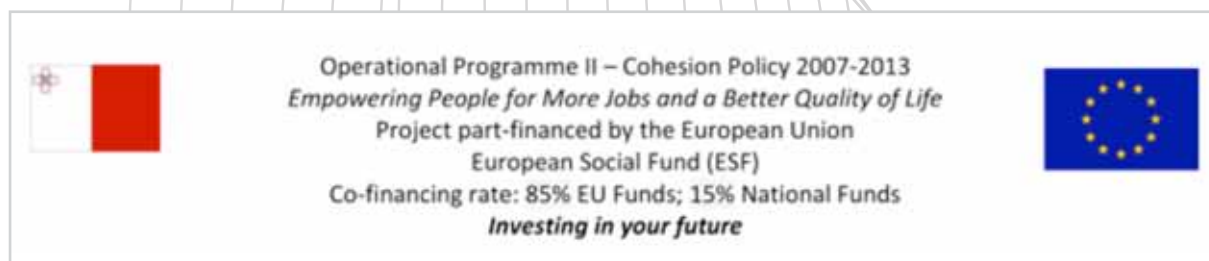
ESF 1.125 - Creating a Knowledge Transfer Framework and Technology Entrepreneurship Training Programme

The University of Malta has been awarded funding through the European Social Fund to carry out a project entitled 'Creating a Knowledge Transfer Framework and Technology Entrepreneurship Training Programme'. This project, which falls under the Cohesion Policy Programme 2007 – 2013, has a total budget of €1,331,530 and will be managed by the University's Corporate Research and Knowledge Transfer Office together with the Entrepreneurship Unit within the Institute for Sustainable Development. The Malta Council for Science and Technology, Malta Enterprise and the Malta Chamber of Commerce, Enterprise and Industry are partners on the project.



Through the project the University of Malta aims to establish an Intellectual Property (IP) and Knowledge Transfer (KT) framework and introduce an intensive training programme in science and technology entrepreneurship. The University has recently set up Knowledge Transfer and Intellectual Property Rights Offices on campus which will benefit from the project through consolidation of their IP and KT activities and processes. Training will be provided to University support staff and staff from Malta Enterprise and the Malta Council for Science and Technology to enable them to provide the necessary support services related to the technical, legal, financial and commercial aspects of IP, KT and Business Incubation activities. One of the roles of the IPR and KT offices will be to raise awareness and build basic skills in this area through training activities for academics and students. The IPR and KT offices will also be responsible for the monitoring and publicising of IP protection and KT activities and related achievements, as well as disseminating information regarding University IP rights and expertise.

Activities that will be carried out through the project will include two series of seminars, one for University staff and students and another for the broader ecosystem including business representatives, entrepreneurs, potential investors and other external participants involved in the area. The second seminar series, which will be organised with the collaboration of the Malta Chamber of Commerce, Enterprise, and Industry, will involve training and networking activities aimed to increase business to academia linkages and encourage cooperation between the various stakeholders.



Participation in conferences and events

19-20 September 2011 Urban Europe JPI Governing Board Meeting, Malta Council for Science and Technology, Bighi, Malta

Dr Maria Attard continued to support Malta's participation in this important EU Joint Programming Initiative by attending as observer the Governing Board meeting which was organised in Malta. The University of Malta also sponsored the participant's dinner on the 19th of September.



28 October 2011 International Conference on Border Securities, Human Experiences (Enacting Laws and Policies and Embodying State Practices, Bugibba, Malta

Dr Maria Attard and Dr John A. Schembri from the Geography Department presented a paper on Change and permeability in Mediterranean boundaries: a geographic perspective at this conference organised by the University of Malta.

9-12 November 2011 CONNECTBALTICA Inauguration Convention, Tallinn, Estonia

Dr Maria Attard was invited to deliver a presentation during the inaugural convention of CONNECTBALTICA, a new association aimed at bringing together transport professionals in the Baltic region. The title of her presentation was ITS in Urban Areas: the case of Valletta, Malta.



14 November 2011 Promoting Resilience in Education, Malta

Ms Thérèse Bajada attended this conference organised by the University of Malta European Centre for Educational Resilience and Socio-Emotional Health. Ms Bajada represented the Institute given its involvement in supporting the University wide project to promote higher education in Malta.

25 November 2011 SLOWTOUR Final Conference, Perugia, Italy

Dr Maria Attard was invited to deliver a presentation during the final conference of the EU funded project SLOWTOUR on Sustainable Tourism (Project Reference ENT/CIP/09/B/N06S00. The Conference was organised by the University of Perugia in Passignano sul Trasimeno in Umbria, Italy. Following from this conference the Institute established a research collaboration with the Dipartimento di Scienze Economico-Estimative e degli Alimenti of the University of Perugia, Professor Antonio Boggia. Professor Boggia will act as co-supervisor to a post-graduate researcher within the Institute in the academic year 2012-13.



SLOWTOUR Conference at Lago Trasimeno, Italy.

10-11 February 2012 NECTAR Cluster 2 Meeting: Urban and Regional Transport: Regulation, Sustainability, E-mobility, Dresden, Germany

Following the successful participation in the NECTAR Conference of 2011, Dr Maria Attard coordinated with other members of Cluster 2 a meeting in Dresden. The meeting focused on electric mobility and Dr Attard presented a paper entitled Car ownership, mode choice and the future of electric mobility in island states.

23-28 February 2012 Association of American Geographers (AAG) Annual Meeting, New York, USA

For the first time Dr Maria Attard attended the AAG meeting which in 2012 was organised in New York. This is a gathering which attracts over 5,000 geographers from all over the world. Dr Attard presented a paper entitled The promise of accessibility: the application of road pricing in Valletta, Malta. This is the first participation by a UOM academic, participating in the Transport Geography Sub-Committee.



13 April 2012 Sustainable Urban Mobility Plans (SUMP) Workshop, Bari, Italy

Dr Maria Attard was invited to deliver a presentation and contribute to the workshop on Urban Sustainable Mobility Plans organized by the Regione Puglia in collaboration with CIVINET (the CIVITAS City Networks) and ELTIS (the European Urban Mobility Platform) in Bari, Italy. Her presentation was entitled *Sustainable Urban Mobility Plans: The case of Valletta*. Proceedings of the workshop are available at <http://www.ricerchetrasporti.it/pums/>

Dr Maria Attard being interviewed for a webcast following the workshop in Bari.



23-26 April 2012 Transportation Research Arena 2012, Athens, Greece

Dr Maria Attard attended the Transportation Research Arena 2012. This is the Transportation Conference supported by the European Commission DG TREN and various entities and organizations at European Level. TRA is a bi-annual conference and aims to mirror the US National Academies Transport Research Board Annual Meeting which occurs in Washington DC every year and attracts over 8,000 transport professionals over the world. Dr Attard's attendance was supported by the Brokerage Events Scheme of the Malta Council for Science and Technology.



26 April 2012 ICOD Annual Commonwealth Training Programme on Coastal Recreational Resources, Malta

Ms Thérèse Bajada contributed to this Training Programme with a lecture entitled *Sustainable Development in Vulnerable Environments: the case of Islands*.

1 June 2012 EUREKA Seminar, University College London (UCL), London

Ms Thérèse Bajada contributed to this EUREKA Seminar with a presentation entitled *Modelling Public Perception on Modal Choice: the case study of the Malta bus reform*.



3 July 2012 ESRI GIS User Conference, St Julian's Malta

This year marked the first ever GIS User conference organised in Malta by ISYS, local distributors for ESRI. For this event the Institute for Sustainable Development organised a stand where it promoted its research programmes and projects. Ms Thérèse Bajada and Mr Raphael Mizzi attended the conference and provided useful information to participants.



ISD stand at ESRI GIS User Conference. Ms Bajada and Mr Mizzi manned the stand.

14 September 2012 Waste Reduction and the EWWR 2012 (European Week for Waste Reduction), Malta

This seminar was attended by Ms Margaret Camilleri, latest addition to the Institute staff.

