

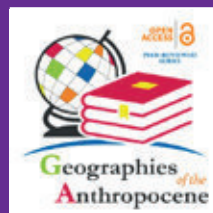
Climate change related urban transformation and the role of cultural heritage

Matthias Ripp & Christer Gustafsson
(Eds.)



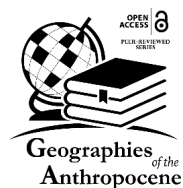
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Matthias Ripp & Christer Gustafsson
Editors



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9. The impact of the photovoltaic system on Florence's roofs. Collaboration and balance between innovation, Authenticity and Integrity.

Carlo Francini¹, Gaia Vannucci²

Abstract

Considering the Historic Centre of Florence World Heritage site as a case study, the paper aims to provide a reflection about the need to reconcile the protection of the site's Outstanding Universal Value with the increasing urgency to implement adaptation strategies to climate change in urban heritage environments. The municipal regulations are the result of an attempt to reconcile these needs, and are part of a national and regional regulatory framework that has recently undertaken an evolution oriented towards the need to provide a rapid response to the contingent energy crisis.

The Florence experience serves as example of how studies and researches on the territory, additional levels of safeguard and international conventions and recommendations can be transposed in local legislation but also come into conflict with it. Therefore, climate change turns out to be an ambivalent threat: for itself and for those measures that risk contradicting the objective of maintaining the Integrity and Authenticity of the site.

In this context, the vision adopted by the Florence World Heritage and Relations with UNESCO Office of the Municipality of Florence aims to consolidate the presence of culture and heritage in urban policies - in accordance with UNESCO's Recommendation on the Historic Urban Landscape - with the ambition of focusing on the city's historical, cultural, environmental and social identity in a dynamic, value-based context, and not only prescriptive and of mere preservation, enhancing its uniqueness and at the same time its universality.

Keywords

Historic centres, UNESCO World Heritage sites, Authenticity & Integrity, Historic Urban Landscape, photovoltaic system, Florence.

¹ Florence World Heritage and Relations with UNESCO Office, Municipality of Florence, Italy; carlo.francini@comune.fi.it

² Università degli Studi di Firenze, Italy; gaia.vannucci@unifi.it. Corresponding Author

1. Premises and objectives of the paper

Climate change is having a profound impact on conservation and protection practices worldwide, especially in sites protected under the UNESCO Convention concerning the Protection of the World Cultural and Natural Heritage. It has been 50 years since the adoption of this important international heritage protection instrument, and climate change is one of the most significant threats affecting the Outstanding Universal Value of the sites inscribed. State Parties are working to address this issue, although, conflict between local and supranational norms often appears. The extensive global debate on ecological and energy transition has resulted in the development of a comprehensive regulatory framework that inevitably intersects with the preservation of cultural heritage and landscape. The aim of the research is therefore to understand if and how these components can coexist.

The inscription of Florence's Historic Centre on the UNESCO World Heritage List in 1982 went relatively unnoticed for over twenty years at both the local and national levels. However, it gained renewed significance after the establishment of the Florence World Heritage and Relations with UNESCO Office within the municipal administration in 2005. This office is dedicated to the enhancement and management of the site. Over time, interest in the preservation of the World Heritage Site grew, especially following the approval of the first Management Plan³ in 2006 and the preparation of essential documents⁴ such as the Periodic Report and the Retrospective Statement of Outstanding Universal Value in 2014.⁵ This gradual yet significant process of recognizing the value of the World Heritage Site provided a vital opportunity to reconsider the management policies and programmatic instruments within the municipal administration (Francini C., Montacchini A., Scuto L. R., Tanturli C., Vannucci G., 2022).

The experience of Florence's Historic Centre, as discussed in the present paper, serves as an example of how studies and research on the territory, ad-

³ Following the 2016 update and the 2018 Monitoring, the third update of the Management Plan of the Historic Centre of Florence site was released in 2022 (approved by the City Council on 30 December 2021, deliberation No. 670). Florence World Heritage Office and Relations with UNESCO, curated by Francini C., 2022, The Management Plan for the Historic Centre of Florence - UNESCO World Heritage Site, Firenze

⁴ All public documents relating to the Historic Centre of Florence World Heritage site can be found at the following links: <https://www.firenzepatrimoniomondiale.it/archivio-documenti/> and <https://whc.unesco.org/en/list/174/documents/>

⁵ UNESCO, Adoption of Retrospective Statements of Outstanding Universal Value, Draft Decision 38 COM 8E, Doha 2014, 92-94 Link: <https://whc.unesco.org/archive/2014/whc14-38com-8E-eNo.pdf>

ditional protective measures (e.g. the identification of the Buffer Zone of the World Heritage Site), and international conventions and recommendations can be incorporated and implemented within the existing municipal regulations. The objective is not to introduce further constraints on initiatives aimed at energy transition, but rather to facilitate them, achieving mutual benefits in the process.

Using the UNESCO Historic Centre of Florence World Heritage Site as a case study,⁶ this paper aims to demonstrate how a balanced and coherent approach to energy transition, aligned with the conservation of the site's Outstanding Universal Value, is crucial not only to ensure the Integrity and Authenticity of the site but also to rethink urban planning.



Figure 1: View of Florence Core and Buffer Zones from Belvedere Fortress.

⁶ The Variant also affected the Core Zone and Buffer Zone of the World Heritage site Medici Villas and Gardens in Tuscany (inscribed in 2013), a serial site whose villas of Castello, Careggi, Petraia and Poggio Imperiale, as well as the Boboli Gardens, are included in the Municipality of Florence. No additional level of protection has been provided for these areas as they are already subject to landscape constraints.

