



*La riqualificazione degli scenari notturni nel borgo di Fontecchio (AQ), by Di Giorgio S., Munzi C., Paglione M., Sciandra.*

# The urban lighting in the rehabilitation of the minor historical centre The design scenarios for the architectural valorisation and the energy efficiency improvement of the urban environment

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## ABSTRACT

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In the last decades, the topic of lighting of the historical minor centres is taking a prominent role in the cultural debate on the urban recovery interventions, because of the development of a greater awareness of the regenerative potential role that a careful planning system of urban lighting can take in this context.

The latter, which had a purely functional role in the past, has recently taken a figurative and emotional role, associated with the vision of the urban light scene during the night and its valorization.

The study of light, therefore, has inevitably turned into an instrument of knowledge and critical interpretation of the urban spaces, aimed both to functional recovery of the lighting network technology, and the regeneration of the urban image and its night scenes.

The needs that this sector should satisfy are multiple and, sometimes, conflicting: the need for road safety, the reduction of light pollution, the need for energy and cost savings.

The research aims to define an operative methodology to deal with the light planning in complex contexts as the minor historical centers, in which the concept of transformation of the urban scene clashes directly with the concept of preserving the identity features of the places and its constructive values and materials.

Among the goals, there is therefore the aim of highlighting the main gaps in the network, due both to plant engineering reasons and to the obsolescence of the existing lighting fixtures.

We operatively work in the urban voids system field, as spaces that characterize the urban scene. Through the knowledge of their dominant features it is possible to preserve their identity and, at the same time, enhance their singularity, with a suitable lighting project, which requires the study of materials, colors and consumption.

The purpose is to promote an urban development, able to produce positive economic, social and cultural effects, oriented to improve the quality of life, as well as to value the architectural and environmental heritage giving importance to energy and economic saving.

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## KEYWORDS

*Urban lighting, minor historical centres, night scenes regeneration, compatibility*

## 1. INTRODUCTION: THE HISTORICAL CENTRES AND THE LIGHT PROBLEM

The urban fabric of the minor historical centres that characterize the Italian Apennine mountains, as well as the Abruzzo Region, can be defined as an *architecture without architects* (May et al 2010). It is characterized by a sober language, which has preserved its character of unity over the centuries, result of the handing down of a practical knowledge from generation to generation.

The basic building of the historical buildings has generally a quite poor shape, characterized by the use of local natural materials, manufactured in an elementary way and set in place using simple constructive techniques (Ortolani 1961). The set of building fabric and open spaces constitutes a single network of historical, environmental, landscape and material culture values with the surroundings: they are the expression of the environmental value of the whole (Zordan et al 2002) architecture that integrates perfectly with nature and a spontaneous perfection that produces an organic and harmonious system, unique case by case.

Among the less investigated aspects within the minor historical centres there is the supply, the distribution and the consequent energy and services management and the way of integration of the plant elements in an urban landscape that, originally, was not created to host them.

Those that are usually identified as immaterial networks (Pazzaglini 2004) are now clearly and strongly recognizable within the minor historical centers, often giving rise to forms of architectural and figurative degradation, as well as inefficient plant engineering.

Among them, the electrical grid has contributed

much more than the other to determine the transformation of the landscape and the urban areas. The advent of electricity, in fact, has led to the rise of deep incompatibilities between its associated grid and the historical fabric of the minor building, born and developed in pre-industrial times.

In particular, the system of public lighting has contributed for decades to modify the perception of open spaces and urban scenarios (Schivelbusch 1994), as well as to create incompatibility with the historical fabric, bearer of values.

The historical built doesn't preserve its inheritance of contents related to the artificial lighting: initially it didn't represent a component within the construction rules, but it responded to an essentially pragmatic approach. Artificial lighting has been introduced for purely functional reasons and with very limited possibilities, allowed by use of torches or flame devices.

In this field there isn't an inheritance to preserve and protect: the new elements don't have, therefore, a past to refer and it can simply overlap proposing new contents to improve and value the existing buildings, giving new quality.

The failure of an exhaustive know-how development on the role of light in the definition of nocturnal identity of the historical centres, therefore, has given for a long time to the lighting the only function of visibility and road safety, neglecting the intrinsic potentialities of light to improve the perceptive quality of the built environment (Gugliermetti et al 2011).

It is necessary to differentiate between the concept of urban lighting and public lighting. The first is intended as a multidisciplinary issue that requires both a study of light on a subjective, psychological and emotional level, and a study of urban places on an objective level. The second one means the mere functional lighting of

outdoor spaces, responding only with regulatory requirements and its parameters (Bisegna et al 2010).

Just because of the multidisciplinary nature of the theme of urban lighting, the topic is not yet well detailed and not exhaustively defined: it ranges, in fact, from the rehabilitation and recomposition of urban spaces, the historical and aesthetic valorisation of the places, to the efficiency and energy saving problem, which leads to confer to urban lighting the role of sustainable development promoter.

## 2. A METHODOLOGY FOR THE REHABILITATION OF LIGHTING SCENES: OBJECTIVES AND NEEDS

This study aims to assign a fundamental role to light even in small contexts but rich in value, thanks to its ability to enhance the architectural singularity, emotionally characterizing the places, recreating the original spatial hierarchies, uniformity or differentiation, giving social relevance to the spaces .

Artificially lighting up means, in fact, taking into account also another vision of the historical built. The masonry texture, the plastic effects of facade elements, the characteristics of materials which have been used, are products of the incidence of light on the matter and of the variation of intensity and color temperature.

