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Urban open and green spaces: is Malta planning and designing them to increase resilience

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Abstract

2030 has been set as the target for achieving most of the sustainable development goals and in this path urban open and green spaces have been identified as drivers and accelerators for increasing resilience and adapting cities to climate change. The pandemic has acted as a further catalyst for the reorganization and re-assessment of the role of open spaces. This work focuses on the system of urban open and green spaces whose planning and design, through a systemic approach, can address the current and future urban challenges such as climate change. The main aim of the paper is to define the key elements for the planning and design of urban and open green spaces, starting from the EU referring framework and the case study of Malta. The outputs can support the local decision-makers in increasing the sustainability and resilience of urban areas by improving the provision of these physical elements. Findings suggest that EU and international strategies advocate urban open and green spaces as an indisputable requirement for increasing resilience, energy sustainability and adaptive capacity of urban systems. However, in comparison, there is still scope for improvement when considering Malta's planning framework. While there is a growing sentiment for the appreciation and need for green open spaces from the users, important characteristics are still lacking within planning processes.

Keywords

Urban open and green space systems; Urban sustainability; Climate change; Urban resilience; Urban design.

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1. The role of urban open and green spaces in addressing urban sustainability

By 2030 local policy and decision-makers should be able to accomplish most of the 17 SDGs goals, as «64% of the policies related to them are to be implemented in cities» (ESI ThoughtLab, 2021). Unfortunately, since their definition 8 years ago no country is on track to reach the main purpose of ending poverty, fighting social and economic inequalities and tackling climate change (Swain, 2018; UN, 2022). Numerous reports mainly developed by non-governmental bodies tried to justify this due to the pandemic situation, but scholars have raised numerous questions about the effective attainability of the SDGs targets through their quantification and monitoring, relating them to different territorial and urban contexts (Ustaoglu & Aydinoglu, 2019). For instance, Bali Swain et al. (2020), Butcher et al. (2021) and Hickel (2019) brought out the contradictions across the goals and the still existing imbalance between socio-economic characteristics of cities in developing countries. Nevertheless, a mounting body of scientific studies is engaged in overcoming these impasses to pursue urban sustainability goals that are compatible with available resources. On one side, a field of research has been identifying barriers and gaps of the governance process to provide tools and guidelines for building dialogues with local stakeholders and communities (Alberti & Senese, 2020; Hansson et al., 2019; Waage et al., 2015). On the other side, scholars are also trying to support the choices of urban sustainable transformations to reorganise cities in the most efficient way (Krellenberg et al., 2019; Lai et al., 2021; Patterson et al., 2021; Zucaro & Carpentieri, 2019). In this last perspective, there is a wide consensus on the role of green and urban open spaces as drivers and accelerators of sustainable urban development, urban regeneration and moreover climate change adaptation. Various attempts have been made to develop a framework aimed at illustrating how urban open spaces can contribute to these issues (e.g. Kremer et al., 2019; Monte-Mór, 2018). For instance, in relation to resilience and climate, using urban open green spaces as a form of green infrastructure represents an important pillar for the 'climate proofing' of UK towns and cities who first began to work in this direction and similarly for energy efficient cities worldwide (Gargiulo et al. 2017; Pilogallo et al., 2019; Shirgir et al., 2019). Hansen et al. (2017) advocate that urban open and green spaces «can play a key role in strategies for climate change adaptation and – to a lesser degree – mitigation...Importantly, planned adaptation is more cost effective than emergency measures and retrofitting». (Hansen et al., 2017, p.8). Through the shading and evapotranspiration of tree vegetation, the temperature in the summer months can decrease to such an extent that it improves the feeling of thermal comfort inside the buildings that benefit from these effects, due to their proximity to greenery, with the consequent lower need for air conditioning and thus leading to a reduction in energy consumption and climate-changing emissions (Tan et al., 2021; Yu et al., 2018). As a result of these strategies, there are an increasing number of urban regeneration projects based on the widespread presence of green areas and rows of trees both in densely built-up portions of the city and in the more peripheral and degraded areas, so as to also contribute to improving the quality of life of the inhabitants (Łażniewska et al., 2021). A careful distribution of green areas on an urban scale can make a strong contribution to solving energy-environmental problems, such as the heat island, and help improve air quality and provide pleasant spaces for social inclusion (Salata & Yiannakou, 2023). Through an extensive literature review the potential role that urban open spaces play in relation to the three dimensions of sustainable development was identified (Scheiber, 2021). Fig.1 summarises the value of urban open spaces from the environmental, social and economic points of view, by referring them to current and near-future urban challenges too. Reducing the risk of flooding; mitigating the urban heat island effect; contributing to better health and increased well-being; guaranteeing social cohesion; increasing local competitiveness; boosting the real estate values (Fig.1) can be identified as some of the main reasons for realising greener cities through the appropriate design and transformation of open spaces (Spiiker & Parra, 2018; Stobbelaar et al., 2022).

	Value Category	Key Principle	Authors
Environmental value	Micro-climate	Urban open spaces with appropriate vegetation can mitigate the urban heat island and improve micro-climate conditions.	(Bell, 2012; Atiqui Haq, 2011; Loibl, et al., 2014; Forest Research, 2010; Chang, Li, & Chang, 2007)
	Air Quality	Urban greening can reduce the level of air pollutants as particles can be absorbed by vegetation. Attractive urban spaces influence residents' decisions to live or spend free time in the city thus reducing travel. Attractive and appropriately design urban spaces, in particular streets, facilitates the use of sustainable travel modes.	(Bilgili & Gokyer, 2012; Atiqui Haq, 2011; Forest Research, 2010; Holden & Liversedge, 2014; Brodhead, 2009; Banister, Watson, & Wood, 1997)
	Noise Pollution	The presence of green space with appropriate vegetation, in urban areas can significantly reduce noise pollution.	(Senate Department for Urban Development and Housing, n.d.; Atiqui Haq, 2011; Peng, Bullen, & Kean, 2014; Brodhead, 2009)
	Ecology, Ecosystems & Biodiversity	Urban green spaces have an important relation with ecology and can provide various ecosystem services such as: cleaning the air, water purification, cycling nutrients, generating soils, regulating climate, sequestering carbon, habitat provision, etc. Urban open spaces particularly in the form of GI can influence ecosystem services and hence biodiversity by increasing habitat area; increasing populations of some protected species; and by increasing species movement.	(Austin, 2014; Forest Research, 2010; Atiqui Haq, 2011; Laforteza, Davies, Sanesi, & Konijnendijk, 2013; Stiles, 2009)
	Water Management	Urban open spaces if appropriately designed (use of SUDS), can contribute to: reducing flood risk; improving water quality; reducing water usage; replenishing ground water and reducing costs for water drainage infrastructure. SUDS reduce rainwater runoff by increasing permeability, infiltration and storage capabilities of urban areas.	(Beatley, 2012; Hoyer, Dickhaut, Kronawitter, & Weber, 2011; Forest Research, 2010; Austin, 2014; Duffy, et al., 2008)
	Food Production	The presence of open spaces or GI in urban areas has the potential to create space for food production. This has environmental benefits due to the decreased carbon footprint when food is produced locally but it can also have social (community engagement) and economic (job creation) benefits.	(Hansen, Rall, Chapman, Rolf, & Pauleit, 2017)
Social value	Social Interaction & Cohesion	Green areas and natural features increase the use of outdoor areas, which in turn facilitates social interaction and thus cohesion. UGI can counteract social exclusion e.g. through participatory community greening activities.	(Jain, 2013; Priego, Breuste, & Rojas, 2008; Gehl, 1987; Forest Research, 2010; Sullivan, Kuo, & DePooter, 2004; Brodhead, 2009; Hansen, Rall, Chapman, Rolf, & Pauleit, 2017; Ambrose-Oji, et al., 2017)
	Recreation & Well-being	Urban green spaces provide a source for relaxation and recreation. Urban nature is a provider of a social service essential to the quality of human life. Open space can also affect the legibility of an urban area which is important for ensuring a sense of well-being.	(Atiqui Haq, 2011; Chiesura, 2004; Beatley, 2012; Krcmarova, 2009; Stiles, 2009)
	Human Health	Access to some form of 'nature' is a fundamental human need. The provision of urban open spaces contributes to positive health by increasing opportunities for physical activity. Green urban spaces have the added benefit of contributing to stress reduction. The presence of green spaces alone is important as a mental space, and in this sense, they are valuable even simply due to their availability, even if not used.	(Thompson, 2002; Austin, 2014; Forest Research, 2010; Brodhead, 2009)
Economic value	Energy Savings	Increasing green space and tree planting in temperate climate cities is a cost-effective reason for reducing the energy cost of cooling buildings. Shading from trees can act as a barrier to solar radiation thus decreasing air and surface warming.	(Sadeghian & Vardanyan, 2013; U.S. Department of Energy, 1995; Bilgili & Gokyer, 2012)
	Infrastructure Savings	The design of urban open spaces, such as streets, affects the ways in which people choose to travel. Infrastructure provision for sustainable transport modes such as walking, cycling and public transport vs private vehicles is more cost effective. While using open space to provide for SUDS may be considered a cost in itself, such systems reduce the demand for traditional infrastructure to provide increasing capacities for infrequent yet high intensity storms. The collection and re-use of rainwater for activities such as irrigation, is also a cost saving technique in terms of reducing expenditure for water consumption.	(Hoyer, Dickhaut, Kronawitter, & Weber, 2011; Beatley, 2012; Stiles, 2009)
	Real Estate Value	Well-designed/maintained open spaces can have an impact on the property market by creating an enhancement value due to their amenity and aesthetic properties.	(Bilgili & Gokyer, 2012; Fausold & Lilieholm, 1996; Forest Research, 2010)
	Tourism, Commercial and Local Regeneration Value	Urban open spaces are essential for events such as concerts or markets take place in urban open spaces. Other activities such as eating out, lingering and drinking coffee are also capitalised on depending on the success and attractiveness of a space and thus the willingness of people wanting to spend time and money as a result. Attractive green spaces also improve a city's competitiveness as a destination for new residents, businesses and tourists. Investment in GI can be used to stimulate local economic regeneration. The investment in green open spaces can create high quality environmentally friendly living and working environments thereby attracting high value industries and skilled workers to a region.	(New York City: Department of Transportation, n.d.; Hansen, Rall, Chapman, Rolf, & Pauleit, 2017; Natural Economy Northwest, 2008; Baycan-Levent & Nijkamp, 2009; Brodhead, 2009; Tuset, 2016; Forest Research, 2010)
	Productivity Value	The presence of urban open spaces has also been linked to increased worker productivity by improving people's ability to concentrate.	(Beatley, 2012; Stiles, 2009)