Following the definition of the current regulatory framework, the levels of protection in the territory and the relationship between these elements and the UNESCO conventions and recommendations, the paper will deal with the experience between the Florence World Heritage and Relations with UNESCO Office and the Urban Planning Department concerning the variant to the urban planning instruments that would have regulated the installation of photovoltaic panels in the Florentine territory, and the reflections that ensued.

2. Energy efficiency regulations in historic city centers: international, Italian, and local developments

Although guided by the principles of hierarchy and subsidiarity, European directives, national legislation, and local regulations on energy transition often come in conflict. In the context of World Heritage sites, these inconsistencies not only trigger conflicts among different levels of government but may also lead to contradiction with the guidelines set forth by the World Heritage Centre, potentially compromising the sites' Outstanding Universal Value.

To tackle the negative impacts of climate change, European policymakers have adopted programmatic documents outlining strategic objectives and specific targets for reducing greenhouse gas emissions and promoting renewable energy infrastructure.

In line with European energy objectives, Italy has enacted legislative measures⁷ that combine systematic choices for energy transition with two ad-hoc guidelines, formulated during the pandemic emergency and in response to the recent energy crisis resulting from the conflict in Ukraine, which posed significant challenges to energy supply worldwide.

Within the complex and evolving scenery of national regulation,⁸ one law

⁷ The Italian government set its own energy and climate objectives by presenting, in the year 2020, the Integrated National Energy and Climate Plan 2021-2030 (PNIEC) and subsequently, in the year 2021, the National Recovery and Resilience Plan (PNRR). Specifically, with D.lgs. 199/2021 on the Implementation of Directive 2018/2001/EU, better known as the Renewable Energy Directive II (RED II), Italy also created the basis for an adjustment of the respective regulatory framework, aimed at accelerating a sustainable growth path.

⁸ With D.L. 50/2022 (consolidated with Conversion Law 91 of 15 July 2022), all areas not protected under D.L. 42/2004 (Cultural and Landscape Heritage) and external to the buffer zone of the same assets (7 km for wind power systems and 1 km for photovoltaic systems) were deemed suitable for the installation of energy supply systems. Moreover, on 24 February 2023, D.L. 13/2023 was published, containing urgent provisions for the implementation of the PNRR and the National Plan for Complementary Investments (PNC). Arti-

that regards the enhancement of energy performance in cultural heritage has a particular relevance for the purposes of the present study. The so-called Energy Decree No. 17/2022, converted into Law 34/2022, introduces simplified procedures for installing solar and photovoltaic panels on buildings,⁹ with a particular focus on their implementation within Zone A, i.e., historic centers. Within these areas, the installation of solar panels is exempt from permit requirements, except in regions designated as landscape-protected.

Nevertheless, the Decree specifies that even within protected historic centers, the installation will qualify for the simplified model for rooftop installations if *'the panels are integrated into non-visible roof structures that do not interfere with the urban landscape as seen from the panoramic viewpoints'*, with the simplified procedure not applying to panels installed on rooftops made of *'traditional local materials'*.¹⁰

3. The case study of Florence: a complex definition of protection and safeguard levels

The primary objective behind the variant to the two urban management tools - the Structural Plan and Urban Regulation of the Municipality of Florence - was to address the limitations that hindered the installation of photovoltaic systems in a significant portion of the city. In summer 2022, the need to quickly draft the amendment, thus bypassing the administrative process of obtaining prior permits for installation, led to the establishment of distinct regulations for each of the 'macro areas' that define the administrative division of the Florentine territory. These macro areas, identified in the municipal urban planning instruments as zones and sub-systems, are subject to several

cle No. 47 of the Decree announces the reduction of the same buffer zone mentioned above: the new distances to be exceeded are currently 3 km for wind power systems and 500 m for photovoltaic systems.

⁹ According to Law 34/2022, the properties for which landscape authorisation is required for the installation of energy systems are those:

- subject to a landscape constraint by special Decree pursuant to Article No. 136, paragraph 1, letter b) of D.L. 42/2004 (villas, gardens, parks, etc.)
- located in areas on which a landscape constraint has been imposed pursuant to Article No. 136, paragraph 1, letter c) of D.L. 42/2004, which also includes historical centres;
- subject to cultural constraints, for which the authorisation of the Superintendence must be acquired pursuant to Article No. 21 of D.L. 42/2004.

¹⁰ Law 34/2022, Annex Amendments made upon conversion of D.L. 17 of 1 March 2022, Article No. 9

levels of protection, with the historic center receiving the highest level of priority in this hierarchy. In this respect, areas subject to landscape protection constitute an exception, as in accordance with the provisions of the Territorial Address Plan (PIT) - an urban planning tool that takes on the function of a Landscape Plan - the installation of photovoltaic systems remains subject to the binding opinion of the Superintendence, as required by the Code of Cultural Heritage and Landscape.

3.1 What is meant by 'historic centre'?

In Chapter II of the Code of the Cultural Heritage and Landscape, titled 'Identification of Landscape Assets', Article No. 136 'Buildings and Areas of Notable Public Interest'¹¹ lists among the protected landscape assets '*complexes of immovable things which constitute a characteristic aspect having aesthetic and traditional value, including historic centers*'. Rather than focusing on individual architectural structures, the conservation measures related to such assets thus extend on the entire ensemble. This approach echoes a fundamental principle in the field of urban conservation, initially laid out in the Venice Charter of 1964.¹²

However, recognizing an area of notable public interest under these terms can lead to inconsistency between different regulations. The concept of the historic center proposed by the Code, subject to protection and therefore constrained, lacks objective criteria for determining what constitutes the 'historic center'. As a result, this definition remains subject to individual interpretation and is unlikely to align with the precise technical definition emerging from municipal urban planning regulations.