This makes the landscape that is fixed in the genius loci (Norberg-Schulz, 1979) where we can recognize the places and our belonging to them. Artificial lighting, therefore, cannot have content of uniform standardization, able to remove the difference and identity to historical heritage.

Our aim for the elaboration of a design methodology of small centres lighting is, other

than the reduction of the economic, energy and environmental impact of the intervention, the integration of the lighting system in the identity context.

The ancient contexts, rich in architectural and environmental values, don't bear invasive and standardised operations. They show, however, complex problems and offer an articulate range of solutions that operating in synergy give rise to the most suitable intervention.

A brave recovery of meaning and importance of the project is required: it is the "only instrument able to respond to the heterogeneity and the specificity of the different contextual situations" (Zordan L. et al 2006), of the ability to act with different graduality on urban fabric, on open spaces and on built emergencies, highlighting the significant elements.

Therefore working on different levels at the same time is necessary: firstly providing a security lighting to ensure visibility within the urban fabric, by modulating the level of light intensity at the moment of maximum natural visibility. Secondly, allowing the punctual visibility of the buildings with original solutions of illuminance at the level of color temperature and orientation, so as to emphasize the formal and spatial contents of the object (Bianchi F. 1991).

Today there is a complete lack of balance of the nocturnal landscape of small historical centres, characterized by a discontinuous lighting, uneven lighting installations and architectural emergencies totally out of the surrounding context.

The aim is to develop an aware design methodology, that takes into account the following different approaches, both the technical and functional, and the figurative and emotional, linked by the compatibility of necessary interventions and of compliant solutions with the specific context of investigation.

The methodology considers every historic town as one and indivisible, whose parts must be recognizable, but at the same time linked by a global vision. At the base of this approach there is the identification of the key elements and the logic of cohesion existing between them and the context (Bisegna et al 2010). Besides respecting the existing regulations, the aim is to develop a project of urban lighting that creates a new nocturnal urban identity, not discontinuous, which can enhance key aspects of the built landscape without altering the perceptible forms during the day.

Further impetus to the design is given by the current need to obtain an efficient illumination, able to guarantee the same performances with a lower energy consumption, thanks to the recent development of innovative technologies.

The developed operative methodology is therefore based on the following phases:

- Fact-finding investigation of the current regulations (national, regional and municipal), in order to identify the compliant solutions with the objectives proposed : the light scenarios enhancement, energy saving, safety.
- In-depth knowledge phase of the historic centre, specifically about the functional, morphological and figurative analysis of urban spaces, the identification of the architectural space and the main categories, the analysis of the lighting network and its installations.
- Metaproject phase: identification of critical situations concerning categories of space and lighting system examined, with determination of homogeneous areas of intervention.
- Project phase: application of the compatibility process between the intervention context and the compliant solutions that leads to the development of design scenarios and the resulting final design.

## 2.1. THE REGULATORY FRAMEWORK AND THE CONTROL PARAMETERS FOR URBAN LIGHTING

From the legislative point of view, the urban lighting is not currently regulated according to common guidelines at national or international level, except for the part concerning the reduction of light pollution. About this latter, in fact, in Italy there are standards and recommendations dedicated since the nineties, both about the features of the constituent elements (sources and devices), and about the functionality and safety of the electrical design.

Recently the regions have developed some directives concerning instructions for the reduction of light pollution and energy saving, lacking in any case in terms of quality of the design phase.

In particular, the Abruzzo Region adopted Regional Law n. 12 of 3 March 2005 about urgent measures for the containment of light pollution and energy saving , which regulates the technical requirements and the methods of use of outdoor lighting systems, both public and private. The rule requires the choice of systems able to reduce the energy consumption and the realization of electrical plants not dispersing light in the sky, both to reduce the energy waste and to safeguard the darkness of the night sky, according to the guidelines of International Astronomical Union<sup>1</sup>.

The result of this lack of regulation, especially in the historical field, is a general situation of decay and technological disorder and the existence of planning errors due to the poor knowledge of the usable technologies.

Until now, therefore, for the urban lighting design, we have considered the main rules governing public street lighting at international and national levels<sup>2</sup>. In Italy, in fact, the Municipal Lighting Plan, introduced by the Italian Association of

Lighting is a basic tool for urban lighting design<sup>3</sup>. Being a not mandatory planning instrument, most of Italian municipalities has not yet proceeded to its adoption, although it represents an important support in the design phase.

It coordinates, in fact, different needs: the accuracy and functionality of urban lighting; the valorisation of open spaces and architectural emergences; the reduction of light pollution; the revamping of outdated equipment with the possible conservation of historical equipment; the energy saving. It is, therefore, a tool that allows to avoid errors in the realization of single lighting interventions, establishing a knowledge base to promote the integration of interventions in the context.

Regarding the aims of the urban lighting design, also in the case of minor centres, the main are the security, the containment of light pollution and the energy and cost saving, achievable through improvement measures of the energy grid.

Security is the parameter that arised the need of introducing the urban lighting. In this case the term security takes on a double meaning: road safety for drivers, as it is necessary to avoid the dazzling phenomena that ensure an adequate visibility of any obstacles; and public security, that is the physical and psychological safety of people and places in nightscapes, whose usability must be the same as the diurnal urban environments one (Gugliermetti 2011). At night, in fact, it is necessary to avoid the risk of criminal activities and vandalism at people or things, ensuring the visibility and the recognition of people and thus an appropriate level of luminance in the environment<sup>4</sup>.