Participation in Events on Entrepreneurship

Dr Anton Theuma, Visiting Senior Lecturer attended the following events:

- | | |
|------------------|---|
| 22 February 2012 | Innovation Funding WG – Entrepreneurship Education Call, Brussels |
| 6-8 March 2012 | Schedule for the 10th Swietokrzyskie “Cooperative Exchange of New Technologies of Renewable Energy – Technology of the Future, Poland |
| 12-15 March 2012 | Global Entrepreneurship Congress, Liverpool |
| 23 March 2012 | Entrepreneurship and Innovation Cluster, Brussels |
| 23 April 2012 | EC Workshop H2020: New Approach to SME Support, Brussels |
| 8 May 2012 | EP Seminar. Presentation delivered entitled The Missing Link for a Successful Europe – Responsible Entrepreneurship, Brussels |
| 10 May 2012 | Financial Engineering Workshops – Equity and Debt Financing. Access to Finance for RDI SMEs and Regions, Brussels |
| 25 May 2012 | Economic Growth Needed: Does the financial regulatory framework set the right incentives? Brussels |
| 29 May 2012 | Industrial Innovation: Mission Growth, DG Enterprise and Industry, Brussels |
| 21-22 June 2012 | Digital Agenda Assembly 2012, Brussels |

Events

Briefing Session on Government Scholarships for 2012

17 April 2012, University of Malta, Msida Campus

The Institute for Sustainable Development was pleased to host a briefing session for prospective applicants wishing to pursue their studies at Masters and Doctoral level. The briefing session was delivered by the Directorate for Lifelong Learning of the Ministry for Education and was well-attended by students who asked numerous questions with regard to the scholarship requirements. This is the second year in which the Institute is supporting such an event.



As the relationship grows between the Institute for Sustainable Development and the Cleaner Technology Centre, the Institute supported a number of seminars and short courses organized by the Cleaner Technology Centre. These included:

24-28 October 2011 A five-day Ecodesign Course on the Environmental Improvement of Products, Processes and Services prepared by Innovació per a la sostenibilitat (inèdit) and the Universitat Autònoma de Barcelona and organized by the Cleaner Technology Centre and the Regional Activity Centre for Cleaner Production.



6 December 2011 A Seminar entitled POPs in our Life, University of Malta, Msida Campus.

POPs are chemical products that are present in many processes, objects and elements in our lives. Historically, they have improved our way of life, but in recent decades, due to their increase, it has been discovered that they are hazardous both to human health and to the environment. Following the event, the CTC facilitated the attendance of Prof. Emmanuel Sinagra to the Workshop on alternative identification and assessment training of POP's in Barcelona on the 13th December 2011.

25 September 2012 A Seminar entitled Foods, Diet and Environment

This seminar was organized by the CTC in collaboration with the Department of Food Studies and Environmental Health of the Faculty of Health Sciences and the Italian Cultural Institute. Ms Margaret Camilleri from the Institute for Sustainable Development assisted in the organization.

The Cleaner Technology Centre organizes also a number of local awards.

- In the period under review Dr Maria Attard was part of the adjudication committee for the **2011 Environment Awards for Industry** organized by the Cleaner Technology Centre.
- In 2012 the Cleaner Technology Centre started on the collaboration with WasteServ in organizing the **Second Edition of the Waste Minimisation Award**.

Last but not least, the Cleaner Technology Centre is facilitating the implementation of an agreement between the University of Malta, the Autonomous University of Barcelona and the Regional Activity Centre of UNEP/MAP to Green the University. The finalized project would serve as a model for other Mediterranean Universities. Ms Margaret Camilleri is assisting the CTC in this project.

Fifth International Summer School in Geographic Information Systems

22 - 28 June 2012, University of Malta, Msida Campus

The Institute for Sustainable Development of the University of Malta in collaboration with the Department of Civil, Environmental and Geomatic Engineering, University College London (UCL) and the Department of Geography of the University of Portsmouth has once again successfully completed the Summer School on Geographic Information Systems which was held between the 22nd and 28th of June 2012 at the University Msida Campus.



The Institute also launched its forthcoming conference, the first of a series of conferences dealing with various aspects of sustainable development.

The conference website is available at www.um.edu.mt/isd/isdconference

The Institute for Sustainable Development is organising
a national conference entitled:

Sustainable Mobility in Malta
Transport Research in Practice

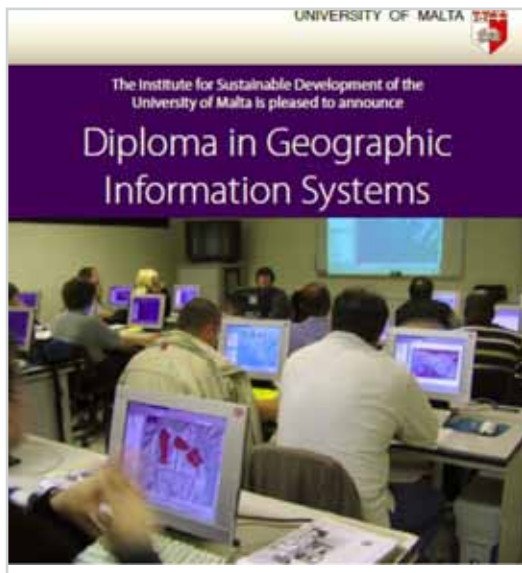
SmartCity Malta, Ricasoli - 30th November 2012



University of Malta
L-Università ta' Malta

The Institute's Study Programmes

The Diploma in Geographic Information Systems



The Diploma in Geographic Information Systems is the first opportunity for formal training for those interested in developing skills in this very specialised discipline. This is a part-time (evening) course over six semesters and falls under the Get Qualified funding scheme where students get financial support to undertake their studies.



YEAR ONE

- ISD1100 Basic Skills in Geographic Information Systems (Lab Practicals) 6 ECTS
- ISD1101 Basic Concepts of Geographic Information Systems 4 ECTS
- ISD1102 Introduction to Geographic Information 4 ECTS
- ISD1103 Introduction to Geographic Analysis 4 ECTS
- ISD1104 Introduction to Database Management Systems for GIS 4 ECTS
- ISD1105 Remote Sensing and Applications 4 ECTS
- ISD1106 Mobile Geographic Information Systems 4 ECTS

YEAR TWO

- ISD1203 Intermediate Skills in Geographic Information Systems (Lab Practicals) 6 ECTS
- CRM1001 Geographic Information Systems and Crime Mapping 4 ECTS
- ISD1200 Geovisualisation 4 ECTS
- ISD1201 Programmable Aspects of Geographic Information Systems 4 ECTS
- ISD1202 Cartography and Digital Mapping 4 ECTS
- ISD1204 Geographic Information Systems and Geodemographics 4 ECTS
- ISD2205 Geographic Information Systems and Databases 4 ECTS

YEAR THREE

- ISD2000 Long Essay 8 ECTS
- ISD2305 Advanced Skills in Geographic Information Systems (Lab Practicals) 6 ECTS
- ISD2301 Web Mapping 4 ECTS
- ISD2302 Geographic Information Systems in Transportation 4 ECTS
- ISD2303 Managing Geographic Information Systems 4 ECTS
- ISD2304 Advanced Geographic Analysis and Mapping 4 ECTS

The Diploma in Sustainable Land and Real Estate Management

The Diploma in Sustainable Land and Real Estate Management is an interdisciplinary study programme bringing together the main aspects related to land and estate management. The study programme is designed in such a manner as to effectively develop skills and knowledge required by land managers to understand the complexities of rural and urban management and development. The study programme includes a number of study units aimed at the teaching of basic concepts of economics, law, geography, environment, finance, planning, management, architecture, marketing, ICT tools and statistics. This is a part-time (evening) over six semesters.