Similarly, the ministerial definition of the 'historic center', referred to as the homogeneous territorial Zone A, also fails to provide a definitive solution. It is described as '*parts of the territory affected by urban agglomerations with historical, artistic, or exceptional environmental value, or portions thereof, including the surrounding areas, that can be considered integral parts, due to these characteristics, of the agglomerations themselves*'¹³ - a definition obtained from the document provided by the Technical Rules of Implementation

¹¹ Paragraph as modified by D.L. 63/2008, Article No. 2

¹² The Venice Charter 1964, Article No. 1: The concept of a historic monument embraces not only the single architectural work but also the urban or rural setting in which is found the evidence of a particular civilization, a significant development or a historic event. This applies not only to great works of art but also to more modest works of the past which have acquired cultural significance with the passing of time.

¹³ D.M. 1444 of 2 April 1968, Article No. 2 Homogeneous Territorial Zones

(NTA) of the General Regulatory Plan of the Municipality of Florence.¹⁴ Due to the lack of precise criteria, defining the exact boundaries of the historic center remains a subjective matter, leading to potential discrepancies between different interpretations and municipal plans.

3.2 Florence levels of protection and safeguard

In the case of Florence, there are several levels of protection and safeguard to consider: the Historic Centre or Zone A1, the Core Zone and Buffer Zone of the World Heritage Site, the area subordinate to landscaped constraints.

The Urban Regulation (now converted into the Operative Plan) of the Municipality of Florence defines the ‘Historic Center’ (or Zone A1) as the urban fabric within the boundaries of the last city wall. Until 2021, it coincided with the Core Zone of the Historic Centre of Florence World Heritage site. During the 44th extended session of the World Heritage Committee in Fuzhou, China, from July 16 to 31, 2021,¹⁵ the minor boundary modification of the Core Zone was approved under decision 44 COM 8B.56. The modification aimed to rectify a formal representation error in the site mapping, error that previously excluded the San Miniato al Monte complex from the delineated perimeter, despite its explicit mention in the 1982 Declaration of Outstanding Universal Value.¹⁶

¹⁴ Municipality of Florence Urban Planning Department, Technical Rules of Implementation of the General Regulatory Plan. Regional Approval: Regional Council resolution No. 385 of 2 December 1997. Municipal Council acknowledgement: Resolution No. 141 of 9 February 1998. Link: https://ediliziaurbanistica.comune.fi.it/export/sites/ediliziaurbanistica/materiali/SUE/NTA_PRG1998_agg_marzo2014.pdf

¹⁵ Office of Florence World Heritage and Relations with UNESCO, 2020, Proposal for a Minor Boundary Modification to the boundaries of the World Heritage Property ‘Historic Centre of Florence’ Link: <https://whc.unesco.org/document/181268>

¹⁶ Link: <https://whc.unesco.org/en/list/174/>



Figure 2: Discrepancies between the Core Zone of the Historic Centre of Florence World Heritage site and the 'Historic Centre' or Zone A1.

This process provided an opportunity to include not only the previously missing attribute but also an area characterized by natural elements such as gardens, avenues, and ramp systems, which collectively form an urban park designed to embrace greenery and offer panoramic views of the city, while also serving as a link between the historic center and the hilly ecosystem (Francini C., Montacchini A., Scuto L. R., Tanturli C., Vannucci G., 2022).

Thanks to its strategic position between the Arno River and the hilly landscape, Florence has preserved over the centuries its naturalistic features, where the traditional landscape, characterized by farmhouses, historic villas, and religious buildings, can still be discerned (Agnoletti M., 2010). The nature of the hillside system and its visual relationship with the built environment of the historic center are among the foundational elements of Authenticity and

Integrity that led to the inclusion of the Historic Centre of Florence in the UNESCO World Heritage List in 1982.

In the Municipality of Florence, the area subordinate to landscaped constraints consists of the overlapping of 12 areas¹⁷ deemed of public interest due to specific characteristics. These include *'areas with particular orographic properties'*; *'areas with a diverse combination of wooded and cultivated spaces - some of which constitute ancient rural landscapes'*; *'areas where human works are inseparably fused with nature'*; *'areas with historically and architecturally significant installations, including numerous villas, ancient buildings, and churches immersed in olive plantations, which not only form a natural landscape of uncommon natural beauty but also constitute a characteristic ensemble with aesthetic and traditional value'* and *'areas that offer accessible viewpoints from where to enjoy the spectacle of beauty and renowned monuments'*.¹⁸ The individual areas follow linear systems such as main roads and rivers or define zones with specific characteristics as mentioned earlier. However, they collectively form an incomplete and fragmented framework, lacking a broader perspective.

¹⁷ The areas registered and mapped are those protected under the former Law 1497 of 29 June 1939 Protection of Natural Beauties (although in some cases it was also possible to recover measures issued under the former Law 778 of 11 June 1922 Protection of Natural Beauties and Properties of Special Historical Interest), later repealed and replaced first by D.L. 490 of 29 October 1999 Unified text of legislative provisions on cultural and natural heritage, then by D.L. 42 of 22 January 2004 Code of the Cultural Heritage and Landscape. Following the revision actions carried out jointly by the Region of Tuscany, the Ministry of Cultural Heritage and Activities (through the involvement of the Regional Directorate for Cultural and Landscape Heritage of Tuscany and the Territorial Superintendencies) and the LAMMA Consortium, the perimeter of the landscape constraints were validated.