Fig.1 Main roles of open and green spaces in relation to the different components of sustainability (Scheiber, 2021)

Additionally, (Scheiber, 2020) developed a theoretical framework identifying design principles grouped into twelve main categories (Tab.1) through which urban open spaces can provide the social, environmental and economic value presented above and thus fulfil their potential in contributing to sustainable development and

mitigating or adapting to climate change challenges. As stated by Latinopoulos (2022) and Wang & Foley (2021) the pandemic has acted as a further catalyst for the reorganisation of the urban environment by city dwellers and thus for a re-assessment of the role of open spaces as relevant components for building green networks. In other words, well-planned and designed open spaces and moreover their integration as part of a network of green open spaces can contribute to defining a system of physical elements through which the adaptive capacity of cities can be improved together with increasing the functionality and value of these otherwise "urban voids" (Gargiulo & Zucaro, 2023).

According to this scientific framework, this work focuses on the system of urban open and green spaces whose planning and design, through a systemic approach, should be addressed to provide multipurpose places that are vital to urban resilience, as well as sustainability, health, safety, and well-being (Gargiulo et al., 2023).

Design categories	Sub-categories
Spatial & structuring qualities	Open spaces as structuring element, connectivity
Contextual relationships	Physical, functional, socio-cultural
Character & form	Typology, visual interest, spatial proportion & enclosure, responding to site & identity
Activities & functionality	Recreational facilities & functionality, user preferences, diversity, multi-functionality & flexibility, supplementary equipment
Accessibility	Vicinity & availability, legibility, movement
Climatic response	Responding to seasonality, micro-climatic comfort
Water management & use	Surface water drainage, ground coverage & storage areas, use of water
Use of vegetation	Presence, location, form & type
Lighting	Energy efficiency
Resources management	Locally sourced & recyclability, durability
Maintenance & management	Operations, roles & responsibilities
Community involvement	Voluntary schemes, participation during the design & planning process

Tab.1 Categories of the design principles for open and green spaces to contribute to sustainability (Scheiber, 2020)

Their spatial organization and usability can have a positive impact on people's sense of wellness and contentment, influencing how they mingle in these areas. Improving both the quality of physical characteristics of open spaces and their spatial relationship with the urban fabric where they are located is essential for creating a well-designed open space that attracts people, supports their activities, and encourages them to spend more time outside. In addition, they help to define urban identity, serving as a tool for municipal branding and promotion.

In this perspective, the main aim of the paper is to define the key elements for the planning and design of urban and open green spaces, starting from the EU referring framework and the case study of Malta. The outputs can support the local decision-makers in increasing the sustainability and resilience of urban areas by improving the provision of these physical elements. The work is a first step to answering the following questions: how can the planning and design of urban open and green spaces be improved according to the new climate energy and resilience needs of urban systems? Looking at the case study of Malta, are these requirements in line with the European Framework?

The paper is structured as follows: section 2 provides an overview of the main European (2.1) and Malta (2.2) planning strategies aimed at a sustainable and green transformation of urban areas and territories; section 3

illustrates the proposed quali-quantitative method; section 4 describes the outputs from the Malta case study; section 5 draws the conclusions to answer the research questions.

2.1 European planning frameworks for urban open and green spaces

Considering the multiple benefits which green and open spaces can provide for cities, the choice of localization, distribution and design of these areas within different kinds of urban fabrics should integrate dimensional and performance criteria (related to the urban load) with more effective ones of resilience, energy saving and overcoming social inequalities (Gargiulo et al., 2017; Gargiulo & Zucaro, 2020). This “new” approach is advocated by IPCC and EEA reports too, as well as the most recent EU documents, such as the Green Deal and the Recovery Fund Next Generation, which constitute the main strategic and financial axes for initiating the ecological transition of member countries. The EU also introduced the requirement for Urban Greening Plans for cities with over 20.000 inhabitants, supporting their development through the Urban Greening Platform to facilitate the transfer of scientific evidence into practical greening transformations. Furthermore, this platform is among the dissemination initiatives promoted within the Green City Accord aimed at accelerating the implementation of relevant EU energy, climate and environment targets at the local level.

The Urban Greening Plans do not represent an additional top-down requirement defined by EU, rather they suggest an operational framework aimed at facilitating: (i) the implementation of linear, punctual and area greening interventions through the development of new skills, (ii) the dissemination of funding opportunities including from private parties, (iii) the trigger of a cultural change amongst all stakeholders when it comes to the inclusion of green or retention of the existing natural environment in project planning and management. Actually, the role of urban open and green spaces to improve the city’s resilience to climate and sustainability issues has been recognized by the EU since the report “Soil and Sustainable Land Use Management” (2012). In fact, the EU refers to open spaces as relevant physical elements to guide sustainable land use planning and favour the maintenance of environmental services associated with hydrological and thermoregulation functions. Following this, the “European Strategy to Adaptation to Climate Change” (2013) identified open and green spaces as solutions for climate-proof, resilient and resource-efficient urban systems. The “EU Greening Infrastructure Strategy” (2013) and the document “Towards an EU Research and Innovation Policy Agenda for Nature-Based Solutions & Renaturing Cities” (2015) emphasised how urban well-being and sustainable development are inseparable from the spread of these kinds of spaces in cities. In particular, the second report was in line with a previous document “Renaturing cities: systemic urban governance for social cohesion” (2014) that underlined the key role that green areas can play in reorganising urban systems, by acting on its natural resources. In addition to the development of strategic documents to support member states, the EU tries to facilitate the networking of local decision-makers and research communities to fill knowledge and implementation of green and open area gaps through Horizon 2020 programs. The “URBAN GreenUP” (2017-2022) is aimed at defining “ad hoc” greening and open space interventions in the 2 involved cities mainly to adapt them to floods and UHI. EU research programs also aim to upscale urban greening and open space sustainable transformations from EU to worldwide. “CLEARING HOUSE” (2019-2023) and “INTERLACE” are oriented to enhance the adaptive capacities of urban areas with higher exposure to social inequalities and disaster-climate events, by sharing technical, policy and procedural capacities and thus contributing in filling the gap between developed and developing countries.

Summarising, it can be stated that the EU has dedicated substantial funding for research and development projects on UGI, and more recently for the related concept of nature-based to address these deficits. However, the integration among greening, cohesion and design in a systemic and local-level planning vision can ensure the effective pursuit of the outlined objectives. There is currently a lack of understanding about how to implement a green open space system that supports the forestation and the climate adaptation goals at the EU level.

2.2 Malta's planning framework for urban open and green spaces

Malta has the highest population density of EU Member States: in 2021, the population was 519,562 implying a density of 1,649 persons per km² (NSO, 2022) and 95% of the population lived in urban areas (World Bank, n.d.). Additionally, Malta can be defined as an entirely urban area (Antikainen, 2005; Zammit, 2010) with a surface of 316 km². Complementary to the EU strategies are Malta's national and local policies that seek to realise appropriate urban transformations to balance sustainability and urban development that is more pronounced in a small but densely populated and already urbanised area such as Malta. A review of Malta's planning framework (data collection 2a) served to investigate whether national strategies and spatial planning policy (see Tab.2) address the planning and design of open and green space systems. This step is useful to identify the different or common goals in relation to European Frameworks.

