

Chapter N (please do not write anything in this line. Editors will annotate the chapter number)

Application of the DNSH principle to the restoration and enhancement of a historical garden: the project "Well-being and spirituality: Orto-giardino Laudato Si"

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Abstract. The application of the "Do No Significant Harm" (DNSH) principle, as foreseen by the Italian Recovery and Resilience Plan (so-called PNRR in Italian), intends to demonstrate that a project intervention does not cause significant harm to the environment and can produce positive impacts. This paper describes the results of a preliminary analysis of environmental aspects and impacts, in accordance to DNSH, related to the restoration and reforestation of the historic garden of Villa San Leonardo al Palco, in Prato. Alongside the care and restoration of the villa, which already hosts events, conferences and retreats, the project "Well-being and spirituality: *Orto-giardino Laudato Si*" will enhance the garden and preserve biodiversity, with benefits for citizens and tourist attractions. One of the main objectives is the adoption and development of ecosystem functions in the garden, with direct and positive environmental effects. The principles of both circularity and sustainable agriculture let inspire the creation of the bioactive garden, to cultivate local biodiversity for self-consumption, with the possibility to enhance sustainable food models, health and well-being. The garden will become an ecological, economic and social laboratory, capable of strengthening and spreading scientific, technical, botanical and environmental knowledge.

Keywords. urban gardens, circular economy, environmental impacts, well-being

1. Introduction

The mechanism for Recovery and Resilience (according EU Regulation 241/2021) stipulates that all measures in Recovery and Resilience plans must comply with the principle of “Do No Significant Harm” (DNSH) to environmental objectives and impacts^a. This requirement translates into an assessment of the project intervention and the evaluation of compliance with DNSH. The Italian National Recovery and Resilience Plan (the so-called PNRR in Italian) also includes the DNSH principle and ask for its application in new project interventions^b.

In 2022, the Italian Government launched a call, on the framework of the PNRR, with the aim to fund the restoration and the enhancement of historic parks and gardens (i.e. *Misura 2 “Rigenerazione di piccoli siti culturali, patrimonio culturale, religioso e rurale” Investimento 2.3: “Programmi per valorizzare l’identità dei luoghi: parchi e giardini storici” la Missione 1 – Digitalizzazione, innovazione, competitività e cultura, Componente 3– Cultura 4.0 - MIC3*). Promoting this financial line, the main objectives for the Italian Government are the increasing of the touristic and the cultural appeal of historic gardens (public and not public) by: i) modernizing material and immaterial infrastructure of historical and artistic heritage; ii) improve cultural usability and tourist accessibility through digital investments and investments aimed at removing physical and cognitive barriers to heritage; iii) renewing and modernizing the tourism offer also through the upgrading of accommodation facilities and the strengthening of strategic tourism infrastructures and services; iv) support the recovery of the cultural and creative tourism industry.

In response to the above-mentioned call, the Diocesi of Prato decided to submit a project proposal for the restoration and modernisation of the historic garden of the monastery of San Leonardo al Palco, in Prato. The main aim of the project, called “Well-being and spirituality: *Orto-giardino Laudato Si*” is to promote of space fully harmonic with the nature and living

^ahttps://ec.europa.eu/info/sites/default/files/2021_02_18_epc_do_not_significant_harm_-_technical_guidance_by_the_commission.pdf

^b<https://italiadomani.gov.it/en/strumenti/documenti/archivio-documenti/the-do-no-significant-harm--dnh--principle-in-the-national-rec.html>

beings; an ecological, economic and social laboratory aimed at identifying the optimal dimensions of a sustainable, resilient and autonomous living space. Although the monastery and its garden are owned by the Diocesi of Prato, the project proposal fits perfectly into the sustainable development and circular economy framework already implemented by the City of Prato. Thus, the intervention of planting trees in the garden is in line with the city's forestation plan (i.e. Prato Urban Jungle^c); the circular economy principles inspiring the intervention (i.e. circular urban gardens) agree with the so called Prato Circular City^d local strategy. Moreover, the project is also described in the 'Next Generation Prato' document, published by the Municipality of Prato in July 2021 in response to priority interventions on PNRR^e. By applying DNSH principle, an assessment was made regarding the consistency of the proposed intervention in relation to the PNRR measures. The project "Well-being and spirituality: *Orto-giardino Laudato Si*" the project was judged eligible for funding.