¹⁸ Landscape Constraint, Territorial Coordination Plan of the Province of Florence, Knowledge Framework, List of Properties and Areas of Significant Public Interest, approved by resolution of the Provincial Council No. 1 of 10 January 2013. Link: https://www.cittametropolitana.fi.it/wp-content/uploads/Vincolo_PAE.pdf

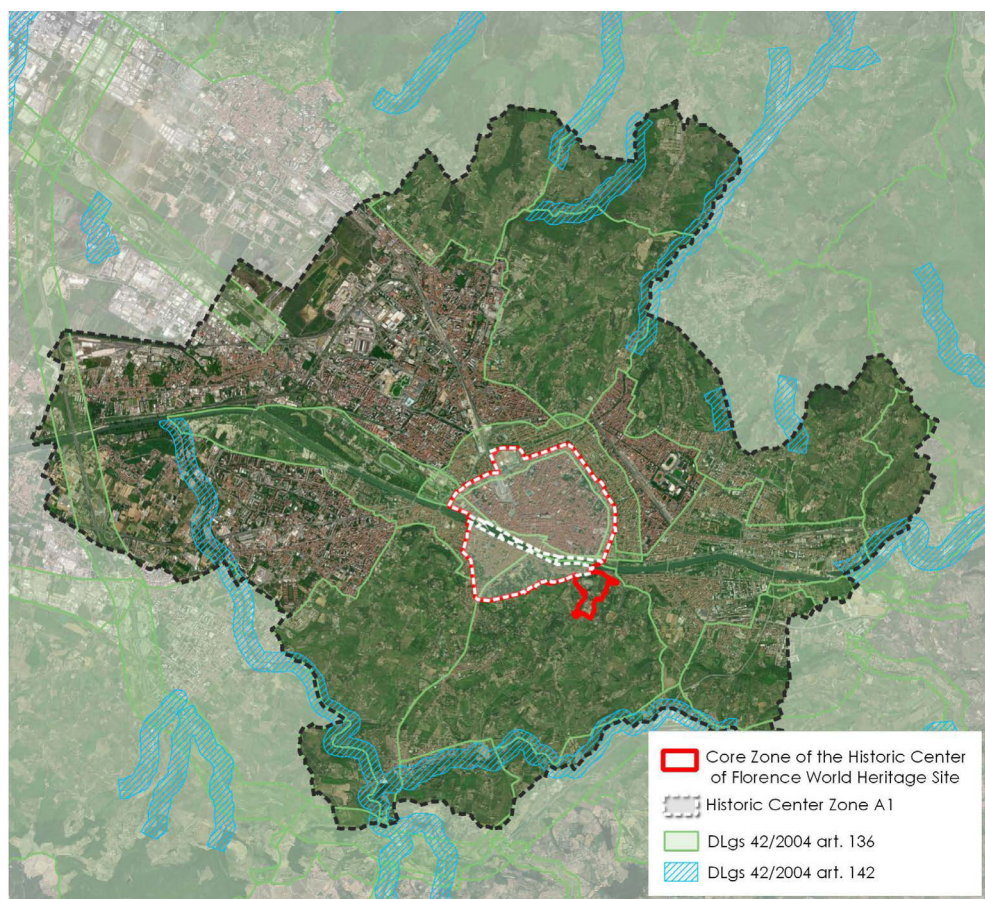


Figure 3: Areas subordinate to landscape constraints: these, together with Zone A1 and the Core Zone, constitute the mosaic of protection levels relevant to the variant.

It is essential to highlight that the concept of the historic center basic to the different levels of protection described so far in this paragraph, with the exception of the Core Zone, does not consider the UNESCO Recommendation on the Historic Urban Landscape (HUL)¹⁹ of 2011 although this is dealt with in the Historic Centre of Florence Management Plan as well as a prerequisite to the very formulation of the guidelines of the entire document. The HUL is defined not as a heritage category but as a methodology used to govern the territory in an integrated and holistic manner. HUL applies to an urban area resulting from a historical layering of cultural and natural values that go beyond the notion of a ‘historic center’. It encompasses a broader context that includes various factors, taking into account the quality of the

¹⁹ UNESCO, 2011, Recommendation on the Historic Urban Landscape, Parigi

human environment and the productive and sustainable use of urban spaces in a balanced relationship (Francini C., 2020). This methodology promotes a vision that aims to *'consolidate the role of culture and heritage in urban policies, placing the city's historical, cultural, environmental, and social identity at the core in a dynamic and value-based context, rather than being purely prescriptive and focused on conservation, highlighting both its uniqueness and universality'* (Francini C., 2017).

Another level of safeguard, coherent with the principles of HUL, stems from the recognition of the Buffer Zone of the World Heritage Site, which, in the case of Florence's Historic Centre, occurred in 2015 through the identification of an area resulting from the overlay of different levels of protection (Bini M., Capitanio C., Francini C., 2015) and more than 50 panoramic viewpoints on the urban landscape. The Buffer Zone provides an additional layer of safeguard to sites by ensuring the preservation of the historic city's background, main vistas, and other structural and functional characteristics. In 2020, the Municipality of Florence incorporated the Buffer Zone²⁰ and eighteen viewpoints (out of over 50 identified), along with their visual axes,²¹ into local urban planning instruments. Due to the extensive expanse of the Buffer Zone, spanning 10,453 hectares and including parts of neighboring municipalities, it was not deemed feasible, in the case subsequently discussed, to define specific guidelines for the installation of photovoltaic systems that would apply to the entire area.

