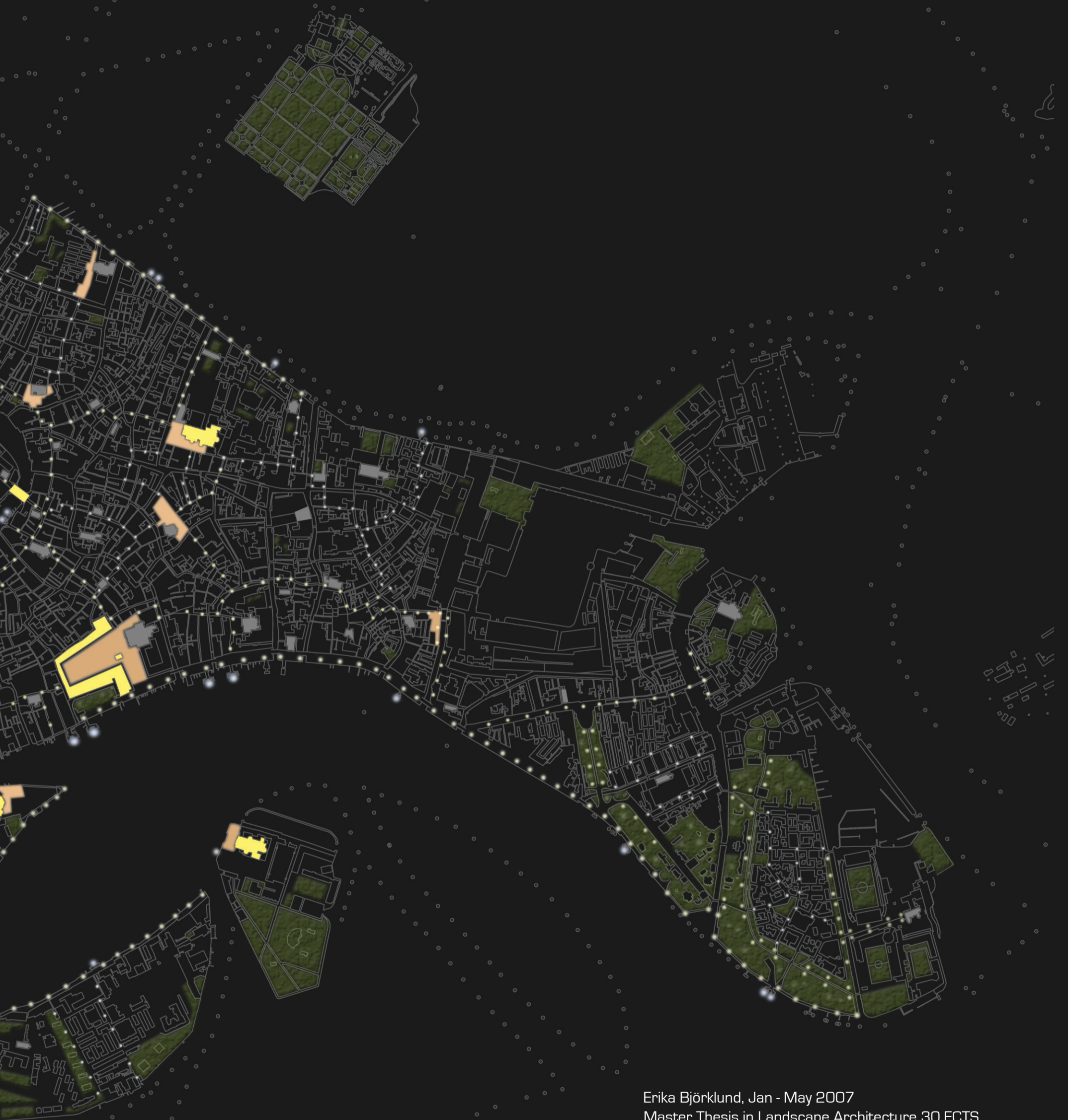


# URBAN REVITALISATION THROUGH LIGHTING DESIGN

*- Environmental Lighting Plan for Venice*



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Master Thesis in Landscape Architecture 30 ECTS  
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## PREFACE

This is my thesis in my Master Degree in Landscape Architecture at the Swedish University of Agricultural Studies in Uppsala. I have chosen to focus this last part of my studies on lighting design, as it is something I wish to learn more about. During a field trip to *Lights in Alingsås* in 2004 I became interested in lighting. After that trip I studied two lighting design courses in 2006, one called *Landscape Lighting* at the University in Jönköping and the other a workshop in Alingsås.

The thesis was done during an Erasmus exchange to the IUAV (Istituto Universitario di Architettura di Venezia) in Venice in the spring semester of 2007. I chose to do the project abroad in order to learn more about lighting and appreciate the differences between northern and southern European cultures.

## ACKNOWLEDGEMENTS

*Ylva Dahlman*, architect and Assistant Professor in graphic arts and design at the SLU, has supervised my work and helped me with the structure and content of the thesis. *Monica Säter*, Associated Professor and Doctoral Student in lighting design, and *Johan Rökländer*, Lecturer in Lighting Design, both from the Department of Lighting Design at the University in Jönköping, have given me advice about lighting. *Clas Florgård*, Professor in landscape architecture at the SLU, was the examiner together with *Marianne Lind*, landscape architect and lighting designer from Retea AB.

*Roberto Corradini*, lighting designer in Milan, gave me advice about lighting in Venice and feedback on my lighting proposal. *Marina Vio*, Professor in lighting design at the IUAV, tried to answer my questions about lighting in Venice. As Marina Vio only spoke Italian I was lucky to have *Franziska Kohner*, who could help me translate the parts I did not understand, together with other texts that were in Italian. *Steven Raman* gave me feedback on the text and corrected my English.

In addition, many thanks to the *International Department at SLU* for giving me the Erasmus grant and to *Kungliga Skogs- och Lantbruksakademien* and *Lennart Halls Stiftelse* for financial support during my time in Venice.



# ABSTRACT

## Urban Revitalisation Through Lighting Design

- Environmental Lighting Plan for Venice

Venice has a unique location in the Lagoon which dates back to the first century BC. It is thanks to this isolation that Venice has been able to evolve with success for centuries. Today, in contact with post-modern society, the former republic *La Serenissima* faces various problems. During the last 300 years, many changes have taken place to transform the original structure and use of the city. With the construction of the railway and road, which connects the archipelago to the mainland, access was made easier. The new link further meant an increase in tourism, a monoculture that is evident today when visiting the city. The steady reduction in population since the Second World War together with urban decay has meant that Venice feels like a museum of art and architecture. Historically, Venice was vivid but this former bustle can today only be traced during the day and in some parts of the city. An improved lighting system could encourage activity after dark, as well as it would improve the feeling of safety, enhance the aesthetic appearance of the city, reduce light pollution and save energy.

Artificial lighting was introduced rather early in Venice and today many of the original luminaries, which were constructed for gas, oil or incandescent have been restored or reproduced. This enables an impression suitable from a historic point of view, but the city is today over-illuminated and glare is frequent. The most commonly used light source is mercury vapour, a choice neither good for the environment or for the rendering of colours. There is currently no existing lighting plan but a law exists in an attempt to reduce light pollution and to protect the image of the city.

When planning lighting it is important to consider light distribution, light level, glare, reflexes, shadows and light colour. Our vision is based on contrasts and our ability to read three dimensional spaces improves if the gradient between light and dark is gradual. The difficulties of planning lighting for Venice are great due to its rich history and unique location, and also the conflicts that exist between different groups in society such as locals, tourists, professional workers, shop and restaurant owners and conservationists. These different users of the urban scene all have various needs which should be taken into account. At the same time the lighting should fit into context.

Through walks in the city during day and night I analysed the urban structure by the use of Kevin Lynch's five elements - nodes, paths, edges, landmarks and districts. This analysis formed the base for the lighting masterplan with guidelines which aims at creating harmonious and historically appropriate lighting. By applying different lighting techniques for these urban elements identity and *sense of place (genius loci)* could be created. Moreover, the guidelines attempt to reduce light pollution by a change in light sources and decrease the risk of glare. The light level in Venice should instead be lowered so that qualities such as shadows and reflexes could be appreciated through contrasts.

The Venetian square, *campo*, is the traditional meeting place in the city. The chosen site for the lighting project, Campo Santi Giovanni e Paolo, is a good representative for the campi in Venice as it is an enclosed space which is focused towards a main building. It is situated outside the most popular tourist area and is mainly a place where locals meet. Lively at daytime, the *campo* is lifeless after dark and its architectural qualities have disappeared. With an improved lighting, the hierarchy of the site could be emphasised upon and the striking image which hits the visitor at daytime could be further evident after dark. Greenery exists sparsely in the city and by illuminating the solitary tree seasonal changes would become apparent. The play between light and shadow would be evident in the foliage and on the ground beneath as well as on the canal where mirroring and reflexes could be appreciated through a decrease in light level. Together this represents an atmosphere which reminds of the one during the day. By placing pole-mounted luminaires that are cut-off on the far side opposite the church, the space would become further enclosed. After sunset it would still be possible to sit down and enjoy the features of the space.



# SAMMANFATTNING

## Urban förnyelse genom ljussättning

- Belysningsprogram för Venedig

Det som idag är Venedig var befolkat redan första århundradet innan Kristi födelse. På grund av sitt unika geografiska läge i lagunen har staden kunnat utvecklas på ett framgångsrikt sätt genom århundradena. I och med *La Serenissimas* anpassning till vårt post-moderna samhälle har en rad problem på senare tid uppstått. De senaste 300 årens förändringar har förvandlat den traditionella strukturen och användningen av staden. När järnvägen och vägen byggdes blev öriket tillgängligt från fastlandet, vilket bidrog till en ökad turism och monokultur som är påtaglig när man idag vistas i staden. Befolkningsminskningen har pågått sedan Andra Världskriget och har tillsammans med ett stadsmässigt förfall bidragit till att Venedig känns som ett museum. Historiskt sett var det en livlig plats, något som idag endast kan upplevas under dygnets ljusa timmar och i vissa delar av staden. Genom en förnyad ljussättning skulle förutsättningarna för rörelse och aktivitet förbättras, vilket i sin tur inger en känsla av trygghet. Förutom det är en lyckad belysning bra för stadens estetiska framtoning samtidigt som den kan minska ljusföroreningen och spara energi.

Flera av de armaturtyper som finns i Venedig idag härstammar från en tid då artificiell belysning först introducerades i staden. Dessa armaturer har återskapats eller nytillverkats vilket ger ett historiskt passande intryck. På den tiden användes gas, olja eller glödlampor, men för några år sedan gick över till kvicksilver som ljuskälla. Det kan inte anses vara ett bra val då det dels är skadligt för miljön samt återger färger på ett onaturligt sätt. Venedig är för övrigt överbelyst och bländning är vanligt förekommande. För tillfället finns ingen ljusplan för Venedig, men en lag har arbetats fram i ett försök att skydda stadsbilden och minska ljusföroreningen.

När man planerar en ljussättning är det viktigt att tänka på ljusfördelning, ljusnivå, bländning, reflexer, skuggor och ljusfärg för att åstadkomma ett lyckat resultat. Vår syn baseras på kontraster och när övergången mellan ljus och mörker sker gradvis kan vi bäst tolka rummets uppbyggnad. Venedigs rika historia och unika geografiska läge innebär vissa svårigheter när ett belysningsprogram ska arbetas fram. Samtidigt som belysningen ska passa i sitt sammanhang måste hänsyn tas till de olika brukargruppernas behov. Konflikter uppstår lätt när belysningen ska passa affärsinnehavares, arbetare inom exempelvis lokaltrafiken, lokalbefolkningens, turisternas och naturvårdares önskemål.

Med hjälp av Kevin Lynchs fem element - nod, stråk, gränser, landmärken och områden har jag analyserat Venedigs urbana struktur. Dessa element tillämpades på stadens beståndsdelar samtidigt som jag genom promenader skaffade mig en bild av hur staden används under dag- och nattetid. Ljusplanen med riktlinjer har baserats på denna analys och är gjord i ett försök att skapa en harmonisk och historiskt passande belysning som ska vara till glädje för både lokalbefolkning och besökare. Genom att använda varierande belysningstekniker för stadens olika element kan identitet och *sense of place* (*genius loci*) skapas. Förutom det är riktlinjerna skrivna så att ljusföroreningen avtar genom ett byte av ljuskällor samt minskad risk för bländning. Istället bör ljusnivån reduceras så att kvaliteter såsom skuggor och reflexer kan uppskattas genom kontraster.

Torget, även kallat *campo*, är den traditionella mötesplatsen i Venedig. Jag valde Campo Santi Giovanni e Paolo för belysningsprojektet eftersom det kan ses som representativt för de *campi* som finns i Venedig. Riktlinjerna för Venedig använde jag på torget i ett försök att visualisera hur den föreslagna belysningen kan komma att se ut. Campo Santi Giovanni e Paolo är omslutet av lägre byggnader och vänder sig mot en respektingivande kyrka, samtidigt som en kanal går längs ena kortsidan. Eftersom platsen ligger utanför de mest populära turiststråken är det i huvudsak en plats där lokalbefolkningen träffas. Torget är aktivt under dagtid, men när mörkret faller förlorar det sin livlighet och sina arkitektoniska kvaliteter. Genom att belysa kyrkan kan platsens hierarki förstärkas och den imponerande bild som slår besökaren dagtid, kan upplevas även då det är mörkt. Eftersom grönska är sparsamt förekommande i Venedig kan årstidväxlingarna göras tydligare med en belysning av trädet på torget. Spelet mellan ljus och skugga blir närvarande i löverket och på marken, tillsammans med de speglingar och reflexer som kan ses på vattenytan då ljusnivån sänks. Detta ger ett intryck som kan liknas vid den bild som uppträder på dagen. Torget ramas ytterligare in genom att stolpararmaturer placeras på långsidan mittemot kyrkan. Armaturerna är avbländade vilket gör det möjligt att sitta och njuta av platsen även då solen har gått ner.

## Reader's Guide

A list of used references is given at the beginning of each chapter or underneath headlines if the source of reference has changed. Whenever a quote has been used it is stated in the endnotes, likewise are those references that have only been used briefly.

The first two chapters contain a historical background of Venice. An analysis of Venice follows together with a description of what light is and how it has been used in Venice. The second part of the thesis is my proposal for the new lighting, which is presented together with plan drawings and images.



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## INTRODUCTION

In this thesis I have planned the overall lighting for Venice, with special focus on the square as a public space. The current lighting has been in use for a very long time and the reasons behind new guidelines and a lighting masterplan are many. Good illumination will make the city more attractive and sustainable, as it improves safety and security and makes it more aesthetically appealing for the people who use it. Evolution has meant that today's technology is more energy-efficient. Consequently, a review of the old luminaires and light sources is not only good for the economy in Venice, but also for the environment.

Venice has had problems with a continuous reduction in population ever since the Second World War. Only about a quarter of the maximum number of inhabitants remains today, resulting in many empty buildings and urban decay. As of today the city feels more like a museum than the vibrant commercial centre it used to be.

*Can improved lighting serve as a means of revitalising the city of Venice?*

Since Venice is a city with a remarkable history when it comes to art and architecture, it is especially important that the lighting fits into context, so that Venice is not transformed into an over-lit theme park. It is thanks to Venice's unique heritage and location that many people from around the world come to visit the city every year. When planning the lighting for such a city it is essential not to forget the people who live there permanently, different needs must be assessed, so that the new lighting fills its function.

*How can one develop a lighting plan for a city with a historical context, which respects the sense of place, and at the same time, takes the different needs of its inhabitants into account?*

The aim has been to develop a lighting masterplan with guidelines for Venice, which emphasises the hierarchy in the urban layout and highlights certain objects and paths in order to improve orientation. The lighting should respect the sense of place and make the city feel safer to walk in at night for everyone.

To visualise what it could look like when these guidelines are applied on a specific site, I made a detailed proposal for a square, *Campo Santi Giovanni e Paolo*. Completely pedestrianised, the squares are the traditional meeting places during the day, when they are full of life and activity. I anticipate that a new lighting for Venice can allure people to stay outside once dark falls and make the squares active at night. In turn, the increased human interaction would mean a greater feeling of safety.

*Could the campo once again work as a meeting place and establish an identity to the area?*

## METHODS

workshop "Lights in Alingsås" 2006:

I attended the yearly workshop in Alingsås in order to appreciate and practice how a lighting project should be developed, from the concept phase to implementation.

Inspiration:

During my semester in Venice I also undertook trips to Barcelona, Budapest, Krakow and Vienna. These cities are, in my opinion, "ahead" of Venice when it comes to lighting design and it was interesting and inspiring to see how the historical heritage was treated when in contact with the modern city.

Theoretical Studies:

The theoretical study included books, articles in magazines, internet resources and an Italian thesis. I also had contact with a professor in lighting design at the IUAV. I learnt how Venice was formed and problems which the city faces today and for the future. I also studied the history of lighting in Venice.

Analysis:

Apart from theoretical studies my analysis was based on observations and interpretations which I gathered through walks around Venice both during day and night. Together this formed my decision of determining an appropriate square to focus the detailed lighting project on. When I analysed the urban structure of Venice and the square I used the method of Kevin Lynch, where the city is based on five main physical elements.

Design:

Previously mentioned studies led to the development of a lighting masterplan. The guidelines helped create a connection and consistency through Venice. The chosen concept was going to be implemented on a public square in order to see how it would work in reality. However, lighting trials were not possible to organise both due to the lack of luminaires at the University and the unwillingness of companies to help students. Organising electricity also posed a problem. Instead, the design was developed through sketches and rendering in Photoshop. The result is also shown in plan view.

## STRUCTURE AND LIMITS

The thesis consists of two parts, the first part, a theoretical background study with a historical outlook and analysis and a second part, the environmental lighting plan with guidelines for Venice. The plan works as a guide for Venice in order to create a connection between different areas. The boundaries of the areas I worked with are shown on a plan drawing. The section also contains the detailed proposal for one of the many squares in the city, *Campo Santi Giovanni e Paolo*.



# Prologue Venice

La Serenissima - the Most Serene Republic  
The Golden Years  
The Construction of Venice  
The Architecture of Venice  
The Fall of the Republic



Rialto and Canale Grande.



Palazzo Ducale, the *piazzetta*,  
Libreria Marciana and the  
*campanile* in the background.



View from the *piazzetta* towards  
Canale Grande and Santa Maria  
della Salute.

# Prologue Venice

[References: Biocchi, E., and Pilling, S., *Venice: An Architectural Guide*; Goy, R., *Venice: the City and its Architecture*; Howard, D., *The Architectural History of Venice*, p. 19-21, 47, 55, 67-69, 78, 193-194; Italia Nostra, *Venice for Modern Man: Ten Centuries of History Face Modern Town Planning*]

## La Serenissima - the Most Serene Republic

The coastal region surrounding the lagoon is referred to as Venetia and was settled in the first century BC by the Romans. When the Empire's capital moved to Constantinople in 330, Venetia became a province of Byzantium. Geographically, Venice was strategically positioned in the centre of eastern and western civilisations. The Empire used it as religious and political tool.

As European troops continuously invaded northern Italy, people fled to the Venetian Lagoon for protection, inhabiting the area from the fifth century. The acclaimed site was protected from mainland attacks due to its location at sea, but because of its many scattered islands and sand banks it was hardly an ideal position for a future city. Most parts of the Lagoon were very shallow and it was difficult for anyone but the settlers themselves to navigate through. In the following decades the settlements gradually became more and more distinct and the communities grew increasingly independent from the mainland. This resulted in the election of the Doge, the head of the oligarchy, that occurred by the end of the seventh century. The stable government gave much strength to Venice as it bound individual and state together. *La Serenissima* became the motto of the Republic.

With a distance of three to four kilometres east of the mainland, the Realtine archipelago is situated in the middle of the Lagoon. To reach the Adriatic Sea, boats could cruise the meandering channel which stretched through the islands. It had the well-known S-shape and was to become the Grand Canal. Scattered in the archipelago were islands of different sizes and shapes, at first called *Rivo Alto* - high banks. A network of canals made the islands accessible, although the marshy area closer to the mainland was too shallow to traverse. The firmest and largest islands were the most appeal-

ing to early settlers. One area turned out to be of special importance for Venice's development, here the Grand Canal was at its narrowest point and where the islands on both sides were firm enough, Ponte di Rialto was built.