Light pollution, instead, is a parameter which indicates the alteration of lighting levels in the nocturnal environment because of the introduction of artificial light. This phenomenon takes place when the light is scattered outside

of the areas where its function is required, as for example the light emitted by external lighting fixtures dispersed upwards, towards the the sky. It causes environmental damages, being a disturbing element for astronomical observations, and economic ones, because of the dispersion of light towards areas that do not need it. It is therefore an energy and economic waste, sign of inadequate urban lighting.

The national standard reference<sup>5</sup> sets the maximum intensity allowed in the upper hemisphere, depending on the territorial zone, and the higher average emission as evaluation parameters of light pollution.

Therefore, the respect of these parameters is a good rule in the planning phase, in order to limit the phenomenon, following expedients such as the reduction of the luminous flux towards the sky and the maintenance of lighting within the geometric shapes of the buildings, whereby the intervention concerns the lighting of vertical facades.

From the energy point of view, the field of public lighting is one of the most energivorous, because it is characterized by high power consumption and excessive waste. These are mainly caused by the generalized use of obsolete technologies with low efficiency, by inadequate or absent network control and by poor maintenance and retrofit interventions practically unimplemented. However, the reduction of costs and consumptions is possible, implementing initiatives for the replacement of old lighting fixtures with new LED lighting technology and through the introduction of intelligent management and control of public lighting system, which automatically regulate and turns off the lighting fixtures, according to the intended use of the illuminated areas and to any set time. These systems allow to achieve a high energy and cost saving, at the expense of higher costs of intervention, for which an

amortization plans should be defined.

## 2.2 THE OPEN SPACES AND THEIR FEATURES

In the dense urban system of small towns, the open spaces are the social and connective system of the built fabric, of which are complementary. The conformation of the open spaces varies from centre to centre, depending on the prevalent form: the geometric structure of the internal road network may accompany the urban margins with a linear profile, according to the prevailing soil arrangement, a curvilinear or orthogonal profile. The transverse paths with respect to the main axes, however, adapt themselves to the

performance of the ground profile taking the form of ramps or stairways (Rolli 2004).

In the centres of Abruzzo Region can be considered relevant open spaces not only confined spaces, generally understood as squares or places of relationship, but also urban spaces connecting various areas, the empty spaces arose after the earthquake of 2009, the margin space, meaning any kind of area outside

Figure 1.

The map of open spaces in the minor centre of Fontecchio (AQ). Design by Di Giorgio S., Munzi C., Paglione M., Sciandra S.



the historical built.

After defining the investigation field, a number of small towns included in the seismic crater of the in the province of L'Aquila<sup>6</sup>, it was possible to proceed with a classification of these spaces through an in situ season of surveys and an extensive photographic documentation.

In order to understand and examine the types of spaces, firstly we considered the morphological and functional features. The morphology identifies the physical-space of the settlement, which relates the size and the shape of spaces, particularly significant in the compact built of minor centres.

The functional survey identifies, however, the uses of spaces and the relationships between them, distinguishing between public and private urban open spaces.

The morphological and functional analysis allowed to define the kinds of prevalent space: the relationship spaces, such as squares and public spaces, which are spaces of varying sizes for collective use and for social grouping.

The morphology and development of the connecting spaces, which release the function of connective tissue of the urban system, is influenced by the settlement site characteristics and by the logic of buildings aggregation: covered ways, discovered ways or staircases. Finally the adjacent spaces and the empty spaces: the first, in most cases are private, such as courts, indoor gardens and vegetable garden; the second formed after the collapses and alterations due to the earthquake (Fig.1).

Bearing in mind the specificity of the topic, it is also carried out the perceptive analysis of space, depending on the characteristics of ways and sequence of the points of view as well as the landscapes partial views.

The recognition of spatial characteristics is aligned with the study of lighting network.

This analysis allows us to identify the type of equipment and light sources existing, their photometric characteristics, the maintenance status of the plant network and the level of correct lighting parameters.

All the previous analyses lead to the identification of the existing critical issues both at an illuminating engineering and installation level, as well as the formal incompatibilities with the built.

In the municipality of Fontecchio (Fig.2), in the Province of L'Aquila, it has been detected the distribution of the electrical grid and the spots lighting indicating the progressive number, the height and the Watt power.

Rough set data analysis has highlighted that the electrical distribution grid is mainly transmitted through overhead cables, apart from a little way in the ancient village.

In this little way the electrical grid is underground, in accordance with good engineering practice, in order to protect the safety and the longevity of the grid.

The evaluation of the electricity supply lines has highlighted a general state of obsolescence of the network and the luminous bodies, that request an upgrade according to the current legislation.

In general, it was noticed an insufficient level of lighting of many internal roads and open spaces; in San Nicola square, in the ancient village, there is an excess of electric cables, both overhead and on the facades, which provokes an evident decay of the public space.

The devices installed near the covered ways don't guarantee an adequate level of lighting, with regard to both safety of people and characterization of the elements themselves.

Dazzling phenomena, instead, occur close to the architectural emergency of the fourteenth-century fountain, where numerous illuminating bodies have been installed without a suitable

planning.

In the whole village the cables of the conductors and the steel wire ropes joints are often roughly hooked on the facades of the buildings, with a consequent figurative damage.