²⁰ Second mid-term variant to the Structural Plan and Urban Regulations, approved in April 2020 by the City Council with DCC 2020/C/00007.

²¹ Table 3 - Protections of the variant of the Structural Plan, approved by the Municipality of Florence on 31 December 2014.

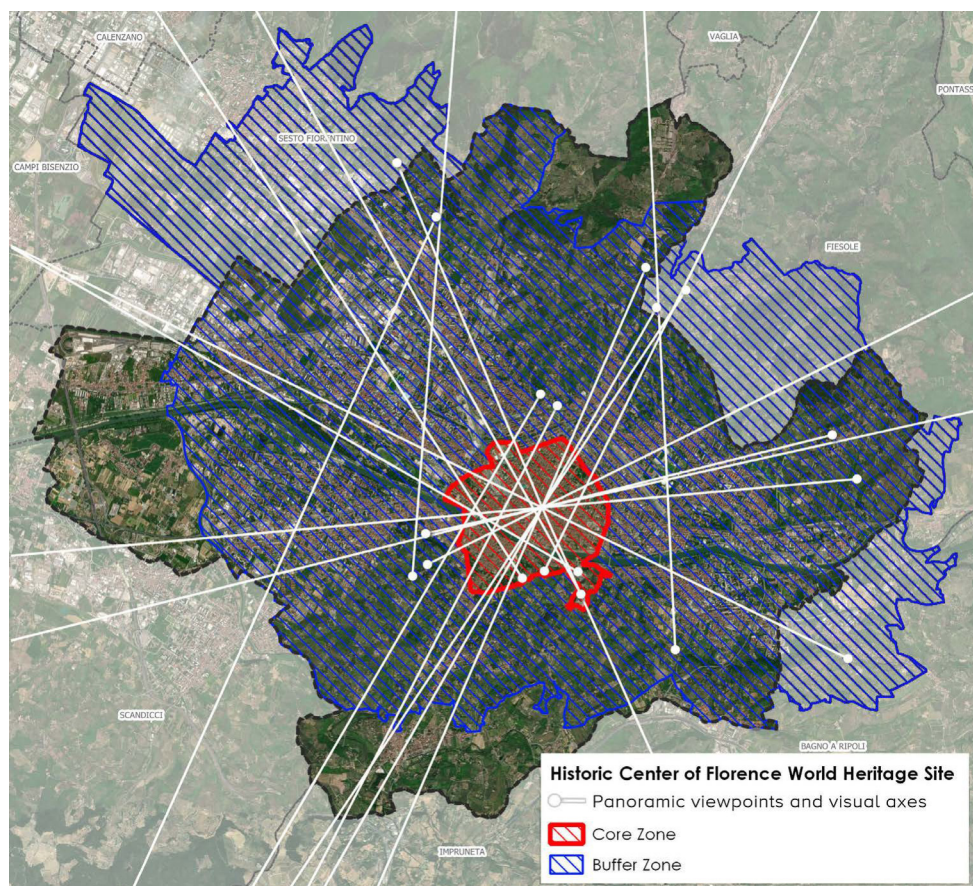


Figure 4: Core Zone and Buffer Zone of the Historic Centre of Florence World Heritage site with the eighteen panoramic viewpoint.

4. The process of amendment to the ‘Variant to the Technical Rules of Implementation of the Structural Plan and Urban Regulation regarding the installation of photovoltaic and solar thermal systems’

In recent years, the municipal administration of Florence has been working on the development of new urban planning instruments - the Operative Plan (PO), formerly known as the Urban Regulation, and the Structural Plan (PS) - to align the municipal planning with the existing regional legislation, Regional Law 65/2014. In 2022, changes in national regulations and the growing attention within the European debate made it essential to prepare a variant to the urban planning instruments that would anticipate the update of the Operative Plan, scheduled for 2023. The aim was to quickly align the local normative provisions with the changing national and European framework.

4.1 What the variant proposal involves

The variant related to photovoltaic and solar thermal systems began its urban and environmental evaluation process in the summer of 2022, in compliance with the provisions of the superordinate planning instruments: the Territorial Address Plan (PIT),²² a tool of the Tuscany region with landscape planning value, and the Regional Environmental and Energy Plan (PAER).

The Structural Plan sets out broad principles that urban planning elaborates in detail, and therefore, the variant also involved this instrument. Specifically, through Article No. 11 of the NTA,²³ the Structural Plan indicates that the Operative Plan must ensure that neither photovoltaic nor solar systems are installed within the Historic Centre (Zone A1) or the UNESCO Core Zone.²⁴ It should also *'comply with what is indicated by the PIT in areas subordinate to landscaped constraints'*. Referring to Section 4 of the PIT, it states: *'The installation of energy production systems using photovoltaic and solar panels must be designed in relation to the characteristics of the building and the intercepted views, and should not involve mere placement of elements on the roof, in favor of appropriate integration, employing suitable technological solutions...'* While the indications from the PIT are mostly consistent with the previously mentioned Law 34/2022, they lack the important specification that exempts *'roofs made of traditional local materials'* from the obligation of integration.²⁵

²² Adopted by the Regional Council Resolution No. 58 of 02 July 2014, the Territorial Address Plan (PIT), with the same value as the Regional Landscape Plan, represents the instrument by which Tuscany pursues landscape protection, valorisation and promotion objectives (in line with the European Convention), in an integrated manner with the other territorial government instruments. The PIT serves an important function, as a reference framework for planning instruments at local level, and as a landscape regulation tool through the indication of protection measures aimed at safeguarding and enhancing the most important areas.