Name of document	Type of document
Malta's National Biodiversity Strategy and Action Plan 2012-2020 (NBSAP) (GoM, 2012a)	Strategy & action plan
Malta's National Strategy on Climate Change Adaptation (GoM, 2012c)	Strategy
A Sustainable Development Strategy for the Maltese Islands 2007-2016 (GoM, 2006) due to be replaced by Malta's Sustainable Development Strategy for 2050 (MEEE, 2023)	Strategy
National Environmental Policy (GoM, 2012) due to be replaced by National Strategy for the Environment 2050 (ERA, 2022)	Strategy
Investing in the multi-functionality of Green Infrastructure (GI) – An Information Document to support GI Thinking in Malta (ERA, 2019)	Information document
Strategic Plan for Environment and Development (SPED) (GoM, 2015)	Strategic spatial plan
Guidelines on Trees, Shrubs and Plants for Planting and Landscaping in the Maltese Islands (GoM, 2002)	Policy
The Development Control Design Policy, Guidance and Standards 2015 (DC 2015) (GoM, 2015b)	Policy
Malta's Second Water Catchment Management Plan 2015-2021	Plan
Local Plans (1995-2006)	Land use plans

Tab.2 Malta's most relevant strategies and plans in relation to urban open and green spaces

National strategies exist, such as Malta's National Biodiversity Strategy and Action Plan 2012-2020 (NBSAP) (GoM, 2012a), Malta's National Strategy on Climate Change Adaptation (GoM, 2012) and A Sustainable Development Strategy for the Maltese Islands 2007-2016 (NCSD, 2006). The latter is in the process of being updated by Malta's Sustainable Development Strategy for 2050 (MEEE, 2023) which has recently been published for public consultation. The National Environment Policy (GoM, 2012b) identified the importance of the quality of urban open spaces (UOS) in relation to sustainability. This is also due to be replaced by the National Strategy for the Environment 2050 recently published for consultation (ERA, 2022).

It can be noted that older strategies such as the NBSAP 2012-2020 and Malta's National Strategy on Climate Change Adaptation (GoM, 2012c) do not recognise the potential role which the planning and design of open spaces within urban areas may play. On a positive note, however, the newly published National Strategy for the Environment (ERA, 2022) places a strong emphasis on the importance of urban green and open space systems. On the other hand, while the public consultation draft Sustainable Development Strategy for 2050 (MEEE, 2023) does acknowledge the importance of open spaces, when considering implementation and monitoring of the strategy, there are no specific targets set such as for other sectors e.g. sustainable mobility. A draft version of the National Biodiversity Strategy and Action Plan to 2030 (ERA, 2023) has also just been published. Unfortunately, there is still no real focus on the potential role and importance to be played by open spaces in urban areas. Considering green infrastructure (GI), the Environment and Resources Authority (ERA) document on GI in Malta concludes that there are potential research opportunities for adopting a «multifaceted planning approach to GI and building expertise and experience in this regard» (ERA, 2019, p. 52). Ultimately different social and environmental goals are identified within strategic documents which could be addressed

by urban open and green spaces. These include: improving liveability and urban quality; increasing soft and active mobility; addressing health issues related to obesity due to lack of physical activity; mitigating or adapting to climate change; improving air and water quality; and addressing the loss of biodiversity. However, there is scope for the potential role which urban open and green spaces play to emerge more strongly.

In relation to spatial planning documents, The Strategic Plan for Environment and Development (SPED) (GoM, 2015) is the document that at the highest planning scale (national level) seeks to address territorial and urban transformations. Due to the island's size, policy is often developed at a national scale, also considered to be the city scale, since the size of the Principal Urban Area is comparable to that of a medium-sized European city. The national and local scales, therefore, interact in a manner specific to the Maltese context. This requires specific responses when considering the planning and design of urban open and green spaces. Principles of urban open and green space planning often require a regional approach to address the integration of different scale levels. The importance of connectivity means that the planning of such open and green spaces systems needs to happen at the city and regional scales and the role of various spaces as part of a wider network/system needs to be determined. Malta's particular scale means that locality sizes are small and it is the combination of localities which create a city or regional scale. It would also be more efficient to coordinate certain aspects such as: provision of expertise; monitoring and maintenance (to some extent); or funding and implementation programs at a more regional level while still retaining strong local input and facilitating bottom-up initiatives. Developing the right framework and set-up for coordinating and integrating the different scales for the planning and design of urban open and green spaces is therefore crucial (Scheiber, 2020). Included in the SPED (GoM, 2015), is the organisation and transformation of unbuilt open spaces as given Malta's size, and the scarcity of land as a resource, the issue of regulating them is crucial, also due to the fact that these border developable areas. Undeveloped land which is classified as outside the limits to development for planning purposes, does exist within the urban conurbation. This land forms strategic gaps of open spaces within a very dense urban environment and are under constant pressure for development (GoM, 2003; Zammit, 2010; ToM, 2016; The Malta Independent, 2016). The SPED defines these as areas of 'High Landscape Protection', 'Areas of Landscape Protection' and 'Strategic Open Gap to be Retained'. Strategic planning of such open spaces does not exist. The SPED recognises the importance of open spaces when increasing densities and that the low provision of urban green spaces in Malta does not encourage healthy lifestyles (GoM, 2015). The inclusion of urban green and open space systems oriented to guarantee sustainable development is however still quite lacking (Scheiber, 2021).

While planning documents mention the need of increasing and preserving the presence of both kinds of spaces and improving their management, proactive spatial and systemic visions or plans for the use and management of open spaces, especially in urban areas, do not, unfortunately, exist. As a result, the planning of areas such as the 'strategic open gaps' for example, is limited to a conservationist approach with no proactive frameworks for increasing the value of open and green spaces. This leads to a lack of use and management of such spaces, resulting in their undervaluation and lack of appreciation. Similarly, Coastal Zones for example, are simply described as 'Predominantly Urban Coast or Rural Coast' giving no further indication as to what the breakdown of the qualities and functionality of these places might be. Provisions relating to the implementation of interventions like reforestation, regeneration of open spaces, etc. are present in the documents as single and possible interventions, lacking an integrated approach. Supplementary planning documents also exist that set out guidance and policies, such as the 'Guidelines on Trees, Shrubs and Plants for Planting and Landscaping in the Maltese Islands' (GoM, 2002). Such guidance is generally applicable at a national scale. The Development Control Design Policy, Guidance and Standards 2015 (DC 2015) (GoM, 2015b) is a document which Zammit (2014) advocates sets a new approach for Malta in urban design by starting with improved streets. Despite this, the document provides limited policy and guidance for urban open spaces (Scheiber, 2021). Considering the design categories (Tab.1), there is no overall strategy to guide the functionality or character of open spaces in terms of hierarchy or typology. There is also no guidance on the use of materials,

or street furniture and the boundary treatments of open spaces are only addressed with respect to front garden walls. Climatic comfort is also overlooked and policies relating to the use of vegetation are limited to the allowable type of species and permitting process for removal or pruning of trees.

Where policies do exist, these tend to be strategic, primarily in the form of objectives which without additional standards or guidelines are open to interpretation. Additionally, implementation mechanisms are lacking. So, while numerous objectives and policies exist requiring for example the prioritisation of pedestrians, traffic calming and increased connectivity, they are not actively implemented. This is also the case in relation to: creating ecological corridors and introducing sustainable water drainage systems. Additionally, policy inadequacies exist. With respect to mobility, for example, the requirement of minimum parking standards as opposed to maximum parking standards in inner urban areas still exists. Additionally, terms such as 'the need to provide a garden setting' in particular spaces are used, without a proper definition or understanding of what this really means. At a land use planning level, seven local plans exist which define regions in the Maltese Islands for which urban spatial development policies are determined. These cover land use, building heights, conservation, open space, and transportation aspects amongst others. A review of the current local plans had been announced due to the introduction of the SPED (GoM, 2015a) which introduced a hierarchy of urban areas, namely the 'Principal Urban Area' (PUA), Regional Urban Settlements and Small Urban Settlements. At the time of writing, there is still no indication as to the framework or scale which will be adopted for the next planning level under the SPED (GoM, 2015a). It is unclear how, when and whether this will support the necessary strategic planning of urban open and green spaces.

What is clear, however, is that compared to international planning frameworks (Beatley, 2012; Ritchie & Thomas, 2003), strategic planning, standards and design guidance for urban open spaces are lacking. Due to the lack of research concerning urban open spaces (UOSs) specific to the Maltese context, Scheiber's (2021) work proposes a research methodology with the intention of developing a framework for the planning of UOSs for improving their contribution to sustainable development.

