

Building capacity for mainstreaming nature-based solutions into environmental policy and landscape planning

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Reviewable v 1

Received: 25 Sep 2020 | Published: 29 Sep 2020

Citation: Balzan MV, Tomaskinova J, Collier MJ, Dicks L, Geneletti D, Grace M, Longato D, Sadula R, Stoev P, Sapundzhieva A (2020) Building capacity for mainstreaming nature-based solutions into environmental policy and landscape planning. Research Ideas and Outcomes 6: e58970. <https://doi.org/10.3897/rio.6.e58970>

Abstract

Nature-based solutions (NBS) is a term often used to refer to adequate green infrastructure that provides multiple benefits to society whilst addressing societal challenges. They are defined as actions to protect, sustainably manage and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits. Malta, the smallest member state of the EU, has been characterised by rapid economic growth and urbanisation and Maltese citizens had the highest rate of exposure to pollution, grime or other environmental problems, in the EU. The project ReNature aims to establish and implement a nature-based solutions research strategy for Malta with a vision to promote research and innovation and develop sustainable solutions whilst improving human well-being and tackling environmental challenges. Here, we introduce the opening of ReNature collection of research articles in the Open Access Research Ideas and Outcomes (RIO) journal to

publish unconventional research outputs and training materials. It will host key outputs relating to the sustainable use of biodiversity, biodiversity – ecosystem functioning, green infrastructure and ecosystem service assessments across rural-urban gradients, equitable access to the benefits derived from nature in cities and socio-environmental justice, payments for ecosystem services, and designing nature-based solutions.

Keywords

nature-based solutions, ecology, ecosystem services, learning materials, trainings, biodiversity, capacity building

Introduction

A growing recognition of the socio-cultural and economic benefits provided by nature has led to a surge in policy and research initiatives that aim to better integrate nature in cities and landscapes to address key societal challenges. The term ‘nature-based solutions’ is often used to refer to adequate green infrastructure that provides multiple benefits to society whilst addressing societal challenges. Within nature-based solutions approaches, ‘*nature*’ (ecosystems or biodiversity) is seen as a solution to our societal and environmental challenges, rather than something to protect and conserve which have been the focus of traditional legislation and policy initiatives.

Nature-based solutions (NBS) are defined as actions to protect, sustainably manage and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits (Cohen-Shacham et al. 2016). Examples of nature-based solutions include different forms of green and blue infrastructure, green roofs and walls, rain gardens, sustainable urban drainage systems, natural water retention measures, hedgerows, salt marshes and dunes, floodplains, and urban green spaces. Nature-based solutions are by definition multifunctional, delivering multiple ecosystem services which simultaneously provide economic, social, and environmental benefits.

A key characteristic that distinguishes nature-based solutions interventions from other ‘nature-based approaches’ is that they are used to address key societal challenges. Societal challenges arise from a combination of natural and anthropogenic factors, and include climate change, disaster risk, economic and social development, human health, food security, water security and environmental degradation and biodiversity loss (Cohen-Shacham et al. 2016). Establishing a clear understanding of the challenges to be addressed is a key criterion for nature-based solutions implementation and can be used to develop a rationale and strategy for nature-based solutions implementation that maximises benefits to human well-being and biodiversity (IUCN 2020). For example, nature-based solutions can address the societal challenges of innovation, job creation and community development while at the same time create net positive effects on the environment by making a sustainable use of biodiversity and natural resources (Maes and Jacobs 2017).

Hence, nature-based solutions present an opportunity to planners and decision-makers to improve the quality of life of citizens whilst benefiting biodiversity and supporting the delivery of a range of ecosystem services.