YEAR ONE

CVL110 Law of Ownership and Property Law Relating to Sustainable Estate Management 4 ECTS
 MGT1013 Fundamentals of Management 4 ECTS
 ISD1110 Principles of Sustainability 6 ECTS
 ECN1003 Introductory Economics for Land and Real Estate Management 4 ECTS
 GEO1042 Socio-geographic Aspects of Land Management 4 ECTS
 ISD1108 Geographic Information Systems for Land Management 4 ECTS
 ISD1109 Quantitative Techniques for Land Management 4 ECTS

YEAR TWO

CVL1109 Legal Anthropological Perspectives on Land, Property and the Environment 4 ECTS
 GEO1041 Urban and Rural Geography 4 ECTS
 RFS1400 Rural Policy and Land Use Management 6 ECTS
 EMP1201 Impact Assessment and Monitoring 4 ECTS
 LIN1063 Academic Reading and Writing in English 2 ECTS
 MRK1011 Introduction to the Marketing Concepts 6 ECTS
 SPI1011 Development and Spatial Planning 4 ECTS

YEAR THREE

BKF2200 Real Estate Finance 4 ECTS
 CIS1043 Information Systems for Land Management 4 ECTS
 CNM1041 Property Valuation 4 ECTS
 ERL1000 Principles of Environmental and Development Planning Law in relation to Estate Management 4 ECTS
 MGT1052 Leadership and People Management 4 ECTS
 ISD1205 Project 10 ECTS



The Postgraduate Certificate in Geographic Information Systems

The Postgraduate Certificate in Geographic Information Systems covers the principles of the Geographic Information Science, such as spatial databases, programming, remote sensing and digital cartography and the technology supporting Geographic Information Systems such as principles, management and applications. It is a part-time (evening) course over two semesters.



YEAR ONE

- ISD5001 Principles of Geographic Information Systems 5 ECTS
- ISD5002 GIS and Databases 5 ECTS
- ISD5003 Applying GIS (Lab Practicals) 5 ECTS
- ISD5004 Geographic Information, Remote Sensing and Digital Cartography 5 ECTS
- ISD5005 Managing Geographic Information Systems 5 ECTS
- ISD5006 Programming in GIS 5 ECTS

Six students followed the degree programme and successfully passed their exams. The following class will be graduating in November 2012:

Mr Raphael Mizzi
Perit Wendy Jo Attard
Ms Elizabeth Olivieri

Mr Sergio Tartaglia
Mr Eric Santucci
Ms Joanna Vassallo



The Master of Science by Research (Sustainable Development)

The Master of Science (Sustainable Development) is a research programme enabling researchers to focus on a variety of topics to be studied in depth through full-time or part-time study. The study programme is over three semesters or equivalent in part-time.

Research conducted by MSc students is outlined in Annex 1.

YEAR ONE

ISD5100 Dissertation 80ECTS

ISD5101 Research Methods 5ECTS

ISD5102 Principles of Sustainability 5ECTS

Student Intake 2011-2012

Student	Dissertation Title
Ms Annalise Grech (Full-time)	Household water consumption in Malta: an analytical study Supervisor: Dr Maria Attard Co-supervisor: Dr Ing. Antoine Riolo
Ms Deborah Mifsud (Full-time)	Public transport as a tool towards sustainable mobility Supervisor: Dr Maria Attard Co-supervisor: Ms Thérèse Bajada
Mr James Cassar (Full-time)	Effectiveness of green travel planning measures: case study analysis of travel behaviour at UOM Msida Campus Supervisor: Dr Maria Attard
Ms Rebecca Pirotta (Part-time)	Transport modes amongst Maltese children Supervisor: Dr Maria Attard
Perit Duncan Mifsud (Part-time)	The Grand Harbour Regeneration Plan: an analytical study interrogating the sustainable use of housing stock Supervisor: Dr Simon Mercieca Co-supervisor: Dr John A. Schembri
Mr Johann Attard (Part-time)	Assessing Participatory GIS for the ECO Gozo Initiative Supervisor: Dr Maria Attard

Research Activity

Over the period October 2011 and March 2012 the Institute was busy writing up project proposals and joining consortia to submit requests for funding. Table 1 shows the projects which were developed by the Institute and its partners and the outcome of the funding.

Student Quality of Life Research collaboration

The Institute for Sustainable Development is collaborating with the Geography Department at the University of Malta and the Geography Department at the University of Innsbruck on research into Quality of Life of students. This research is based on a methodology developed by Dr Lars Keller one of the leaders of the project. Other members include Dr John A. Schembri (Geography), Dr Maria Attard (Geography, ISD), Ms Thérèse Bajada (ISD), Mr Andrea Pace and Ms Roberta Gauci both past students of the departments involved. A questionnaire was developed and distributed to University of Malta students.

Dr Lars Keller has been the beneficiary of Erasmus Mobility Funds to visit Malta for the past three years and develop this collaboration. In 2013 it is expected that the mobility is reciprocated with a visit by Dr Maria Attard to Innsbruck.

Further research and a publication are expected in 2013.

STRatEgia IntEgrata per un Trasporto Sostenibile Italia-Malta (STREETS)

The Institute for Sustainable partnered with the local transport regulator Transport Malta and developed a proposal in collaboration with four Sicilian partners with the aim of building an integrated information system and strategy for more efficient transport between Malta and Sicily. This project was submitted for funding under the 2012 Italia-Malta Call and was lead by the Regione Sicilia. Other partners include ARCES, Port Authority of Catania and Comune di Vittoria. The strategic nature of these calls required a focus on the benefits of the project to Government entities. The Institute for Sustainable Development is therefore supporting the requirements of Transport Malta in this project. The project is due to start later in 2012.

Table 1. Proposals for funding applied for during the period 2011-2012.

Funding Programme	Title of Project	Project Partners	Outcome and Value
UOM R&I	Transport Models: Capacity Building and Application Potential for Malta	Dr Maria Attard, Institute for Sustainable Development; Dr Kenneth Scerri, Faculty of Engineering, Dr Adrian Muscat, Faculty of ICT	AWARDED EUR3,000
MCST R&I Programme	MOVEMALTA	Dr Maria Attard, Dr Matthew Montebello, Dr Ing. Saviour Zammit, Dr Ing. Adrian Muscat University of Malta; Ing. Matthew Spiteri, Altern Ltd; James Abela and Matthew Sammut, NIU Ltd	NOT AWARDED
COST	Action IC1203 <i>ENERGIC</i> European Network Exploring Research into Geospatial Information Crowdsourcing	Dr Maria Attard part of the Action Management Committee	AWARDED
OP Italia Malta 2007-2013	STREETS Integrated Strategy for a Sustainable Transport Italy-Malta	Regione Sicilia (Lead), Collegio Universitario ARCES, Comune di Vittoria, Autorita' Portuale di Catania, Transport Malta, University of Malta	AWARDED Total Value: EUR2.5M UOM Share: EUR250,000
OP Italia Malta 2007-2013	Sustainable WASTE MAnagement (SUWAMA)	Regione Sicilia, Universita degli studi di Catania, University of Malta, Wasteserv Ltd.	NOT AWARDED
FP7 Regions of Knowledge Call Identifier: FP7-REGIONS-2012-2013-1	NAVITAS Fostering sustainable research clusters for energy-efficient citizens' mobility in European regions	CERTH Hellenic Institute of Transport (Lead), Politecnico di Torino, Imperial College London, University of Malta supported by 11 partners from government and industries making up a total of four clusters in Greece, Italy, Malta and UK. Malta partners included the Valletta Local Council and IMovo Ltd	Awaiting result of awarding body



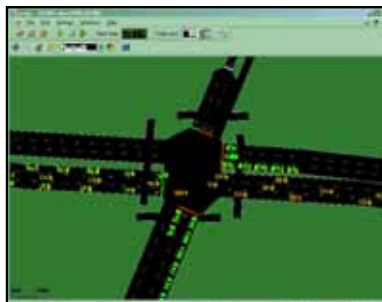
Transport Information Systems and Telematics (TISTA) Research Group

The TISTA Group continued its collaboration during the academic year 2011-12 with an application for funding under the MCST R&I 2012 Programme and the University R&I programme. The successful project funded by the University R&I was entitled Transport Models: Capacity Building and Application Potential for Malta.

The research team, composed of Dr Maria Attard, Dr Kenneth Scerri and Dr Adrian Muscat was successful in accessing the funds and a short-term Research Officer was employed within the Institute during the summer months. Ms Nicolette Formosa joined the Institute in July 2012 and was tasked with reporting on available commercial or open source traffic simulation programmes, and test at least one programme for its capabilities.