The secondary establishments in the archipelago were monastic institutions. They turned out to be very important for the structural form of the city. Almost all of them were built with proximity to water. The island-parishes formed a network over the city, establishing an important base for the urban structure.

In front of the church there was a grassed area called *campo* [square], and next to the church, but freestanding, was the bell tower, *campanile*. Surrounding the *campo* were the homes of the leading citizens of the parish. A well was placed in the centre of the square to provide fresh water through the sampling of rainwater.

Venice's street system is rather difficult to navigate through due to the fact that there is no relationship in the urban structure between the different island-parishes. The islands are separated by numerous canals and connected by bridges.

By the beginning of the twelfth century the population had grown tremendously and it was necessary to divide the city into districts, *sestieri*. There were three on either side of the Grand Canal, providing different functions to the city. The Republic's trading and market places were located in San Polo. San Marco is at its heart, traditionally forming the political and commercial centre. More than 100 islands form the historic centre in Venice, which is focused around the Grand Canal.

## The Golden Years

From the beginning, the future wealth of Venice relied on the trade with the East. Commerce flourished due to the region's contribution of ships and resources to crusading forces. After the fourth crusade in 1204 almost a third of the Empire was given up in favour for Venice.

Towards the fifteenth century Venice became an important mainland power, due to aggressive politics from the Doge of the time. This marks a period of great expansion when Venice was the wealthiest and one of the largest cities in Europe. Architecturally and culturally it is referred to as the *Golden Age*. The visual appearance became increasingly important, especially the Grand Canal. As buildings were transformed and new construction took place the look of the Grand Canal changed.

It was also during this period as the *scuole grandi* were established. The *scuole grandi* originated in the thirteenth century and played an important role in the history of architecture in Venice as they ordered some of the most prominent architects to enhance mainly the building's façades, in order to reflect their importance to the world. At the most there were seven *scuole grandi*. The point of the *scuole* was to improve the status of Venice, however, some rivalry existed between them and this explains the great architecture which was achieved. The *scuole piccole* were smaller than the *scuole grandi* and often represented religious or ethnic groups in the community. The *trade guilds* on the other hand, represented specific crafts. The majority of the population was incorporated in the *scuole* and *trade guilds*.



Map of Italy and the Mediterranean with the Veneto region marked.

## The Construction of Venice

Venice's unique conditions enabled new solutions to evolve. Three principles of construction were devised:

1. To build lightweight structures to avoid stress on the difficult subsoil of the Lagoon.
2. To build flexibly so that if settlement occurs, it would not harm the basic stability of the structure.
3. To ensure even loading, which otherwise could result in uneven settlement.

These three principles formed the motto for any type of construction in Venice. Large churches were especially difficult to construct. Since vaults and domes are sensitive to movement they are rare in Venice. They became more common in the Gothic period. Perhaps the *campanili*, bell towers, were the type of structures which were most difficult to construct. It was adjacent to the church, but not connected to it, and a lot of weight was concentrated in a small area. There were great problems to load the base evenly and through the centuries many towers have collapsed.

The primary material used for building was brick. It was manufactured in Mestre, across the Lagoon on the mainland, for several centuries. As the city expanded and got wealthier the image of the city and its monuments became important. It became essential to find a new material to decorate the buildings with. A suitable stone was found on Istria, on the peninsula across the Gulf. It is used all over Venice and forms a characteristic combination when used together with the orange-red bricks.

Marble was used for more prominent buildings and was imported from both East and West. The most commonly used type came from the Venetian city of Verona. It had an orange-red tone and used in combination with Istrian limestone it created a special contrast.

## The Architecture of Venice

The Venetian government was rather conservative and any change in architectural style came slowly. Although it followed the progress made in the rest of Europe architectural styles always had a distinctive Venetian look, with an eastern influence.

The Byzantine style is the foundation of Venice and it is where it lasted longer than any other place in Europe. The earliest existing examples were constructed in the seventh century. Several changes took place regarding politics and commerce during the following six centuries, which in turn affected the nature of the architecture.

From the ninth century and onwards the growing trade with the Islamic world could be seen in the architecture. Many buildings were decorated with mosaics, inlaid marble and carvings in a two dimensional manner, in contrast to the traditional high relief of Roman ornaments. During the Crusades undertaken by Venice an increasingly deeper knowledge of Islam was brought back. Following was a late Byzantine architecture, starting in the twelfth century, with an exotic touch of wealth derived from the Crusades. The Veneto-Byzantine style did not look like anything else in Europe.

It was not until the thirteenth century that the pointed arch started to drive out Byzantine forms. Gothic architecture had presented itself. During the same period many foreigners entered the city, thus changing its character with shops and newly formed religious areas, which gave the city a pictorial grace. The Gothic époque coincided with a time when Venice was at its most prosperous state, both regarding trade and population, and the architectural style dominated during the fourteenth and fifteenth century. The population reached its peak of 190000 inhabitants in the second half of the sixteenth century.

The first Renaissance designs appeared in the sixteenth century, together with town planning ideas. However, formal planning ideas had a limited impact on the existing organic form, due to the earlier mentioned conservatism from the government.

Several urban renewal projects were encouraged in the later part of the sixteenth century. Due to land shortages it resulted in governmental funded reclamation projects.

The Church was active through the reconstruction and modernisation of many churches. Santa Maria Formosa and San Michele were rebuilt. The Redentore and San Giorgio Maggiore made significant contributions to the image of the city as they demonstrate the desire to enhance and extend the heart of Venice. After nearly two centuries of renovation and building, the core of the Empire had developed into its definite form by the end of the sixteenth century.

The 'woodcut' by Jacopo de Barbari illustrates the urban structure of Venice in the sixteenth century, at a time when no major changes were made to the buildings and Guidecca had grown to be the largest island in the archipelago.



The pointed arc at *Palazzo Ducale*, where the play between light and shadow clearly can be seen.

## The Fall of the Republic

Politically Venice's power had weakened and without a monopoly on trade Venice's prime days were over and its influence and authority decreasing. Napoleon entered the Republic in 1797 and the former power gave up without a struggle. Napoleon had a number of changes in stall; the city was going to be modernised and cleaned from its Republican passed. Several canals were filled in and streets were widened in order to rationalise the organic urban fabric. The intention of improving traffic failed, as the filled in canals were hardly used anyway. An even worse problem was drainage which it caused when the outflow was impeded. Originally the tidal flows cleaned the city from waste water every day.

Napoleon soon changed the governmental system and planned a royal palace on the Piazza San Marco. San Marco was supposed to be the cathedral of Venice. Consequently, many scuole were closed and churches destroyed. Due to this break with tradition, many Venetian families left their houses causing several great buildings to fall into disrepair.

The railway was built within the next 50 years when Venice was under Austrian dominance, and the economy started to grow again. What came to be a success was tourism. The new train station, built in 1861, led to the construction of new bridges across the Grand Canal and improved access through the city was high on the agenda. An increasing amount of canals were filled in and a shift occurred between the different communication systems; streets and waterways. To further develop the link between the train station, Rialto and San Marco, streets were widened to improve the pedestrian networks.

Modernisation and industrialisation changed the scale of the city, but it also added a number of new building types around the historic centre. Development was no longer within its original limits and Venice spread to mainland areas. Access was made further possible by the completion of a new road parallel to the train tracks in 1932-33. With an increased number of vehicles in the centre there was an urgent need to provide parking. Instead of demolishing existing buildings an artificial island was created, Tronchetto. The new district has not only destroyed valuable greenery, but it looks quite out of place compared to the nearby picturesque urban form.



*Piazza San Marco with the Basilica,*  
Canaletto 1730



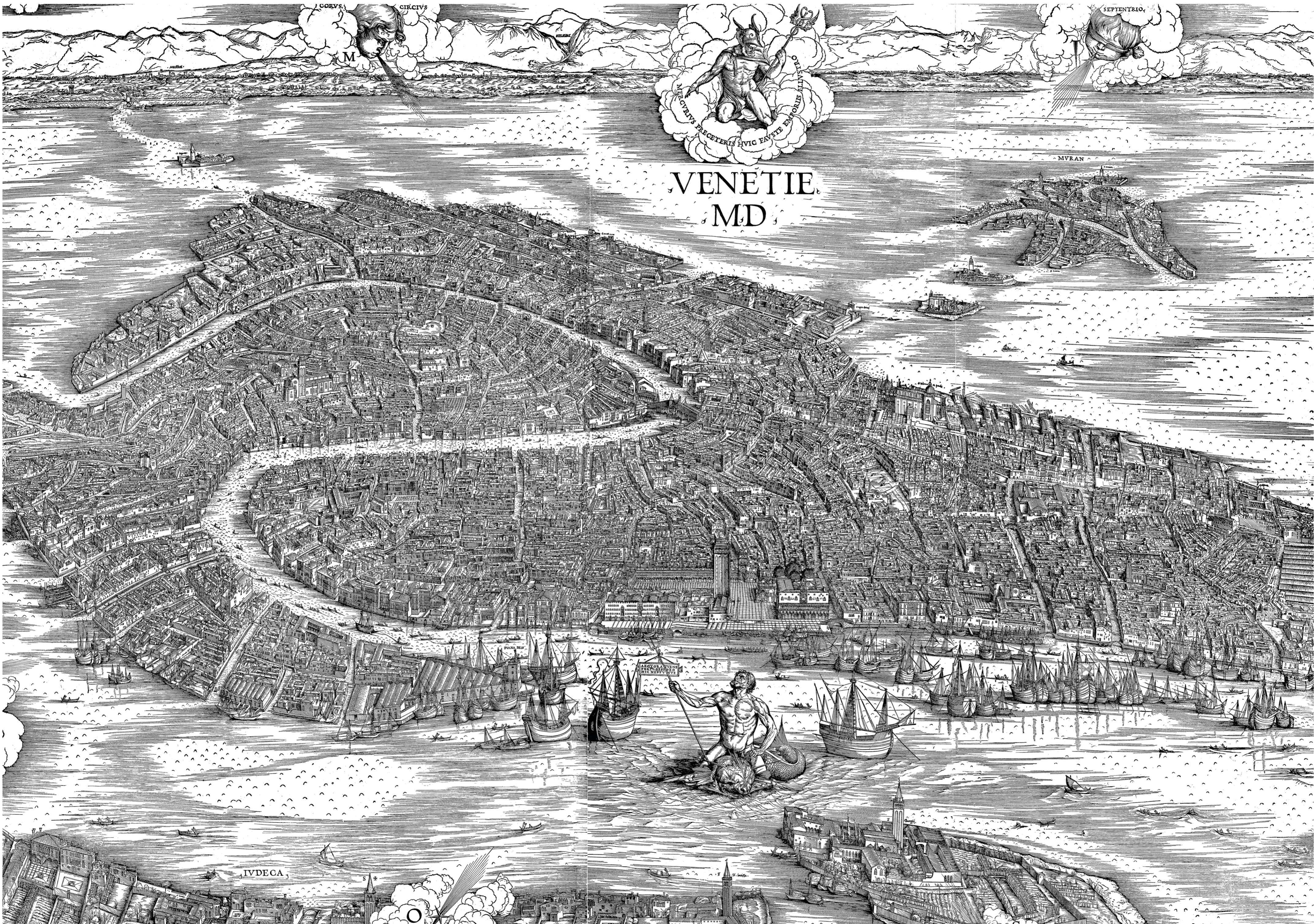
*The Bucintore Returning to the Molo on Ascension Day,*  
Canaletto 1740



*The Molo Looking West,*  
Canaletto 1730

*The 'woodcut' of Venice,*  
Jacopo de Barbari around 1500





VENETIE  
MD

IVDECA

SEPTENTRIO

M

CORVUS

CIRCVS

ASCOCLA VENENSIS  
SVC NIPPVS

MVRAN





Plan of Venice  
Scale 1:25000





# Problems of Modern Venice

Past meets Future  
Tourism  
Traffic and Pollution  
*Acqua Alta* - High Tides  
Urban Decay  
Tomorrow's Venice



View from Ponte dell'Accademia across Canale Grande.

Aerial photo of Venice, where San Michele, San Giorgio Maggiore, Giudecca, Sacca Fisola, Tronchetto and parts of Lido can be seen.



# Problems of Modern Venice

[References: Davis, C.R., and Marvin, R.G., *Venice, the Tourist Maze: a Cultural Critique of the World's Most Touristed City*, p. 1-7, 77-87, 99-107, 190-197, 202-205; Lonely Planet Guidebooks, *Italy*, p. 339-340, 360; Italia Nostra, *Venice for Modern Man: Ten Centuries of History Face Modern Town Planning*, Plant, M., Venice, *Fragile City 1797-1997*, p. 423-436]

## Past meets Future

In order to prevent Venice from transforming into a modern business centre, with traffic going right through its core, Italia Nostra (the National association for the safeguarding of the artistic heritage and natural environment of Italy, Venice department), developed a plan. In this aim from the 1960s five main issues were discussed.

1. Venice should preserve its traditional structure and restore ancient buildings to their initial condition. For it to be feasible, the city needed to be protected from tides and erosion, together with a renovation of dangerous buildings and bridges.
2. Life should continue the way it always has so that the city does not turn into a museum.
3. To create a breathing city a number of actions were proposed, such as an improved traffic situation to the main port, administrative functions suitable for a regional capital were recommended, and in order to give Venice a specific function, a cultural event of international standard, which could help to initiate modern activity in the old palaces.
4. The mainland areas of Venice should serve with the functions which are not appropriate for the historical core, for example industries, the main residential areas and sport centres.
5. The mainland and archipelago of Venice must work well together.

In contrast to what Italia Nostra anticipated, the issues discussed in the development plan, does not seem to have improved the situation in Venice. Instead it seems as if the existing problems are further deepened and new ones have arisen.

## Acqua Alta - High Tides

When Sirocco winds come about from the east, together with the regular cycle of lunar high tides, an *acqua alta* occurs. The first one was documented in 782. To flood the lowest parts of the city, an increase of about 80 centimetres is necessary. At times the level reaches nearly 140 centimetres above normal, resulting in a whole city under water. Removable walkways are put in place during times of flooding to make it easier for people to move around the city. However, since these *passerelle* are narrow they are barely enough during light traffic. The *acque alte* are becoming more frequent and higher. The climate change could possibly make the sea level rise a further half a metre by the year 2100, making Venice uninhabitable.

The increased number of *acque alte* can according to scientists partly be explained by the pumping of water from aquifers, which occurred from the 1950s and for the following two decades, to supply the industries in the port of Marghera. This meant that the city has sunken about twelve centimetres. Further, the sea level has risen with more than ten centimetres. However, many believe that the main reason is the deepened channel that allows for ships to pass to port. It has resulted in changed currents and faster flow of water. [1]

A solution to the problem is supposed to be the *MOSE project* (Modulo Sperimentale Elettromeccanico) which can be completed in 2011 at the earliest. The idea is to place 79 movable barriers on the three openings to the Lagoon; Lido, Malamocco and Chioggia. They would be filled with seawater and buried in the ground. When there is a risk of a high tide the water could be pumped out, instead filling it with air to make it buoyant, thus creating a dam. After the emergence it could yet again be filled with water and sunk out of sight. One potential problem with this solution is that it may prevent the cleaning of the Lagoon if high tides are blocked out. [2] Italia Nostra, environmentalists and the WWF (World Wide Fund for Nature) are all against the project as they believe it will interfere with the ecosystem in the Lagoon. [3]

Another attempt to raise the city in order to protect it from *acqua alta* started in 1997. Since the buildings themselves cannot be elevated it has certain limits. The quays and canal banks have been raised in an effort to lift the edges of the city. According to studies, this way 84 percent of the city can be protected against tides up to 120 centimetres.



Acqua alta at Piazza San Marco.



The *fondamenta* at San Marco is currently being raised in an attempt to protect the area from *acqua alta*.

## Traffic and Pollution

One of Venice's attempts to be a modern society proved to be quite unsuccessful. To allow for gigantic tankers to reach the refinery in mainland Marghera, the Giudecca Canal was made 14 metres deep in the 1960s. This changed the natural tidal currents, which used to flush out waste water to keep the canals clean. Further it allows water to move quicker, in turn having serious effects upon *acqua alta*.

The many canals of Venice are being increasingly trafficked by motorised vessels, such as boats that provide goods for shops and hotels, taxis, *vaporetti* and tourist boats, causing both traffic jams and pollution. Cruise ships have also started to traffic the Lagoon and the Giudecca Canal as they pass on their way to the port. When these cruise ships enter Venice it also changes the connection between the historical city and the post-modern world.

One of the main problems in Venice is access, especially from the mainland. Every day almost twice the Venetian population size travel to Venice. The bridge to the mainland connects the economic parts - where most of the housing is found, with the historic centre. Piazzale Roma or Ferrovia, the train station, is the end (or start point) for all of these people. Problems also plague the island of Tronchetto due to the high concentration of traffic. To make access easier, traffic has been diverted from the Grand Canal to the Giudecca Canal.



Cruise ships on the Giudecca Canal.



Examples of the urban decay which is evident in many areas.



## Urban Decay and Redevelopment

The reduction in population has occurred since the Second World War and is perhaps the one single thing which mostly points towards a dying city. Many industries and offices have closed and moved to the commercial centres in Mestre and Padova, thus affecting Venice's economy. This has ensured that the monoculture in tourism became even clearer.

The debate on how to treat empty buildings had been going on for decades. At the end of the century things started to happen and several redevelopment schemes were planned. Both Ca'Foscari University and the IUAV have been primary clients. The last couple of years many initiatives have resulted in accommodation for incoming students to Venice. In all the conversions the main motive is the need to create a community apart from that of tourism.



Molino Stucky, a former industrial building on Giudecca, is in the near future going to be used as a hotel.

## Tourism

Tourism, mainly from England and France, began in the late seventeenth century and despite the fact that the visitors were quite unimpressed by the offered goods, this influx continued toward the fall of the Republic. After 1797 a new type of tourism entered the market – packaged tours, which used the newly opened rail link across the Alps. In common with tourism of today is the never ending search for romance. Even though the city is far more commercialised today it still succeeds in offering what tourists look for.

Almost half of the Venetian population makes their living providing things for tourists, although many try to escape in peak season when up to 100,000 people visit the small city in one day. Venice risks being transformed into a theme park if the population continues to decline, it has already halved since the Second World War. The flourishing community that once existed is under the great risk of completely vanishing.

Venice's hotspots for tourists can, according to the authors of *Venice, the Tourist Maze: a Cultural Critique of the World's Most Touristed City*, be marked by a triangular shape between the Rialto Bridge, San Marco and Galleria dell'Accademia. This area is referred to as the "Tourist triangle". To find these landmarks pedestrian routes have been formed from Piazzale Roma and Ferrovia. The sign-posted routes indicate the shortest walk to the destination. These major routes work only in theory as they leave parts of Venice left for Venetians only, and the visitors can find their destination. However, in peak season it is very difficult to get anywhere with the high concentrations of tourists in certain parts. Consequently, many locals have chosen to take their own back routes, which may turn out to be quicker although they cover more distance.



The yearly *Carnevale* attracts visitors from around the world.



Piazza San Marco

## Tomorrow's Venice

Through history the architecture and town planning of Venice has met the future needs of tomorrow. The adaptable forms were suitable for living for centuries, enabling light, air and space. The different geographical districts were efficient in serving what ever activity they offered to the inhabitants. Venice was a thriving multi-activity community.

In central Venice today, we find a mix of change and continuity since the fall of the Republic. Venice is no longer just the archipelago in the lagoon; it has now spread to the mainland and beyond Mestre and Marghera. Many functions work the way they always have, although they serve an increasing number of tourists every year. If this continues the city streets are threatened to become lifeless after day travellers return to where they came from. Urban decay has been a problem for some time. In an attempt to make Venice a flourishing city again a fourth bridge across the Grand Canal is going to be added. When this bridge is in place it will connect the train station and Piazzale Roma.