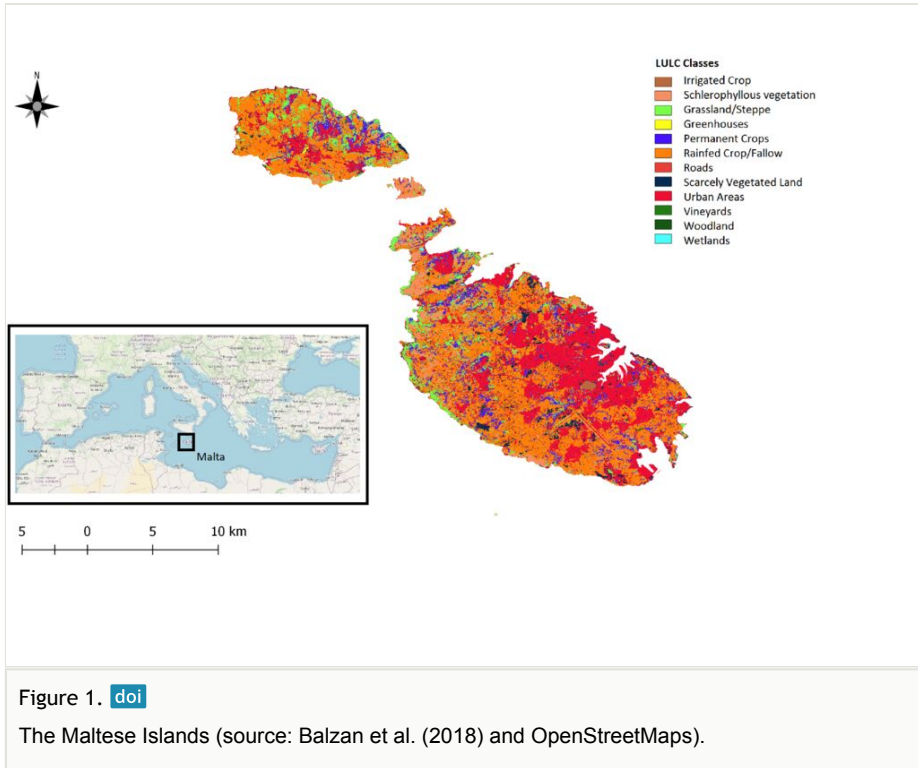
Nature-based solutions have become a key priority to mainstream environmental protection and sustainable use of biodiversity at global (IUCN 2020) and regional (e.g. Mediterranean (Canals Ventin and Lazaro 2019) and European (Faivre et al. 2017) scales). However, uptake of nature-based solutions depends largely on decisions taken at country level and even when nature-based solutions are included in policy instruments, there are normally no quantitative and measurable targets or mandatory standards (Davis et al. 2018). There is a lack of integrated urban policies that use nature-based approaches in the Mediterranean region (IUCN 2019), whilst actions that are aimed at supporting regulating and cultural ecosystem services are often not supported with an adequate knowledge-base (Cortinovis and Geneletti 2018; La Rosa et al. 2016). Similarly, there are also few examples of stakeholder involvement in nature-based solutions co-creation in scientific literature (Hanson et al. 2020), whilst in most cases practitioners do not have a comprehensive understanding of the associated costs and benefits associated with nature-based solutions implementation (Grace et al. submitted).

ReNature: Establishing and implementing a nature-based solutions research strategy in Malta

The challenge of putting together socio-economic demands and environmental challenges are particularly felt in Malta, the smallest member state of the European Union (EU). With a land area of around 316 km² (Fig. 1), an average resident human population of 1,505 persons per km² in 2017, and a strong and demanding tourism sector, Malta has been characterised by rapid economic growth and urbanisation. Socio-economic inequalities in life expectancy and health status have been identified as a persistent concern (OECD/ European Observatory on Health Systems and Policies 2019) and Maltese citizens had the highest rate of exposure to pollution, grime or other environmental problems, in the EU (Eurostat 2017). The region is also characterised by an increased risk to human life driven by a strong rise in the frequency and intensity of heat waves towards the South of Europe and an upsurge in drought conditions, leading to higher rates of weather fatalities in Southern European countries, as a consequence of climate change (Forzieri et al. 2017). Recent research from the study area has identified a rural – urban gradient in availability of green infrastructure and in ecosystem services capacities (Figs 2, 3), with urban cores having high population densities considered as ecosystem services coldspots. At the same time, green infrastructure within the urban environment is more strongly used per unit area, and therefore having higher ecosystem service flows, by urban residents (Balzan et al. 2018; Balzan and Debono 2018).