As regards the luminous sources, they are all sodium-vapour sources, mostly 70 Watts of power, except some spotlights used on some buildings of value ( the Church of Santa Maria della Pace, the abandoned Church of S. Nicola and porta Castello), that have a wattage that goes from 250W to 400W.

The temperature of the colour is indistinct and on warm tones on all the present devices.

The final effect is an accurate and irregular lighting, with little illuminated areas and an

inadequate color rendering.

Regarding the architectural emergencies identified, in fact, only public lighting allows a minimum nocturnal perception of their qualities, with an insufficient color rendering of the illuminated buildings.

Numerous road illumination devices don't have a glass closing, condition that provokes a reduction of the source life continually exposed

Figure 2.

The map of the existing electrical network in the village of Fontecchio (AQ). Design by Di Giorgio S., Munzi C., Paglione M., Sciandra S.



to temperature leaps and a premature decrease of the device efficiency, up to 70% less, losses due to the dirt stratified on the lamp. Some areas, therefore, are not sufficiently reached by the flux produced by the system, with the consequent decrease of the homogeneity of illumination.

The analysis of the spaces and the critical issues of the illumination system (Fig.3) leads to the identification of minimum unities of intervention, homogeneous areas associated by the same spatial and functional characteristics.

For each one the needs are defined and the objectives of the various phases of the productive process are rationalised (scheduling, planning, implementation, management and

maintenance), always taking into account the hierarchy and the connection between the parts.

### 2.3. THE DESIGN OF LIGHTING SCENARIOS

After the identification of critical issues and needs of the different spatial categories, the recognition of project actions is based on the choice of solutions that conform with the context of investigation, among the compliant solutions resulting from the state of the art. For every type

Figure 3.

*Analysis of lighting network critical of Fontecchio (AQ). Design by Marchionni C.*



of scenery there are both statutory requirements, resulting from the rules or from specific classes of needs, and voluntary requirements, which define an additional level of quality in addition to the bare minimum level, dictated by statutory requirements. These are for example the need to improve the comfort, the quality of life, the balance between natural and human systems, the energy saving.

The design approach developed is based on the assumption that the center has its own nocturnal image so, in order to respect both the nocturnal and diurnal identity of the places, it is necessary to define a system of hierarchies and differences between all the elements that compose it.

For each spatial category identified in the knowledge phase, open spaces of relationship, connecting spaces, urban voids, margin spaces, as well as historical systems, historical and architectural buildings and monuments, corresponds the definition of a concept, and thus of a luminous scenario that respects the mentioned requirements concerning lighting (Fig. 4).

It is essential, in defining these scenarios, to consider lighting as a cultural factor, even before a technical one and to evaluate the effective diurnal and nocturnal environmental impact through the light intensity, the color rendering in relation to building materials, the effects of shadow, the visual impact of the elements and their integration in the context.

In the theme of urban lighting, the primary requirement is to illuminate open spaces, individual facades of historical and architectural buildings, emphasizing the lighting on some elements, in order to create visual hierarchies and connections, also on the basis of scenographic reasons.

In the historical centres, however, the use of chromatic effects or impactful lighting fixtures

should be avoided, because it can alter the perception of the different architectural elements of relief.

In addition, in every identified field, particular attention needs to be paid in the design phase to the features of the devices and the light sources to adopt, on the basis of features such as color temperature and color rendering. In the first stage of defining the scenarios, methodology

#### Figure 4.

*Identification of critical situations and strategies of the open spaces of Fontecchio (AQ). Design by Di Giorgio S., Munzi C., Paglione M., Sciandra S.*