*"Venice's challenge at the beginning of the 21st century remains how to rebuild a balanced and vital society."* [4]



# Analysis

## - A Walk Through Venice

Landmarks  
The Square as Public Space  
Urban Greenery

A walk through Venice is fascinating and charming in many ways. Without vehicles and bikes it is a dream for pedestrians. The weave of canals and narrow alleys add to the enthralling experience. In spite of the centre being small enough to cover in a couple of hours, it always has something new to offer. There seems to be an endless layer of details to unfold and explore.



View from the *campanile* of San Marco towards the mainland.



The island of San Giorgio Maggiore.



The public gardens in Venice.

# Analysis - A Walk Through Venice

## Landmarks

(References: Biucchi, E., and Pilling, S., *Venice: An Architectural Guide*; Kaminski, M., *Venice: Art & Architecture*; Lonely Planet Guidebooks, *Italy*, p. 346-350, 355-357, 359-361)

## Ponti - Bridges

### Ponte di Rialto

For a long time the Rialto Bridge was a simple wooden structure and the first stone bridge was put in place towards the end of the sixteenth century. The intention was to make a unique architectural symbol. Until 1854 Ponte di Rialto was the only point where it was possible to cross the Grand Canal, which changed when Ponte dall'Accademia was constructed. The current Rialto Bridge is the sixth one, resembling its fore-runner with its arcades of shops on both sides.

The arch at the top of the bridge has a globular luminary placed in the ceiling. It provides a bright light which is evenly spread. Both sides of the bridge are lit up by floodlights, placed on poles. The light is extremely strong and glaring and creates discomfort if one faces it.

### Ponte dell'Accademia

The wooden bridge was put in place temporarily in the 1930s in the wait for a permanent solution but still remains today since none of the design proposals for the competition were considered good enough.

The bridge has got luminaries placed on poles on both railings. The glass is frosted and reduces glare. The design is old and fits well together with the wooden structure.

### Ponte degli Scalzi

The bridge connects Ferrovia with Santa Croce, from where it is close to walk to Piazzale Roma.

There is no lighting on the bridge; neither is there any lights facing it.



Ponte di Rialto at night.



Basilica di San Marco



The view of Santa Maria della Salute from the Giudecca canal. Below its night time appearance seen from the Grand Canal.



## Churches and Basilicas

### Basilica di San Marco

The Basilica di San Marco was constructed around 830 and was home for the Doge and memorial for St Mark. Today's structure dates back to the eleventh century and was inspired by the Eastern Christian Church. It demonstrates different architectural styles as decorations and details have been added through the centuries. It is dominated by Byzantine style, but Romanesque and Renaissance features can be traced. The arch of the central door was designed in the thirteenth century, from this period mosaics were also put in place above the doorways. During the following centuries gold and mosaics were added to the building, displaying its successes in trade.

The basilica itself is not lit up at night, but as the surroundings are it leaves the building in a glowing golden shimmer.

### Chiesa di Santa Maria della Salute

Santa Maria della Salute is by many regarded as the characteristic building of seventeenth-century Venice. It makes an important landmark across the Basin. It is a votive church and was a public work made after the last great plague, in which a third of Venice's population passed away.

Positioned towards the tip of the island Santa Maria della Salute can be seen from every direction. It is lit up by the use of floodlights, which are placed on poles. The technique creates rather sharp shadows on the roof. I believe that the lighting works well from a distance but excess glare and high light levels detract from its aesthetic when looking close up.

### Chiesa di Santa Maria Gloriosa dei Frari

The basilica was originally used by the Franciscan order that started to construct it in 1250. It soon became too small, following changes and additions it was completed in 1445. It is an outstanding example of Gothic architecture in Venice. Like other medieval churches brick has been used, with Istrian stone as the contrasting material.

The building is left in complete darkness at night. One can see the foundation and base, but the top of the church disappears into the sky. The impression is completely the opposite from that at day time.

*Chiesa dei Santi Giovanni e Paolo and Scuola Grande di San Marco*

The campo is dominated by the Gothic church of the Dominican order. Like the Franciscan Frari church it is built on land donated by the Republic on an allocated position, not too close to the political centre and with enough distance to the Frari church to avoid competition for donors. However, it was built to compete with the Frari church in size and greatness. The glass windows are the largest in Venice and were made in Murano in the fifteenth century, by designs of several artists.

Next to the church stands the former building of Scuola Grande di San Marco, a very influential *scuola grande* which as members had some of Venice's most regarded citizens. In 1485, briefly after it was finished, a terrible fire destroyed it. It took ten years to rebuild and both the exterior and interior are highly decorated in coloured marble.

Just like the Frari church, Santi Giovanni e Paolo is left in darkness. Being regarded as an impressive church during the day it is the dominant feature on the site. However, nothing can be seen of this at night and its height disappears into the dark sky. The hospital has a white façade and light from chandeliers is reflected onto it, which is why it can be seen from a distance.

*Il Redentore*

Il Redentore was commissioned to Andrea Palladio and built in an attempt to save the population from disease. Giudecca was chosen as the appropriate site since the church could then be seen across the lagoon, from the main island. It is made from white stone which makes a contrasting appearance to the surrounding low and simple buildings.

The front of the church is lit up by floodlights, placed on adjacent buildings. Because of its white façade it can clearly be seen across the lagoon. The light is not glaring, unless one stands just outside the entrance of the church. However, it creates sharp shadows on the roof of the building.



Palazzo Ducale



San Giorgio Maggiore

*San Giorgio Maggiore*

Andrea Palladio got the assignment to design a new church for the Benedictines in 1565. The result provides a good complement to the buildings around Piazza San Marco on the opposite side of the lagoon. The temple front is made from Istrian marble, while the Basilica and *campanile* are mainly in brick.

Floodlights are placed on poles at the edge of the *fondamenta* and the church is in a subtle light. The lighting technique creates discomfort when at the site, but the accent lighting of the church is only turned on for a couple of hours every night. However, since the island mainly houses the church and accompanying buildings, together with a monastery, it does not disturb residents.



Ferrovia

*Palazzo Ducale (Doge's Palace)*

The palace was built in the ninth century but it did not start to get its current look until 500 years later. It was the residence of the Doge and also housed the seat of the government, bureaucracy and the main prison. The beautiful façades are made of Istrian stone and marble from Verona, creating the characteristic contrast in colour. Palazzo Ducale's façade is an example of Gothic architecture with an Islamic touch. A special and original feature is the circular stone tracery above the Gothic pointy arch. This is a motif that was to be extensively copied on other buildings in Venice. A sunny day, the contrast of light and shadow makes an aesthetic display.

*Libreria Nazionale Marciana*

Designed by Sansovino in the sixteenth century it is an example of High Renaissance architecture. The library connects the individual parts of the piazzetta and it visually matches the architecturally different Gothic Doge's Palace across the square. It was intended to be the new seat of office for the procurators of San Marco. Today it hosts the Biblioteca Marciana.

Chandeliers with four arms are placed in the middle of the *piazzetta* and along the façades of both Palazzo Ducale and Libreria Nazionale Marciana. Every luminaire is equipped with filters to reduce glare and there are three light sources in every one of them. The light source is compact fluorescent with a warm light.

*Ferrovia*

The current railway station was not completed until the mid 1950s, although the railway was in place in 1846, connecting Venice to the mainland. The structure and design of the building has no sense of place nor does it blend in with the architectural styles, instead it works as a barrier through the appearance of the massive stairs and creates a dead space in front of it where the square meets the Grand Canal.

The traditional chandeliers with three arms are placed outside the modern building. They have all been equipped with filters and the light source is mercury vapour.

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## The Square as a Public Space

[References: Carmona, M., Heath, T., Oc, T., and Tiesdell, S., *Public Places – Urban Spaces*, p. 140-146; Moughtin, C., *Urban Design: Street and Square*, p. 98-101]

For the first time visitor, it requires a big effort not to get lost in Venice. Even after months in the city it is still possible. Many consider this is one of its many charms. When walking along one of the numerous streets, often one finds a dead end which meets a canal. Other times one is likely to find oneself in a square, Venice has got plenty of them!

Squares can be described as either formal or informal depending on their layout and the surrounding buildings. There is a difference between those square that are built to mark the importance of a certain building and those that are designed for people. However, some squares work as both. Camillo Sitte and Paul Zucker had different approaches on how to better appreciate the aesthetic values and features of squares.

For Sitte, enclosure was of main importance and he had the belief that it should not be possible to see out of the square along no more than one street at a time. He identified wide and deep spaces and believed that the shape should be determined by the major building on the site. Irregular layouts, such as those found in Venice, were favourable.

Zucker identified five different types of squares. Normally a square falls into more than one category. The squares in Venice are mainly enclosed with buildings forming their shapes. The focus is often towards a basilica or *scuola*, but sometimes there are other features evident, such as statues in the centre of the square. Further, ancient wells often remain in the centre of squares. These features mean that the squares in Venice fall under the following identified categories:

1. *The closed square – space self-contained:* It is a complete enclosure which is only interrupted by the street leading in to it. Repetition of similar buildings or façades and its layout on plan are important attributes.
2. *The dominated square – space directed:* The square faces a building or a group of buildings, which surrounding buildings relate to.
3. *The nuclear square – space formed around a centre:* A central monument such as a statue creates a sense of space around it which keeps the square together.

## Campi – Squares in Venices

[References: Centro Studi Storici di Mestre, *Piazze e Città nel Territorio di Venezia*, p. 46-56; Hyman, I., and Trachetenberg, M., *Architecture: from Prehistory to Post-modernism / the Western Tradition*, Kaminski, M., Venice: Art & Architecture; Moughtin, C., *Urban Design: Street and Square*, p. 88-89; Woolley, H., *Urban Open Spaces*, p. 53, 87-88]

The richness of public squares (*campi*) in Venice could be explained by the climatic conditions, which favour outdoor activities and the outgoing nature of its people, which have led to public life and vitality in the city. As one of the oldest types of open space within the traditional city, the squares used to house a variety of functions. Apart from being a marketplace, it could also house events such as bullfighting and be used for different types of ceremonies. Often it would be near an important building such as a church, and the space would be defined by the surrounding façades.[5]

Today the squares are active during daytime, when they host markets and work as meeting place for young and old. Children often use the squares as playgrounds, due to the shortage of public green spaces. Many of the bigger squares have shops facing the open space and there are also cafés and restaurants which provide seating for their guests. Together this makes the Venetian *campi* an active part of the city during the day. After dusk these sites are not as vivid as most of the shops and cafés are closed, at least in the areas outside the popular “tourist triangle”. There is generally not enough seating provided, such as benches, and the light does not enhance the qualities of the square.



A view across Venice and Piazza San Marco seen from the *campanile*.

## Piazza San Marco

The square of San Marco is the only *piazza* in Venice as the other squares are called *campi*. The piazza is located in front of the Basilica and it leads into the *piazzetta* between Palazzo Ducale and Libreria Nazionale Marciana. It has two columns towards the waterfront that represents the city's patron saints the Lion of St Mark and St Theodore. The *piazzetta* was traditionally used for markets and political meetings and occasionally public executions took place there. Together Piazza San Marco and the adjoining *piazzetta* create an L-shaped square, considered to be one of the grandest public squares in the world. The *piazza* was traditionally the central point of the Republic where its inhabitants celebrated processions, parades and ceremonies. On other days it was used as a marketplace. Today, it is crowded with people throughout the day.

The *campanile* of San Marco is the dominating feature on the two squares. It has been added to by many generations and in the sixteenth century it obtained its present form. In 1902 the tower collapsed and was later rebuilt in exactly the same dimensions with a height of 95 metres.



The *piazzetta* and *campanile* are brightly lit at night.



The chandelier is equipped with compact fluorescent.

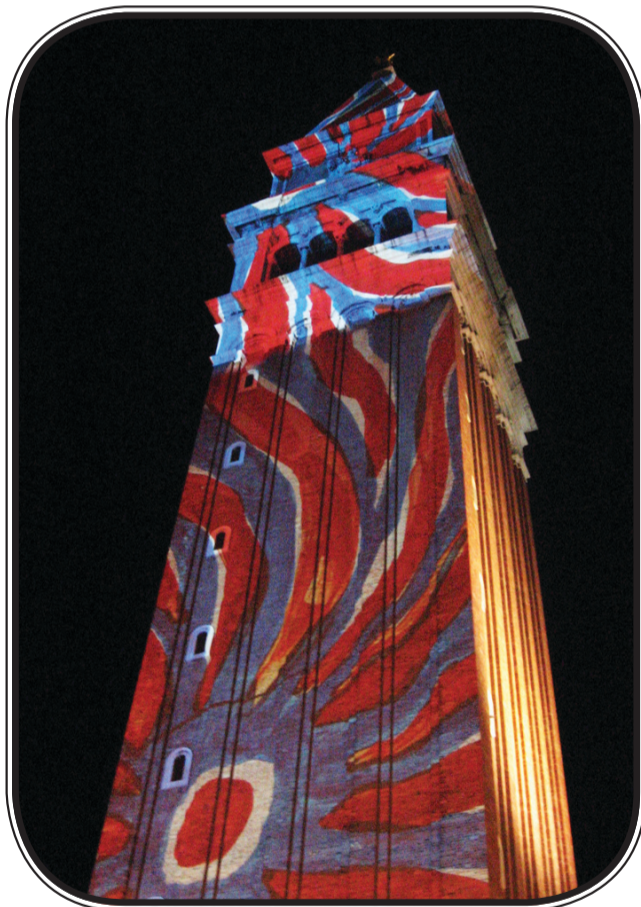
The *piazza* was the first place in Venice to be accentuated through artificial lighting. The façades surrounding the square have all been furnished with lights that are placed on little poles, outside both sides of every window. The light is warm, probably from normal incandescent lamps. The arcades at ground level are lit up by globular luminaires. All together it fits into context very well. There are small spotlights which emphasise the columns in the arcade. The light source is thought to be halogen.



Floodlights are placed on the surrounding façades to light up the ground.

The side of the *campanile* that faces the basin is lit up by two floodlights with warm colour, likely to be high-pressure sodium. They are placed on the façade of the library. The spread of light is uneven and the transition between the different lights can be seen clearly on the façade as the colour of the bricks appears different.

The *piazzetta* gets its light from chandeliers equipped with four luminaries each. They all have filters and the light source is compact fluorescent. The *fondamenta*, between the canal and the *piazzetta*, has got chandeliers with three arms in double rows. However, they are not equipped with filters and the light appears even stronger and colder and comes from mercury vapour. There is a great difference in light levels; therefore it is difficult to see the faces of oncoming people.



The *campanile* during this year's carnival together with diod lighting of the surrounding buildings.

The appearance of the site changes greatly for a couple of months every year. Before Christmas a different type of lighting is additionally put in place, to a great extent it consists of typical coloured 'Christmas lights'. They remain in place until after *Carnevale*, the popular event which lasts for ten days and finishes in the end of February. During this event the lighting reaches its peak, or its most horrific state, depending on the observer. In 2007 iGuzzini was responsible for it. The theme of the year was to project different images and texts onto the *campanile* and surrounding buildings. Even the Basilica got its fair share of light.



*Campo dei SS. Giovanni e Paolo*

The island on which Campo dei SS. Giovanni e Paolo is situated is divided into two different zones. The northern part stretches all the way to the edge of the Lagoon incorporating religious complexes and a hospital. To the south a canal and an alley make the boundary. The Gothic façade of Chiesa di San Giovanni and Paolo together with the Renaissance façade of Scuola Grande di San Marco make a beautiful backdrop of the square to the north. Bricks are used for the church and perspective drawings in marble are made on the façade of the hospital. In the middle of the square a statue of Bartolomeo Colleoni stands. The qualities of the space are made further evident through the irregular elements such as the steps facing the canal, Rio dei Mendicanti, and the bridges on one side. From time to time ambulance boats pass on their way to the hospital, located in the former building of the *scuola grande*.

The light is provided by the traditional wall brackets, equipped with mercury vapour. There are also different chandeliers at the square, mainly along the canal; with one, three and four luminaries. They all have filters and the light source is mercury vapour throughout. There are high differences in light levels which make the square seem darker than it actually is. The statue is accentuated with a floodlight, which is placed on the roof of the opposite building. The light is warm, probably from high pressure sodium, and creates discomfort when passing it.



Campo dei Santi Giovanni e Paolo

### Campo del Ghetto

For economic and religious reasons, in 1516 the Mayor of the Republic decided that an easily controllable area within the city would be reserved for the Jewish community. The chosen island was completely closed by a canal and an old canon factory existed there, called Getto del metallo, thereby the name Ghetto, which became widespread all over Europe as to indicate a place where Jews were safe and protected. It got its negative association with the Nazis and the Second World War.

Compared to the typical Venetian squares, Campo del Ghetto does not have any impressive churches or palaces. The site is framed by a compact curtain of buildings without ornaments and with small entrances. There is however one exception, being the synagogue with its wide and spacious windows. The square used to be filled with clothing merchants, banks and bakeries.

Today this *campo* is rather lifeless. It houses several Jewish meeting places, but lacks the type of establishments which make it an active place after dark.

The lighting at the square comes from commonly used wall brackets which are placed on all the façades. There are also a few examples of another old type of wall bracket. It has frosted glass and is very elegant.



The ground floors of the buildings at Campo del Ghetto are empty or closed.

### Campo Santa Maria Formosa

The vast square was the civil and religious centre in the seventh century. It is positioned where the districts of San Marco, Castello and Cannaregio meet. Towards the end of its importance the square was home to *guilds* and *scuole*, as well as a host for shows with famous bullfighters and open stage performances.

Chiesa di Santa Maria Formosa was built in the seventh century but was reconstructed in the sixteenth century. The church is the main focus of the square, which it through its placement divides into different subspaces. Adjacent to it is the Baroque campanile from 1688. It works as a connection between the different areas. The site is approached from several bridges on two of its sides and here palaces face the square.

Unlike many other squares this is one which is quite active even after dark. The site has several restaurants and small market stalls which are open in the evenings.

The buildings around the square have wall-mounted luminaries with mercury vapour placed in strategic positions. There are also some single chandeliers, placed next to the bridges and one besides the church. There are big differences in light levels and the square appears to be quite dark. In the evenings the market stalls are equipped with their own lights.



The light distribution at Campo Santa Maria Formosa is uneven which makes the middle appear to be in complete darkness.

### Campo Santa Margherita

This square does not have a religious building as is main focus; but yet, it is still a very popular place to go to. The shape of the square differs from others in Venice as it has an irregular form. The ground levels of the surrounding buildings are very active with different types of shops, restaurants and cafés. During both day and evening market stalls sell fruit and vegetables. No matter what time of day, the site is always full of people, mainly students since the universities are close by.

Traditional wall brackets are places around the square. Although the lighting is bad at the square, including a light level which is too low in the middle, the site does not feel unsafe as it is always populated.



Activity on Campo Santa Margherita.



Light comes from inside the shops and restaurants, which together with the light from the wall brackets make the edges of the square too bright.

*Campo San Polo*

Being the largest square in Venice Campo San Polo opens itself with an exceptional width. It got its final form in the eighteenth century when a rio, that ran along its oriental side, was filled in.

The foundation of the church is similar to the one at Campo San Giacomo dell'Orio in its placement and was built in a Gothic style but with neo-classical reconstructions. The square is mainly characterised by the long curved line of façades which close the square on the oriental side, thus forming a large amphitheatre which was an ideal place for popular events such as bull runs, theatre and religious ceremonies. It took until 1494 before Campo San Polo was paved with bricks. It gave the ground a warm red character, much different to the grey paving which is present today.

Being on one of the main routes to Rialto, Campo San Polo it is passed by many people. Due to its vastness, it is a popular place for children to play. However, there are not enough shop fronts at ground level to encourage meetings and activities.

Just like in most squares, the traditional wall brackets are placed on the façades. With such a vast open area there is not enough light in the middle of the square. At night the square is empty, apart from the stray person passing by on his way through one of the main routes.



Campo San Polo is lifeless at night.

*Campo San Giacomo dell'Orio*

Similar to Campo Santa Maria Formosa the church is placed in the centre of the square, therefore forming different spaces around it. The main area of the square is characterised by the numerous trees. The atmosphere of the square is constituted of blocks of modest residential buildings. The ground did not used to be paved and was made of soil, the same for many past Venetian *campi*. The community used to arrange small feasts on the campo, hang out their laundry to dry and also organise bullfights. The sombre shape and materials used in the church enhance the atmosphere of the square. The first foundation from the tenth century was later reconstructed and transformed in 1225.

