

6.3 Section 1: Summary of Entity Profile

6.3.1 To include:

- The name and distinctive mission of your entity

The **Department of Environmental Design (EVD)** has the remit of focusing on the environmental performance of buildings, including topics of environmental performance, building engineering physics, energy efficiency, climate and building comfort, natural and artificial lighting and acoustic performance, and related building regulations, and building services systems.

- Its overall governance structure (e.g. Faculty Board, Centre/Institute Board) and its members, as relevant
Faculty for the Built Environment, Faculty Board

- A summary of its main activities and highlights for the year under review

The Department was primarily involved in the teaching of various Study-Units pertaining to the courses offered by the Faculty for the Built Environment, including also the supervision of postgraduate taught programme dissertations. Additionally, Members of staff of the department were also involved in the teaching of a number of study units offered by the Faculty of Engineering and the Institute of Sustainable Energy, together the supervision of postgraduate taught programme dissertations offered by these two same entities.

In addition, members of staff also sat on the various Board of Studies related to the courses offered by the Faculty for the Built Environment. Members of staff of the department also sat as members of the Board of Studies of the Masters in Building Services Engineering (MSc Building Services Engineering) offered by the Faculty of Engineering.

Department members, namely Dr. Ing Simon P. Borg, Prof. Vincent Buhagiar and Dr. Ing. Daniel Micallef are also associate members of the same Institute of Sustainable Energy.

The Department currently has a part-time PhD doctoral student (Perit Etienne Magri) and 2 students reading for an MPhil. (Perit Luca Carsuo and Perit Alexei Pace) with a view to transfer to PhD.

In terms of externally funded projects, the department was involved in six projects, namely:

- ✓ VARCITIES, Horizon 2020 (<https://www.varcities.eu/>) (ongoing)
- ✓ JustNature, Horizon 2020 (ongoing)
- ✓ LIFE Integrated Projects (LIFE IP) Programme entitled 'Optimising the implementation of the 2nd RBMP in the Malta River Basin District' (ongoing)
- ✓ MEDSOLAR, Technology Development Programme, MCST (ongoing)
- ✓ Double C-Block Research Grant, R&I_2019_010T, funded through the MCST, TDP FUSION R&I Technology Development Programme (<https://www.um.edu.mt/newspoint/news/2021/03/double-c-block>) (ongoing)
- ✓ SEA_EU: 'Blue Nights Project: Light Pollution in Coastal and Heritage sites' (ongoing)
- ✓ APACHE: 'Aerodynamic, pedestrian level, Air Quality Control using Urban Vegetation Elements' (secured September 2022. Signing of contract agreement ongoing)

The Department also organised three networking events:

- ✓ The first was a hybrid one-day event open to the general public named 'Regenerative Buildings: the future of construction is now' held on the 15th of October 2021 at the UoM Valletta Campus. The hybrid one-day seminar introduced the concept of Regenerative Buildings and the results of a four-year Horizon 2020 funded project called RESTORE, an acronym that stands for REthinking Sustainability TOwards a Regenerative Economy to a wide non-technical audience.
- ✓ The second event was a group co-ordination meeting for the SEA_EU: 'Blue Nights Project: Light Pollution in Coastal and Heritage sites' project. This was organised in Malta, May 2022. Delegates from the University of Brest, Brittany and University of Cadiz, Spain were in attendance.
- ✓ The third event was the VARCITIES 4th progress meeting held on the 6th and 7th of September 2022 at the UoM Valletta Campus. This involved the organisation of the progress meeting for the H2020 project VARCITIES. All consortium partners were invited to participate allowing for networking to take place since thus far meetings since the start of the project were only held online.

In terms of new equipment, the Department also brought in a number of new pieces of equipment including:

- Artificial Sky Lab

- *Light Meters*
- *Sound Pressure and Vibration Meters, Tapping machine*
- *Air Conditioning Test Rig*
- *Procurement of a 1.8m x 1.6m cross-section wind tunnel (ongoing tendering process)*
- *Procurement of an axial flow fan for wind tunnelling application (ongoing tendering process)*
- Any major developments/initiatives envisaged for the year ahead; and
 - ✓ *Members of staff of the department have also applied for a number of projects for which a response is expected in 2022-2023.*
 - ✓ *Members from the Department, namely, Dr. Ing. Simon P. Borg, Prof. Vincent Buhagiar and MPhil Candidate Perit Luca Caruso will be representing the University of Malta, at the 17th Conference on Sustainable Development of Energy, Water and Environment Systems (SDEWES), to be held in Paphos, Cyprus in November 2022. At the conference they will be presenting three conference papers related to the research currently being carried out within the Department.*
- Other point(s) worthy of note. (E.g. members of staff being promoted; members of staff completing their PhD; staff engagement and retirement; etc.)
 - ✓ *Two new part-times RSOs were recruited for the LIFE Integrated (LIFE IP) Programme entitled 'Optimising the implementation of the 2nd RBMP in the Malta River Basin District' project.*
 - *Ing. Matthew Aquilina, RSO2, part-time*
 - *Jessica Galdes, RSO2, part-time*
 - ✓ *Two new full-time RSOs were recruited for the VARCITIES project.*
 - *Emma Clarke, RSO1, full-time*
 - ✓ *One new part-time RSO was recruited for the VARCITIES project.*
 - *Antoine Gatt, RSO2, part-time*
 - ✓ *One new full-time RSO was recruited for the VARCITIES project.*
 - *Mohamed Soliman Mohamed Daoud, RSO2, full-time*