3. Methodology

This work adopted a mixed methods research approach (see Fig.2) for supporting decision-making processes. This is deemed appropriate in the context of urban planning and design, because it «allows to follow the subsequent phases of project formulation and it allows to have a dataset built on the results of the previous one» (Berta et al., 2018). This together with the intent to research a specific context suggested qualitative research strategies (Creswell, 2014; Groat & Wang, 2013). The pragmatic nature of the research also concluded that a mixed method strategy would be appropriate, since when considering pragmatic orientations, the idea is to use whichever research type might be suitable to understanding the problem at hand (Creswell J. W., 2014). According to Palinkas et al., (2019) «each set of methods plays an important role in achieving the project's overall goals and is enhanced in value and outcome by its ability to offset the weaknesses inherent in the other set and by its engagement with the other set of methods in a synergistic fashion». Using Creswell and Piano Clark's (2011) definition of 'Exploratory Sequential Mixed Method Strategy', an adapted version was used starting with an inductive qualitative phase and a second qualitative phase rather than quantitative. The work and method presented are from the first phase of the Malta case study (steps 1 & 2 in Fig.2) which is further developed in relation to a review and comparison to European Planning Frameworks (steps 3 & 4 in Fig.2) so as to further understand the areas which Malta should focus on as outlined in the research question for this paper (see Section 1). The five data collection techniques of the Malta case study (see Fig.2) are: a review of existing strategies and policies (2a) physical surveys of existing open spaces (2b); interviews with local councils (2c); an online user survey (2d); and an in-depth qualitative review of three case study open space projects (2e).

Firstly, to understand urban open space design policies and identify gaps, a policy review (2a) of national strategies, policies and spatial planning documents and guidelines. Next, in order to identify design principles or themes relevant and specific to the design of urban open and green spaces in Malta and their potential to contribute to sustainable development physical surveys (2b) of a sample of existing urban open spaces were carried out. This may be seen as across-case research gathering quantitative data (Neuman, 2014). Additionally, semi-structured interviews (2c) with five local councils provide further insight into some of the themes which could not be investigated on site. The localities and participants were selected through purposive sampling. Through this technique, the specific instances are chosen such that they have the potential to reveal the most relevant data (Yin, 2018). Since maintenance was one of the aspects to be further investigated, data from the physical surveys were analysed to inform the choice of localities. The relationship between maintenance level and localities was tested using the Chi-Square test, however, none was established. Nonetheless, the cluster diagram did reveal some patterns/extremities where localities were categorised as follows: A = Leans towards badly maintained; B = Leans towards well maintained; and C = No pattern. It was decided to choose a selection of localities representing both badly maintained and well-maintained spaces.

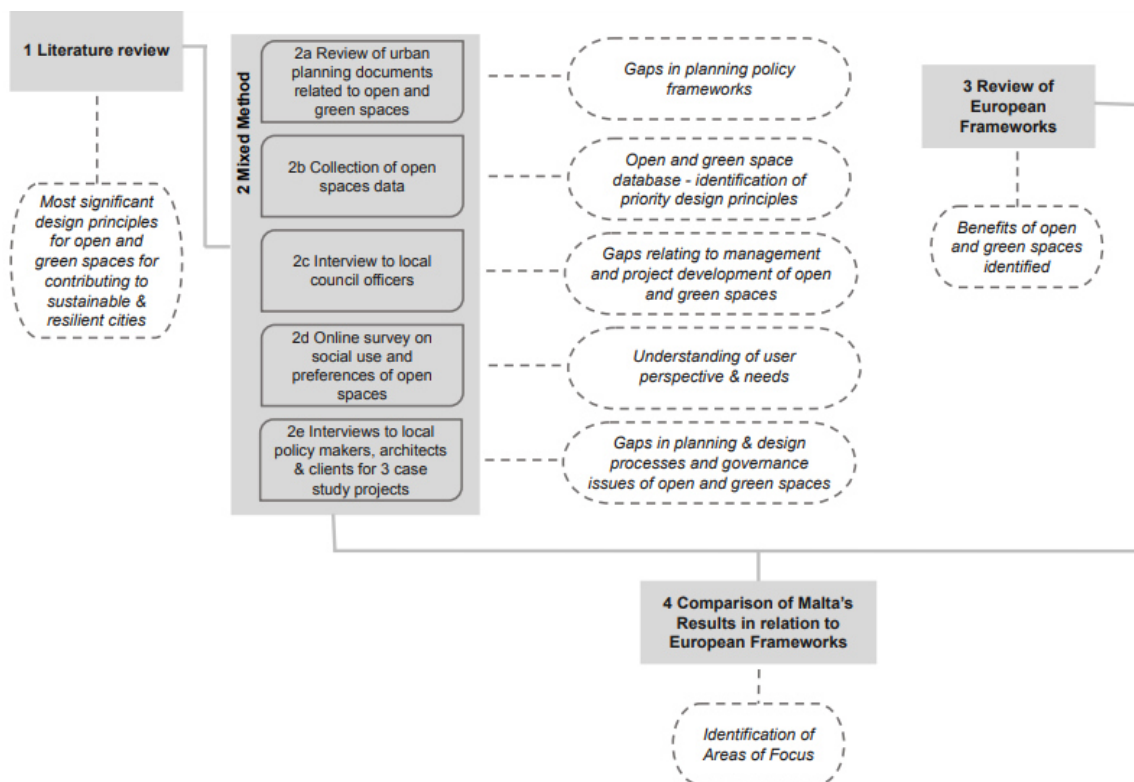


Fig.2 Diagram of the mixed-method

An online survey (2d) was carried out to gather data on the user perspective with regard to how urban open spaces are responding to user preferences and needs. From the theory (see Tab.1), the categories where the user perspective is more relevant are: accessibility and use; character and identity; and functionality. In total 127 responses were collected. The target sample size was calculated using an online tool (Creative Research Systems, n.d.). Based on a population size of 493,559 (NSO, 2019) and assuming a confidence level of 95% and confidence interval of five, a sample size of 384 would be required assuming that this would be normally distributed. The survey was therefore left open for as long as was feasible, approximately two months, with constant sharing of the link every few days. With a sample size of 127 and confidence level of 95% the confidence interval which was eventually achieved was 8.69. This suggests a limitation, in terms of representativeness of the sample due to size, however as part of a mixed methods approach it still served to provide useful insight into the user perspective on urban open spaces in Malta. Additionally, three case studies

of recently designed and implemented urban open spaces in Malta were chosen and studied in detail (2e). Here, the focus is on qualitative data. This is seen as suitable, as it allowed the linking of the micro-level (the design of urban open spaces) to the macro-level (the planning of urban open spaces) (Neuman, 2014). It also made it possible to understand how spatial planning policy is failing to support the design of urban open spaces with the potential to contribute to sustainable development. An initial list of projects was developed and shortlisted using purposive sampling. The cases are considered paradigmatic, that is, they were selected because they have prototypical value (Brink et al., 2017). The criteria considered projects implemented in the last 10-15 years (to have a good number to choose from) and which are representative of typical spaces. The first selection was then reduced to the final three using convenience sampling. This was necessary to make sure that planning permits were available for the projects to be analysed, and that the persons concerned were willing to participate in the research. Some of the shortlisted spaces did not respond, so the three which did were chosen.

Ultimately, the integral review of the literature (oriented both to urban design principles and European frameworks) supported the identification of possible gaps and/or weaknesses of urban transformation strategies, by considering the wider goals of climate adaptation and energy sustainability. In particular, steps (2b-2e) contribute to answering the first research question, by investigating the strengths and weaknesses of urban open and green spaces in Malta that should be enhanced through the adoption of the proper design principles. Finally, a comparison of the results of the Malta case study (including step 2a) with the principles extracted from EU frameworks, identifies the possible and desirable relationships between the strategies outlined by the EU and the planning documents adopted by Malta's decision-makers, according to the second research question.

4. Results

4.1 Physical on-site survey of existing open and green spaces

The results from data collection method 2b, provide evidence on the extent to which the design principles identified through the literature review (Tab.1) are present in the existing open spaces. It is clear that many aspects are lacking for example connectivity; thermal comfort; usability and sustainable water management. Fig.3 below summarises some of the key principles which require attention in the planning and design of the green and open space system.

In terms of connectivity, the quality of connections is poor in terms of pedestrian infrastructure and spaces are not designed and exploited as places to walk through.

Additionally, the connectivity of vegetated open spaces and hence connectivity of habitats is not facilitated. So, while it can be said that there is the potential to create a network of green open spaces, this is currently not being exploited in the individual design of the open spaces due to the quality of connections and the physical boundaries of the open spaces. Moreover, the relationships between the open spaces and surrounding buildings need to be addressed as often open spaces are isolated due to road carriageways and on-street parking and the buildings do not interact with the open spaces. Concerning character, open spaces are predominantly urban (64%).