Today the area houses several restaurants at ground level and a couple of closed shops. The IUAV had one of its faculties at the square. The campo is located on one of the main pedestrian routes and is well signposted which make it active during both day and evening.

In my opinion, the lighting is better at Campo San Giacomo dell'Orio than in most of the other squares in Venice due to suitable luminaries, a good light level and the absence of glare. On the façades a decorative and elegant old type of luminary has been placed. The frosted glass makes it glare-free. There are also a few single pole chandeliers close to the church which are equipped with filters. The light is enough to highlight the church and make it visible at night. However, as there are many restaurants at the square there are light diodes around their dining areas, both on the façades and connected to the trees, thus making a bad contribution to the ambience of the space.



Campo San Giacomo dell'Orio



Incandescent lamps outside one of the restaurants at the square.

## Urban Greenery

(Reference: Italia Nostra, *Venice for Modern Man: Ten Centuries of History Face Modern Town Planning*)

There were about 400 gardens in Venice in the sixteenth century and many of those were open to the public. This changed the following century as the city became increasingly dense and even the outlying areas had buildings constructed on them. Venice had slowly started to sink and to compensate for this the street level was raised and paved. Gardens and orchards became a rare sighting and it was not until Napoleon entered Venice that this changed. The public gardens of Castello were established together with the cemetery on San Michele. When families could not afford to pay the tax, their houses were destroyed and small orchards or gardens were put in place.

According to the members of Italia Nostra it is of great importance for Venice's inhabitants to increase the number of public gardens in the city. This is especially necessary for children as they have nowhere to play but on the squares. An increase in the amount of greenery would further help to reduce air pollution.

When looking at a map or an aerial photo of Venice one can see plenty of green spaces, sometimes quite vast. The majority of these are hidden in courtyards behind palaces and other buildings and only very few of them are open to the public. The ones that are accessible are often behind walls and the gates are closed in the afternoon or evening.

The island of Sant'Elena is an exception in Venice. It houses Parco delle Rimembranze, a widespread park along the *fondamenta*, making it a popular place for walks and outdoor activities. Not far away, next to the Biennale Pavilions, lays Giardini Pubblici. In contrast to Parco delle Rimembranze, this park closes its gates in the evening.



Giardino ex Papadopoli near to Piazzale Roma.



Parco delle Rimembranze at the green island of Sant'Elena is an oasis in the otherwise sparsely vegetated Venice.



The same park as above at night.

In close proximity to Piazza San Marco, the small park called Giardini ex Reali is a popular resting point for tourists. However, it closes its gates when night falls.

In a more central location, at least with today's transport modes, Giardino ex Papadopoli can be found. It has a strategic position opposite Piazzale Roma and is passed by many people on their way to Ferrovia. It contains a little playground for younger children, but closes early.

Since the greenery is generally not accessible at night, the lighting is sparse and not very appropriate. In those areas where it does exist, such as all the above mentioned parks, a more modern type of pole luminary is used. It is painted in green, but does not blend in very well during the daytime. They are placed along the paths, leaving the trees and shrubs in darkness. The lighting could be improved in order to make the greenery an accessible, beautiful and accentuated part of the city at night.



Giardini Pubblici is only lit up with floodlights which are placed on poles. The glare is extremely strong and it feels very unsafe to walk there at night.





1. Piazzale Roma
2. Ferrovia
3. Tronchetto
4. Arsenale
5. Campo del Ghetto
6. Campo San Giacomo dell'Orio
7. Campo San Polo
8. Campo dei Frari
9. Campo Santa Margherita
10. Campo Santo Stefano
11. Piazza San Marco
12. Campo Santa Maria Formosa
13. Campo dei SS. Giovanni e Paolo

14. Ponte degli Scalzi
15. Ponte di Rialto
16. Ponte dell'Accademia
17. Santa Maria della Salute
18. San Giorgio Maggiore
19. Il Redentore
20. Molino Stucky
21. Giardini Pubblici
22. Parco delle Rimembranze



	Transport nodes		Greenery
	"Tourist triangle"		Landmarks and squares
	Area controlled by the military		Major paths



Analysis  
Scale 1:10000

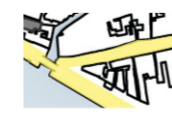







-  Vaporetto stops and roads
-  Squares
-  Primary paths

-  Secondary paths
-  Paths in parks

-  Existing lighting works well
-  Accent lighting of landmarks

Analysis light  
Scale 1:10000





# Light

Glossary  
Our Perception of Light and Spatial Understanding  
Light Sources



Natural and artificial  
light in Vienna.



Accent lighting of the Opera  
house in Vienna, Austria. A  
different light source with  
warmer colour temperature  
have been used for the  
lighting of the road.

## Glossary

[References: Moyer, J.L., *the Landscape Lighting Book*, p. 19, 107-108; Starby, L., *En bok om belysning*, p. 221-222, 224-225; <http://www.archlighting.com/architecturallighting/al/glossaries/terms.jsp>; <http://www.lightingacademy.org/encyclopedia/htm/eng/glossario/gloss.htm>]

### Average rated life...

...means the number of hours it takes before half of the lamps will break. The term is mainly used for filament lamps and fluorescents.

### Ballast

In order for fluorescents and high-intensity discharge lamps to work properly ballasts are required. Ballast provides the voltage which is needed to start the lamp and continuously regulates the current. Sometimes it is integrated in the luminaire, but if there is not enough room it might be placed in the light pole or separately on the side.

### Semiconductor ballast

Semiconductor ballasts are increasingly used for their many advantages:

- longer life for the light source
- stabile light colour
- no flickering
- starts faster
- improved luminous efficacy
- increased energy efficiency
- possibility to regulate the luminous flux
- lighter weight

### Colour rendering index - Ra

Colour rendering index is a measurement of how a light source affects the colour of the object it illuminates, relative to the colour appearance under a reference light source. The highest level is 100 and implies no colour change. It is only achieved by light sources which generate heat, such as incandescent lamps. With a Ra from 80 to 85 there is a slight risk of change for sensitive colours. Below 70 the risk for bad colour rendering is significant.

Colour rendering can only be used as a comparison between light sources whose colour temperatures are the same. Even if the Ra is the same, a colour might not turn out the same. The result also depends on the colour spectrum of the light source.

### Colour temperature

The colour temperature specifies the colour appearance of a certain light source. It is measured to a reference light source which has been heated to the same temperature. A temperature below 3300 K generates a warm light; above 4200 K it is cold. Anywhere in between is characterised as white or neutral. Temperately

colder countries would often prefer a warm colour temperature such as that from incandescent lamps. In warmer countries a cooler tone is mostly preferred.



Different colour temperatures.

### Colour spectrum

Electromagnetic radiation between 380 and 780 nm is visible to the human eye.

- 380-420 nm violet
- 420-495 nm blue
- 495-566 nm green
- 566-589 nm yellow
- 589-627 nm orange
- 627-780 nm red

All light radiation lies within this spectrum, but how it is spread varies from light source to light source. We talk about short, middle and long wavelength with regards to the different types of cones which base our colour vision. The spread over the spectrum shows how the light energy is divided in wavelength. Daylight has quite an even spread from 400-700 nm and the same goes for incandescent and candles. Other light sources have a discontinuing spectrum where the spread occur in sections. What the spectrum looks like affects how colours appear. Two light sources can have the same colour temperature but a different spectral spread, therefore they display colours differently.

### Dimmer

Dimming is useful to change the light depending on variations in the environment. For discharge lamps it is necessary to use semiconductor ballasts for it to be possible.



Light pollution

### Illuminance...

...is the amount of light which hits every square metre of a specific area.

$$E = \text{l u x}, \text{ l u m e n p e r m}^2$$

### Light pollution

Light pollution includes excess artificial light caused by glare, light trespass, over-illumination, sky glow and clutter. It is however common that the definition of what is light pollution varies from one person to another. Shop owners or advertiser might appreciate the bright light caused by their advertisements while others find them irritating. Light pollution is mainly a problem in industrialised and densely populated areas. Its effects include energy waste, obstruction of stars on the night sky, interference with astronomical observatories and disruption of ecosystems. [6]

### Luminary - Lighting fixture

A complete lighting unit which consists of one or several light sources together with the parts that are needed to connect them to power and to distribute the light.

### Luminance...

...is the quantity of light which is reflected off the surface of an object.

$$L = \text{c d p e r m}^2$$

### Luminous efficacy...

...is a measurement of how much light is generated per watt of energy, hence it tells how efficient the light source is. It is measured in lm per W.

### Luminous flux...

...is the number of lumens a light source produces. The amount stated in catalogues is often after the light source has been in use for 100 hours.

$$\Phi = \text{l u m e n}, \text{ l m}$$

### Luminous intensity...

...is a measurement of a light source's luminous intensity in a certain direction.

$$I = \text{c a n d e l a}, \text{ c d}$$

### Service life...

...means the amount of time in hours it takes before the light flow has been reduced to 80 percent of its original state, taking into account both reductions in light flow and loss of light sources.

## Our Perception of Light and Spatial Understanding

(Reference: Liljefors, A., *Seende och ljusstrålning* – *baskompendium i belysningslära*)

By the collaboration between the surrounding and detailed vision we are able to see. Only two degrees of our field of vision is crisp and rich in details, while impressions and information of our surroundings up to 170 degrees help us interpret space.

Our vision is based on contrasts in light and colour. The boundary between two different areas can be sharp, diffuse or distinguished with a gradient. The direction of light determines the look of the shadow and therefore how we visually read form and shape. If the shadow has a gradient it improves our three dimensional understanding.

In order to see in both lightness and darkness the eye has the ability to adapt to the present level. As we get older the lens becomes blurred. The ability of the lens to refract light is adjusted through accommodation. At around the age of 40 this ability starts to diminish as the lens becomes more inflexible. As the retina works slower and adaptation takes more time, older people are more sensitive to glare, something which is important to consider when planning.

### Light level

When light hits a surface that is non-transparent, part of the light is reflected and the rest absorbed. The relation between the two is called reflectance. Reflectance from the surfaces in a room affects the interpreted light level more than light radiation. The interpreted light level is also affected by the light level in a separate part of the room. Through contrasts the interpreted light level can seem higher, whereas monotone lighting without differences is often perceived as darker. How the light level is perceived has a strong connection to emotions and wellbeing.

### Light distribution

The type and placement of the light sources with regards to the reflectance and position of the surfaces affect the light distribution in a room. It is important for the character and ambience of the space and for orientation. Too big differences between light and dark areas can cause glare and make it difficult to read dark surfaces.



Glare disturbs the view and appreciation of the reflexes and shadows that are present.



Reflexes on one of the many canals.



Glare from floodlights affects the light distribution. Further there are differences in light colour.

### Shadows

Shadows describe shapes and help us perceive space. The variations in strength and angle of daylight present space differently. Indistinct shadows complicate how our vision interprets space so a gradient is necessary. If shadows are dark with clear outlines and contrasts are great it can cause discomfort. When designing the lighting it is important to be aware of how the shadows appear.

### Reflexes

Mirroring is reflexes from surfaces and light sources. The surface's shimmer and reflectance determine how sharp and clear the reflexes are seen. Reflexes give life to what we see, whereas plain and dull surfaces easily generate a lifeless character when neither reflexes nor shadows can tell about its qualities. Combinations of dullness and shimmer encourage rich spatial environments. In Venice reflexes mainly occur on the canals, but also when the pavement is wet after rain or during acqua alta.

### Glare

The strongest irritation from glare occurs when the outline of a surface is distinctively separated from the adjacent area. To eliminate glare one needs to work with the contrasts which generate it. The shiny surface should be cut off so that the contrast is not as great and the surrounding area should be made lighter in order to allow for a gradual transition between it and the surface. To reduce glare it is essential to use luminaires which cut off the light properly. The light should also be directed onto façades and trees which reflect it back to the surroundings.

### Light colour

This is the most difficult quality to succeed with when it comes to light. A varied light distribution without glare creates a warm atmosphere. The perception of light colour is mainly connected to emotions. If the light is similar to the uncoloured light the result is natural. Light colours can affect an environment negatively if they do not suit the context. Different use in light colours can separate areas and enhance their qualities.

## Light Sources

[References: Moyer, J.L., *the Landscape Lighting Book*, p. 95-104; Philips, *Philips lampguide 2004-2005, genvägen till bra belysning*, Starby, L., *En bok om belysning*, p. 162-208; [http://en.wikipedia.org/wiki/Incandescent\\_light\\_bulb](http://en.wikipedia.org/wiki/Incandescent_light_bulb), [http://en.wikipedia.org/wiki/Mercury\\_vapour\\_lamp](http://en.wikipedia.org/wiki/Mercury_vapour_lamp)]

### Filament Lamps

#### Incandescent Lamps

Commonly referred to as light bulbs, incandescent lamps consist of an enclosure in glass and a filament of tungsten wire. Light is emitted when an electrical current passes through the filament, which it heats up causing electrons to become excited and continuously transitioning back to lower energy states. When this occurs photons are released, creating a continuous spectrum of light.

- + Warm light, 2700 K
- + Ra: 100
- + Possibility to dimmer and regulate the luminous flux
- + Produced in a wide range of voltages
- Poor luminous efficacy, only 9-20 lm/W
- Heat emission
- Short average rated life, 1000 h
- Sensitive to vibrations and shock

USE: Today mostly for domestic use.

#### Tungsten Halogen Lamps

Tungsten halogen lamps are almost the same type of lamp as filaments but they work with a regenerating process. Halogen gas has been pumped in around the tungsten filament of the lamp and the pressure has been increased, which results in several improvements. There is a wide variety of products to choose from.

- + Crispy white light, 3-3400 K
- + Ra: 100
- + Constant luminous flux during its lifespan
- + Possibility to regulate the luminous flux
- + More compact size than the incandescent lamp and improved optics
- Higher luminous efficacy, 20-36 lm/W, but still quite low
- Heat emission
- Improved average rated life, yet only 3-4000 h
- Particularly sensitive to vibrations and shock

USE: Domestic use, headlights for cars, where light is required for a specific point, accent lighting of statues.

### Discharge Lamps

There are two sub-groups, high-intensity lamps and low-pressure lamps. To create light they send an electric arc through a gas between two electrodes. They all require ballasts which send a pulse to start the lamp and continuously control the amount of current. The luminous efficacy and life expectancy are high.

#### High-intensity Discharge (HID) Lamps

##### Mercury Vapour

This type of discharge lamp uses mercury in an excited state to produce light. The bulb provides thermal insulation and protection from UV-radiation and it may be clear or coated. Discharge generally takes place in a small arc tube inside the outer bulb. When power is supplied ionised mercury strike an arch between the two main electrodes.

Modern mercury vapour lamps have a coating of phosphor on the inside of the outer bulb to improve colour rendering and to fill in the red part of the colour spectrum.

- + Long average rated life, 12000 h
- + Blue-green light that displays greenery well due to the range of its colour spectrum
- With time the luminous flux decreases
- Limited efficacy, 60 lm/W
- Limited colour range
- Bad colour rendering, Ra: 50-60, which also gets worse with time
- Activation and reactivation takes a long time
- Requires a ballast to prevent it from taking excessive current

USE: Mercury vapour lamps have traditionally been used in public areas and industrial sites. These days they are exchanged for better quality options such as metal halide and high-pressure sodium.

Following are a selected variety of light sources which either already exists in Venice or which are appropriate for the new lighting. These are further mentioned in the proposal for the environmental lighting plan.

##### Metal Halide

Metal halide has evolved from mercury vapour lamps. A mix of metal halide has been added and inserted into the discharge tube to increase the spectral range. Consequently, a whiter light with better colour rendering is obtained. It also has an improved efficacy. There are two different types, with or without ceramics.

Ceramic metal halide means that the light source can take higher pressure and temperature which in turn means that its luminous flux is improved; its colour is stable and its average rated life longer. If the light source is used with semiconductor ballast there are even more advantages.

- + Compact in size
- + Balanced white light, temperatures from 3000-6500 K
- + Good colour rendering, up to Ra: 95
- Dimming is not possible
- Long activation and reactivation times
- Requires a ballast

USE: Floodlighting of open spaces, façades and trees where high quality light is required.

##### High-pressure Sodium

Light is produced when an electronic arc passes through sodium gas. The pressure inside the arc tube is higher than for low-pressure sodium lamps. This results in a colour spectrum which is expanded, but still mainly in the yellow part of the spectrum, therefore the received light is perceived as golden yellow.

On the market there are colour improved lamps that produce a whiter light with 2500 K. A side effect is that efficiency and life are reduced.

- + High luminous efficacy, 70-130 lm/W
- + 16000 h service life
- + Possible to regulate luminous flux with a semiconductor ballast
- Poor colour rendering for the standard lamp
- Reduced use since most of its radiation is in the yellow area of the colour spectrum
- Requires a ballast

USE: roads, street lighting in old towns, façades in "sensitive areas", indirect light.

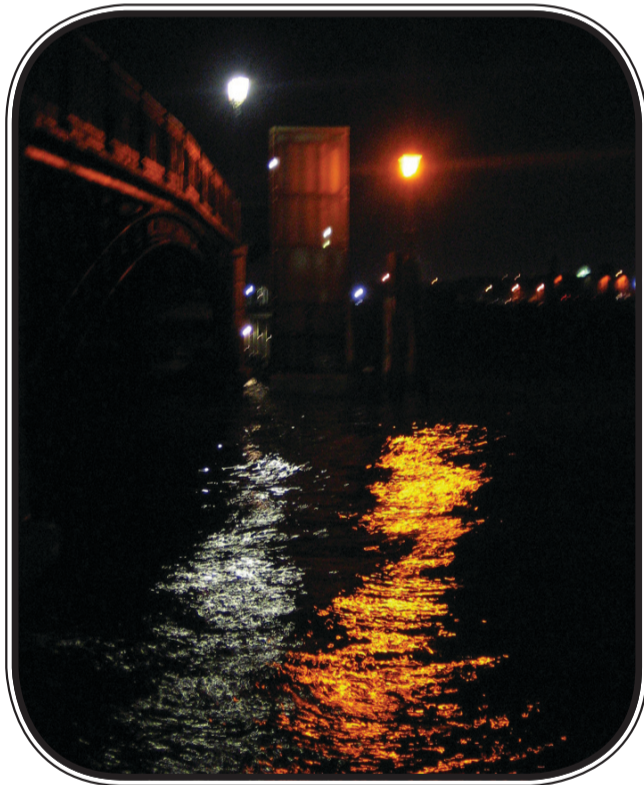


### Low-pressure Sodium

The lamp is filled with sodium gas which produces radiation predominantly in the yellow and orange part of the spectrum.

- + Provides the best luminous efficacy, 200 lm/W
- + Long average rated life, 12000 h
- Monochromatic yellow light
- Can not render any colour well
- Can not be dimmed
- Slow activation and reactivation
- Requires a ballast

USE: It was previously used to light roads, but today better colour rendering is demanded.



A comparison between the light from different light sources. To the left mercury vapour and to the right monochromatic light from low-pressure sodium.

### Low-pressure Discharge Lamps

#### Fluorescents

The tube is filled with mercury and argon or krypton, with an electrode placed in each end, which excites the gas atoms and creates ultra-violet radiation. The radiation excites the phosphorus and fluorescent powder which covers the inside of the tube and produces colours within the visible spectrum. The composition of the mix decides quality and rendering of the light. Fluorescent lamps are classified on the basis of their shapes; linear or compact.

Compact Fluorescent can be described as mini-mised fluorescent lamps where its light quality is similar to the one of full colour fluorescent. There are two different types, either where the components and ballast are incorporated in the lamp or where they come separately.

- + Good luminous efficacy, around 100 lm/W
- + Long average rated life, up to 15000 h
- + Wide selection of effects and dimensions
- + Several different light colours and colour rendering classes
- + Washed light
- + Compact lamps
- + Quick activation and reactivation
- Difficult to control the light beam
- Can be difficult to regulate luminous flux
- Some of the types require ballasts

USE: When an even wash of light is required it is a good choice. Compact fluorescent can be used instead of incandescent lamps when the ballast is incorporated in the lamp.