²³ Municipality of Florence Urban Planning Department, 2023, Technical Rules of Implementation of the Structural Plan Link: https://accessoconcertificato.comune.fi.it/trasparenza-atti-allegati/123766/PS_All_B_NTA_rev2023_signed_signed.pdf

²⁴ The extension of the Core Zone (approved by decision 44 COM 8B.56 during the 44th Extended Session of the World Heritage Committee in Fuzhou, China on 16 - 31 July 2021) was not succeeded by a modification of Zone A1 within the Urban Regulation of the Municipality of Florence, therefore the area subject to the minor boundary modification is not affected by the same protections present on the rest of the Core Zone since it does not coincide with the Zone A1 area. For this reason it is essential that Article No. 11 of the Structural Plan specifies that the constraint affects the area of the Core Zone, thus including the hilly area around the basilica of San Miniato al Monte.

²⁵ Law 34/2022, Annex Amendments made upon conversion of D.L. 17 of 1 March 2022, Article No. 9 Link: <https://www.gazzettaufficiale.it/eli/id/2022/04/28/22A02680/sg>

A photovoltaic system is considered integrated when it does not overlap the pre-existing roof surface but the panels fully replace a portion of the traditional roofing elements on which they are installed.

4.2 Considerations regarding the safeguarding of Authenticity and Integrity

As mentioned earlier, the nature of the hilly terrain surrounding Florence and its visual relationship with the built elements of the historic center are fundamental factors contributing to the Authenticity and Integrity that led to the inclusion of Florence's Historic Center in the UNESCO World Heritage List in 1982. In particular, in the 2014 Retrospective Statement of Outstanding Universal Value, in the section concerning the site's Authenticity,²⁶ it is described as follows: *'The setting in which Florence is situated, surrounded by Tuscan hills and crossed by the Arno River, has remained unchanged over the centuries. The Florentines, aware of their architectural heritage, have been able to preserve the original construction techniques that involve the use of traditional building materials such as 'pietra forte,' 'pietra serena,' plaster, and frescoes [...]'*²⁷.

²⁶ Historic Centre of Florence UNESCO World Heritage site, Authenticity full text: The setting of Florence, surrounded by the Tuscan hills and bisected by the Arno River, has remained unchanged throughout the centuries. Florentines, aware of their own architectural past, have been able to preserve original building techniques with traditional building materials such as 'pietra forte', 'pietra serena', plasterwork, and frescoes. The Historic Centre of Florence has safeguarded its distinguishing characteristics, both in terms of building volume and decorations. The city has respected its medieval roots such as its urban form with narrow alleyways, and its Renaissance identity, exemplified by Palazzo Pitti's imposing structure. These values are still appreciable within the historic centre, notwithstanding the 19th-century transformations undertaken during the period in which Florence served as the capital of Italy. Unique Florentine handicraft and traditional shops in the historic centre are a concrete testimonial to the local past. Thus, they guarantee continuity for an outstanding tradition perpetuating the historical image of the city.

²⁷ UNESCO, Adoption of Retrospective Statements of Outstanding Universal Value, Draft Decision 38 COM 8E, Doha 2014, 92-94Link: <https://whc.unesco.org/archive/2014/whc14-38com-8E-eNo.pdf>



Figure 5: Balance between green areas and terracotta roofs in the Florence Municipality area.

The safeguarding of the Authenticity of a cultural property, among other things, involves the preservation of its traditional building materials. In Florence, among these, we recognize the terracotta elements - particularly the ‘coppì’ and ‘embrici’ tiles - that traditionally compose the roofs of the historic center, large parts of the surrounding areas, and the hilly regions.²⁸

²⁸ In the specific case discussed in this paper, the focus was on the brick elements used for roofing, but the same considerations could apply to other traditional materials and a plurality of interventions on the historic building. Indeed, the preservation of a site’s Authenticity concerns form and design, use and function, traditions and techniques, materials and substance in their broadest sense. Remaining in an area related to the present research, among the World Heritage historical centres that owe the preservation of Authenticity to the construction material of their roofs we can mention the Historic Villages of Shirakawa-go and Gokayamai (Japan, inscribed in 1995) and the Trulli of Alberobello (Italy, inscribed in 1996).

4.3 Office of Florence World Heritage and Relations with UNESCO observations on the variant proposal

Following this consideration, in July 2022, the Office of Florence World Heritage and Relations with UNESCO, part of the Municipality of Florence, raised its observations to the Urban Planning Department regarding the ‘Variant to the Technical Implementation Rules of the Structural Plan and Urban Regulation concerning the installation of photovoltaic and solar thermal systems’.²⁹ The Office emphasized how the request for integration of photovoltaic panels into the roof’s slope - proposed by the PIT for all areas subordinate to landscaped constraints - could lead to the loss of traditional building materials and potentially, in the near future, their replacement with incongruent elements. This would result in the loss of roof uniformity, the harmony of the urban context, and consequently, affect the perception of Florence’s Historic Center from the viewpoints, compromising the site’s Integrity.³⁰

The disincentive towards the practice of integration did not aim to completely prevent the installation of photovoltaic panels but rather to allow their mere placement on the terracotta roof to preserve the traditional elements and facilitate a more straightforward and cost-effective installation. In any case, since these installations would occur in areas subordinate to landscaped constraints, the project for installing the photovoltaic system would be subject to the binding opinion of the Superintendence under the Code of Cultural Heritage and Landscape. The Superintendence would assess that the simplification of the technological project does not result in excessive visual impact.