Contesto interno al nucleo storico		CRITICITÀ PRINCIPALI RILEVATE NELL'AREA IN ESAME		Modalità di intervento	Obiettivi da raggiungere
<p><b>Ob. 1</b> MIGLIORAMENTO DELLA SICUREZZA STRADALE E LA PUBBLICA INCOLUMITÀ.</p> <p><b>Ob. 2</b> MIGLIORAMENTO DEL COMFORT ABITATIVO E DELLA QUALITÀ DELLA VITA.</p> <p><b>Ob. 3</b> MIGLIORAMENTO DELL'ASPETTO ESTETICO DEL BORGO.</p> <p><b>Ob. 4</b> RIDUZIONE INQUINAMENTO LUMINOSO.</p> <p><b>Ob. 5</b> RIDUZIONE DEI CONSUMI ENERGETICI.</p> <p><b>Ob. 6</b> OTTIMIZZAZIONE DEI COSTI DI ESERCIZIO E DI MANUTENZIONE.</p> <p><b>Ob. 7</b> ADEGUAMENTO RISPETTO ALLE DISPOSIZIONI LEGISLATIVE VIGENTI.</p>		<p><b>Cr.1</b></p> <p>Apparecchiatura luminosa inadeguata: Proiettore installato a muro della potenza di 250 W con lampada a vapori di sodio: -Bassa Resa Cromatica; -Apparecchiatura inquinante che disperde luce verso l'alto (non adeguatamente inclinato né schermato) -Sistema che non consente la giusta percezione notturna della qualità architettonica emergente; -Mancanza di elementi luminosi di accento.</p>	<p>Installazione di apparecchi luminosi idonei -scelta di sorgenti luminose ad alto rendimento a LED con indice di resa cromatica alto e Temperatura di colore compreso fra i 3000°-4000°K; -Inserimento di punti luce di accento che risaltano le peculiarità architettoniche; -scelta di effetti luminosi differenziati a seconda dell'elemento in esame</p> <p><b>Ob. 1 Ob. 2 Ob. 3 Ob. 4 Ob. 5 Ob. 7</b></p>		
		<p><b>Cr.2</b></p> <p>Surplus di cavi aerei: -Sistema di cavi elettrici aerei che attraversano l'intera area della piazza; -Sovrapposizione delle linee elettriche dell'impianto di illuminazione pubblica di distribuzione Enel; - Le buone norme consigliano sistemi interrati per le linee elettriche sia per una migliore sicurezza che per una maggiore durata di vita.</p>	<p>Sistemazione e adeguamento della rete di distribuzione dell'illuminazione pubblica: -posizionamento linea elettrica all'interno di cavidotti interrati di almeno 60 cm; -realizzazione di pozzetti di derivazione in corrispondenza di ogni apparecchio luminoso previsto; -conduttura di risalita a parete per l'alimentazione dell'apparecchio.</p> <p><b>Ob. 3 Ob. 7</b></p>		
		<p><b>Cr.3</b></p> <p>Livello di illuminamento inadeguato: -Numero di corpi illuminanti insufficienti; -Interdistanza dei corpi inadeguata.</p>	<p>Installazione di punti luminosi con potenza, caratteristiche e interdistanze adeguate verificate da calcolo.</p> <p><b>Ob. 1 Ob. 2 Ob. 3 Ob. 4 Ob. 5 Ob. 7</b></p>		
		<p><b>Cr.4</b></p> <p>Assenza illuminazione adeguata nei passaggi coperti: -Le apparecchiature presenti in prossimità del passaggio coperto non garantiscono un adeguato grado di illuminazione sia in termini di sicurezza per gli utenti che in termini di valorizzazione e caratterizzazione dell'architettura del borgo.</p>	<p>Installazione di apparecchi luminosi: -Scelta di apparecchiature che caratterizzano i passaggi coperti e garantiscono un'illuminazione adeguata. -Alta resa cromatica; -Temperatura di colore sui toni del caldo;</p> <p><b>Ob. 1 Ob. 2 Ob. 3</b></p>		
		<p><b>Cr.5</b></p> <p>Riqualificazione urbana: -Sistemazione e rifacimento degli intonaci dissestati; -pulizia delle apparecchiature murarie in pietra delle residenze e del rudere della chiesa di San Nicola; -pulizia delle pavimentazioni, -installazione di sistemi di arredo urbano che favoriscano occasioni di sosta</p> <p><b>Ob. 2 Ob. 3</b></p>			
<p><b>CONTESTO GENERALE "intorno al nucleo storico"</b></p>		<p><b>Ambito spaziale "Strade interne"</b></p> <p>Strade interne a carattere prevalentemente pedonale.</p> <p>illuminazione a terra per garantire la corretta percezione del percorso.</p> <p>GERARCHIA DELLE LUCI, per intensità</p> <p>GERARCHIA DELLE LUCI, per temperatura di colore: dal caldo al neutral white</p>	<p><b>Ambito spaziale "Piazza"</b></p> <p>Piazza o spazio interno al borgo ben delimitati da quinte murarie.</p> <p>illuminazione a terra per garantire la corretta percezione della pavimentazione. illuminazione dal basso verso l'alto delle quinte murarie, in modo diffuso ed uniforme, al fine di sottolineare con la luce l'individuazione dello spazio piazza.</p>	<p><b>Ambito spaziale "Emergenza storico-architettonica"</b></p> <p>Elemento d'interesse storico architettonico. In questo caso delimita la piazza pur essendo percepita, per il suo stato di rudere, come parte dello stesso ambito spaziale.</p> <p>illuminazione a terra per garantire la corretta percezione della pavimentazione. illuminazione dal basso verso l'alto delle apparecchiature murarie, in modo continuo lungo l'intera lunghezza, al fine di evidenziare il volume dell'emergenza architettonica. illuminazione specifica per valorizzare gli elementi costruttivi d'interesse.</p> <p>GERARCHIA DELLE LUCI: luci d'ACCENTO</p>	

takes into account the distinction between the intervention context of the internal historic core and the margin context.