Compact fluorescent is placed in the chandeliers on the piazzetta.



# Venice by Night

The Lighting of Venice Historically  
The Lighting of Venice Today  
Light Pollution



Wall brackets with mercury vapour are commonly used in Venice.



Zattere is lit up with mercury vapour placed in chandeliers. The port for cruise ships can be seen in the background

## The Lighting of Venice Historically

(Reference: Ollan, D., and Ranzato, A., *L'evoluzione della Pubblica Illuminazione nel Territorio del Comune di Venezia*)

### Evolution

Artificial lighting was introduced in Venice in the beginning of the Eighteen Hundreds. The first experiments with gas were made in 1816 and the following year inspections of the lighting were undertaken during nights of full moon. A plan which included lanterns was finalised in 1820. During the following years artificial lighting spread to other areas in Venice and improvements and changes were made to the light plan. Public illumination with both oil and gas existed after 1835. The first experiments with electrical light occurred after 1850. At the same time gas light was introduced in private areas. Piazza San Marco was the first site in Venice to get accent lighting. After 1860 all the streets on Venice's main island had lighting from gas. A decade later the public illumination was regulated and activated at certain times. Later on norms for the lighting were formed. At this time the canals were also lit.

Towards the end of the century electrical lighting existed in a number of areas such as Giardini Pubblici, Giudecca, Ferrovia, and also in private spaces. After 1920 all the stations and the Piazza, Piazzetta and Riva degli Schiavoni had electrical light. The new lighting plan which was based on electricity as an energy source was composed in 1928. The chosen technology for the new light plan was considered to be advanced at the time. Since electricity was invented many things have changed and improved, but the technology in Venice does not seem to have been updated.

Following the continued process of the technical evolution and method to work, also the Venetian lighting plan changed, in particular, the attention towards the surrounding environment which was treated sensitively to avoid interference with the historical heritage. When electricity became more widespread, the city tried to limit the visual signs such as cables in the air through the use of subterranean or underwater electricity.

The final stage of public illumination in Venice occurred in 1987, when Philips lit up the *palazzi* and churches in the city for the carnival. The outlines of the buildings were illuminated and created a contrast to the old chandeliers. It was kept for the future but as it did not work, it was taken away shortly after.

For the carnival in 2007 the Italian company iGuzzini was responsible for the lighting at Piazza San Marco. Coloured patterns were projected onto the façade of the bell tower and adjacent buildings. Even the Basilica was painted. For special events such as this I think it is important to remember the history of Venice. Event lighting should be something special, but it has to go hand in hand with the architecture and respect the sense of place. For accent lighting it is also important that it is not the same all the time, therefore variation is a must for it to be appreciated as something special.

Especially around Piazza San Marco and Rialto, in the tourist triangle, there are many shops which are highly illuminated for commercial reasons. From before Christmas to after carnival there are also plenty of coloured diodes which hang from roofs. Several of the older and traditional cafés and pubs around the piazza are trying to have a more historical approach using for example lanterns. The authors are questioning if it would not be an idea to use the traditional Venetian lights in the whole of Venice, especially the commercial streets. The shop and restaurant owners were actually the first ones to introduce light in Venice and they originally used oil lamps.

The authors are of the opinion that the illumination of Venice brings a negative image to the city. They believe there are two possible ways to light Venice; carnival lighting or historical lighting. A city without light is not possible, but what is there today has to change. The way the authors propose is going back to typical historical elements which show continuity between history and Venice today. The cast iron chandeliers were the first attempt to light an artistic city such as Venice. They represent a part of the urban history and harmonise architecture and light. The restoration of the chandeliers is a first attempt. However, changes are difficult to make not due to laws, but conservatism. A lighting plan for the whole of Venice is desirable to achieve. It is a difficult task since it is something which everyone has to agree on and there are many different wishes. In Venice the most important thing is to protect the face of the city and to respect the heritage.

### Luminaries

There is a wide range of luminaries in Venice of which many are reproductions or restorations of historical fixtures. Besides there other excess old fixtures or modern contributions are spread over the city. Moreover, it is common with visible cables which hang on walls or in the air and transformers without protection.

The most commonly used lighting system is the classical wall bracket made from iron. This type is placed on to the façades of most buildings in Venice and on the axes of an intersection, to provide light for the streets. They are placed on alternate sides of the walls to create a uniformed lighting. The majority of the brackets are from the old plan, which was from a time when light was received from gas. The work to alter them was done by the municipality of Venice. They were taken apart separately, where the bracket and the nodes were kept and the rest of the material both bought and reused. The base was burned in a form; brushed, minimally repainted and welded to mend cracks. Every luminary is characterised by a sign which has a number and a letter printed on it to indicate the zone. In total there are 3324 of these types of wall-mounted luminaries.

The most ordinarily used luminaries were completely made from copper and bronze, and designed by the technical office in the municipality of Venice. The shape was studied and developed so that it would have the possibility of being lowered and raised in order to obtain the proper height and right illumination. To reduce glare and to distribute the luminous flux a globe of opal glass was used for the luminaries. After a year and a half an insignificant number of the 2000 prisms were substituted due to breakage, while the opal glass had been changed frequently due to vandalism and other causes in the places where they were located. Today the luminaries are connected by screws, while they were earlier attached by bolts. This old way of construction was rather dangerous due to the vibrations caused by the wind, but the risk was often ignored as the luminary was hung up by hooks. A more appropriate system was later put in place, where the connection was not visible. This was both safer and diminished the probability of theft, which was another problem with the older system.

## The Lighting of Venice Today

(Reference: Vio, Marina)



The most commonly used wall brackets in Venice, here with floodlights placed on the bracket.

Today there is no existing lighting plan of Venice. There are preparations for one, but to this date it is not finished. The public lighting is a responsibility of the municipality, but it is without governance. Mercury vapour has traditionally been used as light source, but it is now being replaced by fluorescent with bulb. The luminaries are mainly brackets or chandeliers, which are often raised and placed on a base of stone. Therefore, there are no problems during *aqua alta*. Vandalism of the luminaries is not common and crime is low.

Those underpasses that are high enough were equipped with an ordinary luminary which was connected to a pole of different length. For the other underpasses a particularly robust type was put in place. It was made in bronze or cast iron and had a big grid of iron bars. This construction was in general within reach for people passing, but proved to be very robust and it could withstand any type attempts of maltreatment.

Venice's most characteristic lighting was created from the chandeliers. They showed off the beautiful architecture along Canale Grande and Riva degli Schiavoni, often placed in double rows. This type of chandelier is made from cast iron and is in a typically Venetian design. They were introduced in the city from 1840 until the end of the nineteenth century. One of the main features of this chandelier was the ornaments which did not embellish the central structure, but the arms. Today the reintroduced chandeliers exist in two varieties, either raised on a base of marble or without. This is to reduce the risk of water immersing the base of the luminary during *acqua alta*. There are a total of four different types of chandeliers in Venice, which are all examples of excellent manufacturing. At Riva degli Schiavoni a model with gas is present. It was shown for the first time for the World Exposition in Paris in 1867. A third variety of chandelier is the single arm chandelier in cast iron. It is widely spread over Venice and often decorates the long canal fronts that are narrow.

To light the gardens which stretch around the bay of Sant'Elena and the Giardini Pubblici, a different approach was undertaken. Larger chandeliers on poles were installed. They were equipped with a commercial American type of luminary, made in cast iron and copper, with a medium sized reflector. It could create a luminous flux as high as 10000 lumen, but was usually set to 6000 lumen. The luminaries were placed in the middle of the path, at a height of six and a half metres.



This type of luminary used to be connected with hooks.

*"Roaming through the narrow streets of Venice brings you face to face with the charm of the city, although you might sense a slight sense of insecurity."* (7)



A robust type of luminary for the underpasses.

Although Venice is considered being secure one can still feel uncomfortable as the alleys are winding and often empty at night. Often one cannot see where a path ends due to all the turns and someone could easily be hiding behind a dark corner.

A good thing about the lighting is that harmony is created due to the consistent use of the same types of old luminaries which fit in well in the city. However, the light which is generated is too strong and not cut off properly causing glare. Thus, it is difficult to see people's faces, which in turn causes a sense of uneasiness. Since the same light sources are used everywhere there is not enough variation in light level or light colour. This means that the light does not guide or mark the different importance or hierarchy in the urban plan, making orientation more difficult.

Accent lighting of landmarks is done in an old manner with floodlights. It works from a distance but does not enhance special architectural features. The lighting was planned by engineers, which can explain the type of system that has been used.



Chandeliers with three arms placed on the *fondamenta* of Giudecca.

## Light Pollution

[References: ARPAV (Agenzia Regionale per la Prevenzione e Protezione Ambientale del Veneto), *A proposito di... Inquinamento Luminoso*, [http://www.aap2020.net/Ems/Venezia/Pol\\_Venezia\\_eng.doc](http://www.aap2020.net/Ems/Venezia/Pol_Venezia_eng.doc); <http://www.lightpollution.it/istil/venice/ProcVenicelowres.pdf>; <http://www.lightpollution.it/istil/venice/venicedeclaration.pdf>]

Large parts of Venice are today over-illuminated, especially from the time before Christmas to after Carnival. This problem also occurs in the main tourist areas all year around. The shops want to market themselves after closing hours and brightly lit shop windows together with normal luminaires create a sense comparable to that of during the day. This type of commercial lighting is not always within the context of the historical city. Neither is the one during Carnival, where colourful patterns are projected onto façades. Apart from that the lighting does not change during the night or from season to season. This means that what could be a special and appreciated effect becomes ordinary after a while.

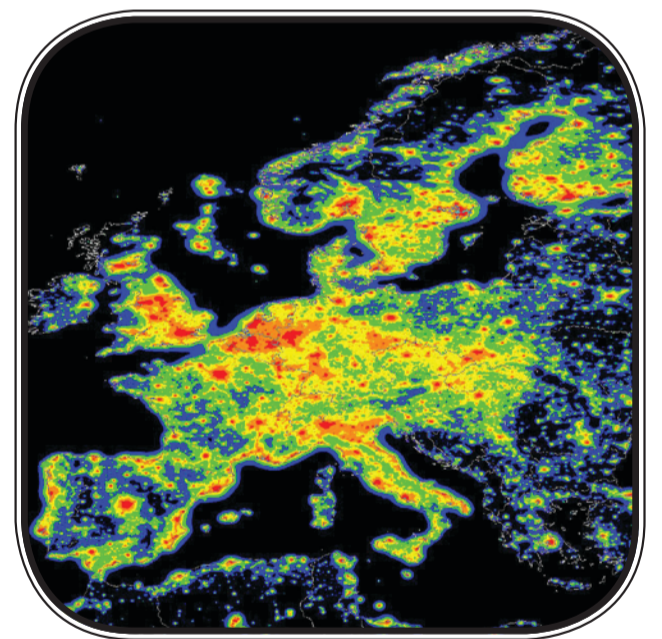
Historically the sky in Venice used to be full of stars as the city, due to its exclusive location, was protected from car headlights. Today progress has caught up with Venice and the lights from industrial Mestre and Marghera can clearly be seen.

Beginning in 2001, the old street lights have been altered to include mercury. With this adaptation came the placement of boxes onto façades and large cables. Not only is mercury toxic, but it additionally has a negative effect upon our nocturnal vision. Mercury is arbitrarily used as light source in street lighting in Venice. These lamps distribute more than three percent of its light upwards which goes against the regulations stated by the Veneto Region (22/97) in order to reduce light pollution. This law is the first of its kind in Italy and aims to protect and improve the ambience in the Veneto region, conserve a balanced ecology in protected environments and to improve the possibilities for scientific research in the astronomic observatories.

In May 2002 a regional meeting was held in Venice on the theme *Light pollution and the protection of the night environment, Venice: Let's save the night*. The International Dark-Sky Association and other participating organisations asked the authorities in Venice *"that the nocturnal environment of the City of Venice be considered part of the historical, artistic and environmental heritage of the city and that it be protected and safeguarded, with its characteristics that make it unique; that its night external lighting systems, both public and private, be planned and installed not only in the full respect of the law for the prevention of the light pollution of the Veneto Region, but also adopting the most effective measures in order to limit the effects of the light pollution and adopting great care to the tradition when choosing the light levels, as deserved by such a world renowned historical city; that the installation of mercury vapour lamps be suspended and those already installed be replaced."* (8)

In 2006 the municipality of Venice developed an environmental energy policy. To save energy a number of things were going to be improved, amongst them the public lighting system. In an attempt to reduce light pollution LEDs (Light Emitting Diodes) were going to be installed in the traffic lights. A special fluorescent light bulb was in addition going to be developed for the chandeliers.

In addition, there are problems with the existing types of luminaires as most of them distribute part of the light to areas where it is not needed. For example has the wall brackets occasionally been shield off towards the façades with black paint as the generated light disturbs residents. This is one of reasons behind light pollution. To improve the situation ARPAV (Agenzia Regionale per la Prevenzione e Protezione Ambientale del Veneto) has made a list of appropriate types of luminaires where the light is directed towards the ground.

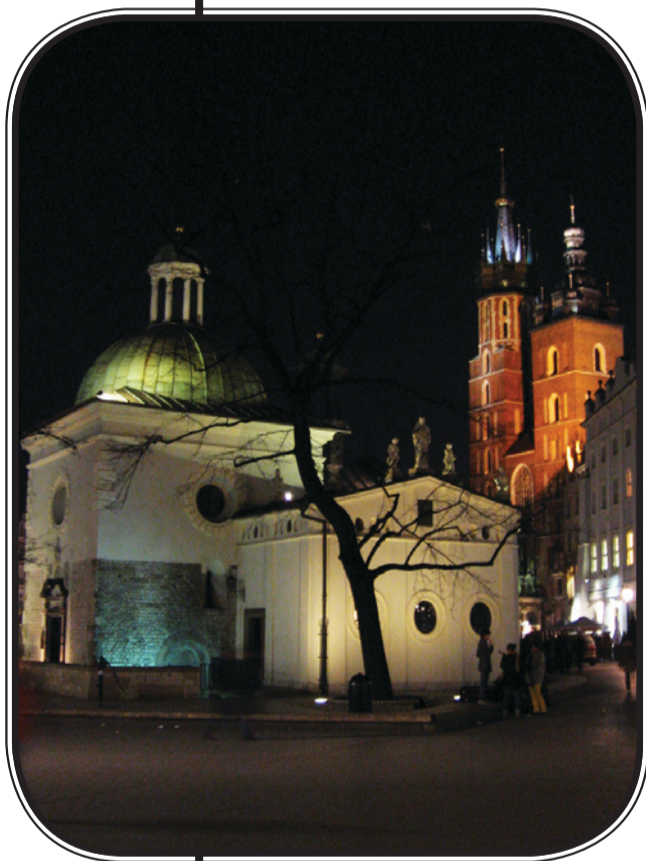


This image of the Earth at night have been obtained from the Defense Metereological Satellite Program (DMSP). It shows light pollution in Europe, where red means more light into space.

# Environmental Lighting Plan

- Proposal

Limitations  
Design Concept  
Urban Lighting Principles Applied on Venice  
Guidelines  
Lighting Masterplan



Inspiration from  
Cracow, Poland, and  
Vienna, Austria.



# Environmental Lighting Plan - Proposal

(Reference: Carmona, M., Heath, T., Oc, T., and Tiesdell, S., *Public Places - Urban Spaces*, p. 96-101)

## Limitations

*Sense of place* is a concept which has been increasingly used since the 1970s. People are thought to have a need to fit into the environment, to feel a sense of identity. The individual identity is characterised by the single person's mark of the environment. This is what creates meaning to a *place*. *Sense of place* can be considered to consist of three basic essentials; physical setting, activities and meaning. The concept of *sense of place* lies in the human interaction between these elements. Sitte's deep and wide squares and Zucker's closed and dominated squares are all variations of the enclosed space. This enclosed mode is the purest expression of a sense of place.

To create a successful public space it needs to be used by people. It must offer what people want and be in a setting which is attractive and safe. When designing a successful public space vital aspects consist of access and linkage, comfort and image, uses, activity and sociability. There are a number of things which can be done to encourage and improve public life in the streets and squares of Venice. Firstly, it is important to reduce the negative impact unoccupied shop fronts have in the squares. Shop fronts could also be improved and equipped with signs that market the business properly and fit into the surroundings. The possibility for market stalls also makes the site more active. The city has numerous landmarks which could be accentuated through lighting. The urban space could also be enhanced if seasonal colour was introduced. This could for example be achieved through the lighting of different objects during the year and by changes in light colour.

The lighting guide is only applicable on the archipelago of Venice with the main island and the six districts Cannaregio, Santa Croce, San Polo, Dorsoduro, San Marco and Castello, together with the surrounding islands of Giudecca, Sacca Fisola, San Giorgio Maggiore, Sant'Elena and San Pietro. The Arsenale is not included as it is an area under the control of the navy. In addition are other areas that are shielded off from public use excluded from the plan.

The boundary of the environmental lighting plan is shown on this aerial photo. The site for the detailed lighting proposal is also marked.

## Design Concept

The environmental lighting plan provides guidelines for a harmonious lighting, which enhances what is characteristic and unique about Venice. The aim is to make Venice active after dark and improve and beautify the environment. Venice should be an attractive place at night for both locals and visitors.

- *Identity* - to design the lighting so that it fits into the context and character of the whole area
- *Importance* - to emphasise hierarchy in the urban layout through different lighting techniques
- *Orientation* - by lighting strategic landmarks
- *Excitement* - by subtle variations in light level and light colour to create reflexes and shadows
- *Contrasts* - to reduce illuminance and create softer gradients between light and darkness
- *Safety* - by highlighting certain paths
- *Aesthetics* - to avoid glare

### Lighting, Economy and the Environment

- Decrease the light level and accentuate specific parts
- Reduce light pollution and save energy by using cut-off luminaries
- Change the existing mercury vapour when possible and to use light sources with a high luminous efficacy and long service life
- Arrange for a timed system so that lights can be turned off during certain hours





# Urban Lighting Principles and Guidelines Applied on Venice

## Guidelines

(Reference: Moughtin, C., *Urban Design: Street and Square*, p. 182-183)

### Safety

The lighting should be designed in a way which is safe for pedestrians, vehicles and boats. Most of Venice is pedestrianised which reduces the conflicts between different users. Piazzale Roma and Tronchetto are the only areas where cars, buses and pedestrians share space. These are also sites where the fast moving post-modern society meets the more tranquil historic centre. Therefore the transition and scale of the lighting system is especially important.

### Security

Venice is a very safe city. However, a feeling of being unsafe can still occur, even if crime is low. Through improved lighting, more people could access and use the public spaces in the city, such as squares and parks. It is a positive cycle as the more people who are out at night the safer the city feels. Moreover reduction of glare would make it possible to see the surroundings and faces of approaching people.

### Aesthetic

To be aesthetically appealing and enable a sense of order it is important that the same lighting principles are followed throughout an area. The artificial lighting should in addition work well together with the pace of the urban space.

Variation in illuminance is important in order to give an exciting impression. Our vision is based on contrasts. If the light level is decreased the experience of effects such as shadows, relieves and reflexes would improve. A lighting which can be changed during the seasons, the time of day and on special occasions is also essential.

The lighting should respect the character and context of the space. By applying an appropriate scale in relation to the buildings and the people who use the space, a sense of harmony can be achieved.

Being one of the main elements in Venice the watercourse has formed the urban layout. It is an important element in the city as it connects one area to another. Navigable canals which have served as important routes have been replaced by rail and road connections. Others have been filled in and are today used as pedestrian paths and work as links in the urban network. Originally the watercourse had the form of paths in the city as it was the main mode of transportation, but since its use has changed with modern society a majority of the canals are today perceived as edges.

The most important pedestrian routes such as those leading to San Marco, Accademia, Ferrovia and Rialto are well signposted and mark the shortest route to the landmark. It is very easy to get lost in Venice since the urban plans of the districts do not relate to each other. The winding pattern of narrow streets and canals often end up in a small square, once full of life and active but today lifeless. The six *sestiere*, districts, in Venice are all independent and have survived through history due to the fact that Venice consists of several islands. The bridges were mainly built to make it easier for people to travel around one district.