Ms Formosa delivered her full report to the group by September 2012. The group agreed that this was an important step in developing this much needed area of research at the University of Malta, and that further efforts will be made to obtain funding to conduct more testing and simulation in the local context. A brief of Ms Formosa's report is attached in Annex 2.

In the meantime members of the TISTA group have submitted abstracts for the ISD Conference in November 2012.



Participation in International Scientific Committees

Academic members of staff of the Institute have participated and contributed to a number of scientific committees and conferences during the period under review.

Dr Maria Attard was appointed member of the Scientific Committee for the 1st Conference on Urban Sustainability and Resilience organised by UCL Centre for Urban Sustainability and Resilience, London, UK, November 5th-6th November, 2012.

Dr Maria Attard was appointed member of the Scientific Committee for the conference on Flow modelling and urban management organised by IFSTTAR, Lille Grand Palais, France, June 13th-14th, 2012.

Ms Thérèse Bajada was appointed paper reviewer for the 13th International Conference on Travel Behavior Research 2012, organised by the International Association for Travel Behaviour Research (IATBR), Toronto, Canada, July 15-20, 2012.

Dr Maria Attard was appointed paper reviewer for the WCTR13 Conference organised by the World Conference on Transport Research, Rio de Janeiro, Brazil, July 15-18, 2013.

Dr Maria Attard was appointed Cluster 2 Leader for the NECTAR 2013 International Conference on *Dynamics of Global and Local Networks*, organised by NECTAR (Network on European Communications and Transport Activities Research), St Miguel, Azores Islands (Portugal), June 16-18, 2013. She is collaborating with Prof. Yoram Shiftan (Technion University, Israel), Prof. Edoardo Marcucci (Roma3, Italy) and Prof. Harry Geerlings (Erasmus University Rotterdam, Netherlands).

Dr Maria Attard was also appointed paper reviewer to a number of academic journals including the Journal of Transport Geography (Elsevier), ICE (Institute of Civil Engineers) – Transport (ICE), Island Studies Journal, Human Geographies and Transportation and Research Part A: Policy and Practice (Elsevier).

Projects

Assessment of key success indicators for the Public Transport Reform in Malta

Following the agreement reached between the Institute for Sustainable Development and Transport Malta in 2010, work has continued on this project. The project aims to collect information about success indicators for public transport and analyse their progress over a period of five years. Key indicators include emissions, travel time, bus journey time and reliability and customer perception of the bus service. This project will see the Institute carry out surveys throughout the five year period (2011-2016) and produce reports analysing the data and comparing them temporally. This project will also be complemented with student research and publications.

Resilience in Education: WG4 University Structures Committee

The Rector, Prof. Juanito Camilleri lead a project whereby a number of initiatives were undertaken by various members of the academic body at University to encourage more students to follow post-secondary and university education from the Cottonera region. Dr Maria Attard lead the WG4 dealing with University Structures aimed to promote the University. This group included Dr Carmel Cefai, Ms Patricia Camilleri, H.E. Dr Simone Borg, Mr Stephen Cachia, Dr Josann Cutajar, Ms Bernadine Satariano, Ms Ritienne Gauci and Perit Christopher Spiteri. Amongst the various initiatives developed, two major projects were undertaken.

Cottonera Resources Centre

In an attempt to bring the University closer to the Three Cities, the University Structures Committee decided to investigate the possibility of an off-site location for the University in the area. Following site visits to a number of potential locations in the Three Cities, the group developed a proposal for a Cottonera Resources Centre which will now be located in St Margaret's College at Fortini. This Centre will act as an outreach location for the University, to promote higher education and raise awareness of the importance of education for sustainable development. Subsequently Ms Andrea Dabbens and Dr Josann Cutajar were appointed Director and Chair respectively, of the Centre.

Discover University at the Three Cities

Following the success of Discover University 2011, this year the Committee entrusted the Communications Department to develop a Discover University at the Three Cities, in an attempt to raise awareness of the important and interesting work carried out by the University of Malta. A purposely branded tent will be set up in each of the Three Cities and presentations and discussions will be made to entertain viewers and visitors.



Travelling Smart – The Green Travel Plan Committee at the University of Malta



Following from last year Dr Maria Attard continues to chair the Green Travel Plan (GTP) Committee which aims to implement the University Green Travel Plan approved in 2011. This year Mr Raphael Mizzi was appointed as GTP Coordinator within the Institute. He has taken over the administration of the GTP work as well as act as secretary to the GTP Committee.

The GTP Committee for 2011-12 was made up of:

Dr Maria Attard (Chair)	Perit Christopher Spiteri (Director Estate & Works)
Mr Joseph Camilleri (Precincts Officer)	Ms Nathalie Cauchi (UHM)
Mr Mario Cachia (President, KSU)	Mr Henry Aquilina (Office of Human Resources)
Prof. Luciano Mulé Stagno (UMASA)	Ms Thérèse Bajada (Travel Plan Expert, ISD)
Mr Raphael Mizzi (Secretary)	

During 2012 a number of initiatives were undertaken by the GTP Committee and the GTP Coordinator in order to improve travel to the University.

Cycling

With respect to cycling a geographic analysis of the location of bicycle racks around the campus was carried out by Mr Mizzi. Efforts are at hand to relocate existing cycle racks as well as identify new locations to improve access for students and staff that make use of this transport mode. The GTP Committee is also working on a design competition for new, sheltered bicycle racks around campus.



In addition to this, a group of the University's academic and administrative personnel headed by the Rector got together for a bike ride of 27kms, from Ta' Qali to Wied iz-Zurrieq, to raise some money for the charity Puttinu Cares.



Pedestrian Safety

The GTP Coordinator is collaborating with technical experts within Transport Malta to redesign the University ring road and produce a traffic management scheme that will ensure safety standards are achieved for use of the ring road by both cars and pedestrians.



In addition safer infrastructure has been installed in Wied Ghollieq which is a main pedestrian route for staff and students living in the San Gwann/Kappara area.





Public Transport

Links have been established with ARRIVA Malta, the national public transport operator to provide information about public transport for university staff, students and visitors. A number of promotional posters have been distributed to all faculties to increase the visibility of public transport information.

Car-pooling

This initiative is still in its infancy, however the GTP Committee is looking at means of facilitating car pooling amongst staff through the development of software and websites that bring people together.

Fresher's Week

The GTP Coordinator was busy collaborating with various entities involved in the organisation of Fresher's Week to ensure suitable and clear information is available to all students and staff at the beginning of the academic year.



Finally, the GTP Coordinator has been leading by example and has shifted his travel mode to University by using public transport and conducting errands around campus using a foldable bicycle. Efforts are being made to transfer this success story to other sectors of University employees.

More information about the Green Travel Plan can be found by visiting the GTP website.

www.um.edu.mt/isd/greentravel

Other Initiatives

Participation in COST

In the period under review, Dr Maria Attard continued to serve as member of the Transport and Urban Development Domain Committee within COST.



Dr Maria Attard and Dr Vincent Buhagiar (Faculty of the Built Environment) are members of a COST Action TU0803 Cities Regrowing Smaller - Fostering Knowledge on Regeneration Strategies in Shrinking Cities Across Europe (CIRES) (2009-2013).

Dr Maria Attard was appointed DC Rapporteur on the COST Action TU1102 Towards Autonomic Road Transport Support Systems (ARTS) (2011-15).

Dr Maria Attard and Dr Matthew Montebello (Faculty of ICT) are members of a new COST Action IC1203 ENERGIC (European Network Exploring Research into Geospatial Information Crowdsourcing): software and methodologies for harnessing geographic information from the crowd (2012-17).

During academic year 2011-2012 Dr Attard attended several COST events.