2. Materials and methods

The DNSH principle is based on what is specified in the taxonomy system of environmentally sustainable activities indicated in Article 17 of Regulation EU 2020/852, adopted to promote private sector investment in green and sustainable projects and to help realise the objectives of the Green Deal. In fact, there is currently no unambiguous methodology for assessing DNSH in Italy, even a guideline has been issued early 2022^f. Actually, the main reference are checklists prepared at European level, for the compilation of which no standardised instructions are provided (e.g. on how to measure specific requirements or any reference methods). For this work, in order to carry out the assessment, the methodology included: on-site

^c <https://www.pratourbanjungle.it/>

^d <http://www.pratocircularcity.it/>

^e <http://www.pratocircularcity.it/it/tavoli/tavolo-governance/next-generation-prato/scheda-9/pagina2611.html>

^f <https://italiadomani.gov.it/>

visits; semi-structured interviews; desk review of existing documents about structural interventions planned. The requirements included in the checklists “Afforestation - Table 19” and “Cultivation of perennial and non-perennial crops - Table 20”[§] have been considered as references.

3. Results and discussion

The project targets the courtyard within the perimeter walls (area of 15,000 m²). It contains approximately 350 olive trees and a water source. A hydraulic system compensates for the water levels originating from the spring by a system of cascade basins. The courtyard is substantially flat, all around the main body of the monastery, and is characterised by the presence of numerous plant varieties, trees and an Italian-style garden.

The interventions included in the project proposal are listed in Table 1:

Table 1: Major interventions proposed

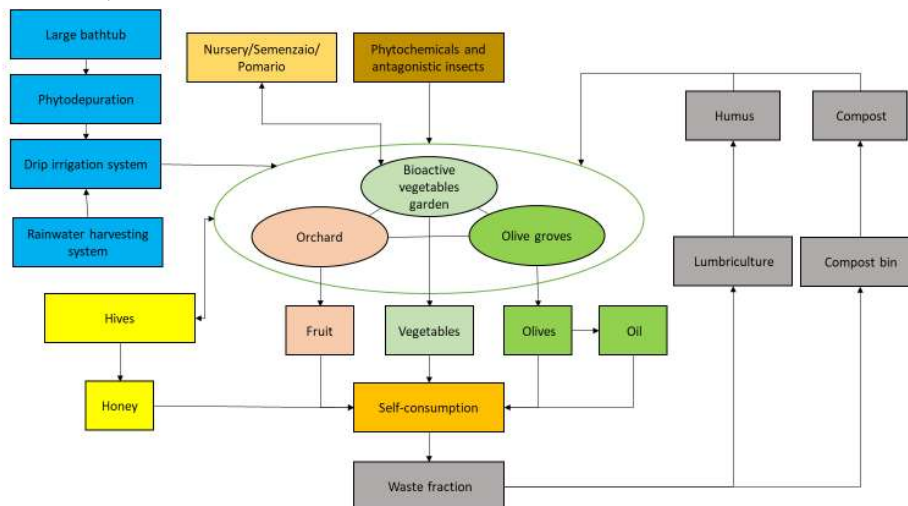
a. Plant component and garden design:	<ul style="list-style-type: none"> •introduction of new plant elements respecting and consistent with the historical, landscape and soil characteristics of the site; •creation and recovery of bioactive orchards; •creation of suitable habitats and arrangements to attract insects; •inclusion of hives and swarms of bees that will perform pollination and gene exchange between plants.
b. Architectural and sculptural component:	<ul style="list-style-type: none"> •restoration of stone walls and “Belvedere”; •resurfacing of the forecourt and the drainage of rainwater.
c. Plant component:	<ul style="list-style-type: none"> •restoration and upgrading of hydraulic systems of historical interest and the restoration of tanks with phyto-purification functions); •implementation of energy-efficient lighting systems; •installation of photovoltaic panels
d. Safety and accessibility:	<ul style="list-style-type: none"> •installation of a video surveillance system; •installation of an access ramp •construction of a pedestrian boulevard; •installation of charging systems for electric mobility.
e. Valorisation and communication:	<ul style="list-style-type: none"> •inclusion of the garden within cultural itineraries in the area; •participation in participatory local development initiatives •involvement of voluntary associations and citizens in maintenance, management, enhancement and communication activities.

Sources: Author

Figure 1 summarises the interventions and their interconnections by application of virtuous practices of circular economy and environmental and climate protection.

[§] <https://italiadomani.gov.it/Interventi/dnsh.html>

Fig. 1. Circular system of the intervention.



Source: Authors

The self-assessment was conducted through the use of DNSH self-assessment form for Measure 2 (Table 2) and by check lists “Afforestation” and “Cultivation of perennial and non-perennial crops”. The purpose of the datasheets is to provide a summary of operational and regulatory information that identifies DNSH constraints.