There is scope to: increase the sense of refuge (24% scored positively), provide spaces which give a sense of being in touch with nature (12% scored positively); reduce the impact of vehicular traffic (43% were characterised by 'traffic') and provide more playful and adventurous spaces. There is also the need to consider the provision of more attractive amenities and features and detailing of street furniture and materials and their impact on the aesthetics of a place. There is the need to improve circulation paths, particularly on the approach to open spaces (streets) and within natural / semi-natural areas (Fig.4). Footpath widths need to increase together with the provision of seating and vegetation. When considering activities, there is the

need to provide spaces which allow for a more varied type of activity such as formal and informal recreation, physical exercise and flood mitigation. Children’s play areas need to increase the variety of playscapes on offer with more informal, adventurous, interactive and unstructured play. There also needs to be more provision for 16-20-year-olds/youths, and spaces which facilitate community activities.

There is also scope for providing more spaces which mix compatible user groups rather than, for example, separately/isolating children’s play areas.

Overall, smaller spaces (< 3,000m²), tend to be readily available within the required vicinity (400m) while the availability of larger spaces (> 3,000m² and > 2 ha) requires attention. District parks greater than 20ha are lacking altogether. In order to provide local parks (i.e. parks > 2ha), the potential of valleys and other semi-natural spaces needs to be considered. Existing open spaces also require attention in terms of climatic comfort.

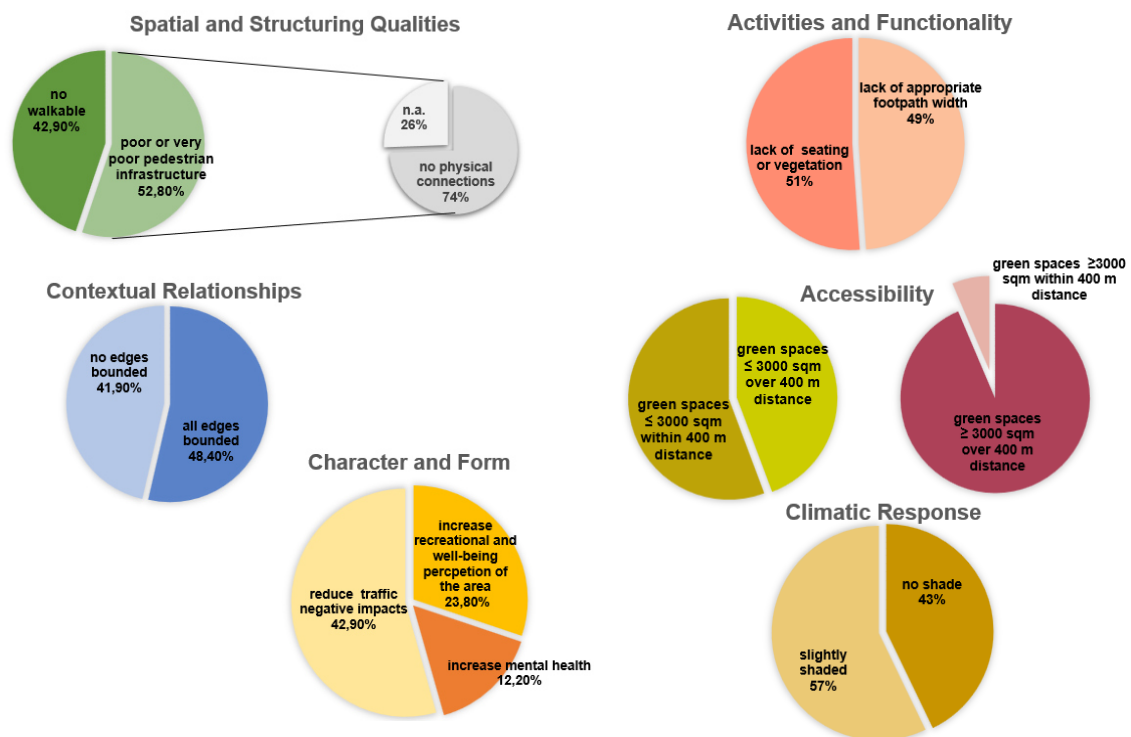


Fig.3 Overall qualities and activities in Malta’s open and green spaces: outputs of the physical surveys

This would mean providing more areas which are shaded and usable during warmer months, while still retaining some areas to enjoy the sun during colder periods.

Gardens/parks and natural areas are the typologies which tend to perform well while children's playgrounds, civic squares and main streets do not. Stormwater management needs attention, particularly with regard to the use of sustainable approaches such as water infiltration, storage and re-use. 92% of the spaces did not have an irrigation system (Fig.5).

The presence of vegetation should also be maximised. In 30% of the cases, less than 10% of the area was allocated to vegetation, with a further 30% having between 10-30% of the area as vegetation. The type of vegetation present was also analysed. With respect to trees, attention should be paid to their potential to provide shade. With respect to ground cover, there is scope to increase this so as to provide a greener environment as well as provide benefits such as noise mitigation, wind protection and mitigate air pollution. There is also scope to improve the level of visual interest and to consider types of planted vegetation which require lower maintenance levels.

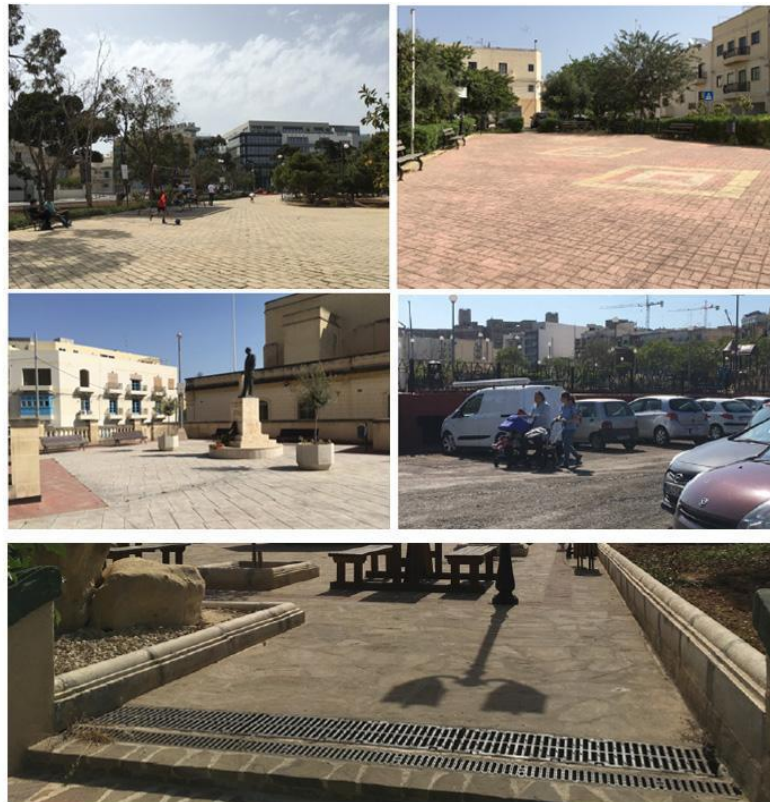


Fig.4 Images illustrating open spaces with minimal vegetation, shade, vehicular orientation / dominated space and the lack of sustainable urban drainage systems

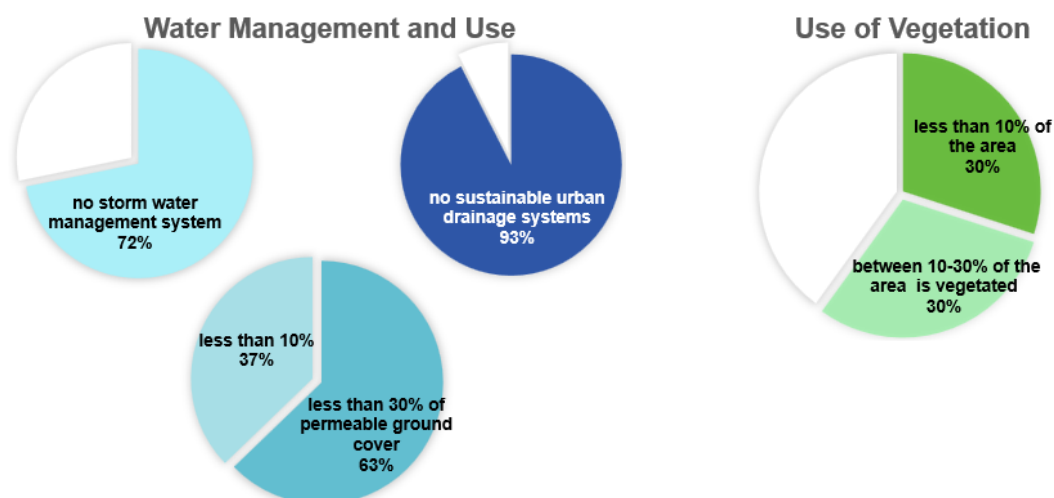


Fig.5 Sustainable water management and presence of vegetation in Malta's open and green spaces: outputs of the physical surveys (2b)

4.2 Interviews with local councils

To expand on a number of themes which could not be easily analysed through on-site visits, five interviews (data collection 2c) were carried out with local councils in the study areas. The themes requiring more input were: Social Context and Use; Water Management and Use of Water; Maintenance and Management; and Community Involvement. The opportunity was also taken to gain insight on some additional aspects emerging through the policy review, these being: the local council's experience with the planning process and use of policy; and issues encountered when embarking on projects for public open spaces.