The project ReNature aims to establish and implement a nature-based solutions research strategy for Malta with a vision to promote research and innovation and develop sustainable solutions whilst improving human well-being and tackling environmental challenges. The strategy is complemented by a newly-developed research and

practitioners' cluster to act on it, with a vision to stimulate both scientific excellence and innovation capacity to promote action towards the Sustainable Development Goals. More specifically, the objectives of the ReNature project are to:



1. strengthen collaborations across the science-policy interface and stimulate common research projects and information flow among the different players;
2. provide opportunities for capacity-building to enable Maltese entities to collaborate and link up with third parties for the development of excellent scientific research in the nature-based solutions sector;
3. develop the evidence-base for landscape and urban planning to better integrate nature-based solutions approaches;
4. carry out a knowledge synthesis for policy-making and share a developed, evidence-based compendium, consisting of research data and peer-reviewed publications from collaborative research, in open access repositories;
5. extend the partnership by clustering with ongoing and future projects on nature-based solutions at European scale, and
6. provide solutions and alternatives to national authorities, policy-makers and businesses on the implementation of nature-based solutions.

ReNature has established collaborative research and capacity-building initiatives between the Malta College of Arts, Science and Technology (MCAST), as a tertiary and research organisation based in Malta, and the Trinity College Dublin (Ireland); University of Trento (Italy); University of East Anglia and University of Cambridge (United Kingdom), and Pensoft Publishers (Bulgaria). The activities carried out have included training and networking events aimed at building up the research capacity and at promoting research excellence in the field of nature-based solutions. The ReNature team has organised four training courses, attended by academics and relevant stakeholders, focussed on topics relating to: biodiversity and land monitoring; mainstreaming nature-based solutions in planning and policy-making; nature-based solutions in urban planning; and nature-based solutions in rural landscapes. The main objective of these capacity building activities is to create a space for open and inspiring discussion among project partners, academics, practitioners and stakeholders. One PhD Summer School (the [Renaturing Cities: Interdisciplinary Summer School](#)) was organised with the support of the COST Action Circular City. The First ReNature Summer School was aimed at providing participants with an understanding of the features and potential of NBS in the context of a holistic approach towards landscape sustainability, and has also included “problem-based” learning sessions aimed at stimulating professional development and further cooperation among students also in the aftermath.