6.4 Section 2: Staff Profile

6.4.1 To incorporate:

- Number and names of resident and visiting academic staff; number and names of support and administrative staff.
 - *Dr. Ing. Simon P. Borg, Resident academic, senior lecturer, full-time (HoD)*
 - *Professor Vincent Buhagiar, Resident academic, professor, full-time*
 - *Dr. Ing. Daniel Micallef, Resident academic, senior lecturer, full-time*
- Number and names of resident and visiting academic staff; number and names of support and administrative staff.
 - *Ing. Noella Cassar, Visiting*
- Full bibliographical details of academic publications of each member of staff during the year under review.

Dr. Ing. Daniel Micallef

 - ✓ *E.TSEKERI, D. KOLOKOTSA, A. LILLI, K. CALLEJA, D. QUACINELLA, D. MICALLEF, E. DUCA, A. BISELLO. (2021) The "human community" in the eye of the future cities' vision. The VARCITIES Project Approach ISOCARP conference <https://doha2021.isocarp.org/>*

Prof. Vincent Buhagiar

 - ✓ *BLIŪDŽIUS, R., MISKINIS, K., BUHAGIAR, V., BANIONIS, K. (2022) "Sound Insulation of Façade Element with Triple IGU". Buildings; Manuscript ID: buildings-1832143*

- Any additional relevant outputs, such as: presentation of papers at conferences; engagement in externally or internally funded projects; involvement in community initiatives; and advisory or consultancy services to public or private entities related to their university work.

Conferences Attended

Dr. Ing. Daniel Micallef

- *The Science of Making Torque from Wind (TORQUE) 2022* - Conference was attended online, but nonetheless online networking opportunities were available and this allowed for creating potential collaborations.
- *The 28th Annual Engineering Conference Industry 4.0 | Engineering a Smarter Industry*

Prof. Vincent Buhagiar

- *Malta Sustainability Forum: Food for Planetary wellbeing.*
- *Malta Sustainability Forum: Urbanism – The “doughnut model” a tool for transformative action*
- *Malta Sustainability Forum: Work-Life balance, a healthy and sustainable lifestyle*

Public Talks & Lectures

Dr. Ing. Daniel Micallef

- *Youths for Sustainability - Panel Member*
- *Regenerative Buildings - The future of construction is now*

Involvement in Projects

Dr. Ing. Daniel Micallef

- ✓ *Principal Investigator – VARCITIES, Horizon 2020 (<https://www.varcities.eu/>)*
- ✓ *Project Researcher – JustNature, Horizon 2020*
- ✓ *Project Researcher – MEDSOLAR, Technology Development Programme MCST*

Dr. Ing. Simon P. Borg

- ✓ *Project Researcher – VARCITIES, Horizon 2020 (<https://www.varcities.eu/>)*
- ✓ *Project Researcher – Double C-Block Research Grant, R&I_2019_010T, funded through the MCST, TDP FUSION R&I Technology Development Programme*
<https://www.um.edu.mt/newspoint/news/2021/03/double-c-block>
- ✓ *Project Researcher – LIFE Integrated Projects (LIFE IP) Programme entitled “Optimising the implementation of the 2nd RBMP in the Malta River Basin District”*
- ✓ *Project Researcher – JustNature, Horizon 2020*
- ✓ *MC Member COST Action 18219 - Research network for including geothermal technologies into decarbonized heating and cooling grids (Geothermal-DHC)*

Prof. Vincent Buhagiar

- ✓ *Principal Investigator – Double C-Block Research Grant, R&I_2019_010T, funded through the MCST, TDP FUSION R&I Technology Development Programme*
<https://www.um.edu.mt/newspoint/news/2021/03/double-c-block>
- ✓ *Principal Investigator – LIFE Integrated Projects (LIFE IP) Programme entitled “Optimising the implementation of the 2nd RBMP in the Malta River Basin District”*
- ✓ *Principal Investigator – SEA_EU: ‘Blue Nights Project: Light Pollution in Coastal and Heritage sites’ project*
- ✓ *Project Researcher – VARCITIES, Horizon 2020 (<https://www.varcities.eu/>)*