16th TUD DC Meeting, Ohrid, Macedonia 12-15 September 2011

TU0803 CIRES WG4 Meeting, Cambridge, UK 5-6 December 2011

17th TUD DC Meeting, Istanbul, Turkey 22-24 March 2012

18th TUD DC Meeting and Annual TUD Conference, Reykjavik, Iceland 4 – 6 July 2012

Management Committee Meeting COST Action TU1102 ARTS co-located with the 13th IFAC International Symposium on Control in Transportation Systems, Sofia, Bulgaria 12-14 September 2012

Participation in the Climate Change Platform

A platform for Climate Change has been set up at the University of Malta, lead by H.E. Dr Simone Borg. The Institute is represented by Dr Maria Attard. Further developments and projects are envisaged in the coming years.

Staff Publications for 2011-12

1. **Attard, M.**, Schembri, J.A. (2011) Malta: GIS and Geography Teaching in the Context of Educational Reform. In *International Perspectives on Teaching and Learning with GIS in Secondary Schools*. Milson, A.J., Demirci, A., Kerski J. (eds). Springer.
 2. **Attard, M.** (2012) Reforming the Urban Public Transport Bus System in Malta: Approach and Acceptance. In *Transportation and Research A: Policy and Practice*. Vol. 46 pp 981-992.
 3. **Theuma, A.** (2012) Smart Specialisation Report – PPP as an example of Innovation in the Regions 2014 – 2020.
 4. Theuma, A. (2012) The UOM: An Evolving Intellectual Leadership contributing to Smart Sustainable Growth in Malta, Europe and beyond. Internal report, University of Malta.
 5. *Under Review* **Bajada, T.**, Interpreting the public's perception on modal choice. The Maltese case before a bus reform. Paper submitted to the Working Paper Series, Institute for Sustainable Development, University of Malta.
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Annex 1

Research Article: Is living in denser settlements better or worse?

by Andrea Pace B.A. Hons (Melit.), M.Sc.

Traditionally dense urban environments have been associated with ill-health and social problems (Jianling and Rainwater 2008). This perception is built on an anti-urban tradition that can be dated back to the eighteenth and nineteenth century industrial revolution. This anti-urban sentiment has been epitomised by Cowper (1785) who wrote; 'God made the country, and man made the town'. In the Western World this led to urban sprawl and the desire for less dense and more spacious urban development. Nowadays, urban sprawl is associated with negative environmental impacts. Scholars like Newman and Hogan (1981) have shown that dense settlements provide for more efficiency when it comes to the design and operation of transport systems and overall environmental protection.

It is also acknowledged that the negative perception to density is the result of a confusion of density to crowding. Stokols (1972) explained that population density can be defined as 'a physical condition in which a large population occupies a limited space. Crowding is however a psychological condition that arises from a person's perception of the high-density environment in which a person is confined' (as cited in Brannon and Feist 2007, p.114). According to Regoeczi (2003), density is an essential ingredient for crowding, but someone living in a dense environment might not experience crowding (as cited in Brannon and Feist 2007, p.114).

Spatial knowledge and planning is of utmost importance in a small, highly populated island like Malta. The 2005 State of the Environment Report stated that 23 per cent of Malta is urbanised and that 23 per cent of the dwelling stock is temporary or permanently vacant (MEPA 2006). Apart from the 23 per cent of urban areas one can include another 7.4 per cent of industrial areas, giving a total of 30 per cent built-up area (MEPA 2010b). This percentage is very high when compared to the results obtained from the 2009 Eurostat Land use/cover area frame statistical survey (LUCAS). The countries with the highest percentage of urbanised land cover were Belgium and the Netherlands with 13 and 10 per cent urbanised land respectively (EUROSTAT 2010).

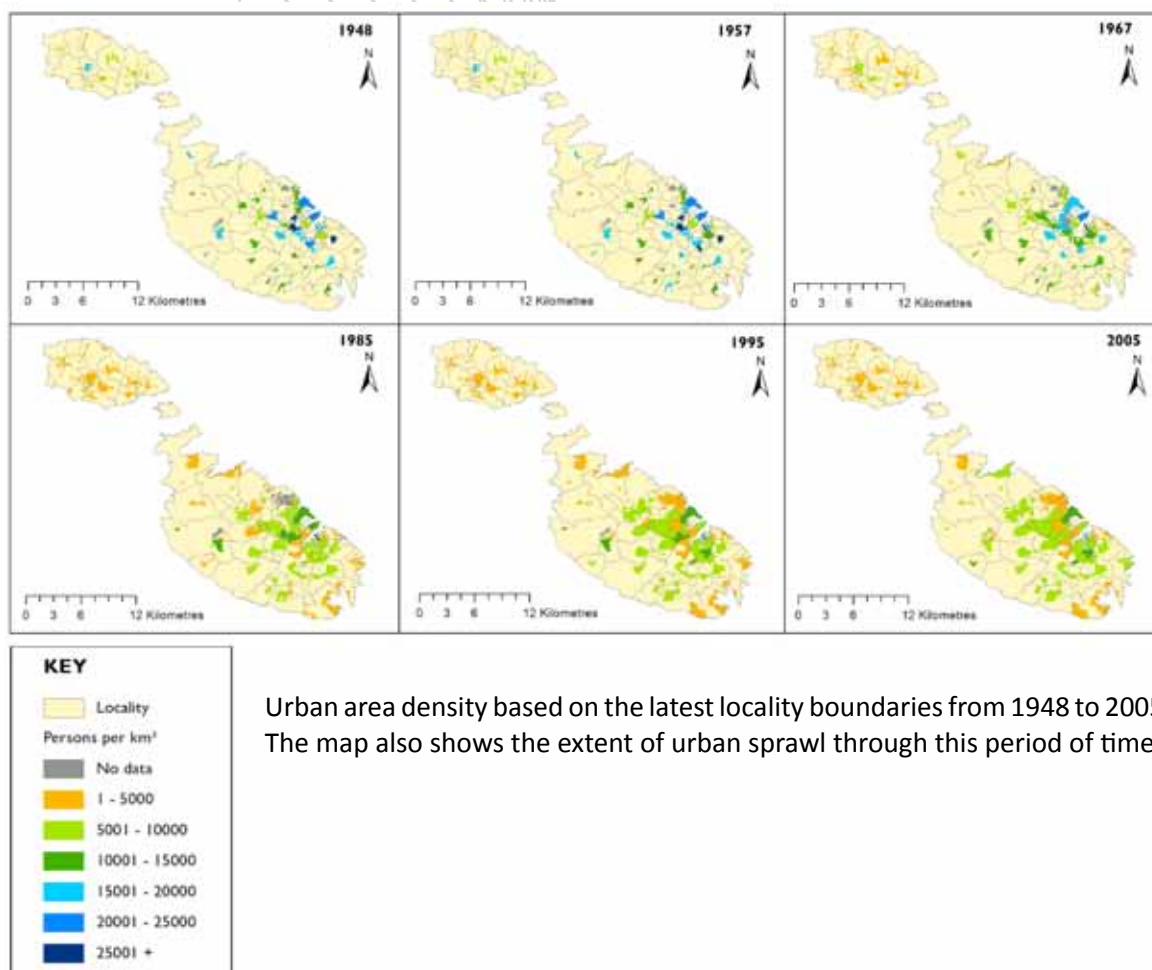
In the 2008 Environmental Report, MEPA acknowledged the fact that high rise buildings may be a solution for more efficient land use. Yet this might come at the detriment to the landscape value (MEPA 2010a). The 2008 Environmental Report also points out the dense nature of Maltese localities. This problem is becoming more acute due to a relaxation of building height limitations. The same report also assumes that these dense urban areas lead to a demand for less dense areas and subsequently to urban sprawl. The problem is also linked to land use particularly due to the amount of vacant property, land prices and ongoing construction (MEPA 2010a).

The problem of dense settlements was tackled in a recent research project entitled "Analysing Education and Health Indicators and Malta's Urban Development Densities using GIS". This study adopted a geodemographic approach to the relationship between the social context, mainly education and health, and urban development densities. Sleight (1997) defined geodemographics as the 'analysis of people by where they live'.