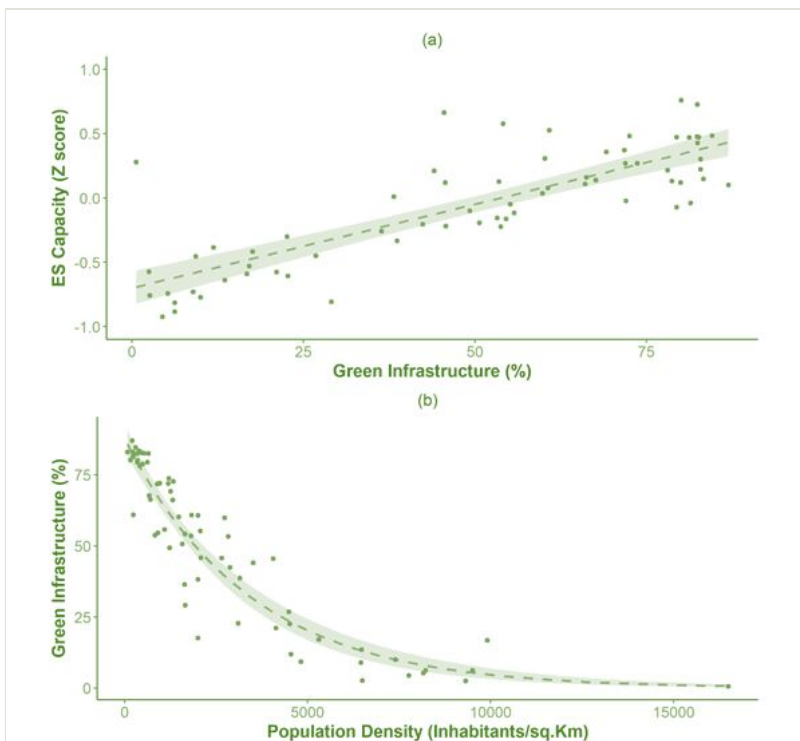
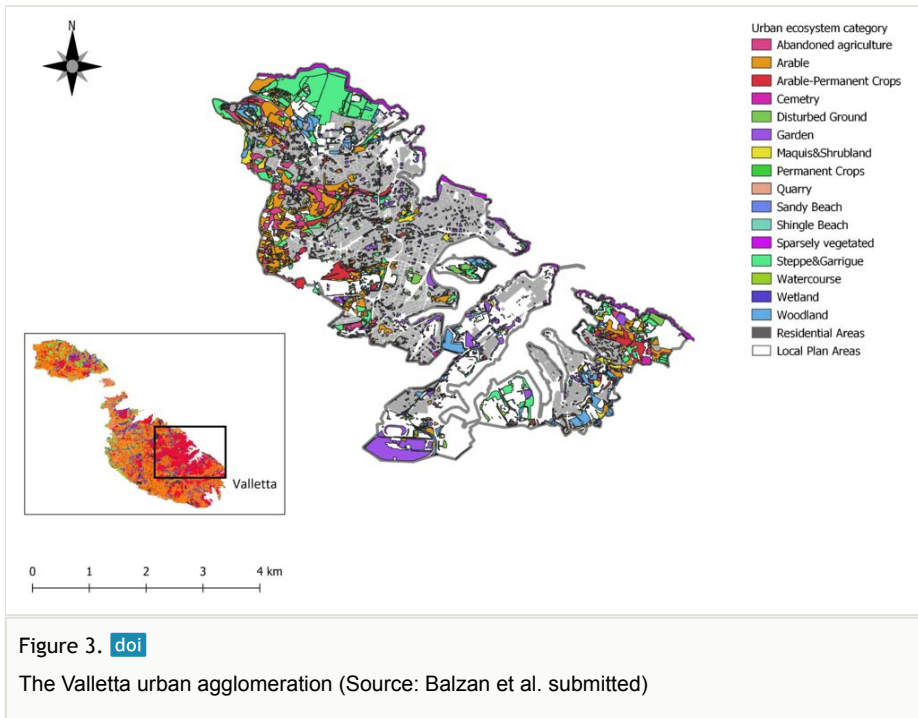


Figure 2. [doi](#)

(a) Assessing the relationship between green infrastructure cover (GI) in each local council and average ES capacity and (b) population density (Adapted from: Balzan 2017).



The ReNature RIO Collection: Building capacity for nature-based solutions

Open science is one of the key pillars of the ReNature project, which has already openly shared access to developed training material and scientific outcomes. Similarly, the ReNature Nature-based Solutions Compendium has collated information about nature-based solutions in Malta and shared data openly with all interested users and practitioners (Williams et al. 2019). ReNature has established a *Research Ideas and Outcomes (RIO)* collection to publish unconventional research outputs and training materials, and to ensure that all project outcomes are available in open access, with a stable DOI assigned and comprehensively collected in one place. The innovative features of [RIO Journal](#) allow for open and public post publication peer review, encouraging discussion among peers and consecutively allowing the publication of updated versions of each article, linked via Cross Mark.

The ReNature RIO Collection will host key outputs relating to the sustainable use of biodiversity, biodiversity – ecosystem functioning, green infrastructure and ecosystem service assessments across rural-urban gradients, equitable access to the benefits derived from nature in cities and socio-environmental justice, payments for ecosystem services, and designing nature-based solutions. Reports from workshops attended by students, early career researchers and policy makers from all over the world will accumulate further empirical knowledge on the ReNature subjects. This Collection will continue to be

developed further as the ReNature project continues to promote open innovation whilst effectively engaging communities in the co-development and exchange of knowledge for nature-based solutions implementation.

Acknowledgements

The ReNature project receives funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 809988.

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