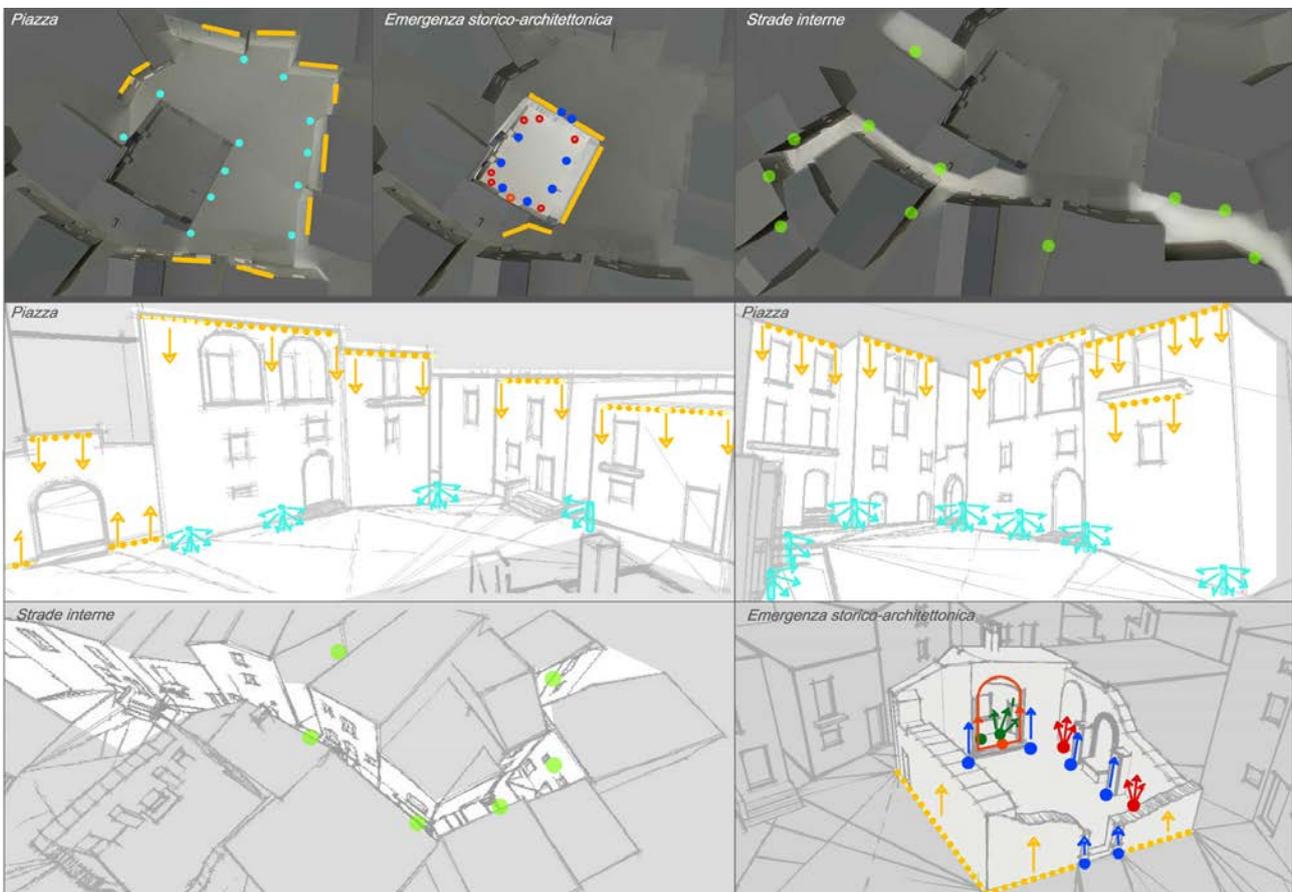
In both fields, dealing with the lighting of pedestrian and vehicular paths, the focus is primarily on the safety factor, ensuring adequate levels of illumination and uniformity on the ground, and accentuating perspective views and directions through the right amount of illumination. In this case, the color rendering is not essential, but it is however appropriate not to create excessive visual contrast, also with a view to the contemporary visual perception of any

other elements in the urban scene.

The scenery may change according to the type and level of importance attributed to the different roads in the hierarchy defined in the analysis phase. The main roads will thus be characterized by a greater emphasis than the minor roads that merge with them.

Figure 5.

*Lighting concept on the redevelopment of the church of S. Nicola in Fontecchio (AQ). Design by Di Giorgio S., Munzi C., Paglione M., Sciandra S.*



The lighting of pedestrian areas and streets, in this case, goes beyond the simple functional requirements, that refer to the values of horizontal and vertical illuminance, becoming the characterization tool of the type of scene and ensuring a correct identification of the ground path.

In the case of green spaces lighting, it is important to underline the characterizing and constituent elements (arboreal species, water spaces, etc.) and the geometric signs on the ground, in order to create suggestive nocturnal images, giving a safe perception of the paths.

Regarding the facades of the buildings inside the historical centre, with their function of urban scenes, the project scenario proposes an illumination that enhances the singularities of the buildings themselves, rather than a uniform illumination of the whole external facade.

However, the architectural features of the buildings should not be distorted, by placing incorrectly the light sources or exceeding with the light intensity, and the relationship between the elements should be maintained, emphasizing any remarks or openings on the surfaces. The placement of lamps on poles, on the ground, or on the surrounding buildings depends on the existing installation possibility and the compatibility with the built. In the particular case of historical and architectural emergencies, the methodological approach involves the creation of a hierarchy of formal, figurative and volumetric values, with the consequent introduction of some contrasts that create different levels of reading, based on the choice of points and directions of observation that must be emphasized (Gugliermetti et al 2011).

In this case the legislation is a support for the indication of the illuminance levels to ensure, depending on the type of material that is illuminated.

In the case of architectural elements or monuments is also important the consideration of the shadows: in fact, in order to avoid the creation of unwanted shadow zones in the initial design, it is often necessary to introduce corrective lights (Fig. 5).

Finally, the wall margin scenes of the historical centres, designed as the edges of the building development of the town, often characterized by the presence of wall houses, deserve a separate mention.

Though these elements are considered as interruptions of continuity, actively participate in the visual urban organization, because they hold together all the internal parts of the village. They will have a diffused and uniform light, able to allow a long-distance perception of the historical centre (Fig. 6).

During the design phase, it is necessary to control all the light parameters, and the correctness of the results achieved both from the technical-functional point of view, assessing their compliance to the previously described rules, and the perceptual and emotional one, also using specific modeling and lighting control software (Initial Fig. and Fig. 7).