The research project focused on analysing social issues from 1948 to today. Existing indicator systems addressing urban social issues were collated and compared to the data available. An ad hoc set of density,

demographic, education and health indicators was created following this process. Data was collected from various censuses and government health reports found at the University of Malta Melitensia Special Collection, the National Archives of Malta, Santo Spirito in Rabat, the National Library of Malta in Valletta and the Health Information and Research Department Library in Gwardamangia. Data was tabulated in spreadsheets and collated according to the 2005 census districts (South Harbour, North Harbour, South Eastern, Western, Northern and Gozo & Comino) to ensure comparability between different years. IBM SPSS was used to analyse the data for any association. The Pearson product-moment correlation coefficient and the General linear regression were used. A Geographic Information System (GIS) was used to aid in visualising and interpreting the distribution of social indicators.

The density indicator used for the purposes of the study was urban density based on the districts' urban areas rather than the districts' total area. This indicator gave a more authentic picture of population densities over time. From the data collected it was evident that the urban density was in decline between 1948 to 1985. By 1995, density was again on the increase primarily because of the Temporary Provision Schemes (1990) which placed a limit to urban development in Malta. The comparative analysis has shown that there is no statistical association between social indicators and the urban area densities. The significant exceptions were live birth rates (used to calculate mortality rates in the first years), the incidence of broncho-pneumonia and pulmonary tuberculosis and deaths by pulmonary tuberculosis. In the case of these notifiable diseases data was limited to up to 1967.



Urban area density based on the latest locality boundaries from 1948 to 2005. The map also shows the extent of urban sprawl through this period of time.

The study confirmed that even though there are differences between regions, national trends are stronger (even because of the limited size of Malta). Some of the differences observed were based on contextual factors, for example the lack of primary industry in the harbour districts due to the highly urbanised nature of these districts. Other differences were the result of a mix of compositional and contextual elements, for example the concentration of secondary industry in the southern districts.

The study highlighted the need for more consistency in boundaries and the data collected in censuses and surveys. The emergence of new settlements and changes in boundaries made spatio-temporal comparison at locality level difficult. More consistency would have yielded better and more accurate results. More accessibility to data is also needed to understand social issues better. The lack of statistical associations between urban development density and social indicators confirms that compact settlements can be liveable cities and can be an alternative to the traditional urban sprawl. Restraining urban sprawl in Malta, mainly through the Temporary Provision Schemes and through the promotion of regeneration programmes, can preserve valuable open spaces.

The research project has created a methodology which can be updated with newer data provided primarily by future censuses. In this way the analysis can become more reliable and would also aid at increasing indicators and making future projections. The research framework can also be applied to islands similar to Malta. The Mediterranean region can be an ideal area to export the research process and apply in other places.

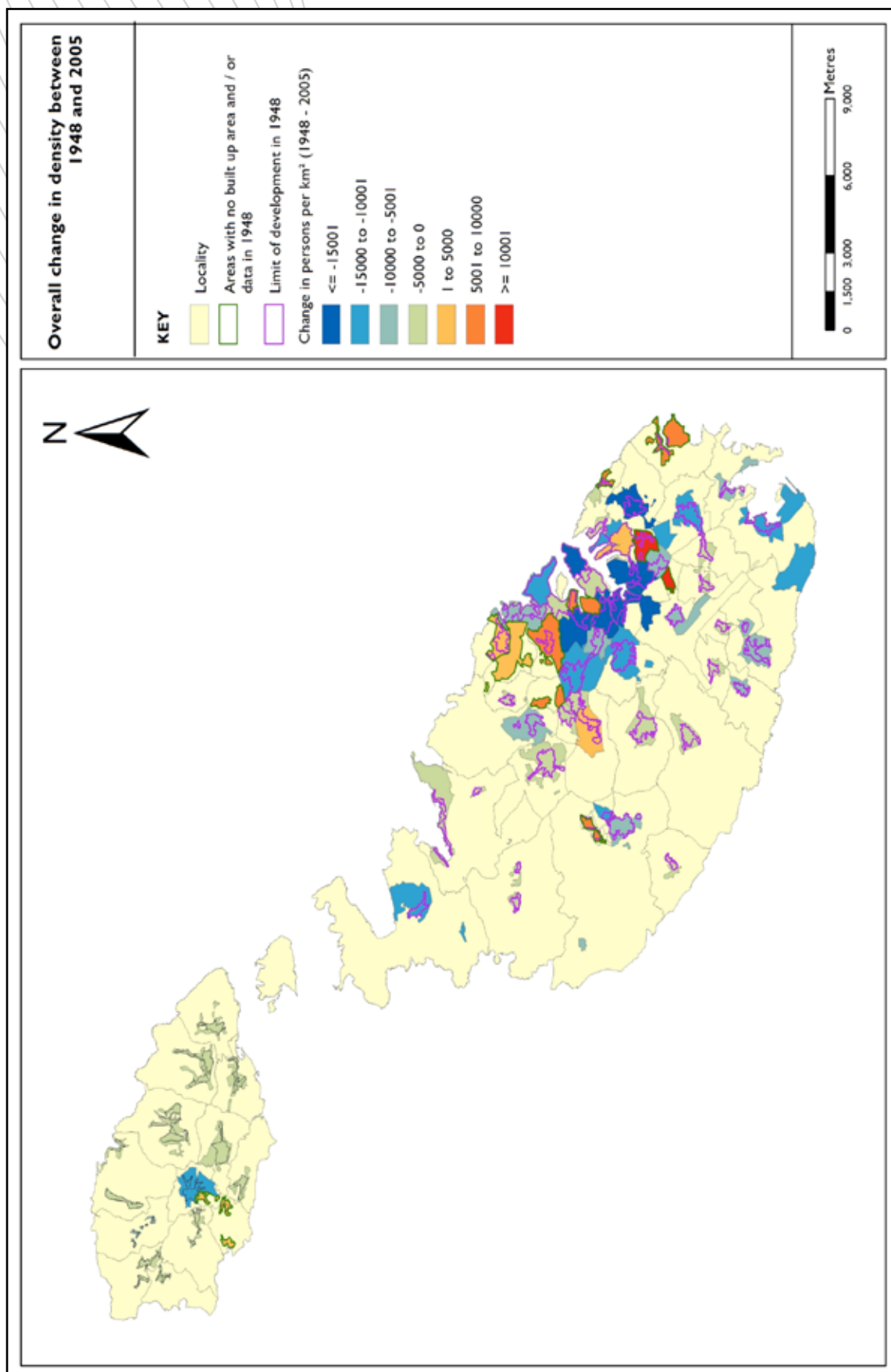
The study has shown how geodemographics and GIS can be used to support policy and decision makers to better understand spatial patterns and trends. Such studies also help to raise awareness about the importance and usefulness of analysing data both spatially and temporally. Spatial and temporal thinking are both important in the realm of sustainable development. This approach needs to be applied to the study of urban areas, which are likely to become more inhabited in the coming years and where major challenges will be created.



Andrea Pace completed his MSc research in 2012 under the supervision of Dr Maria Attard. The research project was funded by the Strategic Educational Pathways Scholarship (STEPS) programme, which is part financed by the European Union – European Social Fund (ESF) under operational programme II – Cohesion policy 2007-2013, ‘Empowering People for More Jobs and a Better Quality of Life’.

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This map shows the change in density from 1948 to 2005. Nearly all the localities that marked an increase in density were those localities which had no data in 1948. The three localities that registered an increase in density from 1948 were Attard, Cospicua and Senglea.

Research Article: Mapping social inequality: The spatial distribution of early school leavers in Malta

by Jacqueline Gatt B.Ed. Hons (Melit), M.Sc.

Early school leaving was declared by the European Commission (2010) to hamper economic and social development. The Commission stated that in order to obtain smart, sustainable and inclusive growth, the rate of early school leavers should be around or less than 10 per cent. At present, there is a great concern over this issue since Malta has one of the highest rates of early school leaving in Europe, and in the year 2010 the percentage of early school leavers was 36.9 (EUROSTAT, 2011), which as a percentage is still far away from the stipulated target of 10 percent. The objective of this study therefore was to discover significant trends and patterns that might explain the high rate of early school leavers in Malta, using Geographic Information Systems to map the data available from the National Statistics Office and focus on the spatial distribution of early school leavers and socio-economic inequalities in Malta. The software ArcGIS was used as a tool to capture, structure, manage, analyse and visualise the data so that trends, patterns and relationships could be investigated in more depth and displayed visually. This study utilised a quantitative methodology using secondary data (collected in the Census 2005) to create population maps that could display the socio-economic information on all districts in Malta.