As earlier mentioned in the text, there are distinct variations in the urban layout in Venice.

- Traditionally the richest and most successful people in Venice lived in vicinity to Canale Grande or around the squares. This can clearly be seen in the architecture. Additionally, these are the areas most frequently visited by tourists and as a consequence restorations are most common here.

- Urban decay is more evident in the outskirts of Venice, especially in the northern parts of Cannaregio and in Castello. This can both be traced in the architecture and the many empty apartments.

- Modern means of transport and 'newly' built industrial areas have added a different scale and rhythm to Venice, which is mainly prevalent in the western part of the archipelago.

- Giudecca, an island earlier distinguished by its many factories, today has a new identity. Numerous celebrities have houses there while students are accommodated in residences. Sacca Fisola on the other hand, houses many families. Almost seen as suburbs to Venice itself, Giudecca and Sacca Fisola have wider streets and more space.

- Sant'Elena is the greenest area in Venice, with most of the parks open around the clock. It is also an island where many of Venice's inhabitants live and the housing is more modern.

According to Kevin Lynch there are five main physical elements which define a city: paths, edges, nodes, landmarks and districts. These elements were used as a means to briefly analyse the urban structure. I have divided Venice into a number of subcategories with suggestions for different lighting approaches.

Paths - the routes along which most people travel

Main road to Venice and streets in modern areas

The road which leads to Venice from Mestre is on the first part equipped with a type of pole painted blue, which has four coffer luminaires in yellow placed at the top. They are placed in the middle of the road. The second part of the road is wider and closest to Venice and here the lighting consists of normal coffer luminaires at a height of approximately ten to twelve metres. The luminaires are equipped with high-pressure sodium and placed on one side of the road. As the road has two lanes going in each direction this placement does not provide enough light on the entire surface.

The road to Venice is solely used for vehicular traffic, thus the lighting system should provide enough light for vehicles. To cover the width of the road a placement in the middle is advisable. To enable a sense of harmony and visual guidance it is suggested that the same type of coffer luminaire and light source are used both on the road to Venice as well as Tronchetto and the rest of the modern transportation area. The luminaires should be cut-off and direct the light onto the road. High-pressure sodium is an appropriate choice as it has a high luminous efficacy and long service life.

Streets in historical Venice

As the bridge crosses the railway and leads towards Piazzale Roma a new type of modern pole luminaire in green is used. It is made from Philips and is equipped with metal halide with a reflector and the colour temperature is appreciated to 3000 K. The light it emits works quite well; however, the luminaire does not fit into the historical context.

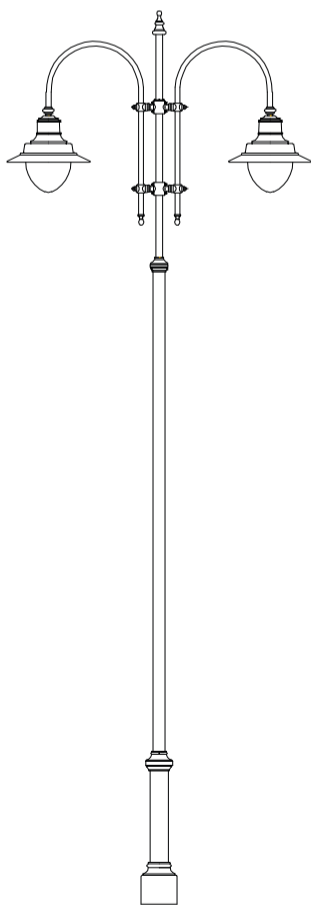


The existing lighting on the road to Piazzale Roma.

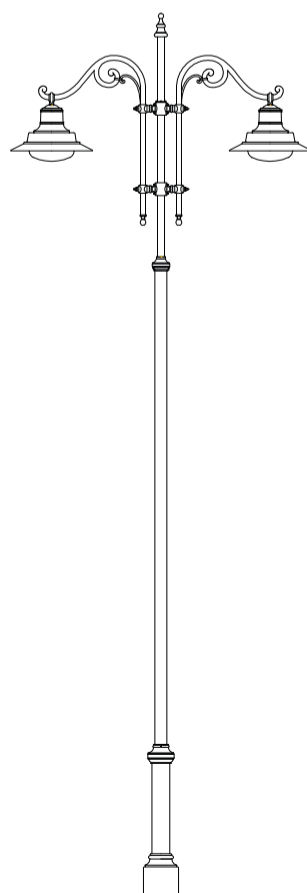
A different type of 'old style' luminaire could be used for the roads in the historical parts of Venice. In order to bring the scale down to fit with the existing buildings in the area and to reduce speed, the mounting height should be no higher than six metres. Where there is a pedestrian sidewalk additional luminaires at a lower mounting height should be placed.

The chosen type of luminaire should be cut-off in order to focus the light downwards and the light colour warm white, colour rendering qualities should also be good.

The Italian company Neri has many 'old style' luminaires which would be appropriate to use in Venice. The different parts; pole, bracket and luminaire can be combined in various ways. The system allows for the placement of luminaires at various heights, thus it provides for separate systems for vehicles and pedestrians. The height of the luminaire is six metres for the roads and its light distribution asymmetrical. It could be equipped with ceramic metal halide 3000 K.



Pole 1305.016  
Arm 4202.290  
Luminary S220A



Pole 1305.016  
Arm 4202.215  
Luminary S221A

Main canals which are thoroughfares for vaporetti and other boats

The existing luminaires produce a distinctive orange light, most likely to be low pressure sodium. As low pressure sodium is monochromatic it has very poor colour rendering. A change to high pressure sodium might be necessary.

Fondamente - paths along the canals

Most of the fondamente which face major canals are all decorated with chandeliers, either with one or three arms. It provides a very characteristic look. The chandeliers are also beautiful to look at during the day. These Austro-Hungarian influenced chandeliers have been reproduced by the Italian lighting company Neri. However, at night the light from the mercury vapour is too bright. The glare can often be explained by the long distance between each chandelier and the high effect. Consequently, the contrasts become too great.

To improve the situation the chandeliers should be equipped with a different light source that has a warm white light and lower effect, to create a warmer ambience. For this to be feasible the socket might need to be changed. The ballast could be laced in the top of the luminaire. A suitable light source is Master White SON which is an improved type of high-pressure sodium lamp with good colour rendering abilities. The light it produces is warm with a colour temperature of 2500 K. The single arm chandeliers could also be used on the *fondamente* which are wide enough and where it is suitable.

Pedestrian paths

Today all the paths are lit in the same way, with mainly two types of luminaries and mercury vapour as light source. The light is bright and causes discomfort-glare. It also disturbs the people who live in the buildings.

To increase orientation and safety the light should be cut-off and directed properly and the light level reduced. It should be possible to see the faces of oncoming people. It is essential that the luminaries are placed in a position that respects people's privacy. Sightlines are important to keep in mind, so that the placement of a luminary and the light it generates do not block the view to a landmark.

- Primary paths, those marked with signs

These types of paths provide the easiest way to get from point A to B. A suitable luminary is the existing wall bracket with frosted glass which used to be connected with hooks. It could be cut off by the incorporation of a reflector. Other appropriate choices include brackets 4012 or 4014 from Neri, depending on how wide the street is. On these brackets, luminary 801 which is frosted fits. To further distinguish the primary paths and to make orientation easier a different light source should be used. It should be equipped with ceramic metal halide 2800 K.

- Secondary paths, commonly used

People who know Venice often choose these paths, they are normally not signposted and not as many people use them as the primary paths. The most frequently used wall brackets can be used if the light is distributed properly by the installation of reflectors. Even if the windows are equipped with closable doors, the light should not disturb and glare must be reduced to a minimum. The existing light sources should be changed, preferably to compact fluorescent with incorporated ballasts. If this is not possible they should be replaced by an improved type of mercury vapour called Super DeLux with...  
 ...a better Ra of 60-69  
 ...higher service life of 16000 h  
 ...a colour temperature of 3000 K

- Tertiary paths, not commonly used

These paths should have the lowest light level. To protect the night sky and to save energy light may not be needed on every path. To enable order and harmony the same luminary as for the secondary paths can be used. The light source should be the same.

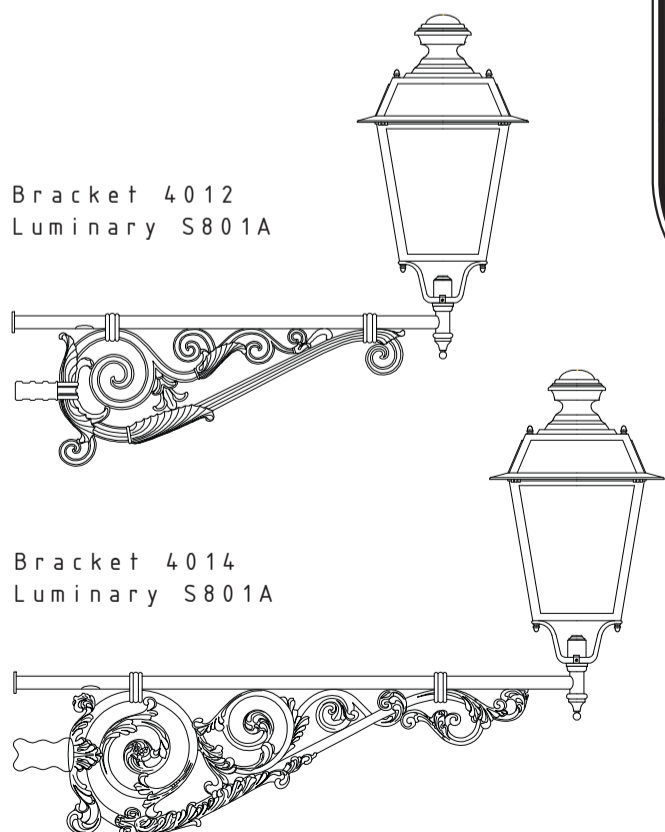
- Paths in parks

It is standard in Venice today to only light the paths and not the greenery with a modern type of luminary which does not blend in very well. This approach creates high differences in light levels and means that large areas are left in darkness. These are often areas where vegetation is dense, in itself a reason to feel unsafe. It should be possible to take a walk in the park and have the ability to see further than the path on which one walks and for everyone to feel safe.

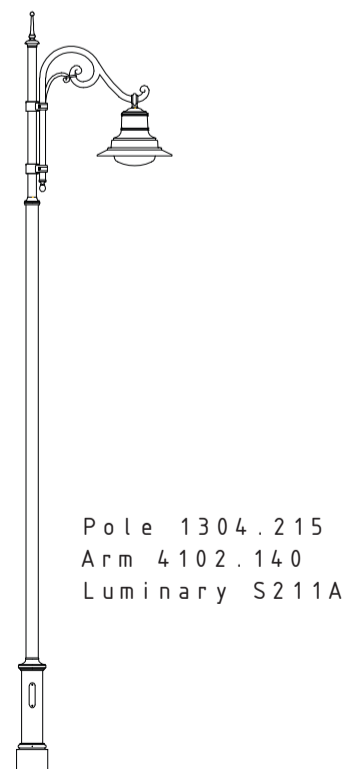
The lighting could be improved by a different type of pole-top luminary and by placing floodlights on poles, to light up strategic trees in the park and give depth to the parks. As there are so few parks that are accessible to the public this would at the same time enhance the green qualities of Venice. Seasonal colour could also be introduced to create excitement and variation.

The Italian company Neri has many 'old style' luminaries which would be appropriate to use in Venice. The different parts; pole, bracket and luminary can be combined in various ways. The light distribution is asymmetrical and it could be equipped with ceramic metal halide 3000 K. [photo on the side].

For the lighting of the trees the exact positioning and type of floodlight has to be chosen after lighting trials. Ceramic metal halide is a good choice of light source.



The existing wall brackets need to be shielded off to prevent light pollution and disturbance.



Edges - boundaries or interruptions between areas

#### Canals

The system of canals provides great opportunities for reflections during the day. To keep this effect at night it is important that light levels are kept low and that it instead is the interplay between contrasts in light and shadow which enable reflections on the surface.

#### Buildings and façades

Through its urban structure Venice has plenty of edges which take the form of façades. People live in most of these buildings; however there are some shops on the ground floors which are often lit at night. Lighting should be used to reveal the rhythm of the space and to make orientation easier.

#### Parks

The lighting of the few public parks in Venice should be improved in order to reveal the seasonal texture of the growing material in the city. It would make a positive contribution as it is difficult to access the greenery at night. Rhythm and depth can be achieved by lighting the canopies of selected trees. This would also improve the view and sightlines in the park which creates a greater sense of safety. The luminaries should be placed on poles in order to reduce the risk of vandalism. What light source which is optimal depends on the type of tree. The colour rendering abilities should be good. To avoid perceiving surrounding areas as too dark quite low contrasts between light and shadow and no glare is important.

Nodes - strategic points in a city which primarily take the form of a junction or a concentration of functions

#### Ferrovia - Train station

Ferrovia is the entry point for thousands of people each day. The modern architecture of the station building stands next to one of Venice's many beautiful churches. The difference looks quite out of place. However, the traditional lighting, with old chandeliers in front of the station works well and binds the spaces together. The general light level should be reduced to avoid glare. A suitable light source is Master White SON or Compact fluorescent. These light sources produce a warm light with a colour temperature of 2500-2700 K.



Ferrovia

#### Vaporetto stations

The many platforms have to be visible at night, even when fog covers the canals. Today's luminaries are modern and do not blend into the surroundings, nor are they beautiful by themselves. The light is indirect, which works well and helps when to locate the station. It is blue at the top of the luminary, where it is transparent, and a white light is focused downwards. A new type of luminary, which works as a transition between the modern vaporetto stop, the old architecture and the chandeliers would suit better.



Vaporetto stop

#### Piazzale Roma - Bus station

Just like Ferrovia, Piazzale Roma is the entry point to Venice for a lot of people. Therefore it is essential that the site makes a good first impression. Piazzale Roma is today lit up by floodlights which are placed on poles and on top of the roof of the multi-storey car park. This lighting system is not pedestrian-friendly. An improved lighting would be pole mounted luminaries of the same type as on the road, possibly with a lower mounting height to bring down the scale, as Piazzale Roma is the transitional zone between the modern road and the historic district. The same light source as what is used on the road, ceramic metal halide 3000 K and with good colour rendering qualities is appropriate.



Piazzale Roma

#### Bridges

There are approximately 400 bridges in Venice, all providing connections between the islands. These nodes are of different importance. It would be inappropriate to illuminate all of them as it would make it less special if too many of the bridges were lit. In darker areas the bridges make beautiful reflections in the canals beneath and they do not require any artificial light.

Today two of the bridges on Canale Grande are lit. The illuminations reveal their importance as links across this major watercourse at night. The existing lighting at Ponte di Rialto and Ponte dell'Accademia should be looked over and improved. Ponte degli Scalzi and the fourth bridge should also be enhanced by lighting. When performing lighting trials it is important to look at the bridge from different positions in order to find the right placements of the luminaries and to reduce the risk of glare.

### Squares

The squares are the meeting points in Venice. This is where a lot of activities occur during the day. The lighting has to take into account what function the square should have at night. Maybe the smaller squares only work as passageways to somewhere else and the bigger squares are the places where people gather. How can the lighting emphasise on the unique qualities of the square and yet fit in with the surroundings?

Campo Ghetto Novo, Campo del Apostili, Campo Santi Giovanni e Paolo, Campo Santa Maria Formosa, Piazza San Marco, Campo Francesco Morosini, Campo Sant'Angelo, Campo Santa Margherita, Campo San Polo, Campo dei Frari and Campo San Giacomo dell'Orio are the main squares in Venice. The lighting of these squares should encourage public life after dark and enhance their architectural features. Here the light should not be provided by wall brackets, but if necessary from pole mounted luminaires. It is important to consider the impact which light from shop windows impose.

Neri produces many 'old style' luminaires and the same style of luminaire used in the parks, are appropriate for the squares. The light distribution is asymmetrical and it could be equipped with ceramic metal halide 3000 K. (photo on the side).

On some of the squares a characteristic chandelier with four arms is placed. It is a restoration made by the Italian company Neri. Each of the luminaires is equipped with four fluorescent light bulbs, providing an immense amount of light. They used to be equipped with incandescent bulbs and the placement of the light sources is in the bottom.

To improve the situation the existing fluorescent bulbs could be exchanged for ones with lower wattage. Otherwise the socket in the luminaire could be replaced so that other light sources would fit and the required ballasts could be placed in the pole. Master White SON would be appropriate. It is an improved type of high-pressure sodium lamp and has...

- ...a Ra of above 80
- ...a service life of 10000 h
- ...a colour temperature of 2500 K

- If there is a dominant feature on the site the hierarchy should be highlighted at night and its characteristics emphasised.
- There should be a combination between light from inside the building and light onto the façade.
- The chosen light sources must work well together with the material of the building. For brick façades Master White SON is the best choice as it displays red tones well.
- Good colour rendering is important for all the lighting on the squares.
- Glare must be reduced to a minimum.

If there are trees on the square and it is feasible they should be lit up. When possible, the contrast between light and shadow from the foliage could be projected onto the ground to create an exciting pattern, just as the sun does during the day.

Lighting trials should be performed at every site in order to decide the exact position of the luminaires.

When lighting a historic building it is important to remember what setting it is in, as modern floodlighting is a rather new invention. Further it is essential to look at the building during the day. Depending on their qualities certain elements can be highlighted through lighting. It is also important to look at the building from different positions at night to reduce glare. To increase modelling and three-dimensional qualities it is better to use less light at an angle towards the façade. During lighting trials the appropriate light sources and position can be determined. The church should not look empty at night so some light should be provided from the interior as well. A good lighting of a landmark makes orientation easier and can provide an attraction in itself. In order for accent lighting to be something special and appreciated it would be beneficial to only light it at certain occasions. It does not for example need to be turned on all night, but only for a few hours in the evening, or only when there is a mass.[9]

### Churches and Campanili

There are many beautiful churches in Venice. Typically the square is focused towards the building. The new lighting of the church should enhance its importance at the site. The lighting of a few *campanili* helps orientation as they provide the highest points in the skyline.

### Bridges

The aim is to illuminate all the four bridges on Canale Grande to further reveal the connection between San Polo, Santa Croce and Dorsoduro with Cannaregio, Castello and San Marco visually. The bridge between Sacca Fisola and Giudecca could also be illuminated. Lighting trials have to be performed at every site in order to decide the exact position of the luminaires. It is important that the lighting fits together with the character of the surrounding area and that it is free from glare. Colour rendering qualities must be good.



Examples of accent lighting of landmarks from Vienna.



## Lighting Masterplan

Districts - areas which are joined together by their identity or character

### *Tronchetto and modern transportation area*

The lighting of the most modern contribution to Venice must be different to that of the historical centre. It should reveal the change in rhythm and make clear what area is for vehicles or pedestrians. Moreover, it is the entry point for many people and it works as a transition zone between the different scales and areas.

### *Historic centre*

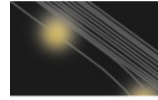
Most importantly, the lighting must respect the architecture and context. Traditionally lighting in Venice was about light and shadow enabled from the sun and moon. Therefore, light levels should be kept low and more emphasis should be on contrasts.

### *"Tourist Triangle"*

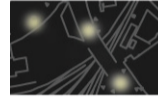
The area called the "Tourist triangle" is full of people no matter what month or what time of day. Consequently, many shops want to market their business after dark and after closing hours. This means that much light is reflected onto the streets. Therefore, the general light level is already sufficient and the need for additional light from wall-mounted luminaries is not as urgent. Cooperation between shop owners and the municipality is necessary to agree on regulations for the lighting. For example, there could be limits set for what brightness that should be allowed for display and restrictions for advertising, both in order to agree on a lighting which fits in Venice and to reduce light levels. Further, regulations and time frames for when diodes are allowed should be decided upon.

### *Sant'Elena*

The qualities of Sant'Elena, with its extensive parks, are rare in Venice. This uniqueness should be emphasised through lighting. It would make the area accessible also at night and extend its use as a green oasis. As trees change during the seasons so should the lighting. This would also create a sense of surprise.