Other Community Work

Dr. Ing. Simon P. Borg

- ✓ *Member of the Education Sub-Committee – Chamber of Engineers. (Voluntary Basis)*

6.5 Section 3: Learning & Teaching Programme Profile

6.5.1 To present:

- *A list of programmes of study offered and serviced by your entity, starting from certificate courses, through bachelor programmes, master level programmes and doctoral level programmes (if any).*

Staff was involved in the teaching of various study-units at both undergraduate and postgraduate level in the following programmes:

- ✓ *BSc Built Environment Studies (BSc. Built Environment Studies)*
- ✓ *Masters in Architecture (MArch.)*
- ✓ *Masters in Building Services Engineering (MSc. Building Services Engineering)*
- ✓ *Masters in Sustainable Energy (MSc. Sustainable Energy)*
- ✓ *Masters in Environmental Ethics (M.A. Env. Ethics), offered by the Faculty of Theology.*

6.6.2 Category: Student information

6.6.2.1 This information can be organised in terms of each specific programme of study. To report should contain the following information:

- The number of students following each programme (indicating: male, female and other students; and local and international students)

General to the faculty

- Titles of final year student projects, dissertations or theses

- ✓ *Alexia Bonello Ghio, 'Acoustic Performance of a High-Performance Building Block: The Sound of Sustainable Design', supervised by Prof. Vincent Buhagiar, co-supervised by Ing. Noella Cassar, M.Eng., Dissertation Academic Year 2021-2022.*
- ✓ *James McElhatton, 'A numerical thermal model of a building', supervised by Dr. Ing Daniel Micallef, co-supervised by Dr. Ing. Simon P. Borg, MSc Building Services Eng., Dissertation Academic Year 2020-2021.*
- ✓ *Amy Abdilla, 'A Review and analysis of HVAC Technologies in Data Centre Configurations in Malta', supervised by Dr. Ing. Simon P. Borg, MSc Building Services Eng., Dissertation Academic Year 2020-2021, ongoing due to requested extension.*

6.7 Section 4: Achievements Profile

6.7.1 To portray:

- Achievements in teaching, research, community engagement, collaboration with other entities, funded projects and administrative service (including quality assurance and quality audit activities) to the University.
- Brief details of all projects in which your entity participated, giving an overview of the scope, value and timeframe of the project as well as the input made by the entity.

VARCITIES, Horizon 2020 (<https://www.varcities.eu/>)

The vision of VARCITIES is to implement nature-based actions in cities. In an increasingly urbanised world, cities face several challenges and threats and struggle to propose credible urban futures and new opportunities for their citizens. VARCITIES is an ambitious project that puts the citizens and the "human communities" at the centre of future cities' vision, in the belief that future cities should become fully human-centred.

The project officially started in September 2020 and it will last until February 2025. The Consortium is composed of 25 partners under the lead of Telecommunication System Institute (TSI). Eight Pilot Cities will test and implement a series of innovative nature-based actions.

JustNature, Horizon 2020

Cities are major energy consumers and significantly contribute to greenhouse gas (GHG) emissions. They have a high density of socio-economic activities and a built environment design that enhance these issues. In this regard, especially developed cities can be exemplars in leading the way towards a low-carbon society, and turning it into an opportunity as recently iterated by the European Green Deal. Such advances can address several other challenges arising from urbanisation and structural socio-economic changes. Cities represent a complex setting, where low income populations are more exposed to environmental ills, environmental and climate impacts are not distributed evenly, environmental qualities are becoming increasingly exclusive to high-income households, and wealthier neighbourhoods are more biologically diverse than others. In this regard, the overall objective of JUSTNature is the activation of nature-based solutions (NbS) by ensuring a just transition to low-carbon cities, based on the principle of the right to ecological space. This in particular refers to the right to clean air and indoor/outdoor thermal comfort for human health and well-being, as well as thriving biodiversity and ecosystems. It also refers to the duty of not constraining the ecological space of others, in particular in relation to the mitigation of climate change and measures required for reducing GHG emissions. JUSTNature will contribute to this vision of shaping low-carbon cities by developing a set of typical Low carbon / High air quality NbS in seven European city practice labs. By activating their just implementation, it will drive the co-design, co-creation and co-decision of supporting interventions with regard to four innovation dimensions:

- o *Enabling effective governance;*
- o *Enabling NbS system maintenance and operation;*
- o *Enabling innovative business models and market design; and*
- o *Enabling efficient technologies and applications.*

The University of Malta will be working with Gzira Local Council to Implement Nature Based Solution through the development of a City Learning Lab (CiPeL) within Gzira. The aim of the CiPeL is to enhance citizen

engagement with research while helping to mitigate traffic, air and noise pollution, and the urban heat island effect.