Early school leavers were defined as those individuals aged between 18 to 24 years, with a minimum of lower secondary education and not in further education or training (EUROSTAT, 2010). This research shows that early school leaving can be considered as a consequence due to the number of diverse interrelated socio-economic inequalities concentrated in particular districts. These inequalities do not, in themselves necessarily determine whether young individuals stay in or leave school early; rather, they interrelate with each other to make early school leaving more likely. This research strongly supports the idea that the locations of residence, and the interplay of inequalities within, render early school leaving an option for some, but not for others. In Malta a strong correlation was reported between districts with high socio-economic inequalities and early school leavers. These findings are in line with research carried out by GHK (2005) and the Council of Europe (2011), which further reports that a disadvantageous socio-economic background negatively influences the decision to stay in school.

The Southern Harbour district, (as shown in Figure 1) especially the localities of Marsa, Valletta, Isla and Bormla were found to produce the highest rates of early school leavers and socio-economic inequalities in Malta. On the other hand, the localities with the lowest rates of early school leavers and socio-economic inequalities were Attard, Iklin, Balzan and Swieqi. Gozo was the only district not to follow this pattern, since it presented a weak correlation between socio-economic inequalities and early school leaving rates. Gozo (followed by the Southern Harbour district) with the highest rank of socio-economic inequalities and individuals who are at-risk-of-poverty, unemployed, with a low income and in need of social benefits from the government. This result encourages further research, since socio-economic background can be considered to be a good variable for early school leaving in Malta, but not in Gozo. The smaller size, double insularity and the specific economic background of Gozo (NSRF, 2006) offers different challenges to school leavers and therefore it might have a different impact on the decision to further education than in Maltese students.

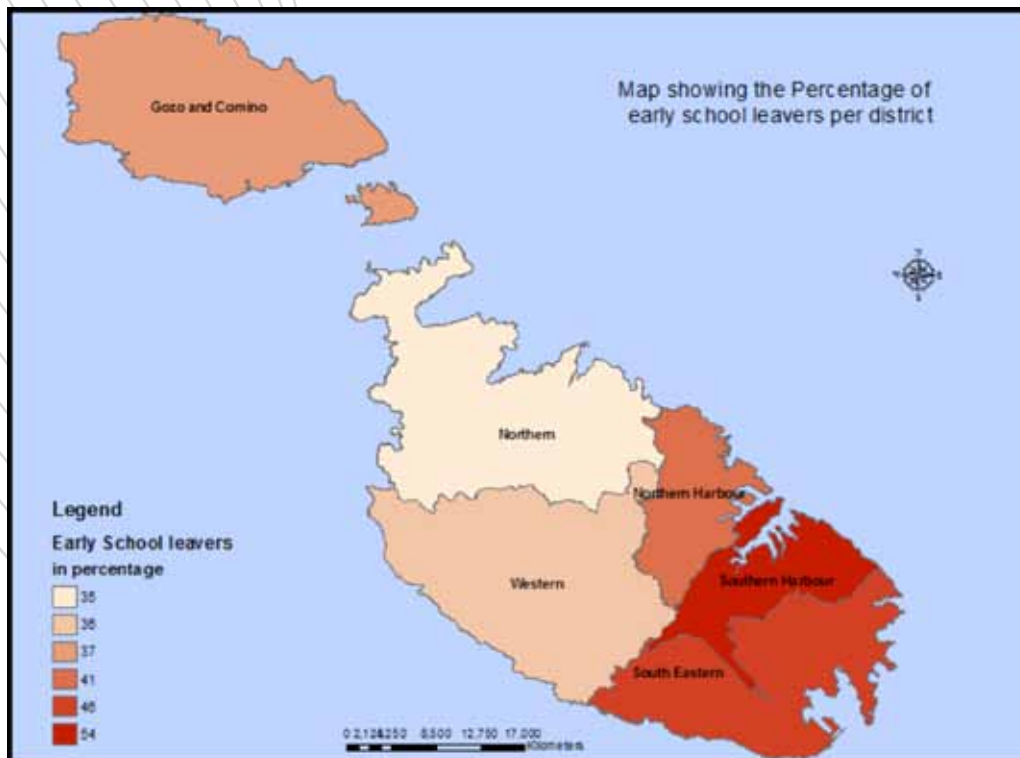


Figure 1: Map showing the percentage of early school leavers per district.

A strong North-South divide was also evident in Malta, with the Northern part experiencing less inequalities and better conditions (less people are unemployed, at-risk of poverty and have lower incomes), as opposed to the Southern localities. The aggregation of inequalities in certain districts (such as the Southern Harbour) creates zones (hotspots) of high interest. This research has, therefore, investigated the impact of the neighbourhood on the decision for early school leaving, otherwise referred to by Miller (1977) as the 'Przeworski environmental effect'. Results indicate that districts with higher rates of professionals and more educated individuals have lower rates of early school leavers, whilst districts with less qualified individuals have higher rates of early school leavers, even though schooling is offered equally to all students. In this way, economically advantaged individuals or families owning a higher cultural capital translate this capital into higher grades for their children (Bourdieu, 1977). As Sultana (1997, p.24) reports 'the social origin of an individual determines social destinations despite the mediating factor of school'. Another important outcome reported in this research is the strong correlation which exists between employment and early school leaving (Figure 2).

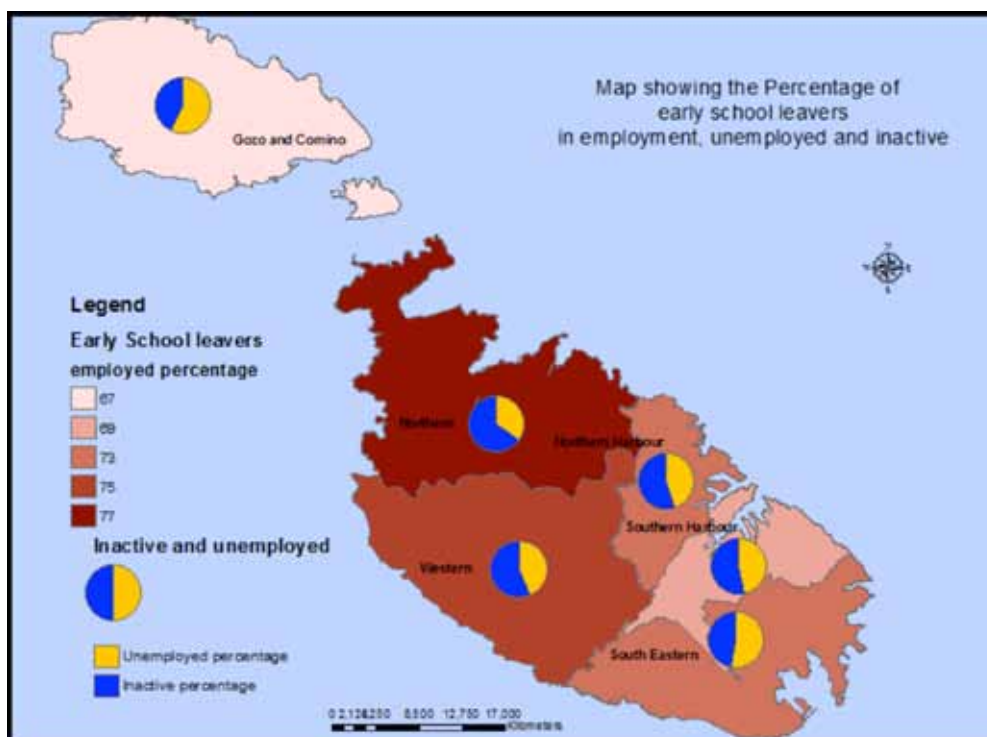


Figure 2: Map showing the percentage of early school leavers in employment, unemployment and inactive.