The findings can be summarised in terms of three themes: socio-cultural; process barriers; and sustainable management.

- Socio-cultural: Public open spaces are valued and used in various ways (informally, structured activities & traditional practices) by different demographics and are seen as important assets for cultural integration, with local councils organising events to promote community cohesion. Open spaces are however lacking, in particular gardens and green areas and spaces which facilitate the integration of different age groups.
- Process Barriers: Local councils (LC) do not play an active role in implementing local plan policies. They lack expertise and resources to do so; they prefer their own ideas and feel that local plan policies don't address the community's needs; and there is a lack of positive engagement and relationships with the authorities e.g. Planning Authority and the Environment & Resources Authority (ERA). Community participation during the development of project ideas is limited. There exists a genuine effort by LC's however since this often results in a tedious and difficult process, and resources are limited, this can be sometimes neglected. LC's also lack the staff resources required for implementing new projects, as well as, the lack of available contractors, suppliers and expertise when it comes to developing and implementing small projects. There could be a platform which local councils would turn to for advice and expertise on planning aspects and developing project ideas.
- Sustainable Management: Local councils require expertise and assistance especially for the sustainable use of vegetation and water management. The development of guidelines on these aspects would be helpful. There is also scope to provide centralised resources to assist local councils on technical issues. Local councils are responsible for the upkeep and maintenance of local open spaces but their resources are very limited. They do not have sufficient funds or expertise to go beyond embellishment. Repairs beyond general maintenance are problematic as it is difficult to find contractors for small jobs or the process for engaging them is lengthy. A system which facilitates this is required – possibly on a more regional level. Schemes to support and encourage grass root initiatives or civil society involvement in the voluntary care and management of their own neighbourhoods are also lacking.

4.3 User survey: the user perspective

The data from the online user survey (data collection 2d), allowed some key themes as to the user's views about existing open spaces to be extracted. The 127 respondents came from 43 different localities. With respect to the participants' characteristics, there was a higher response from the 35-44-year olds, and the majority of the respondents, 60.6%, were full-time employed (Fig.6).

It can be said that open spaces are valued and used by the Maltese population. 43% of respondents used open spaces at least once a week with a further 26% using them once or twice a month. Spaces are mostly used for walking and taking children out to play.

However, they are also used for a variety of activities. Relaxing/quiet time was another common use meaning that people are searching for places of refuge.

The quality of open spaces however does not match what users expect and 86% felt they were missing something (Fig.7). Greenery/Trees/Nature emerged clearly as a missing characteristic. Respondents mostly like open spaces which provide qualities associated with nature such as: trees and greenery, peacefulness, fresh air, wilderness, sea views and a sense of openness.

Qualities which they disliked were: lack of cleanliness and maintenance; too much traffic; too crowded or too small. They also lack the presence of different uses. A number of lacking activities/functionalities were identified, the most common being: picnics, reading in peace, training options, long walks, trekking/hiking; biking and skating (kids), jogging, cycling, and ball play. The lack of spaces which facilitate physical activity is therefore evident.

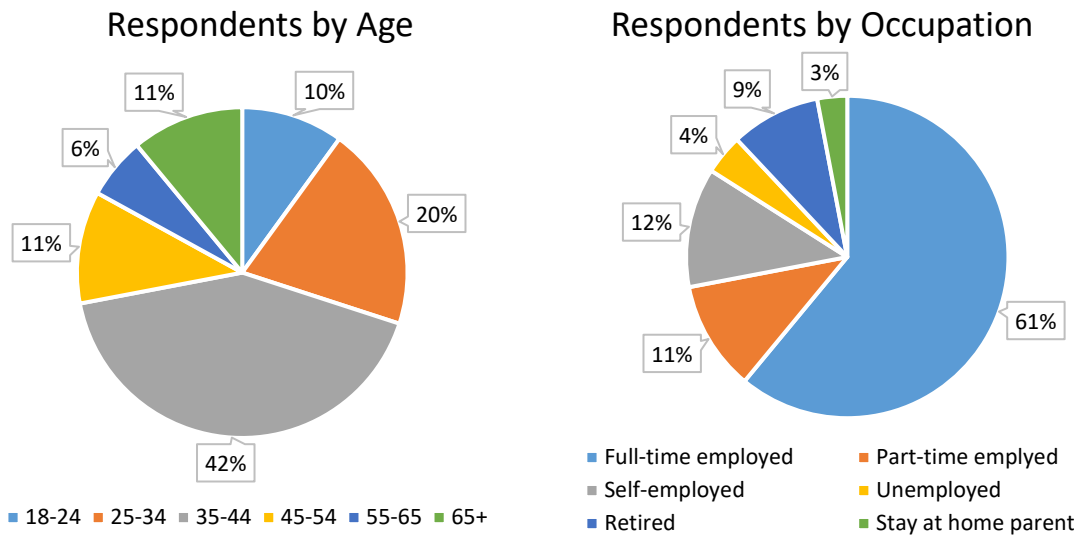


Fig.6 Demographics of the survey respondents

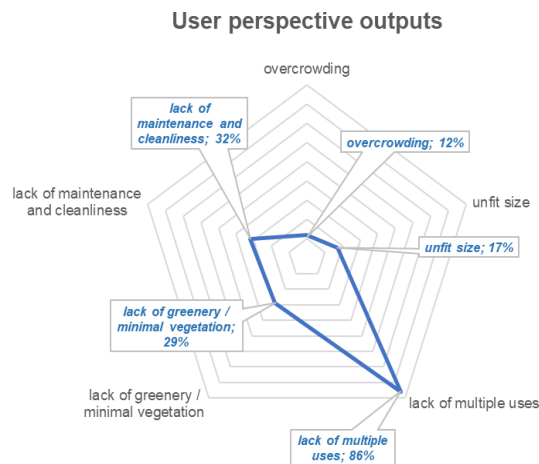


Fig.7 Malta's urban open and green space quality, according to the user surveys

4.5 Review of 3 case study projects

Through the purposive sampling outlined in section 3, three case studies (data set 2e) were chosen which represented the typologies of open spaces being studied. The case studies were:

- Pembroke Garden: The project was part of a number of projects aimed at upgrading the tourism product in Tourism Zones. The open space is a public garden which provides informal recreational areas and formal play areas for children of different ages. It is surrounded by different uses including: 5-star hotels; residential areas, sports fields and a natural stretch of coastline. The size of the space studied is about 7,300 sqm;
- Cospicua Waterfront Regeneration of an Industrial Dock: This is a waterfront space which includes different typologies including: a promenade; informal recreational / garden areas; civic squares and a local street. The waterfront was previously closed off as an industrial dock. The size is about 33,200 sqm;
- Paola Square: This open space is a town centre civic square which already existed in a different form and the project consisted of its transformation. In general, it retains the function of a civic square and aims at improving the quality of the place through improved traffic management. The size is about 10,500 sqm.

Analysis of the interviews with the client, design architect and planning officers of each of the 3 case studies provided insight into three main aspects: addressing the design principles during the design process;

addressing the design principles during the planning permitting review process; as well as gaps in relation to planning and governance frameworks.

Design Principles during the design process

Through analysing the interview transcripts, it was possible to understand which of the design principles extracted through the literature (see Tab.1) were taken into consideration during the design process. Based on the 3 projects studied, it was clear that some of the themes were in fact given due attention. This meaning they were discussed throughout the design process and were given importance by the designers. Other themes were identified as requiring more attention. In such cases these design principles were either not considered, were considered in a limited manner or deserve more attention especially when considering their potential importance in contributing to the sustainability of urban areas (Tab.3).