²⁹ Variant to the Technical Rules of Implementation of the Structural Plan and Urban Regulation concerning the installation of photovoltaic and solar thermal systems | Verification of submissibility to Strategic Environmental Assessment and screening of impact assessment (Regional Law 10/2010 Articles No. 22, 23 and 73ter).

³⁰ Historic Centre of Florence UNESCO World Heritage site, Integrity full text: The Historic Centre of Florence comprises all the elements necessary to express its Outstanding Universal Value. Surrounded by Arnolfian walls that date to the 14th century, the city includes the ‘quadrilatero romano,’ which is made up of the present Piazza della Repubblica, the narrow, cobblestone streets of the medieval city, and the Renaissance city. The urban environment of the historic centre remains almost untouched and the surrounding hills provide a perfect harmonious backdrop. This landscape maintains its Tuscan features, adding to its value. Many of the threats to the historic centre relate to the impact of mass tourism, such as urban traffic air pollution, and of the decreasing number of residents. Natural disasters, specifically the risk of floods, have been identified as a threat to the cultural heritage and landscape. The 2006 Management Plan addresses this concern by defining emergency measures to be taken in the case of flooding.



Figure 6: Solution required by the PIT and in the variant: integrated solar panels involving the dismantling of a traditional roof portion.



Figure 7: Alternative solution: solar panels overlapping the existing roof, allowing the integrity of the roof and its traditional materials to be preserved with a very modest elevation of the whole.

An additional recommendation suggested by the Office to the Urban Planning Department to support this process and the drafting of the variant was to consider implementing the Heritage Impact Assessment (HIA) within the evaluation processes, applying the Preliminary Assessment Model developed by the joint Heritage and Research laboratory³¹ specifically for Florence's

³¹ The Heritage and Research laboratory, HeRe_Lab, is the joint laboratory, set up in 2015, between the Florence World Heritage and UNESCO Relations Office of the City of Florence and the departments of the University of Florence: DIDA (Department of Architecture), DAGRI (Department of Agricultural, Food, Environmental and Forestry Science and Technology) and DISIA (Department of Statistics, Informatics and Applications), and the involvement of individual members of SAGAS (Department of History, Archaeology, Geography, Art and Performing Arts) and DISEI (Department of Science for Economics and Enterprise). The laboratory, coordinated by Giuseppe de Luca and Carlo Francini, is composed of a multidisciplinary team and carries out research activities with the aim of defining plans and projects dedicated to the safeguard, conservation and valorisation of the Outstanding Universal Value of World Heritage Sites by identifying shared solutions for the conscious and sustainable management of tangible and intangible cultural, natural and landscape heritage Link: https://www.firenzepatrimoniomondiale.it/here_lab-heritage-research/ HeRe_Lab is recognised as good practice at national and international level: in particular, in 2017 it received the appreciation of the UNESCO/ICOMOS Advisory Mission in Florence, while in 2021 it was included in the PANORAMA - Solutions for a Healthy Planet platform (jointly coordinated by ICCROM, ICOMOS and IUCN) as an emblematic example of governance of a World Heritage site. Link: <https://panorama.solutions/en/solution/herelab-joint-heritage-research-lab-management-world-heritage-property-florence-italy>

Historic Centre.³² The HIA methodology, another tool for implementing the HUL approach, is based on the *Guidance on Heritage Impact Assessments for Cultural World Heritage Properties* developed by ICOMOS International in 2011 and can be used as a method for assessing the potential impacts of development actions or transformation projects with the aim of proposing mitigation measures to reduce the possible negative effects on the OUV of a World Heritage site. The HIA is akin to the existing Environmental Impact Assessment (VIA) and Strategic Environmental Assessment (VAS): procedures used to ensure environmental sustainability concerning changes to projects, policies, and urban plans - however, unlike these methodologies, HIA is not legally binding (Francini C., Montacchini A., Scuto L. R., Tanturli C., Vannucci G., 2022). In the Florentine context, the *Preliminary Assessment Model* has recently been incorporated into the Municipal Operative Plan (PO), adopted on March 13, 2023.³³ This model should be utilized both at a political and procedural-technical level, particularly for guiding interventions involving the transformation of the city's skyline based on the viewpoints identified.³⁴

³² HeRe_Lab, curated by Francini C., 2019, Appunti per un modello di Valutazione di Impatto sul Patrimonio (HIA), Firenze Link: <https://www.firenzepatrimoniomondiale.it/progetti/heritage-impact-assessment-hia/> The model designed by HeRe_Lab is currently being used for the Heritage Impact Assessment of Pier Luigi Nervi's Artemio Franchi Stadium renovation project (the competition was won by Arup studio, with David Hirsch as chief architect) on the Historic Centre of Florence site.

³³ Adoption of the Structural Plan and Operational Plan by the City Council on 13 March 2023, by DC/2023/00006.

³⁴ Specifically, this Model was used experimentally by the Florence World Heritage and Relations with UNESCO Office, in accordance with the Municipality of Florence, during the past years to monitor the refunctionalising interventions of large complexes and abandoned areas within both the World Heritage site and its Buffer Zone. For example, since 2021, an HIA process has been underway for the redevelopment of the Artemio Franchi Stadium, originally designed by Pierluigi Nervi. Some guidelines recommended by the Florence World Heritage and Relations with UNESCO Office have been included in the competition notice promoted by the Municipality of Florence. Currently, the comparison between the winning team of the competition and the same Office is ongoing in order to facilitate the definition of the project in compliance with the OUV of the World Heritage site.