The Maltese Islands reports one of the highest percentages of employed early school leavers in Europe. Therefore, the labour opportunities available support the high percentage of early school leavers registered. This does not imply that employment is the direct cause for such a high rate but it can be an incentive. A strong correlation is present in districts registering high rates of early school leavers and low-skilled jobs, or areas with higher concentrations of family owned businesses. This leads to a two-fold employment theory that states that more employment availability can be an incentive for early school leaving, whilst, on the other hand, further education is not a definite necessity for employment (Mickelwright, 1990). The availability of work offered to early school leavers within family enterprises grants employment in high status jobs, not on the basis of meritocracy but on the inheritance of such positions. Therefore, such possibilities result in early school leavers attaining higher economic capital without investing in education (human capital) as a means to achieve this. Bourdieu (in Bourdieu and Passeron, 1977) explains how people gain access to powerful positions through connection with others, as they have a higher social capital.

According to this research, employment and unemployment have the highest impact on the increase or decrease of early school leavers. The results discovered have important implications for policy making, in that addressing inequalities within the districts' is vital if a decrease in early school leavers is desired in Malta as well. The National Commission for Sustainable Development (2006, p.53) states that 'Early school leaving should be avoided at all costs'. Furthermore, the types of occupations available also explain the higher rate of male early school leavers. A high gender bias (in favour of males) exists in the labour market since more elementary occupations which require male employees are available. Higher percentages of younger males are in employment, and this may be due to the aspirations and expectations that the Maltese society has for its male and female population. Most women in paid work feel overwhelming guilt feelings imposed by the Church and the ideology of motherhood (Camilleri,

2004). Females, only account for a small percentage of full time job employment, and in January 2011 there were 1,431 unemployed women in Malta and Gozo, making Malta's female employment rate the lowest in Europe (NSO, 2006). This lack of labour opportunity explains why more females have progressed into further education. Furthermore, districts with higher rates of teenage pregnancy also have higher rates of female early school leavers. This shows that females are still limited when it comes to education and employment, especially when they have family responsibilities (Darmanin, 2006).

This research has offered a highlight of some of the most important spatial aspects surrounding early school leavers today. This work provides relevant information and reliable maps to support the outcomes reported. The spatial analysis maps designed and presented in this research have proved to be highly efficient in revealing patterns which further indicate the spatial distribution of socio-economic inequalities in relation with the spatial distribution of early school leavers, and highlight phenomena which persist in Malta's districts. These maps therefore contribute to the body of existing knowledge on early school leavers, which can be used to understand better the districts' socio-economic dynamics, and inform some measures that should be undertaken to achieve the Vision 2020 Strategy.

The geographical analysis presented on socio-economic inequalities and early school leavers help identify more clearly districts which require further attention in terms of policy and investment in education. My discovery of associations between selected socio-economic variables and early school leavers in Malta can therefore help policy to make the required informed decisions. The arguments and findings reported might have many practical implications, and policies can be directed to specific geographical locations and young people mostly at-risk of early school leaving. Policy makers can eventually take more informed decisions, grounded on such clear visual representations.



Jacqueline Gatt completed her MSc research in 2012 under the supervision of Prof. Ronald Sultana and Dr Maria Attard (co-supervisor).

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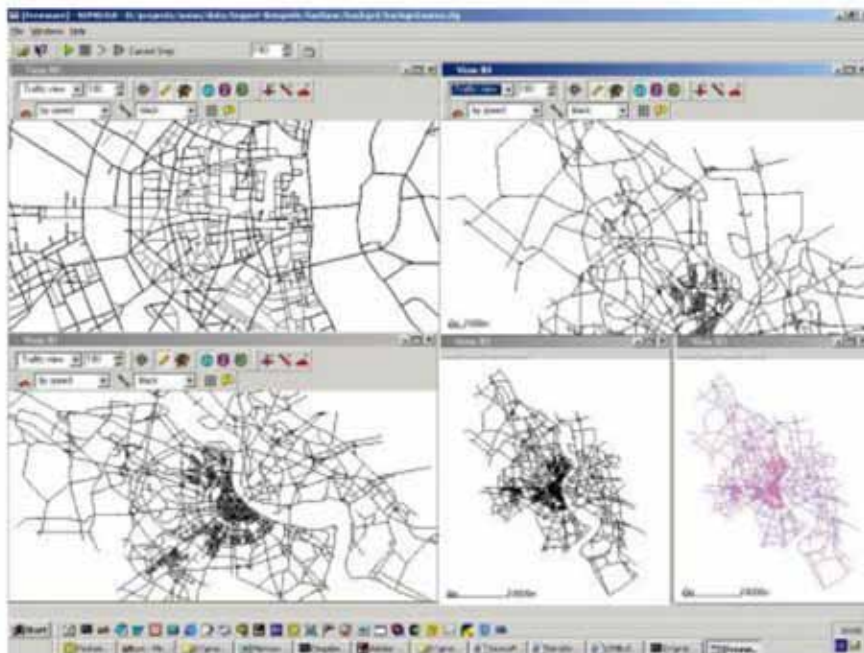
Annex 2

Transport Models: Capacity Building and Application Potential for Malta

Report on Traffic Simulation by Nicolette Formosa B. Eng. (Hons.) (Melit.)

A drastic increase in traffic and transportation for both personal and commercial purposes can be observed in the last decades in Malta. When considering the number of licensed motor vehicles by the end of March, 2012 which stood at 313,027 and had already increased by 2.4% when compared to last year. Planning authorities in Malta, such as Transport Malta (TM), are concerned in developing traffic plans for their city centres in order to ensure proper development, ease of access for the inhabitants of the particular town and to decrease the traffic jams together with air pollution. These goals can be achieved through the introduction of Intelligent Transport Systems (ITS).

After years of research in traffic flow, this research developed a variety of available methods which gave rise to a plethora of methodologies designed to plan and manage traffic flow and come up with tools to process such data. The main objective was to assess the benefits and limitations of the various simulation programs available on the market which continuously update the coordinates of each vehicle. Moreover, the performance of the network had to be quantified by summing the results of each vehicle movement. In order to reach this objective, various traffic simulator software packages were reviewed. Such simulation programs have numerous advantages such as having the ability to model a complete street network from which one can observe the effects of change on a specific part of the network when compared to the entire network.



Some of the major software packages were tested and compared. Key components were analysed such as what features each software package includes, their portability, licenses required and what operating system they require. Scripting was also noted as it allows the alteration and modification of the already implemented algorithms and so can be altered depending upon the requirement within the

traffic network. Additional capabilities such as the graphical user interface and the quality of graphics of each simulator were also noted. Out of the numerous software that were considered, SUMO (open source simulator) and AIMSUN (commercial package) were considered to be the best simulators.

Due to the limited time available, only SUMO was tested and further reviewed. For this report, the lanes and junctions of Sliema, Malta were being considered. Each vehicle had a defined vehicle route which the specific vehicle will carry out. Furthermore, other detailed characteristics consisting of the departure/arrival properties, the position and the velocity of the car within each lane, the pollution concentration, noise emission and the amount of fuel consumed were also recorded. Vehicular communication was also an important option so that the vehicles are more aware of their surrounding environment. Traffic Control Interface (TraCI) allows access to a running traffic simulation. Thus, it permits the retrieval of particular values of the simulated objects which are required. It also allows manipulation of the simulated objects behaviour "on-line". The route choice was implemented using the Dijkstra algorithm so as to find the shortest route within the traffic network. Sliema being a tourist resort and is typically frequented by large crowds of people each day, public transport was very essential and was implemented within the simulation. The speed limitations in Malta are generally 80 km/h outside built-up areas and between 30 to 50 km/h in urban sprawls. SUMO allows the lanes to have some defined speed limit which is important for the road network.

SUMO is not only a traffic simulator but rather a suite of applications which helps to prepare and to perform the simulation of traffic. In today's hectic world, traffic simulators together with good management can lead to save precious time and money, reduce congestion and maximise safety.



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