Design principles given due attention	Design principles requiring more attention
Open space as a structuring element	Socio-cultural contextual relationship
Connectivity	Spatial proportions and enclosure
Physical contextual relationship	Supplementary equipment
Functional contextual relationship	User preferences
Typological/Character of space	Moment with respect to reducing the vehicle prioritisation
Visual interest	Climatic response
Recreational facilities and functionality	Sustainable water management
Multi-functionality and flexibility	Use of vegetation: presence, location, form and type
Vicinity and availability	Lighting in relation to energy efficiency
Legibility	Resource management
Access to all	
Use of water: aesthetics/feature	

Tab.3 Malta’s urban open and green space quality, according to the user surveys

For example, regarding vegetation, in the Pembroke Garden, the idea was to create a ‘natural’ space, but vegetation was limited to certain areas so as to prioritise views to the sea, or to create underground storage areas which in fact has never been used. In the Paola square, even though the project sought to create a ‘garden setting’ or an ‘urban garden’ the planting of trees was actually restricted to a small part of the site. Attempts to address climatic comfort is also limited. When this issue was raised during interviews some mentioned the need to mitigate the sun when walking, an architect mentioned the introduction of canopies, although admitting that these were also primarily an architectural feature. In all cases the spaces are pretty much exposed to the sun and the use of trees to provide shade is quite limited. One particular site is quite windswept and even though the architect raised this point himself, the design did not seek to address this to create comfortable conditions. It was accounted for simply when choosing vegetation which could resist the wind. In this project in fact retaining clear view paths to the sea was more important than using more trees to create more shaded areas for the climatic comfort of the space. Tab.3 gives an overview of which design principles can be said to have been given due attention and which require more attention.

Design themes during the planning project review

Analysis of each of the three project’s planning application process was carried out to understand to what extent the various design categories were considered when projects were reviewed when applying for a planning permit.

When considering spatial and structuring design objectives, comments during planning review are limited to connectivity for pedestrians and connections between open spaces. Developing connectivity between

vegetation to facilitate habitat creation and biodiversity did not feature. With regards to contextual relationships discussions were limited to physical relationships. Responding to functional and socio-cultural contexts did not really feature. In terms of character and form, the interpretation of objectives varied depending on the case officer and architect since no guidelines exist. For example, for one project planning policy required the provision of a 'garden setting'. The architect felt that since more trees and soil were provided than previously this was sufficient. The planning officer also felt that such a policy was subjective and that since a number of trees had been proposed then this policy had been respected.

With respect to functionality, the provision of particular uses and activities is not guided by planning policy, and so it does not form part of wider planning objectives. Rather it is based on the architect's interpretation. Creating visual interest and the spatial proportions and enclosure of the space did not really emerge in the discussions. Meanwhile, responding to the site and the identity of the place featured as an important aspect. This was mostly about responding to historical contexts and respecting archaeological findings. This is sometimes too focused on ensuring traditional use of materials and finishes. Additionally, policies intended for buildings are being applied to open spaces and the extent to which contemporary design which responds to a historical context is considered appropriate depends on the case officer.

When considering the provision of supplementary equipment, discussions were limited to the provision of fire hydrants in one of the projects. Concerning other functional aspects, the discussion primarily focuses on the use of materials. Details are sometimes requested but it is not clear against what they are assessed. Mostly the discussions related to contextual suitability rather than functionality. The use and allocation of space, seating, provision of facilities etc. are not really part of the discussions. A review of use value could be considered non-existent. The suitability of the design to respond to user needs/preferences, the type of activities which are provided for, the multi-functionality, flexibility or adaptability did not feature. In terms of access to open space, no discussion existed regarding whether the type of open space proposed is important for the locality or at which scale, or how it relates to other open spaces in the locality. When considering movement, the focus was on vehicular access. The transport authority does not seem to concern itself with pedestrian access. The PA also doesn't comment on the suitability of pedestrian provision. The focus is also on ensuring parking provision rather than restricting vehicular access. Meanwhile, "Access for All" was an important focus reviewed by an independent entity.

Climatic comfort and suitability through design did not feature. Regarding water management, requests for the use or provision of water reservoirs generally come through other entities other than the PA. If there are requests from the PA this is dependent on the case officer's views. There are no guidelines as to what sizes should be requested or what is considered appropriate. There is a lack of awareness and expertise as part of the planning review process in this area. It is also not clear who is responsible for reviewing such aspects. Even though the use of water as an amenity featured in all projects, no discussions emerged during the review process.

The planning review doesn't really go into the design or use of vegetation. The fact that some vegetation was provided seemed to be sufficient. It also emerged that ERA should be responsible for reviewing such aspects however their role and if it is happening was not so clear. Requests by PA are limited to the type of species. The potential benefits of vegetation for environmental aspects or climatic comfort did not feature. Requirements for the maintenance of vegetation varied from project to project. While adherence to landscape proposals is checked, these can vary and the suitability of any changes is at the discretion of those checking the compliance.

With regards to lighting, engineer reports are sometimes requested but it is not clear what guidelines are being followed, and how reports are assessed. It seems to be self-regulation. Cut-off lighting emerged as the main requirement. There was also no real focus in terms of resource management. The SPED objective to be "energy and water efficient" is not really understood or followed up.

Gaps in planning and governance processes

Vagueness and lacuna of guidelines regarding open spaces: This can lead to frustrating processes and waste of resources by applicants as it is not clear what is considered acceptable. It was felt that initiatives to improve open spaces are not always facilitated by the Planning Authority. Additionally, this lacuna should not necessarily be addressed by policy but also through guidelines, awareness/knowledge building or standards. There was a general feeling that creating more policies would be restrictive and reduce flexibility in allowing a contextual response.

Lack of creative planning: Interviews with architects identified that the planning process lacks a formal opportunity for applicants or architects to present and explain their design ideas to the planning officers or board. It was felt that the review process is more about responding to technicalities, clarifying the submission documents and making amendments to satisfy stakeholder requests. When design discussions do take place they tend to focus on subjective aesthetic and contextual considerations. Finally, the feedback received from the planning commission/planning board tends to be just before a decision for the planning application is taken and can be quite ad hoc, depending on the board's opinions at the time.

Lack of consistency: Open space projects are allocated to planning officers according to whether it is a major project, a project within a development scheme or within an Urban Conservation Area (UCA), resulting in differences when applying policies. Additionally, the planning process allows for applications dealing with minor amendments. These applications are reviewed by a different team so the planning officer may not be fully aware of all the issues which might have arisen under the main application leading to potential gaps in the assessment.

Stakeholder Participation - Design Process: This could be more structured and broader. Currently, the extent of participation varies depending on the architect and client. This is especially the case for community and local council involvement. Hesitation to involve local councils, when they are not leading the project, stems from anticipating their objection to the project. Discussions with the transport authority also need to be facilitated so as to reduce the impact of vehicles/vehicular flow on the quality of public spaces. Even though various policies exist to promote pedestrian priority or traffic calming schemes, the case studies revealed that there is still a tendency to prioritise vehicular provision and parking before anything else. Existing objectives and policies do not seem to count for much. Dealing with utility companies can also be difficult as they are not always organised and ready to provide input. Consultation with the Superintendence of Cultural Heritage (SCH) and the Commission for the Rights of Persons with Disability (CRPD) seemingly happened at an early stage in the process and was always given importance. On the other hand, consultation/participation of environmental NGOs during the design process was minimal. This happened for one project and mainly for public relations concerns.

Stakeholder Consultation - Planning Review: Stakeholder input during project review tends to focus on comments regarding: transportation (TM); cultural heritage (SCH); Access for All (CRPD); and civil protection (CPD). Input from utility services is limited. Environmental input and review are also lacking or limited to the requirements for: transplanting/tree removal permits; compensatory planting; and the use of species (invasive/non-invasive). The role of the Environment and Resources Authority as a consultee is not very evident. Additionally, it is not clear which policies or guidelines are being used to assess the design of urban open spaces, other than the Guidelines on Trees, Plants & Shrubs for Planting and Landscaping in the Maltese Islands (2002). There is also a lack of clarity on who is reviewing aspects related to water and energy and according to which guidelines. Opportunities for public participation are very limited. The public has the right to submit representations in writing; however, the extent to which these affect the outcome of a project application is quite limited. Additionally, proactive community engagement is non-existent.

Lack of driving entity & adequate resources: There is a lacuna in terms of the governance of urban open spaces. There is seemingly no entity or process to manage and facilitate the development or transformation

of public areas. This is not the role of the PA or ERA. The local councils are responsible for the upkeep and maintenance of urban open spaces within their locality; however, their resources are extremely limited. The case studies illustrated that the presence of an authority leading the project with direct access to the central government was an important model for realising projects of significant size and complexity. The authority varied in all three projects: The Grand Harbour Regeneration Corporation; The Consultative Council for the Southern Region; and the Malta Tourism Authority. These entities all had specific goals, with the necessary drive and resources. Additionally, National or EU funds (rather than simply local council funds) are required to carry out projects which go beyond embellishment to bring about change and substantial improvement. These entities all had the remit to be allocated or resources to tap into such funds. Other themes which emerged include: the need to facilitate the use of Private Public Partnerships; the lack of enforcement which was one of the reasons why entities did not like introducing 3rd parties into the operations of public spaces; the tendering process which emerged as a limiting factor in realising innovative solutions; and addressing complications when transforming open spaces across local council boundaries.