### 3. CONCLUSIONS

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This study shows how essential it is to deal with the lighting of the historic village through a consistent rehabilitation of the urban context, considering it as a single organism, in which the problem lies in the subtle relationships that interconnect the parts and each part with the whole. Through the culture of design and the application of the proposed methodology, it is then possible to predict compatible and non-invasive interventions, able to enhance

the existing cultural contents, both specific contents of the object and those arising from its relationship with the context. The aim is to offer new emotional and suggestive contents without disturbing or altering the existing values. At the same time, it is important to model the light and make it flexible, in order to adjust the luminous flux, overcoming the rigidity and fixity of the uniform and predefined contributions; proposing, instead, the introduction of some components able to change their content and the specific values of intensity, color temperature, directional flow, etc..

Administrations and local communities are interested and involved in the valorisation of the

built environment through the night lighting, in an attempt to give new dignity to the environment through a more accurate reading of its assets throughout the whole day.

The tasks of the administrations is to control the phase of maintenance of the asset, which should be easily manageable by unskilled personnel, and to control the management stage that, for a better efficiency of the whole, should provide sectors with variable operation, with motion detectors able to activate illumination levels mutable as a function of time, in different hours of the night.

Figure 6.

*Concept and realistic view of the margins spaces of Fontecchio (AQ). Design by Di Giorgio S., Munzi C., M. Paglione, Sciandra.*

Figure 7.

*Lighting control of S. Nicholas square in Fontecchio (AQ). Design by Di Giorgio S., Munzi C., M. Paglione, Sciandra S.*

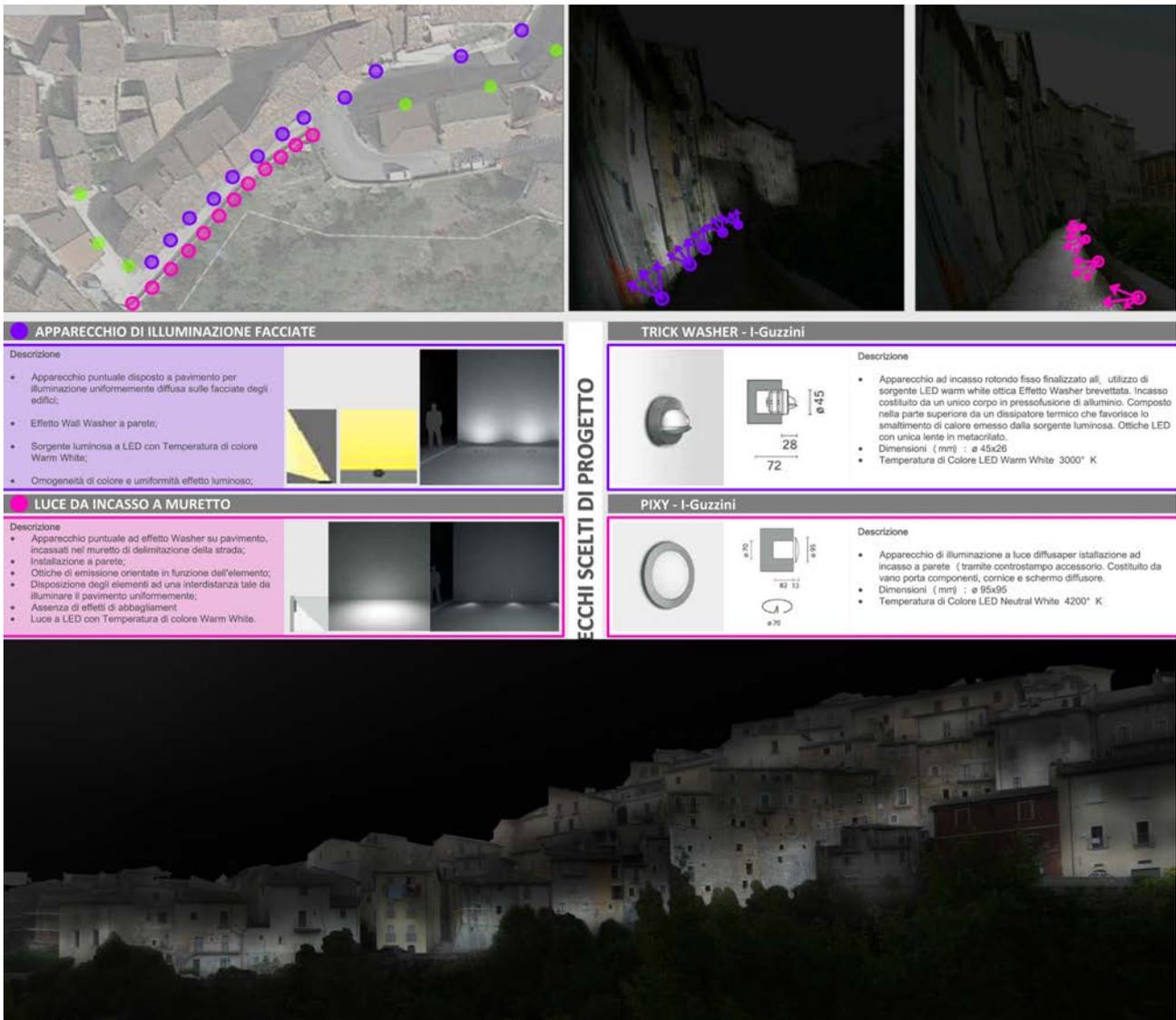


Figure 6.