4.4 Counterclaims of the Urban Planning Department

In response³⁵ to the observations made by the Florence World Heritage Office, the Urban Planning Department argued that the existing methods are sufficient to mitigate the potential impact of the variant, so as not to require the specific use of the HIA in their opinion. Regarding the installation methods of the panels, the Urban Planning Department deemed it necessary to fully adhere to the provisions of the PIT as the superior instrument, thereby maintaining the obligation to integrate the panels and consequently dismantle portions of the traditional roofs in areas subject to landscape protection. This decision was made despite acknowledging the concern that significant roof portions will need to be removed and recognizing that the rapid advancement of panel technology will likely render the PIT requirement outdated in the near future.

The variant to the technical rules for the implementation of the Structural Plan and Urban Regulations concerning the installation of photovoltaic and solar thermal systems was adopted in November 2022 and took effect on May 3, 2023.³⁶

5. Conclusions

As a result of the drafting of the variant under consideration, the operative approach towards local urban transformations has revealed a ‘deficiency’ in the provisions of a supra-local tool, the PIT, which lacked a comprehensive reception of the national regulations and an ad hoc regulation for the protection of historic centres that is mindful of the recommendations on the Historic Urban Landscape.

The experience of the Historic Centre of Florence can be considered a positive example of how studies and research on the territory, additional levels of safeguard (such as the identification of the Buffer Zone of the World Heritage Site) and international conventions and recommendations can be incorporated and implemented within the existing municipal regulations - the

³⁵ Observations and counter-deductions can be found in the following document: Town Planning Department of the Municipality of Florence, variant to the Technical Rules of Implementation of the Structural Plan and Urban Regulation concerning the installation of photovoltaic and solar thermal systems, Technical Reports, Annex A, pp. 72-73
Link: https://accessoconcertificato.comune.fi.it/trasparenza-atti-allegati/143233/All_A_RelaUrbaRappAmb_VarFTV_Approv_2023sg100807_signed_signed_signed.pdf

³⁶ In accordance with Article No. 32 Regional Law 65/2014, following publication of notice in Burt No. 18.

effective integration of HIA into the territorial governance tools is a unique exemplum in the Italian panorama. Despite this, there remain objective difficulties in the application of the UNESCO World Heritage Centre recommendations and in the correct and effective use of the HIA, which proves to be a pragmatic approach with non-systematic utilization to date. Therefore, in the immediate future it will be necessary to evaluate within the site's governance the opportunities related to a concrete and effective application of the HIA, as well as a proper dissemination of the values related to the recommendations on HUL. Additionally, there should be a consideration of how the Management Plan should harmoniously interact with the local urban planning instruments, aiming for an integrated management of the entire World Heritage site: an urban planning capable of interpreting, integrating and pursuing the Outstanding Universal Value.

With their typical value-based approach to heritage, the UNESCO conventions and recommendations offer the opportunity to better understand the relationships between heritage, city, territory, environment and community, putting to the background a merely constraining approach that, by itself, cannot guarantee the safeguarding and preservation of a World Heritage site.

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List of acronyms

D.C.C. - Municipal Council Resolution
D.L. - Decree-Law
D.Lgs - Legislative Decree
HIA - Heritage Impact Assessment
HUL - Historic Urban Landscape
L.R. - Regional Law
NTA - Technical Rules of Implementation
PAER - Regional Environmental and Energy Plan
PIT - Territorial Address Plan

PNC - National Plan for Complementary Investments
PNRR - National Recovery and Resilience Plan
PO - Operative Plan
PS - Structural Plan
VAS - Strategic Environmental Assessment
VIA - Environmental Impact Assessment

With regard to technical terminology, please refer to the Italian system.

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Starting with a systemic understanding of cultural heritage, climate-change related urban transformation processes are analyzed through a multi-disciplinary lens and methods that blend the arts, humanities, and sciences. Governance-specific topics range from relevant cultural markers and local policies to stimulate resilience, to a typology of heritage-related governance and the vulnerability of historic urban landscapes. A variety of contributions from the Americas, Asia, and Europe describe and analyze challenges and potential solutions for climate-change related urban transformation and the role of cultural heritage. Contributions focusing on innovation, adaptation, and reuse introduce the concept of urban acupuncture, adaptive reuse of industrial heritage, and how a historical spatial-functional network system can be related to a smart city approach. The potential role of cultural traditions for resilience is analyzed, as is the integration of sustainable energy production tools in a historic urban landscape. Examples of heritage-based urban resilience from around the world are introduced, as well as the path of medium-technology to address climate adaptation and prevention in historic buildings. The contributions emphasize the need for an updated narrative that cultural heritage can also contribute to climate adaptation and mitigation.

Matthias Ripp, a senior heritage manager with a background of historical geography, is coordinating the “Old Town of Regensburg with Stadthof” site. He is active in numerous networks such as Heritage Europe and ICOMOS. He coordinated the EU HerO (Heritage as Opportunity) project and chairs the UNESCO world heritage working group on historic city centres of the German Association of Cities. Since November 2011 he has also been regional coordinator for the North West European and North-American region of the Organisation of World Heritage Heritage Cities (OWHC), is teaching at different Universities and works as a trainer, facilitator and consultant.

Christer Gustafsson, Ph.D. is Full Professor in Conservation at Uppsala University, Sweden. Currently, he is engaged as a member of the UNESCO Culture 2030 Indicators Expert Facility, an international expert group working with indicators for the United Nations’ Sustainability Goals (Agenda 2045), Secretary-General for ICOMOS International Scientific Committee on Economics of Conservation as well as Chairman for EIT Culture & Creativity strategic topic group for Innovative, entrepreneurial and circular adaptive re-use of cultural heritage.