Table 2: DNSH self-assessment form for Measure 2

Environmental objectives	Questions	Yes/No	Substantive justification if NO has been selected
1. Climate change mitigation	Is the measure expected to lead to significant GHG emissions?	NO	
2. Climate change adaptation	Is the measure expected to lead to an increased adverse impact of the current climate and the expected future climate, on the measure itself or on people, nature or assets?	NO	
3. The sustainable use and protection of water [...]	Is the measure expected to be detrimental: (i) to the good status or the good ecological potential of bodies of water, [...]		

4. The circular economy, including waste prevention and recycling	Is the measure expected to: (i) lead to a significant increase in the generation, incineration or disposal of waste, [...]; or (ii) lead to significant inefficiencies in the direct or indirect use of any natural resource at any stage of its life cycle which are not minimised by adequate measures; [...]?	NO	Given its nature, the investment has no foreseeable impact on this environmental objective, taking into account both direct and primary indirect effects. However, parks and gardens produce a huge number of cubic metres of bulk green waste annually from tree and shrub removal, pruning, weed removal and lawn mowing throughout the park.
5. Pollution prevention and control to air, water or land	Is the measure expected to lead to a significant increase in the emissions of pollutants into air, water or land?	NO	Treatments against parasites, pathogens and pests must preferably be carried out by recurring to cultural criteria, and other biological control or chemical substances of low or zero toxicity to humans, on wild fauna and flora..
6. The protection and restoration of biodiversity and ecosystems	Is the measure expected to be: (i) significantly detrimental to the good condition and resilience of ecosystems; [...]?	NO	In order to manage the soil pollutants it is planned to create guidelines for the correct management of agronomic activities and the collection and disposal of agricultural waste

Sources: Authors

The initial situation with 350 mature olive trees plays a significant role with a CO₂ absorption in one year of about 3500 kg (Palese et al., 2013). The intervention includes the planting of more than 1000 plant species, that together, will bring the total CO₂ absorption balance to 9500 kg per year. The selection of crops will be added to those already present, bringing the soil coverage to almost all of it, thus well above the minimum 75% required. Observing Figure 2, the area covered by the project will already be covered almost in its entirety by green areas, in particular a garden (approximately 4,200 m²), an olive grove (approximately 8,000 m²) and woodland (approximately 800 m²). An additional green area dedicated to a vegetable garden will also be created. The garden management method (bioactive garden) will have a productive function intended for self-consumption and high social impact purposes. Finally, in the garden area, medicinal and aromatic plants will be planted, as well as flower strips, respecting the historical design of the Renaissance garden (Nanni P, 2010). The analysis of physical climatic risks can be traced back to phenomena that are now

particularly frequent and habitual due to climate change. The use of the motors is compensated by the increased absorption of CO₂ due to the inclusion of the new greenery. In addition, there is already a rainwater collection system that conveys rainwater to a cistern located inside the villa. Table 3 summarises the interventions, by dividing them into those that contribute to the absorption/reduction of CO₂ and those that produce it.

Fig. 2. Green areas Villa del Palco, before and after the planned intervention



Sources: Authors

Table 3: Factors that absorb and produce CO₂ emissions

Factors that absorb or reduce CO ₂ emissions	Factors producing CO ₂ emissions
<ul style="list-style-type: none"> • Introduction of new plant elements (trees, shrubs and hedges, grasses). • Rehabilitation of pomaria and orchards. • Introduction of bioactive vegetable garden. Use of compost bins. • Creation of suitable habitats to attract insects. • Insertion of hives and swarms of bees. • Introduction of phytodepurative plants. • Installation of photovoltaic panels. • Energy-efficient electrical renovation. • Charging systems for electrical mobility. 	<ul style="list-style-type: none"> • Using motors for irrigation pumps. • Use of tractor for garden maintenance and landscaping. • Conveyance of construction waste as a result of improvements to the architectural component. • Use of electrical equipment (video-surveillance, accessibility) in case of energy needs that are not guaranteed by photovoltaic panels.

Sources: Authors

A drip irrigation system is planned for the irrigation of the garden and vegetable garden, which will contribute to the efficient management of water resources. Inside the perimeter wall of the garden it is planned to introduce phytodepurative plants in the existing water tank. Through the construction of a compost heap and an area for mowing, it is intended to generate a closed cycle in which the residues and by-products of production and mowing can return as organic fertilisers. In order to promote the circular economy it is planned to create guidelines for the correct management of the different materials flows.

5. Conclusions and future perspectives

Even a standardised method is not yet in place, by the application of the DNSH principle, it is possible to carry out assessments to demonstrate that the proposed intervention would not generate excessive impacts on the environment. The project *“Orto-giardino Laudato si”* (funded by PNRR) is intended to be a balanced model of landscaping areas, with the possibility also of enhancing sustainable food models that promote wellbeing and health. At the local level, the project fits into the policies of the Municipality of Prato in terms of circular economy, development of urban and peri-urban agricultural systems and forestry.

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