Road to Venice



Roads in Venice



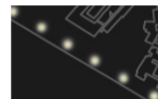
Vaporetto stops



Primary paths



Secondary paths



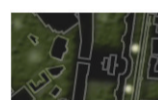
Fondamente



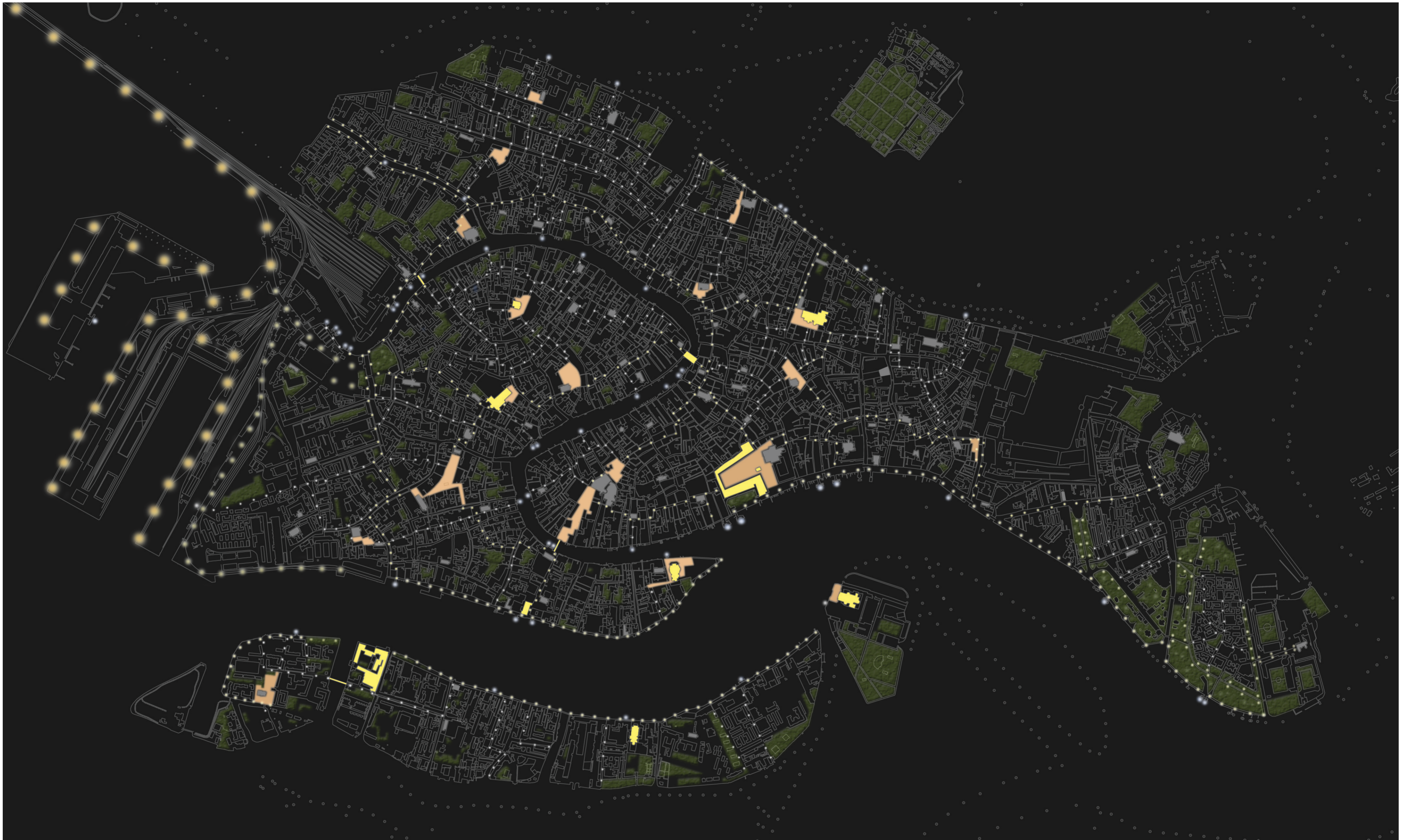
Accent lighting of landmarks



Lighting of squares



Lighting of parks







# The Site

- Campo SS. Giovanni e Paolo

Campo SS. Giovanni e Paolo  
Analysis of the Site and the Existing Lighting Scheme  
Lighting Proposal



Santi Giovanni e Paolo  
and the Scuola Grande  
di San Marco. All  
three are works by  
Canaletto.



# The Site - Campo SS. Giovanni e Paolo

## Campo SS. Giovanni e Paolo

[Reference: Angelo, P., Caccin O.P. M., *Basilica of Saints John and Paul: History and Art*]

After Piazza San Marco, Campo SS. Giovanni e Paolo is the most famous square for its art. The first structure, of what was dedicated to Saints John and Paul, was completed in the thirteenth century. It was donated by Doge Jacopo Tiepolo. With time its importance and popularity grew and it soon had to be reconstructed. Numerous Venetian patricians were chosen to make sure that the church would be completed, and in 1430 it was finally consecrated. During the years a number of Doges chose it as their site for burial. It was the home for the Dominican Friars for about 600 years before the convent was turned into a military hospital in 1806. It is today a civil hospital. A complete restoration was made of the church in the beginning of the twentieth century. During the First World War it was bombed. The damage was of minor nature and it was soon restored.

The façade that faces the canal is made in a monastic Gothic manner, typical for Italy. It is divided into three parts by the two pillars and the rose window has a central position. On each side of the pillars, one smaller window is placed. The top of the façade is decorated with three white tabernacles, which represent three saints. On the top of each pinnacle starting from left rests an eagle [Saint John the Evangelist], the Eternal Father and the Lion of Saint Mark.

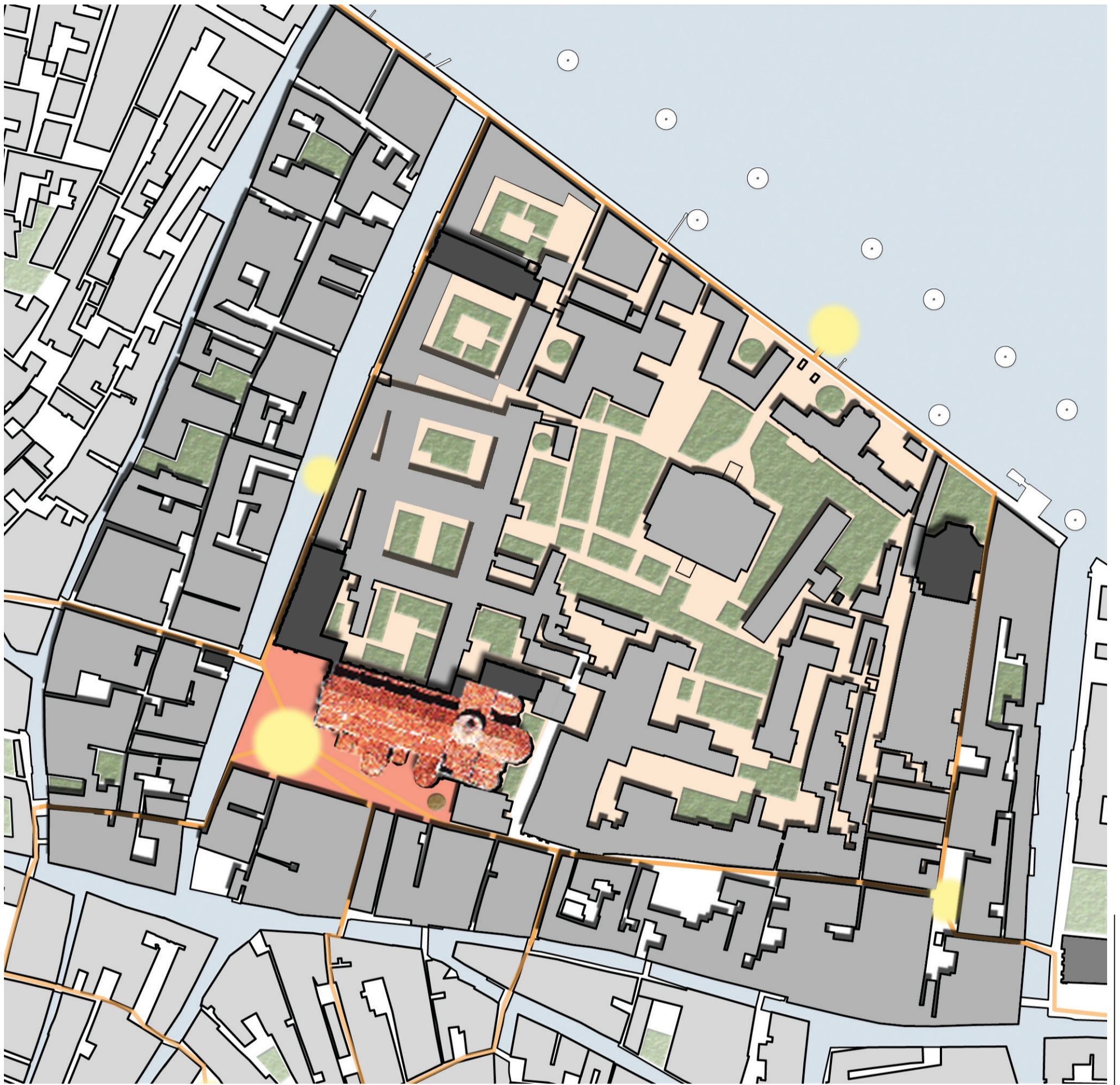
The far side of the church has got what seems to be an additional building attached to it. This is the former Scuola of the Holy Name of Jesus. The following chapel is the one of B. Giacomo Salomoni. Next is the side door of the church. The chapel of Saint Dominic follows and finally a large Gothic window decorates the wall. The glass comes from Murano and features coloured cartoons. An important building for the history of painting in Venice, the former Scuola of Saint Orsola from 1300, is connected to the church. Since 1810 it has housed the Dominican Fathers. On the other side of this building one can see the apse of the church.



One of the six scuole grande in Venice, Scuola Grande di San Marco, is located to the left of the Basilica, facing the square. The statue has been on the site since 1496 and is the result of a competition. It is in memory of Captain Bartholomeo Colleoni, who paid a large sum of money in order to have the monument set up by the Republic. The square was paved in 1592. At the site there is a richly decorated wellhead from the sixteenth century.




*“Without the square there is no city...  
There is no substitute for the  
spontaneous social conflux whose atoms  
unite,  
precisely as citizens of the city” (10)*








Analysis of the site  
Scale 1:2000



-  Buildings within site boundary
-  Buildings outside boundary
-  Church and square

-  Area shielded off from access
-  Paths
-  Nodes

## Analysis of the Site and the Existing Lighting

Like most campi in Venice the space is enclosed, focused towards a main building - the Church of Santi Giovanni e Paolo.

### Activities and Users

Campo Santi Giovanni e Paolo is not on the main tourist route. It seems to be a place, which only those who spend several days in Venice or are there for the second time, make their way to. However, this changes in spring when many visitors discover the qualities of the site. Residents in the area are the main users of the site and children especially seem to appreciate it as a playground for ballgames. An active place during the day with many cafés and bars, it is lifeless at night as most property owners close relatively early. The hospital, housed in the old scuola grande, attracts people around the clock.

### Accessibility/Entrances

The site is accessible from all directions. It is signposted if coming from Santa Maria Formosa and Canareggio. Most of the routes are connected via bridges with stairs, but since there is a hospital on the site disabled persons have access from Fondamenta Nuove. The alleys are all lit up by wall brackets, placed at a height of about five metres.

### Safety and Security

The wall brackets, which are used both in the square and on the paths leading into it, are too strong without being cut off. As they are placed along the façades of the houses the empty areas in the middle of the square are interpreted as too dark, hence the light distribution needs to be improved. The brackets cause discomfort both for the people who live in the houses and for pedestrians. The shop windows provide little or no light at night.



The hierarchy at the site, which is very evident in daylight, is lost at night. The church disappears into the dark and since it is built from brick it does not reflect much of the light. However, the hospital with its light façade appears quite well without being lit.

Mainly wall brackets are used and they have all been equipped with the same light source, hence no variation is created. Many of the wall brackets and chandeliers are due to their placement in the way of sightlines towards the church. Since they cause glare, the beautiful features of the site are lost.

### Luminaires

The square is equipped with the traditional wall brackets and three different types of chandeliers. The chandelier in the middle of the square has got four lights on one pole. On each side of the stairs, leading down to the canal, there is a light pole with three lights in one line. Along the path past the hospital there are also two single chandeliers. The statue has been lit up with a floodlight, which is placed on the roof of one of the buildings.

### Light Sources

Mercury vapour is used in all the luminaires, apart from the one illuminating the statue which is focused on by a warm light and is probably high pressure sodium. The chandelier with four arms has compact fluorescent placed in its sockets. The light distribution is not good and the difference between light and dark too great. It would be better to reduce the wattage to create a softer gradient between light and dark. It is also important to change to light sources which render colours well and to reduce glare.

### Aesthetics

The square has got one standout feature that is the illumination of the statue in the middle of the square. Enabling a nice view from where the light is coming from, it is not cut off in the opposite direction. Therefore it is very uncomfortable to watch the statue from other angles.





Existing lighting  
Scale 1:1000



Single pole chandeliers



Chandeliers with three arms



Chandelier with four arms



Wall brackets



Accent lighting of statue

# Lighting Proposal

## Keywords

Warm - Impressive  
Friendly - Surprise  
Light - shadow

The proposal for the lighting aims to...  
...create a sense of place  
...encourage activity

This will be achieved through...  
...emphasis of the hierarchy of the site  
...light poles to display direction and sense of space  
...seasonal changes  
...contrasts and variation by reflections on the surface of the canal and projected shadows on the ground



Warm atmosphere



Light and shadow

## Luminaires and Light Sources

### Hierarchy - Church

To emphasise the hierarchy of the site the church could both be lit up from the inside and onto its façade. Due to its location on a square where it is going to be passed by people it is not possible to place floodlights on poles from a distance as it would cause glare.

The entrance to the church should be marked with light on both the columns on its sides. Recessed luminaires with a narrow beam spread are appropriate. They should have an IP rating of 68 to withstand water and dust. The door and arch should also be lit. A spotlight with a narrow beam spread could be placed at a distance as long as it is free from glare. Ceramic metal halide 2800 K is an appropriate light source.

The big rose window of the façade that faces the canal, and where the entry to the church is, should be backlit. There is a ledge underneath these windows where luminaires can be placed. In this position they cannot be seen from beneath. An appropriate light source is ceramic metal halide with good colour rendering index. Colour temperature should be decided after lighting trials.

The top of the façade is decorated with three white tabernacles which could be highlighted in order to be seen from a distance. Ceramic metal halide 2800 K with a narrow beam spread could work.

Characteristic Gothic windows are located above the low building on the far side of the church. These windows could be lit from within by the placement of floodlights with ceramic metal halide on the beams in the ceiling. The colour temperature should be the same as for the rose window.

The following chapel is shielded off by a fence. Inside the fence recessed luminaires with an IP class of 68, to withstand *aqua alta* and be protected from dust, could be placed. An adjustable beam makes it possible to light up the façade between the windows softly. The bricks are best rendered with a warm light. Ceramic metal halide 2800 K with a narrow beam spread is appropriate.

Above the Gothic windows and chapel there is a second level on the façade. As this level stretches towards the sky it should be made lighter. Wall-washers could be placed and hid on the roof. A ladder is placed on the roof which makes access and maintenance easier. Master White SON should be used to enhance the bricks in an optimal way.

The highest point of the church is the cupola and it is therefore suitable to reveal it with light. Behind the bells there is room to place a floodlight with ceramic metal halide 2800 K. On top of the big cupola a smaller one is placed. This could be lit with a spotlight from within.



The top cupola of the church should be lit up in the same way but with a colder light colour..



By lighting the cupola the full height of the building would be seen at night. Photo from Cracow.

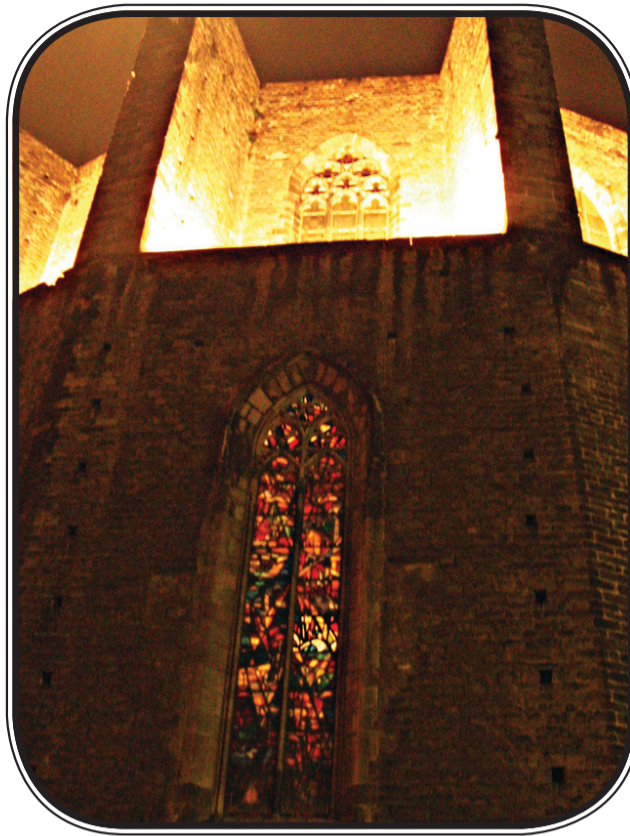


Photo of a church in Barcelona where the windows are backlit and the top of the church highlighted.



Direction and sense of space

*Direction - Sense of Space*

Neri produces many 'old style' luminaires and the same style of luminaire used in the parks, are appropriate for the squares. The light distribution is asymmetrical and it could be equipped with ceramic metal halide 3000 K. (photo on the side).

To reveal a sense of space and frame the square the pole-top luminaires should be placed in a row along the edge, a couple of metres in front of the buildings. The light enables visual direction and is free from glare.

*Seasonal Changes - Tree*

To highlight the differences during the year the tree on the site could be lit from underneath. Since the site is under the risk of being flooded it is important to choose a luminary with an IP rating of 68. This is the highest class and ensures that it can withstand water and dust.

Two in-ground luminaries can be placed up to two metres from and on each side of the trunk; the light source should be ceramic metal halide 3000 K. To project shadows from the foliage onto the façade of the church and ground, a floodlight with ceramic metal halide 3000 K can be placed on the top of the roof. Exact positions must be decided after lighting trials.

*Contrasts and Variation*

Subtle contrasts in light levels together with a variation in light colour create an exciting square. Reflexes from the water in the canal and shadows from the foliage of the tree further enhance the space.

The large Gothic window with coloured glass is a beautiful feature inside the church when the sun is out. At night this could be displayed to the outside if it is lit up from within the church. Ceramic metal halide could work as a light source. It is important that the floodlight is placed in a position where it can not be noticed.

On the other side of this building one can see the apse of the church. The lighting technique should be the same as for the chapel on the far side. At ground level up-lights on stakes could be placed on the lawn as it is shielded off from public use by a fence. On the second level the luminaires could be placed on the balcony. The bricks are best rendered with a warm light. Ceramic metal halide 2800 K with a narrow beam spread could work.



The beautiful stained glass window of the church.