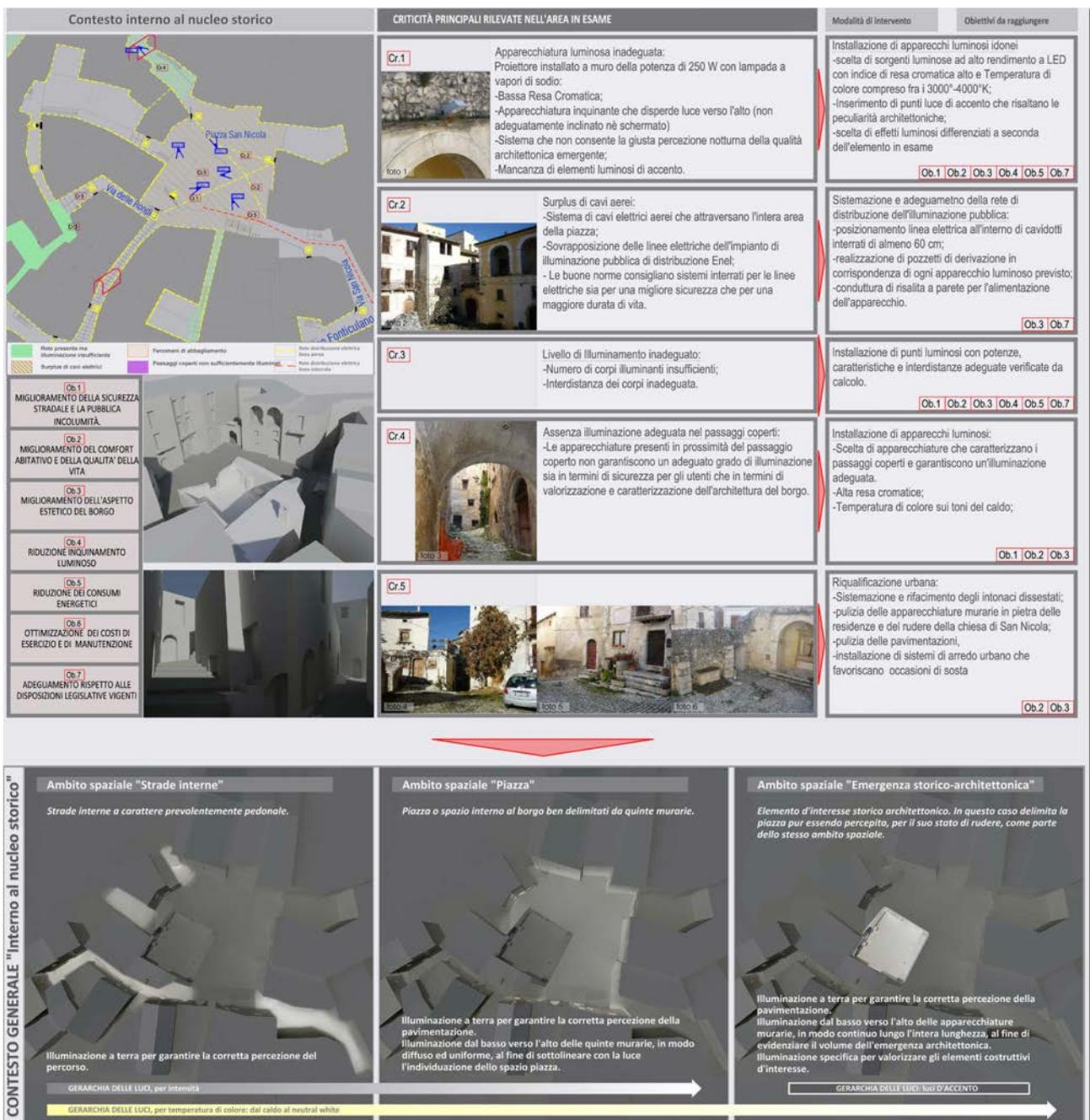


Figure 7.

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## ACKNOWLEDGMENTS

The project of lighting regeneration of open spaces of minor centre of Fontecchio (AQ) was developed by students Sabrina Di Giorgio, Chiara Munzi, Paglione Marina, Sciandra Silvano, within the course of Techniques of Production and Preservation of Building Materials, Professor P. De Berardinis, a.a. 2013-2014.

## NOTES

1. Civil protection and environment direction. Policies for sustainable development service, Regional investigate on the implementation of LR March 3, 2005 n. 12 "Urgent measures on light pollution and energy saving".
2. At European level, in order to develop and public the standards, the European Commission established the European Committee for Standardization (CEN) that in case of international standards is limited to the implementation of the same. In Italy there is the Technical Commission UNI Light and Lighting, which takes part in the Italian and European law, translating into Italian the standards issued by CEN and devising new ones.
3. The AIDI (Italian Lighting Association) publishes guides in order to make available the requirements and specify the methods of implementation. Among the objectives of the documents prepared by AIDI there is the definition of a general methodology for urban lighting, with the contribution of land regulation in the lighting field (PRIC), is one of the aim of the documents prepared by the AIDI.
4. The illuminance values are regulated by Standard EN 13201.
5. UNI 10816 - Outdoor lighting installations. Requirements for the limitation of the upward dispersion of the luminous flux.
6. The earthquake that struck the Abruzzo Region in April 6, 2009 has only aggravated an already difficult situation: the area defined as seismic crater occupies a portion of land of approximately 3000 square kilometers, comprising 57 municipalities, divided between the Provinces of L'Aquila, Pescara and Teramo.