MEDSOLAR, Technology Development Programme MCST

A photovoltaic system designed specifically for Mediterranean style flat roofs. The solution which will not only provide the same benefit at a similar cost to current systems, but will be easier to install and provide energy saving benefits as well as be less of an eyesore than current PV systems. Such a solution would be perfectly suited not only to Maltese homes but also anywhere with similar construction such as the southern Mediterranean, Middle-East and North Africa.

Double C-Block Research Grant, R&I 2019 010T, funded through the MCST, TDP FUSION R&I Technology Development Programme (<https://www.um.edu.mt/newspoint/news/2021/03/double-c-block>)

This project, originating from the Faculty for Built Environment, is proposing a new building element, namely the Double C-Block, which is an innovative idea of combining both hygro-thermal and acoustic properties en suite, condensed into a 200mm building block, yet without compromising the desired consistent structural compressive strength.

The University of Malta has already been supporting this idea, spurring from a Master Dissertation in 2014, into a few prototype blocks and wall, tested to destruction for their compressive strength, after conducting thermal and acoustic tests of sample walls in a hot box and acoustic chamber.

Development of this block will now be researched further in collaboration between the University of Malta and Cementstone Manufacturing Co. Ltd., a local established leading manufacturer of the standard HCB units, as part of Attard Bros. Group of Companies.

Following promising results from laboratory tests, the building technology will be taken to the next level by building comparative test cells, simulating a full-scale habitable room; one built in standard 230mm HCB and another using the 200mm Double C-Block.

The test cells will be monitored over a 12-month period, testing for seasonal hygro- thermal performance and the overall acoustic performance. Data will eventually be used to validate and calibrate established software modelling, for further refined simulations and testing.

Prof. Vincent Buhagiar, who is leading the project, said that once this project reaches fruition, it will lead to a huge change in the way construction is undertaken in Malta. He also said the data generated from this project will be used to develop the research into a full product launch on the local and possibly attract attention in the international market.

Perit Luca Caruso, RSO II, will be directly involved in both simulation and site monitoring: he is sure that studying the hygro-thermal process and finding alternative design mixes will lead to cutting-edge research aligned to the ones currently conducted at international level.

Dr. Ing. Simon P. Borg, Senior Lecturer, will be responsible for procurement of all data logging equipment and on-site monitoring, which will be used in the testing phase of the project.

Project R&I 2019 010T Double C Block is financed by the Malta Council for Science & Technology, for and on behalf of the Foundation for Science and Technology, through the FUSION: R&I Technology Development Programme'.

SEA_EU: "Blue Nights Project: Light Pollution in Coastal and Heritage sites"

The project is a collaboration between three EU countries, as members of the SEA-EU programme. These include the University of Malta, the University of Brest, France, and the University of Cadiz, Spain. The aim of the project is to highlight the excessive lighting in place in coastal, rural and heritage sites (cities and forests), and its influence on Astronomy and Bird life and energy use. Satellite imagery and aerial photography will compare two case studies from each country.

LIFE Integrated Projects (LIFE IP) Programme entitled 'Optimising the implementation of the 2nd RBMP in the Malta River Basin District'

The LIFE IP RBMP, being proposed to be sited at the University campus within (or in close proximity to) the Sustainable Living Complex footprint is an innovative heating and cooling system whereby a system of

underground pipes will be used to transfer heat from the ground and vice versa, thus rendering the air conditioning of the building process significantly more energy efficient.

6.8 Section 5: Governance Profile

6.8.1 To comprise:

- List of committee meetings (e.g. Departmental Staff meetings; Boards of Studies meetings; Boards of Examiners meetings) for which minutes have been placed in the UM repository.

Departmental Staff Meetings for which minutes have been placed in the UM repository: 2

6.9 Section 6: Planning Profile

6.9.1 Include:

- A brief account of any strategy/planning initiatives held within the entity.
- Whether any major strategic initiatives are planned for the forthcoming year.

Apart from consolidating on the work done during the previous year, including that related to teaching and project funded research, the Department's effort will be directed towards a two pronged approach.

- ✓ *Finalising the procurement of all Building Science Laboratory equipment including the setting up of modern Environmental Laboratory facilities, as part of the new SLC (Sustainable Living Complex), currently being built on Campus, (target mobilisation: 2023-Q4); and*
- ✓ *Outreach to the other entities stakeholders and the general public, through the creation of specific events, non-academic publications, such as newspaper or magazines articles, related to all the above initiatives.*