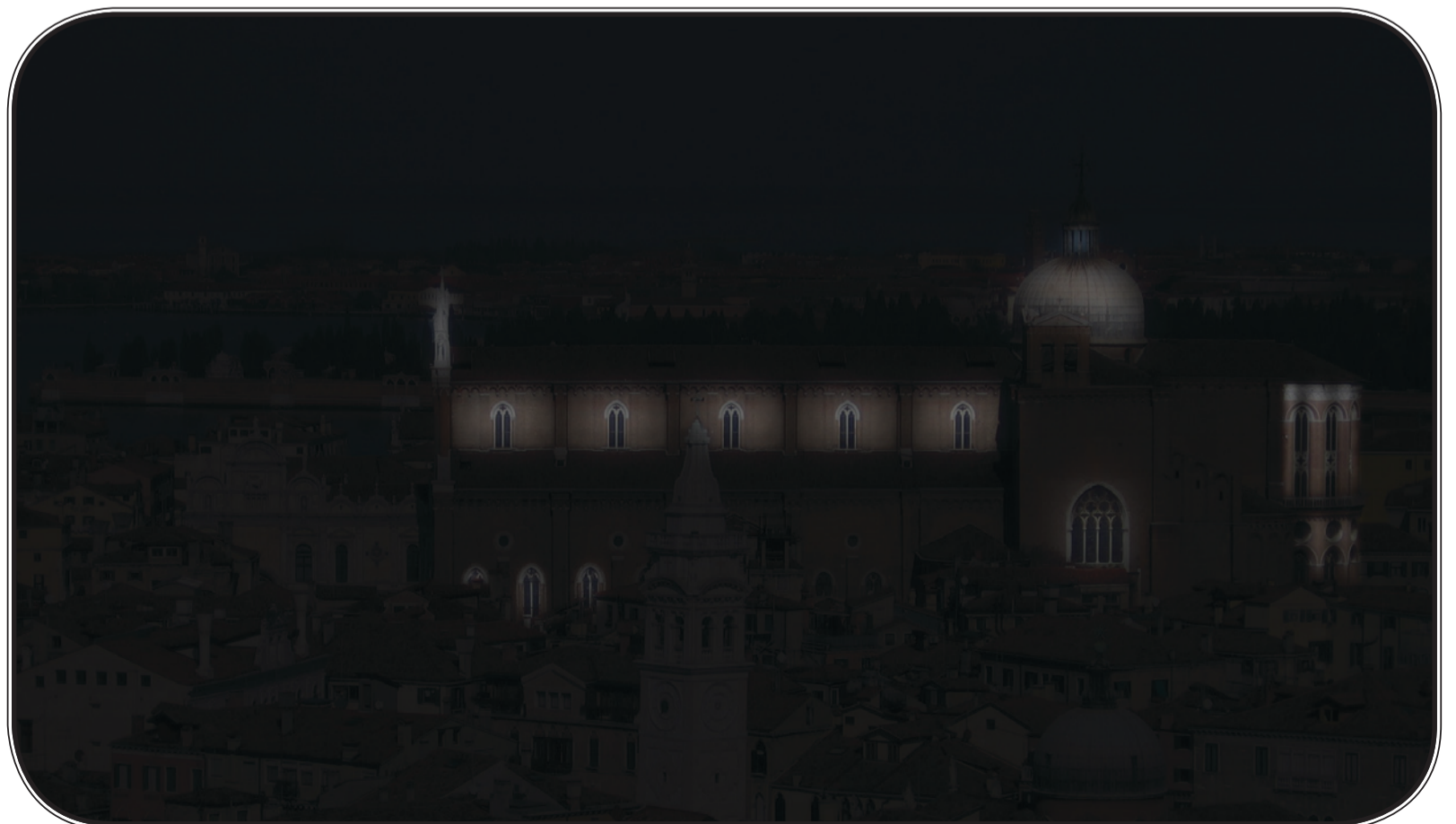


By lighting the church from the inside as well as the outside it looks active. Photo from Vienna.

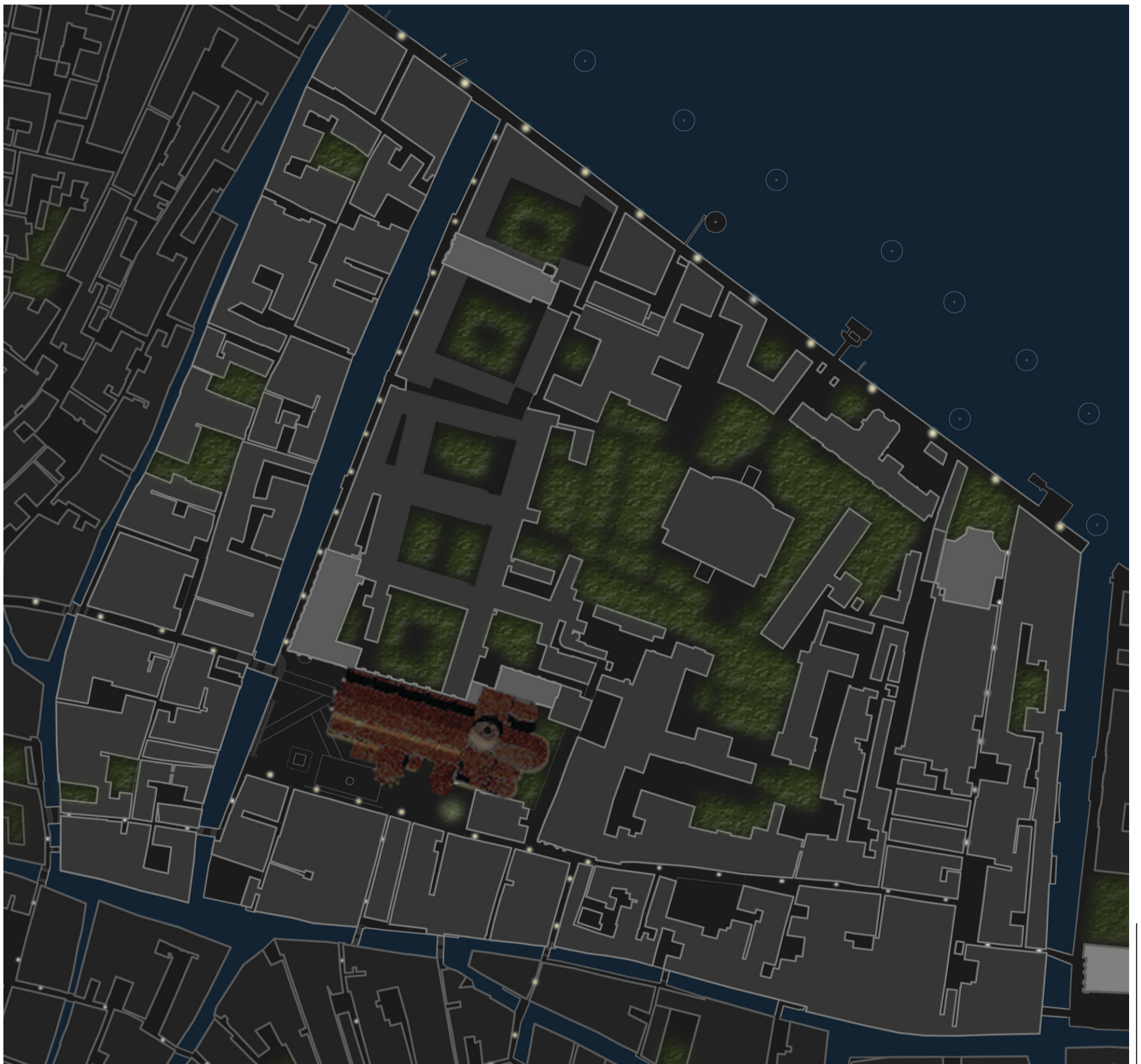


The tree could be lit with two recessed luminaries with metal halide and one floodlight on top of the roof. That way shadows could be projected onto the ground, just like during the day.

Illustration of the lighting could look like from *campanile di San Marco*.







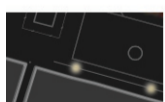
Lighting proposal  
Scale 1:2000



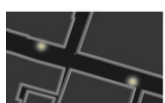
Chandeliers with Master white SON on Fondamenta Nuove



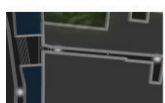
Single pole chandeliers with Master white SON



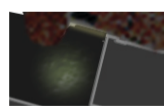
Pole luminaire from Neri with metal halide



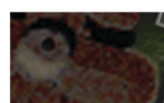
Wall brackets from Neri with metal halide on primary paths



Wall brackets with compact fluorescent on secondary paths



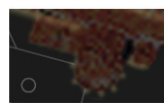
Lighting of tree with recessed luminaries and floodlight



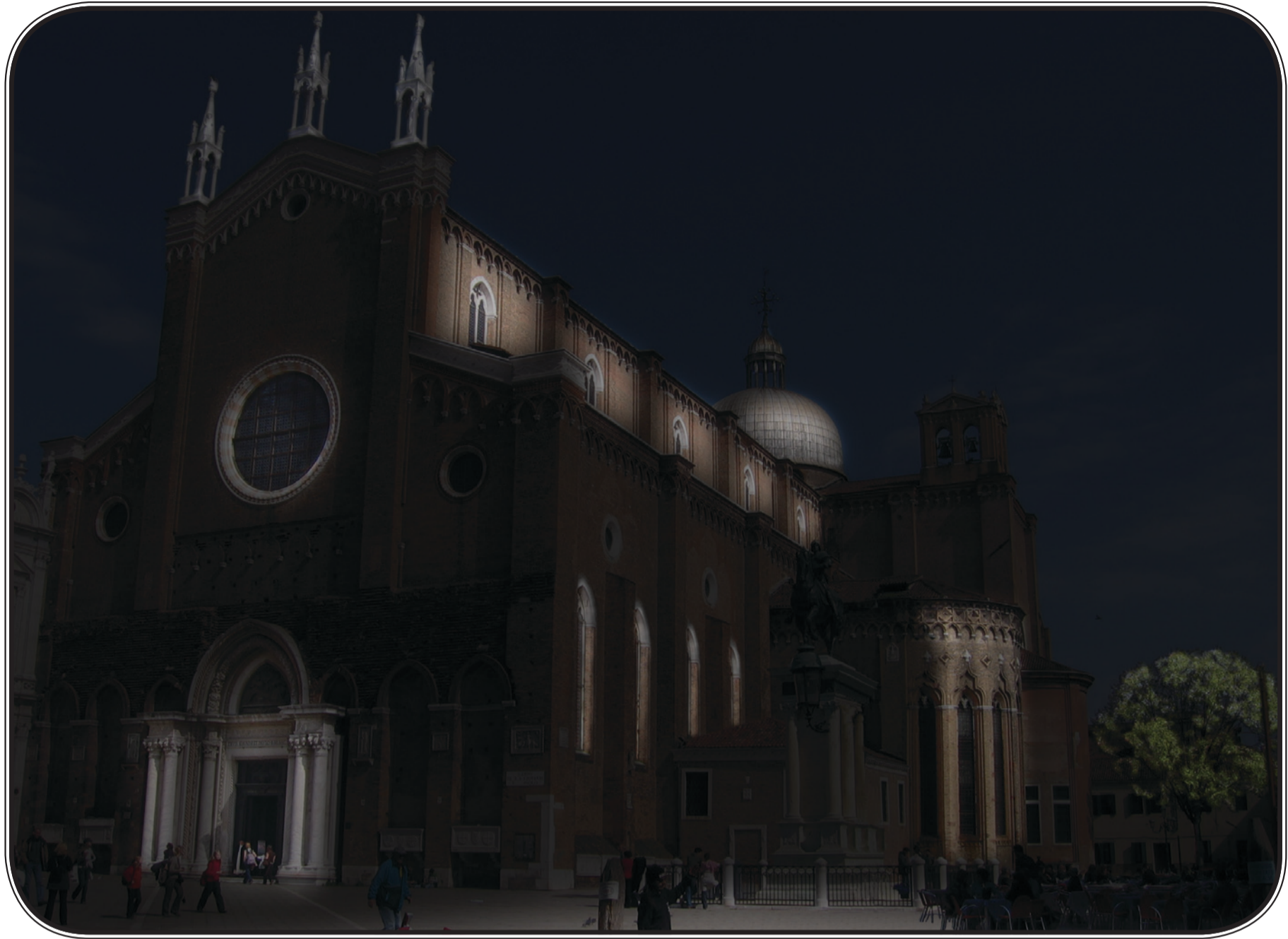
Lighting of the apse and cupola



Lighting of the tabernacles, rose window and entrance



Lighting of facade and chapel with warm light



Illustrations of the proposed lighting design for the site.



# Reflections

## ...about the process

My time in Venice turned out to be somewhat different to what I originally had in mind. At the same time, it has provided me with many great experiences. My first problem turned out to be the language barriers as the university staff and professors only speak Italian. Secondly, communication proved to be even more difficult due to the hierarchy between teacher and student. Thirdly, the willingness to help students is not as profound as it is in Sweden. Together this meant that I was basically 'on my own' whilst working in Venice.

The IUAV had plenty of material on the essential subjects; the problem was more how to limit my theoretical studies as there was so much information to go through. To move and study in a place abroad, without family or friends, makes it difficult to distinguish between studies and normal life. As part of the process included an analysis of Venice, I never completely forgot about my work when walking around the city. I could not discuss ideas or show sketches to an expert in the subject while being abroad. I found it quite difficult to explain the situation or problem to somebody in Sweden who does not know Venice as well as I do. From time to time this made my work frustrating and I had to trust my own ideas and knowledge to a great extent. Looking back, I think my previous studies abroad have helped me as well as my preceding work experience. During that time I got far less feedback than what is offered at SLU.

The reason why I chose to go to Venice was partly because a Master Degree in lighting design used to be offered by the IUAV. Therefore, I assumed there would be no problems to arrange lighting trials. I soon learnt that that was not going to be the case. Lighting trials are not common practice in Italy, or at least not when educating future lighting designers, as they are supposed to 'think light' and visualise it on the computer. Consequently, I had to change my approach for the lighting proposal and render images of what the site could look like in reality. This method of course has its limits as you can never be sure if this is the way the actual lighting is going to look like.

## ...about lighting

Like in many fields, Venice was early to adapt to the new technique and develop a lighting plan. The system was considered modern at the time but has aged without modernisation. Once a leading city in art and architecture, I think Venice today struggles to create something of its own, apart from that which is created solely for tourism.

The change to mercury vapour as a light source was begun in 2001. Mercury lamps were the light source next developed after low-pressure sodium, which is why it is surprising that the municipality of Venice would decide to use it at a time when there are several more appropriate options to choose from, with lower mercury content, higher luminous efficacy and better colour rendering abilities. The following year the International Dark-Sky Association held its regional meeting in Venice on the theme "Light pollution and the protection of the night environment, Venice: Let's save the night" where they asked the authorities in Venice to stop the installation of mercury as light source and replace the existing ones. It was advised to adopt great care when choosing light levels and to limit light pollution. They further asked that new lighting would go hand in hand with the heritage and unique characteristics of the city. As of today the lighting in Venice is yet to see the results of this meeting.

The work to replace mercury as a light source has now begun and the chandeliers are the first luminary to get equipped with compact fluorescents. Four lamps per luminary are installed and each pole contains four luminaries. If one assumes that the wattage for each of these lamps is 20 W it means that the entire luminary generates 320 W. Firstly, one can question if such a large amount of light is needed. Secondly, is it not better to change the sockets and use a different light source which alone emits enough light? Moreover, it is not all that easy to change light sources in 'old style' luminaries with mercury vapour. The socket most likely needs to be changed and there must be enough room for the ballast, either in the luminary itself or in the pole.

With a conservative past when it comes to architectural changes, it is surprising what type of lighting that is allowed in the city. For example, the lighting during Carnevale in 2007 did not respect the site at all. Was it done to please the masses of tourists that entered the city or was it simply a good opportunity for advertisement for iGuzzini? How a city such as Venice can treat their heritage this way is to me an obscenity. In addition, I find it interesting that one is allowed to place coloured diodes wherever one feels like, or at least that is the impression I got. I even saw diodes attached to the façade of one of the churches! The IUAV educates great numbers of architects every year which is why it is unexpected that engineers have designed the accent lighting of the city's landmarks.

A law which contains regulations to prevent light pollution in the Veneto region has existed since 1997. In this law it is stated that the light into the sky should be less than three percent of the total light emitted. It is however an aim that it is reduced to no light at all. A majority of the luminaries in the city cause glare and spread light where it is not needed. During my time in Venice I saw no attempts to reduce unwanted light into the sky, apart from that of residents who painted the glass on the wall-brackets to keep light from shining in through their windows. In general a lot of time and money seems to be spent on talking about the problems and to form regulations. It all looks very good on paper; however, action is yet to come.

... about cultural differences

The cultural differences regarding light that I had earlier read about exist, both regarding colour temperature and glare. The light is generally colder in temperately warmer locations such as Venice, even though according to me, it would be more appropriate with a warmer light colour, due to the original lighting of the city. As mentioned throughout the text, glare is a common disturbance. In Sweden we tend to use partly or fully cut-off luminaries whereas Italy does not. As a foreigner I have questioned if the locals do not get annoyed with the strong light, or if it is just me who is bothered. Roberto Corradini gave me one explanation. He said that glare exists all over the country and that there are few examples of good lighting, it (good lighting) is something the general public has rarely experienced. What you have not seen and do not have knowledge of you do not question.

The question of safety posed another difference. It is in Venice common to see cables in the air or attached onto façades together with transformers. Some of these can be traced to private installations, such as those for restaurants. Here it can be explained by climatic differences, as the Mediterranean climate makes the outdoors enjoyable during a large part of the year, whereas in Sweden is not. However, a majority of the visible cables come from luminaries installed by the municipality. Apart from being unsafe it poses a negative impact on the surroundings and ambience of the space.

... about the result

My work has become more theoretical than I first anticipated. This is mainly due to the fact that I could not perform lighting trials and spent more time writing than I previously had planned. As I could not perform lighting trials it is impossible to choose the exact type of luminary and its positioning. Therefore I only formed a concept for Campo Santi Giovanni e Paolo that I visualised in Photoshop. The feasibility of the result can of course be questioned, but as this is not a design that is going to be installed in reality it is acceptable. One can only hope that lighting trials are organised for 'real' projects!

When I created the guidelines for the lighting masterplan I took into account the problems of light pollution and glare. As the 'old style' luminaries suit well in Venice I chose to keep them. These luminaries are not good for light pollution or glare today and therefore needs to be equipped with reflectors to refrain light into the sky. I believe that the challenge to replace them with other luminaries would be too great and costly. There is a slight contradiction about using recessed luminaries since they contribute to light emission into the sky. However, as I chose to place them underneath the tree the canopy and foliage absorbs most of the light. Further, it will not be turned on in winter. I also chose to place recessed luminaries to light up the façade of the church. In this case the optic is asymmetrical and therefore the light is not directed into the sky.

... about the future

The most visible threat to Venice is the continuous influx of tourists and a monoculture that does not seem to have an end. Tourism does not affect the existence of the city but it might jeopardise its survival as a city as many Venetians abandon it. Today there are still some areas which are solely for locals. If the increase in tourism continues this might change. However, it does not seem as though the Venetian authorities want to reduce this source of income. Fondamenta Zattere is currently being widened so that passengers of cruise ships can board this part of Venice.

Back to the key issues;  
*Can improved lighting serve as a means of revitalising the city of Venice?*

I believe that improved lighting would make the city more attractive for the people who live there as it currently disturbs many of its inhabitants with glare and high light levels. It also poses a negative impact on the architecture and ambience due to the choice in light source which creates an unnatural colour rendering for its purpose.

Good lighting is an attraction in itself and it has been shown that it is good for the economy. A modernised system would not only save money due to more efficient light sources and properly directed light, but could further make people spend more time in the city. Together this would benefit locals as well as tourists. Locals are the ones that spend every day life in the city. Consequently, they are the ones who would get most pleasure out of new guidelines for the lighting.

*Could the campo once again work as a meeting place and establish an identity to the area?*

As there is at least one major campo in every identified district, this is the apparent place for people there to meet. This means that the locals themselves create the identity or sense of place of the site, which I believe can be further strengthen by an improved lighting that makes the square accessible and usable also at night.



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Inspiration  
Endnotes

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## I m a g e s

The photographs used in the thesis are my own.

Page 13, sketches

*Le prospettive di Venezia, dipinte da Canaletto e incise da Antonio Visentini*, (Mestre: Grafiche Vianello srl/VianelloLibri)

Page 16, paintings

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Page 46, light pollution in Europe

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Page 57, paintings

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www.wga.hu

Page 57, sketch

*Le prospettive di Venezia, dipinte da Canaletto e incise da Antonio Visentini*, (Mestre: Grafiche Vianello srl/VianelloLibri)

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25/08/2006

## F a i r s

A visit to Euroluce in Milan on the 22nd and 23rd of April, 2007.

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