Maintenance and Management: The provision of funding for maintenance is not generally sourced upfront. National funds were required to keep up with commitments once projects were finalised. Local councils do not under normal circumstances have the resources and funds to manage and maintain open space projects of a certain level.

5. Discussion and conclusions

European and international strategies advocate urban open and green spaces as an indisputable requirement for increasing resilience, energy sustainability and adaptive capacity of urban systems. Nevertheless, a mismatch between policy and the operational level seems to characterise the spatial planning of these spaces (Ganzleben et al., 2020; Orsetti et al., 2022). Among these, two elements are interesting with respect to this work: (i) the numerous functions which create competing demands on land and resources (Chatzimentor et al., 2020): urban open and green spaces need to: be liveable; be accessible to the population; contribute to improving thermal comfort; and increase the permeable capacity of a city. These goals represent different kinds and priorities of intervention, according to both their localization and their specific characteristics (e.g. surface, vegetation, ...). The last two aspects require particular attention to the (ii) design and planning of these spaces since their shape, configuration and composition, and their distribution in the urban area, contribute to the desired performance of the urban system in terms of climate, energy and sustainability issues (Gargiulo & Lombardi, 2016; Graça et al., 2022; Papa et al., 2014; Scheiber, 2021).

To contribute to filling these gaps, the main aim of this work was to investigate the spatial planning and design of urban open and green spaces in Malta. Following on from this the intention being to understand the results in relation to European Frameworks, to identify whether there is scope for the spatial planning system to facilitate their potential to add value to the built environment and develop recommendations for improving the contribution to urban sustainability, resilience and climate change adaptation or mitigation. It is worth noting that in Malta's planning there is a general lack of consideration of urban open and green spaces as elements of the same system. This can be due to the fact that green infrastructure grasped the attention of climate goals leaving out the additional benefits that open spaces can provide through careful planning and design. Referring to Fig.8, it clearly shows that while EU strategies and documents are open and green space compliant, there is still scope for improvement when considering Malta's planning framework. In particular there is the need for strategic planning so as to improve the organisation of urban areas in terms of actively introducing urban open and green space networks. The potential for such systems to contribute to carbon sequestration, thermoregulation and mitigate soil sealing are areas which require particular improvement, with inclusivity and the hydrological function also deserving more attention. Additionally, while newly developed strategic documentations seem to be showing increased awareness in the potential contribution of urban open

and green space systems, the extent to which these will be implemented and translated into actionable spatial planning policy is still to be seen.

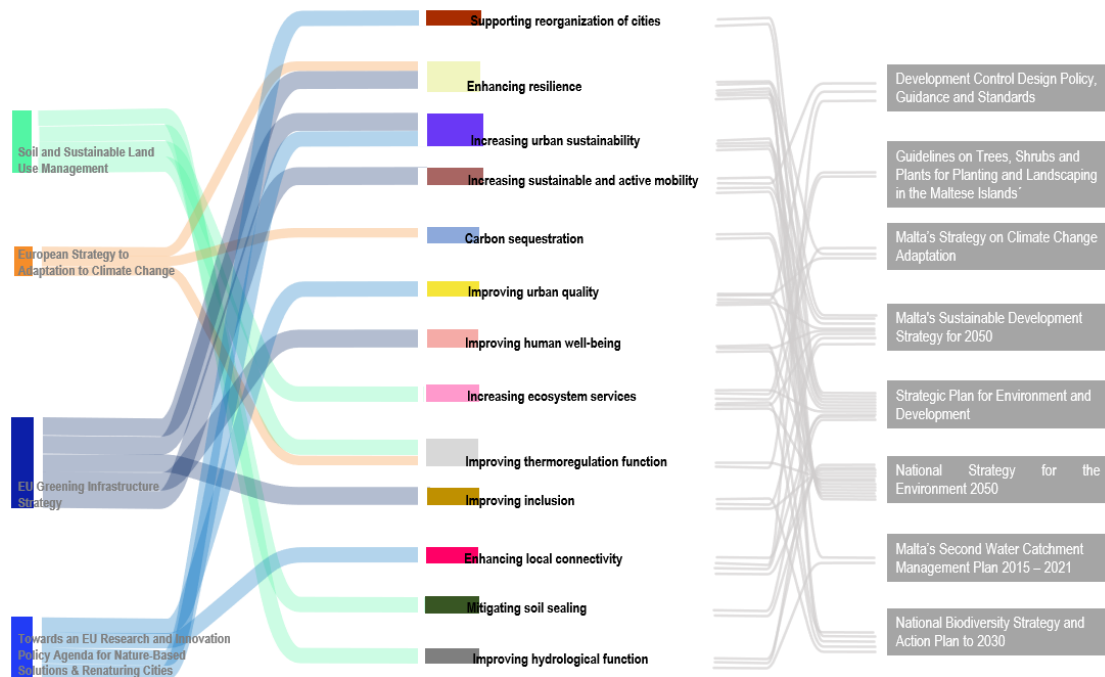


Fig.8 Positive benefits linked to the green and open spaces in cities as identified by EU strategies and Malta key urban planning documents.

One of the challenges in addressing the interlinkages between climate and energy issues and planning and design of open and green spaces could be due to the limited capacity across public sectors and policymakers, gaps in cross-sectoral knowledge and communication between planning experts and planners, as well as the shortage of human and economic resources. A systemic approach to increase the supply of urban open and green spaces is still lacking in Malta’s spatial planning documents, particularly at the local and actionable scale. Policy-makers are aware that they need to address sustainability and resilience issues but they are not necessarily doing this through the strategic planning and design of urban open and green space. This represents a weakness when it comes to addressing current and long-term challenges such as climate adaptation and energy sustainability. On the other hand, as identified through local interviews and surveys, there is a growing sentiment for the appreciation and need for green open spaces from users. Inhabitants seem to understand the importance of the restoration, connectivity and multi-functionality of these spaces but these characteristics are lacking within planning documents and policy-makers approaches. So, while recent national strategies illustrate that there is clearly a growing interest in increasing the supply of urban open and green space across the various governance levels, challenges still exist in relation to socio-cultural and socio-political trends which so far do not prioritise open and green spaces in comparison to other land use functions e.g., building development and provision for vehicular movement (Scheiber, 2022). Finally, there is also the need to ensure that investment in new green open spaces appreciates the importance of the strategic planning of urban open and green spaces systems in terms of a network and the reorganisation of cities so as to ensure that the various potential benefits are capitalised on. Ultimately, this work has identified the specific areas (carbon sequestration, thermoregulation, soil sealing, inclusivity and hydrological function) in reference to the EU urban open and green space planning strategies which in the context of Malta are still lacking. Going further into how urban open and green spaces could contribute to these aspects specifically in terms of planning and policy frameworks could be the focus of future work.

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Image Sources

All Figures are authors' elaboration.

Author's profile

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Sarah is specialised in urban design and spatial planning and is a lecturer at the Faculty for the Built Environment – University of Malta. Her research focuses on the planning and design of urban open spaces and sustainable mobility in relation to green infrastructure; placemaking; inclusivity; integrated planning and design; and sustainable and resilient cities. Her PhD looked into the adoption of 'Urban Green Infrastructure Planning' in the Maltese context. Prior to entering academia, Sarah spent several years working as an urban designer in both private and public spheres in The Netherlands, the United Kingdom and Malta. Sarah is passionate about improving the quality of the urban environment and is co-founder of 'Dawra Madwarna: Connecting People, Connecting Places', a platform set up to create a network of interdisciplinary professionals working to contribute to the transformation of public spaces within Malta's urban areas for a more sustainable future.

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She is an engineer, Ph.D. in Hydraulic, Transport and Territorial Systems Engineering at the Department of Civil, Building and Environmental Engineering (DICEA) – University of Naples Federico II. She received a M.Sc. in Environmental and Territorial Engineering at the University of Naples Federico II with a specialization in management of urban and territorial transformations. Since 2021 she is an assistant professor at DICEA and she has currently been involved in three main research projects: she is a component of the research team of the ERASMUS + Key Action2: Project "Development of a Master Program in the Management of Industrial Entrepreneurship for Transition Countries" (MIETC); she is a component of the research team of the Centro Nazionale per la mobilità sostenibile – Spoke 8 – MaaS & Innovative services (CUP E63C22000930007) within the Italian National Recovery and Resilience Plan supported by funding from the Next Generation EU programme; she is head of the TeMALab research team, with Gerardo Carpentieri, of the project STEP UP – Walkability for Women in Milan financed by Fondazione Cariplo. Her research interests are in the field of land use planning and energy saving integration in urban policies and sustainable mobility.